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Pesticide Registration

Medical Toxicology

Worker Health and Safety

Environmental Monitoring and Pest Management

Pesticide Enforcement

Information Systems

Audits

Resources Management

January 24, 1997

TO: Interested Parties

SUBJECT: 1996 REPORT ON THE RICE PESTICIDE PROGRAM

Enclosed is the information regarding rice pesticides submitted by the Department of Pesticide Regulation (DPR) to the California Regional Water Quality Control Board Central Valley Region at the close of 1996, with appendices. This report includes a summary of the 1996 programmatic results including monitoring for rice pesticides in the agricultural drains and Sacramento River.

DPR and the Regional Board agreed to operate under a triennial calendar for future review of the rice pesticide program. The next formal review of the rice pesticide program will be conducted by the Regional Board for the 1998 season. In the interim, modifications could be made to the program, as needed to respond to issues of concern.

Thank you for your interest in this program.

Please contact Dr. Nan Gorder at (916) 324-4265, or Mr. Marshall Lee at (916) 324-4269, both of my staff, with any questions you may have.

Sincerely,

John S. Sanders

John S. Sanders, Ph.D., Chief
Environmental Monitoring and
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(916) 324-4100

Enclosure

cc: Dr. Nan Gorder (w/o enclosure), Mr. Marshall Lee (w/o enclosure)

State of California

Memorandum

To: James R. Bennett
Interim Executive Director
California Regional Water Quality
Control Board
Central Valley Region
3443 Routier Road
Sacramento, California 95827-3098

Date : December 31, 1996

From: **Department of Pesticide Regulation** - 1020 N Street, Room 100
Sacramento, California 95814-5624

Subject: RICE PESTICIDE PROGRAM UPDATE

Pursuant to our agreement of how the Rice Pesticide Program would be conducted under a triennial review process, my staff prepared the attached review of the 1996 rice season.

The goal of the program was to meet performance goals for the rice pesticides established by the Board's Basin Plan to protect water quality and prevent toxicity. The five pesticides were the herbicides molinate and thiobencarb, and the insecticides carbofuran, methyl parathion, and malathion. The most significant points of this review are:

- Rice acreage increased from 1995 by about eleven percent; the use of the herbicides, molinate and thiobencarb increased, the use of the insecticides, carbofuran and methyl parathion, decreased.

- Concentrations of molinate, thiobencarb, and carbofuran exceeded performance goals in both the Sacramento Valley agricultural drains monitored during 1996. Concentrations of malathion exceeded the performance goal at the Colusa Basin Drain monitoring site. Molinate was the only rice pesticide detected in the Sacramento River, but concentrations kept below one part per billion.

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- An assessment of water quality monitoring and pesticide use data indicates that the most significant sources of rice pesticides in surface water appear to be aerial drift, seepage beyond field perimeters, and emergency releases.

- Water holding requirements used to facilitate dissipation of rice pesticides on the site of application appear to be adequate for meeting performance goals.

- Compliance with management practices for minimizing spillage of rice pesticides into surface water was excellent.

- Largely in response to unusual mid-May rains and strong winds, 89 variances on water holding requirements (emergency releases) were approved in addition to a release from Recirculation District 1001. These releases could have contributed to the pesticide concentrations at monitoring sites.

- Water samples were periodically collected from the Colusa Basin Drain in May and June and used in toxicity tests and one sample was toxic to invertebrate test organisms. Malathion concentrations were high enough in that sample to help explain the toxicity. Evidence suggests that off-site deposition and water released from a malathion-treated field shortly after application probably contributed significantly to the malathion found in that sample.

The Department of Pesticide Regulation (DPR) will execute the 1997 rice pesticide program following the same basic framework as the 1996 program with the following emphases:

- Management practices for containing seepage, and the pesticides it may carry, will be addressed through education and implemented through voluntary efforts. DPR will continue to work with other agencies to better educate growers on the seepage problem and to better quantify effects of seepage on water quality.

- Drift control measures will focus on educating the rice-growing community about the potential problems associated with aerial applications to properties near agricultural drainage canals and deposition to sweat ditches (small drainage ditches used to channel seepage water away from a field's perimeter).

- DPR continues to work towards finding solutions to aerial drift problems, so that these solutions can be applied to the Rice Pesticides Program.

A study on toxicity monitoring in recirculating systems conducted by DPR in 1995 was described in the 1995 Report on the Rice Pesticide Program. Our final interpretation of the data from this study is that the potentially toxic discharges of field water into a multigrower water management system were immediately rendered nontoxic upon joining other waters of the closed system. There is no evidence to suggest that the current holding times for growers discharging into a closed system result in toxicity within the closed system. Thus, the holding times required within closed systems will remain unchanged.

Please contact me, or have your staff contact Nan Gorder, at (916) 324-4265, or Marshall Lee, at (916) 324-4269, both of my staff, if you have any questions.

James W. Wells
Director
(916) 445-4000

Attachment

cc: Paul H. Gosselin
Jean-Mari Peltier
Nan Gorder
Marshall Lee

Information on Rice Pesticides Submitted to the California Regional Water Quality Control Board Central Valley Region

December 31, 1996

by

Nancy K. N. Gorder, J. Marshall Lee, and KayLynn Newhart

California Environmental Protection Agency
Department of Pesticide Regulation
Environmental Monitoring and Pest Management Branch
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1020 N Street, Sacramento, California 95814-5624

Department of Pesticide Regulation
Information on Rice Pesticides
Submitted to the Central Valley Regional Water Quality Control Board
December 31, 1996

Programs have been implemented by the Department of Pesticide Regulation (DPR) since 1983 to reduce discharges of the rice herbicides molinate (Ordram®) and thiobencarb (Bolero®and Abolish®) into surface waterways. In 1990, the objectives of these control efforts were clarified and expanded, following the adoption of amendments to the Central Valley Regional Water Quality Control Board's (Regional Board) Water Quality Control Plan (Basin Plan). This plan established performance goals for molinate and thiobencarb beginning in 1990, and for the insecticides carbofuran (Furadan®), methyl parathion, and malathion beginning in 1991. Regional Board staff are currently in the process of amending the pesticide section of the Basin Plan. This Basin Plan amendment will include defining numeric water quality objectives for the rice pesticides addressed in this program.

The following review describes the factors affecting quantities of molinate, thiobencarb, carbofuran, methyl parathion, and malathion discharged to agricultural drains and the Sacramento River and efforts to meet the performance goals in 1996. A summary of pertinent water quality monitoring efforts is provided. Programs implemented in 1996 helped control discharges of molinate, thiobencarb, carbofuran, methyl parathion, and malathion from rice fields to comply with the performance goals and the water quality objective for toxicity in the Basin Plan.

REVIEW OF 1996 PROGRAM

Discussion

A summary of the 1996 rice pesticide program can be found in the following sections. Program requirements were implemented by county agricultural commissioners using restricted material permits. A description of the 1996 rice pesticide program requirements can be found in the guidelines provided to the county agricultural commissioners by the Director of DPR in a memorandum dated March 8, 1995 (see Appendix A). The 1995 permit conditions were determined appropriate for use in 1996. The commissioners also provided information to growers on the voluntary malathion program. Additional efforts were taken by DPR staff to continue improved communication about the seepage and drift problems to the rice industry. Aspects of the 1996 program that were different from the 1994 program are summarized in Appendix B.

Molinate

The standard molinate holding period remained 28 days in the Sacramento Valley. Shorter holding periods were available for molinate users in specific areas (closed water

management systems, water-short areas, in hydrologically isolated fields throughout the rice-growing region, and in the San Joaquin Valley).

Thiobencarb

The standard Bolero holding period remained 30 days in the Sacramento Valley, while the standard Abolish hold was 19 days. Shorter holding periods were available for thiobencarb users in specific areas (closed water management systems, water-short areas, in hydrologically isolated fields throughout the rice-growing region, and in the San Joaquin Valley).

Carbofuran, Methyl parathion, and Malathion

The programs for the insecticides retained the basic strategies of the programs used in 1995, with standard required holds of 28 days for carbofuran-treated fields and 24-day holds for methyl parathion-treated fields. Shorter holding periods were available for carbofuran users within closed water management systems. Malathion is not a restricted material; there are no requirements that treated field water be held on site. Malathion users are encouraged to voluntarily hold malathion-treated water for 4 days.

Seepage Control

Users of rice pesticides were required to prevent seepage of field water through the field's weir box, generally by securing the box with plastic and with soil to a depth higher than the water level.

Additionally in 1996 as in 1995, the county agricultural commissioners' offices were supplied with several handouts providing guidance to growers on voluntary seepage prevention measures (see Appendix C). The single page handout was prepared by DPR and numerous interested parties representing the industry, the University of California, the agricultural commissioners, and the United States Department of Agriculture. The handout entitled: *Closed Rice Water Management Systems* was prepared by the United States Department of Agriculture with the University of California Cooperative Extension. This information was distributed to growers at the time of permit issuance.

Use of Selected Pesticides in 1996

In rice-growing counties of the Sacramento Valley, county agricultural commissioners record the acreage treated with molinate, thiobencarb, carbofuran, and methyl parathion when Notices-of-Application are submitted by the grower to each county office. Based on these records, and on pesticide use reports where available, it was estimated that 356,225 acres were treated with molinate, 137,476 with thiobencarb, 154,433 with carbofuran, and 20,494 with methyl parathion (Table 1). These estimates indicate that molinate use increased approximately 7.2 percent over use in 1995; thiobencarb use

increased 28.8 percent; carbofuran use increased 5.6 percent; and methyl parathion use decreased 27.1 percent. Pesticide use report data for other important rice pesticides, malathion and bensulfuron methyl (Londax®), are not available yet. About 517,000 acres of rice were harvested in California in 1996, an increase of about 11.2 percent from the 1995 crop.

Enforcement Activities

The county agricultural commissioners are responsible for enforcement of the rice pesticide programs. The role of the commissioners and their staffs includes explaining the program to growers, pest control advisers and operators; issuing restricted material permits; inspecting fields for compliance; evaluating emergency release variances; and providing DPR with information on the use of pesticides.

Before any material on the list of California restricted materials may be applied, growers must obtain a permit from their county agricultural commissioner. The permits may specify conditions for use of the material, including post-application water-holding requirements. A Notice-of-Intent must be filed with the county agricultural commissioner 24 hours prior to the application, providing the commissioners with the option to observe the mixing, loading, and application of the material, thus enforcing regulations that pertain to pest control operations. Molinate, thiobencarb, carbofuran, and methyl parathion are currently California restricted materials; malathion is not. Permits which specify post-application water-holding requirements, like those for the use of molinate, thiobencarb, carbofuran, and methyl parathion, also require that the Notice-Of-Application (NOA) be filed with the county agricultural commissioners within 24 hours after the application. NOAs are used to determine when holding periods begin.

In 1996 DPR and the county agricultural commissioners implemented a Prioritization Plan and a Negotiated Workplan. Part of this plan was a negotiated number of waterhold inspections. These plans allow the counties to set priorities within standard guidelines. Rice pesticide applications and water-hold inspections are ranked as "High Priority" inspections as the rice pesticides are restricted materials, and several rice pesticides are under special study by DPR. The county offices then receive partial reimbursement from DPR based on numbers of inspections completed.

Staff of county agricultural commissioners' offices and DPR's Pesticide Enforcement Branch inspected 2,886 rice fields for compliance with water-holding requirements. Twenty-one growers were cited for holding violations. None of the twenty-one violations were a result of intentional release of water. Additionally there were 216 inspections of the pesticide mixing and loading process with two in non-compliance and 317 inspections of pesticide applications with 23 in non-compliance. Only ten of the total violations were serious enough to warrant agricultural civil penalty actions. None of the violators were cited in previous years.

The county agricultural commissioners no longer grant variances on the holding requirements for fields treated with molinate if the length of the holding time is adversely affecting the rice plants. In 1996, emergency releases were limited to fields where an 11-day molinate hold had elapsed and circumstances beyond a conscientious grower's control led to the need to release water. Growers granted such variances were instructed to drain water only to the extent necessary to restore a healthy growing environment for the rice seedlings. Mid-May rains followed by over one week of strong winds in 1996 overwhelmed some growers, resulting in early releases, in addition to the limited emergency releases. Commissioners were instructed by DPR to allow early releases only if water holding structures were at risk of giving way (more discussion later in report). In 1996, eighty-nine early and emergency releases were granted (affecting 5,193 molinate-treated acres; Appendix G) and forty-two were denied by commissioners' office staff. Table 2 presents information on emergency releases from molinate-treated fields from 1987 through 1996. Clearly, the more restrictive requirements for emergency releases reduced the number of growers qualifying for holding-time variances. Weather conditions can occasionally overwhelm even the best of closed systems.

Beginning in 1994, repeat and multiple violators were required, as part of special permit conditions, to make improvements in their water management capabilities. Such improvements may include installation of pumps for tailwater recirculation or leaving land fallow to contain spillage. Growers who violate water holding requirements are subject to maximum penalties within DPR's Enforcement Guidelines. However, conditions preceding violations (e.g., unfavorable field conditions that could not be moderated by the growers' best efforts) may be considered when assessing penalties.

COOPERATIVE WATER QUALITY MONITORING PROGRAM

The California Rice Industry Association retained the consulting firm Kleinfelder, Inc., to collect water monitoring samples from the Colusa Basin Drain at Highway 20 (CBD5) in Colusa County, Butte Slough at Lower Pass Road in Sutter County, and from a site on the Sacramento River at the Village Marina (see Figure 1). The sampling methods and chemical analyses of the water samples from all three sites were conducted in the same manner. The monitoring protocol is in Appendix D.

Summaries of the monitoring activities addressing molinate, thiobencarb, carbofuran, methyl parathion, and malathion in Sacramento Valley waterways in 1996 are presented below.

Sampling and Analytical Regimen

Samples were collected from all three sample sites from mid-April through late June. Samples were collected from CBD5 twice weekly. Samples were collected from Butte Slough and the Sacramento River near the Village Marina weekly during the first and last two weeks of this period, and twice weekly during the middle six weeks. Additionally, in

response to a period of bad weather, samples were collected at CBD5 and Butte Slough on May 18 and 26.

Samples were delivered to Zeneca Ag Products, manufacturer of Ordram, for molinate analyses. Samples were delivered to Valent, the primary distributor of products containing thiobencarb, for analyses . Samples were delivered to FMC Corporation, manufacturer of Furadan, for carbofuran analyses and to the California Department of Food and Agriculture (CDFA) laboratory for methyl parathion and malathion analyses. Additional samples representing over half of the total samples collected at CBD5 and analyzed by the primary laboratories were analyzed as quality control samples. Molinate, thiobencarb, and carbofuran concentrations in the quality control samples were determined by the CDFA laboratory, and methyl parathion and malathion by Alta Laboratories. Additional samples were collected, stored and analyzed when confirmations of analytical results were required. Blind spikes were periodically submitted for analyses with field samples.

The City of Sacramento analyzed water samples collected from the Sacramento River at the intake to its water treatment plant. Samples were collected on May 16 and 23 and twice weekly from May 27 through June 20.

Toxicity Testing

Water samples were collected from the Colusa Basin Drain at CBD5 weekly from April 23 through June 4. Department of Fish and Game staff exposed neonate (<24 hours old) cladocerans (*Ceriodaphnia dubia*) to sample water for 96 hours, as well as to control and blind spiked water samples. Percent survival was recorded.

Results of the 1996 Monitoring Program

Results of the monitoring program are found by monitoring site in Tables 3, 4, and 5.

Molinate

The highest concentration of molinate detected in these waterways in 1996 was 43.68 parts per billion (ppb) at CBD5 on May 23, as reported by Zeneca. These data indicate the performance goal for molinate (10 ppb) was exceeded in the Colusa Basin Drain for a five week period and in the Butte Slough for three weeks, but not in the Sacramento River. Table 7 presents the peak concentrations of molinate in the Sacramento Valley waterways in each year since 1980.

Molinate was detected in the Sacramento River at the Village Marina in Sacramento County on May 28 and 30, at less than 1 ppb. The City of Sacramento detected concentrations of molinate in the Sacramento River at the intake to its water treatment

facility on one day in May and three days during a week in mid-June with a peak concentration of 0.14 ppb (Table 6). A peak of 1.7 ppb was found there in 1993. The maximum contaminant level for molinate, established to protect public health, is 20 ppb.

Thiobencarb

Analytical results reported by Valent indicated thiobencarb concentrations in the agricultural drains were highest in CBD5, where they peaked at 16.2 ppb on June 11 (Table 3). Based on these results, the thiobencarb performance goal (1.5 ppb) was exceeded on sampling dates from May 16 through June 20 in the Colusa Basin Drain (with one exception), and on one sampling date (May 18) in Butte Slough (Table 4). Thiobencarb was not detected in the Sacramento River or at the City of Sacramento drinking water intake (Tables 5 and 6, respectively). Table 8 presents the peak concentrations of thiobencarb in Sacramento Valley waterways in each year since 1980.

