



Pesticide Reduction Evaluation for Cranberry Bog Drainage in the Grayland Area

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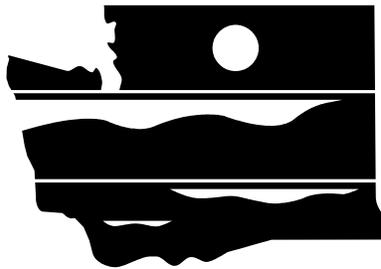
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Pesticide Reduction Evaluation for Cranberry Bog Drainage in the Grayland Area

by
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Abstract

Cranberry farmers along Washington's coast, in the Grayland to North Cove area, have been implementing best management practices. An evaluation of their effectiveness was conducted to measure compliance with water quality criteria during the peak pesticide application period. Three sites were sampled in the Grays Harbor County ditch (GHCDD-1) and six sites in the Pacific County ditch (PCDD-1). Samples were collected one week prior to pesticide application, during the week of peak application, and two weeks following application. Organophosphorus and carbamate pesticides were targeted for evaluation. Data also were made available for chlorinated and nitrogen-containing pesticides that were inadvertently analyzed by the lab.

Past Department of Ecology studies in 1996 and 1998 found concentrations of three organophosphorus pesticides – azinphos-methyl (guthion), chlorpyrifos (lorsban), and diazinon – in water from the ditches that exceeded applicable water quality criteria.

During this current study, July 2 through August 1, 2002, concentrations of multiple pesticides were still found to be exceeding water quality criteria. Although it appears some improvements have been made, best management practices have not gone far enough to bring those pesticides found in 1996 and 1998 to levels within water quality criteria during the growing season.

Two pesticides on the 1998 303(d) list for GHCDD-1, parathion and carbaryl, were not detected during this study and are recommended for removal from the list. The chlorinated pesticide DDT was detected at four of six PCDD-1 sites, while metabolites DDE and DDD were detected at one site in GHCDD-1. A high baseline concentration of diazinon was detected in both ditches during the pre-application period. Caffeine, a common domestic waste constituent, was found in both ditches and is likely from septic system inputs.

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Introduction

South of Grays Harbor, along Washington’s coast, the area between Grayland and North Cove uses ditch systems to drain surface and ground water from cranberry-growing operations and run-off from residential property (Figure 1). Grays Harbor County and Pacific County each manage a ditch system that originates in wetlands near the Grays Harbor/Pacific County line, west of Highway 105. The Grays Harbor County ditch (GHCDD-1) flows north for about 2.8 miles, draining water from around the county line through the Grayland area, and discharges to Grays Harbor’s South Bay. The Pacific County ditch (PCDD-1) flows south for about 5 miles, from around the county line and discharges to the North Cove of Willapa Bay.

During the cranberry-growing season, concentrations of three organophosphorus pesticides – azinphos-methyl (guthion), chlorpyriphos (lorsban), and diazinon – have been reported at levels in water from one or both ditches that exceeded recommended water quality standards (Davis *et al.*, 1997; Anderson and Davis, 2000). In addition, carbaryl, a carbamate pesticide, has been identified as causing water quality concerns. Cranberry growers have been implementing best management practices (BMPs) for some time, and there is a need to evaluate the effectiveness of these measures. Currently, both ditches are on the state’s 1998 303(d) list for not meeting water quality standards or recommended standards for multiple toxic pollutants. The target parameters for this sampling are currently-used pesticides on the state’s 303(d) list.

Table 1. The GHCDD-1 and PCDD-1 303(d) list for surface water.

Waterbody	New WBID	Old WBID	1996 303(d)	1998 303(d)	Parameter
GHCDD-1	AB55IV	None	No	Yes	Carbaryl
GHCDD-1	AB55IV	None	No	Yes	Parathion
GHCDD-1	AB55IV	None	No	Yes	Diazinon
GHCDD-1	AB55IV	None	No	Yes	4,4’-DDD
GHCDD-1	AB55IV	None	No	Yes	Azinphos-Methyl
PCDD-1	YF44AK	WA-24-1030	Yes	Yes	Fecal Coliform
PCDD-1	YF44AK	WA-24-1030	Yes	Yes	Dissolved Oxygen
PCDD-1	YF44AK	WA-24-1030	No	Yes	Diazinon
PCDD-1	YF44AK	WA-24-1030	No	Yes	Chlorpyriphos
PCDD-1	YF44AK	WA-24-1030	No	Yes	Carbaryl
PCDD-1	YF44AK	WA-24-1030	No	Yes	Azinphos-Methyl
PCDD-1	YF44AK	WA-24-1030	No	Yes	4,4’-DDD

Bolded parameters are being addressed in this study.

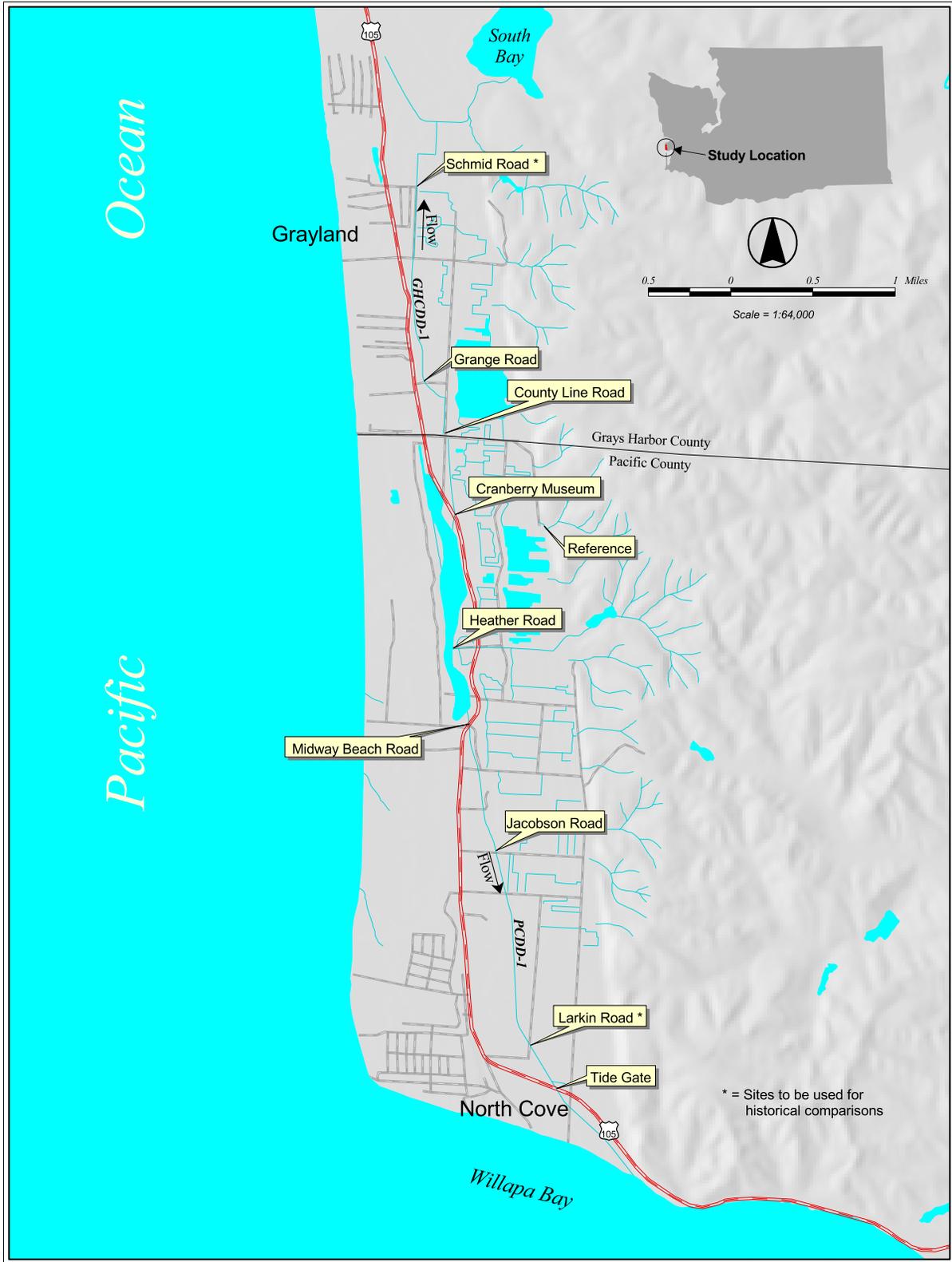


Figure 1. Sampling Site Locations for the Grayland Ditches Pesticide Project

Both ditches also are listed for the chlorinated pesticide ¹4,4'-DDD. A legacy chemical, DDD is a metabolite of DDT which was banned from agricultural use in the United States in 1972. However, because of budget constraints and the fact that these chlorinated pesticides are no longer used, they were not included in the study.

