

STATE OF CALIFORNIA
The Resources Agency
Department of Water Resources



BULLETIN No. 174-1

# THE FATE OF PESTICIDES APPLIED TO IRRIGATED AGRICULTURAL LAND

## BIO-ENGINEERING ASPECTS OF AGRICULTURAL DRAINAGE





MAY 1968

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ACKNOWLEDGMENT

This report would not have been possible were it not for the generous cooperation of the following organizations:

Hugh Bennett Ranch, Incorporated, Firebaugh, California

USDA, Soil Conservation Service, Firebaugh, California

University of California Water Resources Center, Los Angeles, California

USBR, Bureau of Reclamation, Region II, Sacramento, California

Westlands Water District, Fresno, California

USDA, Agricultural Research Service, Ground Water Recharge Center, Fresno, California

Owens-Corning Fiberglass Corporation, Santa Clara, California

Land Improvement and Development Corporation, Brawley, California

American Concrete Pipe Association, Chicago, Illinois

Jourdan Concrete Pipe Company, Fresno, California

Arroyo Rock Company, Madera, California

The Department of Water Resources is deeply grateful for their cooperation and that given by the many individuals, too numerous to mention by name, who through their efforts made the task of preparing this report easier.


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## FOREWORD

For aeons man has known how to irrigate his lands to increase productivity. However, he did not recognize the need for drainage until recently. Without proper drainage, hundreds of thousands of acres of once fertile land have been forced out of production.

In 1957, the State Legislature authorized the San Joaquin Valley Drainage Investigation to solve the drainage problems of the Valley. This investigation marked the first attempt by the State to solve the complex problem of agricultural drainage on a basin-wide scale.

Several phases of the Drainage Investigation, primarily those being conducted by the Quality and Treatment Unit, are of such a nature that they merit separate publication. The results of these studies will, of course, be included in the final report of the Investigation. Details of the studies, however, are important enough to be published for distribution to other organizations and interested individuals. This bulletin is the first of a series intended to serve this purpose. Bulletins to be released in the future, as part of this series, will cover subjects such as: analyses of data pertaining to the quality of agricultural waste water treatment, studies of the ecology of several microsystems, and analyses of time-series data.

The fate of pesticides applied to irrigated agricultural land was selected as the subject for the first bulletin of the series because of the extreme concern that pesticide use in the San Joaquin Valley is causing a critical degradation of the environment. Hopefully, the conclusions presented in this report will do much to reduce this concern.

William R. Gianelli

William R. Gianelli, Director
Department of Water Resources
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April 16, 1968

ABSTRACT

The results of the first two years of a continuing study of the fate of pesticides applied to irrigated agricultural land are presented. The work was conducted on a 110-acre test plot in western Fresno County. The soil of the plot is Lethent silty clay loam, strong alkali.

By applying DDT and Lindane to one of three blocks in the plot, and measuring the chlorinated hydrocarbon pesticide content in and the quantities of the applied water, tailwater (surface runoff), tile drain effluent and soil, it was concluded that (1) the pesticide content of subsurface tile drainage effluent is not significantly greater than that of the applied water when pesticides of low solubility, such as DDT, are applied, (2) the concentration in tile drainage effluent of a more soluble pesticide, as represented in this study by Lindane, is significantly higher than that of the applied water, (3) the pesticide concentrations found in soil vary with time at a rate that is proportional to the concentration present. The rate of change is also influenced by moisture conditions of the soil environment. The nature of this variation indicates that some of the pesticides in the soil are decomposing in place, (4) effluent from tile drainage did not appear to remove an appreciable quantity of chlorinated hydrocarbonic material from the field, and (5) when considering the fate of pesticides applied to an irrigated field, more is removed through decomposition in the soil than through leaching.

## INTRODUCTION

What becomes of the pesticides applied to a field?

Do they remain in the soil or are they removed in the surface runoff or tile drainage?

These questions are examples of those commonly asked of the Department of Water Resources. This report presents the results of a study conducted to provide information needed to answer them. The following conclusions are examples of those drawn from the information provided:

(1) Tile drain discharge does not remove a significant proportion of the pesticides applied to a field. (2) Considerably more pesticides remain in the soils of a field than are removed by tailwater (surface runoff) or tile drainage.

### Bennett Plot

The investigation leading to this report is part of a continuing study on the Bennett Plot, a 110-acre plot of land, which is located approximately 6 miles south of Dos Palos on the east side of Russell Avenue in Western Fresno County (Figure 1). It had never been cultivated prior to September 1963. The soil of the plot is classified as Lethent silty clay loam, strong alkali.

Prior to the application of irrigation water, subsurface tile drains were installed in the plot. The drainage system was designed to make possible the determination of the leaching effectiveness of two sizes of drain tile (4" and 6" inside diameter), and of several different methods of tile installation. This was accomplished by installing seven drain lines in each of the three blocks comprising the plot. Each of the seven lines represented a different type tile or different method of installation. Blocks A and B contain lines 900 feet long, while the lines in Block C are 600 feet long. All tile lines are spaced 200 feet apart on a slope of 0.002 feet per foot.

To date, the test plot has been flooded three times: from October 5, 1963 to January 27, 1964: from July 12, 1964 to September 25, 1964: and from May 15, 1965 to September 20, 1965. Rice was grown during the third flooding and subsequently harvested.

Pesticides were applied to the soil surface of Block B prior to each flooding. No pesticides were applied to any of the other blocks. The fate of the pesticides applied to the plot was determined by measuring the concentrations of pesticides in the applied water, tailwater, tile drain discharge, and soil.

On September 23, 1963, DDT (a chlorinated hydrocarbon pesticide) and Parathion (a thiophasphate pesticide) were applied at rates of 2 and

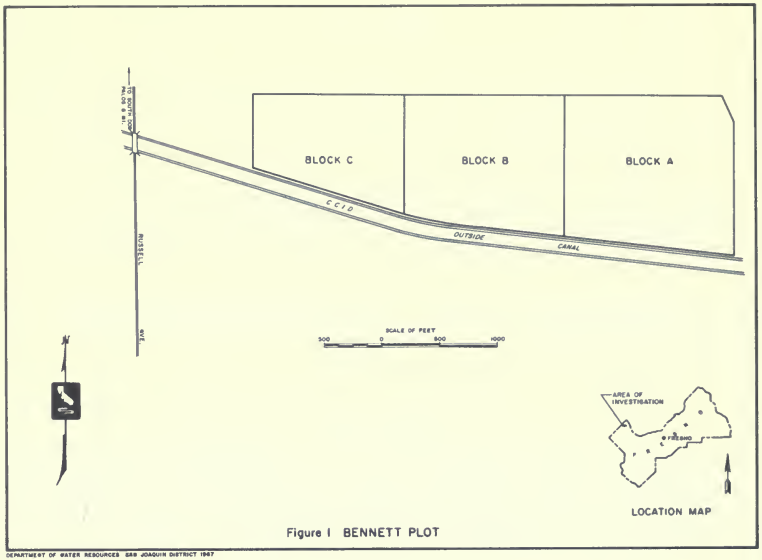


Figure 1 BENNETT PLOT

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0.1 pounds per acre, respectively. On July 9, 1964, DDT and Parathion were again applied; however, the application rates were doubled (4 and 0.2 pounds per acre, respectively). Before the third flooding, on May 6, 1965, 3.3 pounds per acre of Lindane (a chlorinated hydrocarbon pesticide) were applied. These application rates are slightly higher than the rates normally used in the area. The higher rates were used to make detection easier and to determine if increased application would result in excessively high concentrations of pesticides in the tile drainage and tailwater. The change from DDT to Lindane was made in an attempt to determine if Lindane (with a solubility approximately 100 times that of DDT) would leach through a soil column faster than DDT. The Fresno County Mosquito Abatement District applied 0.1 pounds per acre of Parathion on July 9, 1965. The Parathion application made by the abatement district was done while the plot was flooded.

The thiophasphate pesticides applied never reached the drain tiles in significant, measurable concentrations, even though they are considerably more soluble than the chlorinated hydrocarbons. In addition, they are easily broken down in the environment and consequently have a short life. Data obtained from this study and other data collected in the San Joaquin Valley substantiate this. Statistically meaningful thiophosphate data were not obtained during the course of this specific study. Therefore, this report discusses only the chlorinated hydrocarbon pesticide data, and thiophosphate pesticides are not considered further.

## Sample Collection and Analysis

The backbone of any water quality investigation is the data. Without reliable data, it is impossible to meet the objectives of any program, and all effort to overcome this shortcoming will be in vain. Because of the inherent difficulties in collecting and analyzing pesticide samples, it is important to describe the techniques used. Appendix A presents a summary of the methods used to take the samples and to analyze them. It is believed that these methods provide the best data obtainable at this time.

## RESULTS

The chlorinated hydrocarbon pesticide data collected to date for this program are presented in Appendix B and are summarized in the tables of this section of the report.

Table 1 presents the summary of the concentrations of chlorinated hydrocarbon pesticides found in the water applied to the plot. The tail-water (surface runoff) and tile drain effluent pesticide concentrations are presented in Tables 2 and 3. The results of the soil pesticide analyses are summarized in Table 4. Figure 2 graphically illustrates soil pesticide concentrations in Block C and is presented to assist in the comprehension of the results of these analyses. No special significance should be attached to the particular example selected.

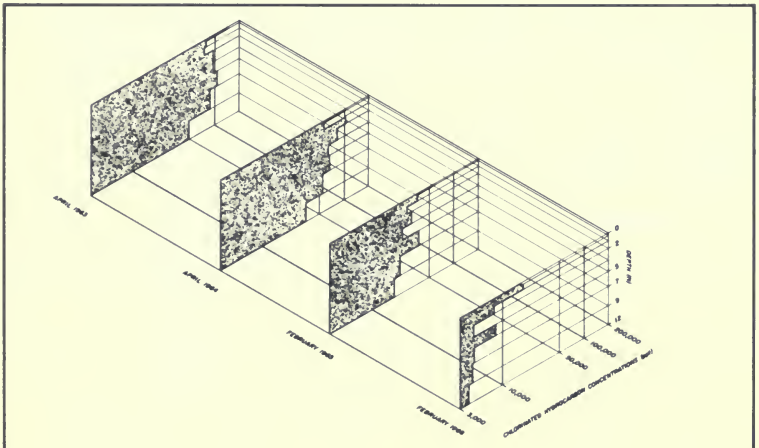


Figure 2. SUMMATION OF
IDENTIFIED CHLORINATED HYDROCARBONS vs DEPTH
FOR BLOCK C OF BENNETT PLOT

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The average chlorinated hydrocarbon pesticide concentrations for the applied water, tailwater, and tile drain effluent are presented in Table 5. The concentrations listed are the averages for the summation of identified chlorinated hydrocarbon pesticides detected in the various samples.

