FMCSF 19.3.2
FMR+HR 7.3
9/1/98

ENVIRONMENTAL RESOURCES MANAGEMENT GROUP

GROUNDWATER SAMPLING PROGRAM

5-YEAR DATA EVALUATION REPORT

FMC CORPORATION
FORMER FMC PESTICIDE FORMULATION FACILITY
YAKIMA, WASHINGTON

Prepared By:

ERM-West, Inc.
915 118th Ave. SE Suite 130
Bellevue, WA 98005

SEPTEMBER, 1998

ERM

USEPA SF
1395982

TABLE OF CONTENTS

	Page
LIST OF TABLES	iv
LIST OF FIGURES	v
LIST OF ACRONYMS	vi
EXECUTIVE SUMMARY	**VII**
SECTION 1.0	**1-1**
INTRODUCTION	1-1
1.1 Site Background	1-1
1.2 Environmental Setting	1-3
1.3 Remedial Objectives	1-3
1.4 Groundwater Monitoring Workplan Modifications	1-5
1.5 Site Hydrogeology	1-6
SECTION 2.0	**2-1**
SITE CHARACTERIZATION	2-1
2.1 Source Area	2-1
2.1.1 Boundary Zone Between Areas 4 and 5	2-1
2.1.2 Area 6	2-4
2.1.3 Former Disposal Pit Area	2-4
2.1.4 Undiscovered Source Areas	2-5
2.1.5 Discussion	2-5
2.2 Compounds of Concern	2-7
2.3 Extent in Groundwater	2-11
SECTION 3.0	**3-1**
FATE AND TRANSPORT	3-1
3.1 Transport to Groundwater	3-1
3.1.1 Solubility and Soil Affinity	3-1
3.1.2 Source of Water	3-2
3.1.3 Advective Groundwater Transport	3-5
3.1.4 Colloidal Particle Transport	3-5
3.2 Fate in Groundwater	3-10
SECTION 4.0	**4-1**
RISK ASSESSMENT	4-1
SECTION 5.0	**5-1**
DATA EVALUATION	5-1

TABLE OF CONTENTS

	Page
SECTION 6.0	**6-1**
CONCLUSIONS	6-1
SECTION 7.0	**6-1**
RECOMMENDATIONS	7-1
SECTION 8.0	**8-1**
REFERENCES	8-1

TABLE OF CONTENTS

APPENDIX A	GROUNDWATER ANALYTICAL DATA
APPENDIX B	BORING LOGS AND MONITORING WELL AS-BUILTS
APPENDIX C	HELP MODEL OUTPUT

LIST OF TABLES

Tables		Page
TABLE 1-1	Groundwater Elevations (1997)	1-8
TABLE 2-1	Summary of Soil Sample Analytical Results	2-3
TABLE 3-1	VOC Concentrations in Groundwater	3-3
TABLE 3-2	Summary of Water Balance Computations	3-4
TABLE 3-3	Comparison of Filtered and Unfiltered Sample Concentrations in the W-13 October 1997 Sample	3-9

LIST OF FIGURES

Figures		Page
FIGURE 1-1	Topographic Map	1-2
FIGURE 1-2	Potentiometric Surface (1997)	1-4
FIGURE 2-1	RI Area Designations	2-2
FIGURE 2-2	Dieldrin Concentrations in Phase II Pit Excavation Confirmation Samples	2-6
FIGURE 2-3	Concentration of Aldrin plus Dieldrin in Selected Wells	2-8
FIGURE 2-4	Concentration of DD-Series in Selected Wells	2-9
FIGURE 2-5	Concentration of Endosulfans in Selected Wells	2-10
FIGURE 2-6	Organochlorine Compounds in Groundwater October, 1997	2-12
FIGURE 2-7	Organochlorine Compounds in Groundwater, September, 1995	2-13
FIGURE 3-1	Endosulfan Concentration versus Water Level in W-13	3-6
FIGURE 3-2	Dieldrin plus Aldrin Concentration versus Water Level in W-13	3-7
FIGURE 3-3	June, 1995 Ratio of Aldrin to Dieldrin in Groundwater	3-11
FIGURE 4-1	Water Well Survey Locations	4-2

LIST OF ACRONYMS

Acronym	Definition
ANOVA	Analysis of Variance
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CR	Carcinogenic risk
FMC	FMC Corporation
HELP	Hydrogeologic Evaluation of Landfill Performance
MDL	Method Detection Limit
NPL	National Priorities List
PQL	Practical qualification limits
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compounds

EXECUTIVE SUMMARY

The FMC Yakima Pit site consists of a 58,000 square foot area where pesticide dusts and liquids were processed between 1951 and 1986. From 1952 until 1969 wastes associated with the pesticide processing were disposed of in an onsite pit. After 1969, waste materials were disposed of offsite. Liquid products were blended onsite in the 1970s using solvents, emulsifiers and stabilizers. Accidental releases of the liquid materials contaminated soil and concrete at the site.

A Remedial Investigation (RI) was conducted at the site in 1988, and removal actions consisting of excavating, removing and disposing over 850 tons of contaminated soil were completed in 1988 and 1989. In 1990 a Record of Decision (ROD) for the site was implemented. The ROD addressed the contamination that remained in the process areas and some contaminated soil beneath the former disposal pit. The ROD specified removal of additional pesticide- and metal-contaminated soil, and some buildings and concrete structures. The soil excavation and structure demolition was completed between August and December 1992. Approximately one-third of excavated soil was cobble, which was determined to be clean and returned to excavated areas. The balance of the soil was incinerated or disposed offsite as hazardous waste. The ROD specified a groundwater monitoring program be implemented to monitor the effect of the contaminant source removal on groundwater (Bechtel, 1994).

The groundwater monitoring program has been conducted by ERM since December, 1993 on a quarterly basis. During 1993, quarterly monitoring was completed by others. The program has shown that since completion of the removal actions, the following pesticide compounds that were previously present in groundwater are no longer detected.

- Endrin-series compounds last detected in March, 1995;
- Dicofol, ovex, and perthane last detected in June, 1994.
- 4,4-Methoxychlor last detected in April, 1994;
- Heptachlor epoxide last detected in July, 1993, and heptachlor last detected in April, 1993;
- Chlordane last detected in August, 1992; and,
- Toxaphene and captan last detected in March, 1991.

Pesticides that continue to be detected in groundwater are the organochlorine pesticides DDT, aldrin, dieldrin and endosulfans. Of these compounds, only

dieldrin and DDT are present at concentrations that exceed risk-based (10^{-6} cancer risk) concentrations.

This report evaluates the groundwater monitoring data collected to date at the site. The extent and seasonal fluctuation in concentration of the organochlorine pesticides still present in groundwater is evaluated. The transport mechanisms that effect organochlorine pesticides in groundwater at the site are discussed, and the ultimate fate of these compounds is determined.

Results of these evaluations suggest that the extent of the organochlorine pesticides still present at the site is stable (i.e., plume positions are not moving). A seasonal fluctuation in concentrations, caused by recharging irrigation water that increases groundwater elevations, is apparent.

There is minimal potential of risk to human health or the environment from these compounds in groundwater provided there is a restriction of on-site use of groundwater. Because of the minimal potential risk, and the stability of the contaminant plumes, the following recommendations are made.

- Institutional controls restricting the use of site groundwater should be implemented.
- Groundwater monitoring should be continued at the site until organochlorine pesticide compounds still present in groundwater at the site are no longer detected. The frequency of sampling, and number of wells sampled, however, should be reduced to reflect the limited area of risk-based exceedances.

SECTION 1.0

INTRODUCTION

FMC Corporation (FMC) has completed the removal of approximately 6,000 cubic yards of soil and on-site incineration of approximately 3,800 cubic yards of soil at FMC's former agricultural chemical site in Yakima, Washington. This work was conducted following the *Remedial Action Work Plan* (dated January 30, 1992) approved by the United States Environmental Protection Agency (USEPA) pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Record of Decision (ROD). The ROD requires FMC to conduct a five-year groundwater monitoring program to demonstrate the effectiveness of the site remedial actions.

To satisfy requirements for groundwater monitoring during various stages of the site investigation, FMC installed a network of monitoring wells. Fourteen rounds of sampling have been completed to satisfy the ROD requirement. Quarterly monitoring was completed for four years; currently sampling is completed semi-annually. All sampling events have been conducted as described in the report entitled *Long-Term Monitoring Plan* (ERM, June 1994). Analytical results of these sampling events, as well as results from previous sampling events, are presented in Appendix A.

This report evaluates the groundwater monitoring data collected to date. The objective of this evaluation is to support the FMC and USEPA 5-year review of the groundwater monitoring program. The format of the report is as follows:

Section 1.0 Introduction

Section 2.0 Potential Source Area Analysis

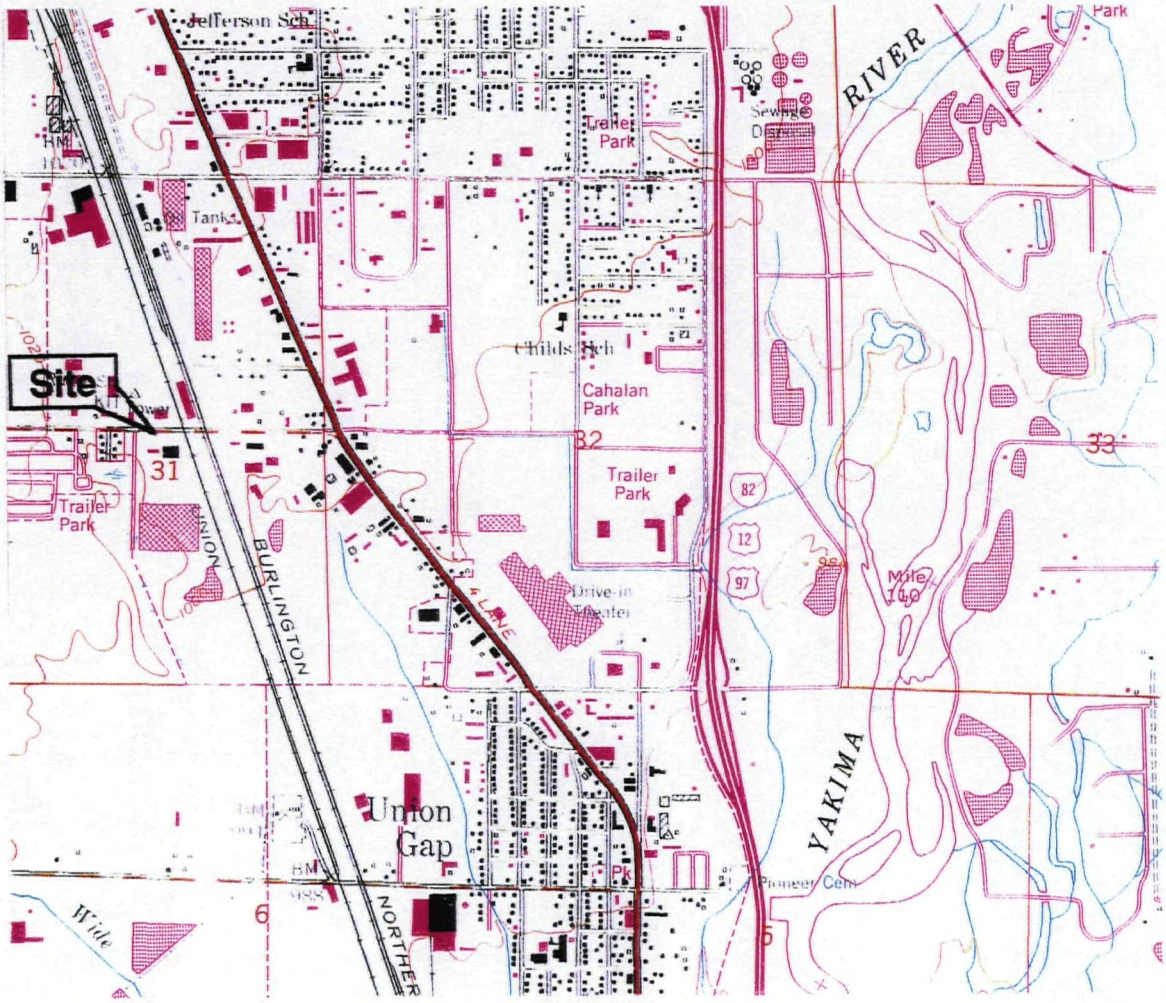
Section 3.0 Fate and Transport

Section 4.0 Data Evaluation

Section 5.0 Conclusions

1.1 Site Background

The former FMC Yakima pesticide formulation facility is located at Four West Washington Avenue (Figure 1-1), approximately 1 mile east of the Yakima Municipal Airport in Yakima, Washington. The site consists of a 58,000-square-foot fenced area leased from the Union Pacific Railroad. FMC operated the facility from 1951 to 1986. Waste materials and an estimated 2,000 pounds of



1" = Approx. 2000'

0 2000'

Base From USGS
7.5 Minute Topographic
Map Series, Yakima East
Washington Quadrangle (1985)

Figure 1-1
Topographic Map
Former FMC Pesticide Formulation Facility
Yakima, WA

ERM-West, Inc. 8'95
2672.07/WDK/08.01.95

various chemicals were dumped into an on-site disposal pit between 1952 and 1969.

A preliminary investigation was conducted for USEPA in 1982, and the site was subsequently placed on the National Priorities List (NPL). An Administrative Order issued by the State of Washington in 1983 required a study of the former disposal pit area. USEPA issued a Consent Order in 1987 requiring an RI/FS for the site. The RI/FS was followed by FMC's removal of the pit contents in two phases between 1988 and 1989. A Superfund Record of Decision (ROD) was issued in 1990 to specify selected remedies to address residual site contamination. Subsequent remedial actions included removal of additional contaminated soil and concrete as well as groundwater monitoring.

Structures remaining on the site include an office building, a warehouse with loading dock, and a parking lot. The property was sold by the railroad in 1992. The site currently contains an active metal fabrication facility and parking lot. Figure 1-2 shows these structures, the location of the former disposal pit, and the groundwater monitoring wells.

1.2 Environmental Setting

The former FMC Yakima site slopes to the southeast with a grade of less than one percent. The property is outside the 500-year flood plain of the Yakima River 1.5 miles east of the site and Wide Hollow Creek, which is approximately 1 mile south of the site. No surface water bodies or wetlands exist on the property. Vegetation within the fenced site is limited to weedy forbs and grasses.

1.3 Remedial Objectives

The remedial objective of the groundwater monitoring program is to demonstrate that previous remedial actions on the site have been successful in protecting human health and the environment. The ROD specified soil cleanup levels for dieldrin, endosulfans and DD-series compounds (DDD, DDE, and DDT) along with a number of additional compounds. ROD specified cleanup levels have been attained for all site soils with the exception of areas discussed in Section 2.0. In addition, the ROD specified a five year groundwater monitoring program to evaluate and confirm contaminant source removal.

In accordance with provisions of the ROD, the Yakima groundwater monitoring program is intended to determine if:

- Health-based concentrations of chemicals are achieved;

CAD File:	Drawn By:	Date:	Project No.
FMC-1-2	N. Dieterich	8/10/98	2672.73

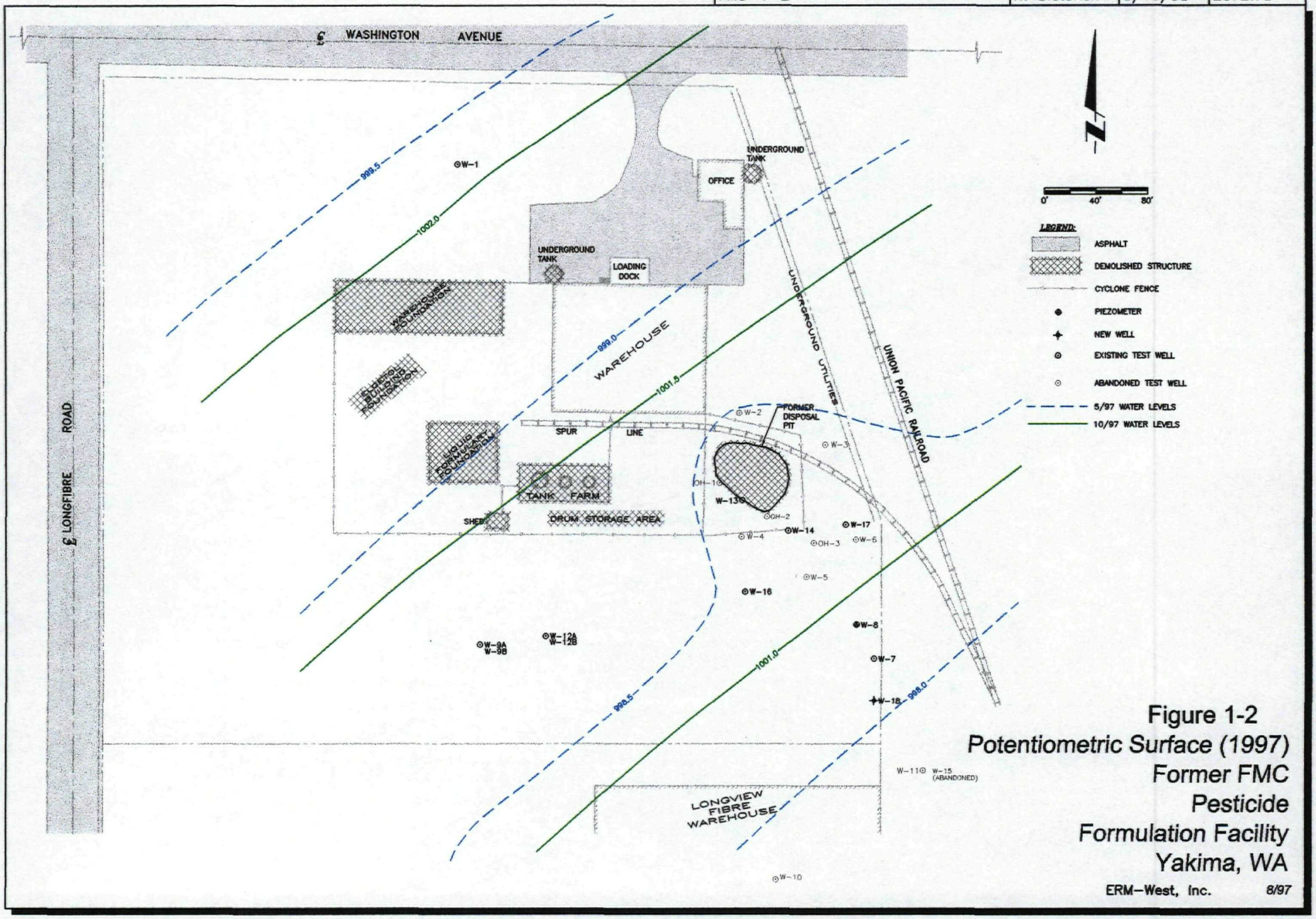


Figure 1-2
Potentiometric Surface (1997)
Former FMC
Pesticide
Formulation Facility
Yakima, WA

ERM-West, Inc. 8/97

- Chemical concentrations show a declining trend; and
- Sources of groundwater contamination have been removed.

When the ROD was issued, pesticide constituents of concern in groundwater were endosulfans and DD-series compounds (DDD, DDE, and DDT). Since the ROD was issued the non-carcinogenic hazard index for endosulfans has been revised, resulting in a new hazard index risk criterion of 200 µg/l. The concentration of endosulfans in site groundwater is significantly less than 200 µg/l; however, EPA is requiring the continued monitoring of endosulfan because it is suspected to be an endocrine disrupter, and the chronic toxicity of that entire class of chemicals is under review by EPA. In addition, the fact that endosulfan concentrations in groundwater have increased following the removal action is of concern.

The 10^{-6} carcinogenic risk (CR) level for dieldrin is 0.004 µg/l, and the CR level for DDT is 0.2 µg/l. By mutual agreement between EPA and FMC, ROD indicator parameters for comparison with semi-annual sampling data based on the greater of the CR level and laboratory practical qualification limits (PQLs) are currently as follows:

- Dieldrin at 0.05 µg/l; and,
- DDT at 0.2 µg/l.

1.4 Groundwater Monitoring Workplan Modifications

To satisfy the remedial objectives, the monitoring plan provides extensive data for the first 2 years of sampling. The well sampling frequency was modified after the first two sampling events (December 1993 and March 1994) as described in the *Long-Term Monitoring Plan.* The modifications included:

- Analyzing only for organochlorine pesticides;
- Abandonment of wells OH-1, OH-2, and OH-3; and
- Installation of replacement wells W-13(OH-1) and W-14(OH-2).

Additional modifications to the sampling plan requested by the USEPA in June 1995 included:

- Addition of monitoring well W-7 and W-1 to the sampling events;
- Replacement of damaged and abandoned monitoring well W-11 with W-15;

- Abandonment of monitoring well W-10; and,
- Replacement of previously abandoned monitoring wells W-2, W-3, W-4, W-5 and W-6 with W- 16 and W-17.
- Use of low-stress, low volume sampling techniques.

USEPA and FMC agreed in January 1996 to modify the sampling event frequency to semi-annually following the second quarter 1996 sampling event. Subsequent sampling events will occur during the second and fourth quarters of each year during the weeks of 15 April and 15 October.

Monitoring well W-15 was irreparably damaged in late November 1996 and has since been abandoned, leaving W-7 as the most downgradient well.

1.5 Site Hydrogeology

A total of 21 monitoring wells have been installed on the FMC site and the immediate vicinity. Twelve of these monitoring wells are currently monitored semiannually. Other wells have been properly abandoned. A copy of the boring logs and a summary of as-built diagrams for all monitoring wells are included as Appendix B of this report.

Groundwater from the unconfined alluvium aquifer occurs at a seasonally high depth of about 2 to 3 feet below grade and an average depth of 7 to 8 feet below grade. The alluvium aquifer, which extends to 35 to 40 feet below grade, is underlain by cemented basalt.

Groundwater elevations exhibit a five to seven foot seasonal fluctuation at the site. The highest groundwater elevation (999 to 1,002 feet above mean sea level (ft amsl)) typically occurs in September, and the lowest groundwater elevation (995 to 997 ft amsl) occurs in February and March. The contrast is shown in Figure 1-2, which shows the potentiometric surface in May and October, 1997. Groundwater elevations are listed on Table 1-1. The groundwater flow direction in the alluvial aquifer is to the southeast. The horizontal flow ranges from 0.002 to 0.003 feet per foot (ft/ft). The main source of recharge is from crop irrigation; the source of water is primarily surface water through canals. Elevated groundwater elevations caused by recharge of irrigation water occurs from May through September each year. Recharge from precipitation, which is minor compared with recharge from irrigation, occurs primarily from January through April.

Three well nests are present at the site. At each of the well nests, measurements indicate that a downward vertical groundwater flow gradient exists. The average vertical gradient is 0.02 feet per foot (ft/ft). The potentiometric surface is between

0.2 and 0.7 feet higher at the water table surface compared with the base of the aquifer. This variation in head is from hydraulic friction loss along the vertical flow path.

Aquifer characteristics were evaluated by conducting an 8-hour aquifer pumping test on W-7 in 1989. The test was conducted at a discharge rate of 52 gpm. Distance drawdown analysis by Jacob's straight line method results in a calculated transmissivity of 76,300 gpm/ft^2 and a storativity of 0.19 (Lohman, 1979). For an aquifer thickness of 30 feet, calculated hydraulic conductivity is 5,500 gpd/ft^2. Distance drawdown data is as follows:

Well Number	Distance to Pumping Well (feet)	Maximum Drawdown (feet)
W-7	0	1.32
W-8a	30	0.29
OH-3	103	0.1

For the alluvial aquifer the seepage velocity is calculated to be 7 ft/day. This value is calculated from the hydraulic conductivity estimated from the aquifer test using Darcy's Law (v = K [i/n]), assuming a volumetric porosity of 0.25, and an average hydraulic gradient of 0.003 ft/ft.

TABLE 1-1
1997 Groundwater Elevations

WELL	Top of Screen (ft amsl)	Bottom Screen (ft amsl)	Top of Casing (ft amsl)	May, 1997 Depth to Water (ft bgs)	May, 1997 Groundwater Elevation (ft amsl)	October, 1997 Depth to Water (ft bgs)	October, 1997 Groundwater Elevation (ft amsl)
Existing Wells							
W-1	1001.81	996.81	1006.79	7.37	999.42	4.74	1002.05
W-7	984.16	969.16	1004.60	7.15	997.45	4.32	1000.28
W-8A	968.18	967.13	1004.94	--	--	4.53	1000.41
W-8B	981.36	980.31	1005.04	--	--	4.48	1000.56
W-8C	993.27	992.32	1005.11	--	--	4.18	1000.93
W-9A	971.3	966.3	1004.10	5.68	998.42	2.96	1001.14
W-9B	994.8	989.8	1004.39	5.78	998.61	3.06	1001.33
W-12A	990.45	985.45	1004.76	6.40	998.36	3.63	1001.13
W-12B	998.45	993.45	1004.88	6.30	998.58	3.56	1001.32
W-13	999.26	989.26	1004.36	5.91	998.45	3.08	1001.28
W-14	998.68	988.68	1005.29	6.86	998.43	4.1	1001.19
W-16	998.58	988.58	1004.38	5.90	998.48	3.15	1001.23
W-17	998.14	988.14	1004.94	6.60	998.34	3.84	1001.10

SECTION 2.0

SITE CHARACTERIZATION

A complete characterization of the former FMC pesticide formulation facility, including historical chemical usage and disposal history and nature and extent of contamination, is included in the Phase 2 Remedial Investigation (RI) report completed in 1990 (Bechtel, 1990). Additional site characterization data is included in individual operable area closure reports. Information on residual soil contamination, and groundwater contamination, is presented in this section.

2.1 Source Area

Potential sources of organochlorine compounds in groundwater at the site are from residual soil contamination. Based on Phase 2 RI and operable area closure reports, the following are areas with residual soil contamination:

- The boundary zone between Area 4 and 5;
- Area 6; and,
- The former Disposal Pit Area;

The remedial investigation area designations and soil sample locations are shown in Figure 2-1. Results of selected soil sample analyses are shown in Table 2-1.

2.1.1 Boundary Zone Between Areas 4 and 5

Dieldrin and DD-series compounds at concentrations greater than the ROD cleanup levels were detected in post excavation soil samples S-74, S-77, and S-171 obtained in 1990 near boundary of the former drum storage area (Area 4) and the tank farm (Area 5).

To determine whether this area contributed to pesticides detected in groundwater, soil samples were obtained in August 1995 from borings (B-1 and B-2) located adjacent to samples S-74 and S-171. Analytical results, presented in Table 2-1, indicate that dieldrin and DD-series compounds in this area have degraded by a factor of 10 or more to concentrations less than ROD cleanup levels.

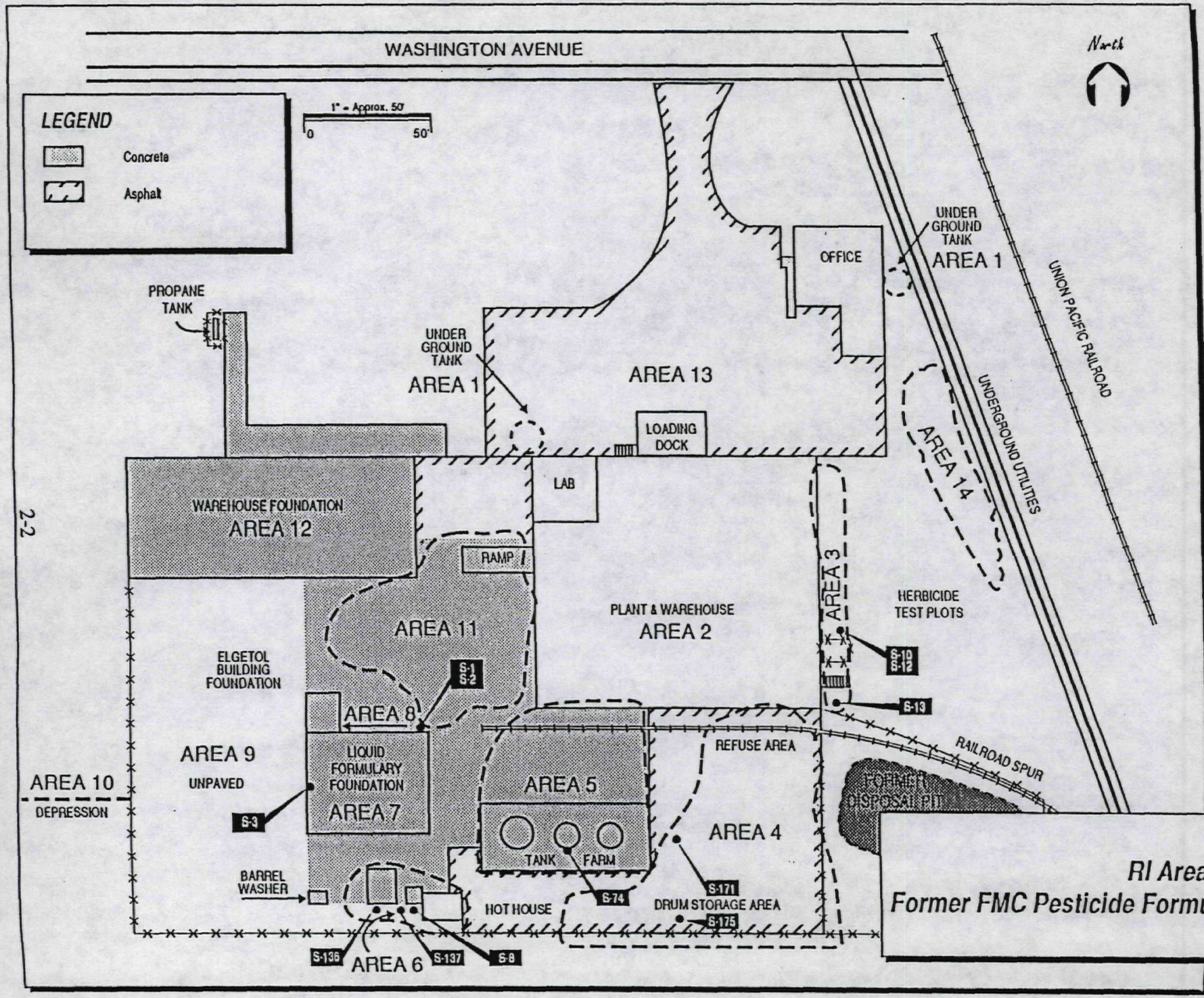


Figure 2-1
RI Area Designations
Former FMC Pesticide Formulation Facility
Yakima, WA

ERM-West, Inc. 8/95
2672.07/WDK/08.01.95

TABLE 2-1

Summary of Soil Sample Analytical Results

Sample	Depth of Sample (feet)	4,4'-DDD	4,4'-DDE	4,4'-DDT	Dieldrin	Endosulfans
ROD Cleanup Level (0-2 ft)		5.1	3.6	3.6	0.076	4.2
ROD Cleanup Level (2-7 ft)		25.5	18	18	1	13.5
Post-excavation samples exceeding ROD cleanup level.						
S-1	1.8	ND	ND	ND	ND	75
S-2	2.5	ND	ND	ND	ND	69
S-3	6.3	ND	ND	ND	ND	186
S-8	5.8	ND	ND	67	40	ND
S-10	1.9	ND	3.1	11	0.19	1.49
S-12	4.9	ND	3.2	23	ND	0.21
S-13	0.0	76	28	210	ND	68
S-74	7.0	150	24	100	47	296
S-77	7.0	32	1	4	4	109
S-136	7.0	22	10	9	10	276
S-137	7.0	22	10	6	10	268
S-171	7.0	52	2	42	30	165
S-175	2.5	7	0.05	0.3	1	0.55
Samples collected by hollow-stem auger borings in August, 1995.						
B-1 (near S-74)	8	0.64	0.095	0.23	0.29	0.92
B-2 (near S-171)	8	2.8	0.25	0.26	0.56	7.8

ND - Not Detected

All values are shown in micrograms per kilogram.

Areas 4, 5 and 6 were backfilled with cobbles that were excavated at the site and screened. The backfill is more permeable since the fines (silt and sand) were removed. As a result, groundwater flows through this area more easily than before the excavation, and at a faster rate than surrounding areas. This is especially true when the groundwater levels are elevated during the summer and fall irrigation season. Since the cobbles are more permeable than the surrounding soils, groundwater elevations are slightly lower within this area immediately adjacent to and above soil with residual organochlorine compound contamination. As a result, excess groundwater is pulled through those residually contaminated soils into the cobble backfill and drawn in a cross-gradient direction toward the former disposal pit area.

2.1.2 Area 6

Dieldrin at concentrations greater than the ROD cleanup levels was detected in subsurface soil samples S-136 and S-137 (obtained in 1992) in Area 6. The detected concentrations, however, were considerably lower than those in the boundary zone between Areas 4 and 5. In addition, dieldrin has not been detected in downgradient monitoring wells W-9a, W-9b, W-12a or W-12b since October 1994. Consequently, it is not likely that dieldrin and DD-series compounds in soil from Area 6 contribute to groundwater contamination.

2.1.3 Former Disposal Pit Area

The former disposal pit is shown in the southeast part of the site in Figure 1-2. The initial remedial excavation of the disposal pit occurred in June 1988 and removed contamination to a depth of 4 feet below grade where groundwater was encountered. A subsequent remedial excavation, completed in March of 1989, stopped at a depth of 7 feet below grade when groundwater was encountered. Closure samples confirmed that contamination remained above ROD cleanup levels in a 3,600 square foot area in the former disposal pit area. USEPA agreed at the time that further excavation was not warranted or practical. In the 1989 removal action, dieldrin concentrations in soil samples obtained from the limits of the excavation ranged from 0.02 to 4.0 mg/kg; DDT concentrations ranged from 0.2 to 38 mg/kg. All other parameters were less than ROD cleanup levels. Soil sample location and analytical results are presented in Figure 2-2.

As discussed in Section 1.5, groundwater elevation fluctuates between 2 and 8 feet below grade. Residual soil contamination at the base of the excavation, which is 7 feet below grade, is in direct contact with groundwater during periods

of average and seasonally high groundwater levels. Elevated groundwater levels caused by recharge of irrigation water occur from May through September each year. The highest groundwater elevation (999 to 1,002 ft amsl) typically occurs in September, and the lowest groundwater elevation (995 to 997 ft amsl) occurs in February and March. A comparison of these elevations with the elevations of the disposal pit excavation, shown on Figure 2-2, shows that during the annual high water table event, groundwater is in direct contact with contaminated soil that remains at the base of the excavation.

Maximum concentrations of dieldrin and endosulfan are typically detected in the fall after the annual high water table event. Groundwater monitoring wells W-13 and W-14 are hydraulically downgradient from the disposal pit. These two monitoring wells have had the greatest and most persistent detections of organochlorine compounds at the site. This indicates that the source of the remaining dieldrin and endosulfan plumes is the former disposal pit area.

2.1.4 Undiscovered Source Areas

Site remedial investigation activities have included soil boring, monitoring well installation, grid sampling, historic research and interviews with former site personnel. None of these site investigation activities have revealed source areas, other than the former disposal pit, that would explain the groundwater detections. In addition, the groundwater detections to date are fully explained by contaminated soil residuals from the base and sidewalls of the former disposal pit. Finally, the fact that an active disposal pit was present at the site from 1952 until 1969 (providing a convenient method for disposal of chemicals and waste) makes it unlikely that alternate disposal areas would have been created.

2.1.5 Discussion

Groundwater contamination at the site is the result of residual soil contamination left in place after excavation and subsequent backfilling of the former disposal pit and other nearby areas. FMC and USEPA agreed to halt removal excavations at a depth of approximately 7 feet below grade where groundwater was encountered. Analytical results from post-excavation samples indicate soil concentrations of organochlorine compounds greater than ROD cleanup levels are present in soils beneath the bottom of the excavation. Residual soil contamination at the base of the excavation is in direct contact with groundwater during periods of average and seasonally high groundwater levels. Backfilling with cobbles increased the permeability of the soil above the residual soil contamination, and created a "bathtub" effect where locally higher groundwater levels occur. As a result, maximum concentrations of organochlorine compounds are typically detected in monitoring wells immediately downgradient from the disposal pit after the seasonal high water table occurs.

CAD File:	Drawn By:	Date:	Project No.
FMC2-2	N. Dieterich	11/24/97	2672.71

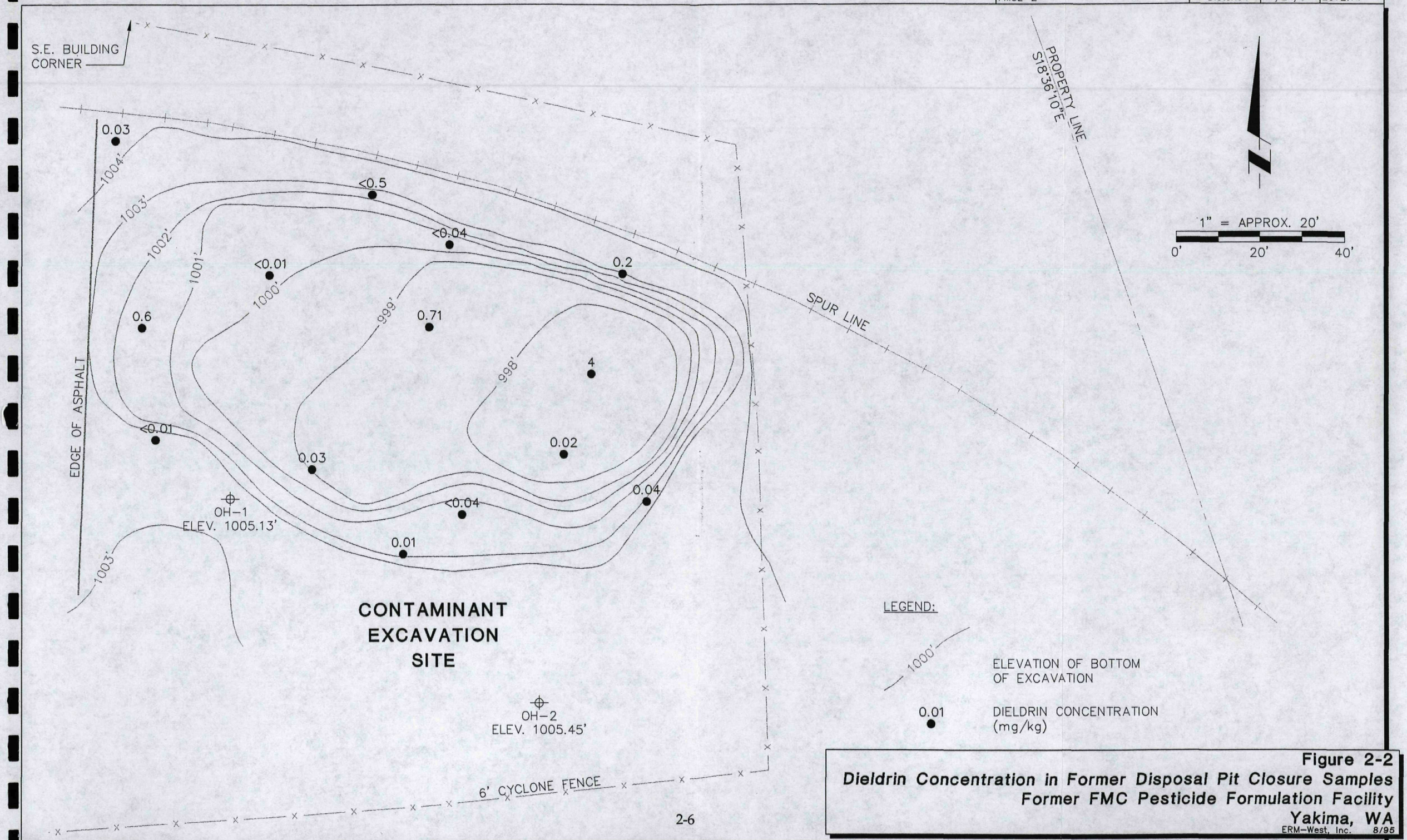


Figure 2-2
Dieldrin Concentration in Former Disposal Pit Closure Samples
Former FMC Pesticide Formulation Facility
Yakima, WA
ERM-West, Inc. 8/95

2.2 Compounds of Concern

DDT and dieldrin are the remaining risked-based compounds of concern at the site. DDT has been detected infrequently (about once each year) in W-13/OH-1. Dieldrin has consistently been detected above the ROD trigger level of 0.05 µg/l at the monitoring well site W-13/OH-1, and infrequently detected at the other source well site W-14/OH-2. Concentrations over time are shown in Figure 2-3. The concentration curve presented on this figure is affected by the timing of sampling events. For example, the seasonal early fall high peak of dieldrin would presumably also appear in 1996 if the wells had been sampled in the early fall.