The state Attorney General has designated drainage ditches as waters of the state. As with other surface water in Washington State, water quality standards apply (Chapter 173-201A WAC). Studies conducted by the Washington State Department of Ecology (Ecology) during the cranberry-growing season of 1996 and 1998 found levels of chlorpyrifos, diazinon, and azinphos-methyl from samples collected in ditches below cranberry farms frequently exceed water quality criteria for protection of aquatic life.

A number of recent programs have been designed to evaluate pesticide levels in the Grayland area ditches with the goal of reducing pollutants to acceptable levels. Area cranberry growers have sponsored research and development of BMPs for their growing operations (Frantz *et al.*, 1996), while the Natural Resources Conservation Service (NRCS - USDA) has for several years provided technical assistance along with equipment cost-share grants to help growers reduce pesticide releases. At the same time a multi-year program to develop a “reduced risk” pest management program has been initiated (Booth *et al.*, 2000).

The Pacific County Conservation District has administered a program to provide cranberry farmers technical assistance and cost-share to implement BMPs, through a federal Clean Water Act Section 319 Grant. The aim of this program was also intended to document effectiveness of BMPs. The Washington State University Long Beach Research and Extension Unit is also conducting a study to evaluate the ability of BMPs to be effective, on an individual farm scale, to maintain pesticide residues below water quality criteria necessary to protect aquatic life (Patten, in progress).

The objectives of the Ecology study are to:

- Assess current levels of azinphos-methyl, chlorpyrifos, carbaryl, diazinon, and parathion in the two ditch systems. These data will allow comparisons to recommended water quality standards for the protection of aquatic life.
- Evaluate the effectiveness of BMPs implemented by the cranberry growers by comparing pesticide levels in water from the ditches before and after pesticide application to mean baseline data collected in 1996 and 1998.

¹ All references to DDT, DDE, or DDD in the document refer to 4,4'-DDT, 4,4'-DDE, and 4,4'-DDD.

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Methods

Study Design

Water samples were analyzed from three locations in GHCDD-1, six locations in PCDD-1, and one reference site in a natural drainage flowing to GHCDD-1 from hillslopes to the east, which does not receive drainage water from cranberry-growing operations (Figure 1). The Schmid Road site in GHCDD-1 and the Larkin Road site in PCDD-1 coincide with the downstream sites sampled by Ecology in 1996 and 1998. Samples collected from the reference site were analyzed for the same suite of parameters as the Schmid Road and Larkin Road sites. Sample locations are shown on Figure 1 and listed in Table 2. A description of study site locations and their associated coordinates are presented in Appendix A.

Table 2. Summary of station location and analysis requested.

Ditch	Laboratory	Field
GHCDD-1		
Schmid Road	Organophosphorus Pesticides, TSS Carbamates	Temperature, flow
Grange Road	Organophosphorus Pesticides, TSS	Temperature, flow
County Line Road	Organophosphorus Pesticides, TSS	Temperature, flow
Reference Site	Organophosphorus Pesticides, TSS Carbamates	Temperature
PCDD-1		
Tidegate at Highway 105	Organophosphorus Pesticides, TSS Carbamates	Temperature
Larkin Road	Organophosphorus Pesticides, TSS Carbamates	Temperature, flow
Jacobson Road	Organophosphorus Pesticides, TSS	Temperature
Midway Beach Road	Organophosphorus Pesticides, TSS	Temperature
Heather Road	Organophosphorus Pesticides, TSS	Temperature, flow
Cranberry Museum	Organophosphorus Pesticides, TSS	Temperature

Water samples were collected on three occasions between July 2 and August 1, 2002. The exact timing of sample collection was based on pesticide application in the cranberry bogs. This period coincided with the most intensive pesticide application period of the growing season, and in the past resulted in the highest pollutant concentrations in the ditches (Davis *et al.*, 1997).

Samples were collected at each site on three occasions: 1) a week prior to pesticide application, 2) immediately following pesticide application by most growers, and 3) two weeks after the pesticide application.

Pesticide analysis included organophosphorus pesticides and carbamates for samples from Schmid Road, Larkin Road, Tidegate, and the reference site. All other sites were analyzed for organophosphorus pesticides. Total suspended solids (TSS) samples were collected at all sites, in addition to field temperature by alcohol thermometer. Flow was measured at sites accessible by wading, to allow calculation of pollutant loads. Immediately following collection, water samples were placed on ice in a chain-of-custody cooler, for transport to the Manchester Environmental Laboratory (MEL) the following day.

To allow comparisons between pesticide results from the present study and other Ecology studies evaluating the ditches, Tables B1 and B2 in Appendix B summarize the results from samples collected in 1996 by Davis *et al.* (1997) and in 1998 by Anderson and Davis (2000).

Field Procedures

Water samples for pesticide analysis were depth and width integrated. A USGS DH-81 depth-integrated sampler (with a D-77 cap and wading rod) was used that allows sample water to contact only teflon or glass. Samples were collected by slowly lowering the sampler to the bottom and immediately raising it back to the surface in a smooth motion. Sub-samples were collected at each site from three positions across the transect (quarter-point). When ditch water was less than one foot deep, samples were depth integrated by hand collection. Sample water was composited at each site by hand splitting into individual sample bottles. Sample containers were one-third filled by each of three quarter-point sub-samples.

Organophosphorus pesticide samples were collected in one-gallon glass bottles, while carbamate samples were collected in 125 mL amber glass bottles containing monochloroacetic acid as a preservative. Grab samples for TSS were collected in 1000 mL poly bottles. Immediately following collection, samples were placed in coolers on ice, until delivered to MEL the following day.

Temperature was measured *in situ* by alcohol thermometer. At wadable sample sites, flow was measured using a Marsh-McBirney 201 velocity meter and standard top-setting wading rod. Operating procedures for determining discharge follow those described in WAS (1993). Sample site coordinates were determined using a hand-held GPS unit and recorded in field log books along with other pertinent site information such as date, time, weather conditions, site name, field personnel, sample identification, and flow data.

Laboratory Procedures

MEL conducted all sample analysis. Organophosphorus pesticides were analyzed using SW846 Method 8085. This method uses capillary gas chromatography by atomic emission detector (AED). The carbamates were analyzed by SW846 Method 8318, modified using a methylene chloride extraction, with high performance liquid chromatography (HPLC). The target pesticides list, analytical methods, and quantitation limits are presented in Tables C1 and C2. Analytical methods and quantitation limits for pesticide analysis were such that comparison to previous studies could be made. For the analysis of TSS samples, EPA Method 160.2 was used with a practical quantitation limit of 1 mg/L.

In addition to organophosphorus pesticides, MEL inadvertently analyzed the first sample set for chlorinated and nitrogen-containing pesticides. Because the analysis had been completed, the results were reported. Chlorinated pesticides were not analyzed in subsequent samples. Due to some high results found in the nitrogen-containing pesticides, the remaining two sample sets also were analyzed for both organophosphorus and nitrogen-containing pesticides. The chlorinated and nitrogen-containing pesticides were analyzed by Method 8085 using capillary gas chromatography by AED.

Data Quality

MEL employed standard quality assurance/quality control (QA/QC) procedures throughout analysis of project samples. These QA/QC procedures are documented in MEL's Quality Assurance Manual (MEL, 2001). All sample extraction and analysis was conducted within recommended method holding times. No analytes were detected in laboratory method blanks. Method blank surrogate recoveries for organophosphorus pesticides averaged $69 \pm 12\%$, while carbamates averaged $101 \pm 40\%$. These surrogate recoveries are well within the control range of 50-150%.

Matrix spike and a matrix spike duplicate samples were collected from the Schmid Road site for each sample event. Matrix spikes are collected to evaluate potential interferences in the sample matrix and to estimate analytical accuracy and precision. The overall average relative percent difference (RPD) between spike duplicates was 9% (Table C3). Recoveries for target compounds were generally good ranging from 38 to 71%. When spike recoveries were reported below 50%, associated data were qualified as estimates ("J" qualifier). Matrix spike recoveries for chlorpyrifos averaged 44%, ranging from 38-48%. Precision was good, but recovery was not. The associated chlorpyrifos data were qualified as estimates and likely underestimated the true concentration.

Samples collected from the Larkin Road site were duplicated (split) as an estimate of overall precision (sampling and analytical). In general, the study duplicates were in good agreement. The RPD for study duplicates averaged 19% and ranged from 0-53% (Table C4).

Transport blanks are used to detect sample bias due to contamination. They can indicate contamination due to sample containers, cross-contamination during shipping, or laboratory contamination. One transport blank was analyzed with each of the three sample surveys. MEL makes up transport blanks at the laboratory with organic-free water. The sampling team treats it as any other sample, and carries it unopened through the sample day.