Table 6 presents the water balance for the three leachings at the plot. Approximate evaporation and evapotranspiration rates for the general area in which the study was conducted were derived from Department Land and Water Use records.

TABLE 1

CHLORINATED HYDROCARBON PESTICIDES IN WATER APPLIED
TO BENNETT PLOT, FRESNO COUNTY
OCTOBER 1963 to SEPTEMBER 1965

| Pesticides | Times Detected | Concentrations, in parts per trillion | | |
|---|---|---|---|---|
| | | Average | Maximum | Minimum |
| Chlordane | 1 | 100 | 100 | 100 |
| DDE | 2 | 25 | 30 | 20 |
| DDD and/or DDT | 13 | 88 | 220 | 40 |
| Dieldrin | 2 | 13 | 15 | 10 |
| Heptachlor Epoxide | 4 | 15 | 20 | 10 |
| Lindane | 3 | 15 | 20 | 10 |
| No. of Analyses | 14 | | | |

TABLE 2

CHLORINATED HYDROCARBON PESTICIDES IN TAILWATER (SURFACE RUNOFF)
FROM BENNETT PLOT, FRESNO COUNTY

Concentrations in Parts per Trillion

| Pesticide | BLOCK A | | | | | | BLOCK B | | | | | | BLOCK C | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1st leaching | | 2nd leaching | | 3rd leaching | | 1st leaching | | 2nd leaching | | 3rd leaching | | 1st leaching | | 2nd leaching | | 3rd leaching | |
| | Times tested | Ave. conc. | Times tested | Ave. conc. | Times tested | Ave. conc. | Times tested | Ave. conc. | Times tested | Ave. conc. | Times tested | Ave. conc. | Times tested | Ave. conc. | Times tested | Ave. conc. | Times tested | Ave. conc. |
| Aldrin | No Sample Taken | | 0 | — | 0 | — | 1 | 40 | 0 | — | 0 | — | 0 | — | No Sample Taken | | 0 | — |
| BHC | | | 1 | 30 | 1 | 20 | 1 | 30 | 0 | — | 0 | — | 1 | 30 | | | 3 | 45 |
| Chlordane | | | 0 | — | 0 | — | 0 | — | 0 | — | 0 | — | 0 | — | | | 0 | — |
| DDD and/or DDT | | | 1 | 35 | 9 | 62 | 1 | 330 | 4 | 670 | 15 | 151 | 1 | 90 | | | 8 | 81 |
| DDE | | | 0 | — | 0 | — | 1 | 70 | 4 | 232 | 2 | 12 | 1 | 20 | | | 2 | 15 |
| Dieldrin | | | 0 | — | 0 | — | 0 | — | 0 | — | 0 | — | 0 | — | | | 0 | — |
| Heptachlor | | | 0 | — | 0 | — | 0 | — | 0 | — | 0 | — | 0 | — | | | 0 | — |
| Heptachlor Epoxide | | | 0 | — | 0 | — | 0 | — | 4 | 44 | 0 | — | 0 | — | | | 3 | 12 |
| Lindane | | | 0 | — | 6 | 215 | 0 | — | 0 | — | 15 | 9230 | 0 | — | | | 2 | 55 |
| Toxaphene | | | 1 | 80 | 0 | — | 1 | 250 | 0 | — | 0 | — | 0 | — | | | 0 | — |
| Number of Analyses | | | 1 | | 9 | | 1 | | 4 | | 15 | | 1 | | | | 8 | |

TABLE 3

CHLORINATED HYDROCARBON PESTICIDES IN TILE DRAIN EFFLUENT
FROM BENNETT PLOT, FRESNO COUNTY

Concentrations in Parts per Trillion

| Pesticide | BLOCK A | | | | | | BLOCK B | | | | | | BLOCK C | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1st leaching | | 2nd leaching | | 3rd leaching | | 1st leaching | | 2nd leaching | | 3rd leaching | | 1st leaching | | 2nd leaching | | 3rd leaching | |
| | Times tested | Ave. conc. | Times tested | Ave. conc. | Times tested | Ave. conc. | Times tested | Ave. conc. | Times tested | Ave. conc. | Times tested | Ave. conc. | Times tested | Ave. conc. | Times tested | Ave. conc. | Times tested | Ave. conc. |
| Aldrin | 1 | 20 | 0 | — | 0 | — | 0 | — | 0 | — | 0 | — | 0 | — | 0 | — | 0 | — |
| BHC | 3 | 173 | 1 | 40 | 3 | 42 | 3 | 167 | 0 | — | 0 | — | 2 | 25 | 1 | 20 | 0 | — |
| Chlordane | 2 | 50 | 0 | — | 0 | — | 1 | 50 | 0 | — | 0 | — | 1 | 100 | 0 | — | 0 | — |
| DDD and/or DDT | 2 | 262 | 9 | 43 | 13 | 76 | 6 | 118 | 13 | 45 | 26 | 71 | 4 | 91 | 9 | 45 | 19 | 95 |
| DDE | 2 | 60 | 0 | — | 0 | — | 5 | 37 | 4 | 12 | 9 | 14 | 3 | 53 | 1 | 10 | 4 | 14 |
| Dieldrin | 0 | — | 0 | — | 0 | — | 0 | — | 0 | — | 1 | 35 | 2 | 12 | 0 | — | 2 | 22 |
| Heptachlor | 0 | — | 0 | — | 0 | — | 1 | 115 | 0 | — | 0 | — | 1 | 40 | 0 | — | 0 | — |
| Heptachlor Epoxide | 0 | — | 2 | 18 | 7 | 15 | 1 | 15 | 2 | 12 | 7 | 15 | 2 | 60 | 1 | 10 | 7 | 20 |
| Lindane | 0 | — | 2 | 8 | 2 | 20 | 1 | 30 | 3 | 10 | 26 | 834 | 1 | 20 | 0 | — | 7 | 21 |
| Toxaphene | 1 | 50 | 2 | 175 | 1 | 550 | 1 | 500 | 2 | 50 | 0 | — | 2 | 100 | 0 | — | 0 | — |
| Number of Analyses | 12 | | 9 | | 13 | | 15 | | 13 | | 26 | | 14 | | 9 | | 19 | |

TABLE 4

CHLORINATED HYDROCARBON PESTICIDES IN SOIL FROM
BENNETT PLOT, FRESNO COUNTY

| | Block A | Block B | Block C |
|---|---|---|---|
| Sample 1[1] | | | |
| Avg. Concentration[2] | 71,200 | 61,900 | 84,000 |
| $\bar{Y}$[3] | 5.4 | 6.2 | 5.5 |
| Sample 2[1] | | | |
| Avg. Concentration | 64,400 | 69,700 | 60,900 |
| $\bar{Y}$ | 6.3 | 3.1 | 5.1 |
| Sample 3[1] | | | |
| Avg. Concentration | 44,000 | 111,600 | 27,200 |
| $\bar{Y}$ | 4.9 | 2.1 | 5.4 |
| Sample 4[1] | | | |
| Avg. Concentration | 3,500 | 40,200 | 6,200 |
| $\bar{Y}$ | 4.8 | 1.7 | 4.6 |

1/ Sample 1 taken April 1963, before first leaching and known pesticide application.
Sample 2 taken April 1964, after first leaching: October 5, 1963 - January 27, 1964.
Sample 3 taken February 1965, after second leaching: July 12 - September 25, 1964.
Sample 4 taken February 1966, after third leaching: May 15 - September 20, 1965.

2/ Average concentration, in parts per trillion.

3/ Centroidal Depth, in feet, equals distance from soil surface to center of mass of the pesticides in the soil.

TABLE 5

SUMMARY OF CHLORINATED HYDROCARBON PESTICIDES
IN WATERS APPLIED TO OR REMOVED FROM
BENNETT PLOT, FRESNO COUNTY

| | Avg. Concentrations, in parts per trillion | | |
|---|---|---|---|
| | 1st Leaching | 2nd Leaching | 3rd Leaching |
| Applied Water | 127 | N.S.[1] | 95 |
| Tailwater | | | |
| Block A | N.S. | 145 | 208 |
| Block B | 720 | 946 | 9,390 |
| Block C | 140 | N.S. | 120 |
| Tile Drain Effluent | | | |
| Block A | 167 | 92 | 139 |
| Block B | 232 | 61 | 916 |
| Block C | 135 | 49 | 115 |

1/ N.S. = No Sample Taken

TABLE 6

WATER BALANCE FOR THE FIRST THREE LEACHINGS
OF BENNETT PLOT, FRESNO COUNTY

| | Gross Application | Tailwater | Tile Drainage | Losses[1] |
|---|---|---|---|---|
| First Leaching | | | | |
| Acre-Ft./Acre | 3.15 | 0.50 | 1.14 | 1.51[2] |
| Percent of Applied | | 15.9 | 36.2 | 47.9 |
| Second Leaching | | | | |
| Acre-Ft./Acre | 4.71 | 0.40 | 1.19 | 3.12[3] |
| Percent of Applied | | 8.5 | 25.3 | 66.2 |
| Third Leaching | | | | |
| Acre-Ft./Acre | 12.41 | 2.66 | 2.23 | 7.52[4] |
| Percent of Applied | | 21.4 | 17.9 | 60.7 |

1/ Losses due to deep percolation, evaporation, evapotranspiration, changes in soil storage, etc.
2/ Estimated evaporative loss for period of first leaching 0.52 Acre-Ft./Acre.
3/ Estimated evaporative loss for period of second leaching 1.79 Acre-Ft./Acre.
4/ Estimated evapotranspiration for rice during period of ponding 3.09 Acre-Ft./Acre.