Aldrin has also been detected at concentrations above risk-based concentrations in W-13/OH-1. Aldrin was never used at the site, but is a product of the degradation of dieldrin. Aldrin and dieldrin are persistent, non-systemic organochlorine insecticides used for control of termites, locusts, and insect pests. Both dieldrin and aldrin bioaccumulate and are suspected carcinogens.

DDT is detected infrequently at monitoring well site W-13/OH-1 at concentrations below the ROD CR level of 0.2 µg/l. The concentration of DD-series compounds (DDT, DDE and DDD) over time is shown in Figure 2-4. In October, 1997, DDT was detected at 0.07 µg/l. Prior to that, DDT was detected in May 1996 at 0.06 µg/l. Other DD-series compounds were last detected at the site during the December 1995 sampling event.

The only other organochlorine compounds currently present in groundwater at the site are Endosulfans (Endosulfan I, Endosulfan II and Endosulfan Sulfate). Endosulfans in groundwater in the former disposal pit area have been and continue to be elevated since the removal action relative to concentrations present in groundwater prior to the removal action. This is especially true during the early fall when groundwater levels have been high (and presumably in contact with contaminated soils) for a prolonged period of time. Endosulfan concentrations, however, are significantly less than risk-based concentrations of concern. Concentration of endosulfans over time are shown in Figure 2-5. The concentration curve presented on this figure is affected by the timing of sampling events. For example, the seasonal early fall high peak of endosulfan would presumably also appear in 1996 if the wells had been sampled in the early fall.

Other chemicals of concern that have been detected in groundwater at the site include:

- Endrin-series compounds last detected in March, 1995;
- Dicofol, ovex, and perthane last detected in June, 1994.

FIGURE 2-3

Concentration of Aldrin plus Dieldrin in Selected Wells

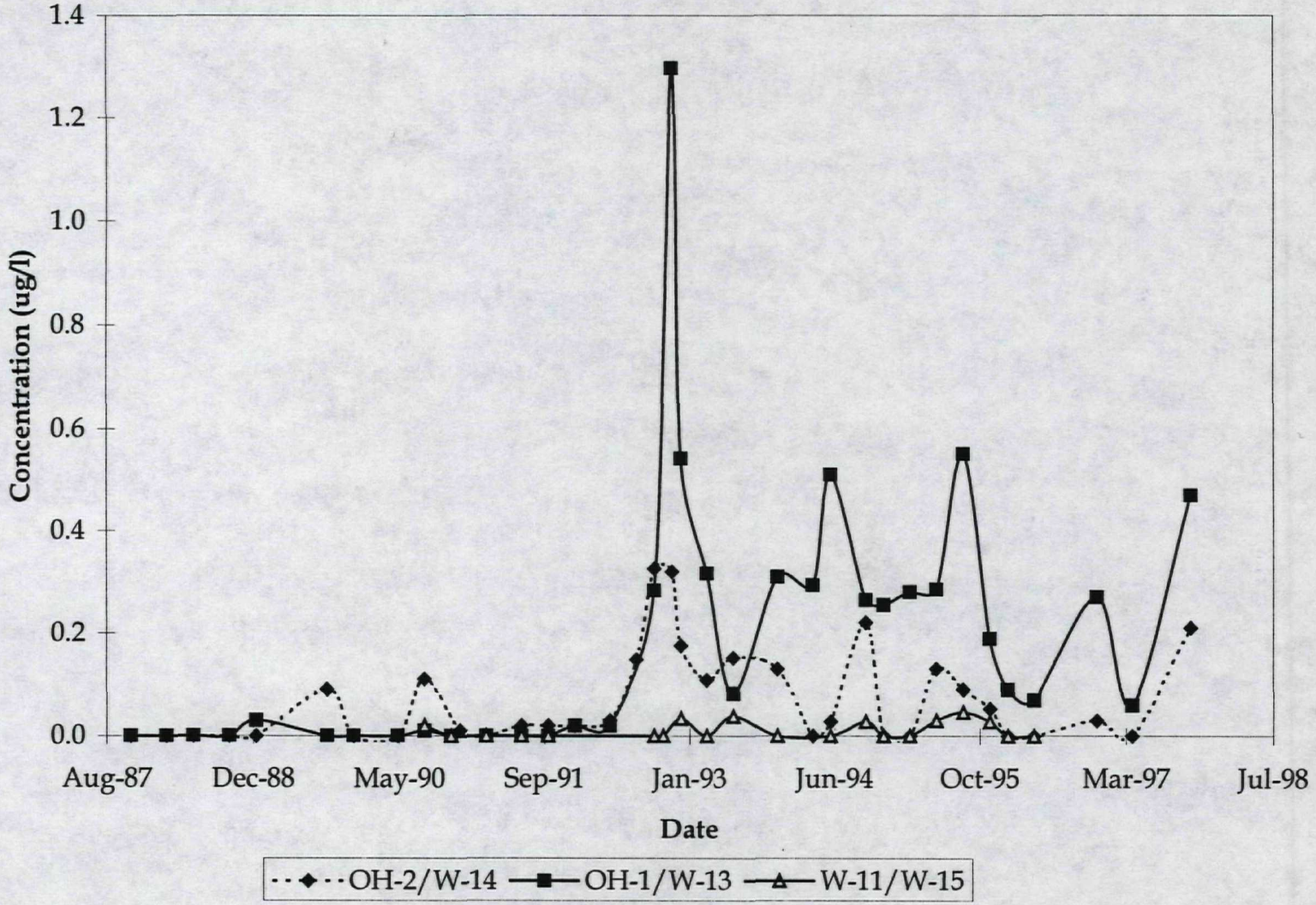


FIGURE 2-4

Concentration of DD-series in Selected Wells

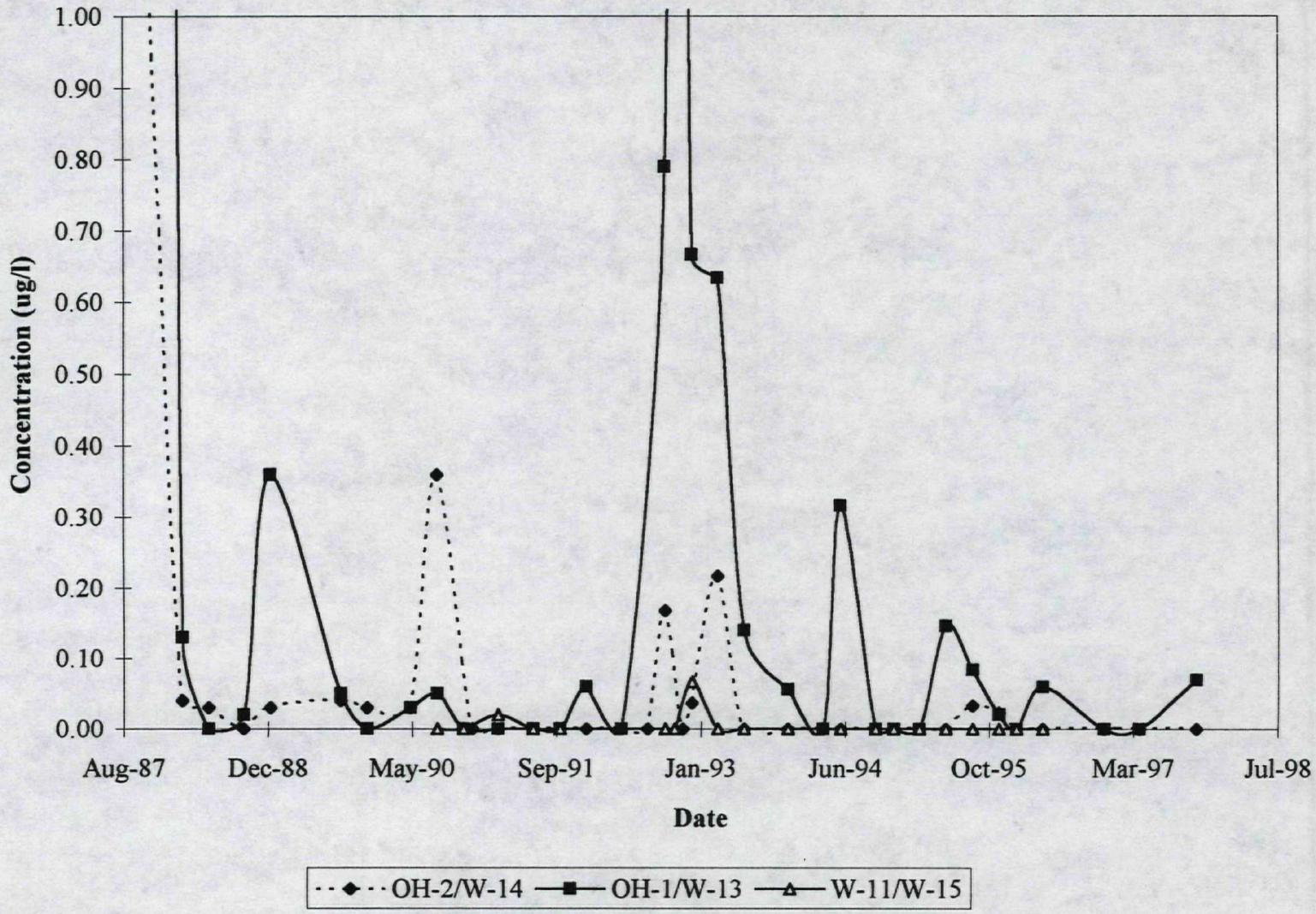
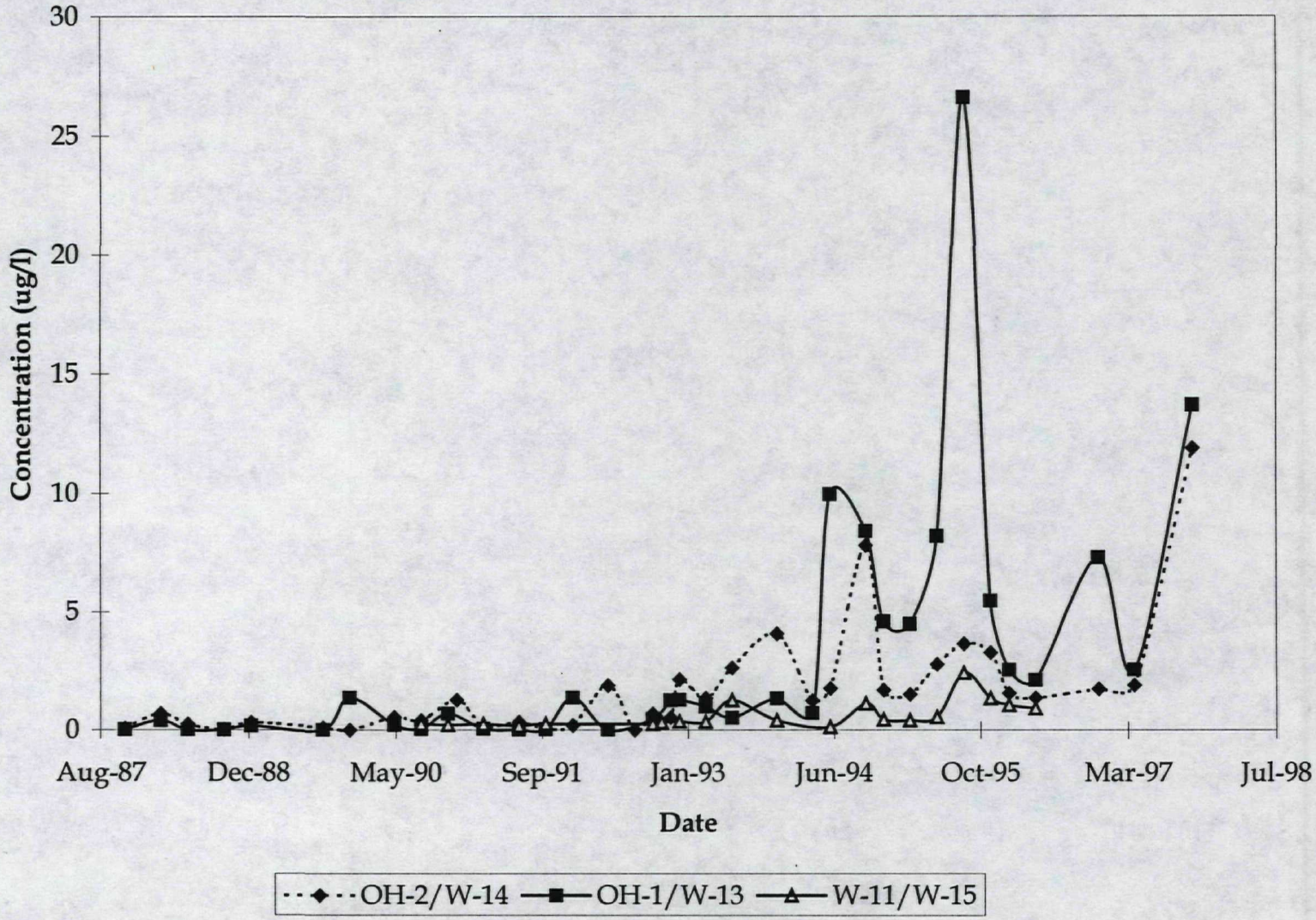


FIGURE 2-5

Concentration of Total Endosulfans in Selected Wells



- 4,4-Methoxychlor last detected in April, 1994;
- Heptachlor epoxide last detected in July, 1993, and heptachlor last detected in April, 1993;
- Chlordane last detected in August, 1992; and,
- Toxaphene and captan last detected in March, 1991.

Since these compounds are no longer present in groundwater at the site, no further evaluations of these compounds are made. Remaining chemicals of concern at the site are dieldrin and DDT.

2.3 Extent in Groundwater

Dieldrin, DD-series compounds, and total endosulfan detected in October 1997 are shown in Figure 2-6. The extent of organochlorine compounds has remained stable since the February 1996 sample event. Prior to that sampling event, the extent of dieldrin was larger as shown in Figure 2-7.

Dieldrin and DDT are detected only in the monitoring wells closest to the disposal pit area. The W-13 and W-14 locations are immediately downgradient of the disposal pit.

In well W-13, dieldrin has been consistently detected at concentrations ranging from 0.06 to 0.5 µg/l over the last few years. During the relatively higher groundwater elevation event that typically occurs in late summer and fall, dieldrin is detected in W-14. Dieldrin was detected after the removal action in several source wells at concentrations that exceeded concentrations detected prior to the removal action. . During the most recent sampling event in October 1997, dieldrin was detected in W-13 at a concentration of 0.47 µg/l and at 0.21 µg/l in W-14.

CAD File:	Drawn By:	Date:	Project No.
FMC-2-6	N. Dieterich	8/19/97	2672.71

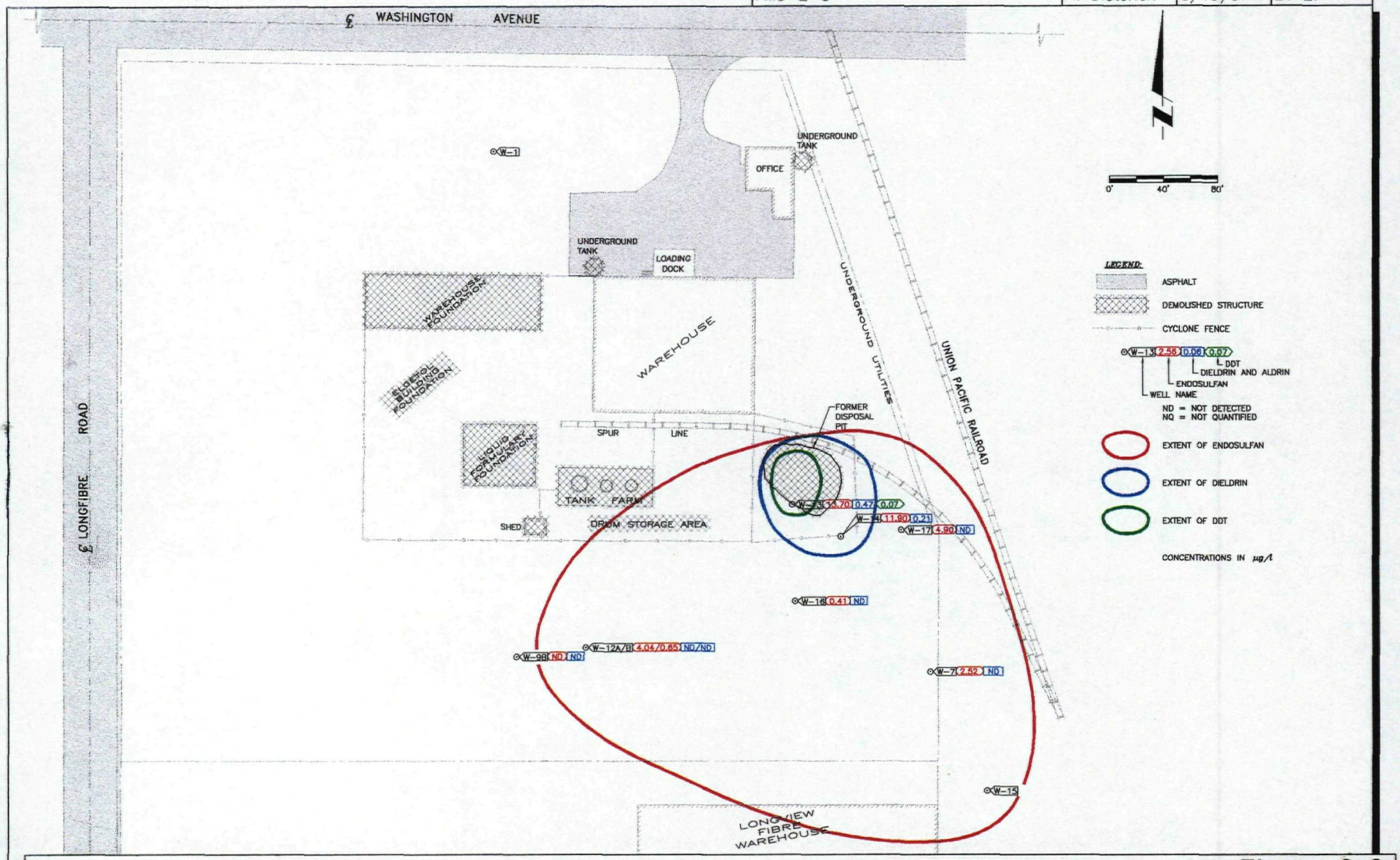


Figure 2-6

Organochlorine Compounds in Groundwater, October 1997

Former FMC Pesticide Formulation Facility

Yakima, WA

ERM-West, Inc. 8/97

CAD File:	Drawn By:	Date:	Project No.
FMC-2-7	N. Dieterich	8/10/98	2672.73

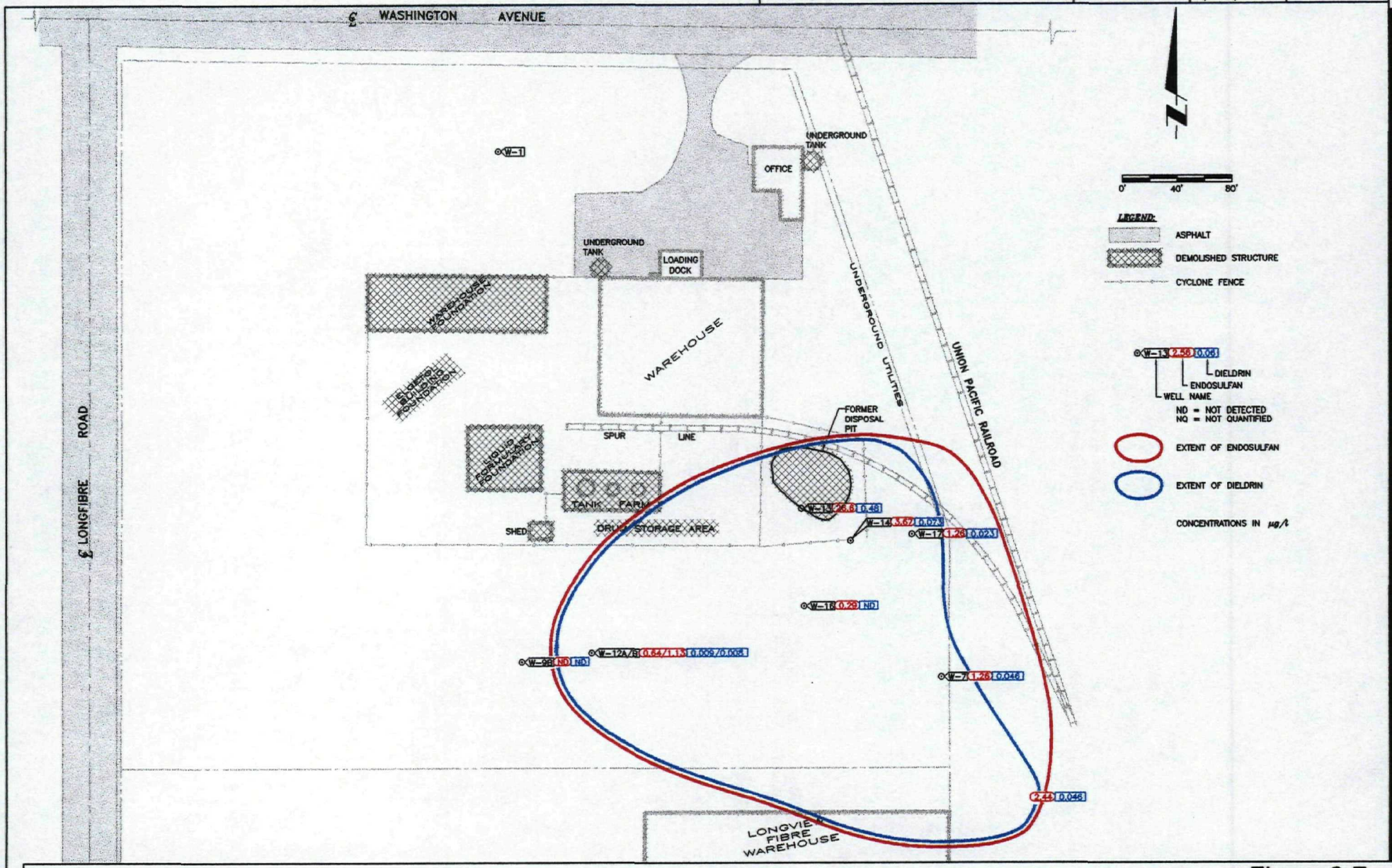


Figure 2-7

Organochlorine Compounds in Groundwater, September 1995

Former FMC Pesticide Formulation Facility

Yakima, WA

ERM-West, Inc. 8/97

SECTION 3.0

FATE AND TRANSPORT

3.1 Transport to Groundwater

The partitioning of organochlorine compounds from soil to water at the site is controlled by:

- the volume and concentration of contaminated soil exposed to water;
- the solubility of the compounds; and,
- the affinity of the compounds to soil.

3.1.1 Solubility and Soil Affinity

The solubility of a compound is an indicator of how much of that compound potentially can dissolve into water. The affinity for soils is an indicator of how persistent the compound will be within an aquifer. These processes compete at the site, and the resulting groundwater concentration reflects the equilibrium or effective solubility in groundwater. The solubilities and soil adsorption rate (from the log Koc values) for the compounds of interest are presented below:

Compound	Solubility	log Koc Value
dieldrin/aldrin	20 - 200 µg/l	4.08 - 4.69
DDT	3 µg/l	4.96 - 6.44
endosulfans	117 - 530 µg/l	3.31 - 3.36

Endosulfan compounds tend to be more soluble and have a lower affinity to soils than dieldrin and DDT. These values indicate that endosulfan is more mobile (i.e., less prone to be absorbed to soil particles) in groundwater compared with dieldrin. This is reflected at the site by the continued detection of endosulfans in downgradient monitor wells.

The Koc of dieldrin and DDT are so great that the continued detection in W-13 should not theoretically occur. One conceivable way that these compounds could still occur is if the solubility were enhanced by other organic chemicals. At the site, however, other volatile organic compounds (VOCs) analyzed from 1987

through 1990 were detected at concentrations much too low to facilitate dissolution of pesticides. VOC concentrations detected at the site are summarized in Table 3-1.

Another possible explanation for the continued persistence of dieldrin in groundwater is by colloidal-facilitated transport. This is further discussed in Section 3.1.4.

3.1.2 Source of Water

The source of water contacting contaminated soil at the base of the former disposal pit is either infiltrating surface water or groundwater or both. To evaluate the source of water, climatalogical data from the Yakima airport were used to estimate the volume of surface water infiltration by water balance computation. The water balance portion of USEPA's Hydrogeologic Evaluation of Landfill Performance (HELP) Model 3.01 includes hydraulic properties for soil types that are similar to those at the site, and uses 5 years of local climate data measured at the Yakima airport. Information on surface topography and ground cover is entered to estimate water storage values and the percentage of surface water leaching to groundwater.

Water balance computations are included as Appendix C and summarized in Table 3-2. Results indicate that recharge from precipitation varies from a low of 0.008 inches per month in November and December to a maximum of 0.012 inches per month in January. Over the approximately one-quarter acre area of the former disposal pit the volume of infiltration from precipitation varies from 56 gallons per month to 84 gallons per month. The results indicate a negative total change in water storage (-3.7 %) for the former disposal pit area. A negative value for water storage indicates that evapotranspiration values are greater than infiltration values, and that infiltration of surface water to groundwater only occurs when snow melt or rainfall intensity is greater than evapotranspiration over a short period of time.

The large seasonal groundwater elevation fluctuations at the site are not explained by the relatively small variations in infiltration. When infiltration from precipitation is at a maximum (from January through May), groundwater elevation is at a minimum. The large seasonal groundwater elevation fluctuations, and the cause for groundwater elevations at the site above approximately 8 feet below grade, is recharge from crop irrigation. Enormous volumes of surface water from reservoirs and rivers are diverted through canals and applied by irrigation to barley and hops fields upgradient of the site. The irrigation season begins in late April or May and extends into September.

Soil contaminated by organochlorine compounds, therefore, is exposed to water at the base and sidewalls of the former disposal pit during the irrigation season. The

TABLE 3-1

VOC Concentrations in Groundwater

		Acetone			Tetrachloroethene			Toluene			Methylene Chloride			Carbon Disulfide			2-Butanone			2-Hexanone		
Well	Date	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
W-1	Oct-83	24	10	B, J	4	5	J	10	5		7	5	B	ND	5		ND	5		ND	10	
W-2	Oct-83	17	10		ND	5		6	5		5	5	B	ND	5		ND	5		2	10	J
W-3	Oct-83	100	10		3	5	J	ND	5		6	5	B	ND	5		ND	5		ND	10	
W-4	Oct-83	3900	10		ND	100		ND	100		160	5	B	ND	5		ND	5		ND	10	
W-5	Oct-83	130	10	B	4	5	J	4	5	J	7	5	B	ND	5		ND	5		ND	10	
W-6	Oct-83	16000	10		ND	500		ND	500		820	5	B	ND	5		ND	5		ND	10	
OH-1	Oct-83	24	10	B	4	5	J	10	5		7	5	B	ND	5		ND	5		ND	10	
OH-2	Oct-83	1200	10	B	ND	5		ND	5		85	5	B	ND	5		ND	5		ND	10	
OH-3	Oct-83	1500	10	B	ND	50		ND	50		86	5	B	ND	5		ND	5		ND	10	
W-1	May-84	ND	10		ND	5		ND	5		ND	5		ND	5		ND	5		ND	10	
W-2	May-84	ND	10		ND	5		ND	5		ND	5		ND	5		ND	5		ND	10	
W-3	May-84	ND	10		ND	5		ND	5		ND	5		ND	5		ND	5		ND	10	
W-4	May-84	ND	10		ND	5		ND	5		ND	5		ND	5		ND	5		ND	10	
W-5	May-84	ND	10		ND	5		ND	5		ND	5		ND	5		ND	5		ND	10	
W-6	May-84	ND	10		ND	5		ND	5		ND	5		ND	5		ND	5		ND	10	
OH-1	May-84	ND	10		ND	5		ND	5		ND	5		ND	5		ND	5		ND	10	
OH-2	May-84	ND	10		ND	5		ND	5		ND	5		ND	5		ND	5		ND	10	
OH-3	May-84	ND	10		ND	5		ND	5		1	5	J, B	ND	5		ND	5		ND	10	
W-1	Sep-84	14	10	B	3	5	B, J	ND	5		ND	5		ND	5		1	5	B, J	ND	10	
W-2	Sep-84	5	10	B, J	3	5	J	ND	5		ND	5		ND	5		ND	5		ND	10	
W-3	Sep-84	6	10	B, J	ND	2		ND	5		ND	5		ND	5		ND	5		1	10	B, J
W-4	Sep-84	7	10	B, J	ND	5		ND	5		ND	5		ND	5		ND	5		ND	10	
W-5	Sep-84	12	10	B	3	5	J	ND	5		ND	5		ND	5		ND	5		ND	10	
W-6	Sep-84	4	10	B, J	2	5	J	ND	5		ND	5		ND	5		3	5	B, J	ND	10	
OH-1	Sep-84	10	10	B	3	5	J	ND	5		ND	5		ND	5		2	5	B, J	ND	10	
OH-2	Sep-84	ND	10		3	5	J	ND	5		ND	5		ND	5		4	5	B, J	2	10	J
OH-3	Sep-84	8	10	B, J	3	5	J	ND	5		ND	5		ND	5		3	5	B, J	ND	10	
W-1	Aug-85	18	10	B	3	5	J	ND	5		ND	5		ND	5		ND	5		ND	10	
W-2	Aug-85	30	10	B	5	5		2	5	J	ND	5		4	5	J	ND	5		ND	10	
W-3	Aug-85	11	10	B	4	5	J	ND	5		ND	5		ND	5		ND	5		ND	10	
W-4	Aug-85	29	10	B	4	5	J	ND	5		ND	5		8	5		ND	5		ND	10	
W-5	Aug-85	16	10	B	3	5	J	ND	5		ND	5		3	5	J	ND	5		ND	10	
W-6	Aug-85	5	10	B, J	4	5	J	ND	5		ND	5		2	5	J	ND	5		ND	10	
W-7	Aug-85	9	10	B, J	5	5		ND	5		ND	5		ND	5		ND	5		ND	10	
OH-1	Aug-85	5	10	J	5	5		ND	5		ND	5		ND	5		ND	5		ND	10	
OH-2	Aug-85	16	10		4	5	J	ND	5		ND	5		25	5		ND	5		ND	10	
OH-3	Aug-85	12	10		4	5	J	ND	5		ND	5		4	5	J	ND	5		ND	10	
W-1	Nov-85	ND	10		3	5	J	ND	5		ND	5		ND	5		ND	5		ND	10	
W-2	Nov-85	ND	10		3	5	J	ND	5		ND	5		ND	5		ND	5		ND	10	
W-3	Nov-85	ND	10		3	5	J	ND	5		ND	5		ND	5		ND	5		ND	10	
W-4	Nov-85	ND	10		3	5	J	ND	5		ND	5		ND	5		ND	5		ND	10	
W-5	Nov-85	ND	10		2	5	J	1	5	J	ND	5		ND	5		ND	5		ND	10	
W-6	Nov-85	ND	10		2	5	J	ND	5		ND	5		ND	5		ND	5		ND	10	
W-7	Nov-85	ND	10		2	5	J	ND	5		ND	5		ND	5		ND	5		ND	10	
OH-1	Nov-85	1	10	B, J	3	5	J	ND	5		ND	5		ND	5		ND	5		ND	10	
OH-2	Nov-85	9	10	B, J	2	5	J	6	5		ND	5		ND	5		2	5	B, J	ND	10	
OH-3	Nov-85	ND	10		2	5	J	1	5	J	ND	5		ND	5		ND	5		ND	10	
W-1	Apr-86	3	10	J	3	5	J	ND	5		ND	5		ND	5		ND	5		ND	10	
W-2	Apr-86	ND	10		2	5	J	ND	5		ND	5		ND	5		ND	5		ND	10	
W-3	Apr-86	6	10	J	2	5	J	ND	5		ND	5		ND	5		ND	5		ND	10	
W-4	Apr-86	ND	10		3	5	J	ND	5		ND	5		ND	5		ND	5		ND	10	
W-5	Apr-86	ND	10		3	5	J	ND	5		ND	5		ND	5		ND	5		ND	10	
W-6	Apr-86	ND	10		3	5	J	ND	5		ND	5		ND	5		ND	5		ND	10	
W-7	Apr-86	ND	10		2	5	J	ND	5		ND	5		ND	5		ND	5		ND	10	
OH-1	Apr-86	ND	10		3	5	J	ND	5		ND	5		ND	5		ND	5		ND	10	
OH-2	Apr-86	ND	10		2	5	J	ND	5		ND	5		69	5		ND	5		ND	10	
OH-3	Apr-86	ND	10		3	5	J	ND	5		ND	5		ND	5		ND	5		ND	10	
W-9B	May-86	ND	10		1	5	J	ND	5		ND	5		ND	5		ND	5		ND	10	
W-10	May-86	7	10	J	2	5	J	ND	5		ND	5		ND	5		ND	5		ND	10	

Notes:
Units are ug/L
ND = Non detect
B = Analyte found in blank
J = Concentration below detection limit, value is an estimate

TABLE 3-2

Summary of Water Balance Computations

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1974 THROUGH 1978

	JAN	*FEB*	*MAR*	*APR*	*MAY*	*JUN*	*JUL*	*AUG*	*SEP*	*OCT*	*NOV*	*DEC*
PRECIPITATION	1.38	0.89	0.71	0.62	0.41	0.37	0.18	0.83	0.34	0.3	0.44	0.98
RUNOFF (0.5% SLOPE)	0.568	0.224	0.005	0.005	0	0	0	0.015	0	0	0	0.337
EVAPOTRANSPIRATION	0.467	0.656	1.318	0.727	0.553	0.36	0.263	0.622	0.481	0.217	0.352	0.417
PERCOLATION TO GROUNDWATER	0.0116	0.0101	0.0108	0.0101	0.01	0.0094	0.0095	0.0093	0.0087	0.0083	0.0083	0.0084

base of the disposal pit ranges from 998 to 1001 feet amsl. Water level elevation in W-13, which is adjacent to the former disposal pit, is above 999 ft amsl during the irrigation season. Groundwater elevations during the fall sampling have been measured at elevations of 1,002 ft amsl.

3.1.3 Advective Groundwater Transport

Advective groundwater transport refers to the transport of contaminants along the groundwater flow path associated with the physical movement of dissolved compounds in groundwater. The rate of advective groundwater transport, therefore, is the rate of groundwater flow. For the organochlorine compounds considered herein, the advective transport rate is effected by other processes such as adsorption and degradation.

Fluctuations in endosulfan concentrations are directly related to seasonal fluctuations in groundwater levels as seen in Figure 3-1. The concentration curve presented on this figure is affected by the timing of sampling events. For example, the seasonal early fall high peak of endosulfan would presumably also appear in 1996 if the wells had been sampled in the early fall. The dissolved constituents are transported by advective groundwater flow until sufficient time and adsorption capacity is available for clay and organic particles in the formation to remove the dissolved constituents from solution. Advective groundwater flow velocity at the site is estimated to be 7 ft/day as discussed in Section 1.5.

The maximum estimated distance endosulfan travels along the groundwater flow path (from Figure 2-6) is 270 feet. Groundwater takes approximately 40 days to flow 270 feet. Within that time, therefore, dilution and adsorption effectively reduce endosulfan concentrations to less than analytical detection levels.

Seasonal groundwater fluctuations also correspond to deviations in dieldrin plus aldrin concentrations. Concentrations are shown in Figure 3-2. The concentration curve presented on this figure is affected by the timing of sampling events. For example, the seasonal early fall high peak of dieldrin would presumably also appear in 1996 if the wells had been sampled in the early fall. These compounds are not detected in other monitoring wells frequently enough to make meaningful correlations.

3.1.4 Colloidal Particle Transport

Given the relative insolubility and high affinity to soils of dieldrin and DDT it is possible that the continued detection of dieldrin and aldrin in W-13 is due to dieldrin bonded to colloidal particles suspended in groundwater. In October 1997, a filtered sample of groundwater was collected from W-13 along with an unfiltered sample. Results are compared in Table 3-3. Results indicate that

FIGURE 3-1

Endosulfan Concentration versus Water Level in W-13

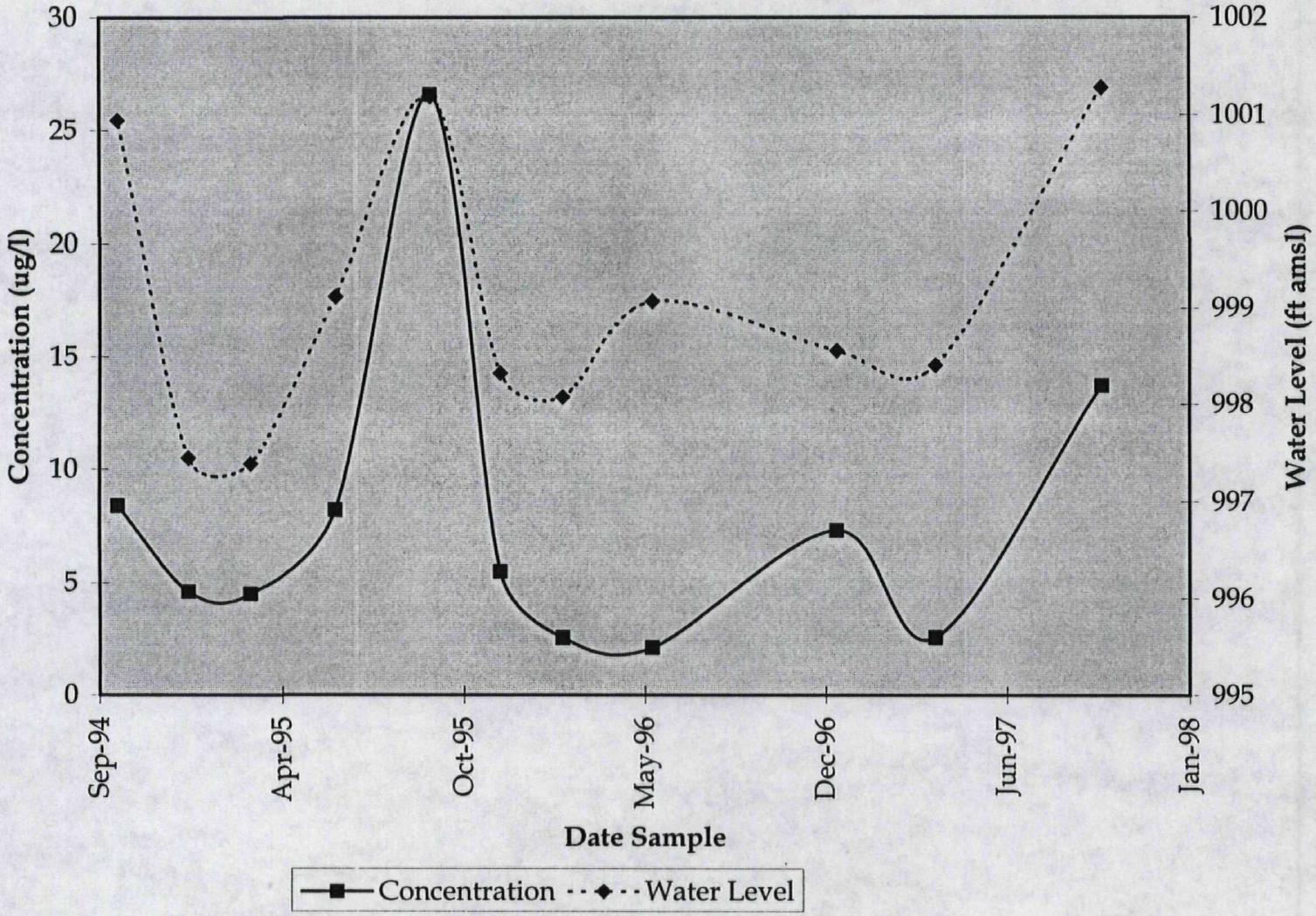
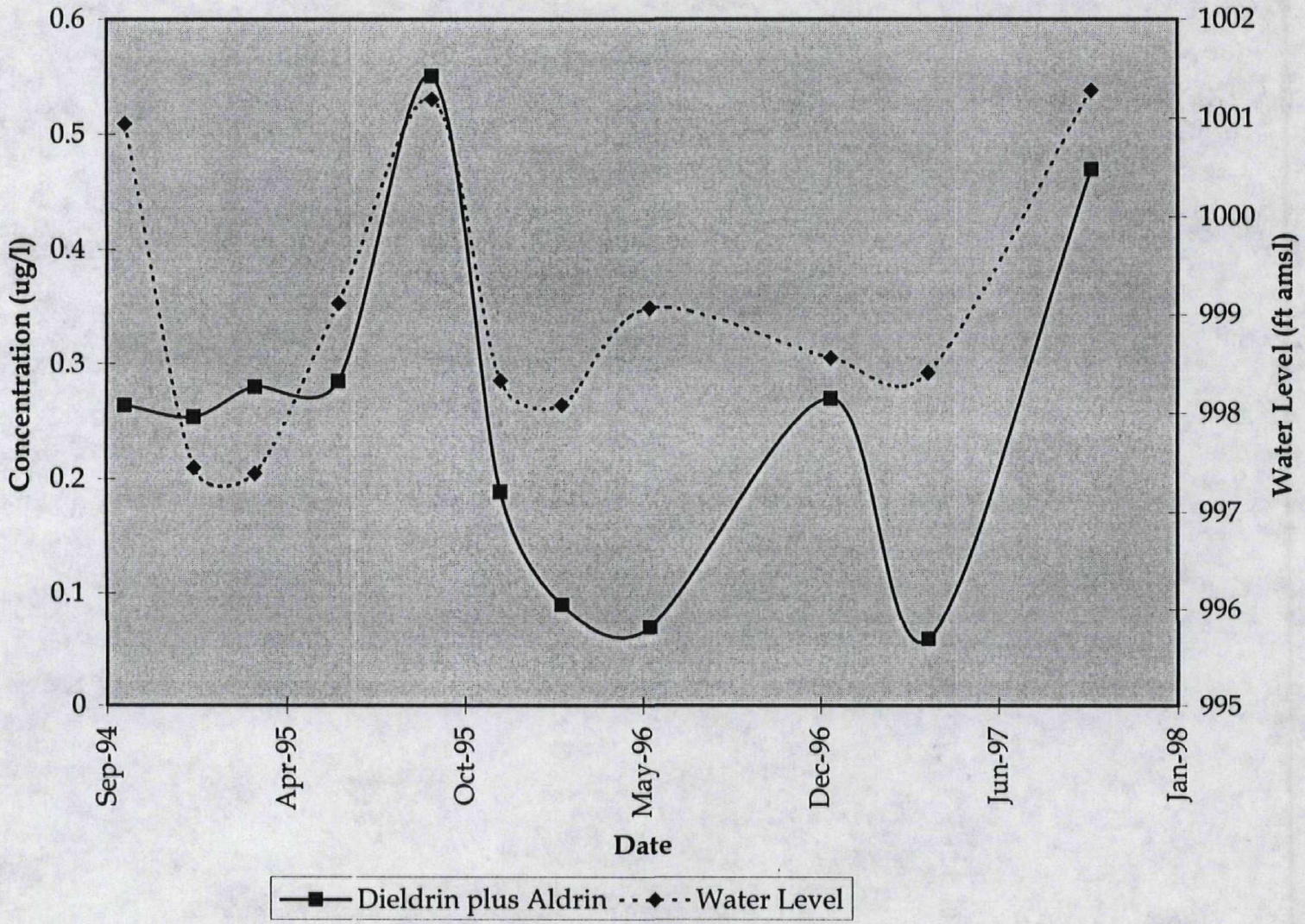


FIGURE 3-2

Dieldrin plus Aldrin Concentration versus Water Level in W-13



dieldrin and DDT exist on colloidal particles. The filter size was 0.45 microns; therefore, the dieldrin that was detected in the filtered sample is either in solution or absorbed to colloidal particles that are smaller than 0.45 microns.