No organophosphorus pesticides were detected in transport blanks from pre- and post-application period surveys. However, diazinon was estimated at 0.0007 ug/L in the transport blank analyzed with the samples collected during the pesticide application period. This low estimated concentration is not very significant with regard to data quality.

MEL uses the EPA's five times rule when contamination is found in blanks. This requires the sample results from that survey less than five times the concentration of the blank be qualified as an estimate ("J" qualifier). The estimated diazinon concentration from the blank was less than

one twentieth the quantitation limit (0.016 ug/L) and near one sixtieth the chronic aquatic life standard (0.04 ug/L). No analytes were detected in any laboratory method blanks, so the transport blank contamination was likely from the sample container or other sample containers in contact with the blank during shipment.

Results and Discussion

Pesticides

A total of six organophosphorus pesticides were detected in water samples collected from GHCDD-1 and PCDD-1 over the three sample events of July 2, July 18, and August 1 (Table 3). Four of the detected pesticides were found in both ditches: azinphos-methyl, chlorpyrifos, diazinon, and sulfotepp. Target pesticides most frequently detected in both ditches were azinphos-methyl, chlorpyrifos, and diazinon. Abate (temephos) was found in PCDD-1 only, in the July 2 sample collected at the Cranberry Equipment Museum. Sulfotepp and abate are not registered for use on cranberries, although sulfotepp is a common impurity in diazinon. Abate is an insecticide that requires a permit and is for emergency use only. The complete data set of organophosphorus pesticide results can be found in Table D1 in Appendix D.

Parathion was not detected in any samples analyzed for this study and should be removed from the state's 303(d) list. The 303(d) listing for parathion in GHCDD-1 was based on the Ecology study in 1996 (Davis *et al.*, 1997). The 1996 study reported parathion was detected as a result of an illegal application by a single farmer. The parathion application resulted in an enforcement action.

Low-level carbamate analysis was conducted on samples collected from Schmid Road, Larkin Road, Tidegate, and the reference site. Carbaryl was detected in only one sample, collected on July 2, from Larkin Road. Carbofuran was detected in three samples from PCDD-1. The complete data set for low-level carbamate results can be found in Table D2 in Appendix D.

Target Pesticide Loads

Pesticide loads for azinphos-methyl, chlorpyrifos, and diazinon were calculated for sites where flow was measured. In general, loads at the Larkin Road were higher than at Schmid Road. This was not surprising considering the larger growing area and greater number of cranberry bogs draining to PCDD-1. At Larkin Road all three pesticide loads were highest during the pre-application period and lowered throughout the study. At Schmid Road diazinon followed the same trend. The higher pesticide loads through the pre-application period was a surprise. During this time, the bees are in the fields for crop pollination, and loads were expected to be low.

Figures 2 and 3 display the loading results for azinphos-methyl, chlorpyrifos, and diazinon at the Schmid Road and Larkin Road sites, while Table 4 presents calculated loads for all sites where flow was measured for the study.

Table 3. Organophosphorus pesticides and carbamates detected in water samples from GHCD-1 and PCDD-1, July 2 through August 1, 2002 (ug/L).

GHCD-1	Sample Date	Schmid Road	Grange Road	County Line Road			
<u>Organophosphorus pesticides</u>							
azinphos-methyl	7/2/02	-	-	0.020 J			
	7/18/02	0.10 J	0.19 J	0.23 J			
	8/1/02	0.20 J	0.19 J	0.30 J			
chlorpyriphos	7/2/02	0.010 J	0.023 J	0.020 J			
	7/18/02	0.0050 J	0.010 J	-			
	8/1/02	-	0.0065 J	0.067 J			
diazinon	7/2/02	0.35 J	0.10 J	0.35 J			
	7/18/02	0.13 J	5.7 J	2.0 J			
	8/1/02	0.018 J	0.033 J	0.036 J			
sulfotepp	7/2/02	-	-	-			
	7/18/02	-	0.0025 J	-			
	8/1/02	-	-	-			
PCDD-1	Sample Date	Tidegate	Larkin Road	Jacobson Road	Midway Beach Road	Heather Road	Cranberry Museum
<u>Organophosphorus pesticides</u>							
azinphos-methyl	7/2/02	0.15 J	0.13 J	0.22 J	0.33 J	0.22 J	0.30 J
	7/18/02	0.012 J	0.013 J	0.0079 J	0.025 J	0.050 J	0.0049 J
	8/1/02	0.0067 J	0.0061 J	0.014 J	0.13 J	0.048 J	0.0060 J
chlorpyriphos	7/2/02	0.030 J	0.033 J	0.034 J	0.039 J	0.039 J	0.041 J
	7/18/02	0.014 J	0.015 J	0.59 J	-	0.019 J	-
	8/1/02	0.030	0.036 J	0.56 J	0.035 J	0.023 J	0.020 J
diazinon	7/2/02	0.71 J	0.60 J	0.12 J	0.10 J	0.10 J	0.22 J
	7/18/02	0.71 J	0.64 J	0.69 J	0.74 J	0.31 J	0.024 J
	8/1/02	0.18 J	0.20 J	0.11 J	0.15 J	0.079 J	0.012 J
imidan	7/2/02	-	-	-	-	-	-
	7/18/02	-	-	-	-	-	-
	8/1/02	0.0047 J	0.0074 J	-	-	-	-
sulfotepp	7/2/02	-	-	-	-	-	-
	7/18/02	-	-	0.0046 J	-	-	-
	8/1/02	-	-	0.0013 J	-	-	-
abate	7/2/02	-	-	-	-	-	0.13 J
	7/18/02	-	-	-	-	-	-
	8/1/02	-	-	-	-	-	-
<u>Carbamates</u>							
carbaryl	7/2/02	-	0.09 J	-	-	-	-
	7/18/02	-	-	-	-	-	-
	8/1/02	-	-	-	-	-	-
carbofuran	7/2/02	-	0.029 J	-	-	0.069 J	0.028 J
	7/18/02	-	-	-	-	-	-
	8/1/02	-	-	-	-	-	-

No data indicates the analyte was not detected.

J = The analyte was positively identified. The associated numerical result is an estimate.

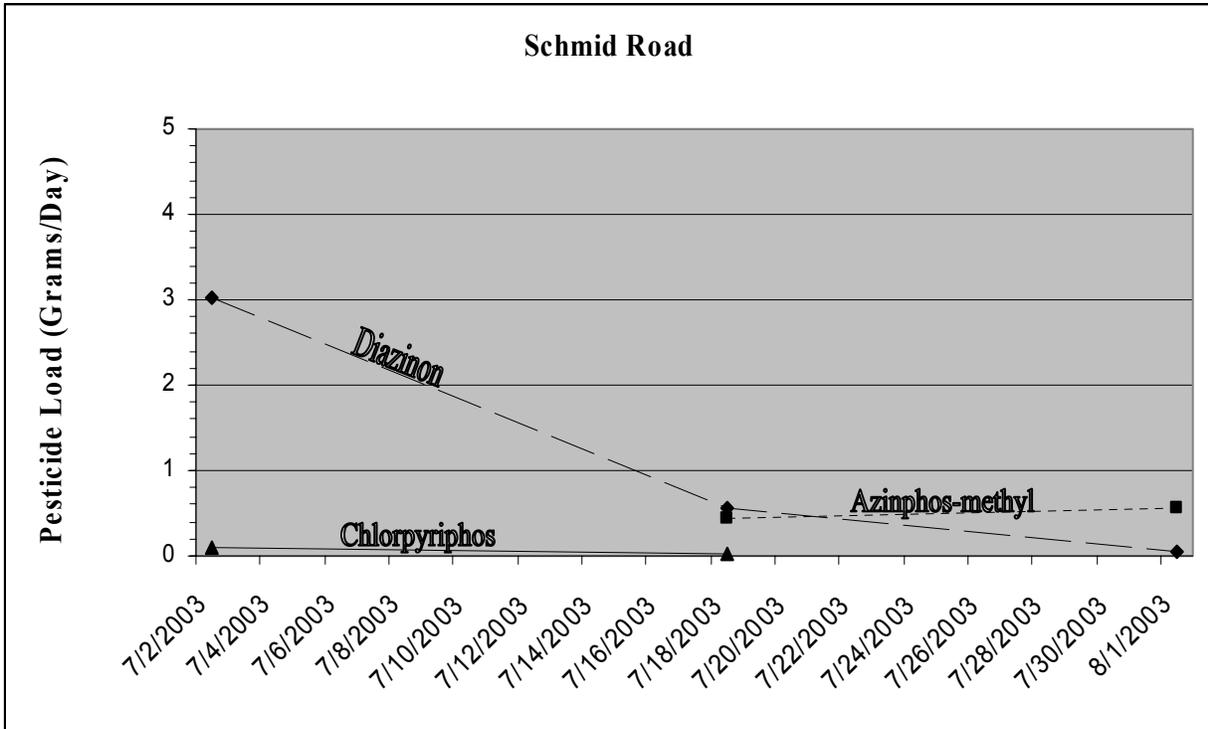


Figure 2. Target pesticide loads at Schmid Road, July 2 through August 1, 2002.