## DISCUSSION

The chlorinated hydrocarbon pesticide data, presented in Appendix B and Tables 1, 2, and 3, have been analyzed using standard statistical techniques ("Student's T" and "F" tests) to a 5 percent level of significance. These techniques were used to determine if there were statistically significant differences between the pesticide concentrations related to the various blocks for the different leaching periods. Tile drain effluent data were normalized by converting the measured concentrations to pounds of pesticide drained per day per acre of land in the particular block. The soil extract results were analyzed by calculating the mean concentrations and the depth to the center of mass of the pesticide in the soil (the centroidal depth). These depths were calculated for the various individual components as well as for the sum of identified chlorinated hydrocarbon pesticides.

### Water Samples

Prior to the third leaching there was no statistically significant difference between the pesticide concentrations of the applied water and that of the tile drain effluents for any of the blocks or that of the tailwaters from blocks A or C. However, the results of the third leachings were considerably different from those prior to that time. The Lindane applied to block B was definitely more soluble than the DDT previously used. It resulted in a statistically significant increase in the tile drainage effluent pesticide content of block B.

The greater pesticide load carried by the block B tile drain effluent during the third leaching was primarily due to the transport of material applied prior to the third leaching and in part due to that applied prior to the second leaching. The more soluble Lindane used prior to the third leaching appeared to reach "equilibrium" with the soil and being leached out within one leaching. However, the DDT, applied prior to the second leaching, did not "break through" until the third one. Of course, the difference in the quantity of water applied for the second leaching and that applied for the third may be as responsible for this as the differences in solubility.

Leaching is the removal of a soluble material from a solid by a liquid. It is the reverse of absorption and dependent on the concentrations of the soluble material (in this case pesticides) in the liquid and on the solid. From this work, it appears that the concentration of pesticides in the leachate, the water, is inconsequential in comparison to that in the solid, the soil. Even though the water is in contact with the soil for an extended period of time, the concentration of leached pesticide did not approach saturation in the water. This can be seen by comparing the concentrations of pesticides found in the tile drain effluent to published pesticide solubilities. It is also apparent from the results of the analyses of the soil samples.

## Soil Samples

By observing the variation of centroidal depth with time for each of the three blocks, it is readily seen that the strong affinity of pesticides for particulate matter is more important than its solubility in water. If the solubility of pesticides in water were the controlling factor, the water passing through the soil would reach saturation. This would result in a smaller fraction of pesticides being removed from the deeper soils than from those closer to the surface. Under these conditions, the centroid of mass would move downward with time. It did not; therefore, this study reaffirms the belief that pesticides have a strong affinity toward particulate matter and are only leached with great difficulty.

The depths to the centroids of mass (Y's on Table 4) for the different soil samples from blocks A and C do not have any significant trend with time. That is, each successive leaching did not cause a drastic change in the location of the center of mass of the pesticides in the soil. The results from block B indicate an ever decreasing centroidal depth.

The lack of a significant trend in the centroidal depths, for blocks A and C, indicates that the material being lost is removed from the increments of depth in a manner that is related to the concentration of pesticide in the increment. With a given quantity of water passed through the soil column, the same percentage of material present is removed from each increment. If the quantity of water passed through the soil column is increased, the percentage removed is increased by the same amount for all depths. However, the increase in the quantity of pesticides removed does not appear to be related linearly to the quantity of water. Two phenomena that are undoubtedly involved are leaching and degradation. The non-linearity, previously mentioned, indicates that leaching is probably not as significant as degradation.

The degradation of pesticides has been shown, in laboratory studies of the movement of pesticides through soils, to be of significance. It may be either chemical or biological in nature. However, it is not possible from results of this study to quantatively separate the significance of leaching, degradation by biological actions, and degradation by chemical reactions.

The decreasing centroidal depth in block B is a result of increased chlorinated hydrocarbon pesticide concentrations in the upper layers of the soil due to application of material to this block. The disproportionately high average concentration found for the third soil sample of block B is due to the large dose of DDT (4 pounds per acre) applied prior to the second leaching. This large dose caused a concentration of nearly three parts per million in the top two inches of the third sample. This application definitely caused an increase in the concentrations of pesticides found at all levels in the soil column. However, the pesticide load carried by the tile drain effluent of block B did not increase significantly (statistically speaking) until the third leaching. This is due to the previously mentioned affinity of pesticides for particulate matter.

The first soil samples, from all three blocks, taken prior to any known pesticide application, contained fairly high concentrations of chlorinated hydrocarbons. The actual cause of these initial concentrations is unknown, but is probably due to overspray from adjacent fields, pesticide transported by seepage, etc.

## Mass Balance

In an attempt to quantitatively determine the fate of applied pesticides, a mass balance was made for the Lindane used on Block B. The tailwater and the tile drain effluents were considered as the only modes of removal and the soil mass as a sink. By doing the mass balance for Lindane, it was possible to eliminate the problems introduced by background concentrations. The soil samples taken prior to application did not contain Lindane in detectable concentrations.

Of the Lindane applied, it was possible to account for less than three percent. Of the Lindane that could be accounted for, approximately 95 percent (2.74 percent of that applied) remained in the soil mass after the leaching, 4 percent (0.12 percent of that applied) was removed in the tailwater, and less than 1 percent (less than 0.02 percent of that applied) was removed in the tile drain effluent. The unaccountable portion (97% of that applied) was possibly lost because of application technique, degradation, seepage to adjacent areas, removal with the rice crop and inaccuracies in sampling and detection methods.

From the fact that pesticide concentrations in the tile drain effluents seldom exceeded the concentrations in the applied water and the results of the mass balance, it appears that degradation possibly account for the removal of more pesticides than does leaching.

## CONCLUSIONS

The following conclusions have been reached as a result of this study:

1. The pesticide content of subsurface tile drainage effluent is not significantly greater than that of the applied water when pesticides of low solubility, such as DDT, are applied.

2. The concentration in tile drainage effluent of a more soluble pesticide, as represented in this study by Lindane, is significantly higher than that of the applied water.

3. The pesticide concentrations found in soil vary with time at a rate that is proportional to the concentration present. The rate of change is also influenced by moisture conditions of the soil environment. The nature of this variation indicates that some of the pesticides in the soil are decomposing in place.

4. Effluent from tile drainage did not appear to remove an appreciable quantity of chlorinated hydrocarbonic material from the field.

5. When considering the fate of pesticides applied to an irrigated field, more is removed through decomposition in the soil than through leaching.

## Appendix A

### SAMPLE COLLECTION AND ANALYTICAL TECHNIQUES

This report is based on the results of two hundred and seventy-seven pesticide analyses. Of the total; 14 samples of applied water, 39 samples of tailwater, 130 samples of tile drain effluent, and 94 soil samples were analyzed. The samples of water (applied, tail, and tile) were taken at such times and in such a way that it is possible to compare the concentrations of pesticide associated with the block receiving direct application (block B) and that caused by overspray, etc. (blocks A and C). The tile drain samples were composites of the effluents from the seven tile lines in each block.

The 94 soil samples were collected prior to the first flooding, and since that time, they have been collected subsequent to each irrigation period. Composite samples were made for each block from soil columns taken from 14 bore holes in the block. The soil samples were combined according to depth; that is, the material comprising the top two inches from each of the 14 bore holes in block A was combined into one sample, as was the material from the two-to twelve-inch depths, the twelve-inch to two-foot depths, etc. This enables the determination of the variation of the concentration of pesticides at various depths in the soil column.

All analyses of pesticides for this program were made by Stoner Laboratories of Campbell, California, using a Dohrman Gas Chromatograph equipped with two microcoulometric detectors. One of the detectors measures chloride concentrations (i.e., chlorinated hydrocarbons) and the other measures sulfur (i.e., thiophosphates).

Pesticides were extracted from 2 gallons of the water samples with a mixed solvent of 10 percent diethyl ether and 90 percent ethyl ether. Once the pesticide was extracted, the solvent-pesticide mixture was concentrated by evaporation and injected into the chromatograph. At the Stoner Laboratory various chromatographic columns are used to separate the pesticides present. Identifications are made by comparing the retention times of the unknown materials injected with those of known standards. On occasion, materials are detected with retention times that do not compare with those of any known material. These are recorded as "unknown" in Appendix B. Concentrations of the specific pesticides identified are calculated from the quantity of chloride or sulfur detected by the microcoulometric detectors. Unknowns are expressed as DDT. In addition, a "Computed Maximum Total" chlorinated hydrocarbon pesticide (CMT) figure is calculated. The CMT is calculated assuming that all of the chloride detected was from DDT. Unknowns and background values are included in this figure.

The microcoulometric gas chromatographic technique used for this study is considered sensitive for concentrations of chlorinated hydrocarbon pesticides in water of 10 parts per trillion or more. When the quantity detected is less than 10 ppt, it is recorded as a "trace".

Soil samples were extracted using the same procedure as that used by the Federal Water Pollution Control Administration (FWPCA) on its Klamath Basin Study with a different solvent. The solvent used for the extractions for this study was made up of 25 percent acetone, 25 percent ethyl ether, and 50 percent petroleum ether with the extraction being performed four times on each sample. After extraction most of the samples were passed through a florosil column. The analyses were made on the same microcoalometric gas chromatographic equipment as that used for the water samples. However, because of various interfering compounds present in the soil extracts, thiophosphate pesticide determinations were not made on them.

## Appendix B

## BASIC DATA

This appendix contains the basic data used in preparing this report. In addition to the results of the analyses for chlorinated hydrocarbon pesticides, values are also given water temperature, electrical conductivity (EC), pH, and flow, whenever available.