Carbofuran

Results of carbofuran analyses performed by FMC are presented in Tables 3, 4, and 5. The performance goal for carbofuran (0.4 ppb) was exceeded in the Colusa Basin Drain at CBD5 on May 2, sampling dates between May 14 and May 30, and again on June 27, with a peak concentration of 2.97 ppb. The performance goal was also exceeded in Butte Slough from May 16 through May 30, with a peak concentration of 1.04 ppb. No carbofuran was detected in the Sacramento River. Note that the preseason detections of carbofuran (April 1 at CBD5) were not associated with the use of this chemical on rice.

Methyl parathion

Results of methyl parathion analyses performed by CDFA indicated that methyl parathion was detected only at the CBD5 site, with a peak concentration of 0.122 ppb on May 14. The methyl parathion performance goal (0.13 ppb) was not exceeded in 1996 (Tables 3, 4, and 5).

Malathion

Analytical results performed by CDFA indicated that malathion was detected only at the CBD5 site, and the malathion performance goal (0.1 ppb) was exceeded at CBD5 sporadically throughout the monitoring season. The peak concentration was 6.00 ppb on May 28 (Table 3). According to the local agricultural commissioners office, there were some irregularities noted in association with a malathion application in the drainage basin. There was evidence of malathion drift associated with an application to a rice field. Water was discharged from this field the day following application; apparently a good faith effort was not being made to voluntarily hold malathion-treated water for at least four days. These events occurred just prior to the high concentration of malathion

occurring at the monitoring site. Note that the preseason detections of malathion (April 23 and 25 at CBD5) were not associated with the use of this chemical on rice.

Toxicity Testing

DFG staff observed significant toxicity only on May 28 (see Appendix E), and it was probably attributable to malathion (present in the split sample at 6.00 ppb). The other pesticide concentrations in the split sample were not high enough to explain the toxicity (Huang 1996).

On two dates (May 16 and 30) carbofuran concentrations exceeded the *Ceriodaphnia dubia* LC_{50} value of 2.6 ppb. Toxicity tests were not conducted on these samples.

Quality Assurance Program

Based on the methods used, all laboratories performed well on internal quality assurance and when provided with blind-spike samples. When primary laboratories found unusually high concentrations or the initial samples collected were lost, backup samples were analyzed. The detailed Quality Assurance Program is in Appendix F.

Discussion of Monitoring Results

Mass Transport of Pesticides in Agricultural Drains and the Sacramento River

Estimates of the total mass of pesticides transported in agricultural drains and the Sacramento River may be used to compare pesticide loading in different years. However, mass transport cannot be used to determine compliance with performance goals. The flow data only recently became available, thus mass transport has yet to be calculated.

Weather and Its Influence on Water Quality

Weather conditions, especially those during and after applications of rice pesticides, influence the performance of water quality control programs. Dissipation rates of many pesticides, e.g., molinate, increase with increasing temperature, so warm weather during water holding periods helps reduce concentrations. Warm weather in May of 1987 and 1992 helped explain why concentrations in waterways and mass transport in the Sacramento River were relatively low in those years. Conversely, in May 1990 and in late May and early June 1993, cool and rainy conditions prevailed, and the results of the molinate program were not as successful. Thus, it is important to be aware of weather patterns when reviewing monitoring data.

The 1993 weather pattern was not conducive to pesticide dissipation and the large number of emergency variances on water management requirements resulted in unusually high pesticide loading in the agricultural drains and the Sacramento River. Likewise, the

1995 season was unusually cool and wet, and not conducive to pesticide dissipation. The 1996 season was notably wet, aggravating the massive weed problems. Late rains in mid-May in 1996, followed by over a week of strong winds, resulted in difficulties in holding water for many growers. Cool temperatures associated with this inclement weather generally slows dissipation of rice pesticides.

Flows in Agricultural Drainage Canals and the Sacramento River

Freshwater flows dilute pesticide-laden water that may enter surface waterways. With the mid-May rains, flows in the Colusa Basin Drain increased over the typical low flows maintained through water conservation efforts within the watershed of the Drain. Yet, the control gates were closed at Knight's Landing from May 18 through 31, eliminating flows from the Colusa Basin Drain to the Sacramento River during that time.

Sources of Pesticides in 1996

Pesticides used in rice culture may enter surface water from five sources under normal conditions. Drift during aerial applications and transport through levees with seepage water can be expected to contribute to loading during and shortly after the application period. Discharges from fields prior to the end of the legal holding times (i.e., illegal releases and emergency releases) are most prevalent two to four weeks following application. Legal releases are the predominant source of loading after the water holding requirements lapse. By examining the occurrence of rice pesticides in surface water in relation to their application schedules (Figures 2-6), presumptions can be made regarding the effects of each potential source.

Aerial Drift

The 1996 rice pesticide program had specific provisions for reducing the effects of aerial drift on water quality, described above. Evidence suggests that aerial drift may continue to account, in part, for peak concentrations of all the rice chemicals in the Colusa Basin Drain. When peak concentrations occur early in the season, and at irregular intervals, the source is likely drift at the time of application. It is significant to note that flows in the Colusa Basin Drain during the period of peak concentrations reflected the additional water from the mid-May rains. The dilution effect for drift may have been attenuated by the early releases.

Drift cannot be addressed with management practices that help control discharges. Spray drift is an on-going issue for DPR. The Environmental Monitoring and Pest Management Branch continues to work with the Enforcement Branch and county agricultural commissioners to educate the rice industry and seek solutions to this problem. Pesticide registrants formed a Spray Drift Task Force to help find solutions to pesticide drift during application. The Spray Drift Task Force has conducted numerous studies and has

provided that data to theUnited States Environmental Protection Agency. Solutions to the aerial drift problem are being sought that, although generic in nature, will be applied to the Rice Pesticides Program in the future.

Seepage

In some rice fields, field water can move laterally through levees and beyond the perimeter of the field. Often levee borrow pits are used as a conveyance for this water (in this case known as "sweat ditches") and, when seepage flows are high enough, discharge the water into local drainage canals. Molinate, apparently transported with this seepage, has been detected in water in sweat ditches at concentrations as high as 840 ppb, even after the ditches were tarped to eliminate influences of aerial drift (Pino 1992). Staff of the Regional Board sampled four sweat ditches in 1994, although in this survey the ditches were not tarped. Molinate was detected in each ditch at concentrations ranging from 44 to 1300 ppb; carbofuran, from 0.4 to 11 ppb. At one of the sites, molinate granules were visible on both sides of the sweat ditch, apparently the result of an inaccurate aerial application. Such aerial deposition of pesticides to sweat ditches is another means of transporting pesticides offsite into surface waterways.

The seasonal changes in molinate concentrations at CBD5 are more characteristic of sustained inputs like seepage than of the effects of incidental aerial drift, as was seen with methyl parathion and thiobencarb. Concentrations rose shortly after the application season began; this was well before sustained post-application drainage from rice fields could occur.

We will continue in our efforts working with the United States Department of Agriculture Natural Resources Conservation Service to quantify grower efforts to contain seepage through a survey. Additionally, DPR is working with the University of California Cooperative Extension Service to prepare an informational brochure providing the basis for the concern about seepage, and efforts that might help to contain seepage water.

Emergency and Early Releases

Eighty-nine early releases were granted in 1996 suggesting growers planned carefully for unusual weather patterns. The total area affected was 7,197 acres. Additionally, 540 acre feet of water were released from Reclamation District 1001 in Sutter County. Approximately eighty of the total early releases and the release from the Reclamation District were a direct result of the mid-May rains and winds. This weather situation resulted in many fields filling with water to the point that levee integrity was at risk. County agricultural commissioners were instructed by DPR to grant early releases only if levee or road integrity was threatened. The standard requirement for emergency releases, of having the only active hold be for molinate (twelve days into the holding period), was waived for this urgent weather situation. It was preferable to allow spillage of treated field water through controlled releases rather than risk extensive contamination of surface

water that would surely follow failed levees. Summaries of the emergency and early releases can be found in Appendix G.

Illegal Releases

Anecdotal reports during the mid-May rains and subsequent windy period suggested some uncontrolled spillage was occurring in areas inaccessible due to flooding. These unquantified spills may have contributed to the pesticide levels detected at the monitoring sites.

Legal Releases

Evidence suggests that the length of the holding times in the Sacramento Valley is adequate to meet performance goals. After June 13, the approximate date on which the early post-application discharges may resume from treated fields, the presence of pesticides in regional waterways appears to be incidental and not characteristic of the sustained contamination expected from inadequate holding requirements. In most cases, performance goals during this period were not exceeded on two consecutive sampling dates, indicative of sources of contamination that are transitory, such as aerial drift from late season applications or emergency and illegal releases.

Additional Information on Thiobencarb

In 1994, the limitations on the sales of thiobencarb products were removed. Programmatic changes such as berming drainage structures and shorter required holding periods for fields treated with Abolish were thought to be helpful in improving water quality overall and precluded the need for a sales limitation. (Abolish, the liquid formulation of thiobencarb is shown to have a lower potential for off-site movement than Bolero, the granular formulation.)

United Agricultural Products (UAP), distributors of Abolish, submitted data regarding the use of Abolish on fields utilizing the "pin-point flood" method of water management. Such fields are flooded, then drained or allowed to dry soon after seeding to help promote root growth in the seedling. Abolish is then aerially applied and the field is reflooded. UAP's data show that thiobencarb concentrations are initially higher in field water treated in this manner, compared to fields treated with the "preflood surface" method (Heier and Sakamoto 1994). However, field concentrations appear to decline quickly so that by nineteen days, the last day of the Abolish holding time in most situations, concentrations are about the same as those in fields treated using the "preflood surface" method. It was demonstrated earlier (Valent 1993) that the potential for thiobencarb to be discharged from a field treated with Abolish using the preflood surface method was much lower than from a field treated with Bolero.

Preliminary use data indicate thiobencarb use increased dramatically in 1995 (up 47 percent over 1994), and again in 1996 (up 29 percent over 1995). This increase can be partially attributed to the usefulness of thiobencarb as a resistance management tool for weed resistance against Londax. The very long water holding periods coupled with grower concerns over the stringent emergency release provisions have resulted in growers turning to alternative production practices, such as the pin-point flood method that provides more flexibility during water holds early in the season. Aerial applications of Abolish lend themselves to use during the practice of the pin-point flood method.

Thiobencarb concentrations in the agricultural drains in 1996 were higher for longer periods than in recent years, yet the water quality objective for toxicity and the additive toxicity levels were fully protected. Although thiobencarb use could rise further, holding periods, if they are properly implemented, will likely remain adequate for meeting the performance goals. The potential concentrations due to drift are not likely to be in excess of the toxicity objectives. Once the final pesticide use report data are available, further analyses will be used to evaluate trends in Abolish versus Bolero use.

1997 PROGRAM

Program Descriptions

The program description for the 1997 season will not differ from that described in the memorandum to the agricultural commissioners in Appendix A. In 1997, the rice pesticide program will continue to use restricted material permits and associated conditions to implement water management practices that reduce pesticide discharges into surface waters. In addition, management of other important sources of contamination will continue to be addressed. These practices, when fully implemented, are expected to result in attainment of water quality objectives and protect performance goals.

Discussion

Water Holding Requirements

The water holding requirements in the Sacramento Valley in 1996 were adequate to meet performance goals and will not be adjusted in 1997. These holding requirements will continue to prevent acutely toxic discharges as well. To prevent acutely toxic discharges of pesticides in the southern Sacramento and San Joaquin Valleys, water holding requirements for most users of molinate and thiobencarb were increased in 1995 and will not change in 1997. In addition, water holding times will not be increased in multi-grower closed systems. Rice growers in one of the several hydrologically-isolated areas may request the county agricultural commissioner to evaluate, on a case-by-case basis, the

characteristics of the local drainage system to determine whether discharged water has hydrologic continuity with perennial streams.

Drift Control

Drift control provisions will be as they were in 1995, and special attention will be given to prevent aerial deposition to sweat ditches during application.

Seepage

Seepage appears to make significant contributions to the pesticide load in local drainage canals. Molinate and carbofuran have been detected in sweat ditches at concentrations high enough to exceed levels reported to be acutely toxic to aquatic invertebrates by Harrington (1990) and Menconi and Gray (1992). Management practices are available that will help minimize these contributions and will be promoted (as in the 1996 season) as means to minimize pesticide movement with seepage.

DPR will work with county agricultural commissioners, University of California Cooperative Extension, and the Natural Resources Conservation Service (formally the Soil Conservation Service), and the California Rice Industry Association to educate growers on the potential adverse effects of discharged seepage and to promote voluntary implementation of practices that will help minimize these effects.

DPR, along with county agricultural commissioners and others, will continue their efforts to identify areas where seepage contributes to local water quality problems and will track voluntary efforts taken by growers to contain or reuse seepage water.

Emergency Releases

No changes in the provisions for emergency releases are considered for 1997.

Education

As was the case in 1996, DPR staff will use opportunities to educate growers, pest control advisors, and applicators on the unique problems of rice pesticides and surface water contamination.

Enforcement

County agricultural commissioners will continue the enforcement program outlined above.

Monitoring

DPR will continue to assume the responsibility of planning and implementing the monitoring program in 1997. Procedures for sampling and coordinating sample delivery to analytical laboratories will continue as in 1996. The California Rice Industry will again support this program through retention of a consultant to collect the water samples.

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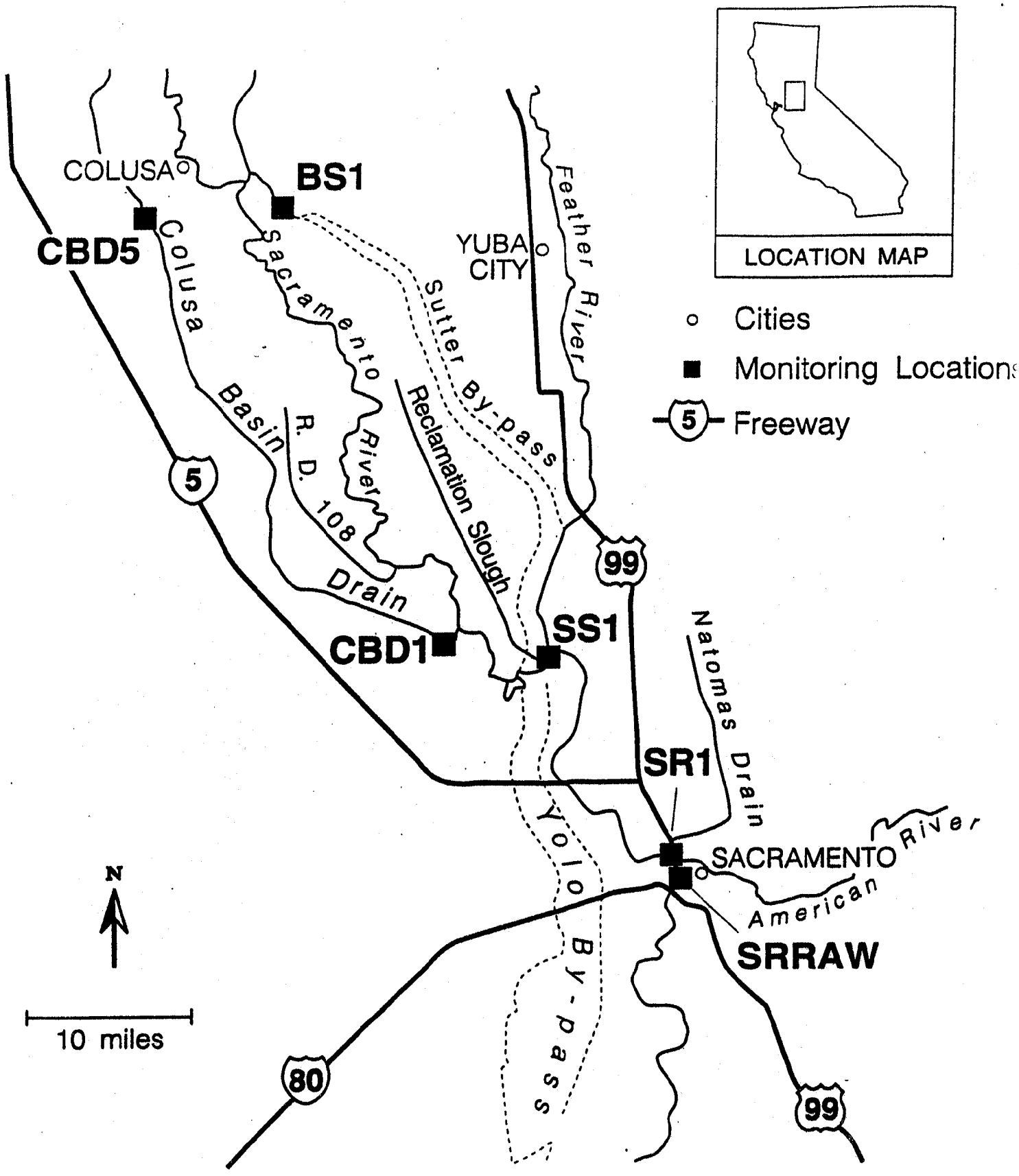

Figure 1. Pesticide monitoring sites in the Sacramento Valley

Monitoring sites in the Sacramento Valley

CBD5	Colusa Basin Drain near Highway 20 in Colusa County.
CBD1	Colusa Basin Drain at Roads 109 and 99E near Knight's Landing in Yolo County, near its outfall on the Sacramento River.
BS1	Butte Slough near Highway 20 in Sutter County.
SS1	Sacramento Slough at the Department of Water Resources gauge station in Sutter County, near its outfall on the Sacramento River.
SR1	Sacramento River approximately 1.5 km upstream from the confluence with American River, at the Village Marina in Sacramento County.
SRRAW	Sacramento River at the intake to the water treatment facility in Sacramento, approximately 0.3 km downstream from confluence with American River, in Sacramento County.