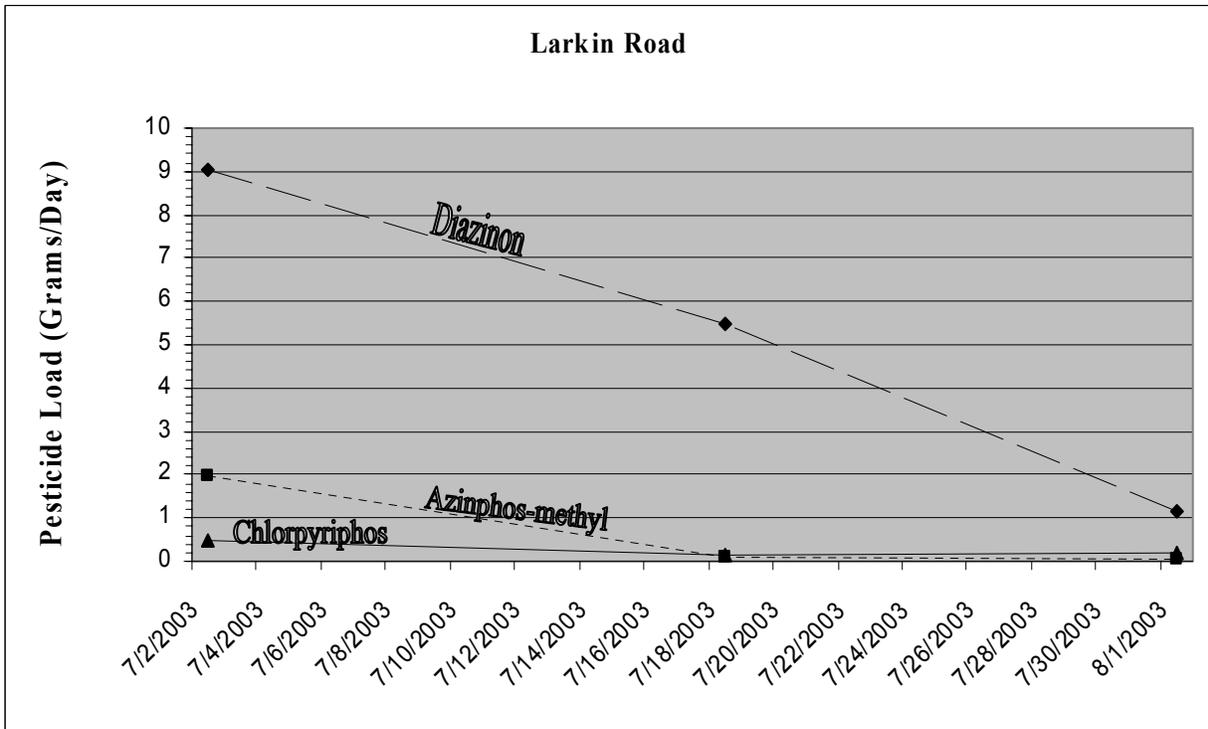


Figure 3. Target pesticide loads at Larkin Road, July 2 through August 1, 2002.

Table 4. Target pesticide loads in GHCDD-1 and PCDD-1, July 2 through August 1, 2002 (grams/day).

	Sample Date	Diazinon Load	Azinphos-methyl Load	Chlorpyrifos Load
GHCDD-1				
Schmid Road	7/2/2002	3.02	-	0.086
	7/18/2002	0.57	0.44	0.022
	8/1/2002	0.050	0.56	-
Grange Road	7/2/2002	0.13	-	0.030
	7/18/2002	-	-	-
	8/1/2002	-	-	-
County Line Road	7/2/2002	6.30	0.36	0.36
	7/18/2002	4.01	0.46	-
	8/1/2002	0.040	0.33	0.074
PCDD-1				
Larkin Road	7/2/2002	9.04	1.96	0.50
	7/18/2002	5.46	0.11	0.13
	8/1/2002	1.14	0.035	0.20
Heather Road	7/2/2002	0.68	1.49	0.26
	7/18/2002	1.49	0.24	0.092
	8/1/2002	0.28	0.17	0.083

No data indicates loads were not calculated due to the analyte being below detection or flow data were not available.

Non-Target Compounds

A total of 11 additional pesticides/herbicides, and caffeine, were detected in water samples from both ditches. Three of the 11 detected analytes were chlorinated pesticides, and seven were nitrogen-containing pesticides/herbicides (Table 5). Chlorinated pesticides were analyzed for the July 2 samples only, while nitrogen-containing pesticides/herbicides were analyzed for all three sample events. The chlorinated pesticides detected were legacy chemicals: DDT, DDE, and DDD.

The County Line Road site in GHCDD-1 had samples detecting DDE, and DDD at a concentration of 0.0067 $\mu\text{g/L}$, while Larkin Road, Jacobson Road, Heather Road and the Cranberry Museum sites in PCDD-1 had samples detecting DDT ranging from 0.026 to 0.091 $\mu\text{g/L}$ (Table 5).

Five of the seven nitrogen-containing pesticides/herbicides were found in both ditches, which included dichlobenil, napropamide, norflurazon, chlorothalonil, and 2,6,-dichlorobenzamide. The compound 2,6,-dichlorobenzamide is a metabolite of dichlobenil. Diethyltoluamide (DEET), an insect repellent, was detected in three samples from PCDD-1. Caffeine was detected at two sites in GHCDD-1 and one site in PCDD-1. Caffeine, a common constituent of sewage, is indicative of domestic septic system inputs to the ditches.

Table 5. Chlorinated pesticides, nitrogen-containing pesticides/herbicides, and caffeine detected in water samples from GHCDD-1 and PCDD-1, July 2 through August 1, 2002 ($\mu\text{g/L}$).

GHCDD-1	Sample Date	Schmid Road	Grange Road	County Line Road			
<u>Chlorinated</u>							
DDE	7/2/02	-	-	0.0067 J			
DDD	7/2/02	-	-	0.0067 J			
<u>Nitrogen-containing</u>							
dichlobenil	7/2/02	1.4	1.1	3.0			
	7/18/02	0.047	0.14	0.13			
	8/1/02	0.027 J	0.033 J	0.063			
napropamide	7/2/02	0.067	0.033	0.080			
	7/18/02	0.065 J	0.010 J	-			
	8/1/02	0.066 J	0.014 J	-			
norflurazon	7/2/02	0.21	0.22	0.37			
	7/18/02	0.062 J	-	0.066 J			
	8/1/02	0.013 J	0.023 J	0.014 J			
chlorothalonil	7/2/02	0.080 J	-	-			
	7/18/02	-	-	-			
	8/1/02	-	-	-			
2,6,-dichloro-benzamide	7/2/02	-	-	0.12 J			
	7/18/02	0.30 J	0.22 J	0.13 J			
	8/1/02	0.19 J	0.13 J	0.070 J			
<u>Caffeine</u>							
	7/2/02	-	-	-			
	7/18/02	0.10 J	-	-			
	8/1/02	0.050 J	-	0.050 J			
PCDD-1	Sample Date	Tidegate	Larkin Road	Jacobson Road	Midway Beach Road	Heather Road	Cranberry Museum
<u>Chlorinated</u>							
DDT	7/2/02	-	0.091 J	0.069 J	-	0.026 J	0.086 J
<u>Nitrogen-containing</u>							
dichlobenil	7/2/02	0.48	0.47	0.50	0.25	0.30	2.3
	7/18/02	0.17	0.17	0.22	0.094 J	0.046 J	0.19
	8/1/02	0.094	0.12	0.054	0.046	-	0.15
simazine	7/2/02	-	-	-	-	-	-
	7/18/02	-	-	-	-	0.0017 J	-
	8/1/02	-	-	-	-	-	-
napropamide	7/2/02	0.056	0.12	0.083	0.11	0.098	0.10
	7/18/02	0.017 J	0.015 J	-	-	0.025 J	-
	8/1/02	0.017 J	0.021 J	0.0067 J	0.017 J	0.020 J	0.046 J
norflurazon	7/2/02	0.34	0.40	0.30	0.22	0.11	0.30
	7/18/02	-	0.19 J	0.065 J	-	0.17 J	-
	8/1/02	0.067 J	0.069 J	0.021 J	0.014 J	0.020 J	0.015 J
chlorothalonil	7/2/02	-	0.023 J	-	0.026 J	-	0.12 J
	7/18/02	-	-	-	-	-	-
	8/1/02	-	-	-	-	-	-
2,6,-dichloro-benzamide	7/2/02	0.075 J	0.098 J	0.11 J	-	0.069 J	0.17 J
	7/18/02	0.14 J	-	0.089 J	0.11 J	0.17 J	0.16 J
	8/1/02	0.0012 J	0.093 J	0.11 J	0.12 J	0.12 J	0.13 J
diethyltoluamide	7/2/02	-	-	-	-	-	-
	7/18/02	-	-	-	-	-	-
	8/1/02	-	-	0.021 J	0.026 J	0.014 J	-
<u>Caffeine</u>							
	7/2/02	-	-	-	-	-	-
	7/18/02	-	-	-	0.057 J	-	-
	8/1/02	-	-	-	-	-	-

No data indicates the analyte was not detected.