TABLE 7

BASIC DATA - APPLIED WATER
BENNETT PLOT, FRESNO COUNTY
Concentrations in parts per trillion

| Date | 10-14-63 | 11-13-63 | 12-10-63 | 5-16-65 | 5-18-65 | 5-25-65 | 6-1-65 |
|---|---|---|---|---|---|---|---|
| Time | 1225 | 1230 | 1150 | 1445 | 1550 | 1750 | 1700 |
| Water Temperature °F | 68 | 62 | 47 | | | | |
| EC (umho/cm) | | | 620 | 340 | 360 | 540 | 350 |
| pH | | | | 7.40 | 7.30 | 7.70 | 7.50 |
| Chlordane | 100 | | | | | | |
| DDE | 30 | 20 | | T[1/] | T | T | |
| DDT | 150 | 40 | | 100 | 50 | 220 | 100 |
| Dieldrin | | | | | | | 15 |
| Heptachlor Epoxide | | 20 | | 10 | T | 15 | T |
| Lindane | | 20 | | T | T | T | 10 |
| Unknown | | | 30 | | | | |
| Sum of Identified | 280 | 100 | 0 | 110 | 50 | 235 | 125 |
| Computed Max. Total | 280 | 100 | 40 | 280 | 150 | 280 | 240 |

| Date | 6-7-65 | 6-14-65 | 6-21-65 | 7-12-65 | 7-29-65 | 8-30-65 | 9-13-65 |
|---|---|---|---|---|---|---|---|
| Time | 1935 | 1525 | 1635 | 1530 | 1530 | 1430 | 1140 |
| Water Temperature °F | | | | | | | |
| EC (umho/cm) | | 300 | 280 | 330 | 420 | 420 | 720 |
| pH | 7.89 | 7.58 | 7.52 | 7.75 | 8.65 | 8.08 | 8.02 |
| Chlordane | | | | | | | |
| DDE | | T | | | | T | T |
| DDT | 50 | 65 | 50 | 100 | 80 | 80 | 65 |
| Dieldrin | | | T | | | | |
| Hepatchlor Epoxide | | | | | 15 | | |
| Lindane | 15 | T | | | | T | T |
| Unknown | 20 | | | | | T | T |
| Sum of Identified | 65 | 65 | 50 | 100 | 95 | 80 | 75 |
| Computed Max. Total | 230 | 140 | 220 | 210 | 320 | 340 | 270 |

1/ T = Trace

## TABLE 8

# BASIC DATA-TAILWATER, BLOCK A

### BENNETT PLOT, FRESNO COUNTY

| Date | Time PST | Temp. °F | EC umho/cm | pH | Flow gpm | Concentrations in parts per trillion | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Aldrin | BHC | Chlordane | DDE | DDD and/or DDT | Dieldrin | Heptachlor | Heptachlor Epoxide | Lindane | Kelthane | Simazine and/or Atrazine | Toxaphene | Unknown | Sum of Identified | Computed Maximum Total |
| 8-17-64 | 1405 | 91 | 1980 | 8.02 | 35 | -- | 30 | -- | -- | 35 | -- | -- | -- | -- | -- | -- | 80 | 20 | 145 | 180 |
| 5-21-65 | 0845 | 81 | 900 | 7.90 | 120 | -- | -- | -- | -- | 45 | -- | -- | -- | 820 | -- | -- | -- | -- | 865 | 920 |
| 6-1-65 | 1345 | 72 | 1270 | 8.08 | 250 | -- | -- | -- | T[1] | 65 | T | -- | T | 170 | -- | -- | -- | -- | 235 | 270 |
| 6-14-65 | 1140 | 67 | 1380 | 8.40 | 85 | -- | -- | -- | T | 140 | T | -- | -- | 150 | -- | -- | -- | 10 | 290 | 370 |
| 6-21-65 | 1205 | 82 | 1420 | 8.61 | 120 | -- | -- | -- | -- | 55 | -- | -- | -- | 90 | -- | -- | -- | -- | 145 | 150 |
| 7-12-65 | 1135 | 77 | 770 | 7.72 | 143 | -- | -- | -- | T | 95 | -- | -- | -- | 40 | -- | -- | -- | 10 | 135 | 320 |
| 7-26-65 | 1500 | 83 | 710 | 8.48 | 200 | -- | -- | -- | -- | 20 | -- | -- | -- | 20 | -- | -- | -- | -- | 40 | 210 |
| 8-30-65 | 1315 | 74 | 680 | 7.98 | -- | -- | 20 | -- | -- | 45 | -- | -- | -- | -- | -- | -- | -- | 10 | 65 | 160 |
| 9-13-65 | 1145 | 65 | 780 | 8.04 | 94 | -- | -- | -- | T | 55 | -- | -- | T | T | -- | -- | -- | 10 | 55 | 210 |
| 9-28-65 | 1500 | 66 | 800 | 8.49 | -- | -- | -- | -- | -- | 40 | -- | -- | T | T | -- | -- | -- | -- | 40 | 230 |

[1] T = Trace

## TABLE 9

## BASIC DATA-TILE DRAIN EFFLUENT, BLOCK A

### BENNETT PLOT, FRESNO COUNTY

| Date | Time PST | Temp. °F | EC umho/cm | pH | Flow gpm | Concentrations in parts per trillion | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Aldrin | BHC | Chlordane | DDE | DDD and/or DDT | Dieldrin | Heptachlor | Heptachlor Epoxide | Lindane | Kelthane | Simazine and/or Atrazine | Toxaphene | Unknown | Sum of Identified | Computed Maximum Total |
| 10-7-63 | 1240 | 73 | -- | -- | 0.9 | -- | 400 | -- | 100 | 500 | -- | -- | -- | -- | -- | -- | -- | -- | 1,000 | 1,000 |
| 10-28-63 | 0850 | 71 | -- | -- | 8.2 | -- | -- | 50 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 50 | 50 |
| 11-28-63 | 0950 | 61 | 36,000 | -- | 8.0 | 20 | 20 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 40 | 80 |
| 12-2-63 | 0940 | 66 | 45,000 | 7.7 | 8.4 | -- | -- | 50 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 60 | 50 | 130 |
| 12-30-63 | 0915 | 61 | 40,000 | 8.0 | 6.9 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0 | 130 |
| 1-27-64 | 1000 | 58 | 48,000 | 8.2 | 6.8 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0 | 95 |
| 2-10-64 | 0845 | 59 | 50,000 | 8.0 | 6.5 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0 | 40 |
| 3-2-64 | 0925 | 56 | 40,000 | 8.2 | 3.4 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0 | 65 |
| 3-30-64 | 0955 | 61 | 30,000 | 8.1 | 1.7 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 100 | 50 | 175 |
| 5-4-64 | 1035 | 62 | 30,200 | 8.0 | 1.6 | -- | 100 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 100 | 290 |
| 6-1-64 | 1025 | 65 | 39,000 | 7.90 | 1.9 | -- | -- | -- | 20 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 20 | 60 |
| 6-22-64 | 1345 | 81 | 38,700 | 7.90 | 1.7 | -- | -- | -- | -- | 25 | -- | -- | -- | -- | -- | -- | -- | -- | 25 | 120 |
| 7-21-64 | 1530 | 75 | 38,000 | 7.95 | 3.0 | -- | -- | -- | -- | 45 | -- | -- | -- | -- | -- | -- | -- | -- | 45 | 50 |
| 7-27-64 | 1330 | 80 | 35,700 | 7.90 | 2.8 | -- | -- | -- | -- | 40 | -- | -- | -- | -- | -- | -- | -- | -- | 40 | 130 |
| 8-3-64 | 1305 | 80 | 30,900 | 7.90 | 6.0 | -- | -- | -- | -- | 55 | -- | -- | -- | -- | -- | -- | -- | 250 | 15 | 305 |
| 8-10-64 | 1535 | 78 | 35,700 | 7.77 | 7.5 | -- | -- | -- | -- | 30 | -- | -- | 25 | -- | -- | -- | -- | -- | 45 | 55 |
| 10-5-64 | 1355 | 76 | 32,800 | 7.8 | 8.4 | -- | 40 | -- | -- | 85 | -- | -- | -- | -- | -- | -- | -- | 100 | 40 | 225 |
| 10-19-64 | 1455 | -- | 38,400 | 7.88 | 3.6 | -- | -- | -- | -- | 40 | -- | -- | -- | -- | -- | -- | -- | -- | 70 | 40 |
| 11-2-64 | 1145 | -- | 39,200 | 7.88 | 2.5 | -- | -- | -- | -- | 30 | -- | -- | -- | 5 | -- | -- | -- | -- | 20 | 35 |
| 11-16-64 | 1110 | 60 | 37,200 | 7.98 | 2.2 | -- | -- | -- | -- | 40 | -- | -- | -- | -- | -- | -- | -- | -- | 40 | 40 |
| 12-14-64 | 0850 | 55 | 28,800 | 8.02 | -- | -- | -- | -- | -- | 20 | -- | -- | 10 | 10 | -- | -- | -- | -- | 270 | 40 |
| 6-7-65 | 1710 | 68 | 33,000 | 7.97 | 6.86 | -- | -- | -- | -- | 70 | -- | -- | -- | -- | -- | -- | -- | -- | 10 | 70 |
| 6-14-65 | 1125 | 67 | 34,200 | 7.88 | 5.02 | -- | -- | -- | -- | 130 | -- | -- | -- | -- | -- | -- | -- | -- | 10 | 130 |
| 6-21-65 | 1200 | 67 | -- | 7.9 | 9.70 | -- | -- | -- | -- | 65 | -- | -- | -- | -- | -- | -- | -- | 550 | 20 | 615 |
| 7-12-65 | 1125 | 69 | -- | 7.9 | 10.28 | -- | -- | -- | -- | 55 | -- | -- | 10 | -- | -- | -- | -- | -- | -- | 65 |
| 7-26-65 | 1445 | 78 | 41,000 | 8.19 | 12.15 | -- | -- | -- | -- | 70 | -- | -- | 10 | -- | -- | -- | -- | -- | 70 | 80 |
| 8-30-65 | 1300 | 77 | 39,600 | 7.88 | 7.56 | -- | -- | -- | -- | 65 | -- | -- | 10 | 20 | -- | -- | -- | -- | 70 | 95 |
| 9-13-65 | 1130 | 72 | 38,800 | 7.80 | 18.21 | -- | -- | -- | -- | 55 | -- | -- | 15 | -- | -- | -- | -- | -- | 65 | 70 |
| 9-20-65 | 1445 | 80 | 36,400 | 7.88 | 18.01 | -- | 20 | -- | T/ | 85 | -- | -- | T | -- | -- | -- | -- | -- | 45 | 105 |
| 9-27-65 | 1455 | 70 | 40,000 | 7.95 | 9.21 | -- | -- | -- | -- | 90 | -- | -- | 10 | T | -- | -- | -- | -- | 30 | 100 |
| 10-4-65 | 1515 | 68 | 38,000 | 7.83 | 4.26 | -- | 75 | -- | -- | 140 | -- | -- | -- | -- | -- | -- | -- | -- | 55 | 215 |
| 10-11-65 | 1200 | 74 | 38,400 | 7.88 | 2.91 | -- | 30 | -- | -- | 90 | -- | -- | 35 | -- | -- | -- | -- | -- | 55 | 155 |
| 10-18-65 | 1130 | 70 | 38,000 | 7.92 | 2.35 | -- | -- | -- | -- | 50 | -- | -- | -- | 20 | -- | -- | -- | -- | 20 | 50 |
| 11-1-65 | 1210 | 70 | 39,600 | 7.98 | 1.66 | -- | -- | -- | T | 25 | -- | -- | 15 | -- | -- | -- | -- | -- | -- | 60 |