Figure 2. Acres treated with molinate in Colusa and Glenn Counties and concentrations of molinate in the Colusa Basin Drain near SR20 in 1996.

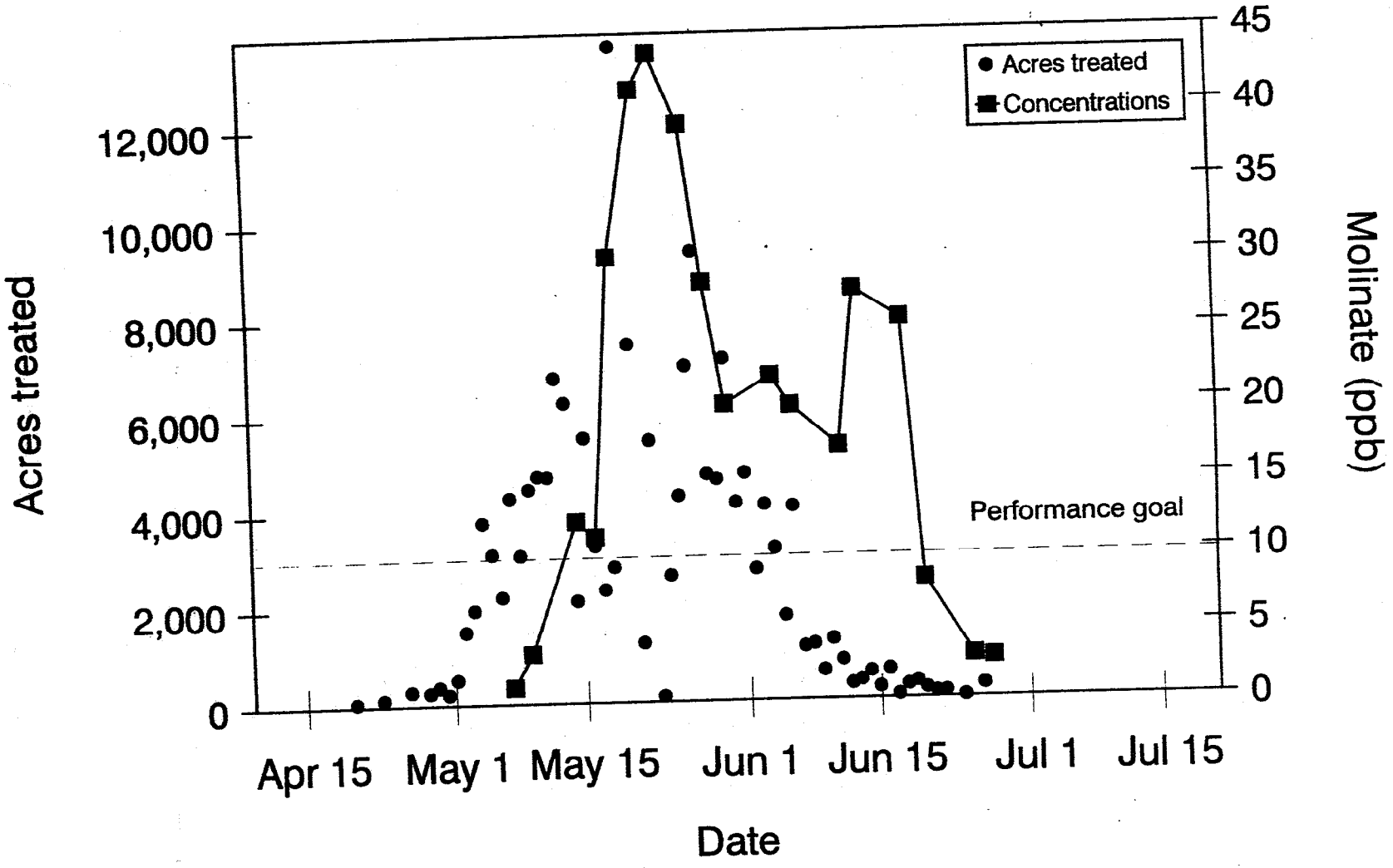

Figure 3. Acres treated with molinate in Butte County and concentrations of molinate in Butte Slough near SR20 in 1996. Concentration values less than the reporting limit are zero.

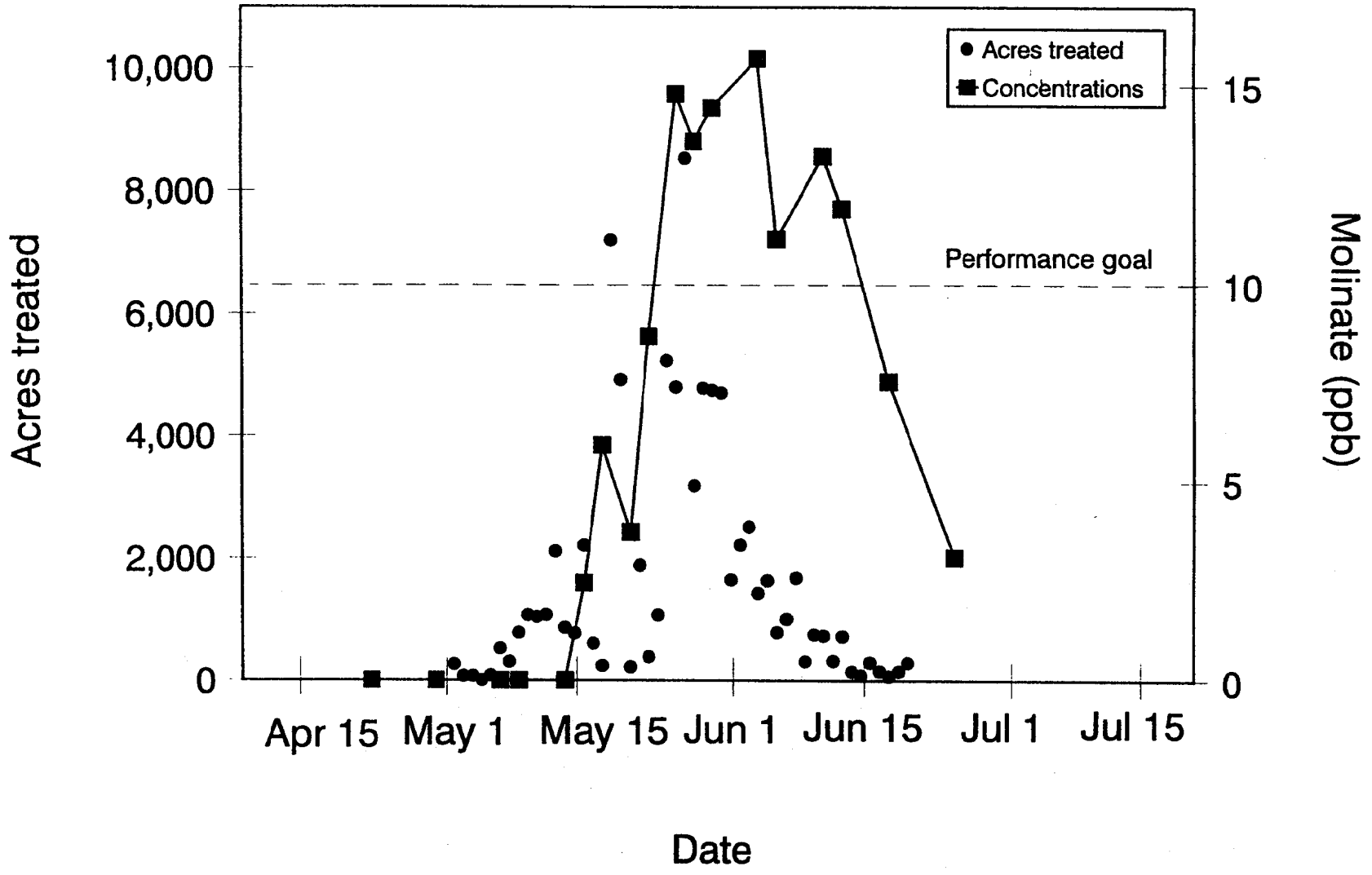

Figure 4. Acres treated with thiobencarb in Colusa and Glenn Counties and concentrations of thiobencarb in the Colusa Basin Drain near SR20 in 1996. Concentration values less than the reporting limit are zero.

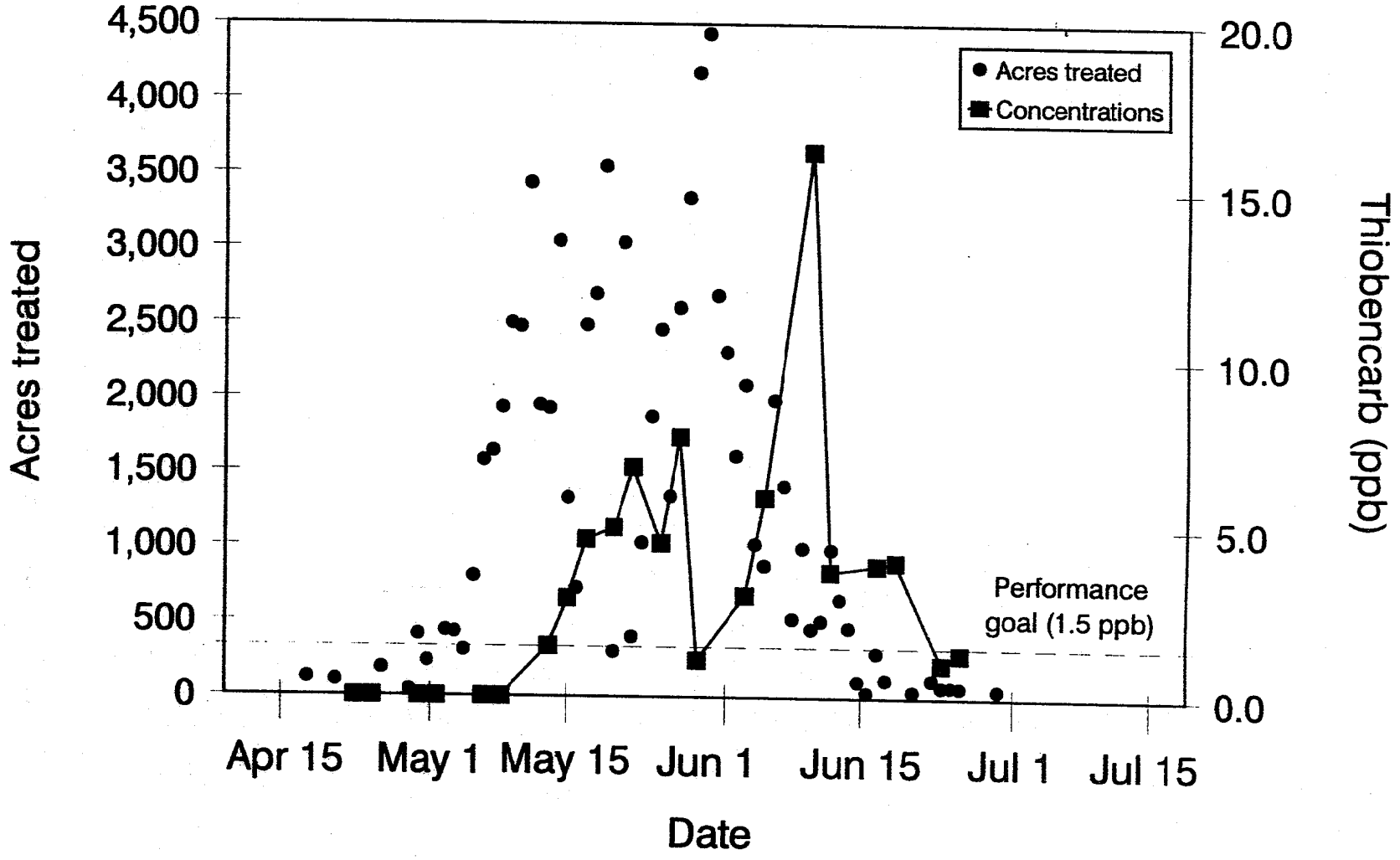

Figure 5. Acres treated with methyl parathion in Colusa and Glenn Counties and concentrations of methyl parathion in the Colusa Basin Drain near SR20 in 1996. Concentration values less than the reporting limit are zero.

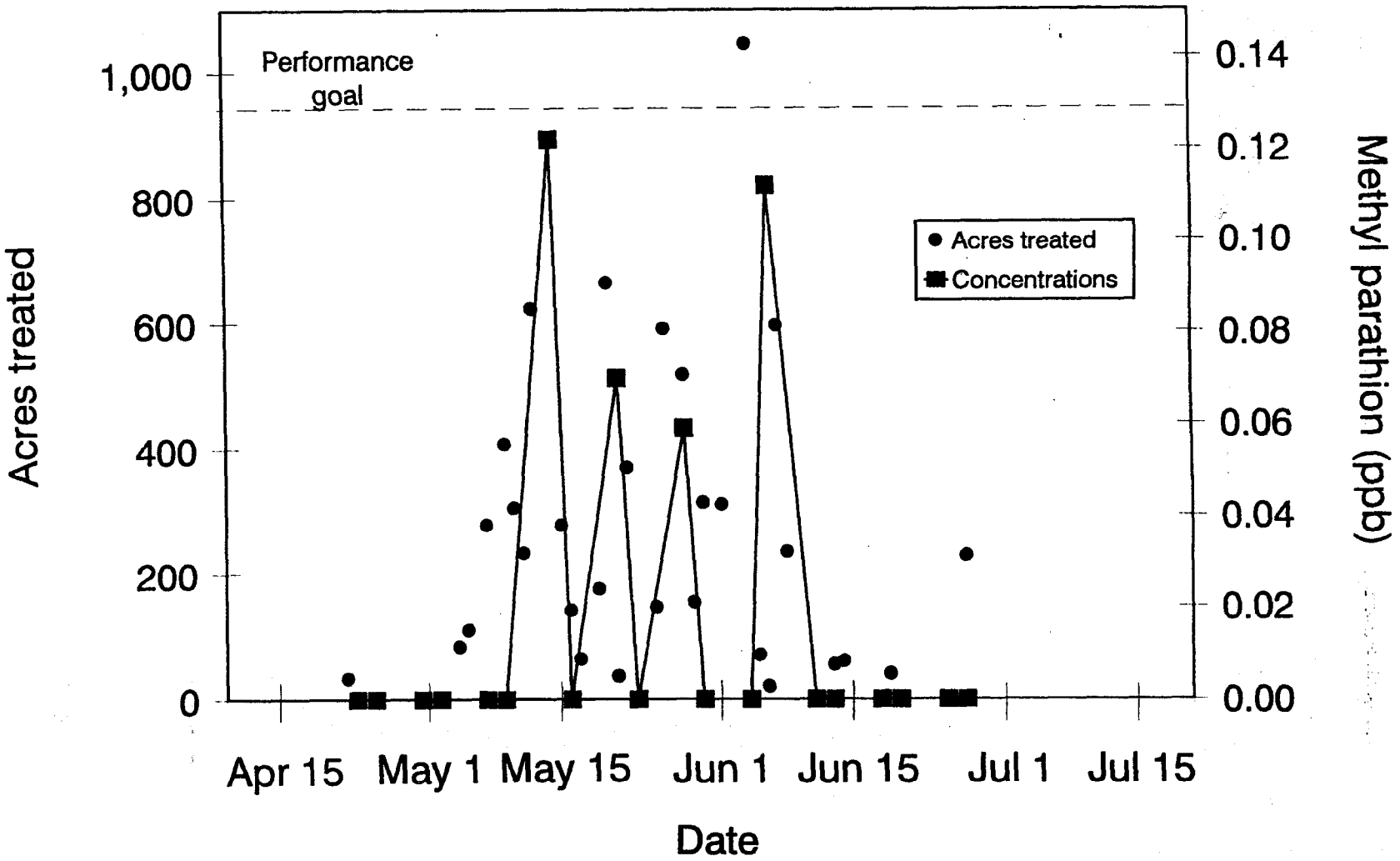

Figure 6. Acres treated with carbofuran in Colusa and Glenn Counties and concentrations of carbofuran in the Colusa Basin Drain near SR20 in 1996. Concentration values less than the reporting limit are zero.