J = The analyte was positively identified. The associated numerical result is an estimate.

The complete data set of chlorinated pesticides results can be found in Table D3, while the nitrogen-containing pesticides/herbicides can be found in Table D4 in Appendix D.

Conventional Parameters

Temperature and discharge were measured during each sample survey, while TSS samples were collected and analyzed at MEL. Temperature data are not available for the survey on July 2 due to a broken thermometer at the first site. At sample sites that were wadable, discharge was measured on survey days. In GHCD-1, Schmid Road and County Line Road had discharge measured for all three surveys, while the Grange Road site had flow measured for the survey of July 2 only. In PCDD-1, only Larkin Road and Heather Road had flow determined, but for all three surveys. Field measurements for temperature and discharge, along with results of the TSS analysis, are presented in Table D5 in Appendix D.

Comparison to Water Quality Criteria

Water quality criteria were compiled from several sources for comparison to study results. No single source of water quality criteria for the protection of aquatic life covers all detected chemicals from the ditches. Available criteria for detected chemicals from the ditches are summarized in Table 6. Chemicals that were detected but are not shown in Table 6 do not have numeric criteria. The state water quality standards in Chapter 173-201A WAC provide criteria for only one target chemical: chlorpyrifos. The state standards also have criteria for DDT and metabolites DDE and DDD.

Table 6. Available water quality criteria for detected chemicals ($\mu\text{g/L}$).

Common Name	Pesticide Group	Trade Name	Aquatic Life Standards		
			Acute	Chronic	¹ RMC
azinphos-methyl	Organophosphorus	Guthion		² 0.01	
carbaryl	Carbamate	Sevin			³ 0.02
carbofuran	Carbamate	Furadan			⁴ 1.8
chlorpyrifos	Organophosphorus	Lorsban, Dursban	⁵ 0.083	⁵ 0.041	
DDT and metabolites	Chlorinated	-	⁵ 1.1	⁵ 0.001	
diazinon	Organophosphorus	Diazinon	⁶ 0.08	⁶ 0.04	
dichlobenil	Nitrogen	Casoron, Norosac			³ 7
simazine	Nitrogen	Princep			⁴ 10

¹ Recommended Maximum Concentration

² USEPA (1986) Water Quality Criteria for Water (Gold Book)

³ National Academy of Sciences (1973)

⁴ CCREM (1999), Canadian Water Quality Guidelines

⁵ Washington State Water Quality Standards, Chapter 173-201A WAC

⁶ Menconi and Cox (1994), California Department of Fish and Game

Below Table 7 summarizes detected chemicals from each ditch that have associated water quality criteria. Information is presented on the percentage of samples exceeding criteria, frequency of detection, and the source of the criteria. Table 8 presents all chemicals detected during the study that exceeded available water quality criteria.

Table 7. Summary of pesticides exceeding available water quality criteria.

Pesticide	Detection Frequency	Percent of Samples Exceeding Criteria	Criteria Exceeded (See references below)
GHCDD-1			
azinphos-methyl	78%	78%	1
chlorpyriphos	78%	11%	2
diazinon	100%	67%	3
DDE	33%	33%	2
DDD	33%	33%	2
PCDD-1			
azinphos-methyl	100%	72%	1
carbaryl	17%	17%	4
chlorpyriphos	89%	11%	2
diazinon	100%	89%	3
DDT	67%	67%	2

- 1 = USEPA (1986) Water Quality Criteria for Water (Gold Book)
 2 = Washington State Water Quality Standards, WAC 173-201A
 3 = Menconi and Cox (1994), California Department of Fish and Game
 4 = National Academy of Sciences (1973)

Table 8. Chemicals detected in GHCCDD-1 and PCDD-1 that exceeded available water quality criteria, July 2 through August 1, 2002 (ug/L).

GHCCDD-1	Sample Date	Schmid Road	Grange Road	County Line Road			
<u>Organophosphorus pesticides</u>							
azinphos-methyl	7/2/02	-	-	¹ 0.020 J			
	7/18/02	¹ 0.10 J	¹ 0.19 J	¹ 0.23 J			
	8/1/02	¹ 0.20 J	¹ 0.19 J	¹ 0.30 J			
chlorpyriphos	7/2/02	-	-	-			
	7/18/02	-	-	-			
	8/1/02	-	-	² 0.067 J			
diazinon	7/2/02	³ 0.35 J	³ 0.10 J	³ 0.35 J			
	7/18/02	³ 0.13 J	³ 5.7 J	³ 2.0 J			
	8/1/02	-	-	-			
<u>Chlorinated pesticides</u>							
DDE	7/2/02	-	-	² 0.0067 J			
DDD	7/2/02	-	-	² 0.0067 J			
PCDD-1	Sample Date	Tidegate	Larkin Road	Jacobson Road	Midway Beach Road	Heather Road	Cranberry Museum
<u>Organophosphorus pesticides</u>							
azinphos-methyl	7/2/02	¹ 0.15 J	¹ 0.13 J	¹ 0.22 J	¹ 0.33 J	¹ 0.22 J	¹ 0.30 J
	7/18/02	¹ 0.012 J	¹ 0.013 J	-	¹ 0.025 J	¹ 0.050 J	-
	8/1/02	-	-	¹ 0.014 J	¹ 0.13 J	¹ 0.048 J	-
chlorpyriphos	7/2/02	-	-	-	-	-	-
	7/18/02	-	-	² 0.59 J	-	-	-
	8/1/02	-	-	² 0.56 J	-	-	-
diazinon	7/2/02	³ 0.71 J	³ 0.60 J	³ 0.12 J	³ 0.10 J	³ 0.10 J	³ 0.22 J
	7/18/02	³ 0.71 J	³ 0.64 J	³ 0.69 J	³ 0.74 J	³ 0.31 J	-
	8/1/02	³ 0.18 J	³ 0.20 J	³ 0.11 J	³ 0.15 J	³ 0.079 J	-
<u>Chlorinated pesticides</u>							
DDT	7/2/02	-	² 0.091 J	² 0.069 J	-	² 0.026 J	² 0.086 J
<u>Carbamate pesticides</u>							
carbaryl	7/2/02	-	⁴ 0.09 J	na	na	na	na
	7/18/02	-	-	na	na	na	na
	8/1/02	-	-	na	na	na	na

1 = USEPA (1986) Water Quality Criteria for Water (Gold Book)
2 = Washington State Water Quality Standards, WAC 173-201A
3 = Menconi and Cox (1994), California Department of Fish and Game
4 = National Academy of Sciences (1973)
na = not analyzed

Azinphos-methyl was routinely detected above chronic criterion in GHCDD-1. Detected values were estimated ranging from twice the criterion to 30 times. Azinphos-methyl was not detected in pre-application period samples from the Schmid Road and Grange Road. At the County Line Road site, azinphos-methyl increased by an order of magnitude between pre-application and application period samples. Concentrations remained high from the application period through the post-application period at all three GHCDD-1 sites.

In PCDD-1, a baseline concentration of azinphos-methyl above criterion was found in pre-application samples. These results were the highest for the three study periods and exceeded chronic criteria by more than an order of magnitude. Concentrations of azinphos-methyl generally lowered through the sampling periods, ending within criteria at half the PCDD-1 sites. Concentrations exceeding the criterion ranged from just above to about 33 times.

Concentrations of chlorpyrifos were generally higher in PCDD-1 than GHCDD-1. Mean concentrations for the study were within water quality criteria at both Schmid Road and Larkin Road. Only one sample in GHCDD-1 and two samples in PCDD-1 exceeded criteria, although the two detections for chlorpyrifos in PCDD-1 exceeded the acute criterion by about seven times.

Diazinon criteria for the protection of aquatic life has not been developed by state or federal agencies. Criteria presented in Table 6 are maximum (acute) and continuous (chronic), developed by the California Department of Fish and Game using the USEPA guidelines (Menconi and Cox, 1994). There was a baseline concentration of diazinon in both ditches during the pre-application period sampling that exceeded acute criterion in all samples.