The difference in concentration between filtered and unfiltered samples is a reflection of the portion of the organochlorine compound absorbed to colloidal particles. Colloidal particles consist of clay sediments and organic materials in the 0.003 to 200 micron range. The use of a 0.45 micron filter removes a significant portion of the colloidal particles from the sample. The resulting filtered sample only contains the dissolved portion of compound plus the portion absorbed to colloidal particles that are smaller than 0.45 microns.

The transport of colloidal particles along the groundwater flow pathway is limited. The ability of colloidal particles to migrate along the groundwater flow path is impeded by the variety of pore sizes and the tortuous flow path a particle must take through the formation at the site. The alluvium aquifer at the site consists of highly angular particles, and the resulting pore space distribution limits the distance a colloidal or clay particle can travel before becoming trapped or wedged within a pore space.

Historically, the concentration of dieldrin has been less than 0.05 μg/l except in monitoring wells that are immediately downgradient (i.e., source wells) of the former disposal pit. Historical detections of dieldrin in downgradient wells W-7, W-12 and W-15 may reflect dissolved dieldrin concentrations in groundwater, and the greater concentrations detected in source wells may reflect dieldrin absorbed onto colloidal particles. Since the maximum concentration detected in the downgradient wells is 0.05 μg/l, the equilibrium solubility of dissolved dieldrin in groundwater may be 0.05 μg/l.

Once a colloidal particle encounters a pore space that impedes further travel, that particle is effectively removed from the groundwater flow path. In many cases a filter is built up within a pore space or against an aperture; larger particles are lodged against each other and the pore space opening, and smaller particles are stacked up behind the large particles. An extraordinary hydraulic stress would be required to dislodge the larger particles and allow further migration of the small particles. Such a hydraulic stress could be from an abrupt increase or decrease in groundwater elevation, or a reversal in groundwater flow from a locally large recharge event. Over a period of time, therefore, migration of colloidal particles can occur in short steps following hydraulic stresses.

The potential for dieldrin and DDT to exist on colloidal particles makes low volume low-stress sampling techniques essential for this groundwater monitoring program. Low-stress sampling techniques have been used for the groundwater monitoring program since the September 1995 sampling event.

TABLE 3-3

Comparison of Filtered and Unfiltered Sample Concentrations in the W-13 October 1997 Sample

Parameter	Unfiltered Concentration (µg/l)	Filtered Concentration (µg/l)	Relative Standard Deviation (%)	PQL (µg/l)
Endosulfan I	6.8	5.5	11	0.05
Endosulfan II	3.7	2.8	14	0.05
Endosulfan Sulfate	3.2	2.8	7	0.05
Dieldrin	0.47	0.29	24	0.05
DDT	0.07	< 0.05	--	0.05

3.2 Fate in Groundwater

The persistence of the organochlorine compounds in groundwater is limited. Limiting factors, in order of importance, are soil adsorption, biodegradation and hydrolysis. Soil adsorption, which also limits transport to groundwater, is discussed in Section 3.1.1.

Organochlorine compounds in soil and groundwater are broken down by a variety of degradation mechanisms including oxidation and aerobic microbial metabolism. In groundwater at the site, dieldrin follows two degradation pathways: biodegradation; and, hydrolysis.

The presence of aldrin provides evidence of a biodegradation reaction at the site. Aldrin was never used or stored at the site. Aldrin occurs as a breakdown product of dieldrin by *Pseudomonas Sp.* Microorganism. Aldrin is then readily oxidized to reform dieldrin. A cyclic pattern is followed, changing dieldrin to aldrin to dieldrin (Montgomery, 1993).

The dieldrin-aldrin-dieldrin cycle is shown in Figure 3-3. In June 1995, aldrin makes up approximately 30% of the dieldrin and aldrin found in W-4. This is a result of microbial degradation of aldrin in the source zone. In September 1995, during a high water table elevation dieldrin enters the groundwater but is not yet metabolized to aldrin and the ratio decreases. In December 1995, as dieldrin is metabolized to aldrin, the aldrin ratios once again rise. Dieldrin and aldrin ratios have followed this same cycle since March 1993.

Dieldrin does not readily metabolize to aldrin outside of the source area. This is because of the absence of acclimated microorganisms downgradient. In the source zone, dieldrin is in relatively higher concentrations, and so microorganisms are acclimated to dieldrin and are able to utilize dieldrin for metabolism. The reaction of aldrin to dieldrin is estimated at a half life of 53 days. The biodegradation of dieldrin outside the source zone is much slower, with a half life estimated between 175 days to 3 years.

Hydrolysis is the direct reaction of the dissolved compound with water molecules. Hydrolysis degradation rates are typically difficult to measure due to competing reactions and slow degradation rates. Dieldrin degrades by hydrolysis with an approximate half-life of 10.5 years. Aldrin degrades by hydrolysis with a half-life of 760 days (Montgomery, 1993).

CAD File:	Drawn By:	Date:	Project No.
FMC-3-3	N. Dieterich	8/19/97	2672.71

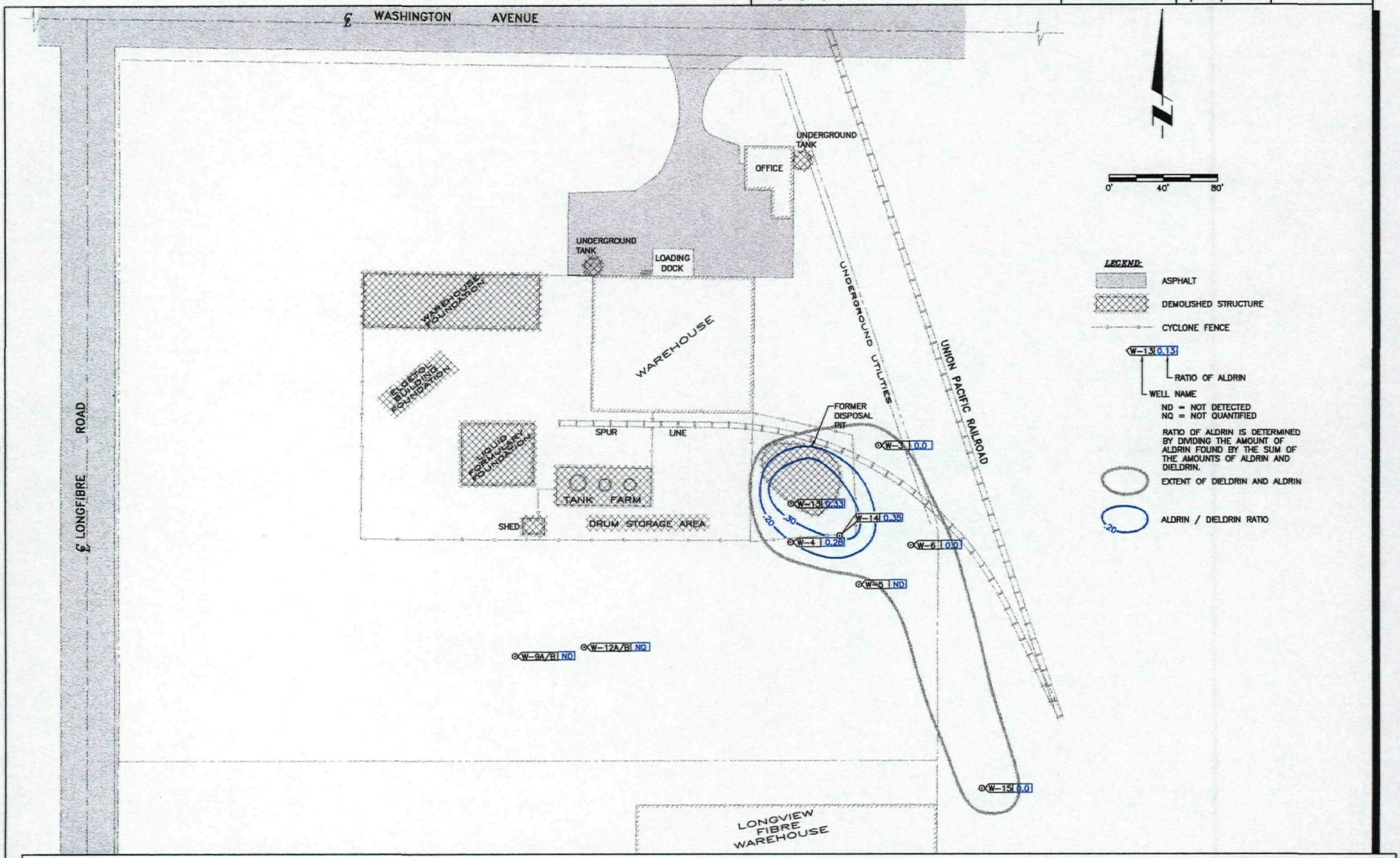


Figure 3-3

June, 1995 Ratio of Aldrin to Dieldrin in Groundwater
Former FMC Pesticide Formulation Facility
Yakima, WA

ERM-West, Inc. 8/97

Endosulfan I and endosulfan II are both metabolized by *Pseudomonads* and other microorganisms to yield endosulfan sulfate. A variety of other metabolites are also produced such as endosulfandiol, endosulfan ether, and endosulfan lactone.

The estimated half life ranges between 2 days and 56 days for aqueous biodegradation. Hydrolysis of endosulfan I and II yields endosulfan sulfate with a reported half life of 9 days. Endosulfan sulfate is further metabolized by a variety of organisms, but the chlorinated endosulfan backbone persists in all known metabolites.

SECTION 4.0

RISK ASSESSMENT

As part of the RI for the site, a risk assessment was completed. Both human health and environmental receptors were evaluated. Conclusions are presented in the Phase II RI Report (Bechtel, 1990).

The receptor survey has been updated for this five-year review. The air pathway is no longer active since the removal actions. Surface water pathways also are no longer of concern because of the removal of surface soil contamination.

Water well records were obtained from the Washington State Department of Ecology and reviewed for wells located within a one-mile radius of the site. As also indicated in the previous 1990 survey, the record search indicates that no receptors from a groundwater pathway are located downgradient from the subject site (Figure 4-1).

Groundwater on the FMC site and immediate vicinity is not currently used for domestic, industrial, or agricultural purposes. Monitoring wells associated with the site are locked to prevent access by unauthorized personnel.

CAD File:	Drawn By:	Date:	Project No.
FMC-4-1	N. Dieterich	11/13/97	2672.71

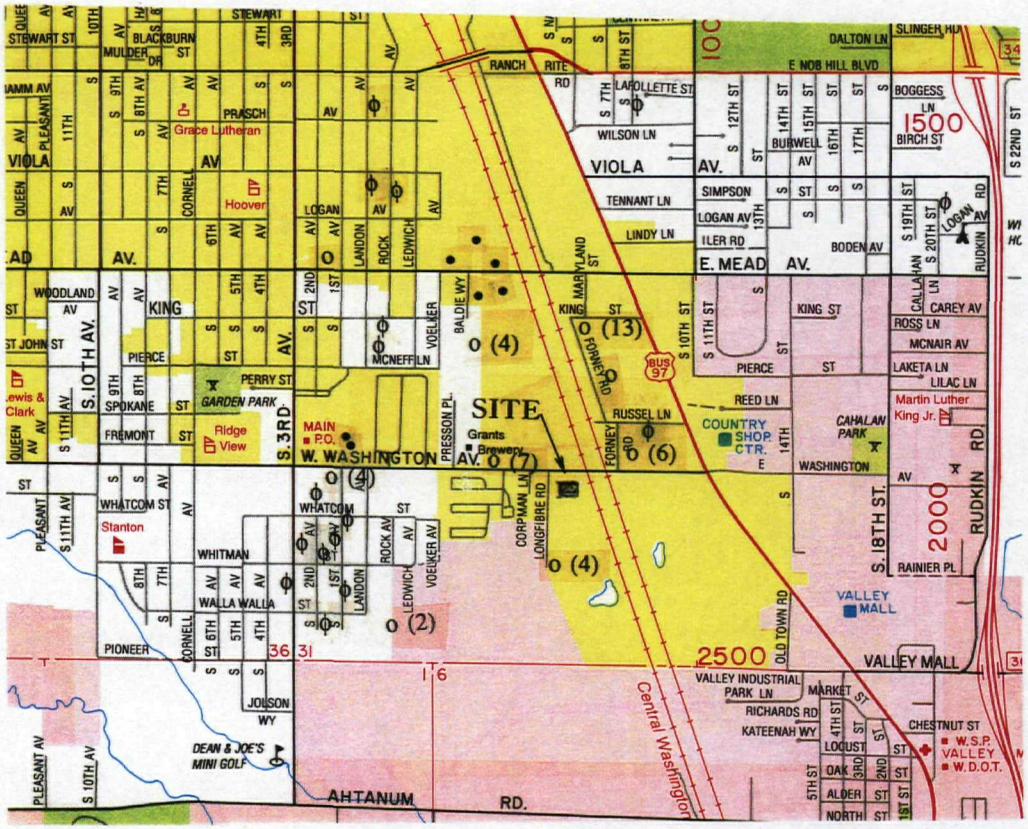


Figure 4-1
Water Well Survey Locations
Former FMC Pesticide Formulation Facility
Yakima, WA
ERM-West, Inc. 11/97

SECTION 5.0

DATA EVALUATION

It is apparent from observations of the time-series graphs (Figures 2-3 through 2-5 and Figures 3-1 and 3-2) that for the source area wells:

- concentrations increased immediately after the excavation of the disposal pit and removal actions;
- some type of seasonal fluctuation effects concentration; and,
- based on the observed endosulfan concentrations, seasonal fluctuations are probably based on groundwater fluctuations.

Since the removal action concentrations of dieldrin have equilibrated, within the range explained by seasonal fluctuations, to concentrations that are greater than concentrations measured in groundwater before the removal action. Except for anomalous values measured in September 1995, which are attributed to well installation interference, concentrations have been between the detection level of 0.05 and 0.6 μg/l. Endosulfan concentrations were increasing until last year, when they appeared to stabilize. Future monitoring will be needed to determine whether endosulfan concentrations have equilibrated.

CONCLUSIONS

The five-year FMC Yakima groundwater monitoring program has shown that residual pesticide contamination continues to be detected in site groundwater. Groundwater contamination associated with the former FMC Yakima site, however, does not currently pose a threat to human health or the environment.

The major source of the organochlorine compounds is the former disposal pit area. There may be other minor sources from former process areas. During the fall, when groundwater is in direct contact with soil containing residual concentrations of pesticides, endosulfan and dieldrin are dissolved and transported by advective groundwater flow. Residual soil contamination at the base of the former disposal pit excavation is in direct contact with groundwater during periods of average and seasonally high groundwater levels. As a result, maximum concentrations of organochlorine compounds are typically detected in monitoring wells immediately downgradient from the disposal pit after the seasonal high water table occurs. In addition, colloidal particles containing endosulfan, dieldrin and DDT may be transported to source wells.

Another potential source area is Areas 4, 5 and 6. Backfilling with cobbles increased the permeability of the soil above the residual soil contamination, and created a "french drain" effect where groundwater can preferentially flows through the surrounding residually-contaminated soils into the backfilled gravel.

Dieldrin and endosulfan have been detected at concentrations that are greater than concentrations detected in groundwater prior to the removal action. The risk-based target concentration for dieldrin is 0.004 μg/l. Dieldrin is typically detected slightly above the analytical detection level (0.05 μg/l) in W-13 during most of the year, and at higher concentrations in W-13 and W-14 during the fall.

W-13 and W-14 are source wells, and when samples are filtered the detected concentrations are approximately one half of non-filtered samples. This suggests that a portion of the dieldrin detected in samples may be bound to clay or colloidal particles in the groundwater. Transport of that fraction of the dieldrin is limited by the size and migration rate of the colloidal particles. Adsorption and biodegradation by microbiological populations are degrading the fraction of dieldrin that is dissolved in groundwater into aldrin, and fixing dieldrin within the biomass until other degradation mechanisms remove dieldrin from groundwater.

Aldrin was last detected in groundwater in 1996. Aldrin is a byproduct of the degradation of dieldrin, and has never been used in process formulations or as a raw material at the site.

Endosulfan concentrations present in groundwater at the site are more than an order of magnitude less than risk-based concentrations of concern. USEPA may, however, further evaluate the risk-based concentration of endosulfan. Until that evaluation has been completed, further monitoring of the extent of endosulfan is necessary. Long-term groundwater monitoring results indicate that the extent of endosulfan remains stable across the site, but during fall sampling events elevated sample concentrations occur due to the seasonal high water table elevation. Endosulfan is present in groundwater within approximately 600 feet of the former disposal pit. The presence of endosulfan sulfate confirms that hydrolysis or microbiological degradation occurs. Groundwater concentrations of endosulfan I and II will eventually decrease as degradation mechanisms act on the remaining soil contamination.

DDT was detected in a non-filtered sample from W-13 in October, 1997 at a concentration of 0.07 μg/l. Prior to that detection, DDT had not been detected since May, 1996 (also in W-13). DDT was not detected in the filtered sample from W-13, which suggests that the DDT may be bound to clay or colloidal particles in the groundwater, and transport could be limited by the size and migration rate of the colloidal particles.

RECOMMENDATIONS

Based on the continued detection of organochlorine compounds at the former FMC pesticide formulation facility, groundwater monitoring should be continued at the site. The following monitoring wells should be sampled during the Fall of each year: W-7, W-12, W-13, W-14, W-16 and W-17. Although not necessary for evaluating compliance with the ROD, a Spring sampling event would be useful for comparison.

W-7 does not serve as a suitable downgradient monitoring well at the site because the top of the water table is not screened. Offsite downgradient monitoring wells W-11 and W-15 have been destroyed; therefore, an onsite replacement well W-18 will be installed and screened across the water table. Monitoring of W-18 will begin during the Fall 1998 sampling event.

Institutional controls restricting the use of on-site groundwater should be implemented.

SECTION 8.0

REFERENCES

Bechtel, 1990, *Phase II Remedial Investigation Report for a Former Pesticide Formulation Facility in Yakima, Washington:* Report to FMC dated April, 1990.

Bechtel, 1994, *Remedial Action Completion Report:* Report to FMC dated May, 1994.

Dowdy, S., and Wearden, 1983, Statistics for Research: John Wiley and Sons, Inc., 537 p.

ERM, 1994, *Long-Term Monitoring Plan:* Report to FMC dated June 1994

Koch, G.S., and Link, R.F., 1970, Statistical Analysis of Geological Data, Volume 1: John Wiley and Sons, Inc., New York, New York, p. 218-220

Loftis, J. C., Montgomery, R. H., Jarris, Jane, Nettles, David, Porter, P. S., Ward, R. C., Sanders, T. G., 1986, Monitoring strategies of groundwater quality management: Colorado Water Resources Research Institute Completion Report 140, p. 74-80.

Lohman, S.W., 1979, Ground-water hydraulics: US Geological Survey Professional Paper 708, 70 p.

Montgomery, John H., 1993: Agrochemicals Desk Reference - Environmental Data: Lewis Publishers, Boca Raton, LA.

Rinehart, Milton, 1982, Statistical Procedure used to detect ground-water contamination: Best Available Technology letter report issued by OEPA, Division of Hazardous Materials Management, 16 p.

Schroeder, P.R., and others, 1984, The hydrologic evaluation of landfill performance (HELP) model: US EPA Publication Number EPA/530-SW-84-010, 80 p.