TABLE 10

# BASIC DATA-TAILWATER, BLOCK B

## BENNETT PLOT, FRESNO COUNTY

| Date | Time PST | Temp. °F | EC umho/cm | pH | Flow gpm | Concentrations in parts per trillion | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Aldrin | BHC | Chlordane | DDE | DDD and/or DDT | Dieldrin | Heptachlor | Heptachlor Epoxide | Lindane | Kelthane | Simazine and/or Atrazine | Toxaphene | Unknown | Sum of Identified | Computed Maximum Total |
| 11-4-63 | 0935 | 55 | -- | -- | -- | 40 | 30 | -- | 70 | 330 | -- | -- | -- | -- | -- | -- | 250 | -- | 720 | 720 |
| 7-30-64 | 1530 | 93 | 3,450 | 8.65 | 5 | -- | -- | -- | 320 | 1,000 | -- | -- | 60 | -- | -- | -- | -- | 30 | 1,380 | 1,360 |
| 8-3-64 | 1100 | 74 | 2,810 | 8.08 | 4.5 | -- | -- | -- | 170 | 680 | -- | -- | 40 | -- | -- | -- | -- | 60 | 890 | 1,000 |
| 8-10-64 | 1145 | 80 | 2,280 | 7.73 | 25.0 | -- | -- | -- | 290 | 470 | -- | -- | 25 | -- | -- | -- | -- | 30 | 785 | 800 |
| 8-17-64 | 1510 | 82 | 2,280 | 8.30 | 6 | -- | -- | -- | 150 | 530 | -- | -- | 50 | -- | -- | -- | -- | 30 | 730 | 800 |
| 5-21-65 | 0915 | 56 | 1,000 | 7.15 | -- | -- | -- | -- | -- | 200 | -- | -- | -- | 37,400 | -- | -- | -- | -- | 37,600 | 42,000 |
| 5-25-65 | 1115 | 67 | 1,500 | 8.00 | 150 | -- | -- | -- | -- | 600 | -- | -- | -- | 62,000 | -- | -- | -- | -- | 62,600 | 70,000 |
| 6-1-65 | 1405 | 73 | 1,800 | 8.50 | 150 | -- | -- | -- | -- | 220 | -- | -- | -- | 9,600 | -- | -- | -- | -- | 9,820 | 9,800 |
| 6-7-65 | 1730 | 78 | 1,610 | 8.20 | 100 | -- | -- | -- | 17 | 320 | -- | -- | -- | 9,000 | -- | -- | -- | -- | 9,320 | 7,000 |
| 6-14-65 | 1250 | 77 | 1,540 | 7.47 | 25 | -- | -- | -- | 12 | 160 | -- | -- | -- | 8,200 | -- | -- | -- | -- | 8,360 | 8,900 |
| 6-21-65 | 1335 | 83 | 820 | 8.36 | 200 | -- | -- | -- | 25 | 110 | -- | -- | -- | 4,700 | -- | -- | -- | 10 | 4,835 | 6,600 |
| 6-30-65 | 1400 | 83 | 620 | 8.40 | 300 | -- | -- | -- | -- | 100 | -- | -- | -- | 2,700 | -- | -- | -- | -- | 2,800 | 2,800 |
| 7-12-65 | 1245 | 83 | 880 | 8.60 | 231 | -- | -- | -- | -- | 90 | -- | -- | -- | 940 | -- | -- | -- | -- | 1,030 | 1,300 |
| 7-19-65 | 1430 | 91 | 700 | 8.68 | 125 | -- | -- | -- | -- | 60 | -- | -- | -- | 1,200 | -- | -- | -- | -- | 1,260 | 1,800 |
| 7-26-65 | 1530 | 84 | 780 | 8.47 | 100 | -- | -- | -- | -- | 35 | -- | -- | -- | 540 | -- | -- | -- | -- | 575 | 940 |
| 8-2-65 | 1250 | 84 | 690 | 7.96 | 600 | -- | -- | -- | -- | 90 | -- | -- | -- | 630 | -- | -- | -- | 10 | 720 | 1,700 |
| 8-9-65 | 1300 | -- | 680 | 8.08 | 250 | -- | -- | -- | -- | 110 | -- | -- | -- | 630 | -- | -- | -- | 20 | 740 | 920 |
| 8-16-65 | 1515 | -- | 670 | 8.08 | 200 | -- | -- | -- | -- | 90 | -- | -- | -- | 490 | -- | -- | -- | -- | 580 | 760 |
| 8-30-65 | 1500 | 78 | 670 | 7.98 | 10 | -- | -- | -- | -- | 30 | -- | -- | -- | 310 | -- | -- | -- | 10 | 340 | 660 |
| 9-13-65 | 1325 | 73 | 720 | 7.98 | 10 | -- | -- | -- | -- | 45 | -- | -- | T | 160 | -- | -- | -- | -- | 205 | 410 |

1/ T = Trace

TABLE II

# BASIC DATA-TILE DRAIN EFFLUENT, BLOCK B

## BENNETT PLOT, FRESNO COUNTY

| Date | Time PST | Temp. °F | EC umho/cm | pH | Flow gpm | Concentrations in parts per trillion | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Aldrin | BHC | Chlordane | DDE | DDD and/or DDT | Dieldrin | Heptachlor | Heptachlor Epoxide | Lindane | Kelthane | Simazine and/or Atrazine | Toxaphene | Unknown | Sum of Identified | Computed Maximum Total |
| 9-23-63 | 1240 | 73 | -- | -- | 5.3 | -- | -- | -- | 100 | 300 | -- | -- | -- | -- | -- | -- | 500 | -- | 900 | 900 |
| 10-18-63 | 1050 | 72 | -- | -- | 56.0 | -- | -- | -- | -- | -- | -- | -- | -- | 30 | -- | -- | -- | -- | 30 | 30 |
| 10-24-63 | 0945 | 71 | -- | -- | 67.3 | -- | 150 | -- | 50 | 200 | -- | -- | -- | -- | -- | -- | -- | -- | 400 | 400 |
| 10-28-63 | 1000 | 71 | -- | -- | 68.6 | -- | 200 | -- | -- | 50 | -- | -- | -- | -- | -- | -- | -- | -- | 250 | 300 |
| 11-4-63 | 1015 | 68 | -- | -- | 69.3 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0 | 20 |
| 11-25-63 | 1125 | 66 | 40,000 | -- | 62.6 | -- | -- | -- | 10 | 60 | -- | -- | -- | -- | -- | -- | -- | -- | 70 | 100 |
| 12-2-63 | 1110 | 63 | 30,000 | 7.8 | 61.6 | -- | -- | 50 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 50 | 120 |
| 12-30-63 | 1100 | 58 | 28,000 | 7.8 | 62.8 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0 | 70 |
| 1-27-64 | 1045 | 60 | 40,000 | 8.0 | 60.9 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0 | 65 |
| 2-10-64 | 1020 | 58 | 38,000 | 8.0 | 49.5 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0 | 30 |
| 3-2-64 | 1155 | 59 | 40,000 | 7.9 | 18.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0 | 75 |
| 3-30-64 | 1130 | 63 | 28,400 | 7.85 | 9.1 | -- | -- | -- | -- | -- | -- | 115 | -- | -- | -- | -- | -- | 100 | 115 | 300 |
| 5-4-64 | 1125 | 60 | 25,600 | 7.90 | 6.6 | -- | 150 | -- | 10 | -- | -- | -- | -- | -- | -- | -- | -- | 200 | 160 | 400 |
| 6-1-64 | 1130 | 67 | 31,500 | 7.92 | 5.7 | -- | -- | -- | 15 | 55 | -- | -- | 15 | -- | -- | -- | -- | 40 | 85 | 150 |
| 6-22-64 | 1455 | 69 | 27,600 | 7.90 | 4.2 | -- | -- | -- | -- | 40 | -- | -- | -- | -- | -- | -- | -- | 150 | 40 | 250 |
| 7-13-64 | 1200 | 79 | 24,300 | 7.90 | 39.8 | -- | -- | -- | 15 | 35 | -- | -- | -- | -- | -- | -- | -- | 75 | 60 | 140 |
| 7-21-64 | 1640 | 74 | 28,400 | 8.00 | 58.6 | -- | -- | -- | -- | 125 | -- | -- | -- | -- | -- | -- | 40 | 50 | 165 | 220 |
| 7-27-64 | 1635 | 80 | 28,800 | 7.81 | 70.2 | -- | -- | -- | -- | 50 | -- | -- | -- | -- | -- | -- | -- | 60 | 50 | 110 |
| 8-3-64 | 1430 | 78 | 29,400 | 7.80 | 83.7 | -- | -- | -- | -- | 35 | -- | -- | -- | -- | -- | -- | 60 | 40 | 95 | 140 |
| 8-10-64 | 1645 | 85 | 27,300 | 7.85 | 92.8 | -- | -- | -- | -- | 20 | -- | -- | -- | -- | -- | -- | -- | 60 | 20 | 100 |
| 8-17-64 | 1510 | 78 | 24,900 | 7.82 | 100.7 | -- | -- | -- | -- | 15 | -- | -- | -- | -- | -- | -- | -- | 50 | 15 | 70 |
| 8-24-64 | 1635 | 82 | 20,800 | 7.90 | 102.8 | -- | -- | -- | -- | 20 | -- | -- | -- | -- | -- | -- | -- | 250 | 20 | 300 |
| 8-31-64 | 1455 | 68 | 25,200 | 7.68 | 84.1 | -- | -- | -- | 15 | 110 | -- | -- | -- | -- | -- | -- | -- | -- | 125 | 140 |
| 10-5-64 | 1510 | 76 | 14,400 | 7.9 | 107.3 | -- | -- | -- | -- | 15 | -- | -- | -- | -- | -- | -- | -- | 85 | 15 | 110 |
| 10-19-64 | 1345 | -- | 30,400 | 7.90 | 22.1 | -- | -- | -- | -- | 15 | -- | -- | -- | -- | -- | -- | -- | 40 | 15 | 60 |
| 11-2-64 | 1340 | | 28,000 | 8.0 | 14.3 | -- | -- | -- | 10 | 50 | -- | 10 | -- | 10 | -- | -- | -- | 25 | 80 | 85 |
| 11-16-64 | 1400 | 64 | 24,800 | 7.90 | 13.0 | -- | -- | -- | 10 | 65 | -- | 15 | -- | -- | -- | -- | -- | 15 | 90 | 125 |
| 12-14-64 | 0945 | 60 | 24,400 | 7.95 | -- | -- | -- | -- | -- | 30 | -- | T 1/ | -- | 10 | -- | -- | -- | -- | 40 | 110 |
| 5-16-65 | 1720 | 67 | 15,000 | 8.70 | 36.4 | -- | -- | -- | 20 | 40 | -- | -- | -- | 1,600 | -- | -- | -- | -- | 1,660 | 1,800 |
| 5-17-65 | 1530 | 68 | 15,000 | 7.98 | 74.7 | -- | -- | -- | 10 | 50 | -- | -- | -- | 1,200 | -- | -- | -- | -- | 1,260 | 1,700 |
| 5-18-65 | 1315 | 68 | 15,600 | 7.90 | 61.7 | -- | -- | -- | 10 | 40 | -- | -- | -- | 850 | -- | -- | -- | -- | 900 | 810 |
| 5-19-65 | 1145 | 72 | 16,400 | 7.98 | -- | -- | -- | -- | 10 | 30 | -- | -- | -- | 1,000 | -- | -- | -- | -- | 1,040 | 600 |
| 5-20-65 | 1615 | 67 | 17,000 | 8.26 | 83.8 | -- | -- | -- | 10 | 30 | -- | -- | -- | 860 | -- | -- | -- | -- | 900 | 530 |
| 5-21-65 | 1050 | 62 | 19,600 | 7.80 | -- | -- | -- | -- | -- | 50 | -- | -- | -- | 390 | -- | -- | -- | -- | 440 | 650 |
| 5-25-65 | 1615 | 78 | 20,000 | 8.25 | 91.6 | -- | -- | -- | -- | 150 | -- | -- | -- | 600 | -- | -- | -- | -- | 750 | 870 |
| 6-1-65 | 1505 | 68 | 27,300 | 8.02 | 105.2 | -- | -- | -- | 10 | 280 | -- | -- | -- | 1,600 | -- | -- | -- | -- | 1,890 | 2,800 |
| 6-7-65 | 1830 | 65 | 25,500 | 7.88 | 88.6 | -- | -- | -- | T | 50 | -- | -- | T | 1,600 | -- | -- | -- | -- | 1,650 | 2,400 |
| 6-14-65 | 1405 | 71 | 26,100 | 7.92 | 95.6 | -- | -- | -- | -- | 40 | -- | -- | T | 1,800 | -- | -- | -- | -- | 1,840 | 1,600 |
| 6-21-65 | 1405 | 83 | 27,300 | 7.92 | 95.3 | -- | -- | -- | -- | 25 | -- | -- | -- | 2,600 | -- | -- | -- | -- | 2,625 | 3,000 |
| 6-30-65 | 1515 | 71 | 28,000 | 7.92 | 99.2 | -- | -- | -- | -- | 65 | -- | -- | -- | 1,600 | -- | -- | -- | -- | 1,665 | 2,000 |
| 7-12-65 | 1350 | 76 | 21,300 | 7.85 | 97.2 | -- | -- | -- | -- | 120 | -- | -- | -- | 890 | -- | -- | -- | 15 | 1,010 | 1,200 |
| 7-19-65 | 1530 | 74 | 22,400 | 8.01 | -- | -- | -- | -- | -- | 80 | -- | -- | -- | 750 | -- | -- | -- | -- | 830 | 1,300 |
| 7-26-65 | 1810 | 78 | 22,200 | 7.91 | 126.9 | -- | -- | -- | -- | 45 | -- | -- | -- | 900 | -- | -- | -- | -- | 945 | 1,400 |
| 8-2-65 | 1345 | 82 | 28,500 | 7.90 | -- | -- | -- | -- | -- | 85 | -- | -- | -- | 370 | -- | -- | -- | 10 | 455 | 1,000 |
| 8-9-65 | 1415 | -- | 23,500 | 8.16 | -- | -- | -- | -- | -- | 30 | -- | -- | -- | 590 | -- | -- | -- | -- | 620 | 940 |