Diazinon was detected in all nine samples from GHCDD-1, with six exceeding the acute criterion. Concentrations from samples exceeding criteria were estimated, ranging from just above the acute criterion to 70 times. The 5.7 $\mu\text{g/L}$ diazinon concentration from the sample collected at Grange Road on July 18, 2002 may be one of the higher concentrations recorded in state waters. Following the high diazinon concentrations from the July 18 survey, all sample sites in GHCDD-1 were within criteria for the third set of samples collected August 1. Diazinon was detected in all 18 samples from PCDD-1, with 15 exceeding acute criterion. Concentrations from samples exceeding criteria were estimated, ranging from the acute criterion to about nine times.

In addition to organophosphorus pesticides, carbamates were targeted for evaluation. Only two carbamate pesticides were detected in ditch samples: carbaryl and carbofuran. Neither chemical was found in samples from GHCDD-1. In PCDD-1 carbaryl was detected in only one sample. The concentration of carbaryl from the PCDD-1 sample exceeded the National Academy of Sciences recommended maximum concentration of 0.02 $\mu\text{g/L}$ by four and a half times. Carbofuran was detected in three samples, all from PCDD-1. None of the detections exceeded the Canadian Water Quality Guidelines of 1.75 $\mu\text{g/L}$.

Other Compounds

Three chlorinated pesticides also were detected in the ditches: DDT and metabolites DDE and DDD. DDE and DDD were detected in one of three samples from GHCDD-1, and were

estimated at almost seven times the chronic Washington State water quality standard of 0.001 ug/L. DDT was detected in four of six samples collected from PCDD-1. Levels of DDT found in PCDD-1 were much higher, with estimated concentrations ranging from 26 to 91 times the chronic standard. The study conducted in 1996 by Davis *et al.* (1997) analyzed samples from PCDD-1 for DDT. Only the metabolite DDD was detected during that study.

From the detected nitrogen-containing pesticides/herbicides and caffeine, only the pesticide dichlobenil and the herbicide simazine have comparative water quality criteria. Dichlobenil was detected in all but one sample collected from both ditches. The highest concentration was less than a tenth of the National Academy of Sciences (1973) recommended maximum concentration of 37 ug/L. The simazine concentration from the PCDD-1 sample was estimated orders of magnitude below the Canadian Water Quality Guidelines of 10 ug/L.

Comparison to Previous Sampling

Pesticide levels in the ditches before and after pesticide application were compared to data from two previous Ecology studies on the ditches. Target pesticides azinphos-methyl, chlorpyrifos, and diazinon were compared to data from a 1996 study by Davis *et al.* (1997) and a 1998 study by Anderson and Davis (2000). Two sample locations were the same in all three studies and were used for comparison. Data from Schmid Road in GHCDD-1 and Larkin Road in PCDD-1 were compared for BMP effectiveness.

In general, the timing of pesticide application in cranberry bogs was thought to be based on initiators like degree days and the removal of the bees used for pollination. The cranberry farmers in the Grayland to North Cove area decide what pesticides are applied to their bogs, and application timing. Trying to compare data from one study to others that have different sampling regimes can be tenuous. The variability of the data between sites, sampling periods, and years also complicates the effort. Statistical comparisons are not possible due to the different sample regimes and small data sets. It seems that meaningful evaluations of BMP effectiveness can only be accomplished by individual farm scale studies. Once specific measures of BMP effectiveness have been determined, requirements for implementation by all farmers should be considered. The high variability within the ditches through the application periods, along with high baseline concentrations of some chemicals, suggests BMPs are not effective.

When data from the 1998 study by Anderson and Davis (2000) were reviewed for making comparisons to the 2002 study, a problem was identified. The three target pesticides from the 1998 study – azinphos-methyl, chlorpyrifos, and diazinon – increased in concentration throughout the study, and were higher than the 1996 study and the present study. The three post-application samples were taken within a four-day period. Either all the post-application samples were collected before the peak loads had moved through the system, or pesticides continued to be applied through the sampling period. The result in either case is that mean concentrations of pesticides from the 1998 study were skewed upward, because only pre-application and peak concentrations were represented in the means. Davis *et al.* (1997) estimated once organophosphorus pesticides have entered the system, it takes from one to two weeks for concentrations to return to baseline levels. The amount of time following pesticide application

for post-application samples from the Anderson and Davis study (2000) was probably not long enough to allow recovery for representative post-application concentrations. The sample design of the present study targeted three sample periods: one week before the highest pesticide application period, the week of pesticide application, and two weeks after the peak pesticide application.

Table 9 compares results from the present study to results from the Ecology studies conducted in 1996 and 1998.

Table 9. Comparison of azinphos-methyl, chlorpyriphos, and diazinon detected in Grayland to North Cove area ditches to data from studies conducted in 1996 and 1998 (ug/L, ppb).

		1996	1998	2002
GHCDD-1 at Schmid Road				
azinphos-methyl	mean	0.17 (n=17)	0.26 (n=5)	0.15 (n=2)
	range	0.010- 0.73	0.004- 1.2	0.10-0.20
chlorpyriphos	mean	0.008 (n=8)	0.38 (n=5)	0.008 (n=2)
	range	0.008-0.016	0.0095- 1.8	0.0050-0.010
diazinon	mean	0.86 (n=26)	1.1 (n=5)	0.17 (n=3)
	range	0.026- 5.4	0.033- 4.4	0.018- 0.35
PCDD-1 at Larkin Road				
azinphos-methyl	mean	0.17 (n=26)	0.33 (n=5)	0.050 (n=3)
	range	0.006- 0.74	0.012-1.4	0.0061- 0.13
chlorpyriphos	mean	0.44 (n=26)	0.58 (n=5)	0.028 (n=3)
	range	0.003- 3.7	0.019- 1.3	0.015-0.036
diazinon	mean	0.29 (n=25)	2.4 (n=5)	0.48 (n=3)
	range	0.008- 1.7	0.033- 7.0	0.20-0.64

Bolded values are greater than available criteria

Azinphos-methyl was detected routinely in samples from both ditches throughout the 1996, 1998, and the present study. Mean azinphos-methyl concentrations from Schmid Road in 2002 are about the same as in 1996, and roughly two-thirds the mean from 1998. At Larkin Road the mean azinphos-methyl concentration in 2002 was roughly one-third the level the 1996 study reported, and one-sixth the level the 1998 study reported. Mean concentrations of azinphos-methyl at Schmid Road and Larkin Road from the 1996 and 1998 studies were about the same. Azinphos-methyl levels at Schmid Road in 2002 were about three times higher than at Larkin Road. Mean azinphos-methyl concentrations from all three studies exceed the USEPA criteria of 0.01 ug/L.

Chlorpyrifos concentrations were low at Schmid Road and Larkin Road in 2002, and did not exceed state water quality criteria. At Schmid Road the mean and range of chlorpyrifos concentrations were similar in 1996 and 2002, and easily within state water quality standards. In 1998 the mean chlorpyrifos concentration exceeded the acute state water quality standard at Schmid Road by almost five times, although this may be an artifact of the sample regime: three of five samples collected within four days. All three studies reported mean concentrations of chlorpyrifos at Larkin Road were higher than at Schmid Road. In 1996 the mean concentrations of chlorpyrifos at Larkin Road exceeded the acute state water quality standard by just over five times, while the 1998 chlorpyrifos levels exceeded acute criterion by seven times.

Diazinon was detected in all but one of the 60 total samples from Schmid Road and Larkin Road for the three studies. Diazinon concentrations were generally high and usually exceeded the California Department of Fish and Game water quality criteria during pre-application conditions. Study data suggest diazinon is routinely applied to cranberry bogs throughout the growing season. Diazinon was reported at Schmid Road in the 1996 and 1998 studies at five and over six times, respectively, the mean concentrations reported in 2002 data. At Larkin Road mean diazinon concentrations in 2002 were about one-fifth the 1998 study results, but were approaching twice the 1996 levels. In 1996 the mean concentration of diazinon at Schmid Road was about three times the mean concentration found at Larkin Road. In the 1998 and 2002 studies, mean concentrations of diazinon found at Larkin Road were over twice the level that was reported from Schmid Road.

Study results for carbaryl show improvement in concentrations for the application period. Carbaryl was not detected in any of the samples from GHCDD-1. Carbaryl was detected in only one of six samples from PCDD-1.

Conclusions and Recommendations

Conclusions

Overall, this study found high variability in target pesticide results. Changes in concentrations between sample periods ranged up to two orders of magnitude for the same suite of pesticides that were being applied during the comparison studies in 1996 and 1998. Exceedance of water quality criteria was still being measured in both ditches for multiple pesticides at levels which can have adverse effects on aquatic life.