APPENDIX A

GROUNDWATER ANALYTICAL DATA

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date		Aldrin			alpha-BHC			beta-BHC			delta-BHC			gamma-BHC			Chlordane	
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
W-1	Oct-97	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-7	Oct-97	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-9B	Oct-97	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-12A	Oct-97	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-12B	Oct-97	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-13	Oct-97	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-14	Oct-97	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-16	Oct-97	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-17	Oct-97	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-7	Apr-97	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-9B	Apr-97	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-12A	Apr-97	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-12B	Apr-97	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-13	Apr-97	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-14	Apr-97	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-16	Apr-97	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-17	Apr-97	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-1	Dec-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-7	Dec-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-9B	Dec-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-12A	Dec-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-12B	Dec-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-13	Dec-96	0.05	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-14	Dec-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-16	Dec-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-17	Dec-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-7	May-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-9B	May-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-12A	May-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-12B	May-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-13	May-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-14	May-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-15	May-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-16	May-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-17	May-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-7	Feb-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-9B	Feb-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-12A	Feb-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-12B	Feb-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-13	Feb-96	0.03	0.05	NQ J	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-14	Feb-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date		4,4'-DDD			4,4'-DDE			4,4'-DDT			Dieldrin		Endosulfan I			Endosulfan II		
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
W-1	Oct-97	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-7	Oct-97	0	0.05		0	0.05		0	0.05		0	0.05		1.0	0.05		0.68	0.05	
W-9B	Oct-97	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-12A	Oct-97	0	0.05		0	0.05		0	0.05		0	0.05		2.0	0.05		1.1	0.05	
W-12B	Oct-97	0	0.05		0	0.05		0	0.05		0	0.05		0.38	0.05		0.18	0.05	
W-13	Oct-97	0	0.05		0	0.05		0.07	0.05		0.47	0.05		6.8	0.05		3.7	0.05	
W-14	Oct-97	0	0.05		0	0.05		0	0.05		0.21	0.05		4.0	0.05		2.9	0.05	
W-16	Oct-97	0	0.05		0	0.05		0	0.05		0	0.05		0.24	0.05		0.11	0.05	
W-17	Oct-97	0	0.05		0	0.05		0	0.05		0	0.05		1.9	0.05		1.3	0.05	
W-7	Apr-97	0	0.05		0	0.05		0	0.05		0	0.05		0.41	0.05		0.22	0.05	
W-9B	Apr-97	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-12A	Apr-97	0	0.05		0	0.05		0	0.05		0	0.05		0.44	0.05		0.19	0.05	
W-12B	Apr-97	0	0.05		0	0.05		0	0.05		0	0.05		1.2	0.05		0.52	0.05	
W-13	Apr-97	0	0.05		0	0.05		0	0.05		0.06	0.05		1.4	0.05		0.77	0.05	
W-14	Apr-97	0	0.05		0	0.05		0	0.05		0	0.05		1.1	0.05		0.55	0.05	
W-16	Apr-97	0	0.05		0	0.05		0	0.05		0	0.05		0.08	0.05		0	0.05	
W-17	Apr-97	0	0.05		0	0.05		0	0.05		0	0.05		0.66	0.05		0.29	0.05	
W-1	Dec-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-7	Dec-96	0	0.05		0	0.05		0	0.05		0.03	0.05	J	0.65	0.05		0	0.05	
W-9B	Dec-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-12A	Dec-96	0	0.05		0	0.05		0	0.05		0	0.05		0.89	0.05		0.45	0.05	
W-12B	Dec-96	0	0.05		0	0.05		0	0.05		0	0.05		1.5	0.05		0	0.05	
W-13	Dec-96	0	0.05		0	0.05		0	0.05		0.22	0.05		3.3	0.05		2.4	0.05	
W-14	Dec-96	0	0.05		0	0.05		0	0.05		0.03	0.05	J	1.3	0.05		0	0.05	
W-16	Dec-96	0	0.05		0	0.05		0	0.05		0	0.05		0.14	0.05		0	0.05	
W-17	Dec-96	0	0.05		0	0.05		0	0.05		0	0.05		0.78	0.05		0.4	0.05	
W-7	May-96	0	0.05		0	0.05		0	0.05		0	0.05		0.22	0.05		0.16	0.05	
W-9B	May-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-12A	May-96	0	0.05		0	0.05		0	0.05		0	0.05		0.56	0.05		0.28	0.05	
W-12B	May-96	0	0.05		0	0.05		0	0.05		0	0.05		1.00	0.05		0.55	0.05	
W-13	May-96	0	0.05		0	0.05		0.06	0.05		0.07	0.05		0.98	0.05		0.66	0.05	
W-14	May-96	0	0.05		0	0.05		0	0.05		0	0.05		0.70	0.05		0.40	0.05	
W-15	May-96	0	0.05		0	0.05		0	0.05		0	0.05		0.33	0.05		0.26	0.05	
W-16	May-96	0	0.05		0	0.05		0	0.05		0	0.05		0.09	0.05		0.05	0.05	
W-17	May-96	0	0.05		0	0.05		0	0.05		0	0.05		0.57	0.05		0.32	0.05	
W-7	Feb-96	0	0.05		0	0.05		0	0.05		0	0.05		0.25	0.05		0.17	0.05	
W-9B	Feb-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-12A	Feb-96	0	0.05		0	0.05		0	0.05		0	0.05		0.45	0.05		0.25	0.05	
W-12B	Feb-96	0	0.05		0	0.05		0	0.05		0	0.05		1.1	0.05		0.54	0.05	
W-13	Feb-96	0	0.05		0	0.05		0	0.05		0.060	0.05		1.3	0.05		0.79	0.05	
W-14	Feb-96	0	0.05		0	0.05		0	0.05		0	0.05		0.87	0.05		0.47	0.05	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date	Endosulfan sulfate				Endrin		Endrin aldehyde			Endrin Ketone				Heptachlor		Heptachlor Epoxide		
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
W-1	Oct-97	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-7	Oct-97	0.84	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-9B	Oct-97	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-12A	Oct-97	0.94	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-12B	Oct-97	0.09	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-13	Oct-97	3.2	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-14	Oct-97	5.0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-16	Oct-97	0.06	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-17	Oct-97	1.7	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-7	Apr-97	0.13	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-9B	Apr-97	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-12A	Apr-97	0.07	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-12B	Apr-97	0.15	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-13	Apr-97	0.40	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-14	Apr-97	0.26	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-16	Apr-97	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-17	Apr-97	0.12	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-1	Dec-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-7	Dec-96	0.41	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-9B	Dec-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-12A	Dec-96	0.15	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-12B	Dec-96	0.23	0.05		0.03	0.05	J	0	0.05		0	0.05		0	0.05		0	0.05	
W-13	Dec-96	1.6	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-14	Dec-96	0.45	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-16	Dec-96	0.04	0.05	J	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-17	Dec-96	0.15	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-7	May-96	0.14	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-9B	May-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-12A	May-96	0.13	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-12B	May-96	0.20	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-13	May-96	0.49	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-14	May-96	0.27	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-15	May-96	0.32	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-16	May-96	0.03	0.05	NQ J	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-17	May-96	0.21	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-7	Feb-96	0.12	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-9B	Feb-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-12A	Feb-96	0.09	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-12B	Feb-96	0.15	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-13	Feb-96	0.47	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-14	Feb-96	0.22	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date	4,4'-Methoxychlor				Toxaphene			Captan			Ovex			Perthane			Dicofol	
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
W-1	Oct-97	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-7	Oct-97	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-9B	Oct-97	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-12A	Oct-97	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-12B	Oct-97	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-13	Oct-97	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-14	Oct-97	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-16	Oct-97	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-17	Oct-97	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-7	Apr-97	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-9B	Apr-97	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-12A	Apr-97	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-12B	Apr-97	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-13	Apr-97	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-14	Apr-97	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-16	Apr-97	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-17	Apr-97	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-1	Dec-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-7	Dec-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-9B	Dec-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-12A	Dec-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-12B	Dec-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-13	Dec-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-14	Dec-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-16	Dec-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-17	Dec-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-7	May-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-9B	May-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-12A	May-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-12B	May-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-13	May-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-14	May-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-15	May-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-16	May-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-17	May-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.50		0	0.05	
W-7	Feb-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.05		0	0.05	
W-9B	Feb-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.05		0	0.05	
W-12A	Feb-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.05		0	0.05	
W-12B	Feb-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.05		0	0.05	
W-13	Feb-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.05		0	0.05	
W-14	Feb-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.05		0	0.05	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date		Aldrin			alpha-BHC			beta-BHC			delta-BHC			gamma-BHC			Chlordane	
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
W-15	Feb-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-16	Feb-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-17	Feb-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-7	Dec-95	0	0.04		0	0.03		0	0.06		0	0.09		0	0.04		0	0.14	
W-9B	Dec-95	0	0.04		0	0.03		0	0.06		0.047	0.09	NQ J	0	0.04		0	0.14	
W-12A	Dec-95	0	0.04		0	0.03		0	0.06		0	0.09		0	0.04		0	0.14	
W-12B	Dec-95	0	0.04		0	0.03		0	0.06		0	0.09		0	0.04		0	0.14	
W-13	Dec-95	0.069	0.04		0.088	0.03		0	0.06		0.22	0.09		0	0.04		0	0.14	
W-14	Dec-95	0.03	0.04	NQ J	0	0.03		0	0.06		0	0.09		0	0.04		0	0.14	
W-15	Dec-95	0	0.04		0	0.03		0	0.06		0	0.09		0	0.04		0	0.14	
W-16	Dec-95	0	0.04		0	0.03		0	0.06		0	0.09		0	0.04		0	0.14	
W-17	Dec-95	0	0.04		0	0.03		0	0.06		0	0.09		0	0.04		0	0.14	
W-1	Sep-95	0	0.04		0	0.03		0	0.06		0	0.09		0	0.04		0	0.14	
W-7	Sep-95	0	0.04		0	0.03		0.013	0.06	NQ J	0.019	0.09	NQ J	0.018	0.04	NQ J	0	0.14	
W-9B	Sep-95	0	0.04		0	0.03		0	0.06		0	0.09		0	0.04		0	0.14	
W-12A	Sep-95	0	0.04		0	0.03		0	0.06		0	0.09		0	0.04		0	0.14	
W-12B	Sep-95	0	0.04		0	0.03		0	0.06		0	0.09		0	0.04		0	0.14	
W-13	Sep-95	0.071	0.04		0.062	0.03		0.063	0.06		0.22	0.09		0	0.04		0	0.14	
W-14	Sep-95	0.017	0.04	NQ J	0	0.03		0.018	0.06	NQ J	0	0.09		0	0.04		0	0.14	
W-15	Sep-95	0	0.04		0	0.03		0.013	0.06	NQ J	0	0.09		0	0.04		0	0.14	
W-16	Sep-95	0	0.04		0	0.03		0	0.06		0	0.09		0	0.04		0	0.14	
W-17	Sep-95	0	0.04		0	0.03		0	0.06		0	0.09		0	0.04		0	0.14	
W-3	Jun-95	0	0.04		0	0.03		0	0.06		0	0.09		0	0.04		0	0.13	
W-4	Jun-95	0.047	0.04		0.052	0.03		0	0.06		0.065	0.09	NQ J	0.042	0.04		0	0.13	
W-5	Jun-95	0	0.04		0	0.03		0	0.06		0	0.09		0	0.04		0	0.13	
W-6	Jun-95	0	0.04		0.047	0.03		0	0.06		0.056	0.09	NQ J	0	0.04		0	0.13	
W-9B	Jun-95	0	0.04		0	0.03		0	0.06		0	0.09		0	0.04		0	0.13	
W-10	Jun-95	0	0.04		0	0.03		0	0.06		0	0.09		0	0.04		0	0.13	
W-11	Jun-95	0.03	0.04	NQ J	0	0.03		0	0.06		0	0.09		0	0.04		0	0.13	
W-12B	Jun-95	0	0.04		0	0.03		0	0.06		0	0.09		0	0.04		0	0.13	
W-13	Jun-95	0.095	0.04		0.054	0.03		0	0.06		0.09	0.09		0.04	0.04		0	0.13	
W-14	Jun-95	0.046	0.04		0.057	0.03		0	0.06		0.084	0.09	NQ J	0	0.04		0	0.13	
W-12A	Jun-95	0.032	0.04	NQ J	0.044	0.03		0	0.06		0.039	0.09	NQ J	0	0.04		0	0.13	
W-3	Mar-95	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	2.00	
W-4	Mar-95	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	2.00	
W-5	Mar-95	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	2.00	
W-6	Mar-95	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	2.00	
W-9B	Mar-95	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	2.00	
W-10	Mar-95	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	2.00	
W-11	Mar-95	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	2.00	
W-12B	Mar-95	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	2.00	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date		4,4'-DDD			4,4'-DDE			4,4'-DDT			Dieldrin		Endosulfan I			Endosulfan II		
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
W-15	Feb-96	0	0.05		0	0.05		0	0.05		0	0.05		0.48	0.05		0.32	0.05	
W-16	Feb-96	0	0.05		0	0.05		0	0.05		0	0.05		0.09	0.05		0.05	0.05	
W-17	Feb-96	0	0.05		0	0.05		0	0.05		0	0.05		0.64	0.05		0.31	0.05	
W-7	Dec-95	0	0.11		0	0.04		0	0.12		0.029	0.02		0.78	0.14		0.48	0.04	
W-9B	Dec-95	0	0.11		0	0.04		0	0.12		0	0.02		0	0.14		0	0.04	
W-12A	Dec-95	0	0.11		0	0.04		0	0.12		0.011	0.02	NQ J	1.7	0.14		0.71	0.04	
W-12B	Dec-95	0	0.11		0	0.04		0	0.12		0.018	0.02	NQ J	2.1	0.14		1.1	0.04	
W-13	Dec-95	0	0.11		0.021	0.04	NQ J	0	0.12		0.120	0.02		2.6	0.14		1.9	0.04	
W-14	Dec-95	0.015	0.11	NQ J	0.0082	0.04	NQ J	0	0.12		0.023	0.02		2.3	0.14		1.0	0.04	
W-15	Dec-95	0	0.11		0	0.04		0	0.12		0.028	0.02		0.86	0.14		0.49	0.04	
W-16	Dec-95	0	0.11		0	0.04		0	0.12		0	0.02		0.24	0.14		0.12	0.04	
W-17	Dec-95	0	0.11		0	0.04		0.0067	0.12	NQ J	0.013	0.02	NQ J	1.6	0.14		0.68	0.04	
W-1	Sep-95	0	0.11		0	0.04		0	0.12		0	0.02		0	0.14		0	0.04	
W-7	Sep-95	0	0.11		0	0.04		0	0.12		0.046	0.02		0.79	0.14		0.48	0.04	
W-9B	Sep-95	0	0.11		0	0.04		0	0.12		0	0.02		0	0.14		0	0.04	
W-12A	Sep-95	0	0.11		0	0.04		0	0.12		0.009	0.02	NQ J	0.41	0.14		0.23	0.04	
W-12B	Sep-95	0	0.11		0	0.04		0	0.12		0.008	0.02	NQ J	0.79	0.14		0.34	0.04	
W-13	Sep-95	0	0.11		0	0.04		0.084	0.12	NQ J	0.480	0.02		13	0.14		7.3	0.04	
W-14	Sep-95	0.021	0.11	NQ J	0.012	0.04	NQ J	0	0.12		0.073	0.02		1.6	0.14		1.1	0.04	
W-15	Sep-95	0	0.11		0	0.04		0	0.12		0.046	0.02		0.89	0.14		0.61	0.04	
W-16	Sep-95	0	0.11		0	0.04		0	0.12		0	0.02		0.19	0.14		0.1	0.04	
W-17	Sep-95	0	0.11		0	0.04		0	0.12		0.023	0.02		0.81	0.14		0.45	0.04	
W-3	Jun-95	0	0.1		0	0.04		0	0.11		0.023	0.02		0.094	0.13	J NQ	0.22	0.04	
W-4	Jun-95	0	0.1		0	0.04		0	0.11		0.120	0.02		1.7	0.13		1.1	0.04	
W-5	Jun-95	0	0.1		0	0.04		0	0.11		0	0.02		0.370	0.13		0.26	0.04	
W-6	Jun-95	0	0.1		0	0.04		0	0.11		0.024	0.02		1	0.13		0.73	0.04	
W-9B	Jun-95	0	0.1		0	0.04		0	0.11		0	0.02		0	0.13		0	0.04	
W-10	Jun-95	0	0.1		0	0.04		0	0.11		0	0.02		0	0.13		0.053	0.04	
W-11	Jun-95	0	0.1		0	0.04		0	0.11		0	0.02		0.34	0.13		0.21	0.04	
W-12B	Jun-95	0	0.1		0	0.04		0	0.11		0	0.02		0.97	0.13		0.51	0.04	
W-13	Jun-95	0.046	0.1	NQ J	0.028	0.04	NQ J	0.072	0.11	NQ J	0.190	0.02		5.3	0.13		2.9	0.04	
W-14	Jun-95	0	0.1		0	0.04		0	0.11		0.084	0.02		1.7	0.13		1.1	0.04	
W-12A	Jun-95	0	0.1		0	0.04		0	0.11		0.017	0.02	NQ J	1.9	0.13		0.88	0.04	
W-3	Mar-95	0	0.1		0	0.10		0	0.1		0	0.05		0.078	0.05		0.11	0.05	
W-4	Mar-95	0.38	0.1		0.27	0.10		0	0.1		0	0.10		0.43	0.05		0.35	0.10	
W-5	Mar-95	0	0.1		0	0.10		0	0.1		0	0.10		0.073	0.05	P	0.10	0.10	
W-6	Mar-95	0	0.1		0	0.10		0	0.1		0	0.05		0	0.05		0.52	0.05	P
W-9B	Mar-95	0	0.1		0	0.10		0	0.1		0	0.10		0	0.05		0	0.10	
W-10	Mar-95	0	0.1		0	0.10		0	0.1		0	0.10		0.7	0.05		0.046	0.10	NQ JP
W-11	Mar-95	0	0.1		0	0.10		0	0.1		0	0.10		0.13	0.05	P	0.16	0.10	
W-12B	Mar-95	0	0.1		0	0.10		0	0.1		0	0.10		0.86	0.25		0.52	0.10	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date	Endosulfan sulfate			Endrin			Endrin aldehyde			Endrin Ketone				Heptachlor		Heptachlor Epoxide		
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
W-15	Feb-96	0.26	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-16	Feb-96	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-17	Feb-96	0.11	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	0.05	
W-7	Dec-95	0.63	0.66	NQ J	0	0.06		0	0.23		0	0.10		0	0.03		0	0.83	
W-9B	Dec-95	0	0.66		0	0.06		0	0.23		0	0.10		0	0.03		0.0058	0.83	NQ J
W-12A	Dec-95	0.25	0.66	NQ J	0.028	0.06	NQ J	0	0.23		0.0072	0.10	NQ J	0	0.03		0	0.83	
W-12B	Dec-95	0.27	0.66	NQ J	0.033	0.06	NQ J	0	0.23		0	0.10		0	0.03		0	0.83	
W-13	Dec-95	0.98	0.66		0.053	0.06	NQ J	0	0.23		0	0.10		0	0.03		0	0.83	
W-14	Dec-95	0	0.66		0.03	0.06	NQ J	0	0.23		0.012	0.10	NQ J	0	0.03		0	0.83	
W-15	Dec-95	0	0.66		0.027	0.06	NQ J	0	0.23		0	0.10		0	0.03		0	0.83	
W-16	Dec-95	0.063	0.66	NQ J	0.0059	0.06	NQ J	0	0.23		0	0.10		0	0.03		0	0.83	
W-17	Dec-95	0.24	0.66	NQ J	0.029	0.06	NQ J	0	0.23		0	0.10		0	0.03		0	0.83	
W-1	Sep-95	0	0.66		0	0.06		0	0.23		0	0.10		0	0.03		0	0.83	
W-7	Sep-95	0.57	0.66	NQ J	0	0.06		0	0.23		0.015	0.10	NQ J	0	0.03		0	0.83	
W-9B	Sep-95	0	0.66		0	0.06		0	0.23		0	0.10		0	0.03		0	0.83	
W-12A	Sep-95	0.19	0.66	NQ J	0	0.06		0	0.23		0	0.10		0	0.03		0	0.83	
W-12B	Sep-95	0.19	0.66	NQ J	0.018	0.06	NQ J	0	0.23		0	0.10		0	0.03		0	0.83	
W-13	Sep-95	6.3	0.66		0	0.06		0	0.23		0	0.10		0	0.03		0	0.83	
W-14	Sep-95	0.97	0.66		0.031	0.06	NQ J	0	0.23		0.023	0.10	NQ J	0	0.03		0	0.83	
W-15	Sep-95	0.94	0.66		0.021	0.06	NQ J	0	0.23		0.02	0.10	NQ J	0	0.03		0	0.83	
W-16	Sep-95	0	0.66		0	0.06		0	0.23		0	0.10		0	0.03		0	0.83	
W-17	Sep-95	0.39	0.66	NQ J	0.022	0.06	NQ J	0	0.23		0	0.10		0	0.03		0	0.83	
W-3	Jun-95	0	0.63		0	0.06		0	0.22		0	0.10		0	0.03		0	0.79	
W-4	Jun-95	0	0.63		0	0.06		0	0.22		0	0.10		0	0.03		0	0.79	
W-5	Jun-95	0	0.63		0	0.06		0	0.22		0	0.10		0	0.03		0	0.79	
W-6	Jun-95	0.79	0.63		0	0.06		0	0.22		0	0.10		0	0.03		0	0.79	
W-9B	Jun-95	0	0.63		0	0.06		0	0.22		0	0.10		0	0.03		0	0.79	
W-10	Jun-95	0	0.63		0	0.06		0	0.22		0	0.10		0	0.03		0	0.79	
W-11	Jun-95	0	0.63		0	0.06		0	0.22		0	0.10		0	0.03		0	0.79	
W-12B	Jun-95	0	0.63		0	0.06		0	0.22		0	0.10		0	0.03		0	0.79	
W-13	Jun-95	0	0.63		0	0.06		0	0.22		0	0.10		0	0.03		0	0.79	
W-14	Jun-95	0	0.63		0	0.06		0	0.22		0	0.10		0	0.03		0	0.79	
W-12A	Jun-95	0.74	0.63		0	0.06		0	0.22		0	0.10		0	0.03		0	0.79	
W-3	Mar-95	0.43	0.10	P	0	0.10		0	0.1					0	0.10		0	0.1	
W-4	Mar-95	0.4	0.10		0	0.10		0	0.1					0	0.05		0	0.05	
W-5	Mar-95	0.14	0.10	P	0	0.10		0	0.1					0	0.05		0	0.05	
W-6	Mar-95	0	0.10		0.41	0.10		0.33	0.1					0	0.10		0	0.1	
W-9B	Mar-95	0	0.10		0	0.10		0	0.1					0	0.05		0	0.05	
W-10	Mar-95	0	0.10		0	0.10		0	0.1					0	0.05		0	0.05	
W-11	Mar-95	0.12	0.10	P	0	0.10		0	0.1					0	0.05		0	0.05	
W-12B	Mar-95	0.16	0.10		0	0.10		0	0.1					0	0.05		0	0.05	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date	4,4'-Methoxychlor			Toxaphene			Captan			Ovex			Perthane			Dicofol		
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
W-15	Feb-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.05		0	0.05	
W-16	Feb-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.05		0	0.05	
W-17	Feb-96	0	0.05		0	1.0		0	0.05		0	0.05		0	0.05		0	0.05	
W-7	Dec-95	0	1.8		0	2.4		0	0.05		0	0.05		0	0.05		0	0.05	
W-9B	Dec-95	0	1.8		0	2.4		0	0.05		0	0.05		0	0.05		0	0.05	
W-12A	Dec-95	0	1.8		0	2.4		0	0.05		0	0.05		0	0.05		0	0.05	
W-12B	Dec-95	0	1.8		0	2.4		0	0.05		0	0.05		0	0.05		0	0.05	
W-13	Dec-95	0	1.8		0	2.4		0	0.05		0	0.05		0	0.05		0	0.05	
W-14	Dec-95	0	1.8		0	2.4		0	0.05		0	0.05		0	0.05		0	0.05	
W-15	Dec-95	0	1.8		0	2.4		0	0.05		0	0.05		0	0.05		0	0.05	
W-16	Dec-95	0	1.8		0	2.4		0	0.05		0	0.05		0	0.05		0	0.05	
W-17	Dec-95	0	1.8		0	2.4		0	0.05		0	0.05		0	0.05		0	0.05	
W-1	Sep-95	0	1.8		0	2.4		0	0.05		0	0.05		0	0.05		0	0.05	
W-7	Sep-95	0	1.8		0	2.4		0	0.05		0	0.05		0	0.05		0	0.05	
W-9B	Sep-95	0	1.8		0	2.4		0	0.05		0	0.05		0	0.05		0	0.05	
W-12A	Sep-95	0	1.8		0	2.4		0	0.05		0	0.05		0	0.05		0.013	0.05	NQ J
W-12B	Sep-95	0	1.8		0	2.4		0	0.05		0	0.05		0	0.05		0	0.05	
W-13	Sep-95	0	1.8		0	2.4		0	0.05		0	0.05		0	0.05		0	0.05	
W-14	Sep-95	0	1.8		0	2.4		0	0.05		0	0.05		0	0.05		0	0.05	
W-15	Sep-95	0	1.8		0	2.4		0	0.05		0	0.05		0	0.05		0	0.05	
W-16	Sep-95	0	1.8		0	2.4		0	0.05		0	0.05		0	0.05		0	0.05	
W-17	Sep-95	0	1.8		0	2.4		0	0.05		0	0.05		0	0.05		0	0.05	
W-3	Jun-95	0	1.7		0	2.3		0	0.10		0	0.05		0	0.05		0	0.05	
W-4	Jun-95	0	1.7		0	2.3		0	0.10		0	0.05		0	0.05		0	0.05	
W-5	Jun-95	0	1.7		0	2.3		0	0.10		0	0.05		0	0.05		0	0.05	
W-6	Jun-95	0	1.7		0	2.3		0	0.10		0	0.05		0	0.05		0	0.05	
W-9B	Jun-95	0	1.7		0	2.3		0	0.10		0	0.05		0	0.05		0	0.05	
W-10	Jun-95	0	1.7		0	2.3		0	0.10		0	0.05		0	0.05		0	0.05	
W-11	Jun-95	0	1.7		0	2.3		0	0.10		0	0.05		0	0.05		0	0.05	
W-12B	Jun-95	0	1.7		0	2.3		0	0.10		0	0.05		0	0.05		0	0.05	
W-13	Jun-95	0	1.7		0	2.3		0	0.10		0	0.05		0	0.05		0	0.05	
W-14	Jun-95	0	1.7		0	2.3		0	0.10		0	0.05		0	0.05		0	0.05	
W-12A	Jun-95	0	1.7		0	2.3		0	0.10		0	0.05		0	0.05		0	0.05	
W-3	Mar-95	0	0.5		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-4	Mar-95	0	0.5		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-5	Mar-95	0	0.5		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-6	Mar-95	0	0.5		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-9B	Mar-95	0	0.5		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-10	Mar-95	0	0.5		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-11	Mar-95	0	0.5		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-12B	Mar-95	0	0.5		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date		Aldrin			alpha-BHC			beta-BHC			delta-BHC			gamma-BHC			Chlordane	
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
W-13	Mar-95	0.11	0.05		0	0.05		0	0.05		0.099	0.05		0	0.05		0	2.00	
W-14	Mar-95	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	2.00	
W-12A	Mar-95	0	0.05		0	0.05		0	0.05		0	0.05		0	0.05		0	2.00	
W-3	Dec-94	0	0.10		0	0.10		0	0.10		0	0.10		0	0.10		0	2.00	
W-4	Dec-94	0	0.10		0	0.10		0	0.10		0	0.10		0	0.10		0	2.00	
W-5	Dec-94	0	0.10		0	0.10		0	0.10		0	0.10		0	0.10		0	2.00	
W-6	Dec-94	0	0.10		0	0.10		0	0.10		0	0.10		0	0.10		0	2.00	
W-9B	Dec-94	0	0.10		0	0.10		0	0.10		0	0.10		0	0.10		0	2.00	
W-10	Dec-94	0	0.10		0	0.10		0	0.10		0	0.10		0	0.10		0	2.00	
W-11	Dec-94	0	0.10		0	0.10		0	0.10		0	0.10		0	0.10		0	2.00	
W-12B	Dec-94	0	0.10		0	0.10		0	0.10		0	0.10		0	0.10		0	2.00	
W-13	Dec-94	0.074	0.10	NQ	0	0.10		0	0.10		0	0.10		0	0.10		0	2.00	
W-14	Dec-94	0	0.10		0	0.10		0	0.10		0	0.10		0	0.10		0	2.00	
W-12A	Dec-94	0	0.10		0	0.10		0	0.10		0	0.10		0	0.10		0	2.00	
W-3	Oct-94	0	0.10		0	0.10		0	0.10		0	0.10		0	0.10		0	1.00	
W-4	Oct-94	0	0.10		0.023	0.10	NQ JP	0	0.10		0.042	0.10	NQ JP	0	0.10		0	1.00	
W-5	Oct-94	0	0.10		0	0.10		0	0.10		0	0.10		0	0.10		0	1.00	
W-6	Oct-94	0	0.10		0	0.10		0	0.10		0	0.10		0	0.10		0	1.00	
W-9B	Oct-94	0	0.10		0	0.10		0	0.10		0	0.10		0	0.10		0	1.00	
W-11	Oct-94	0	0.10		0	0.10		0	0.10		0	0.10		0	0.10		0	1.00	
W-12B	Oct-94	0	0.10		0	0.10		0	0.10		0	0.10		0	0.10		0	1.00	
W-13	Oct-94	0.054	0.10	NQ J	0.033	0.10	NQ JP	0	0.10		0.058	0.10	NQ JP	0.025	0.10	NQ JP	0	1.00	
W-14	Oct-94	0	0.10		0.037	0.10	NQ JP	0.023	0.10	NQ JP	0.055	0.10	NQ JP	0.02	0.10	NQ JP	0	1.00	
W-12A	Oct-94	0	0.10		0.046	0.10	NQ JP	0.027	0.10	NQ JP	0.037	0.10	NQ JP	0	0.10		0	1.00	
W-3	Jun-94	0	0.03		0	0.03		0.017	0.01		0	0.03		0.007	0.03	NQ	0	0.14	
W-4	Jun-94	0.012	0.03	NQ	0.018	0.03	NQ	0.02	0.01		0	0.03		0.008	0.03	NQ	0	0.14	
W-5	Jun-94	0	0.03		0	0.03		0.006	0.01	NQ	0	0.03		0	0.03		0	0.13	
W-6	Jun-94	0	0.03		0	0.03		0.009	0.01	NQ	0	0.03		0	0.03		0	0.14	
W-9B	Jun-94	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.14	
W-10	Jun-94	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.14	
W-11	Jun-94	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.14	
W-12B	Jun-94	0	0.03		0	0.03		0.008	0.01	NQ	0	0.03		0	0.03		0	0.14	
W-13	Jun-94	0	0.03		0.193	0.03	R	0.17	0.01	R	0.388	0.03	R	0.152	0.03	R	0	0.27	
W-14	Jun-94	0	0.03		0.012	0.03	NQ R	0.025	0.01	R	0	0.03		0	0.03		0	0.14	
W-12A	Jun-94	0	0.03		0	0.03		0.006	0.01	NQ	0	0.03		0	0.03		0	0.14	
W-1	Apr-94	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-4	Apr-94	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-9B	Apr-94	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-10	Apr-94	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.14	
W-12B	Apr-94	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
OH-1	Apr-94	0.131	0.03		0	0.03		0	0.01		0.112	0.03		0	0.03		0	0.13	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date		4,4'-DDD			4,4'-DDE			4,4'-DDT			Dieldrin		Endosulfan I			Endosulfan II		
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
W-13	Mar-95	0	0.1		0	0.10		0	0.1		0.170	0.10	P	1.8	0.25		1.5	0.50	
W-14	Mar-95	0	0.1		0	0.10		0	0.1		0	0.10		0.74	0.25		0.48	0.10	
W-12A	Mar-95	0	0.1		0	0.10		0	0.1		0	0.10		0.53	0.1		0.31	0.10	
W-3	Dec-94	0	0.1		0	0.10		0	0.1		0	0.10		0.039	0.1	NQ J	0.05	0.10	NQ J
W-4	Dec-94	0	0.1		0	0.10		0	0.1		0	0.10		0.62	0.5		0.34	0.10	P
W-5	Dec-94	0	0.1		0	0.10		0	0.1		0	0.10		0.10	0.1	NQ JP	0.08	0.10	NQ JP
W-6	Dec-94	0	0.1		0	0.10		0	0.1		0	0.10		0.69	0.5		0.45	0.10	P
W-9B	Dec-94	0	0.1		0	0.10		0	0.1		0	0.10		0	0.1		0	0.10	
W-10	Dec-94	0	0.1		0	0.10		0	0.1		0	0.10		0.11	0.1		0.062	0.10	NQ J
W-11	Dec-94	0	0.1		0	0.10		0	0.1		0	0.10		0.21	0.1		0.13	0.10	
W-12B	Dec-94	0	0.1		0	0.10		0	0.1		0	0.10		0.87	0.25		0.33	0.10	P
W-13	Dec-94	0	0.1		0	0.10		0	0.1		0.180	0.10		2.1	0.5		1.4	0.50	
W-14	Dec-94	0	0.1		0	0.10		0	0.1		0	0.10		0.83	0.5		0.56	0.10	
W-12A	Dec-94	0	0.1		0	0.10		0	0.1		0	0.10		0.43	0.5	NQ J	0.23	0.10	P
W-3	Oct-94	0	0.1		0	0.10		0	0.1		0.047	0.10	NQ J	0.064	0.1	NQ JP	0.100	0.10	
W-4	Oct-94	0	0.1		0	0.10		0	0.1		0.190	0.25	NQ JP	4.2	0.5		2.8	0.25	
W-5	Oct-94	0	0.1		0	0.10		0	0.1		0.022	0.10	NQ J	1.000	0.25	P	0.780	0.25	
W-6	Oct-94	0	0.1		0	0.10		0	0.1		0.097	0.10	NQ JP	1.6	0.5		1.3	0.50	
W-9B	Oct-94	0	0.1		0	0.10		0	0.1		0	0.10		0.028	0.1	NQ JP	0	0.10	
W-11	Oct-94	0	0.1		0	0.10		0	0.1		0.028	0.10	NQ J	0.54	0.2		0.42	0.20	
W-12B	Oct-94	0	0.1		0	0.10		0	0.1		0	0.10		0.8	0.5		0.6	0.50	
W-13	Oct-94	0	0.1		0	0.10		0	0.1		0.210	0.50	NQ J	4.60	1		3.00	0.50	
W-14	Oct-94	0	0.1		0	0.10		0	0.1		0.220	0.50	NQ JP	3.7	0.5	J	2.9	0.50	
W-12A	Oct-94	0	0.1		0	0.10		0	0.1		0.100	0.10		3.4	0.5		2.9	0.50	
W-3	Jun-94	0	0.032		0	0.03		0	0.043		0.048	0.03		0.333	0.031		0.353	0.04	
W-4	Jun-94	0	0.032		0	0.03		0	0.043		0.060	0.03		0.807	0.031		0.578	0.04	
W-5	Jun-94	0	0.031		0	0.03		0	0.042		0	0.03		0.303	0.031		0.175	0.04	
W-6	Jun-94	0	0.032		0	0.03		0	0.044		0.010	0.03	NQ	0.842	0.031		0.456	0.04	
W-9B	Jun-94	0	0.032		0	0.03		0	0.044		0	0.03		0	0.031		0	0.04	
W-10	Jun-94	0	0.032		0	0.03		0	0.043		0	0.03		0.099	0.031		0.062	0.04	
W-11	Jun-94	0	0.032		0	0.03		0	0.043		0	0.03		0.046	0.031		0.033	0.04	NQ
W-12B	Jun-94	0	0.032		0	0.03		0	0.043		0	0.03		1.14	0.031		0.799	0.04	
W-13	Jun-94	0.106	0.032	R	0.038	0.03	NQ R	0.172	0.043	R	0.510	0.03	R	4.74	0.031	R	2.67	0.04	R
W-14	Jun-94	0	0.032		0	0.03		0	0.043		0.028	0.03	NQ R	0.745	0.031	R	0.478	0.04	R
W-12A	Jun-94	0	0.032		0	0.03		0	0.043		0	0.03		0.464	0.031		0.3	0.04	
W-1	Apr-94	0	0.031		0	0.03		0	0.042		0	0.03		0	0.03		0	0.04	
W-4	Apr-94	2.83	0.031		1.73	0.03		0.252	0.042		0	0.03		0.318	0.03		0.225	0.04	
W-9B	Apr-94	0	0.031		0	0.03		0	0.042		0	0.03		0	0.03		0	0.04	
W-10	Apr-94	0	0.032		0	0.03		0	0.043		0	0.03		0	0.031		0	0.04	
W-12B	Apr-94	0	0.031		0	0.03		0	0.042		0	0.03		0.412	0.03		0.224	0.04	
OH-1	Apr-94	0	0.031		0	0.03		0	0.042		0.162	0.03		0.455	0.03		0.259	0.04	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date	Endosulfan sulfate				Endrin		Endrin aldehyde			Endrin Ketone				Heptachlor		Heptachlor Epoxide		
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
W-13	Mar-95	1.20	0.50		0	0.10		0	0.1					0	0.05		0	0.05	
W-14	Mar-95	0.3	0.10		0	0.10		0	0.1					0	0.05		0	0.05	
W-12A	Mar-95	0.17	0.10		0	0.10		0	0.1					0	0.05		0	0.05	
W-3	Dec-94	0.21	0.10		0	0.10		0	0.1					0	0.10		0	0.1	
W-4	Dec-94	0.29	0.10	P	0	0.10		0	0.1					0	0.10		0	0.1	
W-5	Dec-94	0.067	0.10	NQ JP	0	0.10		0	0.1					0	0.10		0	0.1	
W-6	Dec-94	0.26	0.10	P	0	0.10		0	0.1					0	0.10		0	0.1	
W-9B	Dec-94	0	0.10		0	0.10		0	0.1					0	0.10		0	0.1	
W-10	Dec-94	0.052	0.10	NQ JP	0	0.10		0	0.1					0	0.10		0	0.1	
W-11	Dec-94	0.095	0.10	NQ JP	0	0.10		0	0.1					0	0.10		0	0.1	
W-12B	Dec-94	0.065	0.10	NQ JP	0	0.10		0	0.1					0	0.10		0	0.1	
W-13	Dec-94	1.10	0.50		0	0.10		0	0.1					0	0.10		0	0.1	
W-14	Dec-94	0.31	0.10	P	0	0.10		0	0.1					0	0.10		0	0.1	
W-12A	Dec-94	0.081	0.10	NQ P	0	0.10		0	0.1					0	0.10		0	0.1	
W-3	Oct-94	0.13	0.10	P	0	0.10		0	0.1					0	0.10		0	0.1	
W-4	Oct-94	0.48	0.25	P	0.068	0.10	NQ JP	0	0.1					0	0.10		0	0.1	
W-5	Oct-94	0.25	0.25	P	0	0.10		0	0.1					0	0.10		0	0.1	
W-6	Oct-94	0.85	0.50	P	0	0.10		0	0.1					0	0.10		0	0.1	
W-9B	Oct-94	0	0.10		0	0.10		0	0.1					0	0.10		0	0.1	
W-11	Oct-94	0.17	0.20	NQ JP	0	0.10		0	0.1					0	0.10		0	0.1	
W-12B	Oct-94	0.33	0.50	NQ J	0	0.10		0	0.1					0	0.10		0	0.1	
W-13	Oct-94	0.80	0.50		0	0.10		0	0.1					0	0.10		0	0.1	
W-14	Oct-94	1.2	0.50		0	0.10		0	0.1					0	0.10		0	0.1	
W-12A	Oct-94	1.6	0.50	P	0	0.10		0	0.1					0	0.10		0	0.1	
W-3	Jun-94	0.574	0.05		0	0.03					0	0.04		0	0.04		0	0.032	
W-4	Jun-94	0.804	0.05		0.020	0.03	NQ				0	0.04		0	0.04		0	0.032	
W-5	Jun-94	0.267	0.05		0.019	0.03	NQ				0	0.04		0	0.04		0	0.031	
W-6	Jun-94	0.456	0.05		0.023	0.03	NQ				0	0.04		0	0.04		0	0.032	
W-9B	Jun-94	0	0.05		0	0.03					0	0.04		0	0.04		0	0.032	
W-10	Jun-94	0.09	0.05	NQ	0	0.03					0	0.04		0	0.04		0	0.031	
W-11	Jun-94	0.051	0.05	NQ	0.013	0.03	NQ				0	0.04		0	0.04		0	0.032	
W-12B	Jun-94	0.381	0.05		0.028	0.03	NQ				0	0.04		0	0.04		0	0.032	
W-13	Jun-94	2.56	0.05	R	0.063	0.03	R				0.114	0.04	R	0	0.07		0	0.063	
W-14	Jun-94	0.547	0.05	R	0.012	0.03	NQ R				0	0.04		0	0.04		0	0.032	
W-12A	Jun-94	0.187	0.05		0.018	0.03	NQ				0	0.04		0	0.04		0	0.032	
W-1	Apr-94	0	0.05		0	0.03					0	0.04		0	0.04		0	0.031	
W-4	Apr-94	0	0.05		0	0.03					0	0.04		0	0.04		0	0.031	
W-9B	Apr-94	0	0.05		0	0.03					0	0.04		0	0.04		0	0.031	
W-10	Apr-94	0	0.05		0	0.03					0	0.04		0	0.04		0	0.032	
W-12B	Apr-94	0	0.05		0	0.03					0	0.04		0	0.04		0	0.031	
OH-1	Apr-94	0	0.05		0	0.03					0	0.04		0	0.04		0	0.031	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date	4,4'-Methoxychlor				Toxaphene			Captan			Ovex			Perthane			Dicofol	
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
W-13	Mar-95	0	0.5		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-14	Mar-95	0	0.5		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-12A	Mar-95	0	0.5		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-3	Dec-94	0	0.1		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-4	Dec-94	0	0.1		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-5	Dec-94	0	0.1		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-6	Dec-94	0	0.1		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-9B	Dec-94	0	0.1		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-10	Dec-94	0	0.1		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-11	Dec-94	0	0.1		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-12B	Dec-94	0	0.1		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-13	Dec-94	0	0.1		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-14	Dec-94	0	0.1		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-12A	Dec-94	0	0.1		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-3	Oct-94	0	0.1		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-4	Oct-94	0	0.1		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-5	Oct-94	0	0.1		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-6	Oct-94	0	0.1		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-9B	Oct-94	0	0.1		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-11	Oct-94	0	0.1		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-12B	Oct-94	0	0.1		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-13	Oct-94	0	0.1		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-14	Oct-94	0	0.1		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-12A	Oct-94	0	0.1		0	5.0		0	0.40		0	0.40		0	0.40		0	0.40	
W-3	Jun-94	0	0.037		0	0.6		0	0.04		0	0.10		0	0.41		0.049	0.04	
W-4	Jun-94	0	0.037		0	0.6		0	0.04		0	0.10		0	0.41		0.069	0.04	
W-5	Jun-94	0	0.036		0	0.6		0	0.04		0	0.10		0	0.40		0	0.04	
W-6	Jun-94	0	0.038		0	0.6		0	0.04		0	0.10		0	0.42		0	0.04	
W-9B	Jun-94	0	0.037		0	0.6		0	0.04		0	0.10		0	0.42		0	0.04	
W-10	Jun-94	0	0.037		0	0.6		0	0.04		0	0.10		0	0.41		0	0.04	
W-11	Jun-94	0	0.037		0	0.6		0	0.04		0	0.10		0	0.41		0	0.04	
W-12B	Jun-94	0	0.037		0	0.6		0	0.04		0	0.10		0	0.41		0	0.04	
W-13	Jun-94	0	0.073		0	1.1		0	0.08		0.455	0.10	R	0	0.82		0.712	0.04	R
W-14	Jun-94	0	0.037		0	0.6		0	0.04		0	0.10		0	0.41		0	0.04	
W-12A	Jun-94	0	0.037		0	0.6		0	0.04		0	0.10		0	0.41		0	0.04	
W-1	Apr-94	0	0.036		0	0.6		0	0.04		0	0.10		0	0.40		0	0.04	
W-4	Apr-94	0.136	0.036		0	0.5		0	0.04		0.92	0.10		0.758	0.40		0.15	0.04	
W-9B	Apr-94	0	0.036		0	0.5		0	0.04		0	0.10		0	0.40		0	0.04	
W-10	Apr-94	0	0.037		0	0.6		0	0.04		0	0.10		0	0.40		0	0.04	
W-12B	Apr-94	0	0.036		0	0.6		0	0.04		0	0.10		0	0.40		0	0.04	
OH-1	Apr-94	0	0.036		0	0.6		0	0.04		0	0.10		0	0.40		0.303	0.04	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date		Aldrin			alpha-BHC			beta-BHC			delta-BHC			gamma-BHC			Chlordane	
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
OH-2	Apr-94	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-12A	Apr-94	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
OH-3	Apr-94	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-1	Dec-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-2	Dec-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-3	Dec-93	0	0.03		0	0.03		0	0.01		0.049	0.03		0	0.03		0	0.13	
W-4	Dec-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-5	Dec-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-6	Dec-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-7	Dec-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-9A	Dec-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-9B	Dec-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-10	Dec-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-11	Dec-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-12B	Dec-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
OH-1	Dec-93	0.16	0.03		0.033	0.03		0	0.01		0.082	0.03		0	0.03		0	0.13	
OH-2	Dec-93	0.058	0.03		0	0.03		0.019	0.01		0.056	0.03		0	0.03		0	0.13	
W-12A	Dec-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
OH-3	Dec-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-4	Jul-93	0.0488	0.03	J	0.0758	0.03		0.0554	0.01		0.125	0.03		0.0721	0.03		0	0.13	
W-5	Jul-93	0	0.03		0	0.03		0.0617	0.01		0.0871	0.03		0	0.03		0	0.13	
W-6	Jul-93	0	0.03		0.106	0.03		0.117	0.01		0.205	0.03		0.0632	0.03				
W-11	Jul-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-12B	Jul-93	0	0.03		0.582	0.03		0.282	0.01		0.782	0.03		0.340	0.03		0	0.13	
W-12A	Jul-93	0	0.03		0.438	0.03		0.275	0.01		0.627	0.03		0.226	0.03		0	0.13	
W-1	Jul-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-2	Jul-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03				
W-3	Jul-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-7	Jul-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-9A	Jul-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-9B	Jul-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-10	Jul-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
OH-1	Jul-93	0.0377	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
OH-2	Jul-93	0	0.03		0.147	0.03		0.0640	0.01		0.153	0.03		0.122	0.03		0	0.13	
OH-3	Jul-93	0	0.03		0.111	0.03		0.0778	0.01		0.133	0.03		0.0533	0.03		0	0.13	
OH-1	Apr-93	0.127	0.03		0	0.03		0.0305	0.01		0.0481	0.03		0	0.03		0	0.13	
OH-2	Apr-93	0	0.03		0	0.03		0.0230	0.01		0.0559	0.03		0.0324	0.03		0	0.13	
W-7	Apr-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-9A	Apr-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-9B	Apr-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-10	Apr-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date		4,4'-DDD			4,4'-DDE			4,4'-DDT			Dieldrin		Endosulfan I			Endosulfan II		
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
OH-2	Apr-94	0	0.031		0	0.03		0	0.042		0	0.03		0.535	0.03		0.394	0.04	
W-12A	Apr-94	0	0.031		0	0.03		0	0.042		0	0.03		0.279	0.03		0.229	0.04	
OH-3	Apr-94	0	0.031		0	0.03		0	0.042		0	0.03		0.380	0.03		0.196	0.04	
W-1	Dec-93	0	0.031		0	0.03		0	0.042		0	0.03		0	0.03		0	0.04	
W-2	Dec-93	0	0.031		0	0.03		0	0.042		0	0.03		1.31	0.03		0.136	0.04	
W-3	Dec-93	0	0.031		0	0.03		0	0.042		0.072	0.03		2.09	0.03		1.040	0.04	
W-4	Dec-93	0	0.031		0	0.03		0	0.042		0.058	0.03		1.8	0.03		1.120	0.04	
W-5	Dec-93	0	0.031		0	0.03		0	0.042		0	0.03		0.386	0.03		0.200	0.04	
W-6	Dec-93	0	0.031		0	0.03		0	0.042		0.037	0.03		1.21	0.03		0.596	0.04	
W-7	Dec-93	0	0.031		0	0.03		0	0.042		0	0.03		0.706	0.03		0.454	0.04	
W-9A	Dec-93	0	0.031		0	0.03		0	0.042		0	0.03		0	0.03		0	0.04	
W-9B	Dec-93	0	0.031		0	0.03		0	0.042		0	0.03		0	0.03		0	0.04	
W-10	Dec-93	0	0.031		0	0.03		0	0.042		0	0.03		0.08	0.03		0.055	0.04	
W-11	Dec-93	0	0.031		0	0.03		0	0.042		0	0.03		0.201	0.03		0.117	0.04	
W-12B	Dec-93	0	0.031		0	0.03		0	0.042		0	0.03		2.27	0.03		0.984	0.04	
OH-1	Dec-93	0	0.031		0	0.03		0.056	0.042		0.150	0.03		0.683	0.03		0.484	0.04	
OH-2	Dec-93	0	0.031		0	0.03		0	0.042		0.071	0.03		1.99	0.03		1.49	0.04	
W-12A	Dec-93	0	0.031		0	0.03		0	0.042		0	0.03		0.787	0.03		0.376	0.04	
OH-3	Dec-93	0	0.031		0	0.03		0	0.042		0	0.03		0.788	0.03		0.397	0.04	
W-4	Jul-93	0	0.0310		0	0.03		0.0542	0.0420	J	0.146	0.03	J				0.957	0.04	
W-5	Jul-93	0	0.0310		0	0.03		0	0.0420		0	0.03							
W-6	Jul-93	0	0.0310		0	0.03		0	0.0420		0.155	0.03					0.877	0.04	
W-11	Jul-93	0	0.0310		0	0.03		0	0.0420		0.038	0.03		0.413	0.0300	J	0.350	0.04	
W-12B	Jul-93	0	0.0310		0	0.03		0	0.0420		0.095	0.03							
W-12A	Jul-93	0	0.0310		0	0.03		0	0.0420		0	0.03							
W-1	Jul-93	0	0.0310		0	0.03		0	0.0420		0	0.03		0	0.0300		0	0.04	
W-2	Jul-93	0.0538	0.0310		0.0510	0.03		0.139	0.0420		0	0.03		0	0.0300		0	0.04	
W-3	Jul-93	0	0.0310		0	0.03		0	0.0420		0.057	0.03		0	0.0300		0.0865	0.04	
W-7	Jul-93	0	0.0310		0	0.03		0	0.0420		0.032	0.03	J	0.182	0.0300		0.142	0.04	
W-9A	Jul-93	0	0.0310		0	0.03		0	0.0420		0	0.03		0	0.0300		0	0.04	
W-9B	Jul-93	0	0.0310		0	0.03		0	0.0420		0	0.03		0.792	0.0300		0.403	0.04	
W-10	Jul-93	0	0.0310		0	0.03		0	0.0420		0	0.03		0.290	0.0300		0.173	0.04	
OH-1	Jul-93	0	0.0310		0.0291	0.03	NQ J	0.111	0.0420		0.044	0.03		0.218	0.0300		0.167	0.04	
OH-2	Jul-93	0	0.0310		0	0.03		0	0.0420		0.151	0.03		1.16	0.0600		0.788	0.04	
OH-3	Jul-93	0	0.0310		0	0.03		0	0.0420		0.052	0.03		2.39	0.150	J	1.80	0.19	
OH-1	Apr-93	0.120	0.0310		0.0453	0.03		0.469	0.0420		0.190	0.03		0.239	0.0300		0.346	0.04	
OH-2	Apr-93	0.0344	0.0310		0	0.03		0.182	0.0420		0.108	0.03		0.312	0.0300		0.433	0.04	
W-7	Apr-93	0	0.0310		0	0.03		0.0434	0.0420		0.031	0.03		0.203	0.0300		0.160	0.04	
W-9A	Apr-93	0	0.0310		0	0.03		0	0.0420		0	0.03		0	0.0300		0	0.04	
W-9B	Apr-93	0	0.0310		0	0.03		0	0.0420		0	0.03		0	0.0300		0	0.04	
W-10	Apr-93	0	0.0310		0	0.03		0	0.0420		0	0.03		0.127	0.0300		0.0873	0.04	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date	Endosulfan sulfate			Endrin			Endrin aldehyde			Endrin Ketone			Heptachlor			Heptachlor Epoxide		
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
OH-2	Apr-94	0.326	0.05		0	0.03					0	0.04		0	0.04		0	0.031	
W-12A	Apr-94	0	0.05		0	0.03					0	0.04		0	0.04		0	0.031	
OH-3	Apr-94	0	0.05		0	0.03					0	0.04		0	0.04		0	0.031	
W-1	Dec-93	0	0.05		0	0.03					0	0.04		0	0.04		0	0.031	
W-2	Dec-93	0.068	0.05		0	0.03					0	0.04		0	0.04		0	0.031	
W-3	Dec-93	1.22	0.05		0	0.03					0	0.04		0	0.04		0	0.031	
W-4	Dec-93	0.505	0.05		0	0.03					0	0.04		0	0.04		0	0.031	
W-5	Dec-93	0.092	0.05		0	0.03					0	0.04		0	0.04		0	0.031	
W-6	Dec-93	0.374	0.05		0	0.03					0	0.04		0	0.04		0	0.031	
W-7	Dec-93	0.328	0.05		0	0.03					0	0.04		0	0.04		0	0.031	
W-9A	Dec-93	0	0.05		0	0.03					0	0.04		0	0.04		0	0.031	
W-9B	Dec-93	0	0.05		0	0.03					0	0.04		0	0.04		0	0.031	
W-10	Dec-93	0	0.05		0	0.03					0	0.04		0	0.04		0	0.031	
W-11	Dec-93	0.091	0.05		0	0.03					0	0.04		0	0.04		0	0.031	
W-12B	Dec-93	0.148	0.05		0	0.03					0	0.04		0	0.04		0	0.031	
OH-1	Dec-93	0.178	0.05		0	0.03					0	0.04		0	0.04		0	0.031	
OH-2	Dec-93	0.609	0.05		0	0.03					0	0.04		0	0.04		0	0.031	
W-12A	Dec-93	0.135	0.05		0	0.03					0	0.04		0	0.04		0	0.031	
OH-3	Dec-93	0.112	0.05		0	0.03					0	0.04		0	0.04		0	0.031	
W-4	Jul-93	0.602	0.05		0.0369	0.03					0	0.04		0	0.04		0	0.0310	
W-5	Jul-93				0	0.03					0.0314	0.04	NQ J	0	0.04		0	0.0310	
W-6	Jul-93				0	0.03					0.0504	0.04		0	0.04		0	0.0310	
W-11	Jul-93	0.496	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
W-12B	Jul-93				0.0700	0.03					0.130	0.04		0	0.04		0	0.0310	
W-12A	Jul-93				0.0581	0.03					0.0861	0.04		0	0.04		0.195	0.0310	
W-1	Jul-93	0	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
W-2	Jul-93	0	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
W-3	Jul-93	0.251	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
W-7	Jul-93	0.295	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
W-9A	Jul-93	0	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
W-9B	Jul-93	0.183	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
W-10	Jul-93	0.209	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
OH-1	Jul-93	0.138	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
OH-2	Jul-93	0.712	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
OH-3	Jul-93	1.56	0.25		0	0.03					0	0.04		0	0.04		0	0.0310	
OH-1	Apr-93	0.413	0.05		0	0.03					0	0.04		0.0682	0.04		0	0.0310	
OH-2	Apr-93	0.612	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
W-7	Apr-93	0.166	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
W-9A	Apr-93	0	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
W-9B	Apr-93	0	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
W-10	Apr-93	0.0824	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date	4,4'-Methoxychlor			Toxaphene			Captan			Ovex			Perthane			Dicofol		
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
OH-2	Apr-94	0	0.036		0	0.6		0	0.04		0	0.10		0	0.40		0	0.04	
W-12A	Apr-94	0	0.036		0	0.6		0	0.04		0	0.10		0	0.40		0	0.04	
OH-3	Apr-94	0	0.036		0	0.6		0	0.04		0	0.10		0	0.40		0	0.04	
W-1	Dec-93	0	0.036		0	0.5		0	0.04		0	0.10		0	0.40		0	0.04	
W-2	Dec-93	0	0.036		0	0.5		0	0.04		0	0.10		0	0.40		0	0.04	
W-3	Dec-93	0	0.036		0	0.5		0	0.04		0	0.10		0	0.40		0	0.04	
W-4	Dec-93	0.136	0.036		0	0.5		0	0.04		0.92	0.10		0.758	0.40		0.15	0.04	
W-5	Dec-93	0	0.036		0	0.5		0	0.04		0	0.10		0	0.40		0	0.04	
W-6	Dec-93	0	0.036		0	0.5		0	0.04		0	0.10		0	0.40		0	0.04	
W-7	Dec-93	0	0.036		0	0.5		0	0.04		0	0.10		0	0.40		0	0.04	
W-9A	Dec-93	0	0.036		0	0.5		0	0.04		0	0.10		0	0.40		0	0.04	
W-9B	Dec-93	0	0.036		0	0.5		0	0.04		0	0.10		0	0.40		0	0.04	
W-10	Dec-93	0	0.036		0	0.5		0	0.04		0	0.10		0	0.40		0	0.04	
W-11	Dec-93	0	0.036		0	0.5		0	0.04		0	0.10		0	0.40		0	0.04	
W-12B	Dec-93	0	0.036		0	0.5		0	0.04		0	0.10		0	0.40		0	0.04	
OH-1	Dec-93	0	0.036		0	0.6		0	0.04		0	0.10		0	0.40		0.303	0.04	
OH-2	Dec-93	0	0.036		0	0.6		0	0.04		0	0.10		0	0.40		0	0.04	
W-12A	Dec-93	0	0.036		0	0.5		0	0.04		0	0.10		0	0.40		0	0.04	
OH-3	Dec-93	0	0.036		0	0.6		0	0.04		0	0.10		0	0.40		0	0.04	
W-4	Jul-93	0	0.0360		0	0.5													
W-5	Jul-93	0	0.0360		0	0.5													
W-6	Jul-93	0	0.0360																
W-11	Jul-93	0	0.0360		0	0.5													
W-12B	Jul-93	0	0.0360																
W-12A	Jul-93	0	0.0360																
W-1	Jul-93	0	0.0360		0	0.5													
W-2	Jul-93	0	0.0360		0	0.5													
W-3	Jul-93	0	0.0360		0	0.5													
W-7	Jul-93	0	0.0360		0	0.5													
W-9A	Jul-93	0	0.0360		0	0.5													
W-9B	Jul-93	0	0.0360		0	0.5													
W-10	Jul-93	0	0.0360		0	0.5													
OH-1	Jul-93	0	0.0360		0	0.5													
OH-2	Jul-93	0	0.0360		0	0.5													
OH-3	Jul-93	0	0.0360		0	0.5													
OH-1	Apr-93	0	0.0360		0	0.5													
OH-2	Apr-93	0	0.0360		0	0.5													
W-7	Apr-93	0	0.0360		0	0.5													
W-9A	Apr-93	0	0.0360		0	0.5													
W-9B	Apr-93	0	0.0360		0	0.5													
W-10	Apr-93	0	0.0360		0	0.5													