1/ T = Trace

## TABLE II (Continued)

## BASIC DATA-TILE DRAIN EFFLUENT, BLOCK B

### BENNETT PLOT, FRESNO COUNTY

| Date | Time PST | Temp. °F | EC umho/cm | pH | Flow gpm | Concentrations in parts per trillion | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Aldrin | BHC | Chlordane | DDE | DDD and/or DDT | Dieldrin | Heptachlor | Heptachlor Epoxide | Lindane | Kelthane | Simazine and/or Atrazine | Toxaphene | Unknown | Sum of Identified | Computed Maximum Total |
| 8-16-65 | 1615 | -- | 21,600 | 7.72 | -- | -- | -- | -- | -- | 30 | -- | -- | -- | 550 | -- | -- | -- | 60 | 580 | 1,200 |
| 8-30-65 | 1645 | 77 | 21,000 | 7.95 | 42.0 | -- | -- | -- | -- | 30 | -- | -- | 10 | 590 | -- | -- | -- | -- | 630 | 1,080 |
| 9-13-65 | 1430 | 74 | -- | 7.92 | 146.3 | -- | -- | -- | -- | 65 | -- | -- | 15 | 230 | -- | -- | -- | -- | 310 | 760 |
| 9-20-65 | 1645 | 71 | 21,400 | 8.30 | 142.9 | -- | -- | -- | -- | 35 | -- | -- | T | 180 | -- | -- | -- | -- | 215 | 470 |
| 9-27-65 | 1620 | 68 | 25,000 | 7.90 | 38.8 | -- | -- | -- | T1/ | 120 | -- | -- | 10 | 280 | -- | -- | -- | -- | 410 | 565 |
| 10-4-65 | 1705 | 72 | 20,400 | 7.90 | 21.1 | -- | -- | -- | -- | 55 | -- | -- | 15 | 260 | -- | -- | -- | -- | 330 | 560 |
| 10-11-65 | 1515 | 79 | 21,000 | 7.90 | 16.2 | -- | -- | -- | 30 | 110 | 35 | -- | 25 | 155 | -- | -- | -- | -- | 355 | 860 |
| 10-18-65 | 1250 | 72 | 21,300 | 8.03 | 12.2 | -- | -- | -- | 20 | 120 | -- | -- | 10 | 180 | -- | -- | -- | -- | 330 | 920 |
| 11-1-65 | 1455 | 67 | 25,300 | 8.00 | 9.3 | -- | -- | -- | 10 | 75 | -- | -- | 20 | 70 | -- | -- | -- | 15 | 175 | 440 |

1/ T = Trace

TABLE 12

## BASIC DATA-TAILWATER, BLOCK C
### BENNETT PLOT, FRESNO COUNTY

| Date | Time PST | Temp. °F | EC umho/cm | pH | Flow gpm | Concentrations in parts per trillion | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Aldrin | BHC | Chlordane | DDE | DDD and/or DDT | Dieldrin | Heptachlor | Heptachlor Epoxide | Lindane | Kelthane | Simazine and/or Atrazine | Toxaphene | Unknown | Sum of Identified | Computed Maximum Total |
| 11-4-63 | 1125 | 58 | -- | -- | -- | -- | 30 | -- | 20 | 90 | -- | -- | -- | -- | -- | -- | -- | -- | 140 | 140 |
| 5-20-65 | 1645 | -- | 630 | 7.07 | 50 | -- | -- | -- | 20 | 80 | -- | -- | 10 | 50 | -- | -- | -- | -- | 160 | 300 |
| 6-1-65 | 1525 | 78 | 1,000 | 7.92 | 150 | -- | -- | -- | T1/ | 140 | -- | -- | T | 60 | -- | -- | -- | -- | 200 | 280 |
| 6-14-65 | 1415 | 78 | 920 | 7.75 | 40 | -- | 60 | -- | 10 | 130 | -- | -- | -- | -- | -- | -- | -- | -- | 200 | 250 |
| 6-21-65 | 1515 | 89 | 570 | 7.99 | 165 | -- | 45 | -- | T | 85 | -- | -- | -- | -- | -- | -- | -- | -- | 130 | 230 |
| 7-12-65 | 1415 | 85 | 580 | 7.72 | 200 | -- | -- | -- | -- | 65 | -- | -- | -- | -- | -- | -- | -- | -- | 65 | 230 |
| 7-29-65 | 1230 | 77 | 500 | 7.55 | 200 | -- | -- | -- | -- | 30 | -- | -- | T | -- | -- | -- | -- | 10 | 30 | 330 |
| 8-30-65 | 1700 | 75 | 500 | 7.52 | -- | -- | -- | -- | -- | 45 | -- | -- | 10 | -- | -- | -- | -- | -- | 55 | 350 |
| 9-13-65 | 1445 | 68 | 700 | 7.80 | 57 | -- | 30 | -- | T | 70 | -- | -- | 15 | -- | -- | -- | -- | T | 115 | 240 |