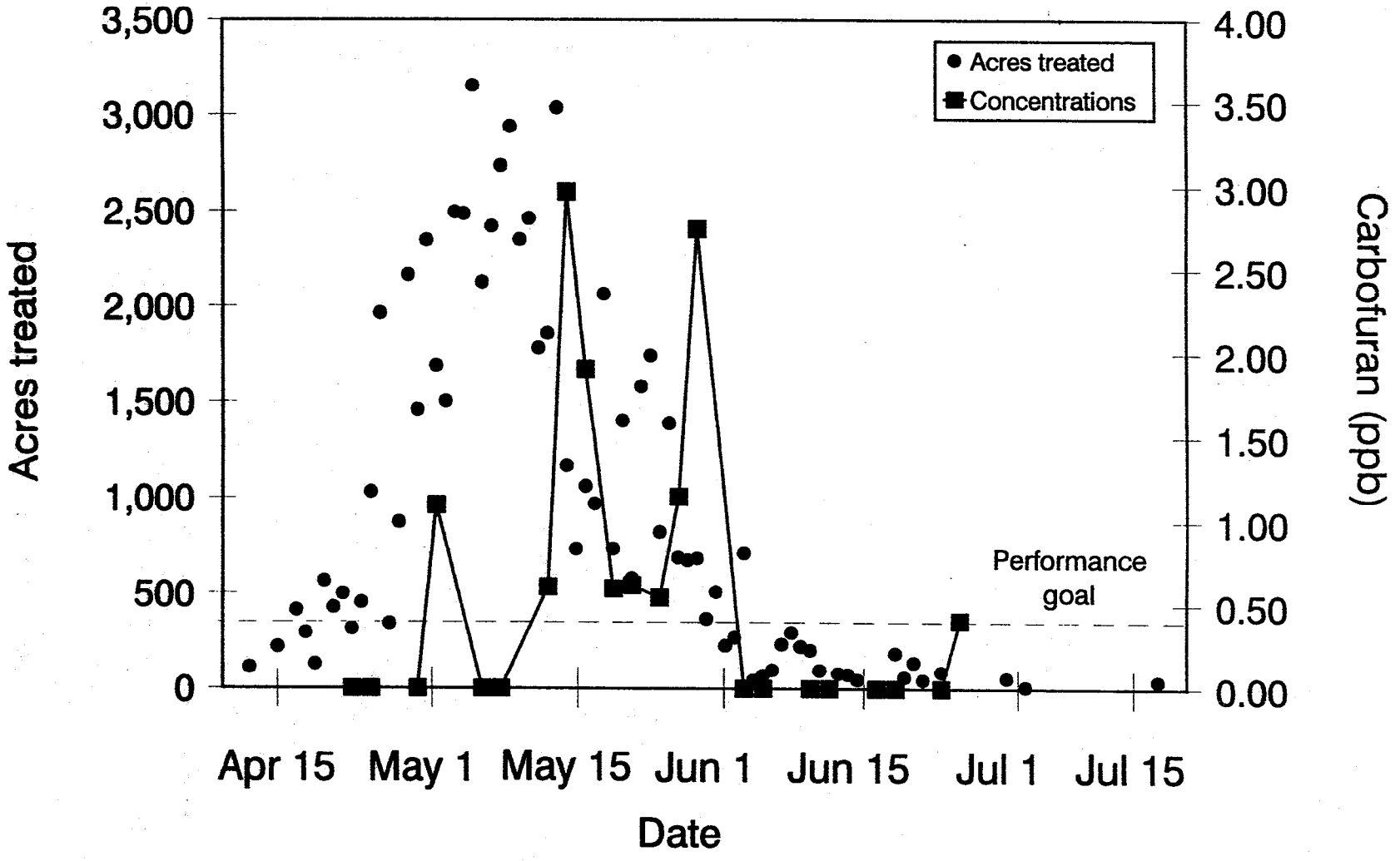

Table 1. Acres treated with molinate (Ordram®)[1], thiobencarb (Bolero® and Abolish®), carbofuran (Furadan®), and methyl parathion in the counties of the Sacramento Valley in 1996[2].

	Acres treated			
County	molinate	thiobencarb	carbofuran	methyl parathion
Butte	80,074	12,773	45,306	830
Colusa	93,037	66,596	43,101	6,584
Glenn	72,678	12,211	23,951	1,606
Placer	7,752	8,683	5,040	1,168
Sacramento	5,908	7,379	1,749	1,222
Sutter	52,561	16,871	20,308	4,885
Tehama	1,133	107	286	0
Yolo	19,512	8,026	540	391
Yuba	22,940	4,830	14,152	3,808
Totals	356,225	137,476	154,433	20,494

1. Molinate may be applied more than once at each site.

2. Most values are based on Notices-of-Application submitted to county agricultural commissioners.

Table 2. Acres of molinate-treated rice fields where water was discharged under emergency release variances in the Sacramento Valley in 1987 - 1996.

Year	Acres	Percent of total acres treated
1987	5,712	1.94
1988	4,897	1.41
1989	3,235	0.86
1990	23,394	6.32
1991	2,224	0.70
1992	1,029	0.29
1993	10,350	2.50
1994	172	0.04
1995	772	0.23
1996	5,193	1.46

PRELIMINARY DATA/SUBJECT TO CHANGE

Table 3. 1996 Pesticide Concentrations at the Colusa Basin Drain near Highway 20 in Colusa County (CBD5) in parts per billion (ppb). Samples collected by Kleinfelder, Inc. under contract with the California Rice Industry Association.

	Molinate		Thiobencarb		Carbofuran		Methyl parathion		Malathion	
Laboratory type	Primary	QC	Primary	QC	Primary	QC	Primary	QC	Primary	QC
Reporting limit (ug/l)	1.0	0.5	0.5	0.5	0.35	0.05	0.05	0.1	0.05	0.1
Date										
4/1	ND	ND	ND	ND	ND	0.165[1]	ND	ND	ND	ND
4/23	ND	NA	ND	NA	ND	NA	ND	(ND)	0.990	(0.86)[3]
4/25	ND	ND	ND	ND	ND	0.162	ND	ND(ND)	0.856	0.846(0.907)[3]
4/30	ND	NA	ND	NA	(ND)	NA	ND	NA	ND	NA
5/2	ND	ND	ND	ND	1.10	0.938	ND	ND	ND	ND
5/7	1.11	NA	ND	NA	ND	NA	ND	NA	ND	NA
5/9	3.34	3.26	ND	ND	ND	0.388	ND	ND	ND	ND
5/14	12.23	NA	1.5	NA	0.61	NA	0.122	NA	0.594	NA
5/16	11.17	11.9	2.9	3.11	2.97	2.176	ND	ND	ND	ND
5/18[2]	30.0	NA	4.65	NA	1.91	NA	NA	NA	NA	NA
5/21	41.25	NA	5.0	NA	0.60	NA	0.07	NA	ND	NA
5/23	43.68	37.3	6.8	7.28	0.62	0.553	ND	ND	0.368	0.254
5/26[2]	38.9	NA	4.54	NA	0.546	NA	NA	NA	NA	NA
5/28	28.20	NA	7.7	NA	1.15	NA	0.059	ND	6.00	3.27

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Table 3. 1996 Pesticide Concentrations at the Colusa Basin Drain near Highway 20 in Colusa County (CBD5) in parts per billion (ppb). Samples collected by Kleinfelder, Inc. under contract with the California Rice Industry Association.

	Molinate		Thiobencarb		Carbofuran		Methyl parathion		Malathion	
Laboratory type	Primary	QC	Primary	QC	Primary	QC	Primary	QC	Primary	QC
Reporting limit (ug/l)	**1.0**	**0.5**	**0.5**	**0.5**	**0.35**	**0.05**	**0.05**	**0.1**	**0.05**	**0.1**
Date										
5/30	19.95	16.6	1.1	1.25	2.75	2.445	ND	ND	ND	ND
6/4	21.80	NA	3.0	NA	ND	NA	ND	NA	0.125	NA
6/6	19.80	17.2	5.9	5.95	ND	0.172	0.112	ND	0.684	0.611
6/11	17.10	(14.9)	16.2	(16.9)	ND	NA	ND	NA	ND	NA
6/13	27.60	24	3.7	3.45	ND	0.217	ND	ND	ND	ND
6/18	25.60	NA	3.9	NA	ND	NA	ND	NA	ND	NA
6/20	8.09	9.28	4.0	4.18	ND	0.218	ND	ND	ND	ND
6/25	2.89	NA	1.0	NA	ND	NA	ND	NA	ND	NA
6/27	2.75	3.83	1.3	1.45	0.41	0.335	ND	ND	0.06	ND

QC	Quality control
Blank cells	Results not yet reported
ND	Not detected
NA	Not analyzed
( )	Backup-split sample analyzed

PERFORMANCE GOALS (ppb):

molinate	10	methyl parathion	0.13
thiobencarb	1.5	malathion	0.1
carbofuran	0.4		

1 Confirmed by re-extraction and mass spectrometry.

2 All samples on these dates were collected by the Department of Pesticide Regulation and analyzed by the California Department of Food and and Agriculture analytical laboratory. Samples on these dates were collected as composite grab samples.

3 Reanalysis after calibration curve standards for malathion were recalculated.

PRELIMINARY DATA/SUBJECT TO CHANGE

PRELIMINARY DATA/SUBJECT TO CHANGE

Table 4. 1996 Pesticide Concentrations at Butte Slough at Lower Pass Road in Sutter County in parts per billion (ppb). Samples collected by Kleinfelder, Inc. under contract with the California Rice Industry Association.

	Molinate	Thiobencarb	Carbofuran	Methyl parathion	Malathion
Laboratory type	Primary	Primary	Primary	Primary	Primary
Reporting limit (ug/l)	1.0	0.5	0.35	0.05	0.05
Date					
4/1	ND	ND	ND	ND	ND
4/23	ND	ND	ND	ND	ND
4/30	ND	ND	(ND)	ND	ND
5/7	ND	ND	ND	ND	ND
5/9	ND	ND	ND	ND	ND
5/14	ND	ND	ND	ND	ND
5/16	2.47	(1.3)	0.44	ND	ND
5/18[1]	5.94	2.04	1.04	NA	NA
5/21	3.74	ND	0.83	ND	ND
5/23	8.69	0.9	0.89	ND	ND
5/26[1]	14.80	ND	0.730	NA	NA
5/28	13.60	ND	0.59	ND	ND
5/30	14.45	ND	0.50	ND	ND

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Table 4. 1996 Pesticide Concentrations at Butte Slough at Lower Pass Road in Sutter County in parts per billion (ppb). Samples collected by Kleinfelder, Inc. under contract with the California Rice Industry Association.

	Molinate	**Thiobencarb**	**Carbofuran**	**Methyl parathion**	**Malathion**
Laboratory type	Primary	Primary	Primary	Primary	Primary
Reporting limit (ug/l)	1.0	0.5	0.35	0.05	0.05
Date					
6/4	15.70	1.4	ND	ND	ND
6/6	11.15	1.1	ND	ND	ND
6/11	13.23	0.7	ND	ND	ND
6/13	11.91	ND	ND	ND	ND
6/18	7.55	ND	ND	ND	ND
6/25	3.11	1.2	ND	ND	ND

Blank cells Results not yet reported
ND Not detected
NA Not analyzed
( ) Backup-split sample analyzed

PERFORMANCE GOALS (ppb):

molinate	10	methyl parathion	0.13	carbofuran	0.4
thiobencarb	1.5	malathion	0.1		

1 All samples on these dates were collected by the Department of Pesticide Regulation and analyzed by the California Department of Food and Agriculture analytical laboratory

PRELIMINARY DATA/SUBJECT TO CHANGE

PRELIMINARY DATA/SUBJECT TO CHANGE

Table 5. 1996 Pesticide Concentrations at the Sacramento River at the Village Marina in Sacramento County in parts per billion (ppb). Samples collected by Kleinfelder, Inc. under contract with the California Rice Industry Association.

	Molinate	Thiobencarb	Carbofuran	Methyl parathion	Malathion
Laboratory type	Primary	Primary	Primary	Primary	Primary
Reporting limit (ug/l)	1.0	0.5	0.35	0.05	0.05
Date					
4/1	ND	ND	ND	ND	ND
4/23	ND	ND	ND	ND	ND
4/30	ND	ND	ND	ND	ND
5/7	ND	ND	ND	ND	ND
5/9	ND	ND	ND	ND	ND
5/14	ND	ND	ND	ND	ND
5/16	ND	ND	ND	ND	ND
5/21	ND	ND	ND	ND	ND
5/23	ND	ND	ND	ND	ND
5/28	0.95	ND	ND	ND	ND
5/30	0.95	ND	ND	ND	ND
6/4	ND	ND	ND	ND	ND
6/6	ND	ND	ND	ND	ND

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Table 5. 1996 Pesticide Concentrations at the Sacramento River at the Village Marina in Sacramento County in parts per billion (ppb). Samples collected by Kleinfelder, Inc. under contract with the California Rice Industry Association.

	Molinate	Thiobencarb	Carbofuran	Methyl parathion	Malathion
Laboratory type	Primary	Primary	Primary	Primary	Primary
Reporting limit (ug/l)	1.0	0.5	0.35	0.05	0.05
Date					
6/11	ND	ND	ND	ND	ND
6/13	ND	ND	ND	ND	ND
6/18	ND	ND	ND	ND	ND
6/25	ND	ND	ND	ND	ND

Blank cells	Results not yet reported
ND	Not detected
NA	Not analyzed

PERFORMANCE GOALS (ppb):

molinate	10	methyl parathion	0.13
thiobencarb	1.5	malathion	0.1
carbofuran	0.4		

PRELIMINARY DATA/SUBJECT TO CHANGE

Table 6. Concentrations of molinate and thiobencarb in the Sacramento River at the intake to the City of Sacramento water treatment facility (SRRAW) in 1996[1].

	Concentration (ppb)	
Date	molinate	thiobencarb
5/16	ND[2]	ND
5/23	ND	ND
5/27	ND	ND
5/30	0.12	ND
6/04	ND	ND
6/05	ND	ND
6/07	ND	ND
6/11	0.14	ND
6/14	0.11	ND
6/17	0.11	ND
6/20	ND	ND

1. Samples collected and analyzed by the City of Sacramento.

2. ND None detected. Reporting limit = 0.10 ppb.

Table 7. Peak molinate concentrations in selected Sacramento Valley waterways[1] in 1981 - 1996.

	Concentration (ppb)[2]				
Year	CBD1	CBD5	SS1	BS1	SR1
1981	340	357	[3]		
1982	204	697		187	27
1983	211	228	68		7
1984	110	120	44		21
1985	95	100	49		16
1986	77	88	30		11
1987	43	53	22	44	8
1988	67	89	30	52	8
1989	51	60	30	43	6
1990	51	59	40	36	9
1991	18	17	10	26	1
1992	6	24	15	26	ND[4]
1993	69[5]	96	31	39	3
1994	21	57	10	18	
1995		25		8	ND[4]
1996		44		15	1

1. CBD1 Colusa Basin Drain at Roads 109 and 99E near Knight's Landing in Yolo County.
   CBD5 Colusa Basin Drain at or near Highway 20 in Colusa County.
   SS1 Sacramento Slough at DWR gauge station in Sutter County.
   BS1 Butte Slough at Highway 20 in Sutter County.
   SR1 Sacramento River at Village Marina in Sacramento County.

2. All concentration values rounded to the nearest whole number.

3. Blanks indicate no data are available.

4. ND None detected. Method detection limit = 1.0 ppb.

5. Mean of duplicate analyses.

Table 8. Peak thiobencarb concentrations in selected Sacramento Valley waterways[1] in 1981 - 1996.

	Concentration (ppb)[2]				
Year	CBD1	CBD5	SS1	BS1	SR1
1981	21	23	[3]		
1982	57	170		10	6
1983	11	9	5		1
1984	8	14	8		1
1985	19	18	11		4
1986	7	7	4		1
1987	4	2	1	ND[4]	ND
1988	4	1	ND	1	ND
1989	1	1	ND	1	ND
1990	ND	ND	ND	2	ND
1991	ND	ND	ND	ND	ND
1992	6	7	2	10	ND
1993	5	4	ND	ND	ND
1994	16	37[5]	ND	1	
1995		4		1	ND
1996		16		2	ND

1. CBD1 Colusa Basin Drain at Roads 109 and 99E near Knight's Landing in Yolo County.
   CBD5 Colusa Basin Drain at Highway 20 in Colusa County.
   SS1 Sacramento Slough at DWR gauge station in Sutter County.
   BS1 Butte Slough at Highway 20 in Sutter County.
   SR1 Sacramento River at Village Marina in Sacramento County.