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date		Aldrin			alpha-BHC			beta-BHC			delta-BHC			gamma-BHC			Chlordane	
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
W-11	Apr-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
OH-3	Apr-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-7	Jan-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-9A	Jan-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-9B	Jan-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
OH-1	Jan-93	0.263	0.03		0.0821	0.03		0	0.01		0.127	0.03		0.0590	0.03		0	0.13	
OH-2	Jan-93	0	0.03		0.0350	0.03		0	0.01		0.0700	0.03		0.0434	0.03		0	0.13	
W-10	Jan-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-11	Jan-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
OH-3	Jan-93	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
OH-1	Dec-92	0.921	0.03		0.261	0.03		0.142	0.01		0.431	0.03		0.168	0.03		0	0.13	
W-11	Nov-92	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.14	
OH-3	Nov-92	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.14	
W-7	Oct-92	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-1	Oct-92	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-2	Oct-92	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03				
W-3	Oct-92	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-5	Oct-92	0	0.03		0.0875	0.03	J	0	0.01		0	0.03		0.0409	0.03		0	0.13	
W-9A	Oct-92	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-9B	Oct-92	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-10	Oct-92	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-11	Oct-92	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-4	Oct-92	0.216	0.03		0.193	0.03		0.215	0.01		0.310	0.03		0.252	0.03		0	0.13	
W-6	Oct-92	0	0.03		0	0.03		0.0473	0.01		0.0856	0.03		0	0.03		0	0.11	
OH-1	Oct-92	0.138	0.03		0.0437	0.03		0.0268	0.01		0	0.03		0	0.03		0	0.13	
OH-2	Oct-92	0.0489	0.03		0.0302	0.03		0.0162	0.01		0	0.03		0	0.03		0	0.13	
OH-3	Oct-92	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
OH-2	Oct-92	0.0658	0.03		0	0.03		0.0341	0.01		0	0.03		0	0.03		0	0.13	
W-1	Sep-92	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-6	Sep-92	0	0.03		0.0952	0.03		0.141	0.01		0	0.03		0.224	0.03		0	0.13	
W-4	Sep-92	0.0918	0.03		0.0536	0.03		0.0457	0.01		0.111	0.03		0.0443	0.03		0	0.13	
W-9A	Sep-92	0	0.03		0	0.03		0	0.01		0	0.03		0	0.03		0	0.13	
W-6	Aug-92	0.215	0.03		0.135	0.03		0	0.01		0.858	0.03		0	0.03		5.67	0.69	
W-4	Aug-92	0.103	0.03		0.146	0.03		0.0481	0.01		0.0953	0.03		0.0993	0.03		0	0.14	
W-4	Aug-92	0.134	0.03		0.131	0.03		0.0579	0.01		0.0796	0.03		0.0858	0.03		0	0.14	
W-5	Aug-92	0.0248	0.03	J NQ	0.0860	0.03		0.0497	0.01		0.0921	0.03		0.164	0.03		0	0.14	
W-5	Aug-92	0.0377	0.03		0.0837	0.03		0.0548	0.01		0.0854	0.03		0.164	0.03		0	0.14	
W-9A	Aug-92	0	0.03		0	0.03		0	0.01					0	0.03		0	0.13	
W-9B	Aug-92	0	0.03		0	0.03		0	0.03		0	0.03		0	0.03		0	0.13	
OH-3	Aug-92	0.101	0.03		0.197	0.03		0.126	0.01		0.257	0.03		0.0340	0.03		0	0.14	
W-2	Aug-92													0.109	0.03				

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date		4,4'-DDD			4,4'-DDE			4,4'-DDT			Dieldrin		Endosulfan I			Endosulfan II		
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
W-11	Apr-93	0	0.0310		0	0.03		0	0.0420		0	0.03		0.137	0.0300		0.102	0.04	
OH-3	Apr-93	0	0.0310		0	0.03		0	0.0420		0	0.03		0.778	0.0300		0.374	0.04	
W-7	Jan-93	0	0.0310		0	0.03		0	0.0420		0.039	0.03		0.233	0.0300		0.133	0.04	
W-9A	Jan-93	0	0.0310		0	0.03		0	0.0420		0	0.03		0.0489	0.0300		0.0453	0.04	
W-9B	Jan-93	0	0.0310		0	0.03		0	0.0420		0	0.03		0	0.0300		0	0.04	
OH-1	Jan-93	0.0656	0.0310		0.0972	0.03		0.504	0.0420		0.279	0.03		0.593	0.0300		0.410	0.04	
OH-2	Jan-93	0.0364	0.0310		0	0.03		0	0.0420		0.175	0.03		0.895	0.0300		0.585	0.04	
W-10	Jan-93	0	0.0310		0	0.03		0	0.042		0	0.03		0.139	0.0300		0.0912	0.04	
W-11	Jan-93	0	0.0310		0	0.03		0.0663	0.042		0.034	0.03		0.169	0.0300		0.115	0.04	
OH-3	Jan-93	0	0.0310		0	0.03		0	0.042		0	0.03		0.959	0.0300		0.501	0.04	
OH-1	Dec-92	0.312	0.0310		0.483	0.03		2.62	0.420		0.376	0.03		0.806	0.0300		0.375	0.04	
W-11	Nov-92	0	0.0310		0	0.03		0	0.0420		0	0.03		0.0966	0.0300		0.0804	0.04	
OH-3	Nov-92	0	0.0316		0	0.03		0	0.0429		0	0.03		0.811	0.0306		0.440	0.04	
W-7	Oct-92	0	0.0310		0	0.03		0	0.0420		0.076	0.03		0.117	0.0300		0.0905	0.04	
W-1	Oct-92	0	0.0310		0	0.03		0	0.0420		0	0.03		0	0.0300		0	0.04	
W-2	Oct-92	0.178	0.0310		0.0657	0.03		0.238	0.0420		0	0.03		0.0505	0.0300		0	0.04	
W-3	Oct-92	0	0.0310		0	0.03		0	0.0420		0.078	0.03		0.0514	0.0300		0.0726	0.04	
W-5	Oct-92	0	0.0310		0	0.03		0	0.0420		0.041	0.03		0.904	0.0300		0.500	0.04	
W-9A	Oct-92	0	0.0310		0	0.03		0	0.0420		0	0.03		0	0.0300		0	0.04	
W-9B	Oct-92	0	0.0310		0	0.03		0	0.0420		0	0.03		0.0647	0.0300		0	0.04	
W-10	Oct-92	0	0.0310		0	0.03		0	0.0420		0	0.03		0.215	0.0300		0.150	0.04	
W-11	Oct-92	0	0.0310		0	0.03		0	0.0420		0	0.03		0.0782	0.0300		0.0584	0.04	
W-4	Oct-92	0.139	0.0310		0.0622	0.03		0.138	0.0420		0.356	0.03		0.481	0.0300		0.248	0.04	
W-6	Oct-92	0.0414	0.0310		0	0.03		0.0422	0.0420		0.143	0.03		1.26	0.150		0.768	0.04	
OH-1	Oct-92	0.124	0.0310		0.0835	0.03		0.582	0.0420		0.145	0.03		0.0818	0.0300		0.109	0.04	
OH-2	Oct-92	0	0.0310		0	0.03		0	0.0420		0.271	0.03		0.128	0.0300		0.106	0.04	
OH-3	Oct-92	0	0.0310		0	0.03		0	0.0420		0	0.03		1.15	0.150		0.765	0.04	
OH-2	Oct-92	0.119	0.0310		0	0.03		0.0489	0.0420		0.260	0.03		0.140	0.0300		0.160	0.04	
W-1	Sep-92	0	0.0310		0	0.03		0	0.0420		0	0.03		0	0.0300		0	0.04	
W-6	Sep-92	0	0.0310		0	0.03		0.504	0.0420		0.192	0.03		1.32	0.150		0.706	0.04	
W-4	Sep-92	0.221	0.0310		0.0387	0.03		0.425	0.0420		0.502	0.03		0.261	0.0300		0.199	0.04	
W-9A	Sep-92	0	0.0310		0	0.03		0	0.0420		0	0.03		0	0.0300		0	0.04	
W-6	Aug-92	0.182	0.0320		1.56	0.14		4.47	0.216		0	0.03		35.3	1.55		50.1	1.96	
W-4	Aug-92	0.163	0.0316		0.0586	0.03		0.143	0.0429		0.439	0.03		0.506	0.0319		0.147	0.04	
W-4	Aug-92	0.141	0.0330		0.0291	0.03		0.214	0.0447		0.427	0.03		0.490	0.0306		0.139	0.04	
W-5	Aug-92	0.0316	0.0330	NQ J	0	0.03		0	0.0433		0.130	0.03		1.15	0.0319		0.607	0.04	
W-5	Aug-92	0.0368	0.0320		0.0128	0.03	J	0	0.0447		0.134	0.03		1.09	0.0309		0.534	0.04	
W-9A	Aug-92	0	0.0310		0	0.03		0	0.0420		0	0.03		0.0135	0.0300	NQ J	0.0144	0.04	NQ J
W-9B	Aug-92	0	0.0313		0	0.03		0	0.0424		0	0.03		0.335	0.0303		0.165	0.04	
OH-3	Aug-92	0.173	0.0320		0	0.03		0.0832	0.0433		0.312	0.03		1.68	0.155		0.876	0.04	
W-2	Aug-92										0.071	0.03		0.107	0.0300		0.246	0.04	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date	Endosulfan sulfate			Endrin			Endrin aldehyde			Endrin Ketone			Heptachlor			Heptachlor Epoxide		
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
W-11	Apr-93	0.108	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
OH-3	Apr-93	0.157	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
W-7	Jan-93	0.191	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
W-9A	Jan-93	0.138	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
W-9B	Jan-93	0.145	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
OH-1	Jan-93	0.285	0.05		0	0.03					0	0.04		0.0874	0.04		0	0.0310	
OH-2	Jan-93	0.680	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
W-10	Jan-93	0.0640	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
W-11	Jan-93	0.0790	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
OH-3	Jan-93	0.132	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
OH-1	Dec-92	0.0770	0.05		0	0.03					0	0.04		0.128	0.04		0	0.0310	
W-11	Nov-92	0.143	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
OH-3	Nov-92	0.323	0.05		0	0.03					0	0.04		0	0.04		0	0.0316	
W-7	Oct-92	0.127	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
W-1	Oct-92	0	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
W-2	Oct-92	0.123	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
W-3	Oct-92	0.297	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
W-5	Oct-92	0.354	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
W-9A	Oct-92	0	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
W-9B	Oct-92	0	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
W-10	Oct-92	0.300	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
W-11	Oct-92	0.113	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
W-4	Oct-92	0.396	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
W-6	Oct-92	1.25	0.25		0	0.03					0	0.04		0	0.04		0	0.0310	
OH-1	Oct-92	0.284	0.05		0	0.03					0	0.04		0.0547	0.04		0	0.0310	
OH-2	Oct-92	0.302	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
OH-3	Oct-92	0.412	0.05		0	0.03					0	0.04		0	0.04		0	0.0310	
OH-2	Oct-92	0.379	0.05		0	0.03					0	0.04		0.0436	0.04		0	0.0310	
W-1	Sep-92	0	0.05		0	0.03		0	0.0290		0	0.04		0	0.04		0	0.0310	
W-6	Sep-92	0.715	0.25		0	0.03		0	0.0290		0.0530	0.04		0	0.04		0	0.0310	
W-4	Sep-92	0.385	0.05		0	0.03		0	0.0290		0	0.04		0.0671	0.04		0	0.0310	
W-9A	Sep-92	0	0.05		0	0.03		0	0.0290		0	0.04		0	0.04		0	0.0310	
W-6	Aug-92	45.8	2.58		4.97	0.17		0	0.0299		0	0.04		0	0.04		0	0.0320	
W-4	Aug-92	0.173	0.05		0	0.03		0	0.0296		0	0.04		0.0673	0.04		0.0179	0.0330	NQ J
W-4	Aug-92	0.178	0.05		0	0.03		0	0.0309		0	0.04		0.0617	0.04		0	0.0316	
W-5	Aug-92	0.332	0.05		0	0.03		0	0.0309		0	0.04		0	0.04		0	0.0330	
W-5	Aug-92	0.278	0.05		0	0.03		0	0.0299		0	0.04		0	0.04		0	0.0320	
W-9A	Aug-92	0	0.05		0	0.03		0	0.0290		0	0.04		0	0.04		0	0.0310	
W-9B	Aug-92	0	0.05		0.0141	0.03	NQ J	0	0.0293		0	0.04		0	0.04		0	0.0313	
OH-3	Aug-92	0.667	0.05		0	0.03		0	0.0299		0	0.04		0	0.04		0	0.0320	
W-2	Aug-92	0.140	0.05		0	0.03		0	0.0290		0	0.04		0	0.04		0	0.0310	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date	4,4'-Methoxychlor			Toxaphene			Captan			Ovex			Perthane			Dicofol		
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
W-11	Apr-93	0	0.0360		0	0.5													
OH-3	Apr-93	0	0.0360		0	0.5													
W-7	Jan-93	0	0.0360		0	0.5													
W-9A	Jan-93	0	0.0360		0	0.5													
W-9B	Jan-93	0	0.0360		0	0.5													
OH-1	Jan-93	0	0.0360		0	0.5													
OH-2	Jan-93	0	0.0360		0	0.5													
W-10	Jan-93	0	0.0360		0	0.5													
W-11	Jan-93	0	0.0360		0	0.5													
OH-3	Jan-93	0	0.0360		0	0.5													
OH-1	Dec-92	0	0.0360		0	0.5													
W-11	Nov-92	0	0.0360		0	0.6													
OH-3	Nov-92	0	0.0367		0	0.6													
W-7	Oct-92	0	0.0360		0	0.5													
W-1	Oct-92	0	0.0360		0	0.5													
W-2	Oct-92	0	0.0360		0	0.5													
W-3	Oct-92	0	0.0360		0	0.5													
W-5	Oct-92	0	0.0360		0	0.5													
W-9A	Oct-92	0	0.0360		0	0.5													
W-9B	Oct-92	0	0.0360		0	0.5													
W-10	Oct-92	0	0.0360		0	0.5													
W-11	Oct-92	0	0.0360		0	0.5													
W-4	Oct-92	0	0.0360		0	0.5													
W-6	Oct-92	0	0.0360		0	0.5													
OH-1	Oct-92	0	0.0360		0	0.5													
OH-2	Oct-92	0	0.0360		0	0.5													
OH-3	Oct-92	0	0.0360		0	0.5													
OH-2	Oct-92	0	0.0360		0	0.5													
W-1	Sep-92	0	0.0360		0	0.5													
W-6	Sep-92	0	0.0360		0	0.5													
W-4	Sep-92	0	0.0360		0	0.5													
W-9A	Sep-92	0	0.0360		0	0.5													
W-6	Aug-92	0	0.0371		0	0.6													
W-4	Aug-92	0	0.0367		0	0.6													
W-4	Aug-92	0	0.0383		0	0.6													
W-5	Aug-92	0	0.0383		0	0.6													
W-5	Aug-92	0	0.0371		0	0.6													
W-9A	Aug-92	0	0.0360		0	0.5													
W-9B	Aug-92	0	0.0364		0	0.6													
OH-3	Aug-92	0	0.0371		0	0.6													
W-2	Aug-92	0	0.0360		0	0.5													