- In general, while some improvements have been noted, best management practices (BMPs) implemented by farmers have not been effective in bringing pesticides to levels within water quality standards during the growing season.
- The Schmid Road site in GHCDD-1 is on the 1998 303(d) list for parathion and carbaryl. Neither parathion nor carbaryl was detected in any samples from GHCDD-1 during the present study.
- Results from the present study suggest chlorpyrifos levels may have improved, compared to the studies conducted in 1996 and 1998, but are still exceeding water quality criteria.
- The chlorinated pesticide DDT was detected at four of six PCDD-1 sample sites. Both PCDD-1 and GHCDD-1 are 303(d) listed for DDD, a DDT metabolite.
- Caffeine was detected in both ditches. Caffeine is a common constituent of domestic waste and is likely a result of septic system inputs to the ditches.
- Both ditches had a high baseline concentration of diazinon, which exceeded criteria during the pre-application sampling period.

Recommendations

- BMP evaluations of individual farms should be supported. If future pesticide results indicate exceedance of water quality criteria, mandatory BMPs should be considered.
- Future pesticide evaluations of the ditches should target the peak application periods. In addition, pesticide samples should be collected between application periods to evaluate the baseline concentrations of pesticides being applied during the growing season.
- The GHCDD-1 should be removed from the state's 303(d) list for parathion and carbaryl.
- Future pesticide evaluations in GHCDD-1 and PCDD-1 should include chlorinated pesticides.

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Appendices

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Appendix A

Sample Station Location Information

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Table A1. Sample station descriptions and coordinates for the Grayland Ditches pesticides study.

Station ID	Latitude			Longitude			Description
	Deg	Min	Sec	Deg	Min	Sec	
<u>GHCDD-1</u>							
Schmid Road	46	48	58	124	05	30	About 0.18 mile east of highway 105 on Schmid Road. Sample site located under County road bridge at the 90° corner.
Grange Road	46	47	57	124	05	21	About 350 feet east of Highway 105 on Grange Road, at the bridge crossing.
County Line Road	46	47	38	124	05	12	About 650 feet east of Highway 105 on the County Line Road, then south about 100 feet on Pacific Cranberry Valley Rd. Samples collected upstream of the culvert.
Reference Site	46	47	18	124	04	28	About 0.54 mile east on County Line Road off Highway 105 to Smith Anderson Road. South 0.56 mile on Smith Anderson Road, to a small stream draining hillslopes to the east.
<u>PCDD-1</u>							
Tidegate	46	44	14	124	04	08	About 50 feet upstream of Highway 105 at the PCDD-1 crossing, just before discharge to the North Cove of Willapa Bay.
Larkin Road	46	44	26	124	04	20	About 0.35 mile northeast of Highway 105 on Larkin Road. Site located under county road bridges.
Jacobson Road	46	45	29	124	04	40	About 0.22 mile east off Highway 105, on Jacobson Road.
Midway Beach Road	46	46	08	124	04	56	At the intersection of Highway 105 and Midway Beach Road. Sampled upstream of culvert.
Heather Road	46	46	33	124	05	07	About 0.12 mile west of Highway 105 on Heather Road - also known as Summers Lane. Sample site at bridge crossing on private property.

Table A1 cont'd. Sample station descriptions and coordinates for the Grayland Ditches pesticides study.

Station ID	Latitude Deg Min Sec	Longitude Deg Min Sec	Description
<u>PCDD-1 cont'd</u> Cranberry Museum	46 47 14	124 05 06	Site located in front of the Cranberry Museum on Highway 105 about 0.53 mile south of the Grays Harbor/Pacific County line.

Datum = NAD27

Appendix B

**Historical Data Tables
and
Comparative Water Quality Criteria**

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Table B1. Pesticides detected in water samples collected in 1996 from the Grayland Ditches by Davis et al. (1997).

<u>GHCDD-1</u>			<u>PCDD-1</u>		
Schmid Road (ug/L, ppb)			Larkin Road (ug/L, ppb)		
chlorpyriphos	range	0.003J – 0.016J	chlorpyriphos	range	0.003J – 3.7
	mean	0.008 (n=8)		mean	0.44 (n=26)
diazinon	range	0.026J – 5.4	diazinon	range	0.008J – 1.7J
	mean	0.86 (n=26)		mean	0.29 (n=25)
azinphos-methyl	range	0.015J – 0.73J	azinphos-methyl	range	0.006J – 0.74J
	mean	0.16J (n=17)		mean	0.17 (n=26)
carbaryl	mean	0.028J (n=2)	carbaryl	mean	0.036J (n=2)

J = The analyte was positively identified. The associated numerical result is an estimate.

Bolded values are greater than available standards.

Table B2. Pesticides detected in water samples collected in 1998 from the Grayland Ditches by Anderson and Davis (2000).

<u>GHCDD-1</u>				<u>PCDD-1</u>			
Schmid Road (ug/L, ppb)				Larkin Road (ug/L, ppb)			
	<i>Pre-Spray</i>	<i>Post-Spray</i>	<i>Mean</i>		<i>Pre-Spray</i>	<i>Post-Spray</i>	<i>Mean</i>
chlorpyriphos	0.017 (n=2)	0.62 (n=3)	0.38 (n=5)	chlorpyriphos	0.038 (n=2)	0.95 (n=3)	0.58 (n=5)
diazinon	0.13 (n=2)	1.8 (n=3)	1.1 (n=5)	diazinon	0.11 (n=2)	3.9 (n=3)	2.4 (n=5)
azinphos-methyl	0.028 (n=2)	0.41 (n=3)	0.26 (n=5)	azinphos-methyl	0.038 (n=2)	0.53 (n=3)	0.33 (n=5)

Bolded values are greater than available standards.

Comparative Water Quality Criteria for Pesticides:

Pesticide	Aquatic Life Standards (ug/L, ppb)		
	Acute	Chronic	RMC ¹
azinphos-methyl		0.01 ²	
carbaryl			0.02 ³
chlorpyriphos	0.083 ⁴	0.041 ⁴	
diazinon	0.08 ⁵	0.04 ⁵	

1 - RMC = recommended maximum concentration

2 - USEPA – Gold Book (1986)

3 - National Academy of Sciences-NAS 1973

4 - Washington State Water Quality Standards, WAC 173-201A

5 - California Department of Fish and Game – Menconi and Cox, 1994

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Appendix C

**Target Analyte List
and
Quality Assurance Information**

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Table C1. Target List for Water Analyses – Organophosphorus Pesticides

SW846 Method 8085				
Analyte	Quantitation Limit ¹ (ug/L)		Analyte	Quantitation Limit ¹ (ug/L)
Acephate	0.30		fenosulfothion	0.075
Azinphos-ethyl	0.12		fenthion	0.055
Azinphos-methyl	0.12		fonophos	0.045
Carbophenothion	0.80		imidan	0.080
Chlorpyriphos	0.055		malathion	0.060
chlorpyriphos-methyl	0.040		merphos	0.12
coumaphos	0.090		methamidophos	0.30
DEF	0.11		mevinphos	0.075
demeton-O	0.055		paraoxon-methyl	0.15
demeton-S	0.060		parathion	0.060
diazinon	0.060		parathion-methyl	0.055
dichlorvos	0.060		phorate	0.055
demethoate	0.060		phosphamidan	0.18
dioxathion	0.12		propetamphos	0.15
disulfthion	0.045		ronnel	0.055
EPN	0.075		sulfotepp	0.045
Ethion	0.055		sulprofos	0.055
ethoprop	0.060		temephos	0.70
fenamiphos	0.12		tertachlorvinphos	0.15
fenitrothion	0.055			

¹Quantitation limits are approximate and are often different for each sample; these values are representative of a typical sample.

Table C2. Target List for Water Analyses – Carbamates

SW846 Method 8318 – Modified				
Analyte	Quantitation Limit ¹ (ug/L)		Analyte	Quantitation Limit ¹ (ug/L)
1-naphthol	0.05		carbofuran	0.28
3-hydroxycarbofuran	0.15		methiocarb	0.5
Aldicarb	0.5		methomyl	0.15
Aldicarb sulfone	0.15		oxamyl	0.15
Aldicarb sulfoxide	0.15		propoxur (baygon)	0.3
Carbaryl	0.28			

¹Quantitation limits are approximate and are often different for each sample; these values are representative of a typical sample.