2. Concentration values are rounded to the nearest whole number.

3. Blanks indicate no data are available.

4. ND Not detected. Different detection limits (lowest quantifiable concentrations) were reported during this period, all of which were less than or equal to 1.0 ppb.

5. A second extraction and analysis was conducted with a rounded result of 40 ppb.

Table 9. Estimated mass transport of molinate and thiobencarb in the Sacramento River past Sacramento in the years 1982-1995.

	Kg (pounds) Transported			
Year	molinate		thiobencarb	
1982	18,464.9	(40,666.9)	[1]	
1983[2]	2,752.9	(6,056.5)	623.7	(1,372.2)
1984	7,352.0	(16,174.4)	715.2	(1,573.5)
1985	6,014.8	(13,232.5)	2,317.5	(5,098.6)
1986	4,622.1	(10,168.7)	845.7	(1,860.6)
1987	2,342.3	(5,153.2)	22.8	(50.2)
1988	3,194.2	(7,027.2)	68.1	(149.8)
1989	1,984.1	(4,365.1)	11.4	(25.1)
1990	3,204.1	(7,049.1)	51.4	(113.1)
1991	99.2	(217.9)	0	(0)[3]
1992	56.6	(124.7)	0	(0)
1993[2]	2,006.9	(4,232.4)	0	(0)
1994	109.1	(239.9)	0	(0)
1995	83.7	(184.4)	0	(0)

1. Mass transport was not calculated due to incomplete monitoring data.

2. The Colusa Basin Drain, a major agricultural drainage canal, did not contribute to the mass transport at Sacramento during all or part of the sampling period because the drain was routed into the Yolo Bypass during unusually high Sacramento River flows.

3. Thiobencarb was not detected in the Sacramento River in 1991 - 1994 (limit of detection = 0.1 ppb).

Table 10. Concentrations of the phenoxy herbicides MCPA and 2,4-D in the Colusa Basin Drain near Highway 20 in Colusa County (CBD5) in 1996.

	Concentration (ppb)	
Date	MCPA	2,4-D
6/4	ND[1]	ND
6/6	ND	ND
6/11	0.38	0.32
6/13	1.98	0.73
6/18	0.19	0.10
6/20	ND	ND

1. ND Not detected. Reporting limit for MCPA and 2,4-D is 0.1 ppb.

Appendix A

California Environmental Protection Agency
James M. Strock, *Secretary for Environmental Protection*

State of California
Pete Wilson, *Governor*

DEPARTMENT OF PESTICIDE REGULATION
James W. Wells, *Director*

1020 N Street, Room 100
Sacramento, California 95814-5624

March 8, 1995

TO: COUNTY AGRICULTURAL COMMISSIONERS IN RICE-GROWING COUNTIES OF THE SACRAMENTO VALLEY

SUBJECT: 1995 RICE PESTICIDES PROGRAM

On January 27, 1995, the Central Valley Regional Water Quality Control Board (CVRWQCB) approved management practices that limit discharges of the rice pesticides molinate (Ordram®), thiobencarb (Bolero® and Abolish®), carbofuran (Furadan®), methyl parathion, and malathion to surface waters. The CVRWQCB staff sent you a copy of the agenda item for this meeting along with a report prepared by my staff entitled: "Information on Rice Pesticides Submitted to the Central Valley Regional Water Quality Control Board" (December 28, 1995). This letter contains details on the 1995 rice pesticide program including conditions you are asked to implement for rice pesticide permits.

Most of the provisions of the rice pesticide program relating to routine water-holding times will remain the same as in 1994. However, changes will apply for regions previously considered hydrologically isolated to ensure compliance with the CVRWQCB's prohibition of acutely toxic discharges to waters that support aquatic habitat.

In addition, the CVRWQCB approved management plans to promote an educational effort with the rice-growing community that stresses the continued importance of drift prevention and introduces the potential contributions seepage water makes to the pesticide concentrations in the agricultural drains. Drift control provisions remain as they were in 1994. Continue to have your staff impress upon commercial applicators the need to better control applications of pesticides near agricultural drains and focus additional enforcement efforts, when possible, on aerial applications made to fields adjacent to agricultural drains. My

staff is working with representatives from the rice-growing community to propose voluntary measures growers might take to prevent rice field seepage water from entering surface waterways prior to the end of the required holding periods for field water. Your assistance in distributing forthcoming information to growers on seepage water containment will be appreciated.

The key features of the 1995 program are as follows:

1. The basic water management requirements for users of those pesticides that require permits (molinate, thiobencarb, methyl parathion, and carbofuran) are the same as in 1994. The water management requirements for the 1995 program as approved by the CVRWQCB are outlined in Attachments 1-4. Holding times for all applications (not just the "preflood surface" applications) of Abolish decreased to 19 days. Areas considered hydrologically isolated must hold water from fields treated with molinate and thiobencarb for longer periods (11 and 19 days, respectively) than previously required. Exceptions for some fields treated with thiobencarb are described in Attachment 2.

2. The water management practices following malathion use in rice are still voluntary. Attachment 5, which describes these practices, was designed to be distributed to growers.

3. Management practices for containing seepage water from rice fields and the pesticides this water may contain will be addressed through forthcoming educational measures and implemented through voluntary efforts by growers.

4. Water management practices within closed systems remain the same for 1995. The Department of Pesticide Regulation (DPR) will conduct a study on toxicity of water in multigrower closed systems to determine any need for longer holds in future years.

5. The emergency release provisions remain the same as in 1994 to continue to meet the CVRWQCB's prohibition of acutely toxic discharges to waters that support aquatic habitat. Growers with fields treated with Ordram may apply for an emergency release after a minimum holding period of 11 days. Fields will be prohibited from using the emergency release management option until the standard holding times for the insecticides have elapsed. Fields treated with Bolero do not qualify for the emergency release option. Attachment 6 is the form which permittees are to fill out as part of their request for an emergency release. Those that are granted an emergency release must also fill out an additional form (Attachment 7) and deliver it to your office. Failure to submit this form will be considered a permit violation. DPR staff will request the information on the completed forms later this summer.

6. Growers using the emergency release provision more than once or cited for water holding violations more than once must make improvements in water management capabilities. Such improvements will be required as conditions on future pesticide use permits and may include retention basins, ponds, or tailwater recovery systems.

7. Drift control provisions will again be an important part of the program. Methyl parathion application provisions are the same as in 1994. They include the use of an effective drift control agent, use of D8 nozzles, wind speeds $\leq$ 5 miles per hour, and a 300-foot downwind buffer zone left untreated. Attachments 8, 9, 10, and 11 outline the provisions for aerial applications of granular and liquid formulations of rice pesticides included in the program. Special attention should be directed, when possible, towards enforcement efforts during aerial applications at sites adjacent to agricultural drains.

8. Weir boxes that control discharges of water from rice fields shall be fully secured during pesticide holding times. A soil berm must be in place in front of each of these boxes

to a level above the water line, or drop boxes shall be filled with soil to a level above the water line. The need for such berms in fields where nonconventional water management systems are utilized, e.g., static/positive pressure systems, may be evaluated by County Agricultural Commissioner's office staff on a case-by-case basis.

Information transmittal of rice pesticide use data from the county offices to DPR will be handled at the end of July rather than on a weekly basis. My staff will discuss the details of this process with your deputies.

Monitoring results will not be available this year until approximately five weeks after sample collection. DPR will continue to send monitoring program results to your offices, via facsimile, when available.

Thank you for your assistance. Your cooperation continues to help make the program a real success. If you have questions, please contact Dr. Nan Gorder at (916) 324-4265 or Mr. Marshall Lee at (916) 324-4269.

Sincerely,

James W. Wells
Director
(916) 445-4000

cc: Dr. Nan Gorder
Mr. Marshall Lee

APPENDIX A

ATTACHMENT 1

MOLINATE WATER MANAGEMENT REQUIREMENTS - 1995

I. All water from fields treated with products containing molinate must be retained on the site of application for at least 28 days following application unless:

A. The water is contained within a tailwater recovery system, ponded on fallow land, or contained in other systems appropriate for preventing discharge. The system may discharge 29 days following the last application of molinate within the system.

1. If the system is under the control of one permittee, water may be discharged from the application site in a manner consistent with product labeling.

2. If the system includes drainage from more than one permittee, water may be discharged from the application site into the system nine days following application.

B. The water is on acreage within the bounds of areas that discharge negligible amounts of rice field drainage into perennial streams until fields are drained for harvest. All water on fields treated with molinate must be retained on the treated acreage until the twelfth day following application.

C. The water is on acreage treated with a preflood application of molinate. The label restrictions apply.

II. Fields not specified in I.A., I.B., and I.C. may resume discharging field water 29 days following application at a volume not to exceed two inches of water over a drain box weir. Unregulated discharges from these fields may then resume after seven days.

MOLINATE WATER MANAGEMENT REQUIREMENTS - 1995

III. The county agricultural commissioner may authorize the emergency release of tailwater 12 days following the last molinate application, following a review of a written request (Attachment 6) which clearly demonstrates the crop is suffering because of the water management requirements. All water management requirements must be followed that are associated with other pesticides that may have been applied to the site. Additionally, the requester must describe preventative action that would avoid the need for future emergency releases. Under an emergency release variance, tailwater may be released only to the extent necessary to mitigate the documented problem. Those issued an emergency release must submit to the county agricultural commissioner a report (Attachment 7) indicating the time and duration of the emergency release and data that can be used to calculate the total amount of water released during the emergency release. Emergency release will only be granted for reasons related to rainfall, high winds, or other extreme weather conditions that cannot be moderated with management practices.

ATTACHMENT 2

THIOBENCARB WATER MANAGEMENT REQUIREMENTS - 1995
Revised April 7, 1995

I. For rice fields treated with thiobencarb in the Sacramento Valley (north of the line defined by Roads E10 and 116 in Yolo County and the American River in Sacramento County), except those treated with Abolish 8EC:

A. All water on treated fields must be retained on the treated fields for at least 30 days following application unless:

1. The water is contained within a tailwater recovery system, ponded on fallow land, or contained in other systems appropriate for preventing discharge. The system may discharge 20 days following the last application of thiobencarb within the system.

a. If the system is under the control of one permittee, water may be discharged from the application site in a manner consistent with product labeling.

b. If the system includes drainage from more than one permittee, water may be discharged from the application site into the system seven days following application.

2. The water is on fields within the bounds of areas that discharge negligible amounts of rice field drainage into perennial streams until fields are drained for harvest. Water from such fields must be held at least 19 days, unless the county agricultural commissioner evaluates such sites. If the commissioner verifies the hydrologic isolation of the fields, the water may be released seven days after application.

THIOBENCARB WATER MANAGEMENT REQUIREMENTS - 1995
Revised April 7, 1995

B. Fields not specified in I.A.1. and I.A.2. may resume discharging field water 31 days following application at a volume not to exceed two inches of water over a drain box weir. Unregulated discharges from these fields may then resume after seven days.

II. For rice fields treated with thiobencarb in the Southern Area (south of the line defined by Roads E10 and 116 in Yolo County and the American River in Sacramento County), except those treated with Abolish 8EC:

A. All water on treated fields must be retained on the treated fields for at least 19 days following application unless:

1. The water is contained within a tailwater recovery system, ponded on fallow land, or contained in other systems appropriate for preventing discharge. The system may discharge 20 days following the last application of thiobencarb within the system.

a. If the system is under the control of one permittee, water may be discharged from the application site in a manner consistent with product labeling.

b. If the system includes drainage from more than one permittee, water may be discharged from the application site into the system seven days following application.

THIOBENCARB WATER MANAGEMENT REQUIREMENTS - 1995
Revised April 7, 1995

2. The water is on fields within the bounds of areas that discharge negligible amounts of rice field drainage into perennial streams until fields are drained for harvest. Water from such fields may be released seven days after application if the county agricultural commissioner evaluates such sites and verifies the hydrologic isolation of the fields.

B. Fields not specified in II.A.1. and II.A.2. may resume discharging field water 20 days following application at a volume not to exceed two inches of water over a drain box weir. Unregulated discharges from these fields may then resume after seven days.

III. For all areas, fields treated with Abolish 8EC:

A. All water on treated fields must be retained on the treated fields for at least 19 days following application unless:

1. The water is contained within a tailwater recovery system, ponded on fallow land, or contained in other systems appropriate for preventing discharge. The system may discharge 20 days following the last application within the system.

a. If the system is under the control of one permittee, water may be discharged from the application site in a manner consistent with product labeling.

b. If the system includes drainage from more than one permittee, water may be discharged from the application site into the system seven days following application.

THIOBENCARB WATER MANAGEMENT REQUIREMENTS - 1995
Revised April 7, 1995

2. The water is on fields within the bounds of areas that discharge negligible amounts of rice field drainage into perennial streams until fields are drained for harvest. Water from such fields may be released seven days after application if the county agricultural commissioner evaluates such sites and verifies the hydrologic isolation of the fields.

B. Fields not specified in III.A. may resume discharging field water 20 days following application at a volume not to exceed two inches of water over a drain box weir. Unregulated discharges from these fields may then resume after seven days.

APPENDIX A

ATTACHMENT 3

CARBOFURAN WATER MANAGEMENT REQUIREMENTS - 1995

I. Pre-flood applications of carbofuran to rice fields must be incorporated into the soil.

II. Water shall not be discharged from sites treated with carbofuran for at least 28 days following initial flooding (pre-flood application) or following application (post-plant application) unless the treated water is contained within tailwater recovery systems, ponded on fallow land, or contained in other systems appropriate for preventing discharge. The system may discharge 29 days following the last application of carbofuran within the system.

A. If the system was under the control of one permittee, treated water may be discharged from the application site in a manner consistent with product labeling.

B. If the system includes drainage from more than one permittee, treated water may be discharged from the application site into the system nine days following application.

APPENDIX A

ATTACHMENT 4

METHYL PARATHION WATER MANAGEMENT REQUIREMENTS - 1995

Water shall not be discharged from sites treated with methyl parathion for at least 24 days following application unless the treated water is contained within a tailwater recovery system, ponded on fallow land, or contained in other systems appropriate for preventing discharge. The system may discharge 25 days following the last application of methyl parathion within the system. Treated water may be discharged from the application site in a manner consistent with product labeling.

APPENDIX A

ATTACHMENT 5

MALATHION WATER MANAGEMENT REQUIREMENTS - 1995

The Central Valley Regional Water Quality Control Board has approved a water management practice following malathion use in rice that will help meet 1995 water quality performance goals for malathion in surface water. Malathion is currently not a restricted material and not subject to use requirements or permit conditions. However, it is important that growers comply with this practice.

Water from fields treated with malathion should be held on the site of application for at least four days following application.

Water quality monitoring will be conducted in 1995 to determine the adequacy of this practice in managing malathion discharges. If malathion levels do not adequately meet the performance goal, a more formal regulatory program may be implemented in future years.

APPENDIX A

ATTACHMENT 6

EMERGENCY RELEASE

Grower:_____ Permit No.:_____

Address:_____ Zip:_____

Field location:_____ Site No.:_____
(Attach detailed map)

Chemical applied:_____ Chemical applied:_____
Rate of application:_____ Rate of application:_____
Date of application:_____ Date of application:_____
Average water depth_____ Average water depth:_____
at time of application:_____ at time of application:_____

Chemical applied:_____ Chemical applied:_____
Rate of application:_____ Rate of application:_____
Date of application:_____ Date of application:_____
Average water depth_____ Average water depth_____
at time of application:_____ at time of application:_____

Starting date of emergency release:_____

Acres in field:_____ Laser leveled? Yes_____ No_____

Type of irrigation system: Flow through_____ Recycle_____ Static_____ Other_____

Date flooding began:_____ No. of days it takes to fill field:_____

Describe problem that led to emergency release: _____
_____
_____
_____

Steps that can be taken to prevent emergency releases from this field in future years:
_____
_____
_____

Recommendation (attached) by:_____

Applications by:_____

Grower's signature: _____ Date: _____

Approved by: _____
Agricultural Biologist

APPENDIX A

ATTACHMENT 7

EMERGENCY RELEASE

Grower: _____ Permit No.: _____

Address: _____ Zip: _____

Field location: _____ Site No.: _____

Beginning date of release: _____ Ending date: _____

The grower must determine the amount of water discharged during the emergency release period. To do this, measure the width of each weir opened to allow the discharge. Then, on a daily basis, measure the height of water flowing over each weir. Record all information in the table below.