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date		Aldrin			alpha-BHC			beta-BHC			delta-BHC			gamma-BHC			Chlordane	
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
OH-2	Aug-92	0.148	0.03		0.304	0.03		0.166	0.01										
W-4	Jul-92																		
W-5	Jul-92																		
W-6	Jul-92																0	0.27	
W-12B	Jul-92																0	1.33	
W-12A	Jul-92																0	1.33	
W-4	May-92																		
W-5	May-92																		
W-9A	May-92																		
OH-1	May-92																		
OH-2	May-92																		
OH-3	May-92																		
W-6	Jan-92																		
W-5	Jan-92																		
W-9A	Jan-92																		
OH-1	Jan-92																		
OH-2	Jan-92																		
OH-3	Jan-92																		
W-1	Oct-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-2	Oct-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.06	
W-3	Oct-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-4	Oct-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.06	
W-5	Oct-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-6	Oct-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.02		0	0.05	
W-7	Oct-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-9A	Oct-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-9B	Oct-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-10	Oct-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-11	Oct-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
OH-1	Oct-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
OH-2	Oct-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
OH-3	Oct-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-1	Jul-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-2	Jul-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-3	Jul-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-4	Jul-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-5	Jul-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-6	Jul-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-7	Jul-91	0	0.01		0	0.01		0	0.02		0.01	0.01		0	0.01		0	0.05	
W-9A	Jul-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-9B	Jul-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date		4,4'-DDD			4,4'-DDE			4,4'-DDT			Dieldrin		Endosulfan I			Endosulfan II		
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
OH-2	Aug-92																		
W-4	Jul-92													1.63	0.15	J			
W-5	Jul-92													2.11	0.15		1.53	0.19	
W-6	Jul-92													1.27	0.6				
W-12B	Jul-92													4.56	0.3		3.96	0.38	
W-12A	Jul-92													3.28	0.3		3.04	0.38	
W-4	May-92	0	0.02		0	0.01		0	0.02		0.010	0.01		0	0.01		0	0.01	
W-5	May-92	0	0.02		0	0.01		0	0.02		0.010	0.01		0	0.01		0	0.01	
W-9A	May-92	0	0.02		0	0.01		0	0.02		0.010	0.01		0	0.01		0	0.01	
OH-1	May-92	0	0.02		0	0.01		0	0.02		0.020	0.01		0	0.01		0	0.01	
OH-2	May-92	0	0.02		0	0.01		0	0.02		0.030	0.01	B	1.1	0.01		0.34	0.01	
OH-3	May-92	0	0.02		0	0.01		0	0.02		0.010	0.01		0.48	0.01		0.16	0.01	
W-6	Jan-92	0	0.02		0	0.01		0	0.02		0.010	0.01		0	0.01		0	0.01	
W-5	Jan-92	0	0.02		0	0.01		0	0.02		0.010	0.01		0	0.01		0	0.01	
W-9A	Jan-92	0	0.02		0	0.01		0	0.02		0.010	0.01		0	0.01		0	0.01	
OH-1	Jan-92	0.03	0.02		0	0.01		0.03	0.02		0.020	0.01		0.52	0.01		0.31	0.01	
OH-2	Jan-92	0	0.02		0	0.01		0	0.02		0.020	0.01	B	0.04	0.01	B	0.015	0.01	
OH-3	Jan-92	0	0.02		0	0.01		0	0.02		0.050	0.01		0.89	0.01		0.27	0.01	
W-1	Oct-91	0	0.02		0	0.01		0	0.02		0	0.01		0	0.01		0	0.01	
W-2	Oct-91	0	0.02		0	0.02		0	0.02		0	0.01		0	0.01		0	0.01	
W-3	Oct-91	0	0.02		0	0.01		0	0.02		0	0.01		0	0.01		0	0.01	
W-4	Oct-91	0	0.02		0	0.01		0	0.02		0.020	0.01		0	0.01		0.04	0.01	
W-5	Oct-91	0	0.02		0	0.01		0	0.02		0	0.01		1.4	0.01		0.61	0.01	
W-6	Oct-91	0	0.02		0	0.01		0	0.02		0.010	0.01		0.4	0.01		0.22	0.01	
W-7	Oct-91	0	0.02		0	0.01		0	0.02		0.020	0.01		0.08	0.01		0.06	0.01	
W-9A	Oct-91	0	0.02		0	0.01		0	0.02		0	0.01		0	0.01		0	0.01	
W-9B	Oct-91	0	0.02		0	0.01		0	0.02		0	0.01		0.15	0.01		0.08	0.01	
W-10	Oct-91	0	0.02		0	0.01		0	0.02		0	0.01		0.15	0.01		0.08	0.01	
W-11	Oct-91	0	0.02		0	0.01		0	0.02		0	0.01		0.12	0.01		0.08	0.01	
OH-1	Oct-91	0	0.02		0	0.01		0	0.02		0	0.01		0	0.01		0.02	0.01	
OH-2	Oct-91	0	0.02		0	0.01		0	0.02		0.020	0.01		0.02	0.01		0.02	0.01	
OH-3	Oct-91	0	0.02		0	0.01		0	0.02		0.010	0.01		1.5	0.01		0.87	0.01	
W-1	Jul-91	0.04	0.02		0.02	0.01		0.05	0.02		0	0.01		0.01	0.01		0.02	0.01	
W-2	Jul-91	0	0.02		0	0.01		0	0.02		0	0.01		0	0.01		0	0.01	
W-3	Jul-91	0	0.02		0	0.01		0	0.02		0.010	0.01		0	0.01		0.02	0.01	
W-4	Jul-91	0	0.02		0	0.01		0	0.02		0.020	0.01		0.03	0.01		0.05	0.01	
W-5	Jul-91	0	0.02		0	0.01		0	0.02		0	0.01		0.85	0.01		0.49	0.01	
W-6	Jul-91	0	0.02		0	0.01		0	0.02		0	0.01		0.2	0.01		0.17	0.01	
W-7	Jul-91	0	0.02		0	0.01		0	0.02		0.020	0.01		0.08	0.01		0.08	0.01	
W-9A	Jul-91	0	0.02		0	0.01		0	0.02		0	0.01		0	0.01		0	0.01	
W-9B	Jul-91	0	0.02		0	0.01		0	0.02		0	0.01		0.1	0.01		0.11	0.01	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date	Endosulfan sulfate				Endrin		Endrin aldehyde			Endrin Ketone				Heptachlor		Heptachlor Epoxide		
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
OH-2	Aug-92																		
W-4	Jul-92																		
W-5	Jul-92	1.33	0.25																
W-6	Jul-92	1.45	0.10																
W-12B	Jul-92	3.27	0.50																
W-12A	Jul-92	2.72	0.50																
W-4	May-92	0	0.02																
W-5	May-92	0	0.02																
W-9A	May-92	0	0.02																
OH-1	May-92	0	0.02																
OH-2	May-92	0.46	0.02																
OH-3	May-92	0.069	0.02																
W-6	Jan-92	0	0.02																
W-5	Jan-92	0	0.02																
W-9A	Jan-92	0	0.02																
OH-1	Jan-92	0.55	0.02																
OH-2	Jan-92	0.14	0.02																
OH-3	Jan-92	0.1	0.02																
W-1	Oct-91	0	0.02		0	0.01					0	0.01		0	0.01		0	0.01	
W-2	Oct-91	0	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-3	Oct-91	0.03	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-4	Oct-91	0.05	0.02		0.02	0.01					0	0.02		0	0.01		0	0.01	
W-5	Oct-91	0.24	0.02		0.04	0.01					0	0.02		0	0.01		0	0.01	
W-6	Oct-91	0.51	0.02		0.01	0.01					0	0.02		0	0.01		0	0.01	
W-7	Oct-91	0.06	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-9A	Oct-91	0	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-9B	Oct-91	0.08	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-10	Oct-91	0.11	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-11	Oct-91	0.06	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
OH-1	Oct-91	0.02	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
OH-2	Oct-91	0.02	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
OH-3	Oct-91	0.48	0.02		0.04	0.01					0	0.02		0	0.01		0	0.01	
W-1	Jul-91	0.03	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-2	Jul-91	0	0.02		0	0.01					0	0.02		0	0.02		0	0.01	
W-3	Jul-91	0.04	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-4	Jul-91	0.08	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-5	Jul-91	0.28	0.02		0.04	0.01					0	0.02		0	0.01		0	0.01	
W-6	Jul-91	0.38	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-7	Jul-91	0.08	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-9A	Jul-91	0	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-9B	Jul-91	0.14	0.02		0	0.01					0	0.02		0	0.01		0	0.01	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date	4,4'-Methoxychlor			Toxaphene			Captan			Ovex			Perthane			Dicofol		
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
OH-2	Aug-92																		
W-4	Jul-92																		
W-5	Jul-92																		
W-6	Jul-92				0	1.1													
W-12B	Jul-92				0	5.5													
W-12A	Jul-92				0	5.5													
W-4	May-92																		
W-5	May-92																		
W-9A	May-92																		
OH-1	May-92																		
OH-2	May-92																		
OH-3	May-92																		
W-6	Jan-92																		
W-5	Jan-92																		
W-9A	Jan-92																		
OH-1	Jan-92																		
OH-2	Jan-92																		
OH-3	Jan-92																		
W-1	Oct-91	0	0.01		0	0.4		0	0.02		0	0.02					0	0.04	
W-2	Oct-91	0	0.01		0	0.2		0	0.02		0	0.02					0	0.04	
W-3	Oct-91	0	1		0	4.0		0	0.02		0	0.02					0	0.04	
W-4	Oct-91	0	0.01		0	0.4		0	0.02		0	0.02					0	0.04	
W-5	Oct-91	0	0.01		0	0.4		0	0.02		0	0.02					0	0.04	
W-6	Oct-91	0	0.1		0	0.4		0	0.02		0	0.02					0	0.04	
W-7	Oct-91	0	0.1		0	0.4		0	0.02		0	0.02					0	0.04	
W-9A	Oct-91	0	0.1		0	0.4		0	0.02		0	0.02					0	0.04	
W-9B	Oct-91	0	0.1		0	0.4		0	0.02		0	0.02					0	0.04	
W-10	Oct-91	0	0.1		0	0.4		0	0.02		0	0.02					0	0.04	
W-11	Oct-91	0	0.1		0	0.4		0	0.02		0	0.02					0	0.04	
OH-1	Oct-91	0	0.1		0	0.4		0	0.02		0	0.02					0	0.04	
OH-2	Oct-91	0	0.1		0	0.4		0	0.02		0	0.02					0	0.04	
OH-3	Oct-91	0	0.1		0	0.4		0	0.02		0	0.02					0	0.04	
W-1	Jul-91	0	0.1		0	0.4		0	0.04		0	0.10					0	0.04	
W-2	Jul-91	0	0.1		0	0.4		0	0.04		0	0.10					0	0.04	
W-3	Jul-91	0	0.1		0	0.4		0	0.04		0	0.10					0	0.04	
W-4	Jul-91	0	0.1		0	0.4		0	0.04		0	0.10					0	0.04	
W-5	Jul-91	0	0.1		0	0.4		0	0.04		0	0.10					0	0.04	
W-6	Jul-91	0	0.1		0	0.4		0	0.04		0	0.10					0	0.04	
W-7	Jul-91	0	0.1		0	0.4		0	0.04		0	0.10					0	0.04	
W-9A	Jul-91	0	0.1		0	0.4		0	0.04		0	0.10					0	0.04	
W-9B	Jul-91	0	0.1		0	0.4		0	0.04		0	0.10					0	0.04	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date		Aldrin			alpha-BHC			beta-BHC			delta-BHC			gamma-BHC			Chlordane	
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
W-10	Jul-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-11	Jul-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
OH-1	Jul-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
OH-2	Jul-91	0	0.01		0.01	0.01		0	0.02		0.01	0.01		0	0.01		0	0.05	
OH-3	Jul-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-7	Mar-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-9A	Mar-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-9B	Mar-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-10	Mar-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-11	Mar-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
OH-1	Mar-91	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
OH-2	Mar-91	0	0.05		0	0.05		0	0.10		0	0.05		0	0.05		0	0.25	
OH-3	Mar-91	0	0.05		0	0.05		0	0.10		0	0.05		0	0.05		0	0.20	
W-2	Dec-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
OH-2	Dec-90	0	0.10		0	0.10		0	0.20		0	0.10		0	0.10		0	0.50	
W-1	Nov-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-3	Nov-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-4	Nov-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-5	Nov-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-6	Nov-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-7	Nov-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-9A	Nov-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-9B	Nov-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-10	Nov-90	0	0.02		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-11	Nov-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
OH-1	Nov-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
OH-3	Nov-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-1	Aug-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-2	Aug-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-3	Aug-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-4	Aug-90	0	0.01		0.02	0.01		0.03	0.02		0.06	0.01		0	0.01		0	0.05	
W-5	Aug-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-6	Aug-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-7	Aug-90	0	0.01		0	0.01		0	0.02		0.01	0.01		0	0.01		0	0.05	
W-9A	Aug-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-9B	Aug-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-10	Aug-90	0	0.02		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-11	Aug-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
OH-1	Aug-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
OH-2	Aug-90	0	0.01		0.04	0.01		0.03	0.02		0.1	0.01		0	0.01		0	0.05	
OH-3	Aug-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date		4,4'-DDD			4,4'-DDE			4,4'-DDT			Dieldrin		Endosulfan I			Endosulfan II		
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
W-10	Jul-91	0	0.02		0	0.01		0	0.02		0	0.01		0.06	0.01		0.03	0.01	
W-11	Jul-91	0	0.02		0	0.01		0	0.02		0	0.01		0.08	0.01		0.04	0.01	
OH-1	Jul-91	0	0.02		0	0.01		0	0.02		0	0.01		0	0.01		0	0.01	
OH-2	Jul-91	0	0.02		0	0.01		0	0.02		0.020	0.01		0.05	0.01		0.13	0.01	
OH-3	Jul-91	0	0.02		0	0.01		0	0.02		0	0.01		0.8	0.01	J	0.59	0.01	
W-7	Mar-91	0	0.02		0	0.01		0	0.01		0.090	0.01		0.04	0.01		0.02	0.01	
W-9A	Mar-91	0	0.02		0	0.01		0	0.02		0	0.01		0.02	0.01		0.02	0.01	
W-9B	Mar-91	0	0.02		0	0.01		0	0.02		0	0.01		0.06	0.01		0.03	0.01	
W-10	Mar-91	0	0.02		0	0.01		0	0.02		0	0.01		0.07	0.01		0.03	0.01	
W-11	Mar-91	0	0.02		0	0.01		0.02	0.02		0	0.01		0.16	0.01		0.06	0.01	
OH-1	Mar-91	0	0.02		0	0.01		0	0.02		0	0.01		0.02	0.01		0.02	0.01	
OH-2	Mar-91	0	0.1		0	0.05		0	0.1		0	0.05		0.17	0.01		0	0.05	
OH-3	Mar-91	0	0.1		0	0.05		0	0.1		0	0.05		0.19	0.01		0.1	0.01	
W-2	Dec-90	0	0.02		0	0.01		0	0.02		0	0.01		0	0.1		0	0.01	
OH-2	Dec-90	0	0.2		0	0.10		0	0.2		0.010	0.01		0.62	0.01		0.27	0.01	
W-1	Nov-90	0	0.02		0	0.01		0	0.02		0	0.01		0	0.1		0	0.01	
W-3	Nov-90	0	0.02		0	0.01		0	0.02		0	0.01		0.37	0.01		0.08	0.01	
W-4	Nov-90	0	0.02		0	0.01		0	0.02		0.020	0.01		0.55	0.01		0.25	0.01	
W-5	Nov-90	0	0.02		0	0.01		0	0.02		0	0.01		0.31	0.01		0.19	0.01	
W-6	Nov-90	0	0.02		0	0.01		0	0.02		0	0.01		0.77	0.01		0.34	0.01	
W-7	Nov-90	0	0.02		0	0.01		0	0.02		0.010	0.01		0.12	0.01		0.06	0.01	
W-9A	Nov-90	0	0.02		0	0.01		0	0.02		0	0.01		0	0.01		0	0.01	
W-9B	Nov-90	0	0.02		0	0.01		0	0.02		0	0.01		0	0.01		0	0.01	
W-10	Nov-90	0	0.02		0	0.01		0	0.02		0	0.01		0.13	0.01		0.07	0.01	
W-11	Nov-90	0	0.02		0	0.01		0	0.02		0	0.01		0.05	0.01		0.06	0.01	
OH-1	Nov-90	0	0.02		0	0.01		0	0.02		0	0.01		0.31	0.01		0.13	0.01	
OH-3	Nov-90	0	0.02		0	0.01		0	0.02		0	0.01		0.67	0.01		0.28	0.01	
W-1	Aug-90	0	0.02		0	0.01		0	0.02		0	0.01		0	0.1		0	0.01	
W-2	Aug-90	0.04	0.02		0.04	0.01		0.09	0.02		0	0.01		0	0.01		0	0.01	
W-3	Aug-90	0	0.02		0	0.01		0	0.02		0	0.01		0	0.01		0	0.01	
W-4	Aug-90	0.03	0.02		0.09	0.01		0	0.02		0	0.01		0	0.01		0	0.01	
W-5	Aug-90	0	0.02		0	0.01		0	0.02		0	0.01		0.56	0.01		0.39	0.01	
W-6	Aug-90	0	0.02		0	0.01		0	0.02		0.020	0.01		0.12	0.01		0.18	0.01	
W-7	Aug-90	0	0.02		0	0.01		0	0.02		0.030	0.01		0.1	0.01		0.06	0.01	
W-9A	Aug-90	0	0.02		0	0.01		0	0.02		0	0.01		0	0.01		0	0.01	
W-9B	Aug-90	0	0.02		0	0.01		0	0.02		0	0.01		0.37	0.01		0.15	0.01	
W-10	Aug-90	0	0.02		0	0.01		0	0.02		0	0.01		0.11	0.01		0.06	0.01	
W-11	Aug-90	0	0.02		0	0.01		0	0.02		0.020	0.01		0.08	0.01		0.08	0.01	
OH-1	Aug-90	0	0.02		0.01	0.01		0.04	0.02		0.010	0.01		0	0.01		0.03	0.01	
OH-2	Aug-90	0.02	0.02		0.11	0.01		0.23	0.02		0.110	0.01		0.13	0.01		0.15	0.01	
OH-3	Aug-90	0	0.02		0	0.01		0	0.02		0	0.01		0.53	0.01		0.38	0.01	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date	Endosulfan sulfate				Endrin		Endrin aldehyde			Endrin Ketone				Heptachlor		Heptachlor Epoxide		
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
W-10	Jul-91	0.05	0.01		0	0.01					0	0.02		0	0.01		0	0.01	
W-11	Jul-91	0.05	0.01		0	0.01					0	0.02		0	0.01		0	0.01	
OH-1	Jul-91	0	0.05		0	0.01					0	0.05		0	0.01		0	0.01	
OH-2	Jul-91	0.16	0.05		0	0.01					0	0.05		0	0.01		0	0.01	
OH-3	Jul-91	0.55	0.05		0.03	0.01					0	0.05		0	0.01		0	0.01	
W-7	Mar-91	0	0.01		0	0.02					0	0.02		0	0.01		0	0.01	
W-9A	Mar-91	0	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-9B	Mar-91	0	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-10	Mar-91	0.02	0.01		0	0.01					0	0.02		0	0.01		0	0.01	
W-11	Mar-91	0.02	0.01		0	0.01					0	0.02		0	0.01		0	0.01	
OH-1	Mar-91	0.02	0.05	NQ	0	0.01					0	0.02		0	0.01		0	0.01	
OH-2	Mar-91	0	0.10		0	0.05					0	0.10		0	0.05		0	0.05	
OH-3	Mar-91	0	0.10		0	0.05					0	0.10		0	0.05		0	0.05	
W-2	Dec-90	0	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
OH-2	Dec-90	0.38	0.05		0	0.01					0	0.02		0	0.01		0	0.01	
W-1	Nov-90	0	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-3	Nov-90	0.31	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-4	Nov-90	0.29	0.02		0.01	0.01					0	0.02		0	0.01		0	0.01	
W-5	Nov-90	0.11	0.02		0	0.20					0	0.05		0	0.02		0	0.01	
W-6	Nov-90	0.26	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-7	Nov-90	0.07	0.02		0.01	0.01					0	0.02		0	0.01		0	0.01	
W-9A	Nov-90	0	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-9B	Nov-90	0	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-10	Nov-90	0.06	0.01		0	0.01					0	0.02		0	0.01		0	0.01	
W-11	Nov-90	0.11	0.01		0.02	0.02					0	0.02		0	0.01		0	0.01	
OH-1	Nov-90	0.25	0.05		0	0.01					0	0.02		0	0.01		0	0.01	
OH-3	Nov-90	0.11	0.05		0	0.01					0	0.02		0	0.01		0	0.01	
W-1	Aug-90	0	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-2	Aug-90	0.03	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-3	Aug-90	0.02	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-4	Aug-90	0.06	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-5	Aug-90	0.39	0.02		0.01	0.01					0	0.02		0	0.01		0	0.01	
W-6	Aug-90	0.3	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-7	Aug-90	0.08	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-9A	Aug-90	0	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-9B	Aug-90	0.08	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-10	Aug-90	0.06	0.01		0	0.01					0	0.02		0	0.01		0	0.01	
W-11	Aug-90	0.1	0.01		0	0.01					0	0.02		0	0.01		0	0.01	
OH-1	Aug-90	0.02	0.05		0	0.01					0	0.02		0	0.01		0	0.01	
OH-2	Aug-90	0.12	0.05		0	0.01					0	0.02		0	0.01		0	0.01	
OH-3	Aug-90	0.36	0.05		0	0.01					0	0.02		0	0.01		0	0.01	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date	4,4'-Methoxychlor				Toxaphene			Captan			Ovex			Perthane			Dicofol	
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
W-10	Jul-91	0	0.1		0	0.4		0	0.04		0	0.10					0	0.04	
W-11	Jul-91	0	0.1		0	0.4		0	0.04		0	0.10					0	0.04	
OH-1	Jul-91	0	0.1		0	0.4		0	0.04		0	0.10					0	0.04	
OH-2	Jul-91	0	0.1		0	0.4		0	0.04		0	0.10					0	0.04	
OH-3	Jul-91	0	0.1		0	0.4		0	0.04		0	0.10					0	0.04	
W-7	Mar-91	0	0.1		0	0.4		0	0.08		0	0.12					0	0.08	
W-9A	Mar-91	0	0.1		0	0.4		0	0.08		0	0.12					0	0.04	
W-9B	Mar-91	0	0.1		0	0.4		0	0.08		0	0.12					0	0.04	
W-10	Mar-91	0	0.1		0	0.4		0	0.08		0	0.12					0	0.04	
W-11	Mar-91	0	0.1		0	0.4		0	0.08		0	0.02					0	0.04	
OH-1	Mar-91	0	0.1		0	0.4		0	0.08		0	0.12					0	0.04	
OH-2	Mar-91	0	0.5		2	0.4		0.4	0.02		0.6	0.02					0.2	0.04	
OH-3	Mar-91	0	0.5		2	0.4		0.4	0.04		0.6	0.02					0.2	0.04	
W-2	Dec-90	0	0.1		0	0.4		0	0.08		0	0.12					0	0.08	
OH-2	Dec-90	0	0.1		0	0.4		0	0.08		0	0.12					0	0.08	
W-1	Nov-90	0	0.1		0	0.4		0	0.08		0	0.12					0	0.08	
W-3	Nov-90	0	0.1		0	0.4		0	0.08		0	0.12					0	0.08	
W-4	Nov-90	0	0.1		0	0.4		0	0.08		0	0.12					0	0.08	
W-5	Nov-90	0	0.01		0	0.1		0	0.08		0	0.12					0	0.08	
W-6	Nov-90	0	0.1		0	0.4		0	0.08		0	0.12					0	0.08	
W-7	Nov-90	0	0.1		0	0.4		0	0.08		0	0.12					0	0.08	
W-9A	Nov-90	0	0.1		0	0.4		0	0.08		0	0.12					0	0.08	
W-9B	Nov-90	0	0.1		0	0.4		0	0.08		0	0.12					0	0.08	
W-10	Nov-90	0	0.1		0	0.4		0	0.08		0	0.12					0	0.08	
W-11	Nov-90	0	0.1		0	0.4		0	0.08		0	0.12					0	0.08	
OH-1	Nov-90	0	0.1		0	0.4		0	0.08		0	0.12					0	0.08	
OH-3	Nov-90	0	0.1		0	0.4		0	0.08		0	0.12					0	0.08	
W-1	Aug-90	0	0.1		0	0.4		0	0.02		0	0.20					0	0.40	
W-2	Aug-90	0	0.1		0	0.4		0	0.02		0.14	0.02					0	0.04	
W-3	Aug-90	0	0.1		0	0.4		0	0.02		0	0.02					0	0.04	
W-4	Aug-90	0	0.1		0	0.4		0	0.02		0.3	0.02					0	0.04	
W-5	Aug-90	0	0.1		0	0.4		0	0.02		0.2	0.02					0	0.04	
W-6	Aug-90	0	0.1		0	0.4		0	0.02		0.23	0.02					0	0.04	
W-7	Aug-90	0	0.1		0	0.4		0	0.02		0.06	0.02					0	0.04	
W-9A	Aug-90	0	0.1		0	0.4		0	0.02		0.02	0.02					0	0.04	
W-9B	Aug-90	0	0.1		0	0.4		0	0.02		0	0.02					0	0.04	
W-10	Aug-90	0	0.1		0	0.4		0	0.02		0.03	0.02					0	0.04	
W-11	Aug-90	0	0.1		0	0.4		0	0.02		0.03	0.02					0	0.04	
OH-1	Aug-90	0	0.1		0	0.4		0	0.02		0	0.06					0	0.04	
OH-2	Aug-90	0	0.1		0	0.4		0	0.02		0	0.29					0	0.04	
OH-3	Aug-90	0	0.1		0	0.4		0	0.02		0	0.02					0	0.04	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date		Aldrin			alpha-BHC			beta-BHC			delta-BHC			gamma-BHC			Chlordane	
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
W-1	May-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-2	May-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-3	May-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-4	May-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-5	May-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-6	May-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-7	May-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-10	May-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
OH-1	May-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
OH-2	May-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
OH-3	May-90	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-1	Dec-89	0	0.01		0	0.01		0	0.02		0	0.01					0	0.05	
W-2	Dec-89	0	0.01		0	0.01		0	0.02		0	0.01					0	0.05	
W-3	Dec-89	0	0.01		0	0.01		0	0.02		0	0.01					0	0.05	
W-4	Dec-89	0	0.01		0	0.01		0	0.02		0	0.01					0	0.05	
W-5	Dec-89	0	0.01		0	0.01		0	0.02		0	0.01					0	0.05	
W-6	Dec-89	0	0.01		0	0.01		0	0.02		0	0.01					0	0.05	
W-7	Dec-89	0	0.01		0	0.01		0	0.02		0	0.01					0	0.05	
OH-1	Dec-89	0	0.01		0	0.01		0	0.02		0	0.01					0	0.05	
OH-2	Dec-89	0	0.01		0	0.01		0	0.02		0.02	0.01	UJ				0	0.05	
OH-3	Dec-89	0	0.01		0	0.01		0	0.02		0	0.01					0	0.05	
W-1	Sep-89	0	0.01		0	0.01		0	0.01		0	0.01		0	0.01		0	0.05	
W-2	Sep-89	0	0.01		0	0.01		0	0.01		0	0.01		0	0.01		0	0.05	
W-3	Sep-89	0	0.01		0	0.01		0	0.01		0	0.01		0	0.01		0	0.05	
W-4	Sep-89	0	0.01		0	0.01		0	0.01		0	0.01		0	0.01		0	0.05	
W-5	Sep-89	0	0.01		0	0.01		0	0.01		0	0.01		0	0.01		0	0.05	
W-6	Sep-89	0	0.01		0	0.01		0	0.01		0	0.01		0	0.01		0	0.05	
W-7	Sep-89	0	0.01		0	0.01		0	0.01		0	0.01		0	0.01		0	0.05	
OH-1	Sep-89	0	0.01		0	0.01		0	0.01		0	0.01		0	0.01		0	0.05	
OH-2	Sep-89	0	0.01		0.06	0.01		0.07	0.07		0.23	0.01		0	0.01		0	0.50	
OH-3	Sep-89	0	0.01		0	0.01		0	0.01		0	0.01		0	0.01		0	0.05	
W-1	Jun-89	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-2	Jun-89	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-3	Jun-89	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-4	Jun-89	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-5	Jun-89	0	0.01		0	0.01		0	0.02		0.02	0.01		0	0.01		0	0.05	
W-6	Jun-89	0	0.01		0	0.01		0	0.02		0.01	0.01		0	0.01		0	0.05	
W-7	Jun-89	0	0.01		0.01	0.01		0.02	0.02		0.04	0.01		0	0.01		0	0.05	
OH-3	Jun-89	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
OH-1	Jan-89	0.01	0.01		0	0.02		0	0.02					0.01	0.01		0	0.05	
OH-2	Jan-89	0	0.01		0	0.01		0	0.02					0	0.01		0	0.05	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date		4,4'-DDD			4,4'-DDE			4,4'-DDT			Dieldrin		Endosulfan I			Endosulfan II		
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
W-1	May-90	0	0.02		0	0.01		0	0.02		0	0.01		0	0.01		0	0.01	
W-2	May-90	0	0.02		0.015	0.01		0	0.02		0	0.01		0	0.01		0	0.01	
W-3	May-90	0	0.02		0	0.01		0	0.02		0	0.01		0.02	0.01		0	0.01	
W-4	May-90	0.15	0.02		0.06	0.01		0	0.08		0	0.04		0.32	0.01		0.2	0.01	
W-5	May-90	0	0.02		0	0.01		0	0.02		0	0.01		0.4	0.01		0.2	0.01	
W-6	May-90	0	0.02		0	0.01		0	0.02		0	0.01		0.4	0.01		0.2	0.01	
W-7	May-90	0	0.02		0	0.01		0	0.02		0	0.01		0.07	0.01		0.03	0.01	
W-10	May-90	0	0.02		0	0.01		0	0.02		0	0.01		0.2	0.01		0.6	0.01	
OH-1	May-90	0	0.02		0	0.01		0.03	0.02		0	0.01		0.04	0.01		0.05	0.01	
OH-2	May-90	0	0.02		0	0.01		0.03	0.02		0	0.01		0.15	0.01		0.1	0.01	
OH-3	May-90	0	0.02		0	0.01		0	0.02		0	0.01		0.6	0.01		0.25	0.01	
W-1	Dec-89	0	0.02		0	0.01		0	0.02		0	0.01		0	0.01		0	0.01	
W-2	Dec-89	0.04	0.02		0.04	0.01		0.06	0.02		0	0.01		0	0.01		0	0.01	
W-3	Dec-89	0.02	0.02		0	0.01		0	0.02		0	0.01		0.18	0.01		0.16	0.01	
W-4	Dec-89	0	0.02		0	0.01		0	0.02		0	0.01		0.43	0.01		0.41	0.01	
W-5	Dec-89	0	0.02		0	0.01		0	0.02		0	0.01		0.19	0.01		0.21	0.01	
W-6	Dec-89	0	0.02		0	0.01		0	0.02		0	0.01		0.52	0.01		0.5	0.01	
W-7	Dec-89	0	0.02		0	0.01		0	0.02		0	0.01		0.15	0.01		0.15	0.01	
OH-1	Dec-89	0	0.02		0	0.01		0	0.02		0	0.01		0.29	0.01	J	0.53	0.01	J
OH-2	Dec-89	0	0.02		0	0.01		0.03	0.02	UJ	0	0.01		0	0.01		0	0.32	
OH-3	Dec-89	0	0.02		0	0.01		0	0.02		0	0.01		0.39	0.01		0.39	0.01	
W-1	Sep-89	0	0.02		0	0.01		0	0.02		0	0.01		0	0.01		0	0.01	
W-2	Sep-89	0.02	0.02		0.01	0.01		0.04	0.02		0	0.01		0	0.01		0	0.01	
W-3	Sep-89	0	0.02		0	0.01		0	0.02		0	0.01		0	0.01		0	0.01	
W-4	Sep-89	0	0.02		0.03	0.01		0.02	0.02		0.020	0.01		0.02	0.01		0	0.01	
W-5	Sep-89	0	0.02		0	0.03		0	0.02		0	0.02		0.36	0.01		0.18	0.01	
W-6	Sep-89	0	0.02		0	0.01		0	0.02		0	0.01		0.09	0.01		0.06	0.01	
W-7	Sep-89	0	0.02		0	0.01		0	0.02		0	0.01		0.02	0.01		0.01	0.01	
OH-1	Sep-89	0	0.02		0.01	0.01		0.04	0.02		0	0.01		0	0.01		0	0.01	
OH-2	Sep-89	0	0.02		0	0.01		0.04	0.02		0.090	0.01		0.07	0.01		0	0.01	
OH-3	Sep-89	0	0.02		0	0.01		0	0.02		0.0	0.01		0.3	0.01		0.2	0.01	
W-1	Jun-89	0	0.02		0	0.01		0	0.2		0.0	0.01		0	0.01		0	0.01	
W-2	Jun-89	0.03	0.02		0.03	0.01		0.11	0.02		0.020	0.01		0.03	0.01		0.04	0.01	
W-3	Jun-89	0	0.02		0	0.01		0	0.02		0	0.01		0	0.01		0	0.01	
W-4	Jun-89	0	0.02		0	0.01		0	0.02		0	0.01		0	0.01		0	0.01	
W-5	Jun-89	0	0.02		0	0.01		0	0.02		0	0.01		0.12	0.01		0.07	0.01	
W-6	Jun-89	0	0.02		0	0.01		0	0.02		0	0.01		0.05	0.01		0.03	0.01	
W-7	Jun-89	0	0.02		0	0.01		0	0.02		0.010	0.01		0.05	0.01		0.02	0.01	
OH-3	Jun-89	0	0.02		0	0.01		0.02	0.02		0	0.01		0.05	0.01		0.03	0.01	
OH-1	Jan-89	0.02	0.02		0.04	0.01		0.3	0.02		0.020	0.01		0	0.05		0.05	0.01	
OH-2	Jan-89	0	0.02		0.01	0.01		0.02	0.02		0	0.01		0.08	0.01		0.06	0.01	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date	Endosulfan sulfate				Endrin		Endrin aldehyde			Endrin Ketone				Heptachlor		Heptachlor Epoxide		
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
W-1	May-90	0	0.05		0	0.01					0	0.02		0	0.01		0	0.01	
W-2	May-90	0	0.05		0	0.01					0	0.02		0	0.01		0	0.01	
W-3	May-90	0.06	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-4	May-90	0.25	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-5	May-90	0	0.02		0	0.05					0	0.02		0	0.01		0	0.01	
W-6	May-90	0.2	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-7	May-90	0	0.05		0	0.01					0	0.02		0	0.01		0	0.01	
W-10	May-90	0	0.05		0	0.01					0	0.02		0	0.01		0	0.01	
OH-1	May-90	0.13	0.05		0	0.01					0	0.02		0	0.01		0	0.01	
OH-2	May-90	0.3	0.05		0	0.01					0	0.02		0	0.01		0	0.01	
OH-3	May-90	0	0.05		0	0.10					0	0.02		0	0.01		0	0.01	
W-1	Dec-89	0	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-2	Dec-89	0	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-3	Dec-89	0.5	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-4	Dec-89	0.44	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-5	Dec-89	0.1	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-6	Dec-89	0.28	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-7	Dec-89	0.18	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
OH-1	Dec-89	0.56	0.05	J	0	0.01					0	0.02		0	0.01		0	0.01	
OH-2	Dec-89	0	0.49		0	0.01					0	0.02		0	0.01		0	0.01	
OH-3	Dec-89	0.12	0.05		0	0.01					0	0.02		0	0.01		0	0.01	
W-1	Sep-89	0	0.02		0	0.01					0	0.01		0	0.01		0	0.01	
W-2	Sep-89	0	0.02		0	0.01					0	0.01		0	0.01		0	0.01	
W-3	Sep-89	0	0.02		0	0.01					0	0.01		0	0.01		0	0.01	
W-4	Sep-89	0	0.02		0	0.01					0	0.01		0	0.01		0	0.01	
W-5	Sep-89	0.08	0.02		0.02	0.02					0	0.01		0	0.01		0	0.01	
W-6	Sep-89	0.09	0.02		0	0.01					0	0.01		0	0.01		0	0.01	
W-7	Sep-89	0	0.01		0	0.01					0	0.01		0	0.01		0	0.01	
OH-1	Sep-89	0	0.05		0	0.01					0	0.01		0	0.01		0	0.01	
OH-2	Sep-89	0.02	0.05		0	0.01					0	0.01		0	0.01		0	0.01	
OH-3	Sep-89	0.1	0.05		0	0.01					0	0.01		0	0.01		0	0.01	
W-1	Jun-89	0	0.05		0	0.01					0	0.02		0	0.01		0	0.01	
W-2	Jun-89	0	0.05		0	0.01					0	0.02		0	0.01		0	0.01	
W-3	Jun-89	0	0.05		0	0.01					0	0.02		0	0.01		0	0.01	
W-4	Jun-89	0	0.05		0	0.01					0	0.02		0	0.01		0	0.01	
W-5	Jun-89	0.12	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-6	Jun-89	0.07	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
W-7	Jun-89	0.05	0.02		0	0.01					0	0.02		0	0.01		0	0.01	
OH-3	Jun-89	0.05	0.05		0	0.01					0	0.02		0	0.01		0	0.01	
OH-1	Jan-89	0.12	0.05		0	0.10					0	0.02		0	0.01		0	0.01	
OH-2	Jan-89	0.17	0.05		0	0.10					0	0.02		0	0.01		0	0.01	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date	4,4'-Methoxychlor			Toxaphene			Captan			Ovex			Perthane			Dicofol		
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
W-1	May-90	0	0.1		0	0.4		0	0.02		0	0.02							
W-2	May-90	0	0.1		0	0.4		0	0.02		0	0.02							
W-3	May-90	0	0.1		0	0.4		0	0.02		0	0.02							
W-4	May-90	0	0.1		0	0.4		0	0.02		0	0.08							
W-5	May-90	0	0.1		0	0.4		0	0.02		0	0.10							
W-6	May-90	0	0.1		0	0.4		0	0.02		0	0.02							
W-7	May-90	0	0.1		0	0.4		0	0.02		0	0.02							
W-10	May-90	0	0.1		0	0.4		0	0.02		0	0.04							
OH-1	May-90	0	0.1		0	0.4		0	0.02		0	0.02							
OH-2	May-90	0	0.1		0	0.4		0	0.02		0	0.04							
OH-3	May-90	0	0.1		0	0.4		0	0.02		0	0.20							
W-1	Dec-89	0	0.1		0	0.4		0	0.02		0	0.02					0	0.04	
W-2	Dec-89	0	0.1		0	0.4		0	0.02		0	0.02					0	0.04	
W-3	Dec-89	0	0.1		0	0.4		0	0.02		0	0.02					0	0.04	
W-4	Dec-89	0	0.1		0	0.4		0	0.02		0	0.02					0	0.04	
W-5	Dec-89	0	0.1		0	0.4		0	0.02		0	0.02					0	0.04	
W-6	Dec-89	0	0.1		0	0.4		0	0.02		0	0.02					0	0.04	
W-7	Dec-89	0	0.01		0	0.4		0	0.02		0	0.02					0	0.04	
OH-1	Dec-89	0	0.1		0	0.4		0	0.02		0	0.02					0	0.04	
OH-2	Dec-89	0	0.1		0	0.4		0	0.02		0	0.02					0	0.04	
OH-3	Dec-89	0	0.1		0	0.4		0	0.02		0	0.02					0	0.04	
W-1	Sep-89	0	0.05		0	0.4		0	0.02		0	0.02					0	0.04	
W-2	Sep-89	0	0.05		0	0.4		0	0.02		0	0.02					0	0.04	
W-3	Sep-89	0	0.05		0	0.4		0	0.02		0	0.02					0	0.04	
W-4	Sep-89	0	0.03		0	0.4		0	0.02		0	0.02					0	0.04	
W-5	Sep-89	0	0.05		0	0.4		0	0.02		0	0.02					0	0.04	
W-6	Sep-89	0	0.05		0	0.4		0	0.02		0	0.02					0	0.04	
W-7	Sep-89	0	0.05		0	0.4		0	0.02		0	0.02					0	0.04	
OH-1	Sep-89	0	0.05		0	0.4		0	0.02		0	0.02					0	0.04	
OH-2	Sep-89	0	0.5		0	0.4		0	0.02		0	0.02					0	0.04	
OH-3	Sep-89	0	0.05		0	0.4		0	0.02		0	0.02					0	0.04	
W-1	Jun-89	0	0.05		0	0.4		0	0.02		0	0.02					0	0.04	
W-2	Jun-89	0	0.05		0	0.4		0	0.02		0.06	0.02					0	0.04	
W-3	Jun-89	0	0.05		0	0.4		0	0.02		0.02	0.02					0	0.04	
W-4	Jun-89	0	0.05		0	0.4		0	0.02		0	0.02					0	0.04	
W-5	Jun-89	0	0.05					0	0.02		0	0.02					0	0.04	
W-6	Jun-89	0	0.05		0	0.4		0	0.02		0.02	0.02					0	0.04	
W-7	Jun-89	0	0.05		0	0.4		0	0.02		0.02	0.02					0	0.04	
OH-3	Jun-89	0	0.05		0	0.4		0	0.02		0.02	0.02					0	0.04	
OH-1	Jan-89	0	0.05		0	0.4		0	0.04		0.25	0.02					0	0.04	
OH-2	Jan-89	0	0.05		0	0.4		0	0.04		0	0.08					0	0.04	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date		Aldrin			alpha-BHC			beta-BHC			delta-BHC			gamma-BHC			Chlordane	
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
OH-3	Jan-89	0	0.02		0	0.02		0	0.40					0	0.02		0	0.15	
W-1	Oct-88	0	0.02		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-2	Oct-88	0	0.01		0	0.01		0	0.05		0	0.01		0	0.01		0	0.05	
W-3	Oct-88	0	0.02		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-4	Oct-88	0	0.02		0	0.02		0	0.02		0	0.01		0	0.01		0	0.05	
W-5	Oct-88	0	0.02		0	0.02		0	0.20		0	0.01		0	0.01		0	0.05	
W-6	Oct-88	0	0.02		0	0.02		0	0.20		0	0.01		0	0.01		0	0.05	
OH-1	Oct-88	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
OH-2	Oct-88	0	0.01		0.03	0.01		0.02	0.02		0.05	0.01		0	0.02		0	0.05	
OH-3	Oct-88	0	0.05		0	0.05		0	0.10		0	0.05		0	0.05		0	0.25	
W-1	Jun-88	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-2	Jun-88	0	0.05		0	0.05		0	0.10		0	0.05		0	0.05		0	0.25	
W-3	Jun-88	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-4	Jun-88	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-5	Jun-88	0	0.05		0	0.05		0	0.10		0	0.05		0	0.05		0	0.25	
W-6	Jun-88	0	0.02		0.02	0.01		0	0.04		0	0.02		0.02	0.01		0	0.10	
OH-1	Jun-88	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
OH-2	Jun-88	0	0.01		0.03	0.01		0	0.02		0	0.02		0.02	0.01		0	0.05	
OH-3	Jun-88	0	0.10		0	0.10		0	0.20		0	0.10		0	0.10		0	0.50	
OH-1	Mar-88	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
OH-2	Mar-88	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.10	
OH-3	Mar-88	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-1	Nov-87	0	0.01		0	0.01		0	0.02		0.04	0.01		0	0.01		0	0.05	
W-2	Nov-87	0	0.04		0.09	0.01		0	0.08		0	0.04		0.04	0.01		0	0.20	
W-3	Nov-87	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-4	Nov-87	0	0.01		0	0.01		0	0.02		0	0.01		0	0.01		0	0.05	
W-5	Nov-87	0	0.10		0	0.10		0	0.20		0	0.10		0	0.10		0	0.50	
W-6	Nov-87	0	0.02		0	0.02		0	0.04		0	0.02		0.03	0.01		0	0.10	
OH-1	Nov-87	0	0.50		0	0.50		0	1.00		0	0.50		0	0.50		0	2.50	
OH-2	Nov-87	0	0.04		0.04	0.01		0	0.08		0	0.04		0.04	0.01		0	0.20	
OH-3	Nov-87	0	0.05		0	0.05		0	0.10		0	0.05		0.07	0.01		0	0.25	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date		4,4'-DDD			4,4'-DDE			4,4'-DDT			Dieldrin		Endosulfan I			Endosulfan II		
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
OH-3	Jan-89	0	0.06		0	0.06		0	0.1		0	0.60		0.47	0.01		0.24	0.01	
W-1	Oct-88	0	0.02		0	0.01		0	0.02		0	0.01		0	0.01		0	0.01	
W-2	Oct-88	0.03	0.02		0.02	0.01		0.11	0.02		0	0.01		0.03	0.01		0	0.06	
W-3	Oct-88	0.02	0.02		0.01	0.01		0.02	0.02		0	0.01		0	0.05		0	0.01	
W-4	Oct-88	0	0.02		0	0.01		0.02	0.02		0	0.01		0	0.01		0	0.01	
W-5	Oct-88	0	0.02		0	0.01		0	0.02		0	0.04		0.66	0.01		0.36	0.01	
W-6	Oct-88	0	0.02		0	0.01		0	0.02		0	0.01		0	0.1		0.06	0.01	
OH-1	Oct-88	0	0.02		0	0.01		0.02	0.02		0	0.01		0.01	0.01		0	0.01	
OH-2	Oct-88	0	0.02		0	0.01		0	0.02		0	0.01		0.02	0.01		0	0.02	
OH-3	Oct-88	0	0.1		0	0.05		0	0.1		0.050	0.01		0.41	0.01		0.28	0.01	
W-1	Jun-88	0	0.02		0	0.01		0	0.02		0	0.01		0	0.01		0	0.01	
W-2	Jun-88	0.1	0.02		0.07	0.01		0.2	0.02		0	0.01		0.16	0.01		0.09	0.01	
W-3	Jun-88	0.02	0.02		0.01	0.01		0.04	0.02		0	0.01		0	0.05		0.01	0.01	
W-4	Jun-88	0	0.02		0	0.01		0	0.02		0	0.01		0	0.01		0.02	0.01	
W-5	Jun-88	0	0.1		0	0.05		0	0.1		0	0.04		0.6	0.01		0.32	0.01	
W-6	Jun-88	0	0.04		0	0.02		0	0.04		0	0.04		0.2	0.01		0.19	0.01	
OH-1	Jun-88	0	0.02		0	0.01		0	0.02		0	0.01		0	0.01		0	0.01	
OH-2	Jun-88	0	0.02		0	0.01		0.03	0.02		0	0.01		0.06	0.01		0.08	0.01	
OH-3	Jun-88	0	0.2		0	0.10		0	0.2		0	0.04		0.57	0.01		0.41	0.01	
OH-1	Mar-88	0	0.02		0	0.01		0.13	0.02		0	0.01		0.04	0.01		0.12	0.01	
OH-2	Mar-88	0	0.02		0	0.01		0.04	0.02		0	0.01		0.04	0.01		0.21	0.01	
OH-3	Mar-88	0	0.02		0	0.01		0.02	0.02		0	0.02		0.06	0.01		0.13	0.01	
W-1	Nov-87	0	0.02		0	0.01		0.1	0.02		0	0.01		0	0.01		0	0.01	
W-2	Nov-87	0.09	0.02		0.16	0.01		0.66	0.02		0.050	0.01		0.07	0.01		0.19	0.01	
W-3	Nov-87	0.12	0.02		0.1	0.01		1.7	0.02		0	0.04		0	0.04		0	0.04	
W-4	Nov-87	0	0.02		0	0.01		0.18	0.02		0.020	0.01		0.01	0.01		0.02	0.01	
W-5	Nov-87	0	0.2		0	0.10		0.3	0.02		0	0.05		0.98	0.01		0.46	0.01	
W-6	Nov-87	0.03	0.02		0	0.02		0.24	0.02		0	0.02		0.27	0.01		0.16	0.01	
OH-1	Nov-87	0	1		0	0.50		9.9	0.02		0	0.01		0	0.01		0.02	0.01	
OH-2	Nov-87	0.05	0.02		0.02	0.01		1.1	0.02		0	0.01		0	0.04		0.07	0.01	
OH-3	Nov-87	0.12	0.02		0	0.05		1.6	0.02		0	0.05		1.1	0.01		0.55	0.01	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date	Endosulfan sulfate				Endrin		Endrin aldehyde			Endrin Ketone				Heptachlor		Heptachlor Epoxide		
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
OH-3	Jan-89	0.11	0.05		0	0.06					0	0.10		0	0.02		0	0.02	
W-1	Oct-88	0	0.05		0	0.01					0	0.04		0	0.01		0	0.01	
W-2	Oct-88	0	0.05		0	0.05					0	0.04		0	0.01		0	0.01	
W-3	Oct-88	0	0.05		0	0.01					0	0.04		0	0.01		0	0.01	
W-4	Oct-88	0	0.05		0	0.01					0	0.04		0	0.01		0	0.01	
W-5	Oct-88	0.29	0.02		0	0.04					0	0.16		0	0.01		0	0.01	
W-6	Oct-88	0.12	0.02		0	0.02					0	0.04		0	0.01		0	0.01	
OH-1	Oct-88	0	0.05		0	0.02					0	0.04		0	0.01		0	0.01	
OH-2	Oct-88	0	0.05		0	0.01					0	0.04		0	0.01		0	0.01	
OH-3	Oct-88	0.32	0.05		0	0.05					0	0.20		0	0.05		0	0.05	
W-1	Jun-88	0	0.05		0	0.01					0	0.05		0	0.01		0	0.01	
W-2	Jun-88	0.05	0.02		0	0.01					0	0.05		0	0.05		0	0.05	
W-3	Jun-88	0.05	0.02		0	0.01					0	0.05		0	0.01		0	0.01	
W-4	Jun-88	0.05	0.05		0	0.01					0	0.05		0.01	0.01		0	0.01	
W-5	Jun-88	0.4	0.02		0	0.04					0	0.20		0	0.05		0.05	0.01	
W-6	Jun-88	0.39	0.02		0	0.04					0	0.20		0	0.02		0	0.02	
OH-1	Jun-88	0	0.05		0	0.01					0	0.05		0	0.01		0	0.01	
OH-2	Jun-88	0.1	0.05		0	0.01					0	0.05		0	0.01		0	0.01	
OH-3	Jun-88	0.49	0.05		0	0.04					0	0.20		0	0.10		0	0.1	
OH-1	Mar-88	0.24	0.05		0	0.02					0	0.04		0	0.01		0	0.01	
OH-2	Mar-88	0.45	0.05		0	0.02					0	0.04		0	0.01		0	0.01	
OH-3	Mar-88	0.08	0.05		0	0.02					0	0.04		0	0.01		0	0.01	
W-1	Nov-87	0	0.05		0	0.01					0	0.02		0	0.01		0	0.01	
W-2	Nov-87	0	0.20		0	0.05					0	0.10		0	0.04		0	0.04	
W-3	Nov-87	0	0.20		0	0.04					0	0.08		0	0.01		0	0.01	
W-4	Nov-87	0	0.05		0	0.01					0	0.02		0	0.01		0	0.01	
W-5	Nov-87	0.22	0.02		0	0.05					0	0.10		0	0.10		0	0.1	
W-6	Nov-87	0.2	0.02		0	0.02					0	0.04		0	0.02		0	0.02	
OH-1	Nov-87	0	0.05		0	0.01					0	0.02		0	0.50		0	0.5	
OH-2	Nov-87	0	0.40		0	0.08					0	0.20		0	0.04		0	0.04	
OH-3	Nov-87	0.33	0.05		0	0.05					0	0.10		0	0.05		0	0.05	

Appendix A. Groundwater data. Concentrations in micrograms per liter.

Well	Date	4,4'-Methoxychlor			Toxaphene			Captan			Ovex			Perthane			Dicofol		
		Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag	Sample Result	Reporting Limit	Flag
OH-3	Jan-89	0	0.15		0	2.0		0	0.08		0	0.20					0	0.08	
W-1	Oct-88	0	0.05		0	0.4		0	0.05		0	0.02					0	0.20	
W-2	Oct-88	0	0.05		0	0.4		0	0.05		0	0.02					0	0.04	
W-3	Oct-88	0	0.05		0	0.4		0	0.05		0	0.02					0	0.04	
W-4	Oct-88	0	0.05		0	0.4		0	0.05		0	0.02					0	0.04	
W-5	Oct-88	0	0.05		0	0.4		0	0.05		0	0.02					0	0.04	
W-6	Oct-88	0	0.05		0	0.4		0	0.05		0	0.02					0	0.04	
OH-1	Oct-88	0	0.05		0	0.4		0	0.05		0	0.02					0	0.04	
OH-2	Oct-88	0	0.05		0	0.4		0	0.05		0	0.02					0	0.04	
OH-3	Oct-88	0	0.25		0	2.0		0	0.25		0	0.10					0	0.20	
W-1	Jun-88	0	0.05		0	0.4		0	0.08		0	0.02					0	0.04	
W-2	Jun-88	0	0.25		0	2.0		0	0.08		0	0.10					0	0.20	
W-3	Jun-88	0	0.05		0	0.4		0	0.08		0	0.02					0	0.04	
W-4	Jun-88	0	0.05		0	0.4		0	0.08		0	0.02					0	0.04	
W-5	Jun-88	0	0.25		0	2.0		0	0.40		0	0.10					0	0.20	
W-6	Jun-88	0	0.2		0	0.8		0	0.40		0	0.04					0	0.20	
OH-1	Jun-88	0	0.05		0	0.4		0	0.08		0	0.02					0	0.04	
OH-2	Jun-88	0	0.05		0	0.4		0	0.08		0	0.02					0	0.04	
OH-3	Jun-88	0	0.5		0	0.4		0	0.40		0	0.20					0	0.40	
OH-1	Mar-88	0	0.1		0.4	0.4		0	0.20		0	0.04					0	0.04	
OH-2	Mar-88	0	0.1		0.4	0.4		0	0.20		0	0.04					0	0.04	
OH-3	Mar-88	0	0.05		0	0.4		0	0.20		0	0.04					0	0.04	
W-1	Nov-87	0	0.05		0	0.4		0	0.10		0.04	0.02					0	0.04	
W-2	Nov-87	0	0.2		0	2.0		0	0.10		0.48	0.02					0	0.20	
W-3	Nov-87	0	0.05		0	0.4		0	0.40		0.23	0.02					0	0.04	
W-4	Nov-87	0	0.05		0	0.4		0	0.10		0.09	0.02					0	0.04	
W-5	Nov-87	0	0.5		0	4.0		0	1.00		0	0.10					0	0.40	
W-6	Nov-87	0	0.1		0	0.8		0	0.20		0	0.04					0.14	0.04	
OH-1	Nov-87	0	2.5		0	20.0		0	0.10		0	1.00					0	2.00	
OH-2	Nov-87	0	0.2		0	2.0		0	0.80		0.46	0.02					0	0.20	
OH-3	Nov-87	0	0.25		0	2.0		0	0.50		0	0.10					0.13	0.04	

NOTE: A zero in the Sample Results Column signifies that the result was not detected above the analytical detection limit.

Flags:
- J: Indicates an estimated value
- P: Analyte detected, RPD>25%
- NQ: Not detected above the PQL
- R: The data are unusable (rejected) for all purposes.
- B: Historical data - best available copy is not clear and value is questionable.

Appendix B

APPENDIX B

BORING LOGS AND MONITORING WELL AS-BUILTS

ERM-WEST
Environmental Resources Management

FMC - Yakima
Job #2672.03
Drilling Log

Project: Former Pesticide Facility Location: Yakima, WA
Owner: FMC Project Number: 2672.03
Well/Boring No.: B-1 Total Depth: ____ Diameter: 10"
Surface Elevation: ____ Water Level: Initial: ____ Ref. Pt.: ____
Screen: Dia.: ____ Length: ____ Slot Size: ____
Casing: Dia.: ____ Length: ____ Type: ____
Drilling Company: Cascade Drilling
Driller: Rodney La Brosse Log by: AMA Date Drilled: 08/24/95

Sketch Map

Notes

Depth (Feet)	Graphic Log	Blow Counts	Sample Number	Well Construction	Description/Soil Classification (Consistency, Moisture, Color, Odor, Staining, Etc.)
0.5					
1					Dark gray gravelly fine to medium SAND, some silt, loose, moist
1.5					
2					
2.5	SP				
3					
3.5					Wet below 3.0 feet
4					
4.5					
5					
5.5					
6			Bentonite Chips		Gray subrounded to rounded fine to coarse GRAVEL, some sand, trace to little silt, medium dense, wet
6.5					
7	GP				
7.5					
8					
8.5		31			
9		50-6"	B-1-8.5		
9.5					
10					
10.5					
11					
11.5					
12					
12.5					
13					
13.5		50-6"	B-1-13.0		
14					Bottom of boring at 13.5 feet
14.5					
15					
15.5					
16					
16.5					
17					

ERM-WEST
Environmental Resources Management

FMC - Yakima
Job #2672.03
Drilling Log

Project: Former Pesticide Facility | Location: Yakima, WA
Owner: FMC | Project Number: 2672.03
Well/Boring No.: B-2 | Total Depth: | Diameter: 10"
Surface Elevation: | Water Level: Initial: | Ref. Pt.:
Screen: Dia.: | Length: | Slot Size:
Casing: Dia.: | Length: | Type:
Drilling Company: Cascade Drilling
Driller: Rodney La Brosse | Log by: AMA | Date Drilled: 08/24/95

Sketch Map

Notes

Depth (Feet)	Graphic Log	Blow Counts	Sample Number	Well Construction	Description/Soil Classification (Consistency, Moisture, Color, Odor, Staining, Etc.)
0.5					
1					Dark gray gravelly fine to coarse SAND, some silt, loose, moist
1.5					
2					
2.5	SP				
3					
3.5					Wet below 3.0 feet
4					
4.5					
5					
5.5			Bentonite Chips		
6					Gray subrounded to rounded fine to coarse GRAVEL some sand, trace to little silt, medium dense, wet
6.5					
7	GP				
7.5					
8					
8.5		50-6"	B-2-8.0		Slight petroleum odor
9					
9.5					
10					
10.5					
11					
11.5					
12					
12.5					
13					
13.5		50-6"	B-2-13.0		
14					Bottom of boring at 13.5 feet
14.5					
15					
15.5					
16					
16.5					
17					

OBSERVATION WELL

PROJECT: FMC - YAKIMA		WELL NO. W-1
NO. 19888	SITE: UPLAND INDUSTRIES	COORDINATES: N 9898.113 E 11005.769
BEGUN 11/14/87	COMPLETED 11/14/87	PREPARED BY R. BISIO
REFERENCE POINT FOR MEASUREMENTS: TOP OF RISER PIPE		

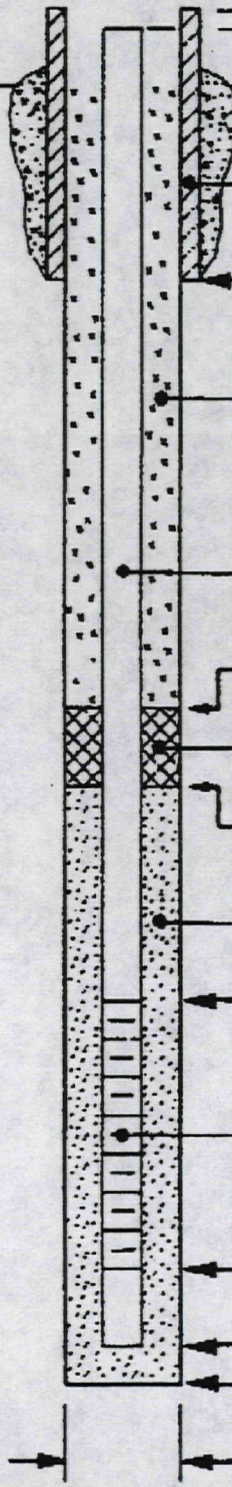
GENERALIZED GEOLOGIC LOG

0 - 8 FT. ALLUVIUM:

0 - 4 FT. SILTY CLAY (CL) WITH SOME SMALL GRAVEL.

4 - 8 FT. SAND (SP) WITH SOME GRAVEL.

GROUND-WATER LEVEL ON 11-17-87 AT DEPTH OF 5.93 FT., ELEV. 1000.86.



	DEPTH (FT)	ELEV. (FT)
ELEV. - TOP OF SURFACE CASING: NONE		
ELEV. - TOP OF RISER CASING: 1006.79		
GROUND SURFACE	0.00	1004.81
SURFACE CASING — DIA: NONE — TYPE:		
BOTTOM OF SURFACE CASING		
BACKFILL MATERIAL — TYPE: CEMENT/BENTONITE GROUT		
RISER CASING — DIA: 2-INCH I.D. — TYPE: LOW CARBON STEEL, STEEL COUPLING		
TOP OF SEAL	1.00	1003.81
ANNULAR SEAL — TYPE: ENVIRO-GEL WYOMING BENTONITE		
TOP OF FILTER PACK	2.00	1002.81
FILTER PACK — TYPE: COLORADO SILICA SAND, 10-20 MESH, ROUNDED, 2-100 LB. BAGS		
TOP OF SCREEN	3.00	1001.81
SCREEN: JOHNSON — DIA: 2⅜-INCH O.D., 2-INCH I.D. — TYPE: WIRE-WRAP, LOW CARBON STEEL — OPENINGS: WIDTH: 0.020-INCH — TYPE: SLOT — 4.6 FT. LONG		
BOTTOM OF SCREEN	7.60	997.21
BOTTOM OF SUMP	8.10	996.71
BOTTOM OF HOLE	8.10	996.71

HOLE DIA: 8-INCH

OBSERVATION WELL

PROJECT: FMC - YAKIMA		WELL NO. W-2
JOB NO. 19088	SITE: UPLAND INDUSTRIES	COORDINATES: N 9697.408 E 11225.864
BEGUN 11/13/87	COMPLETED 11/13/87	PREPARED BY R. BISIO
REFERENCE POINT FOR MEASUREMENTS: TOP OF RISER CASING		

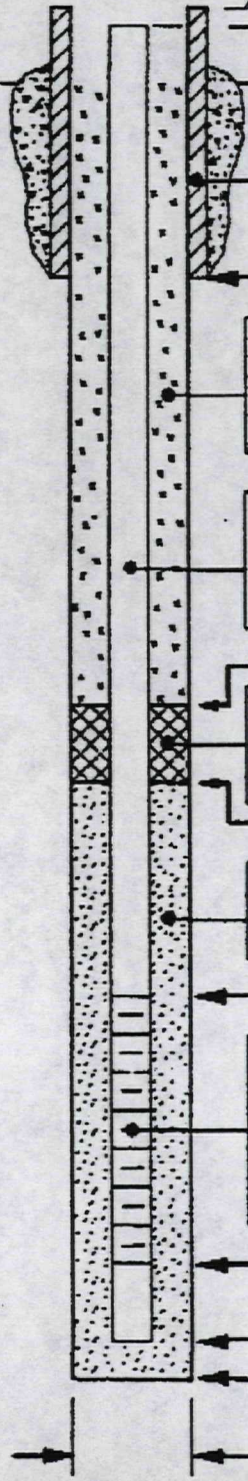
GENERALIZED GEOLOGIC LOG

0 - 2 FT. FILL, SAND AND GRAVEL.

2 - 8 FT. ALLUVIUM:
SANDY GRAVEL (GP): COBBLES TO 8-INCH DIAMETER. LOOSE.

ATTEMPTED TO DRIVE WELL POINT BUT SCREEN DAMAGED AT 2.8 FT. CHANGED TO CABLE TOOL METHOD TO DRILL BORING.

GROUND-WATER LEVEL ON 11-17-87 AT DEPTH OF 6.38 FT., ELEV. 1000.21.



	DEPTH (FT)	ELEV. (FT)
ELEV. - TOP OF SURFACE CASING: NONE		
ELEV. - TOP OF RISER CASING: 1006.51		
GROUND SURFACE	0.00	1004.38
SURFACE CASING — DIA: NONE — TYPE:		
BOTTOM OF SURFACE CASING		
BACKFILL MATERIAL — TYPE: CEMENT/BENTONITE GROUT		
RISER CASING — DIA: 2-INCH I.D. — TYPE: LOW CARBON STEEL, STEEL COUPLING		
TOP OF SEAL	1.00	1003.38
ANNULAR SEAL — TYPE: ENVIRO-GEL WYOMING BENTONITE		
TOP OF FILTER PACK	2.00	1002.38
FILTER PACK — TYPE: COLORADO SILICA SAND, 2 SACKS, 100 LB. EACH, 10 TO 20 MESH, ROUNDED		
TOP OF SCREEN	2.90	1001.48
SCREEN: JOHNSON — DIA: 2⅜-INCH O.D., 2-INCH I.D. — TYPE: WIRE-WRAP, LOW CARBON STEEL — OPENINGS: WIDTH: 0.020-INCH — TYPE: SLOT — 4.6 FT. LONG		
BOTTOM OF SCREEN	7.50	996.88
BOTTOM OF SUMP	8.00	996.38
BOTTOM OF HOLE	8.00	996.38
HOLE DIA: 8-INCH		

RESOURCE PROTECTION WELL REPORT

START CARD NO. A 12190

PROJECT NAME: F.M.C.

WELL IDENTIFICATION NO. n/a W-2

DRILLING METHOD:

DRILLER: RODNEY LABROSSE

FIRM: Cascade Drilling, Inc.