1/ T = Trace

# TABLE 13

## BASIC DATA-TILE DRAIN EFFLUENT, BLOCK C

### BENNETT PLOT, FRESNO COUNTY

| Date | Time PST | Temp. °F | EC umho/cm | pH | Flow gpm | Concentrations in parts per trillion | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Aldrin | BHC | Chlordane | DDE | DDD and/or DDT | Dieldrin | Heptachlor | Heptachlor Epoxide | Lindane | Kelthane | Simazine and/or Atrazine | Toxaphene | Unknown | Sum of Identified |
| 9-23-63 | 0930 | 73 | -- | -- | 4.6 | -- | -- | -- | 100 | 100 | -- | -- | 100 | -- | -- | -- | -- | -- | 300 |
| 10-14-63 | 0855 | 72 | -- | -- | 73.9 | -- | 40 | 100 | -- | -- | -- | -- | -- | -- | -- | -- | 100 | -- | 240 |
| 10-24-63 | 0830 | 71 | -- | -- | 94.7 | -- | -- | -- | 50 | 150 | -- | -- | -- | -- | -- | -- | -- | -- | 200 |
| 10-28-63 | 1120 | 70 | -- | -- | 68.7 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0 |
| 11-11-63 | 1135 | 67 | -- | -- | 90.0 | -- | -- | -- | -- | -- | -- | -- | -- | 20 | -- | -- | -- | -- | 20 |
| 12-2-63 | 1145 | 65 | 7,500 | 7.8 | 90.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0 |
| 12-30-63 | 1120 | 60 | 23,000 | 8.0 | 89.5 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0 |
| 1-27-64 | 1150 | 60 | 8,500 | 8.0 | 74.7 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0 |
| 2-10-64 | 1050 | 59 | 18,000 | 7.9 | 31.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0 |
| 3-2-64 | 1345 | 58 | 16,000 | 8.1 | 7.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0 |
| 3-30-64 | 1330 | 63 | 20,400 | 7.9 | 3.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 100 | 130 | 100 |
| 5-4-64 | 1330 | 61 | 10,300 | 8.02 | 5.2 | -- | -- | -- | -- | -- | -- | 40 | -- | -- | -- | -- | -- | 240 | 40 |
| 6-1-64 | 1330 | 72 | 14,480 | 7.98 | 3.8 | -- | 10 | -- | 10 | 90 | 10 | -- | 20 | -- | -- | -- | -- | -- | 140 |
| 6-22-64 | 1140 | 72 | 13,500 | 7.97 | 1.9 | -- | -- | -- | -- | 25 | 15 | -- | -- | -- | -- | -- | -- | 75 | 40 |
| 7-30-64 | 1200 | 78 | 12,900 | 7.88 | 86.2 | -- | -- | -- | -- | 65 | -- | -- | -- | -- | -- | -- | -- | 65 | 65 |
| 8-3-64 | 1530 | 75 | 12,000 | 7.88 | 114.6 | -- | -- | -- | -- | 30 | -- | -- | -- | -- | -- | -- | -- | 20 | 30 |
| 8-10-64 | 1740 | 78 | 12,000 | 7.78 | 120.7 | -- | -- | -- | -- | 50 | -- | -- | -- | -- | -- | -- | -- | 40 | 50 |
| 8-31-64 | 1355 | 69 | 11,280 | 7.55 | 149.3 | -- | -- | -- | 10 | 95 | -- | -- | 10 | -- | -- | -- | -- | 15 | 115 |
| 10-5-64 | 1550 | 74 | 22,800 | 7.85 | 127.8 | -- | 20 | -- | -- | 40 | -- | -- | -- | -- | -- | -- | -- | 125 | 60 |
| 10-19-64 | 1155 | 69 | 10,400 | 7.98 | 11.6 | -- | -- | -- | -- | 35 | -- | -- | -- | -- | -- | -- | -- | 100 | 35 |
| 11-2-64 | 1445 | -- | 10,950 | 8.07 | 5.0 | -- | -- | -- | -- | 35 | -- | -- | -- | -- | -- | -- | -- | 50 | 35 |
| 11-16-64 | 1505 | 63 | 10,650 | 7.09 | 2.9 | -- | -- | -- | -- | 25 | -- | -- | -- | -- | -- | -- | -- | 95 | 25 |
| 12-14-64 | 1050 | 52 | 11,100 | 7.98 | 1 | -- | -- | -- | -- | 30 | -- | -- | -- | T | -- | -- | -- | 50 | 30 |
| 5-17-65 | 1410 | 68 | 9,100 | 8.02 | 112.9 | -- | -- | -- | -- | 90 | -- | -- | 20 | 10 | -- | -- | -- | -- | 120 |
| 5-18-65 | 1405 | 68 | 6,500 | 8.21 | 126.8 | -- | -- | -- | -- | 60 | -- | -- | 10 | -- | -- | -- | -- | -- | 70 |
| 5-19-65 | 1330 | 68 | 7,500 | 8.01 | -- | -- | -- | -- | T 1/ | 80 | -- | -- | 10 | 10 | -- | -- | -- | -- | 100 |
| 5-21-65 | 1130 | 61 | 7,200 | 8.25 | 142.4 | -- | -- | -- | -- | 75 | -- | -- | T | T | -- | -- | -- | 10 | 75 |
| 5-25-65 | 1715 | 71 | 9,400 | 7.85 | 171.3 | -- | -- | -- | -- | 100 | -- | -- | -- | T | -- | -- | -- | 30 | 100 |
| 6-1-65 | 1615 | 66 | 9,100 | 8.02 | 183.5 | -- | -- | -- | -- | 380 | -- | -- | T | T | -- | -- | -- | -- | 380 |
| 6-7-65 | 1820 | 64 | 8,400 | 7.90 | 123.2 | -- | -- | -- | -- | 170 | -- | -- | -- | -- | -- | -- | -- | 25 | 170 |
| 6-14-65 | 1510 | 68 | 9,600 | 7.90 | 165.8 | -- | -- | -- | -- | 60 | -- | -- | -- | -- | -- | -- | -- | | 60 |
| 6-21-65 | 1610 | 76 | 8,700 | 7.94 | 174.9 | -- | -- | -- | -- | 50 | -- | -- | -- | T | -- | -- | -- | | 50 |
| 7-12-65 | 1505 | 75 | 8,200 | 7.88 | 136.6 | -- | -- | -- | -- | 75 | -- | -- | -- | -- | -- | -- | -- | 55 | 75 |
| 7-29-65 | 1455 | 78 | 10,000 | 8.28 | 182.6 | -- | -- | -- | 10 | 80 | 10 | -- | T | T | -- | -- | -- | 35 | 100 |
| 8-30-65 | 1810 | 74 | 9,000 | 7.78 | 35.6 | -- | -- | -- | -- | 15 | -- | -- | -- | -- | -- | -- | -- | 15 | 15 |
| 9-13-65 | 1600 | 72 | 8,200 | 7.93 | 208.8 | -- | -- | -- | 20 | 120 | -- | -- | 30 | 10 | -- | -- | -- | 25 | 180 |
| 9-20-65 | 1800 | 69 | 8,000 | 7.90 | 176.5 | -- | -- | -- | -- | 35 | -- | -- | T | T | -- | -- | -- | T | 35 |
| 9-27-65 | 1745 | 66 | 8,800 | 8.05 | 31.5 | -- | -- | -- | T | 90 | -- | -- | -- | -- | -- | -- | -- | T | 90 |
| 10-4-65 | 1825 | 67 | 8,200 | 7.91 | 15.1 | -- | -- | -- | 10 | 60 | -- | -- | 20 | 20 | -- | -- | -- | 20 | 110 |
| 10-11-65 | 1635 | 72 | 8,800 | 7.90 | 8.9 | -- | -- | -- | 15 | 110 | 35 | -- | 30 | 40 | -- | -- | -- | 25 | 230 |
| 10-18-65 | 1355 | 72 | 8,300 | 7.92 | 7.3 | -- | -- | -- | -- | 85 | -- | -- | -- | 10 | -- | -- | -- | 35 | 95 |
| 11-1-65 | 0945 | 65 | 8,800 | 8.18 | 2.6 | -- | -- | -- | -- | 65 | -- | -- | 20 | 45 | -- | -- | -- | 20 | 130 |

| Date | Computed Maximum Total |
|---|---|
| 9-23-63 | 300 |
| 10-14-63 | 240 |
| 10-24-63 | 200 |
| 10-28-63 | 200 |
| 11-11-63 | 20 |
| 12-2-63 | 40 |
| 12-30-63 | 75 |
| 1-27-64 | 75 |
| 2-10-64 | 50 |
| 3-2-64 | 45 |
| 3-30-64 | 270 |
| 5-4-64 | 320 |
| 6-1-64 | 150 |
| 6-22-64 | 120 |
| 7-30-64 | 110 |
| 8-3-64 | 65 |
| 8-10-64 | 100 |
| 8-31-64 | 130 |
| 10-5-64 | 180 |
| 10-19-64 | 150 |
| 11-2-64 | 85 |
| 11-16-64 | 125 |
| 12-14-64 | 85 |
| 5-17-65 | 270 |
| 5-18-65 | 100 |
| 5-19-65 | 160 |
| 5-21-65 | 190 |
| 5-25-65 | 180 |
| 6-1-65 | 360 |
| 6-7-65 | 180 |
| 6-14-65 | 90 |
| 6-21-65 | 85 |
| 7-12-65 | 420 |
| 7-29-65 | 540 |
| 8-30-65 | 230 |
| 9-13-65 | 460 |
| 9-20-65 | 200 |
| 9-27-65 | 250 |
| 10-4-65 | 480 |
| 10-11-65 | 1,200 |
| 10-18-65 | 520 |
| 11-1-65 | 560 |

1/ T = Trace

TABLE 14

BASIC DATA--CHLORINATED HYDROCARBON PESTICIDES IN BLOCK A SOIL

Bennett Plot, Fresno County

April 1963

| | Depth | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0-2" | 2"-12" | 1'-2' | 2'-3½' | 3½'-5' | 5'-7' | 7'-9½' | 9½'-12' |
| DDE | 44,600[1] | 14,000 | 11,100 | 12,200 | 18,800 | 10,800 | 6,000 | 9,900 |
| DDD and/or DDT | 56,000 | 38,500 | 21,800 | 38,000 | 40,500 | 23,900 | 12,600 | 26,700 |
| Heptachlor Epoxide | 28,900 | 10,700 | 12,800 | 18,000 | 19,400 | 15,400 | 9,500 | 13,100 |
| Lindane | 31,000 | 23,000 | 19,000 | 22,900 | 21,700 | 17,100 | 13,900 | 16,900 |
| Unknown | 10,600 | 4,000 | 17,200 | 7,500 | 7,600 | 8,200 | 7,500 | 5,300 |
| Sum of Identified | 160,500 | 86,200 | 64,700 | 91,100 | 100,400 | 67,200 | 42,000 | 66,600 |

April 1964

| | Depth | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0-2" | 2"-12" | 1'-2' | 2'-3½' | 3½'-5' | 5'-7' | 7'-9½' | 9½'-12' |
| DDE | 20,600 | 21,200 | 10,600 | 9,400 | 7,600 | 11,100 | 10,200 | 13,000 |
| DDD and/or DDT | 38,400 | 38,600 | 23,000 | 22,500 | 20,800 | 20,300 | 27,000 | 44,000 |
| Heptachlor Epoxide | 23,600 | 20,400 | 7,700 | 8,400 | 9,100 | 6,100 | 8,500 | 10,500 |
| Lindane | 26,200 | 21,800 | 12,300 | 7,100 | 7,400 | 13,600 | 16,100 | 21,000 |
| Unknown | 5,400 | 4,800 | 4,000 | 5,400 | 3,300 | 3,100 | 5,600 | 15,100 |
| Sum of Identified | 108,800 | 102,000 | 53,600 | 47,400 | 44,900 | 51,100 | 61,800 | 88,500 |