Weir 1		Weir 2		Weir 3	
Width:		Width:		Width:	
Date	Height of water	Date	Height of water	Date	Height of water

APPENDIX A

ATTACHMENT 8

DRIFT CONTROL REQUIREMENTS FOR GRANULAR MOLINATE, THIOBENCARB, AND CARBOFURAN APPLIED TO RICE - 1995

Granular molinate, thiobencarb, or carbofuran drifting into waterways (i.e., drainage canals) or onto levees or roadways adjacent to waterways will be considered environmental contamination. Applicators found in violation will be liable for a civil penalty.

Granular molinate, thiobencarb, or carbofuran shall not be applied by air if wind speed is greater than seven miles per hour to avoid drift into drainage canals and ditches.

DRIFT CONTROL REQUIREMENTS FOR LIQUID THIOBENCARB APPLIED TO RICE - 1995

I. Aerial Applications

A. No aerial applications of liquid formulations of thiobencarb to rice shall be:

1. Discharged more than ten feet above the crop or target. Discharge shall be shut off whenever it is necessary to raise the equipment over obstacles such as trees or poles.

2. Applied when wind velocity is more than seven miles per hour.

3. Applied by aircraft except as follows:

a. The flow of liquid to aircraft nozzles shall be controlled by a positive shutoff system as follows:

i. Each individual nozzle shall be equipped with a check valve and the flow controlled by suckback device or a boom pressure release device; or

ii. Each individual nozzle shall be equipped with a positive action valve.

b. Aircraft nozzles shall not be equipped with any device or mechanism which would cause a sheet, cone, fan, or similar type dispersion of the discharged material except as otherwise provided.

c. Aircraft boom pressure shall not exceed 40 pounds per square inch.

d. Aircraft nozzles shall be equipped with orifices directed backward parallel to the horizontal axis of the aircraft in flight.

DRIFT CONTROL REQUIREMENTS FOR LIQUID THIOBENCARB APPLIED TO RICE - 1995

e. Fixed wing aircraft and helicopters operating in excess of 60 miles per hour shall be equipped with jet nozzles having an orifice of not less than 1/16 inch diameter.

f. Working boom length on fixed wing aircraft shall not exceed 3/4 of the wing span; the working boom length of helicopters shall not exceed 6/7 of the total rotor length or 3/4 of the total rotor where the rotor length exceeds 40 feet.

g. Helicopters operating at 60 miles per hour or less shall be equipped with:

i. Nozzles having an orifice not less than 1/16 inch in diameter. A number 46 (or equivalent) or larger whirlplate may be used; or

ii. Fan nozzles with a fan angle number not larger than 80 degrees and a flow rate not less than one gallon per minute at 40 pounds per square inch pressure (or equivalent).

B. Special precautions should be taken to avoid off-site deposition of liquid formulations of pesticides when applications are made adjacent to agricultural drains.

II. Ground Applications - Ground applications of liquid thiobencarb must be applied as per label instructions.

APPENDIX A

ATTACHMENT 10

DRIFT CONTROL RECOMMENDATIONS FOR MALATHION APPLIED TO RICE - 1995

I. No aerial applications of liquid formulations of malathion to rice shall be:

A. Discharged more than ten feet above the crop or target. Discharge shall be shut off whenever it is necessary to raise the equipment over obstacles such as trees or poles.

B. Applied when wind velocity is more than seven miles per hour.

C. Applied by aircraft except as follows:

1. The flow of liquid to aircraft nozzles shall be controlled by a positive shutoff system as follows:

a. Each individual nozzle shall be equipped with a check valve and the flow controlled by suckback device or a boom pressure release device; or

b. Each individual nozzle shall be equipped with a positive action valve.

2. Aircraft nozzles shall not be equipped with any device or mechanism which would cause a sheet, cone, fan, or similar type dispersion of the discharged material except as otherwise provided.

3. Aircraft boom pressure shall not exceed 40 pounds per square inch.

4. Aircraft nozzles shall be equipped with orifices directed backward parallel to the horizontal axis of the aircraft in flight.

DRIFT CONTROL RECOMMENDATIONS FOR MALATHION APPLIED TO RICE - 1995

5. Fixed wing aircraft and helicopters operating in excess of 60 miles per hour shall be equipped with jet nozzles having an orifice of not less than 1/16 inch diameter.

6. Working boom length on fixed wing aircraft shall not exceed 3/4 of the wing span; the working boom length of helicopters shall not exceed 6/7 of the total rotor length or 3/4 or the total rotor where the rotor length exceeds 40 feet.

7. Helicopters operating at 60 miles per hour or less shall be equipped with:

   a. Nozzles having an orifice not less than 1/16 inch in diameter. A number 46 (or equivalent) or larger whirlplate may be used; or

   b. Fan nozzles with a fan angle number not larger than 80 degrees and a flow rate not less than one gallon per minute at 40 pounds per square inch pressure (or equivalent).

II. Special precautions should be taken to avoid off-site deposition of liquid formulations of pesticides when applications are made adjacent to agricultural drains.

APPENDIX A

ATTACHMENT 11

DRIFT CONTROL REQUIREMENTS FOR METHYL PARATHION APPLIED TO RICE - 1995

I. Aerial Applications

A. No aerial applications of liquid formulations of methyl parathion to rice shall be:

1. Discharged more than ten feet above the crop or target. Discharge shall be shut off whenever it is necessary to raise the equipment over obstacles such as trees or poles.

2. Applied within a 300 foot downwind buffer zone from any agricultural drain.

3. Applied when wind velocity is more than five miles per hour.

4. Applied without an effective drift control agent.

5. Applied by aircraft except as follows:

a. The flow of liquid to aircraft nozzles shall be controlled by a positive shutoff system as follows:

i. Each individual nozzle shall be equipped with a check valve and the flow controlled by suckback device or a boom pressure release device; or

ii. Each individual nozzle shall be equipped with a positive action valve.

b. Aircraft nozzles shall not be equipped with any device or mechanism which would cause a sheet, cone, fan, or similar type dispersion of the discharged material except as otherwise provided.

DRIFT CONTROL REQUIREMENTS FOR METHYL PARATHION APPLIED TO RICE-1995

c. Aircraft boom pressure shall not exceed 40 pounds per square inch.

d. Aircraft nozzles shall be equipped with orifices directed backward parallel to the horizontal axis of the aircraft in flight.

e. Fixed wing aircraft and helicopters operating in excess of 60 miles per hour shall be equipped with jet nozzles having an orifice of not less than 1/8 inch diameter.

f. Working boom length on fixed wing aircraft shall not exceed 3/4 of the wing span; the working boom length of helicopters shall not exceed 6/7 of the total rotor length or 3/4 of the total rotor where the rotor length exceeds 40 feet.

g. Helicopters operating at 60 miles per hour or less shall be equipped with:

i. Nozzles having an orifice not less than 1/8 inch in diameter. A number 46 (or equivalent) or larger whirlplate may be used; or

ii. Fan nozzles with a fan angle number not larger than 80 degrees and a flow rate not less than one gallon per minute at 40 pounds per square inch pressure (or equivalent).

B. Special precautions should be taken to avoid off-site deposition of liquid formulations of pesticides when applications are made adjacent to agricultural drains.

ATTACHMENT 11

DRIFT CONTROL REQUIREMENTS FOR METHYL PARATHION APPLIED TO RICE-1995

II. Ground Applications - Ground equipment other than handguns shall be equipped with

A. Nozzles having an orifice not less than 1/16 inch in diameter or equivalent, and operated at a boom pressure not to exceed 30 pounds per square inch; or

B. Low pressure fan nozzles with a fan angle number not larger than 80 degrees and fan nozzle orifice not smaller than 0.2 gallon per minute flow rate or equivalent, and operated at a boom pressure not to exceed 15 pounds per square inch.

Appendix B

RICE PESTICIDES PROGRAM: REQUIRED HOLDING TIMES (1994 and 1996)
(1994 represents the most recent program different from the 1995 and 1996 program.)

HOLDING TIMES (days)						
		SACRAMENTO VALLEY			SAN JOAQUIN VALLEY	
		Standard Hold	Water-short Areas*	Hydrologically Isolated Fields	Standard Hold	Hydrologically Isolated Fields
Molinate	1994	28	8	-	8	-
	1996	28	11	11	11	11
Thiobencarb:						
Bolero	1994	30	6	-	6	-
	1996	30	19	6	19	6
Abolish	1994	19, preflood 30, pinpoint & drill seeded	6	-	6	-
	1996	19, all applications	19	6	19	6
Carbofuran	1994	28	-	-	28	-
	1996	28	-	-	28	-
Methyl parathion	1994	24	-	-	24	-
	1996	24	-	-	24	-
Malathion	1994	4, voluntary	-	-	4, voluntary	-
	1996	4, voluntary	-	-	4, voluntary	-

*Water-short areas of the Sacramento Valley include Placer County and parts of western Yolo County.
Closed systems (tailwater recovery systems) and water ponded on fallow land must meet different (shorter) holding times than indicated on this table. The program requirements for these areas are the same for the 1994 and 1996 programs.

Appendix C

State of California

APPENDIX C

Memorandum

To : County Agricultural Commissioners from Rice Producing Counties

Date: March 24, 1995

Place: Sacramento

Phone: (916) 324-4265

From : **Department of Pesticide Regulation** · John Sanders, Branch Chief
Environmental Monitoring and Pest Managemer

Subject : Rice Pesticides Program
Follow-up on Seepage Water Management Voluntary Guidelines

The 1995 rice pesticide permit conditions were recently mailed to y office with a cover letter dated March 20 and signed by Jim Wells. That letter referred to forthcoming information regarding voluntary guidelines for seepage water management. My staff, with input from representatives of the rice industry, county agricultural commissioners, United States Department of Agriculture (USDA), and others, developed the attached seepage water management voluntary guidelines which are meant to be reproduced and handed out when issuing permits for the use of rice pesticides. Your assistance in this matter is greatly appreciated.

Additionally, for growers interested in technical specifications on berm construction, a second handout is provided from the USDA Natura Resources Conservation Service entitled "Closed Rice Water Managemen Systems". This handout was developed for the California Rice Water Quality Demonstration Project to describe specifications for various closed systems, but it includes useful technical specifications for sound berm construction as well. We are supplying you with camera-ready copies of this handout so your office can make good reproductions for interested growers.

Should you have any questions, please contact Nan Gorder at (916) 324-4265 or Marshall Lee at (916) 324-4269.

for

John S. Sanders
Branch Chief
(916) 324-4100

Printed on Recycled Paper

SURNAME

SEEPAGE WATER MANAGEMENT: VOLUNTARY GUIDELINES

What is seepage?

Movement of water through a rice field levee to an adjacent area.

Why is seepage water a problem?

Seepage water can contain high concentrations of molinate, carbofuran, and potentially other chemicals as well, during the holding periods. If this water is allowed to reach agricultural drains, it could impact efforts to meet performance goals and result in toxicity to aquatic organisms.

What evidence is there to indicate seepage water contains pesticides?

Molinate was detected in rice seepage water from six out of six sites with concentrations ranging from 44 to 1300 parts per billion (ppb). Carbofuran was detected in rice seepage water collected from three out of three sites with concentrations ranging from 0.4 to 11 ppb. (Water samples were simultaneously collected from adjacent fields and carbofuran concentrations were as high or higher than in seepage water.) The current performance goal in the agricultural drains for molinate is 10 ppb and for carbofuran is 0.4 ppb.

Two demonstration sites were set up with tarps covering the seepage area to prevent molinate deposition from drift. Concentrations of molinate from these sites ranged from 37 to over 700 ppb (corrected for background concentrations).

Why are growers being asked to make voluntary efforts to control seepage water?

The Central Valley Regional Water Quality Control Board and the Department of Pesticide Regulation believe it is important that the rice growing community become aware of the potential impact of contaminated seepage water reaching the agricultural drains and have the opportunity to voluntarily address the problem. *If these voluntary efforts are sufficient to minimize the impact of seepage water on the agricultural drains, no future regulatory action will be needed.*

VOLUNTARY GUIDELINES

1. Prevent seepage water from leaving the rice field during the holding period through loosely constructed levees by
   - running a tractor tire or track on top of existing border levees, and
   - ensuring that newly constructed levees are built with mineral soils (not organic matter and plant residues), adequate width, and solid cores (when building levees, run tractor tire or track on top to firm up core of check). Double berming is another method of containing seepage.
   - using technical recommendations for levee construction offered by the USDA in a handout entitled "Closed Rice Water Management Systems," available from your county agricultural commissioner.

2. Prevent water in seepage areas from reaching the drains during the holding period by
   - directing or pumping seepage water to fallow land, and
   - blocking the exit of water from the seepage ditch to agricultural drains.

3. Communicate with applicators to establish the common goal of keeping drift away from seepage ditches, drains, border levees, and roads. Dry material on roads and dry ground is considered to be environmental contamination with the applicator liable for a civil penalty. This material remains viable and any runoff from these areas during wet weather should be held on your property to avoid contaminating agricultural drains.

4. Prevent leakage from levees by inspecting and repairing rodent damage during the holding periods.

tion and adjustments in basin water depth. A pump with pipeline or return ditch is used to convey the tail water back to an upper level rice basin. The minimum sump storage requirement shall be the volume of runoff generated by the normal flow off the bottom weir for 12 hours or 20 percent of the irrigation inflow for 12 hours, whichever is greater. The recirculating pump shall have a capacity equal to or greater than the mean inflow rate.

Static Water Systems - Systems that independently supply water to each basin within the field. Flap-gated inlet pipes or other devices keep pesticide treated water on the field and out of public water ways. It operates on the principle of a variable demand supply, only the amount of water needed to replace evapotranspiration and other losses is placed in each basin either from:

(i) a source ditch with flashboard weirs in the ditch and flap-gated inlet pipes into each basin, or

(ii) a pipeline or ditch with adjustable inlet float control valves into each basin.

Irrigation water in the supply ditch shall be protected from contamination by means of flap gates and other such anti-back flow devices as are appropriate. The flap gates help to keep pesticide treated field water out of the supply ditch and out of public waterways. The capacity of the static system shall be adequate to flood up the basin to the desired depth in 3 days or less.

SYSTEM OPERATION

The owner or producer is responsible for the preparation and implementation of an operation and maintenance plan. The plan will include sufficient instructions to insure that the system achieves its intended purpose.

Revised 11/94

USDA NRCS Design Standards:

587 - Water Control Structures
430 - Irrigation Pipelines
388 - Field Ditches
356 - Dikes
464 - Land Leveling
206 - Rice Water Management Systems

Contact your local USDA Natural Resources Conservation Service:

Auburn	(916) 823-6830
Colusa	(916) 458-2931
Willows	(916) 934-4601
Woodland	(916) 662-2037
Yuba City	(916) 674-1461

Contact your local USDA Consolidated Farm Services Agency for cost-sharing information.

Contact your local U.C. Cooperative Extension Office or ANR Publications at (510) 642-2431 for the following publications:

Rice Irrigation Systems for Irrigation Water Management. Cooperative Extension, University of California, 1994 Pub #21490

Rice Production in California. Cooperative Extension, University of California, 1992 Pub #21498

Integrated Pest Management for Rice. Second Edition, University of California, Statewide IPM project, 1993 Pub # 3280

Engineering Standards and Specifications for

Closed Rice Water Management Systems

California Rice Water Quality Demonstration Project

U.S. Natural Resources Conservation Service

in cooperation with
University of California, Cooperative Extension
and the
Consolidated Farm Services Agency

Closed Rice Water Management Systems

DEFINITION

A closed rice water mangement system is defined as a planned system of level basins or checks in which all necessary structures have been installed for the efficient distribution of irrigation water and containment of rice pesticides.

The standards and specifications described herein refer to the following systems;

Recirculating (tail water recovery) - A flow-through system where water is applied to the upper basin and allowed to flow over weirs through a series of lower basins to a collection point where it is pumped back to an upper level basin or supply ditch for reuse.

Static (Pearson) - A system where water is independently delivered to each basin within a field via a ditch or pipeline usually along one side of the field. Water enters each basin through flap-gated inlet pipes or other antibackflow devices which keep pesticide treated field water within the basin and out of public waterways.

Selection of a specific irrigation water management system is dependent on soil type, slope, aspect (wind direction), and water delivery. No less important is the ability to hold irrigation water for the prescribed period of time necessary for the effective dissipation of pesticides. The following standards and specifications are intended to give the producer a working knowledge of system design and function. Natural Resources Conservation Service should be consulted prior to actual design work or implementation.

DESIGN CRITERIA

All closed rice water management systems described herein are designed to contain pesticide treated water within the system for the required holding period. All drainage outlet gates and structures that can discharge water are designed such that they can be sealed during the holding period.