SIGNATURE: Rodney LaBrosse

CONSULTING FIRM: ERM

REPRESENTATIVE: MIKE ARNOLD

COUNTY: Yakima

LOCATION NE¼ SW¼ Sec. 31 Twn 13N R 19E

STREET ADDRESS OF WELL: 4 WEST WASHINGTON AVE - YAKIMA

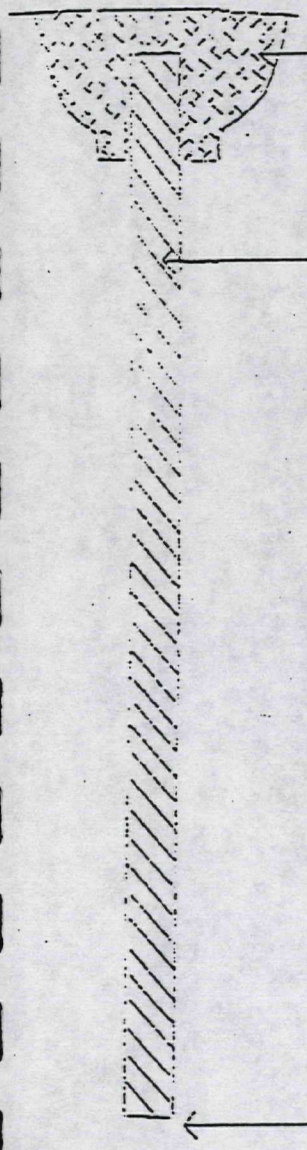
WATER LEVEL ELEVATION: N/A

GROUND SURFACE ELEVATION: N/A

INSTALLED: 8-24-95

DEVELOPED:

5334

AS-BUILT	WELL DATA	FORMATION DESCRIPTION
	abandonment chipped in place CONCRETE SURFACE SEAL	0 - 15 ft. chipped in place
	BACKFILL 1' Bentchips	- ft.
		- ft.
	DEPTH OF BORING 15' "	

RECEIVED
SEP 18 1995
DEPARTMENT OF ECOLOGY
CENTRAL REGION OFFICE

SCALE: 1" = _____ PAGE _____ OF _____

ECY 050-12 (Rev 11/94)

TOTAL P.05

OBSERVATION WELL

PROJECT	WELL NO.
FMC - YAKIMA	W-3

JOB NO.	SITE	COORDINATES
19088	UPLAND INDUSTRIES	N 9672.652 E 11292.898

BEGUN	COMPLETED	PREPARED BY	REFERENCE POINT FOR MEASUREMENTS
11/13/87	11/13/87	R. BISIO	TOP OF RISER CASING

ELEV. - TOP OF SURFACE CASING: NONE

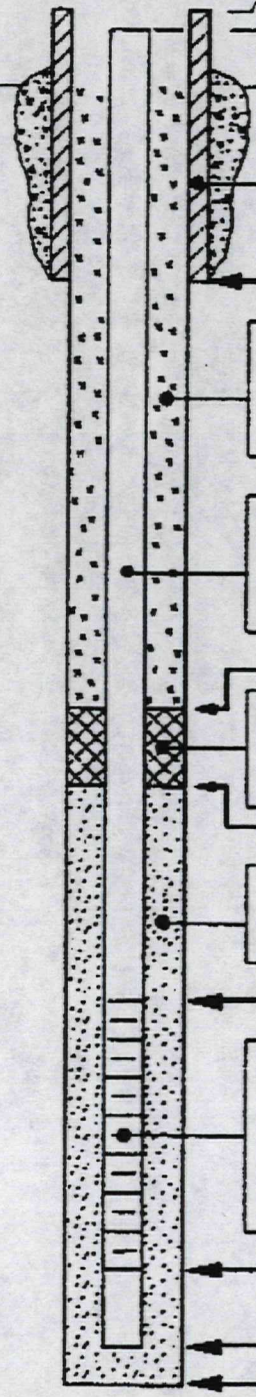
ELEV. - TOP OF RISER CASING: 1006.23

GENERALIZED GEOLOGIC LOG

0 - 1 FT. TOPSOIL, SANDY SILT (ML)

1 - 8 FT. ALLUVIUM: SANDY GRAVEL (GP) LOOSE; SAND AT BOTTOM OF HOLE.

GROUND-WATER LEVEL ON 11-17-87 AT DEPTH OF 6.10 FT., ELEV. 1000.13.



	DEPTH (FT)	ELEV. (FT)
GROUND SURFACE	0.00	1003.85
SURFACE CASING — DIA: NONE; TYPE:		
BOTTOM OF SURFACE CASING		
BACKFILL MATERIAL — TYPE: CEMENT/BENTONITE GROUT		
RISER CASING — DIA: 2-INCH I.D.; TYPE: LOW CARBON STEEL, STEEL COUPLING		
TOP OF SEAL	1.00	1002.85
ANNULAR SEAL — TYPE: ENVIRO-GEL WYOMING BENTONITE		
TOP OF FILTER PACK	2.00	1001.85
FILTER PACK — TYPE: COLORADO SILICA SAND, 10-20 MESH, ROUNDED		
TOP OF SCREEN	2.90	1000.95
SCREEN: JOHNSON — DIA: 2⅜-INCH O.D., 2-INCH I.D.; TYPE: WIRE-WRAP, LOW CARBON STEEL; OPENINGS: WIDTH: 0.020-INCH; TYPE: SLOT; 4.6 FT. LONG		
BOTTOM OF SCREEN	7.50	996.35
BOTTOM OF SUMP	8.00	995.85
BOTTOM OF HOLE	8.00	995.85

HOLE DIA: 3-INCH

RESOURCE PROTECTION WELL REPORT

(4)

START CARD NO. A 12190

PROJECT NAME: F.M.C.

WELL IDENTIFICATION NO.: n/a W-3

DRILLING METHOD: HSA

DRILLER: RODNEY LABROSSE

FIRM: Cascade Drilling, Inc.

SIGNATURE: Rodney LaBrosse

CONSULTING FIRM: ERM

REPRESENTATIVE: MIKE ARNOLD

COUNTY: Yakima

LOCATION NE 1/4 SW 1/4 Sec 31 Twn 13N R 19E

STREET ADDRESS OF WELL: 4 WEST WASHINGTON AVE - YAKIMA

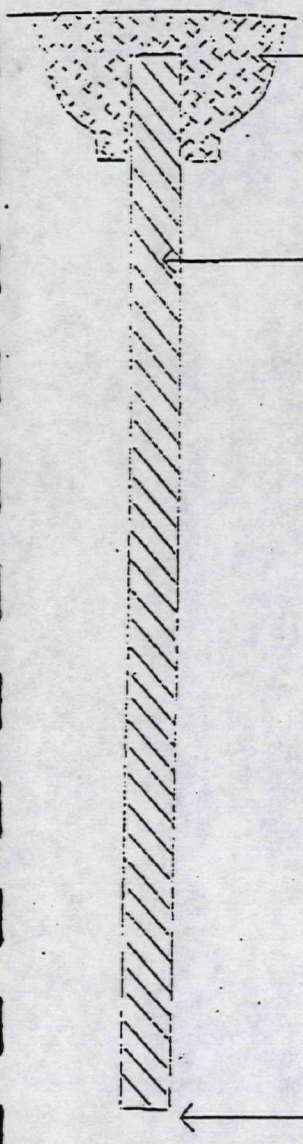
WATER LEVEL ELEVATION: N/A

GROUND SURFACE ELEVATION: N/A

INSTALLED: 8-24-95

DEVELOPED: —

5334

AS-BUILT	WELL DATA	FORMATION DESCRIPTION
	Well abandonment CONCRETE SURFACE SEAL	0 - 8' ft. Bent chips
	BACKFILL 1' Bent chips	- ft.
		- ft.
	DEPTH OF BORING 8' "	

RECEIVED
SEP 13 1995
DEPARTMENT OF ECOLOGY
CENTRAL REGION OFFICE

SCALE: 1" = _____ PAGE _____ OF _____

ECY 050-12 (Rev. 11/95)

TOTAL P.05

OBSERVATION WELL

PROJECT: FMC - YAKIMA		WELL NO.: W-4
JOB NO.: 19088	SITE: UPLAND INDUSTRIES	COORDINATES: N 9600.675 E 11227.600
BEGUN: 11/14/87	COMPLETED: 11/14/87	PREPARED BY: R. BISIO
REFERENCE POINT FOR MEASUREMENTS: TOP OF RISER PIPE		

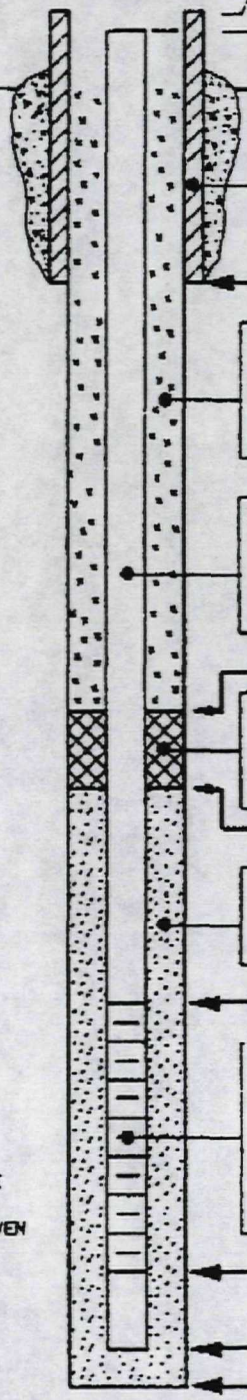
GENERALIZED GEOLOGIC LOG

0 - 8 FT. ALLUVIUM:

0 - 4 FT. SANDY CLAY (CL) WITH SAND AND GRAVEL LENSES.

4 - 8 FT. SANDY GRAVEL (GP) LOOSE, SUB-ROUNDED CLASTS.

GROUND-WATER LEVEL ON 11-17-87 AT DEPTH OF 5.48 FT., ELEV. 1000.10.



	DEPTH (FT)	ELEV. (FT)
ELEV. - TOP OF SURFACE CASING: NONE		
ELEV. - TOP OF RISER CASING: 1005.50		
GROUND SURFACE	0.00	1003.81
SURFACE CASING — DIA: NONE; TYPE:		
BOTTOM OF SURFACE CASING		
BACKFILL MATERIAL — TYPE: CEMENT/BENTONITE GROUT		
RISER CASING — DIA: 2-INCH I.D.; TYPE: LOW CARBON STEEL, STEEL COUPLING		
TOP OF SEAL	1.00	1002.81
ANNULAR SEAL — TYPE: ENVIRO-GEL WYOMING BENTONITE		
TOP OF FILTER PACK	2.00	1001.81
FILTER PACK — TYPE: COLORADO SILICA SAND, 10-20 MESH, ROUNDED, 2-100 LB. BAGS		
TOP OF SCREEN	3.10	1000.71
SCREEN: JOHNSON — DIA: 2⅜-INCH O.D., 2-INCH I.D.; TYPE: WIRE-WRAP, LOW CARBON STEEL; OPENINGS: WIDTH: 0.020-INCH; TYPE: SLOT; 4.1 FT. LONG *		
BOTTOM OF SCREEN	7.50	996.31
BOTTOM OF SUMP	8.00	995.81
BOTTOM OF HOLE	8.00	995.81
HOLE DIA: 8-INCH		

* 0.5 FT. CUT FROM SCREEN WHERE BROKEN AND SCREEN RE-WELDED. THIS SCREEN DAMAGED WHEN DRIVEN AT W-2.

OBSERVATION WELL

PROJECT	WELL NO.
FMC - YAKIMA	W-5

JOB NO.	SITE	COORDINATES
19088	UPLAND INDUSTRIES	N 9596.268 E 11278.129

BEGUN	COMPLETED	PREPARED BY	REFERENCE POINT FOR MEASUREMENTS
11/14/87	11/14/87	R. BISIO	TOP OF RISER CASING

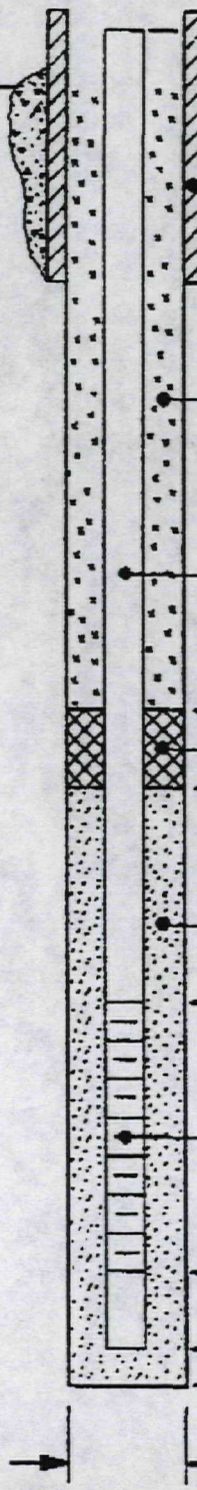
GENERALIZED GEOLOGIC LOG

0 - 8 FT. ALLUVIUM:

0 - 6 FT. SANDY CLAY (CL) WITH SAND AND GRAVEL LENSES.

6 - 8 FT. SANDY GRAVEL (GP) LOOSE, CLASTS OF VOLCANIC AND GRANITIC ROCK, SUB-ROUNDED.

GROUND-WATER LEVEL ON 11-17-87 AT DEPTH OF 5.64 FT., ELEV. 1000.84.



	DEPTH (FT)	ELEV. (FT)
ELEV. - TOP OF SURFACE CASING: NONE		
ELEV. - TOP OF RISER CASING: 1005.68		
GROUND SURFACE	0.00	1003.62
SURFACE CASING — DIA: NONE — TYPE:		
BOTTOM OF SURFACE CASING		
BACKFILL MATERIAL — TYPE: CEMENT/BENTONITE GROUT		
RISER CASING — DIA: 2-INCH I.D. — TYPE: LOW CARBON STEEL, STEEL COUPLING		
TOP OF SEAL	1.00	1002.62
ANNULAR SEAL — TYPE: ENVIRO-GEL WYOMING BENTONITE		
TOP OF FILTER PACK	1.90	1001.72
FILTER PACK — TYPE: COLORADO SILICA SAND, 10-20 MESH, ROUNDED, 2-100 LB. BAGS		
TOP OF SCREEN	3.10	1000.52
SCREEN: JOHNSON — DIA: 2⅜-INCH O.D., 2-INCH I.D. — TYPE: WIRE-WRAP, LOW CARBON STEEL — OPENINGS: WIDTH: 0.020-INCH — TYPE: SLOT — 4.6 FT. LONG		
BOTTOM OF SCREEN	7.70	995.92
BOTTOM OF SUMP	8.20	995.42
BOTTOM OF HOLE	8.20	995.42
HOLE DIA: [illegible]		

OBSERVATION WELL

PROJECT	WELL NO.
FMC - YAKIMA	W-6

JOB NO.	SITE	COORDINATES
19088	UPLAND INDUSTRIES	N 9598.516 E 11316.878

BEGUN	COMPLETED	PREPARED BY	REFERENCE POINT FOR MEASUREMENTS
11/14/87	11/14/87	R. BISIO	TOP OF RISER CASING

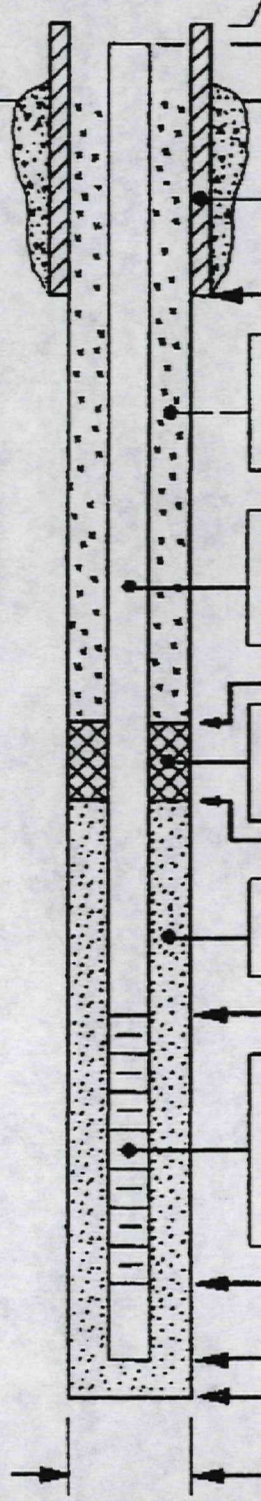
GENERALIZED GEOLOGIC LOG

0 - 8 FT. ALLUVIUM:

0 - 6 FT. SANDY CLAY (CL) WITH SAND AND GRAVEL LENSES.

6 - 8 FT. SANDY GRAVEL (GP) LOOSE, ROUNDED TO SUB-ROUNDED.

GROUND-WATER LEVEL ON 11-17-87 AT DEPTH OF 5.62 FT., ELEV. 1000.84.



	DEPTH (FT)	ELEV. (FT)
ELEV. - TOP OF SURFACE CASING: NONE		
ELEV. - TOP OF RISER CASING: 1005.66		
GROUND SURFACE	0.00	1003.51
SURFACE CASING — DIA: NONE — TYPE:		
BOTTOM OF SURFACE CASING		
BACKFILL MATERIAL — TYPE: CEMENT/BENTONITE GROUT		
RISER CASING — DIA: 2-INCH I.D. — TYPE: LOW CARBON STEEL, STEEL COUPLING		
TOP OF SEAL	1.00	1002.51
ANNULAR SEAL — TYPE: ENVIRO-GEL WYOMING BENTONITE		
TOP OF FILTER PACK	2.00	1001.51
FILTER PACK — TYPE: COLORADO SILICA SAND, 10-20 MESH, ROUNDED, 2-100 LB. BAGS		
TOP OF SCREEN	3.15	1000.36
SCREEN: JOHNSON — DIA: 2⅜-INCH O.D., 2-INCH I.D. — TYPE: WIRE-WRAP, LOW CARBON STEEL — OPENINGS: WIDTH: 0.020-INCH — TYPE: SLOT — 4.6 FT. LONG		
BOTTOM OF SCREEN	7.75	995.76
BOTTOM OF SUMP	8.25	995.26
BOTTOM OF HOLE	8.25	995.26
HOLE DIA: 8-INCH		

OBSERVATION WELL

PROJECT: FMC-YAKIMA, WASHINGTON		WELL NO: W-7
JOB NO.: 19088	SITE: Upland Industries	COORDINATES: N 9504.865; E 11330.634
BEGUN: 4/3/89	COMPLETED: 4/7/89	PREPARED BY: R. Bisio
REFERENCE POINT FOR MEASUREMENTS: Ground Surface (0.3 ft. below concrete pad)		

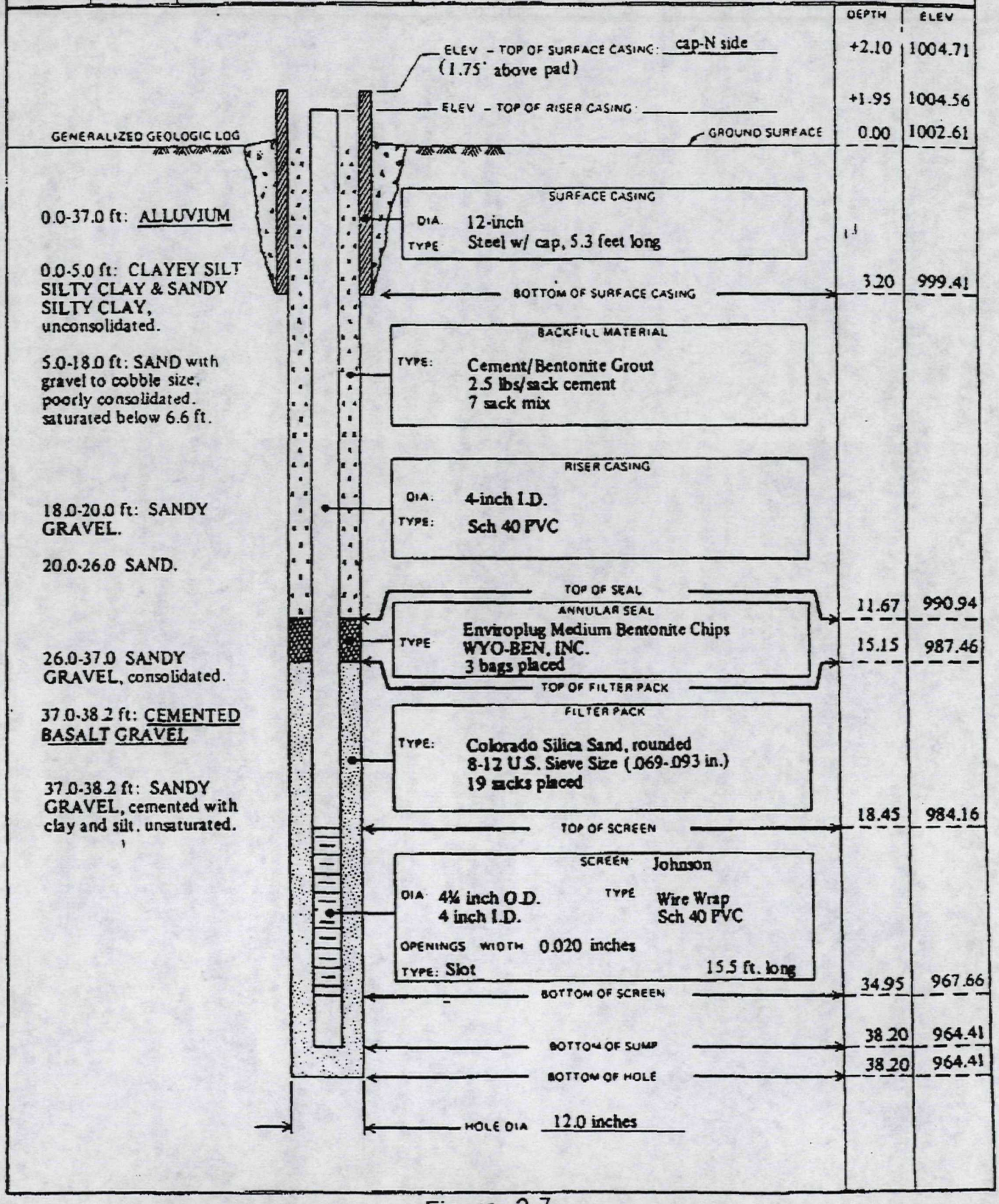
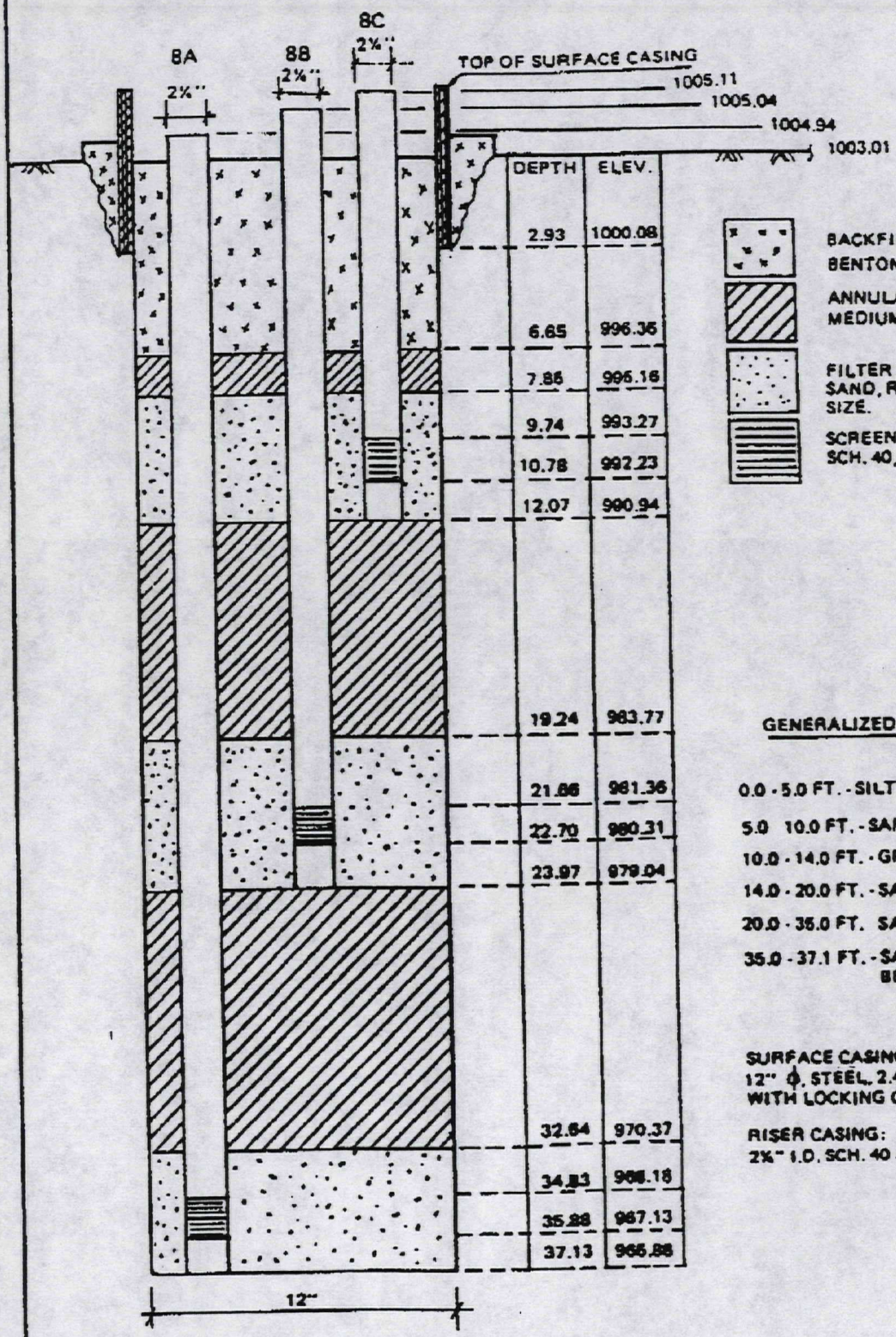


Figure 2-7

OBSERVATION WELL

PROJECT: FMC - YAKIMA		WELL NO: 8A,B,C
JOB NO.: 19088	SITE: UPLAND INDUSTRIES	COORDINATES: N 9531.758; E 11317.044
BEGUN: 4-13-89	COMPLETED: 4-14-89	PREPARED BY: R. COOK
REFERENCE POINT FOR MEASUREMENTS: TOP OF RISER CASING		



BACKFILL MATERIAL: BENTONITE CEMENT GROUT

ANNULAR SEAL: MEDIUM BENTONITE CHIPS

FILTER PACK: COLORADO SILICA SAND, ROUNDED, 8-12 U.S. SIEVE SIZE.

SCREEN: JOHNSON, 2-¾" SLOTTED PVC SCH. 40, SLOT OPENING 1MM

GENERALIZED GEOLOGIC LOG:

0.0 - 5.0 FT. - SILTY CLAY, UNSATURATED.

5.0 10.0 FT. - SANDY GRAVEL

10.0 - 14.0 FT. - GRAVELLY SAND

14.0 - 20.0 FT. - SANDY GRAVEL

20.0 - 35.0 FT. SAND AND GRAVELLY SAND

35.0 - 37.1 FT. - SANDY GRAVEL SATURATED BELOW 6 FT.

SURFACE CASING:
12" Φ, STEEL, 2.4' ABOVE GROUND WITH LOCKING CAP

RISER CASING:
2¾" I.D. SCH. 40 AND 80 PVC

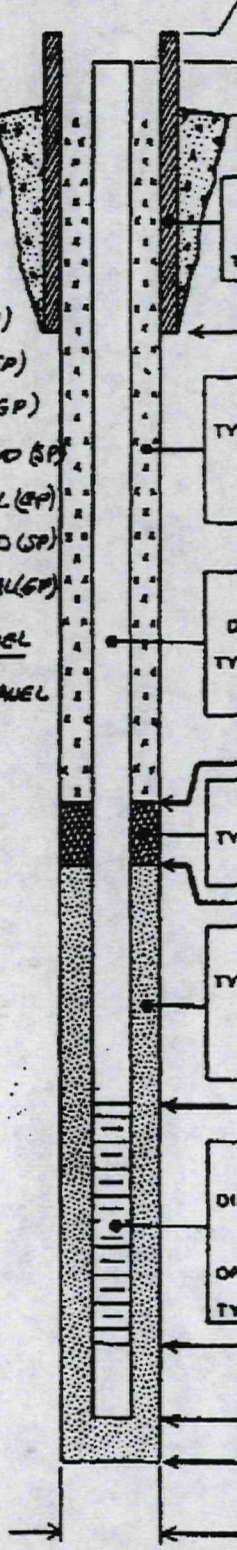
Figure 2-6

OBSERVATION WELL

PROJECT: FMC - YAKIMA			WELL NO: W-9a
J.O.: 17600	SITE: Upland Industries	COORDINATES:	
BEGUN: 7-21-90	COMPLETED: 7-21-90	PREPARED BY: R.P. Bisio	REFERENCE POINT FOR MEASUREMENTS: Ground Surface

GENERALIZED GEOLOGIC LOG

0.0 - 39.0 ALLUVIUM
0.0-1.0 CLAYEY SAND (SC)
1.0-3.0 GRAVELLY CLAYEY SAND (SC)
3.0-5.0 GRAVELLY SAND (SP)
5.0-9.0 GRAVELLY SAND (SP)
9.0-18.0 SANDY GRAVEL (GP)
18.0-20.0 GRAVELLY SAND (SP)
20.0-26.0 SANDY GRAVEL (GP)
26.0-32.0 GRAVELLY SAND (SP)
32.0-39.0 SANDY GRAVEL (GP)
39.0 - ? CEMENTED GRAVEL
39.0 - CLAYEY SANDY GRAVEL (GC)



	DEPTH	ELEV.
ELEV. – TOP OF SURFACE CASING:		
ELEV. – TOP OF RISER CASING:		
GROUND SURFACE	0.00	
SURFACE CASING — DIA: See log W-9b; TYPE:		
BOTTOM OF SURFACE CASING	3.00	
BACKFILL MATERIAL — TYPE: See log W-9b.		
RISER CASING — DIA: 0.17 ID, 0.20 ft O.D.; TYPE: Sch 40 PVC		
TOP OF SEAL		
ANNULAR SEAL — TYPE: Enviroplug medium bentonite chips, WYO-BEN Inc., 9 sacks placed	14.90	
TOP OF FILTER PACK	28.25	
FILTER PACK — TYPE: Colorado Silica Sand, rounded. 10-20 U.S. Sieve size. 8.5 sacks placed		
TOP OF SCREEN	31.70	
SCREEN: Shop manufactured — DIA: 0.19' I.D., 0.20' O.D; TYPE: Slot 120°, Sch 40 PVC I; OPENINGS: WIDTH: 0.020 inches, 0.02' c/c; TYPE: Slot; 4.50 ft long		
BOTTOM OF SCREEN	36.20	
BOTTOM OF SUMP	38.45	
BOTTOM OF HOLE	38.50	
HOLE DIA. 12-inch		

Centralizers 1.20 ft long, 0.5 ft diameter placed above and below screen.

OBSERVATION WELL

PROJECT: FMC YAKIMA		WELL NO.: W-9b
JOB NO.: 19009	SITE: Upland Industries	COORDINATES:
BEGUN: 7-21-90	COMPLETED: 7-22-90	PREPARED BY: R.P. BISIO
REFERENCE POINT FOR MEASUREMENTS: Ground Surface		

DEPTH	ELEV.

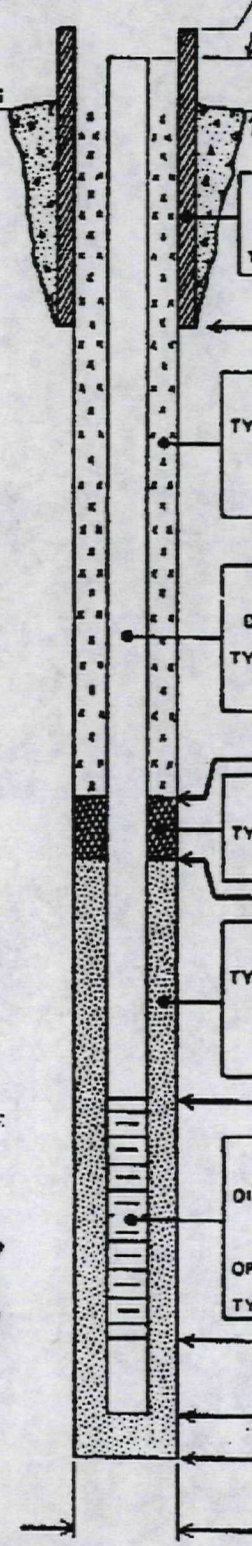
ELEV. - TOP OF SURFACE CASING: _____

ELEV. - TOP OF RISER CASING: _____

2.10

GENERALIZED GEOLOGIC LOG

See W-9a for geologic log



GROUND SURFACE — 0.00

SURFACE CASING
DIA: 8-inch
TYPE: Steel pipe w/ locking cap

BOTTOM OF SURFACE CASING — 3.00

BACKFILL MATERIAL
TYPE: Cement / Bentonite Grout
2.5 lbs bentonite / sack cement
6 bags placed.

RISER CASING
DIA: 0.17' I.D, 0.20 ft O.D
TYPE: Sch 40 PVC

TOP OF SEAL — 4.90

ANNULAR SEAL
TYPE: Enviroplug medium bentonite chips
WYO-BEN INC.

TOP OF FILTER PACK — 6.00

FILTER PACK
TYPE: Colorado Silica Sand, rounded
10-20 U.S. Sieve Size
6 sacks placed.

TOP OF SCREEN — 8.20

SCREEN: Shop manufactured
DIA: 0.19' I.D
0.20' O.D
TYPE: Slot 120
Sch 40 PVC I
OPENINGS: WIDTH 0.020 inches, 0.02' c/c
TYPE: Slot

Centralizers 1.20 ft long
0.5 ft diameter placed
above and below screen

BOTTOM OF SCREEN — 12.60

BOTTOM OF SUMP — 14.70

BOTTOM OF HOLE — 18.50

HOLE DIA: 12-inch

OBSERVATION WELL

PROJECT	WELL NO.
FMC YAKIMA	W-10

JOB NO.	SITE	COORDINATES
19080	UPLAND INDUSTRIES	

BEGUN	COMPLETED	PREPARED BY	REFERENCE POINT FOR MEASUREMENTS
7-11-90	7-11-90	R. BISIO	Ground Surface

GENERALIZED GEOLOGIC LOG

0.0 - 24.9 ALLUVIUM

0.0-2.0 ft CLAYEY SAND, topsoil.

2.0-9.0 SILTY SAND saturated below

9.0-12.0 GRAVELLY SAND

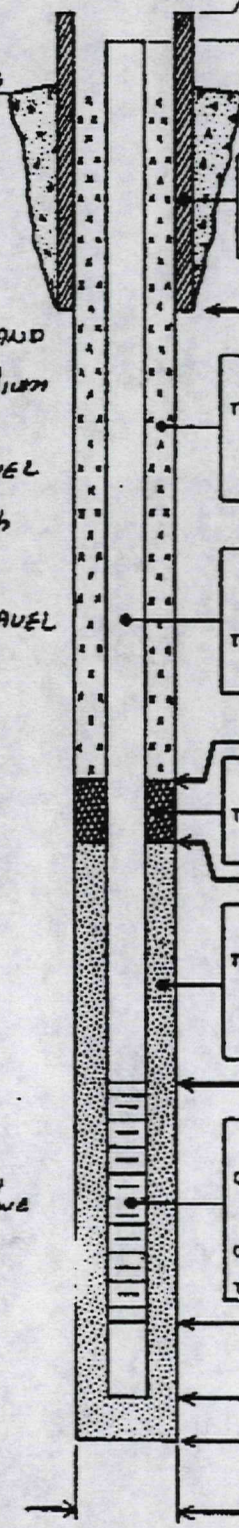
12.0-14.0 SAND, medium grained.

14.0 16.0 SANDY GRAVEL

16.0-24.0 SAND with silt and gravel

24.0-25.0 SANDY GRAVEL

Centralizers 1.20' long, 0.5' diameter placed above and below screen.



	DEPTH ft	ELEV. ft
ELEV. – TOP OF SURFACE CASING: _____		
ELEV. – TOP OF RISER CASING: _____ 1.75'		
GROUND SURFACE	0.00	
SURFACE CASING DIA: 8-inch TYPE: steel pipe w/ locking cap.		
BOTTOM OF SURFACE CASING	3.00	
BACKFILL MATERIAL TYPE: Cement/Bentonite Grout 2.5 lbs bentonite / sack cement 3 sacks placed		
RISER CASING DIA: 0.17 I.D.; 0.20 O.D TYPE: Sch 40 PVC		
TOP OF SEAL	13.80	
ANNULAR SEAL TYPE: Enviroplug Medium Bentonite Chips WYO-BEN Inc. 1 sack placed		
TOP OF FILTER PACK	15.10	
FILTER PACK TYPE: Colorado Silica Sand, rounded 10-20 US. Sieve Size 4 sacks placed		
TOP OF SCREEN	18.24	
SCREEN: Shop manufactured DIA: 0.19' I.D. 0.20 O.D TYPE: Slot, 120°, Sch 40 PVC I OPENINGS: WIDTH 0.020 inches, 0.02' c/c TYPE: Slot 4.28' long		
BOTTOM OF SCREEN	22.52	
BOTTOM OF SUMP	24.92	
BOTTOM OF HOLE	24.92	
HOLE DIA: 8 inches		

OBSERVATION WELL

PROJECT	FMC - YAKIMA
WELL NO.	W-11
JOB NO.	19008
SITE	UPLAND INDUSTRIES
COORDINATES	
BEGUN	7-13-90
COMPLETED	7-13-90
PREPARED BY	R. BISIO
REFERENCE POINT FOR MEASUREMENTS	Ground Surface

GENERALIZED GEOLOGIC LOG

0.0 - 24.5 ALLUVIUM

0.0 - 1.0 SILTY SAND, topsoil.

1.0 - 3.0 SANDY GRAVEL

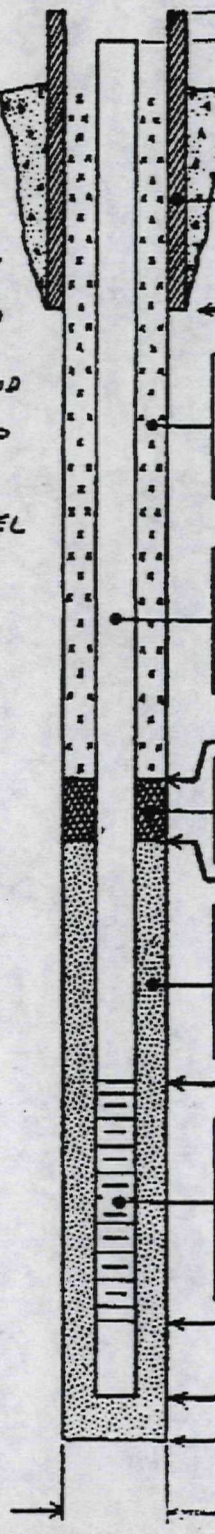
3.0 - 6.0 SANDY GRAVEL saturated below 1.8'

6.0 - 12.0 GRAVELLY SAND

12.0 - 23.0 SAND, fine to coarse-grained.