February 1965

| | Depth | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0-2" | 2"-12" | 1'-2' | 2'-3½' | 3½'-5' | 5'-7' | 7'-9½' | 9½'-12' |
| DDE | 17,800[1] | 16,500 | 8,200 | 6,900 | 7,800 | 5,400 | 4,200 | 3,100 |
| DDD and/or DDT | 31,500 | 32,700 | 10,900 | 18,500 | 11,000 | 14,600 | 10,800 | 7,200 |
| Heptachlor Epoxide | 15,100 | 16,700 | 9,500 | 14,000 | 8,800 | 8,500 | 6,800 | 6,000 |
| Lindane | 22,500 | 24,600 | 16,400 | 19,800 | 18,400 | 12,100 | 13,100 | 10,200 |
| Unknown | 7,300 | 6,500 | 3,000 | 6,000 | 6,900 | 4,000 | 2,900 | 3,300 |
| Sum of Identified | 86,900 | 90,500 | 45,000 | 59,200 | 46,000 | 40,600 | 34,900 | 26,500 |

February 1966

| | Depth | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0-2" | 2"-12" | 1'-2' | 2'-3½' | 3½'-5' | 5'-7' | 7'-9½' | 9½'-12' |
| DDE | 2,300 | 900 | 600 | 600 | 600 | 400 | 300 | 100 |
| DDD and/or DDT | 2,700 | 3,000 | 1,700 | 2,500 | 3,700 | 1,500 | 1,700 | 1,200 |
| Heptachlor Epoxide | 800 | 400 | 500 | 600 | 400 | 200 | 200 | 100 |
| Lindane | 400 | 1,600 | 400 | 100[3] | 100[3] | 700 | 300 | 800 |
| Other Pesticides | 8,000[2] 900[3] | — | — | 700[3] | 400[3] | — | — | — |
| Unknown | — | — | — | 400 | — | — | — | — |
| Sum of Identified | 15,100 | 5,900 | 3,200 | 4,500 | 5,200 | 2,800 | 2,500 | 2,200 |

1/ Pesticide concentrations in parts per trillion
2/ Dieldrin
3/ Heptachlor

TABLE 15

BASIC DATA-CHLORINATED HYDROCARBON PESTICIDES
IN BLOCK B SOIL

Bennett Plot, Fresno County

April 1963

| | Depth | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0-1' | 1'-2' | 2'-3½' | 3½'-5' | 5'-7' | 7'-9½' | 9½'-12' |
| DDE | — | 5,000[1] | 18,000 | 10,000 | 12,000 | 11,000 | — |
| DDD and/or DDT | — | 46,000 | 19,000 | 12,000 | 15,000 | 12,000 | — |
| Heptachlor Epoxide | — | 52,000 | 15,000 | 30,000 | 13,000 | 15,000 | — |
| Lindane | — | — | 12,000 | 9,500 | 11,000 | 10,000 | 67,000 |
| Unknown | 230,000 | 300 | 16,000 | 5,000 | 12,900 | 10,000 | 27,000 |
| Sum of Identified | 0 | 103,000 | 64,000 | 61,500 | 51,000 | 48,000 | 67,000 |

April 1964

| | Depth | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0-1' | 1'-2' | 2'-3½' | 3½'-5' | 5'-7' | 7'-9½' | 9½'-12' |
| DDE | 50,000 | 15,000 | 7,000 | 7,000 | 6,000 | 8,000 | 4,000 |
| DDD and/or DDT | 370,000 | 20,000 | 13,000 | 11,000 | 12,000 | 15,000 | 10,000 |
| Heptachlor Epoxide | — | 17,000 | 4,000 | 10,000 | 13,000 | 8,000 | 9,000 |
| Lindane | — | 22,000 | 6,000 | 8,000 | 13,000 | 8,000 | — |
| Unknown | — | 9,300 | — | — | 7,000 | — | — |
| Sum of Identified | 420,000 | 74,000 | 30,000 | 36,000 | 44,000 | 39,000 | 23,000 |

February 1965

| | Depth | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0-2" | 2"-12" | 1'-2' | 2'-3½' | 3½'-5' | 5'-7' | 7'-9½' | 9½'-12' |
| DDE | 180,000[1] | 28,000 | 16,000 | 10,000 | 13,000 | 4,000 | 5,000 | 5,000 |
| DDD and/or DDT | 2,740,000 | 230,000 | 170,000 | 79,000 | 74,000 | 40,000 | 15,000 | 15,000 |
| Unknown | — | — | — | — | — | — | 5,000 | — |
| Sum of Identified | 2,920,000 | 258,000 | 186,000 | 89,000 | 87,000 | 44,000 | 20,000 | 20,000 |

February 1966

| | Depth | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0-2" | 2"-12" | 1'-2' | 2'-3½' | 3½'-5' | 5'-7' | 7'-9½' | 9½'-12' |
| DDE | 64,200 | 30,500 | 4,000 | 1,000 | 2,000 | — | — | — |
| DDD and/or DDT | 235,000 | 263,000 | 32,000 | 17,000 | 34,000 | 3,000 | 6,000 | 2,000 |
| Heptachlor | — | — | — | — | — | — | — | 1,000 |
| Heptachlor Epoxide | 13,300 | 14,000 | 1,000 | 800 | 1,600 | — | 300 | 100 |
| Lindane | 33,400 | 6,000 | 2,000 | 2,000 | 2,500 | 1,000 | — | 700 |
| Sum of Identified | 345,900 | 313,500 | 39,000 | 20,800 | 40,100 | 4,000 | 6,300 | 3,800 |

1/ Pesticide concentrations in parts per trillion

TABLE 16

BASIC DATA-CHLORINATED HYDROCARBON PESTICIDES
IN BLOCK C SOIL

Bennett Plot, Fresno County

April 1963

Depth

| | 0-2" | 2"-12" | 1'-2' | 2'-3½' | 3½'-5' | 5'-7' | 7'-9½' | 9½'-12' |
|---|---|---|---|---|---|---|---|---|
| DDE | 28,000[1/] | 14,600 | 9,900 | 15,600 | 12,200 | 15,800 | 12,900 | 8,700 |
| DDD and/or DDT | 52,500 | 28,100 | 23,200 | 25,500 | 35,200 | 32,900 | 33,700 | 16,300 |
| Heptachlor Epoxide | 27,200 | 15,100 | 16,500 | 18,500 | 18,300 | 21,500 | 17,000 | 9,500 |
| Lindane | 39,500 | 21,500 | 25,500 | 36,400 | 29,300 | 36,400 | 24,400 | 14,600 |
| Unknown | 15,000 | 10,100 | 5,800 | 19,400 | 15,200 | 19,300 | 14,500 | 5,400 |
| Sum of Identified | 147,200 | 79,300 | 75,200 | 96,000 | 95,000 | 106,600 | 88,000 | 49,000 |

April 1964

Depth

| | 0-2" | 2"-12" | 1'-2' | 2'-3½' | 3½'-5' | 5'-7' | 7'-9½' | 9½'-12' |
|---|---|---|---|---|---|---|---|---|
| DDE | 21,200 | 6,400 | 11,600 | 14,000 | 6,500 | 7,400 | 4,000 | 5,200 |
| DDD and/or DDT | 33,000 | 17,100 | 24,800 | 18,700 | 21,600 | 25,700 | 17,600 | 23,000 |
| Heptachlor Epoxide | 14,100 | 9,200 | 18,400 | 17,500 | 11,300 | 11,600 | 12,800 | 7,900 |
| Lindane | 30,200 | 23,000 | 45,500 | 30,400 | 24,600 | 21,600 | 19,500 | 17,900 |
| Unknown | 5,900 | 14,800 | — | 7,000 | 4,100 | 4,100 | 4,600 | 5,200 |
| Sum of Identified | 98,500 | 55,700 | 100,300 | 80,600 | 64,000 | 66,300 | 53,900 | 33,300 |

February 1965

Depth

| | 0-2" | 2"-12" | 1'-2' | 2'-3½' | 3½'-5' | 5'-7' | 7'-9½' | 9½'-12' |
|---|---|---|---|---|---|---|---|---|
| DDE | 8,000[1/] | 4,600 | 4,100 | 4,300 | 3,400 | 3,700 | 3,100 | 1,300 |
| DDD and/or DDT | 18,800 | 12,600 | 6,200 | 10,400 | 7,000 | 7,100 | 6,600 | 5,300 |
| Heptachlor Epoxide | 8,900 | 4,500 | 4,000 | 5,300 | 5,000 | 6,200 | 4,300 | 3,900 |
| Lindane | 20,600 | 16,100 | 12,800 | 10,300 | 12,900 | 20,000 | 8,600 | 8,800 |
| Unknown | 4,500 | 4,000 | 3,100 | 3,200 | 4,800 | 6,600 | 2,100 | 3,100 |
| Sum of Identified | 56,300 | 35,800 | 27,100 | 30,300 | 23,800 | 37,000 | 22,600 | 19,800 |

February 1966

Depth

| | 0-2" | 2"-12" | 1'-2' | 2'-3½' | 3½'-5' | 5'-7' | 7'-9½' | 9½'-12' |
|---|---|---|---|---|---|---|---|---|
| DDE | 4,000 | 1,000 | 3,000 | — | 4,600 | 1,000 | — | — |
| DDD and/or DDT | 8,000 | 4,000 | 4,000 | 4,000 | 3,000 | 3,000 | 4,000 | 3,000 |
| Heptachlor | — | — | — | — | 400 | — | — | 500 |
| Heptachlor Epoxide | 1,000 | — | — | — | — | — | — | — |
| Lindane | 4,000 | 12,000 | 1,000 | 500 | 300 | 500 | 300 | 400 |
| Sum of Identified | 17,000 | 18,000 | 8,000 | 4,000 | 8,300 | 4,500 | 4,300 | 3,900 |

1/ Pesticide concentrations in parts per trillion