STANDARDS

Land Grading

- Rice only - 0.02 to 0.05 feet per 100
- Rice-row crop rotation 0.05 to 0.2 feet per 100
- Basin elevation difference not > 0.3 feet

Basin size

- Determined by maximum difference in water depth and wind.
- Where wind is a factor levees shall be closely spaced and if possible at 90 degrees to the prevailing winds. Maximum basin size is recommended at 20 acres.

Drainage

- Provisions to drain must be developed.
- Basins to be drained in a single direction no longer than 660 feet.
- Supply ditch or pipeline can serve as the drainage outlet when water control structures can be held open.
- Drainage structures shall be capable of draining basin in less than 3 days.

Dikes (Levees)

- Mineral soil only (plant residues and organic matter create seepage problems).
- Basin levees where the maximum vertical interval between checks is < 0.5 feet - minimum top width = 2 feet.
- Minimum settled height is the depth of ponding plus 0.5 feet with side slopes of 1.5 horizontal to 1 vertical.

Field perimeter dikes (levees)

- Minimum top width of 13 feet, where access is needed, 4 feet without access. Minimum height = ponding depth + 1.24 feet.
- Minimum side slope of 2 horizontal to 1 vertical constructed,
- Where dikes constitute boundaries of downslope fields, and
- Where vertical intervals between basins exceed 4 feet from top to bottom basin.

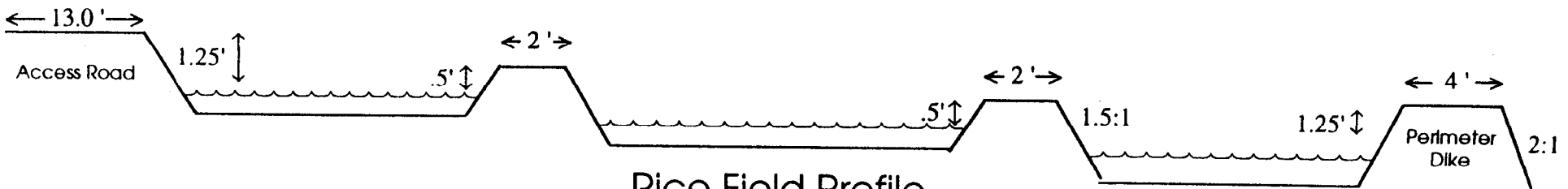
Water Control Structures

Flash board weirs, float control valves, other. Capacity adequate to meet the following:

- Irrigation flow - providing a continuous flooding depth of 4 to 6 inches during stand establishment.
- Field Drainage - to drain the basin within 10 days.
- Storm runoff - capable of draining the runoff produced by a 10-year 24 hour storm within 2 to 3 days (1.7").

SYSTEM DESCRIPTION WATER SUPPLY

Recirculating (tail water recovery) Systems are used with flow-through basins connected in series, where the water depth is controlled by rice boxes or other weirs placed in the levees. A storage sump or ditch is used to provide a buffer for tailwater due to variations in evapotranspira-



Rice Field Profile

Appendix D

California Environmental Protection Agency
Department of Pesticide Regulation
Environmental Monitoring and Pest Management
1020 N Street, Room 161
Sacramento, California 95814
February 22, 1996

1996 RICE PESTICIDES MONITORING PROGRAM PROTOCOL - COLUSA BASIN DRAIN

The 1996 Rice Pesticides Monitoring Program is a cooperative effort between the California Rice Industry Association (CRIA), and the Department of Pesticide Regulation (DPR). The standard operating procedures for this year's monitoring program have changed with respect to the sampling agency and collection methods, however the sampling locations, number of samples, and frequency of sampling remain unchanged from that of the 1995 program. The sampling schedule, estimated number of samples, sample collection and transportation methods, and chain of custody procedures with respect to the Colusa Basin Drain monitoring site (CBD5) only, are described below.

The monitoring program will begin with background sampling two to three weeks prior to the first applications of carbofuran in the region (usually early to mid-April). These samples will be collected by DPR personnel. Surface water sampling and water quality measurements will be performed twice weekly, by a CRIA consultant, for a period of ten weeks following initial field flooding. The predicted sampling schedule is presented in Table 1. The total number of samples for CBD5 only is estimated in Table 2.

Table 1. Sampling schedule for the 1996 Rice Pesticides Monitoring Program

DATE	SITE (CBD5)	
	Day 1	Day 2
Background (2 to 3 weeks prior)	I[a] + toxicity + quality control set	Not sampled
Week 1	II[b]	III[c]
2	II	III
3	II	III
4	II	III
5	II	III
6	II	III
7	II	III
8	I	III
9	I	III
10	I	III

a) Schedule I: molinate, thiobencarb, carbofuran, methyl parathion and malathion.
b) Schedule II: molinate, thiobencarb, carbofuran, methyl parathion and malathion + toxicity.
c) Schedule III: schedule I + quality control set for all chemicals.

Table 2. Estimated number of primary samples from CBD5 for the 1996 Rice Pesticides Monitoring Program

DATE	MOLINATE	THIOBENCARB	CARBOFURAN	METHYL PARATHION & MALATHION†	TOXICITY
Background	2(1)	2(1)	2(1)	2(1)	1
Week 1	3 (1)‡	3 (1)	3 (1)	3 (1)	1
2	3 (1)	3 (1)	3 (1)	3 (1)	1
3	3 (1)	3 (1)	3 (1)	3 (1)	1
4	3 (1)	3 (1)	3 (1)	3 (1)	1
5	3 (1)	3 (1)	3 (1)	3 (1)	1
6	3 (1)	3 (1)	3 (1)	3 (1)	1
7	3 (1)	3 (1)	3 (1)	3 (1)	1
8	3 (1)	3 (1)	3 (1)	3 (1)	0
9	3 (1)	3 (1)	3 (1)	3 (1)	0
10	3 (1)	3 (1)	3 (1)	3 (1)	0
TOTALS	**32 (11)**	**32 (11)**	**32 (11)**	**32 (11)**	**8**

†) Methyl parathion and malathion are analyzed from a single sample.
‡) Numbers in parentheses indicate the number of samples taken for quality control under schedule I.

Total Chemical Analyses = 128 samples
Toxicity (1 sample/wk x 8 wks) = 8 samples

Total = 136 samples

Sampling Methods

Excluding the background samples, all sampling for the 1996 season will be performed by a CRIA consultant. As standard operating procedure, all sampling personnel will wear rubber gloves during sampling and if contamination is suspected, the gloves will be replaced. Every attempt will be made to avoid both disturbing the bottom of the agricultural drain and sampling areas of the drain with no observable flow. All bottles and chain of custody records (COCs) will be provided by DPR.

Samples will be collected using a Kemmerer water sampler (stainless steel and Teflon® model) at a depth equal to one-half the water column. The Kemmerer has a capacity of 1.5 liters, and a composite sample consisting of the appropriate number of sub-samples are to be deposited in a stainless steel container provided by DPR. The volume of water collected is determined by the sampling schedule number (Attachment 1). The composite sample will then be homogenized and split into 1-liter amber bottles with Geotech water splitter provided by DPR. A COC will accompany each sample bottle. Samples will then be stored on wet or blue ice (4°C). All sampling equipment is to be cleaned immediately after sampling.

Samples to be analyzed for carbofuran and methyl parathion/malathion will be acidified with 3N HCl to a pH between 3.0 and 3.5 for increased sample stability during storage. All samples will be stored on wet or blue ice (4°C) until delivered to the laboratory for analyses. The toxicity samples and backups will be collected as part of the primary volume of water. Backup samples will be collected and held in storage (4°C) until the initial data analysis is complete.

Rinse blanks for each monitoring site will be prepared by pouring 4.5 liters of deionized water over the cleaned sampling equipment and collecting the resultant rinse water. The rinse water is then to be transferred to four 1-liter amber bottles and submitted for analyses with the primary samples. This process will occur in weeks three, six, and nine for a total of three samples per target chemical.

Water temperature, pH, and dissolved oxygen will be measured at each monitoring site during all sampling periods and the data recorded on the water quality sheet provided by DPR (Attachment 2).

Sample Delivery

Samples are to be delivered to DPR's West Sacramento facility after each monitoring event. Schedule II event samples (toxicity only) will be delivered by the CRIA consultant to CDFG's Aquatic Toxicology Laboratory (ATL) in Elk Grove by close of business on Tuesday of each week.

RICE PESTICIDES MONITORING 1996

SCHEDULE I (molinate, thiobencarb, carbofuran, methyl parathion, malathion)
9 liters total

Primaries
1) molinate (ME)
2) thiobencarb (TB)
3) carbofuran (CN)
4) methyl parathion/malathion (MP/MN)

Backups
5) acidified (BA1)
6) acidified (BA2)
7) unacidified (BU1)
8) unacidified (BU2)
9) water quality

SCHEDULE II (molinate, thiobencarb, carbofuran, methyl parathion, malathion + toxicity)
12 liters total

Primaries
1) molinate (ME)
2) thiobencarb (TB)
3) carbofuran (CN)
4) methyl parathion/malathion (MP/MN)

Backups
5) acidified (BA1)
6) acidified (BA2)
7) unacidified (BU1)
8) unacidified (BU2)
9) water quality
+
Toxicity tests (3, 1-liter amber bottles)

SCHEDULE III (molinate, thiobencarb, carbofuran, methyl parathion, malathion + quality control set)
12 liters total

Primaries
1) molinate (ME)
2) thiobencarb (TB)
3) carbofuran (CN)
4) methyl parathion/malathion (MP/MN)

Quality Control
5) molinate/thiobencarb (ME/TBX)
6) carbofuran (CNX)
7) methyl parathion/malathion

Backups
8) acidified (BA1)
9) acidified (BA2)
10) unacidified (BU1)
11) unacidified (BU2)
12) water quality

RINSE BLANKS
4 liters total

1) molinate (ME)
2) thiobencarb (TB)
3) carbofuran (CN)
4) methyl parathion/malathion (MP/MN)

WATER QUALITY SHEET

STUDY NUMBER
1996 RICE PESTICIDES MONITORING PROGRAM

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
DEPARTMENT OF PESTICIDE REGULATION
ENVIRONMENTAL HAZARDS ASSESSMENT PROGRAM
1020 N STREET, ROOM 161
SACRAMENTO, CALIFORNIA 95814-5624

DATE/TIME: _____ CREW: _____

LOCATION: _____

WATER TEMPERATURE: _____ AIR TEMPERATURE: _____

DISSOLVED OXYGEN: _____ CALIBRATED AT: _____

WATER pH: _____ NUMBER DROPS OF 3 N HCl ____ TO A pH OF _____

COMMENTS:

_____

_____

_____

_____

_____

_____

WATER DEPTH: _____ VOLUME H_2O COLLECTED:_____

Appendix E

STATE OF CALIFORNIA
DEPARTMENT OF FISH AND GAME

APPENDIX E

AQUATIC TOXICOLOGY LABORATORY

9300 Elk Grove-Florin Road
Elk Grove, California 95624

Lab No. P-1790

Date Received: 04/01/96 04/23/96 04/30/96 05/07/96 05/14/96 05/20/96 05/21/96 05/28/96 06/04/96

E.P. No._____

Sample:

To: Mr. Brian Finlayson, ES IV

Report Date: 10/01/96

ADDRESS: Pesticide Investigation Unit
1701 Nimbus Road, Suite F
Rancho Cordova, CA 95670

Remarks: Water samples were collected by Department of Pesticide Regulation (DPR) staff from April 1 - June 4, 1996, during a routine pesticide and toxicity monitoring study of Colusa Basin Drain. Samples were analyzed for pesticides by DPR staff and water quality and acute toxicity were determined by DFG staff. The control water was prepared by diluting commercial spring or mineral water with high-purity deionized water. Static toxicity tests (96-h) were performed on the undiluted water samples with 48-h renewal of test solutions; tests were performed using the cladoceran *Ceriodaphnia dubia*.

RESULTS OF EXAMINATION

Water Quality Parameters

Water samples were analyzed for specific conductivity, total alkalinity , total hardness and total ammonia (Table 1). The water quality data did not indicate any specific condition considered deleterious to the test organism.

Pesticide Residues

Water samples were analyzed by DPR for five pesticides: molinate, thiobencarb, carbofuran, methyl parathion and malathion. All five pesticides were found in detectable concentrations during the study period (Table 2). Malathion was first detected on April 23, followed by molinate on May 7. All the pesticides were present in water samples from May 14 to June 4, except malathion which was absent on May 21, and carbofuran and methyl parathion which were absent on June 4.

All but one of the undiluted samples from CBD5 showed no statistically significant mortality to *C. dubia* (Table 1). The sample that caused significant mortality (May 28) contained pesticide concentrations well below the LC_{50} except for malathion which was present at approximately four to five times the acute LC_{50} (Norberg-King et al, 1991); it is very likely that malathion was responsible for the mortality in the sample collected on May 28, 2996. Blind blanks from May 20 (#142-0086) and May 21 (#142-0089) induced no mortality but blanks #142-0586 and 142-0568, both containing 4.0 $\mu g\ L^{-1}$ malathion, caused 100% mortality. Control mortality never exceeded 10% over the study period in any of the toxicity tests.

PESTICIDE INVESTIGATIONS UNIT
ENVIRONMENTAL SERVICE DIVISION

By _____
Charlie Huang
Environmental Specialist II

cc: John Sanders
Department of Pesticide Regulation
Sacramento, California

Huang:CH

File: C. Huang, ATL; PIU Chron

REFERENCES

Norberg-King, T.J., E.J. Duran, G.T. Ankley, and E. Robert. 1991. Application of toxicity identification evaluation procedures to the ambient waters of the Colusa Basin Drain, California. Environmental Toxicology and Chemistry. 10:891-900.

APPENDIX E

Table 1. Water quality and acute toxicity of undiluted sample to the cladoceran *Ceriodaphnia dubia*.

Sample Number	Sample Type	Percent Survival		Water Quality[a]			
		Control Water	Undiluted Sample	Alkalinity	Hardness	Conductivity	Ammonia
S040196-1	Water	100	100	248	272	841	0.077
S042396-1	Water	100	100	166	160	521	0.077
S043096-1	Water	100	100	205	211	788	<0.050
S050796-1	Water	95	100	130	130	484	0.056
S051496-2	Water	90	100	159	163	526	<0.050
S052096-1	Water[b]	100	100	18	17	49	<0.050
S052096-2	Water[b]	100	0*	18	16	49	<0.050
S052196-1	Water	100	100	132	129	431	<0.050
S052196-2	Water[b]	100	0*	19	16	48	<0.050
S052196-3	Water[b]	100	100	19	17	50	<0.050
SO52896-1	Water	100	0*	177	236	889	<0.050
SO60496-1	Water	90	100	180	199	740	0.058

[a] Total alkalinity and total hardness reported in mg/L $CaCO_3$; specific conductivity reported in µS/cm; and total ammonia reported in mg/L N.

[b] Blind blank

* Survival significantly less than the control group ($P < 0.05$).

APPENDIX E

Table 2. Pesticide residues of undiluted water samples from the 1996 Rice Toxicity Study using the cladoceran *Ceriodaphnia dubia*.

Sample ID	DPR #	Pesticide Residues[a]				
		Molinate[b]	Thiobancarb	Carbofuran	Methyl parathion	Malathion
S040196-1	142-0601	ND	ND	ND	ND	ND
S042396-1	142-0602	ND	ND	ND	ND	0.990
S043096-1	142-0603	ND	ND	(ND)	ND	ND
S050796-1	142-0605	1.11	ND	ND	ND	ND
S051496-2	142-0604	12.23	1.5	0.61	0.122	0.594
S052096-1	142-0086 (blind blank)	--	--	--	--	--
S052096-2	142-0586 (blind blank)			4.0		
S052196-1	142-0608	41.25	5.0	0.26	0.07	ND
S052196-2	142-0568 (blind blank)			4.0		
S052196-3	142-0089 (blind blank)					
S052896-1	142-0900	28.20	7.7	1.15	0.059	6.00
S060496-1	142-0901	21.80	3.0	ND	ND	0.125

[a] Pesticide residue data (in μg/L) provided by Department of Pesticide Regulation.
[b] 48-hr LC_{50} ($\mu g\ L^{-1}$) for *C. dubia*: Molinate, 9130: Thiobencarb, 510; Carboxyfuran, 2.6; Methyl Parathion, 2.6; Malathion, 1.4.

Appendix F

CALIFORNIA DEPARTMENT OF PESTICIDE REGULATION
Environmental Hazards Assessment Program (EHAP)

Laboratory Project Plan for the 1996 Rice Pesticides Monitoring Program

February 1996

Organization and Responsibility

Kaylynn Newhart is assigned EHAP laboratory liaison for the Department of Pesticide Regulation. Her duties include: reviews laboratory QA/QC plans and QA reports; meets or communicates with field sampling consultant and sample custodian to evaluate progress and resolve problems; submits QA reports to Nan Gorder.

Nan Gorder is assigned agency contact person for the Department of Pesticide Regulation. Her duties include the overall responsibility of agency communications concerning this monitoring project.