23.0 - 24.5 SANDY GRAVEL

Centralizers 1.20' long, 0.5' diameter placed above & below screen



	DEPTH	ELEV.
ELEV. - TOP OF SURFACE CASING:		
ELEV. - TOP OF RISER CASING: 2.38		
GROUND SURFACE	0.00	
SURFACE CASING — DIA: 8-inch; TYPE: Steel pipe w/ locking cap.		
BOTTOM OF SURFACE CASING	3.10	
BACKFILL MATERIAL — TYPE: Cement / Bentonite Grout, 2.5 lbs bentonite per sack cement, 3 sacks placed		
RISER CASING — DIA: 0.17' I.D., 0.20' O.D.; TYPE: Sch 40 PVC.		
TOP OF SEAL	10.90	
ANNULAR SEAL — TYPE: Enviroplug Medium Bentonite Chips, WYO-BEN Inc, 1 sack placed		
TOP OF FILTER PACK	13.20	
FILTER PACK — TYPE: Colorado Silica Sand, rounded, 10-20 U.S. Sieve Size, 4 sacks placed.		
TOP OF SCREEN	17.78	
SCREEN: Shop manufactured — DIA: 0.19 I.D., 0.25 O.D; TYPE: Slot, 120°, Sch 40 PVC I; OPENINGS: WIDTH 0.020 inches, 0.02' c/c; TYPE: Slot		
BOTTOM OF SCREEN	22.06	
BOTTOM OF SUMP	24.46	
BOTTOM OF HOLE	24.46	

HOLE DIA: 8 inches

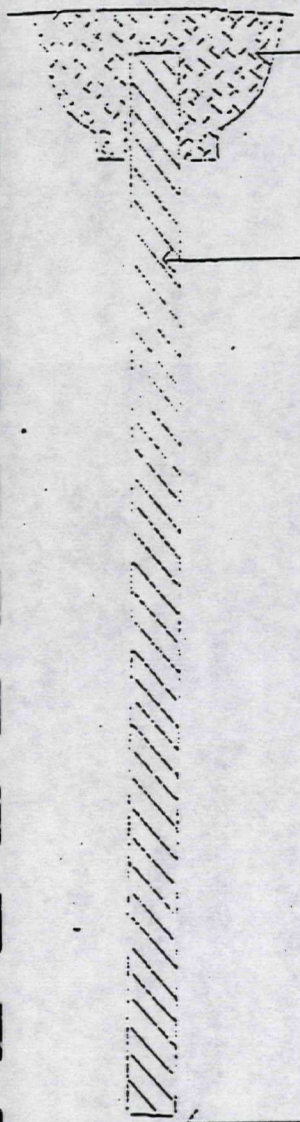
RESOURCE PROTECTION WELL REPORT

START CARD NO. A 12190

PROJECT NAME: F.M.C.
WELL IDENTIFICATION NO. n/a MW-11
DRILLING METHOD:
DRILLER: RODNEY LABROSSE
FIRM: Cascade Drilling, Inc.
SIGNATURE:
CONSULTING FIRM: ERM
REPRESENTATIVE: MIKE ARNOLD

COUNTY: Yakima
LOCATION NE¼ SW¼ Sec 31 Twn 13N R 19E
STREET ADDRESS OF WELL:
4 WEST WASHINGTON AVE - YAKIMA
WATER LEVEL ELEVATION: N/A surface
GROUND SURFACE ELEVATION: N/A
INSTALLED:
DEVELOPED:

5334

AS-BUILT	WELL DATA	FORMATION DESCRIPTION
	Well abandonment	
	CONCRETE SURFACE SEAL	0 - 24 ft. chipped in place
	BACKFILL 6" Bent chip	- ft.
		- ft.
	DEPTH OF BORING 24"	

RECEIVED
[illegible] 8 1995
DEPARTMENT OF ECOLOGY
CENTRAL REGION OFFICE

SCALE: 1" = _____ PAGE _____ OF _____

ECY 050-12 (Rev. 11/94)

TOTAL P.05

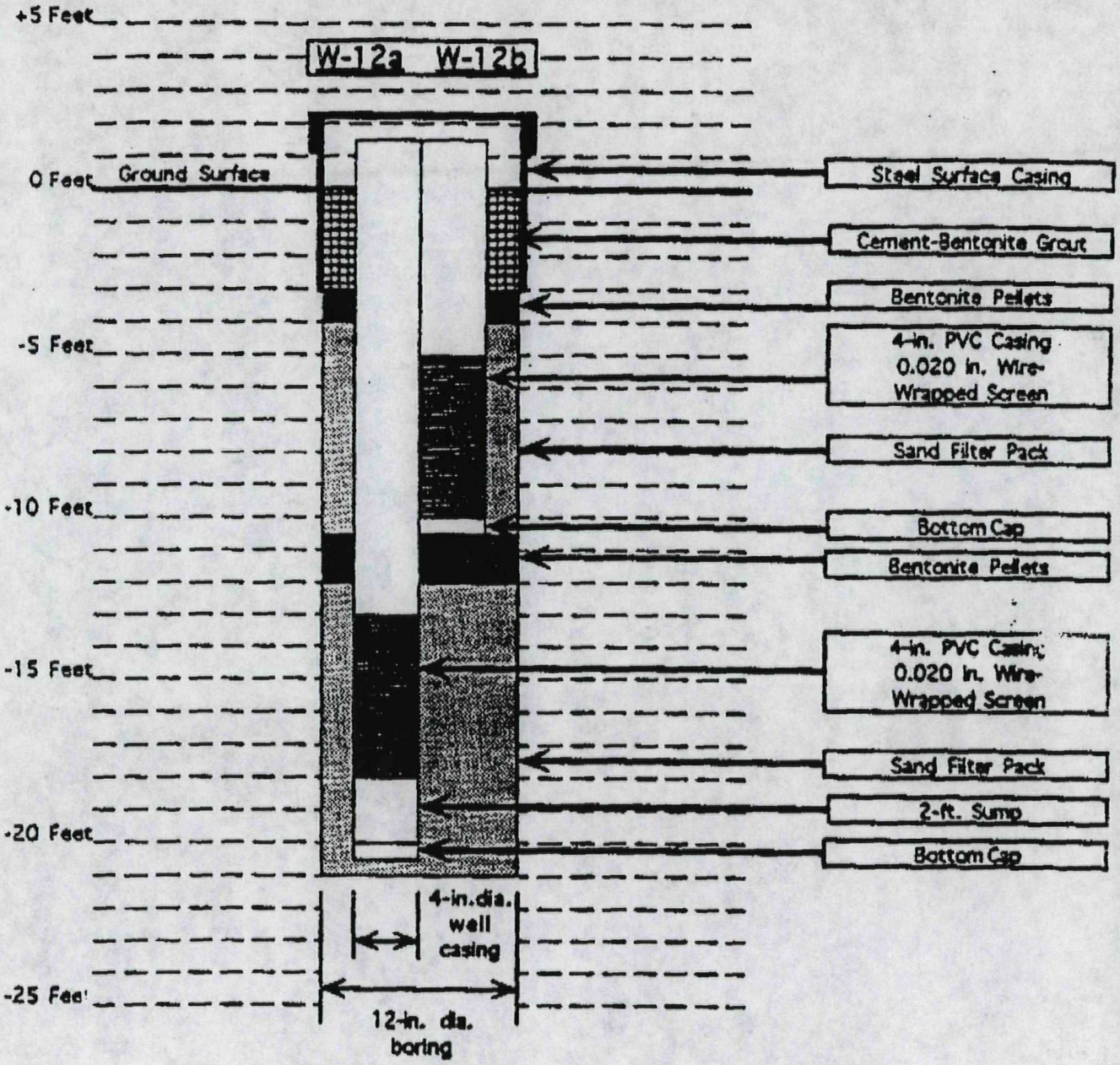


FIGURE 2

SCHEMATIC DIAGRAM OF PROPOSED MONITORING WELLS

NOT TO SCALE

RESOURCE PROTECTION WELL REPORT

START CARD NO. R-19692

PROJECT NAME: FMC
WELL IDENTIFICATION NO. 12 A+B
DRILLING METHOD: Cable Tool
DRILLER: Dale Bigham
FIRM: Oregon Drilling
SIGNATURE: D.D. Big
CONSULTING FIRM: Bechtel
REPRESENTATIVE: Sandy Lawson

COUNTY: Yakima
LOCATION: ~~NW~~ 1/4 SE 1/4 Sec 31 Twn 13 R 19 K
STREET ADDRESS OF WELL: H Washington Ave Yakima
WATER LEVEL ELEVATION: 3.5
GROUND SURFACE ELEVATION:
INSTALLED: 7/21/93
DEVELOPED: 7/22/93

AS-BUILT	WELL DATA	FORMATION DESCRIPTION
	Neat cement	Top soil clayey silt+sand 0-4
5	Bentonite Pellets	
	PVC screen	Sand gravel cobbles 4-10
	10-20 sand	
10	Plug	
	Bentonite Pellets	
	PVC screen	Sand + gravel 10-21
15	10-20 sand	
20	Blank sump	
	Plug	

JAN 20 1994

SCALE: 1" = 5'

PAGE 1 OF 1

ECY 050-12 (Rev. 11/89)

Environmental Resources Management

Drilling Log

Project Ground Water Monit. Owner FMC

Location Yakima Project Number 1005

Boring Number W-13 Total Depth of Auger 16 ft Auger Diameter 4.25 ID

Surface Elevation _____ Water Level: Initial 4.62 ft 24-hrs. _____

Total Depth of Soil Sampler _____ Total Depth of Ground Water Sampler _____

Ground Water Sample Interval(s) _____

Drilling Company Cascade Drilling Method HSA

Driller Steve Butler Log By Tim Lewallen Date Drilled 6/27/94

Sketch Map

Notes
See Attached Site Map

Depth (Feet)	Graphic Log and USCS Designation	FID (ppm)	PID (ppm)	Sample Interval	Soil Description and Observations (Color, Texture, Structures, Odor, Foreign Matter)
0	CL				0-3' Black silty clay loam
	ML				3-5' Dark brown silt with fine gravel
5	SP				5-8' Brown fine to medium sand with fine gravel, wet
10					8-14.5' Brown fine to medium sand, wet
15	GP				14.5-?' Fine to coarse gravel with some fine to coarse sand

Page _____ of _____

ERM-NORTHWEST, INC.
2821 Northup Way, Suite 100, Bellevue, WA 98004-1439; (206) 827-9574/Phone; (206) 827-2408/Fax

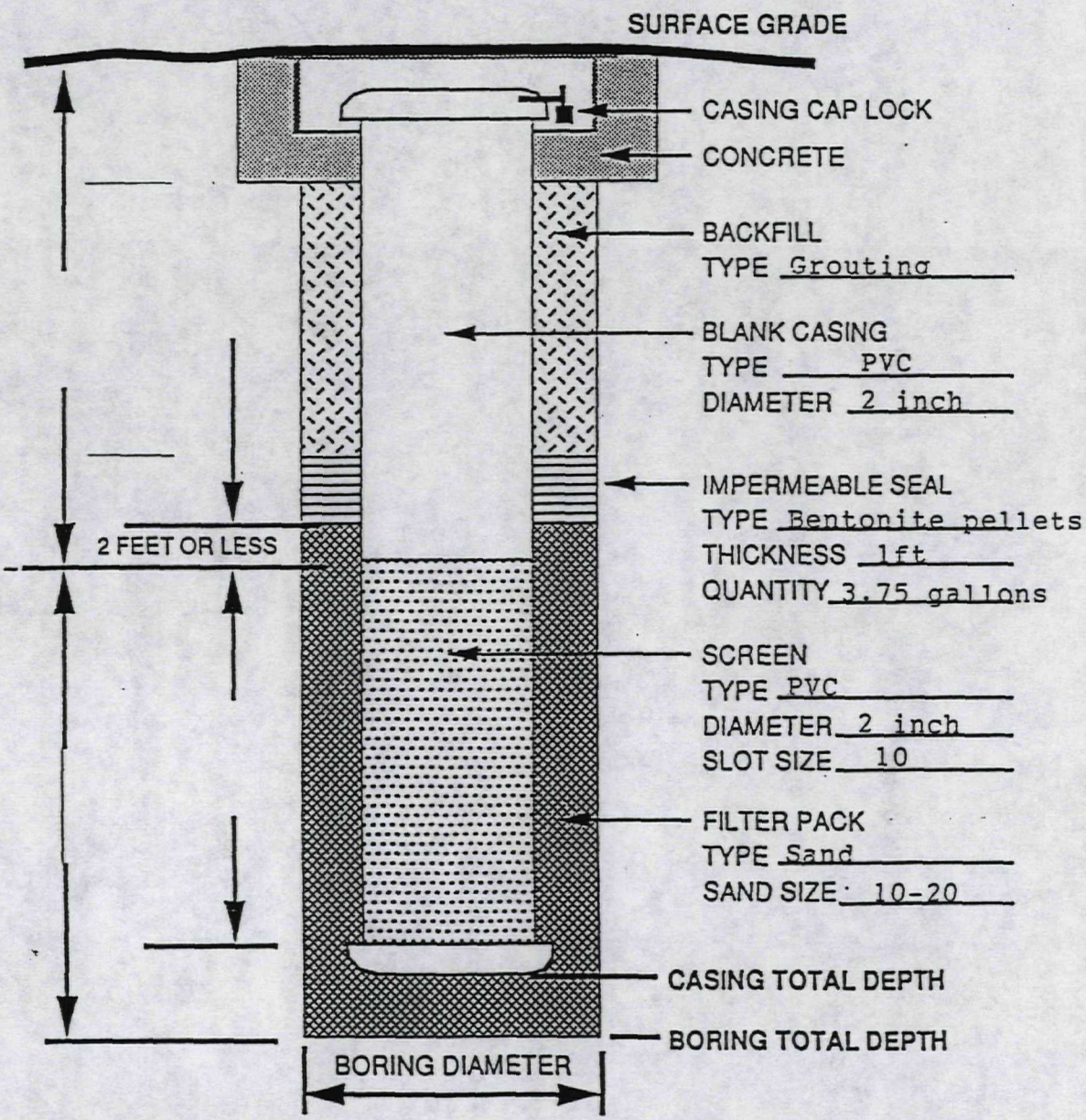
ERM

MONITORING WELL INSTALLATION REPORT

WELL NUMBER: W-13
PROJECT NAME: FMC GWM
ADDRESS: 4 West Washington Av.
Yakima, WA

TYPE OF WELL: Monitoring well
INSTALLATION CONTRACTOR: Cascade Drilling Co.

INSTALLATION DATE: 6/27/94
SURFACE ELEVATION: (FT ABOVE MSL)
TOP OF CASING: (FT ABOVE MSL)
SURVEYED WELL LOCATION:
SITE MANAGER:



RESOURCE PROTECTION WELL REPORT

W-13

START CARD NO. R18785

PROJECT NAME: FMC

WELL IDENTIFICATION NO. ABN 564

DRILLING METHOD: AUGER

DRILLER: STEVE BUTLER

FIRM: Cascade Drilling, Inc.

SIGNATURE: [illegible]

CONSULTING FIRM: ERM

REPRESENTATIVE: DON CLABAUGH

COUNTY: YAKIMA

LOCATION: NE¼ SW¼ Sec 31 Twn 13N R 19E

STREET ADDRESS OF WELL: 4 WEST WA AVE

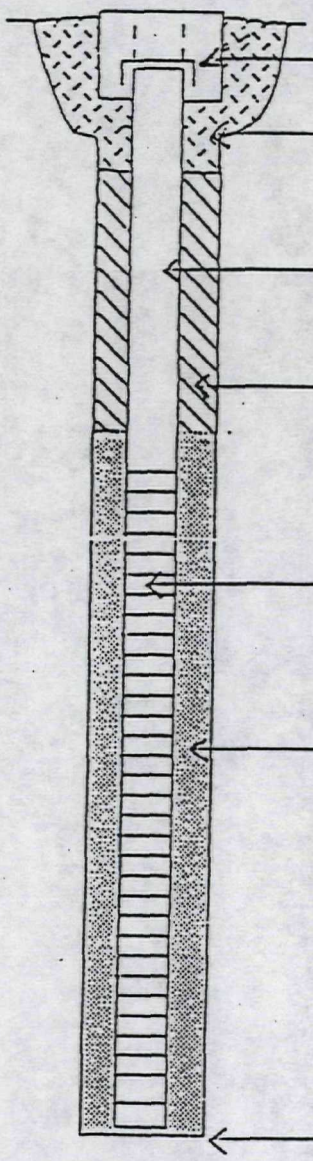
WATER LEVEL ELEVATION: 8'

GROUND SURFACE ELEVATION: N/A

INSTALLED: 6-27-94

DEVELOPED: 6-28-94

4282

AS-BUILT	WELL DATA	FORMATION DESCRIPTION
	WELL COVER CONCRETE SURFACE SEAL DEPTH = 1/ft PVC BLANK 2 "x 6' BACKFILL 2 ft. TYPE: CHIPS PVC SCREEN 2 "x 10' SLOT SIZE: .010 GRAVEL PACK 12 ft. MATERIAL: 10-20 SAND WELL DEPTH 15' "	0 - 4 ft. SILTY CLAY & COBBLES 4 - 8 ft. SILT & GRAVEL 8 - 15 ft. SILTY SAND

RECEIVED
JUL 18 1994
DEPARTMENT OF ECOLOGY
CENTRAL REGION OFFICE

SCALE: 1" = _____

PAGE _____ OF _____

ECY 050-12 (Rev. 11/89)

Environmental Resources Management

Drilling Log

Project Ground Water Monit. Owner FMC

Location Yakima Project Number 1005

Boring Number W-14 Total Depth of Auger 16 ft Auger Diameter 4.25ID

Surface Elevation _____ Water Level: Initial _____ 24-hrs. 5.93 ft

Total Depth of Soil Sampler _____ Total Depth of Ground Water Sampler _____

Ground Water Sample Interval(s) _____

Drilling Company Cascade Drilling Method HSA

Driller Steve Butler Log By Tim Lewallen Date Drilled 6/27/94

Sketch Map

Notes
See Attached Site Map

Depth (Feet)	Graphic Log and USCS Designation	FID (ppm)	PID (ppm)	Sample Interval	Soil Description and Observations (Color, Texture, Structures, Odor, Foreign Matter)
0	CL				0-1.5' Brown silty clay loam
					1.5-4.5' Brown silty clay loam with medium gravel
5	SW				4.5-5.5' Brown medium sand with fine gravel
	SP				5.5-8' Fine to medium sand with fine to coarse gravel
					8-9.5' Fine to coarse sand with fine gravel, wet
10	GP				9.5-14' Coarse gravel with fine to coarse sand, wet
	SP				14-14.5' Medium to coarse sand with fine to coarse gravel
15	GP				14.5-15' Coarse gravel with medium to coarse sand, wet

Page _____ of _____

ERM-NORTHWEST, INC.
2821 Northup Way, Suite 100, Bellevue, WA 98004-1439; (206) 827-9574/Phone; (206) 827-2408/Fax

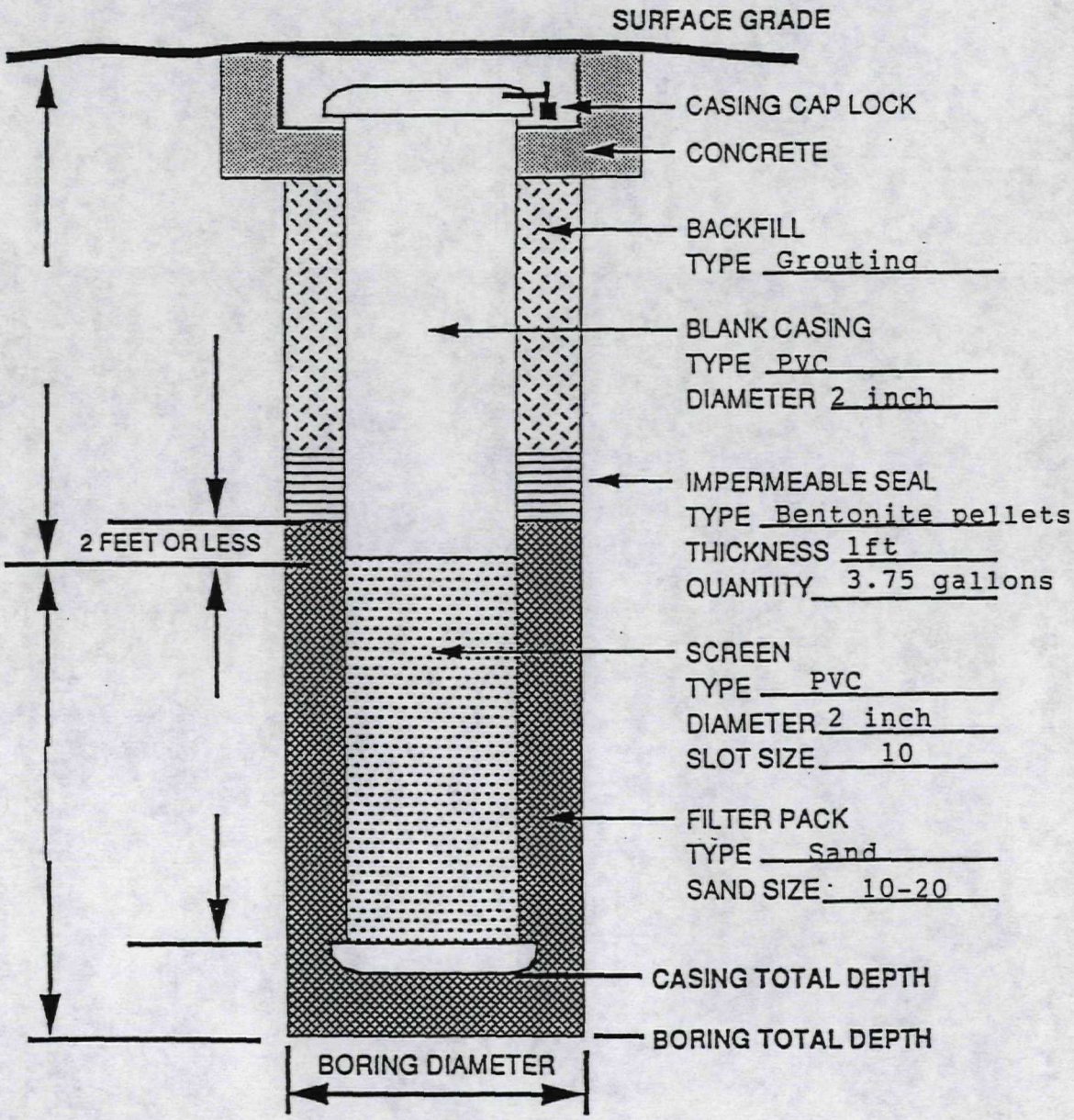
ERM

MONITORING WELL INSTALLATION REPORT

WELL NUMBER: W-14
PROJECT NAME: FMC GWM
ADDRESS: 4 West Washington Av.
Yakima, WA

TYPE OF WELL: Monitoring well
INSTALLATION CONTRACTOR: Cascade Drilling Co.

INSTALLATION DATE: 6/27/94
SURFACE ELEVATION: (FT ABOVE MSL)
TOP OF CASING: (FT ABOVE MSL)
SURVEYED WELL LOCATION:
SITE MANAGER:



W-14

RESOURCE PROTECTION WELL REPORT

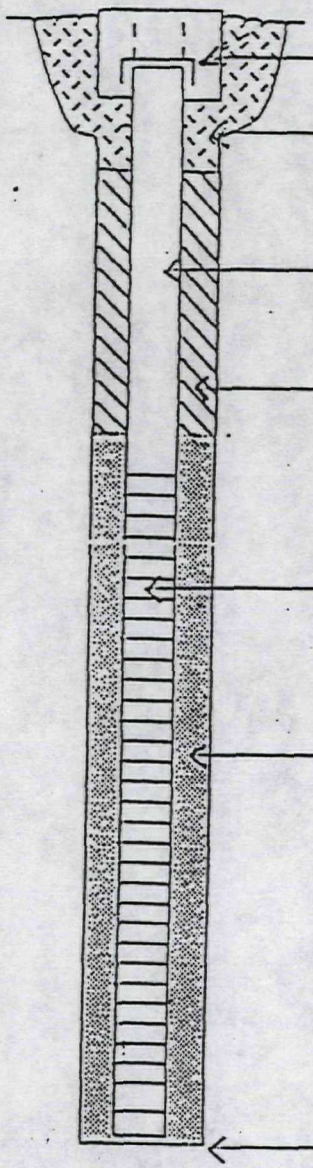
START CARD NO. R18785

PROJECT NAME: FMC
WELL IDENTIFICATION NO. ABN 565
DRILLING METHOD: AUGER
DRILLER: STEVE BUTLER
FIRM: Cascade Drilling, Inc
SIGNATURE: [illegible]
CONSULTING FIRM: ERM
REPRESENTATIVE: DON CLABAUGH

COUNTY: YAKIMA
LOCATION: NE¼ SW¼ Sec 31 Twn 13N R 19E
STREET ADDRESS OF WELL: 4 WEST WA. AVE
WATER LEVEL ELEVATION: 8
GROUND SURFACE ELEVATION: N/A
INSTALLED: 6-27-94
DEVELOPED: 6-28-94

4282

AS-BUILT



WELL DATA

WELL COVER

CONCRETE SURFACE SEAL
DEPTH = 1/ft

PVC BLANK 2 "x 6'

BACKFILL 2 ft.
TYPE: CHIPS

PVC SCREEN 2 "x 10'
SLOT SIZE: .010

GRAVEL PACK 12 ft.
MATERIAL: 10-20 SAND

WELL DEPTH 15' "

FORMATION DESCRIPTION

0 - 4 ft.
SILTY CLAY & COBBLES

4 - 8 ft.
SILT & GRAVEL

8 - 15 ft.
SILTY SAND

SCALE: 1" = _____

PAGE _____ OF _____

ERM-WEST
Environmental Resources Management

FMC - Yakima
Job #2672.03
Drilling Log

Project	Former Pesticide Facility	Location	Yakima, WA		
Owner	FMC	Project Number	2672.03		
Well/Boring No.	MW-15	Total Depth	15.3	Diameter	10"
Surface Elevation		Water Level: Initial	N/A	Ref. Pt.	N/A
Screen: Dia.	2"	Length	10'	Slot Size	.010"
Casing: Dia.	2"	Length	5'	Type	PVC
Drilling Company	Cascade Drilling	Drilling Method	Hollow stem auger		
Driller	Rodney La Brosse	Log by	AMA	Date Drilled	08/24/95

Sketch Map

Notes

Depth (Feet)	Graphic Log	Blow Counts	Sample Number	Well Construction	Description/Soil Classification (Consistency, Moisture, Color, Odor, Staining, Etc.)
0.5	AC			Locking Cap	Asphaltic concrete (4")
1				Concrete	
1.5	GP			2" diameter	Brown angular to subrounded finr GRAVEL, little sand, loose, wet below 1.0 feet (FILL)
2				Bentonite Chips	
2.5				Blank	
3					
3.5	GP				Brown subrounded to rounded fine to coarse GRAVEL, little sand and cobbles, medium dense, wet
4					
4.5					
5					
5.5					
6					
6.5					
7					
7.5					
8				10-20 Sand Pack	
8.5		50-6"	W-15-8.0	Slotted PVC	
9					
9.5					
10					
10.5					
11					
11.5					
12					
12.5		50-6"	W-15-12.0		
13					
13.5					
14					
14.5					
15					
15.5				Cap	Bottom of boring at 15.0 feet
16					
16.5					
17					

ERM-WEST
Environmental Resources Management

FMC - Yakima
Job #2672.03
Drilling Log

Project: Former Pesticide Facility | Location: Yakima, WA
Owner: FMC | Project Number: 2672.03
Well/Boring No.: MW-16 | Total Depth: 15.9' | Diameter: 10"
Surface Elevation: | Water Level: Initial: N/A | Ref. Pt.: N/A
Screen: Dia.: 2" | Length: 10' | Slot Size: .010"
Casing: Dia.: 2" | Length: 6' | Type: PVC
Drilling Company: Cascade Drilling
Driller: Rodney La Brosse | Log by: AMA | Date Drilled: 08/24/95

Sketch Map

Notes

Depth (Feet)	Graphic Log	Blow Counts	Sample Number	Well Construction	Description/Soil Classification (Consistency, Moisture, Color, Odor, Staining, Etc.)
0.5					
1	SP		Concrete		Brown gravelly fine to medium SAND, trace to little silt, loose, moist
1.5			2" diameter		
2			Bentonite Chips	Blank	
2.5					Brown subrounded to rounded fine to coarse GRAVEL, some sand, scattered cobbles, medium dense, moist
3					
3.5	GP				Wet below 3.5 feet
4					
4.5					
5					
5.5					
6					
6.5					
7					
7.5					
8				10-20 Sand Pack	
8.5		30			
9		50-6"	W-16-8.5	Slotted PVC	
9.5					
10					
10.5					
11					
11.5					
12					
12.5					
13					
13.5		50-6"	No recovery		
14					
14.5					
15					
15.5					Bottom of boring at 15.0 feet
16				Cap	
16.5					
17					

ERM-WEST
Environmental Resources Management

FMC - Yakima
Job #2672.03
Drilling Log

Project: Former Pesticide Facility | Location: Yakima, WA
Owner: FMC | Project Number: 2672.03
Well/Boring No.: MW-17 | Total Depth: 16.2' | Diameter: 10"
Surface Elevation: | Water Level: Initial: N/A | Ref. Pt.: N/A
Screen: Dia. 2" | Length: 10' | Slot Size: .010"
Casing: Dia. 2" | Length: 6.5' | Type: PVC
Drilling Company: Cascade Drilling
Driller: Rodney La Brosse | Log by: AMA | Date Drilled: 08/24/95

Sketch Map

Notes

Depth (Feet)	Graphic Log	Blow Counts	Sample Number	Well Construction	Description/Soil Classification (Consistency, Moisture, Color, Odor, Staining, Etc.)
0.5, 1, 1.5, 2	SP		Concrete; 2" diameter	Concrete; Blank	Brown gravelly fine to medium SAND, trace to little silt, loose, moist
2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5, 8	GP		Bentonite Chips	Blank; 10-20 Sand Pack; Slotted PVC	Brown subrounded to rounded fine to coarse GRAVEL, some sand, trace to little silt, scattered cobbles, medium dense, moist Wet below 3.0 feet
8.5		22			
9		50-6"	W-17-8.5		
9.5, 10, 10.5, 11, 11.5, 12, 12.5, 13					
13.5		26			
14		50-6"	W-17-13.5		
14.5, 15					
15.5				Cap	Bottom of boring at 15.0 feet
16, 16.5, 17					

Appendix C

APPENDIX C

HELP MODEL OUTPUT

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**        HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                     **
**         HELP MODEL VERSION 3.01  (14 OCTOBER 1994)                       **
**           DEVELOPED BY ENVIRONMENTAL LABORATORY                          **
**            USAE WATERWAYS EXPERIMENT STATION                             **
**       FOR USEPA RISK REDUCTION ENGINEERING LABORATORY                    **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:   C:\HELP3\PREYAK.D4
TEMPERATURE DATA FILE:     C:\HELP3\TEMPYAK.D7
SOLAR RADIATION DATA FILE: C:\HELP3\SRYAK.D13
EVAPOTRANSPIRATION DATA:   C:\HELP3\ETYAKIMA.D11
SOIL AND DESIGN DATA FILE: C:\HELP3\DATA10.D10
OUTPUT DATA FILE:          C:\HELP3\YAKK.OUT


TIME: 15:12    DATE: 10/27/1997


******************************************************************************

  TITLE: FMCYAKIMA

******************************************************************************


  NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
        COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                LAYER  1
                --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
            MATERIAL TEXTURE NUMBER  6
     THICKNESS              =   36.00  INCHES
     POROSITY               =    0.4530 VOL/VOL
     FIELD CAPACITY         =    0.1900 VOL/VOL
     WILTING POINT          =    0.0850 VOL/VOL
     INITIAL SOIL WATER CONTENT =    0.1472 VOL/VOL
```

EFFECTIVE SAT. HYD. COND. = 0.720000011000E-03 CM/SEC
NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 1.34
FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 4
THICKNESS = 36.00 INCHES
POROSITY = 0.4370 VOL/VOL
FIELD CAPACITY = 0.1050 VOL/VOL
WILTING POINT = 0.0470 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.1165 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.170000002000E-02 CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 8
THICKNESS = 24.00 INCHES
POROSITY = 0.4630 VOL/VOL
FIELD CAPACITY = 0.2320 VOL/VOL
WILTING POINT = 0.1160 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.2121 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.369999994000E-03 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
SOIL DATA BASE USING SOIL TEXTURE # 6 WITH BARE
GROUND CONDITIONS, A SURFACE SLOPE OF 1.% AND
A SLOPE LENGTH OF 70. FEET.

SCS RUNOFF CURVE NUMBER = 86.30
FRACTION OF AREA ALLOWING RUNOFF = 100.0 PERCENT
AREA PROJECTED ON HORIZONTAL PLANE = 0.100 ACRES
EVAPORATIVE ZONE DEPTH = 24.0 INCHES
INITIAL WATER IN EVAPORATIVE ZONE = 3.020 INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE = 10.872 INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE = 2.040 INCHES
INITIAL SNOW WATER = 0.000 INCHES

INITIAL WATER IN LAYER MATERIALS = 14.583 INCHES
TOTAL INITIAL WATER = 14.583 INCHES
TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
YAKIMA WASHINGTON

MAXIMUM LEAF AREA INDEX = 0.50
START OF GROWING SEASON (JULIAN DATE) = 108
END OF GROWING SEASON (JULIAN DATE) = 292
AVERAGE ANNUAL WIND SPEED = 7.10 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 70.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 49.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 49.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 73.00 %

NOTE: PRECIPITATION DATA FOR YAKIMA WASHINGTON
WAS ENTERED FROM THE DEFAULT DATA FILE.

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR YAKIMA WASHINGTON

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
28.20	36.10	41.90	49.20	57.30	64.50
70.40	68.60	60.90	49.90	38.20	31.50

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR YAKIMA WASHINGTON

STATION LATITUDE = 46.34 DEGREES

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 1974

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.67	0.85	1.21	1.46	0.80	0.12
	0.18	0.00	0.02	0.45	0.30	1.14
RUNOFF	0.938	0.000	0.000	0.023	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.647	1.032	1.598	1.342	1.379	0.157
	0.154	0.023	0.020	0.023	0.670	0.581
PERCOLATION THROUGH	0.0229	0.0194	0.0204	0.0188	0.0183	0.0168
LAYER 3	0.0168	0.0160	0.0148	0.0147	0.0137	0.0135

****

****

ANNUAL TOTALS FOR YEAR 1974

	INCHES	CU. FEET	PERCENT
PRECIPITATION	8.20	2976.601	100.00
RUNOFF	0.961	348.804	11.72
EVAPOTRANSPIRATION	7.626	2768.176	93.00
PERC./LEAKAGE THROUGH LAYER 3	0.206154	74.834	2.51
CHANGE IN WATER STORAGE	-0.593	-215.214	-7.23
SOIL WATER AT START OF YEAR	14.583	5293.605	
SOIL WATER AT END OF YEAR	13.990	5078.391	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.001	0.00

****

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 1975

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.28	1.16	0.49	0.40	0.23	0.22
	0.18	2.10	0.00	0.79	0.43	0.55
RUNOFF	0.387	0.822	0.010	0.000	0.000	0.000
	0.000	0.077	0.000	0.000	0.000	0.067
EVAPOTRANSPIRATION	0.548	0.828	1.554	0.649	0.331	0.135
	0.193	1.762	0.368	0.500	0.432	0.332
PERCOLATION THROUGH	0.0131	0.0114	0.0121	0.0113	0.0108	0.0104
LAYER 3	0.0104	0.0100	0.0094	0.0094	0.0088	0.0089

****

****

ANNUAL TOTALS FOR YEAR 1975

	INCHES	CU. FEET	PERCENT
PRECIPITATION	8.83	3205.292	100.00
RUNOFF	1.364	495.056	15.44
EVAPOTRANSPIRATION	7.635	2771.350	86.46
PERC./LEAKAGE THROUGH LAYER 3	0.125833	45.677	1.43
CHANGE IN WATER STORAGE	-0.294	-106.794	-3.33
SOIL WATER AT START OF YEAR	13.990	5078.391	
SOIL WATER AT END OF YEAR	13.696	4971.597	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.002	0.00

****

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 1976

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.56	0.78	0.70	0.33	0.09	0.69
	0.26	0.50	0.13	0.07	0.00	0.07
RUNOFF	0.059	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.481	0.540	0.788	0.875	0.118	0.495
	0.480	0.275	0.218	0.170	0.035	0.048
PERCOLATION THROUGH	0.0089	0.0076	0.0082	0.0078	0.0078	0.0076
LAYER 3	0.0077	0.0075	0.0072	0.0073	0.0070	0.0071

****

****

ANNUAL TOTALS FOR YEAR 1976

	INCHES	CU. FEET	PERCENT
PRECIPITATION	4.18	1517.340	100.00
RUNOFF	0.059	21.458	1.41
EVAPOTRANSPIRATION	4.523	1641.689	108.20
PERC./LEAKAGE THROUGH LAYER 3	0.091848	33.341	2.20
CHANGE IN WATER STORAGE	-0.494	-179.147	-11.81
SOIL WATER AT START OF YEAR	13.696	4971.597	
SOIL WATER AT END OF YEAR	13.202	4792.450	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.001	0.00

****

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 1977

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.12	0.31	0.62	0.01	0.64	0.50
	0.00	1.16	0.89	0.17	0.70	2.80
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	1.620
EVAPOTRANSPIRATION	0.131	0.049	0.916	0.008	0.553	0.625
	0.000	0.620	1.065	0.392	0.286	0.563
PERCOLATION THROUGH	0.0070	0.0063	0.0069	0.0066	0.0066	0.0064
LAYER 3	0.0067	0.0066	0.0063	0.0065	0.0062	0.0064

****

****

ANNUAL TOTALS FOR YEAR 1977

	INCHES	CU. FEET	PERCENT
PRECIPITATION	7.92	2874.961	100.00
RUNOFF	1.620	587.910	20.45
EVAPOTRANSPIRATION	5.207	1890.056	65.74
PERC./LEAKAGE THROUGH LAYER 3	0.078526	28.505	0.99
CHANGE IN WATER STORAGE	1.015	368.488	12.82
SOIL WATER AT START OF YEAR	13.202	4792.450	
SOIL WATER AT END OF YEAR	13.929	5056.279	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.288	104.659	3.64

ANNUAL WATER BUDGET BALANCE 0.0000 0.002 0.00

****

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 1978

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.27	1.33	0.52	0.91	0.28	0.32
	0.29	0.38	0.64	0.00	0.76	0.32
RUNOFF	1.455	0.299	0.014	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.526	0.830	1.735	0.763	0.385	0.388
	0.488	0.432	0.736	0.000	0.339	0.560
PERCOLATION THROUGH	0.0063	0.0057	0.0063	0.0060	0.0061	0.0059
LAYER 3	0.0061	0.0061	0.0059	0.0060	0.0058	0.0060

****

****

ANNUAL TOTALS FOR YEAR 1978

	INCHES	CU. FEET	PERCENT
PRECIPITATION	8.02	2911.261	100.00
RUNOFF	1.768	641.871	22.05
EVAPOTRANSPIRATION	7.181	2606.651	89.54
PERC./LEAKAGE THROUGH LAYER 3	0.072205	26.211	0.90
CHANGE IN WATER STORAGE	-1.001	-363.472	-12.49
SOIL WATER AT START OF YEAR	13.929	5056.279	
SOIL WATER AT END OF YEAR	13.216	4797.466	
SNOW WATER AT START OF YEAR	0.288	104.659	3.59

SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.001	0.00

****

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1974 THROUGH 1978

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.38	0.89	0.71	0.62	0.41	0.37
	0.18	0.83	0.34	0.30	0.44	0.98
STD. DEVIATIONS	0.99	0.39	0.29	0.57	0.30	0.23
	0.11	0.82	0.40	0.32	0.31	1.09
RUNOFF						
TOTALS	0.568	0.224	0.005	0.005	0.000	0.000
	0.000	0.015	0.000	0.000	0.000	0.337
STD. DEVIATIONS	0.620	0.359	0.007	0.010	0.000	0.000
	0.000	0.034	0.000	0.000	0.000	0.717
EVAPOTRANSPIRATION						
TOTALS	0.467	0.656	1.318	0.727	0.553	0.360
	0.263	0.622	0.481	0.217	0.352	0.417
STD. DEVIATIONS	0.197	0.382	0.433	0.481	0.487	0.213
	0.214	0.674	0.419	0.222	0.231	0.230
PERCOLATION/LEAKAGE THROUGH LAYER 3						
TOTALS	0.0116	0.0101	0.0108	0.0101	0.0100	0.0094
	0.0095	0.0093	0.0087	0.0088	0.0083	0.0084
STD. DEVIATIONS	0.0068	0.0057	0.0058	0.0053	0.0050	0.0045
	0.0044	0.0041	0.0036	0.0036	0.0032	0.0031

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1974 THROUGH 1978

	INCHES		CU. FEET	PERCENT
PRECIPITATION	7.43	(1.851)	2697.1	100.00
RUNOFF	1.154	(0.6845)	419.02	15.536
EVAPOTRANSPIRATION	6.434	(1.4645)	2335.58	86.596
PERCOLATION/LEAKAGE THROUGH FROM LAYER 3	0.11491	(0.05505)	41.714	1.54661
CHANGE IN WATER STORAGE	-0.273	(0.7650)	-99.23	-3.679

****

****

PEAK DAILY VALUES FOR YEARS 1974 THROUGH 1978

	(INCHES)	(CU. FT.)
PRECIPITATION	1.40	508.200
RUNOFF	1.620	587.9096
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.000863	0.31333
SNOW WATER	2.15	780.9247

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.1943
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0822

****

****

FINAL WATER STORAGE AT END OF YEAR 1978

LAYER	(INCHES)	(VOL/VOL)
1	4.4942	0.1248
2	4.0430	0.1123
3	4.6789	0.1950
SNOW WATER	0.000	

****
****