All laboratories shall assign one contact person to report all information including analytical data to Kaylynn Newhart.

Protocol

The monitoring program shall follow the approved written EHAP protocol (Appendix 1). Changes to the protocol must be approved by the EHAP.

Quality Assurance Objectives

Each laboratory will use their method detection limit (MDL), instrument detection limit (IDL) and a reporting limit (RL) for each analyte as documented in their approved 1995 analytical method.

Method Validation

The mean and standard deviation (s) values from the 1995 method validation study will be used to set warning and control limits at +\- 2s and +\- 3s, respectively. **Each laboratory will be required to notify the EHAP laboratory liaison of any changes or procedures made to the 1995 analytical method before analyzing any field samples.**

Accuracy is defined as a determination of how close the measurement is to the true value and is often described as percent recovery. Accuracy is to be expressed as Percent Recovery (%). All calculated values for accuracy shall be presented with the analytical results. The equation for calculating Percent Recovery is as follows:

$$\text{Percent Recovery (\%)} = \frac{\text{sample concentration}}{\text{matrix spike concentration}} \times 100$$

Accuracy will be assessed by requiring each laboratory to analyze **two** matrix spike samples per analyte for each extraction set of up to twelve field samples (Appendix 2).

Accuracy control charts will be plotted by EHAP for each chemical and method and for each control sample matrix. The warning and control limits are established as listed in the method validation section. If any continuing quality control spike recovery is not within the limits of these criteria, the following is required:

1. A check shall be made to be sure there are no errors in calculations, surrogate solutions, and internal standards. A check shall also be made on instrument performance.

2. All affected data shall be recalculated and/or the extract shall be reanalyzed if any of the above checks reveal a problem.

3. All affected samples shall be reextracted and reanalyzed if none of the above is identified as a problem.

4. All analytical data shall be flagged as "suspect" if the accuracy still does not fall within the limits of the above criteria. The laboratory QA officer shall notify the EHAP QA officer within 1 working day after discovery of "suspect" data.

5. If an unacceptable value cannot be corrected, additional samples may be analyzed to determine the validity of the original sample results.

The calibration curve should be prepared such that one standard is at the reporting limit and one is higher than the highest expected amount. If after initially shooting the sample extract the concentration of the analyte falls outside the calibration range, the sample should be diluted so it falls within the calibration range. **Each laboratory shall notify the EHAP laboratory liaison of any changes in their 1995 calibration procedures.** As an interlaboratory quality control check a minimum of ten percent of the total samples collected will be analyzed by a second laboratory for verification. CDFA laboratory will analyze split samples for molinate, thiobencarb and carbofuran. ALTA Analytical laboratory will analyze splits for methyl parathion and malathion.

In addition, two rinse blanks per week will be submitted to check for potential field contamination while blind matrix spike samples will be routinely submitted to each laboratory to check for accuracy.

Background surface water will be provided by EHAP to the laboratories and used for control and fortification samples.

Backup field samples collected and stored during the study may be analyzed if sample breakage occurs or if sample results between the primary and quality control laboratories are dissimilar.

Audits of the field sampling and lab analysis may be conducted.

Reporting

Results of field sample and continuing quality control analyses shall be reported to the EHAP laboratory liaison within **21 days of the date samples are received at each laboratory**. Each laboratory shall submit legible, organized reports which contain analytical results of all samples received from EHAP. Analytical results are to be expressed as ug/L to three significant figures for all samples. Positive matrix blank results shall be reported. Do not correct field sample results for background levels. Indicate if the results have been adjusted for spike recoveries. **Each laboratory shall notify the EHAP laboratory liaison of any changes in their 1995 procedures for reporting sample results including number rounding procedures.** The report shall evaluate the quality of the individual sample data, based on the method validation analyses. The reports shall include the following:

1. Chain of custody (COC) forms; all analytical results are to be reported on the COC, including the name of the person extracting and analyzing the sample, date of extraction and the date of analysis for each sample
2. Records of any quality assurance problems and questions pertaining to the samples analyzed
3. Calculations of accuracy
4. Reporting Limit (RL); for those samples that contain no detectable amount, write "ND" and indicate the RL
5. Case narrative, if the data requires it

In addition, the laboratory shall be prepared to provide to the EHAP QA officer all sample custody paperwork, records of times and dates of analyses, and raw data pertaining to both the analyses and the quality control checks within 10 working days after the information is requested.

Archives

All backup samples and sample extracts shall be stored frozen or refrigerated until EHAP authorizes their disposal.

All raw data, including chromatograms, memoranda, notes, worksheets, and calculations that are necessary for the reconstruction and evaluation of the study shall be archived at each respective laboratory for at least three years.

APPROVALS

Field Consultant

Kaylynn Newhart
EHAP Laboratory Liaison

Catherine Cooper
Calif. Dep. Food & Ag. Laboratory

Sharon Pierson
ALTA Analytical Laboratory

Daniel Killingsworth
Zeneca Ag Products, Inc.

Alan Smith
FMC Laboratory

Charles Green
Valent Dublin Laboratory

Appendix 2

1996 Rice Pesticide Continuing Quality Control Procedures

Using background surface water, each laboratory will generate and analyze the following blank matrix and matrix spikes with each extraction set in order to determine accuracy over the duration of the study. All continuing quality control data will be submitted to the EHAP laboratory liaison ***with each extraction set****. Make sure individual field sample numbers are clearly identified with each set.*

Methyl Parathion and Malathion

	CDFA	*ALTA*
1 blank and 2 matrix spikes	*0.2 ppb*	*0.2 ppb*

Molinate

	Zeneca	*CDFA*
1 blank and 2 matrix spikes	*5.0 ppb*	*5.0 ppb*

Thiobencarb

	Valent	*CDFA*
1 blank and 2 matrix spikes	*1.0 ppb*	*1.0 ppb*

Carbofuran

	FMC	*CDFA*
1 blank and 2 matrix spikes	*1.0 ppb*	*0.5 ppb*

Performance Goals for the 1996 Rice Pesticide Study

Methyl Parathion	0.13 ppb
Malathion	0.1 ppb
Molinate	10 ppb
Thiobencarb	1.5 ppb
Carbofuran	0.4 ppb

Attachment 1

RICE PESTICIDES MONITORING 1996

(Schedule definitions and sample identification codes)

SCHEDULE I (molinate, thiobencarb, carbofuran, methyl parathion, malathion)
9 liters total

Primaries
1) molinate (ME)
2) thiobencarb (TB)
3) carbofuran (CN)
4) methyl parathion/malathion (MP/MN)

Backups
5) acidified (BA1)
6) acidified (BA2)
7) un-acidified (BU1)
8) un-acidified (BU2)
9) water quality

SCHEDULE II (molinate, thiobencarb, carbofuran, methyl parathion, malathion + toxicity)
10 liters total

Primaries
1) molinate (ME)
2) thiobencarb (TB)
3) carbofuran (CN)
4) methyl parathion/malathion (MP/MN)

Backups
5) acidified (BA1)
6) un-acidified (BU1)

Toxicity
7) toxicity
8) toxicity
9) toxicity
10) water quality

SCHEDULE III (molinate, thiobencarb, carbofuran, methyl parathion, malathion + quality control set)
10 liters total

Primaries
1) molinate (ME)
2) thiobencarb (TB)
3) carbofuran (CN)
4) methyl parathion/malathion (MP/MN)

Quality Control
5) molinate/thiobencarb (ME/TBX)
6) carbofuran (CNX)
7) methyl parathion/malathion (MP/MNX)

Backups
8) acidified (BA1)
9) un-acidified (BU1)
10) water quality

RINSE BLANKS
4 liters total

1) molinate (ME)
2) thiobencarb (TB)
3) carbofuran (CN)
4) methyl parathion/malathion (MP/MN)

Attachment 2

WATER QUALITY SHEET

STUDY NUMBER
1996 RICE PESTICIDES MONITORING PROGRAM

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
DEPARTMENT OF PESTICIDE REGULATION
ENVIRONMENTAL HAZARDS ASSESSMENT PROGRAM
1020 N STREET, ROOM 161
SACRAMENTO, CALIFORNIA 95814-5624

DATE/TIME: _____ CREW: _____

LOCATION: _____

WATER TEMPERATURE: _____ AIR TEMPERATURE: _____

DISSOLVED OXYGEN: _____ CALIBRATED AT: _____

WATER pH: _____ NUMBER DROPS OF 3 N HCl ____ TO A pH OF _____

COMMENTS:

_____

_____

_____

_____

_____

_____

WATER DEPTH: _____ VOLUME H_2O COLLECTED: _____

Appendix G

Summary of Emergency Releases 1996

County	Grower	Chemical	Release Date	Acres Released	Reason
Yolo	Gary Schaad	Ordram	20-Jun	68.5	Salt pH
Placer	Jeff & Cindy Vogt	Furadan, Abolish	18-May	33	Rain/Wind
Sutter	Allen Catlett	Furadan	16-May	88	Rain/Wind
Sutter	Alan Hawkins	Furadan	17-May	18	Rain/Wind
Sutter	Niegal Farms	Bolero	17-May	109	Rain/Wind
Sutter	Niegal Farms	Bolero	17-May	34	Rain/Wind
Sutter	Niegal Farms	Bolero	17-May	20	Rain/Wind
Sutter	Shannon Farms	Furadan	17-May	166	Rain/Wind
Sutter	FJR Farms	Furadan	17-May	95	Rain/Wind
Sutter	Jason Farms	Furadan	18-May	120	Rain/Wind
Sutter	Tom Amarel	Furadan	18-May	75	Rain/Wind
Sutter	Rai Ranches	Furadan	20-May	103	Rain/Wind
Sutter	Schmidl Bros	Ordram	21-May	285	Rain/Wind
Sutter	Penning Farms	Ordram	21-May	67	Rain/Wind
Sutter	Nock Farm Inc.	Furadan, Bolero	22-May	124	Rain/Wind
Sutter	Reggie Singh	Furadan	22-May	397	Rain/Wind
Sutter	Quad H Ranches	Thiobencarb	23-May	108	Rain/Wind
Sutter	J & A Farms	Ordram	23-May	300	Rain/Wind
Sutter	RD 1001	Furadan, Bolero, Ordram	23-May	540 Acre Feet	Rain/Wind
Sutter	Jim & Scott Leathers	Bolero	23-May	35	Rain/Wind
Sutter	Howard Farms	Ordram	23-May	110	Rain/Wind
Sutter	Hunt Farms	Furadan, Bolero	24-May	72	Rain/Wind
Sutter	Hunt Farms	Furadan, Bolero	24-May	72	Rain/Wind
				2398	
Glenn	Joe Macon	Furadan	17-May	47	Rain/Wind
Glenn	Josama Farms	Ordram, Bolero	17-May	96	Rain/Wind
Glenn	Leonard Kaiser	Ordram	17-May	95	Rain/Wind
Glenn	Mike Landberg	Ordram	17-May	50	Rain/Wind
Glenn	Joe Macon	Furadan	17-May	12	Rain/Wind
Glenn	Rick Taresh	Ordram	18-May	102	Rain/Wind
Glenn	Martinellie Farms	Furadan	21-May	60	Rain/Wind
Glenn	McCracken	Ordram	21-May	71	Rain/Wind
Glenn	Daryl Alberico	Ordram	22-May	14	Rain/Wind
Glenn	Daryl Alberico	Ordram	23-May	24	Rain/Wind
Glenn	Bob Packard	Ordram	24-May	125	Rain/Wind
Glenn	Chuck D. Newton	Ordram	27-May	90	
Glenn	Larry Hansen	Ordram	29-May	106	Rain/Wind
Glenn	Canal Farms	Furadan	30-May	104	Rain/Wind
Glenn	Chas E. Newton	Furadan, Ordram	1-Jun	340	Rain/Wind
Glenn	Chuck D. Newton	Ordram	4-Jun	90	Rain/Wind
				1426	

Summary of Emergency Releases 1996 con't.,

County	Grower	Chemical	Release Date	Acres Released	Reason
Butte	CD Farms	Furadan, Ordram	21-May	115	Rain/Wind
Butte	Blackhorse Inc.	Furadan, Ordram	21-May	62.3	Rain/Wind
Butte	Murphy Bros	Thiobencarb	22-May	209	Rain/Wind
Butte	Meyer Farms	Ordram	22-May	88	Rain/Wind
Butte	G & L Farms	Furadan	23-May	18	Rain/Wind
Butte	Mattson Bros	Furadan, Ordram	23-May	90	Rain/Wind
Butte	Leon & Kathy Hammon	Ordram	23-May	227	Rain/Wind
Butte	Doug Wurlitzer	Ordram	23-May	100	Rain/Wind
Butte	Joe Penning	Ordram	25-May	220	Rain/Wind
Butte	Ken Lytle	Furadan, Ordram	26-May	25	Rain/Wind
Butte	Baja Farms	Furadan	28-May	30	Rain/Wind
				1184.3	
Colusa	E. Dan O'Connell	Ordram	18-May	66	Rain/Wind
Colusa	Jiroc	Furadan, Abolish	18-May	79	Rain/Wind
Colusa	J.A. Carrancho	Ordram	18-May	44	Rain/Wind
Colusa	J.A. Carrancho	Ordram	18-May	59.6	Rain/Wind
Colusa	Canal Farms	Ordram, Furadan	19-May	20	Rain/Wind
Colusa	Canal Farms	Ordram, Furadan	19-May	20	Rain/Wind
Colusa	Justin Sites	Ordram	19-May	85	Rain/Wind
Colusa	J.A. Carrancho	Ordram	19-May	146.6	Rain/Wind
Colusa	J.A. Carrancho	Ordram	19-May	35	Rain/Wind
Colusa	Kyle Sites	Ordram, Furadan	5/19/96	36	Rain/Wind
Colusa	Compton/Hansen	Furadan	19-May	246	Rain/Wind
Colusa	Compton/Hansen	Furadan	19-May	137.2	Rain/Wind
Colusa	Canal Farms	Ordram, Furadan	20-May	20	Rain/Wind
Colusa	Conner Ranch	Ordram, Furadan	20-May	98	Rain/Wind
Colusa	Robert Perry	Ordram	21-May	20	Rain/Wind
Colusa	Cordoriz Ranch	Furadan	22-May	67	Rain/Wind
Colusa	Jim LaGrande	Ordram, Furadan, MePara	22-May	198	Rain/Wind
Colusa	Victoria Farms	Furadan	22-May	127.3	Rain/Wind
Colusa	Victoria Farms	Furadan	22-May	151	Rain/Wind
Colusa	Jerry Maltby	Ordram, Furadan	23-May	164	Rain/Wind
Colusa	Mike and Allen Azevedo	Bolero, Furadan	23-May	3	Rain/Wind
Colusa	Mike and Allen Azevedo	Bolero, Furadan	23-May	3	Rain/Wind
Colusa	Dutch Hill Farms	Ordram, Furadan	24-May	140	Rain/Wind
Colusa	George Corbin	Ordram	24-May	115	Rain/Wind
Colusa	Goddard Farms	Furadan	24-May	130	Rain/Wind
Colusa	Perry Bros.	Ordram	26-May	57	Rain/Wind
Colusa	Philip Southam	Bolero	28-May	51	Rain/Wind
Colusa	BrenDeb	Bolero, Furadan	29-May	38.6	Rain/Wind
Colusa	William S. Barrett	Bolero, Furadan	29-May	20	Rain/Wind
Colusa	Johnna Ornbaun, inc.	Ordram	30-May	139.2	Sick Rice

Summary of Emergency Releases 1996 con't.,

County	Grower	Chemical	Release Date	Acres Released	Reason
Colusa	H.A. Andreotti	Ordram	31-May	54	Study pending. Possible salts.
Colusa	H.A. Andreotti	Ordram, Furadan	2-Jun	53	Seeded two times. Rice dying. Problem with Colusa sewer water.
Colusa	Louis H. Kaelin	Ordram	6-Jun	100	Rain/Wind
Colusa	Herman Ceccon Ranch	Ordram, Furadan	7-Jun	19	Rain/Wind Sick rice due to hot weather
Colusa	Herman Ceccon Ranch	Ordram, Furadan	11-Jun	12	Rain/Wind
Colusa	Herman Ceccon Ranch	Ordram, Furadan	11-Jun	12	Rain/Wind
Colusa	Tom Goddard Farms	Ordram	14-Jun	27.6	Scum
Colusa	Tom Goddard Farms	Ordram	14-Jun	22.6	Scum
Colusa	Jim Traynham	Ordram, Furadan	26-Jun	35	Rice is within rice phenoxy zone, deep water to kill weeds. Salinity.
Colusa	Lurline Farms	Ordram	28-Jun	168	Rice dying (reseed)
Colusa	Lurline Farms	Ordram	28-Jun	80	Due to weather condtions
				3099.7	