Table C3. Matrix spike recovery results for the Grayland Ditches, July-August, 2002
(% recovery)

	<u>GHCDD-1 Schmid Road</u>		
	MS ¹	MSD ²	RPD ³
<u>02- July</u>			
Demeton-O	72	82	13
Sulfotepp	55	62	12
Demeton-S	55	66	18
Fonofos	115	136	17
Disulfoton (Di-Syston)	289	323	11
Methyl Chlorpyriphos	45	52	14
Fenitrothion	60	68	13
Malathion	54	60	11
Chlorpyriphos	48	48	0
Merphos (1 & 2)	51	62	19
Ethion	45	51	13
Carbophenothion	46	55	18
EPN	44	50	13
Azinphos Ethyl	43	48	11

	<u>GHCDD-1 Schmid Road</u>		
	MS	MSD	RPD
<u>18- July</u>			
Ethoprop	85	85	0
Phorate	71	71	0
Dimethoate	70	70	0
Diazinon	51	65	24
Methyl Parathion	79	82	4
Ronnel	69	75	8
Fenthion	82	82	0
Parathion	71	71	0
Fensulfothion	81	83	2
Bolstar (Sulprofos)	76	75	1
Imidan	75	74	1
Azinphos-Methyl	60	57	5
Coumaphos	76	75	1

¹ Matrix spike

² Matrix spike duplicate

³ Relative percent difference (difference/mean x 100)

Table C3 cont'd. Matrix spike recovery results for the Grayland Ditches, July-August, 2002
(% recovery)

	<u>GHCDD-1 Schmid Road</u>		
	MS ¹	MSD ²	RPD ³
<u>01-August</u>			
Demeton-O	54	51	6
Sulfotepp	36	34	6
Demeton-S	48	44	9
Fonofos	50	34	38
Disulfoton (Di-Syston)	50	58	15
Methyl Chlorpyrifos	44	41	7
Fenitrothion	51	46	10
Malathion	42	39	7
Chlorpyrifos	41	38	8
Ethion	39	37	5
Carbophenothion	42	38	10
EPN	45	43	5
Azinphos Ethyl	42	40	5

¹ Matrix spike

² Matrix spike duplicate

³ Relative percent difference (difference/mean x 100)

Table C4. Duplicate analysis results for the Grayland Ditches, July-August, 2002 (ug/L).

	<u>PCDD-1 Larkin Road</u>		RPD ¹
	Sample 1	Sample 2	
<u>02- July</u>			
Chlorpyrifos	0.033J	0.035J	6
Diazinon	0.60J	0.62J	3
Azinphos-Methyl	0.13J	0.18J	32
Carbaryl	0.09J	0.12U	
TSS (mg/L)	5	6	18
<u>18-July</u>			
Chlorpyrifos	0.015J	0.014J	7
Diazinon	0.64J	0.74J	14
Azinphos-Methyl	0.013J	0.0088J	39
Carbaryl	0.12U	0.12U	
TSS (mg/L)	10	10	0
<u>01-August</u>			
Chlorpyrifos	0.036J	0.021J	53
Diazinon	0.20J	0.13J	42
Azinphos-Methyl	0.0061J	0.032UJ	
Carbaryl	0.12U	0.12U	
Imidan	0.0074J	0.022UJ	
TSS (mg/L)	6	6	0

¹ Relative percent difference (difference/mean x 100)

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Appendix D

Study Results

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Table D1. Organophosphorous Pesticides Results for the Grayland Ditches, July-August, 2002 (ug/L).

Field ID Sample Number 02... Date	<u>Schmid Road</u>			<u>Grange Road</u>		
	278701 07/02/02	298701 07/18/02	318701 08/01/02	278702 07/02/02	298702 07/18/02	318702 08/01/02
Demeton-O	0.015 UJ	0.015 UJ	0.015 UJ	0.015 UJ	0.014 UJ	0.014 U
Sulfotepp	0.013 U	0.013 U	0.013 U	0.013 U	0.0025 J	0.012 U
Demeton-S	0.015 U	0.015 UJ	0.015 U	0.015 U	0.014 UJ	0.014 U
Fonofos	0.013 U	0.013 U	0.013 U	0.013 U	0.012 U	0.012 U
Disulfoton (Di-Syston)	0.013 UJ	0.013 U	0.013 U	0.013 UJ	0.012 U	0.012 U
Methyl Chlorpyrifos	0.017 U	0.017 U	0.017 U	0.017 U	0.016 U	0.016 U
Fenitrothion	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U
Malathion	0.017 U	0.017 U	0.017 U	0.017 U	0.016 U	0.016 U
Chlorpyrifos	0.010 J	0.0050 J	0.017 U	0.023 J	0.010 J	0.0065 J
Merphos (1 & 2)	0.025 U	0.025 UJ	0.025 U	0.025 U	0.024 UJ	0.024 U
Ethion	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U
Carbophenothion	0.021 U	0.021 U	0.021 U	0.021 U	0.020 U	0.020 U
EPN	0.021 U	0.021 U	0.021 U	0.021 U	0.020 U	0.020 U
Azinphos Ethyl	0.033 U	0.033 U	0.033 U	0.033 U	0.031 U	0.032 U
Ethoprop	0.017 UJ	0.017 UJ	0.017 U	0.017 UJ	0.016 UJ	0.016 U
Phorate	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U
Dimethoate	0.017 UJ	0.017 UJ	0.017 UJ	0.017 UJ	0.016 UJ	0.016 UJ
Diazinon	0.35 J	0.13 J	0.018 J	0.10 J	5.7 J	0.033 J
Methyl Parathion	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U
Ronnel	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U
Fenthion	0.015 U	0.015 UJ	0.015 U	0.015 U	0.014 U	0.014 U
Parathion	0.017 U	0.017 U	0.017 U	0.017 U	0.016 U	0.016 U
Fensulfothion	0.021 UJ	0.021 U	0.021 UJ	0.021 UJ	0.020 U	0.020 UJ
Bolstar (Sulprofos)	0.015 U	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U
Imidan	0.023 UJ	0.023 UJ	0.023 U	0.023 UJ	0.022 UJ	0.022 U
Azinphos-Methyl	0.033 UJ	0.10 J	0.20 J	0.020 UJ	0.19 J	0.19 J
Coumaphos	0.025 U	0.025 U	0.025 U	0.025 U	0.024 U	0.024 U
Dichlorvos (DDVP)	0.017 UJ	0.017 UJ	0.017 U	0.017 UJ	0.016 UJ	0.016 U
Mevinphos	0.021 UJ	0.021 UJ	0.021 U	0.021 UJ	0.020 UJ	0.020 U
Dioxathion	0.035 UJ	0.035 U	0.035 UJ	0.035 UJ	0.033 U	0.034 UJ
Propetamphos	0.042 U	0.042 UJ	0.042 U	0.042 U	0.039 U	0.040 U
Methyl Paraoxon	0.038 UJ	0.038 U	0.038 U	0.038 UJ	0.035 U	0.036 U
Phosphamidán	0.050 UJ	0.050 UJ	0.050 UJ	0.050 UJ	0.047 UJ	0.048 UJ
Tetrachlorvinphos	0.042 UJ	0.042 U	0.042 U	0.042 UJ	0.039 U	0.040 U
Fenamiphos	0.031 UJ	0.031 UJ	0.031 U	0.031 UJ	0.030 UJ	0.030 U
Tribufos (DEF)	0.029 U	0.029 U	0.029 UJ	0.029 U	0.028 U	0.028 UJ
Abate (Temephos)	0.13 U	0.13 UJ	0.13 UJ	0.13 UJ	0.12 UJ	0.12 UJ

U – The analyte was not detected at or above the reported result.

J – The analyte was positively identified. The associated numerical result is an estimate.

UJ – The analyte was not detected at or above the reported estimated result.

Bolding is used for analytes positively identified as a visual reference.

Table D1 cont'd. Organophosphorous Pesticides Results for the Grayland Ditches, July-August, 2002 (ug/L).

Field ID Sample Number 02... Date	County Line Road			Tidegate		
	278703 07/02/02	298703 07/18/02	318703 08/01/02	278704 07/02/02	298704 07/18/02	318704 08/01/02
Demeton-O	0.015 UJ	0.014 UJ	0.014 U	0.014 UJ	0.015 UJ	0.015 U
Sulfotepp	0.013 U	0.012 U	0.012 U	0.012 U	0.013 U	0.013 U
Demeton-S	0.015 U	0.014 UJ	0.014 U	0.014 U	0.015 UJ	0.015 U
Fonofos	0.013 U	0.012 U	0.012 U	0.012 U	0.013 U	0.013 U
Disulfoton (Di-Syston)	0.013 UJ	0.012 U	0.012 U	0.012 UJ	0.013 U	0.013 U
Methyl Chlorpyrifos	0.017 U	0.016 U	0.016 U	0.016 U	0.017 U	0.017 U
Fenitrothion	0.015 U	0.014 U	0.014 U	0.014 U	0.015 U	0.015 U
Malathion	0.017 U	0.016 U	0.016 U	0.016 U	0.017 U	0.017 U
Chlorpyrifos	0.020 J	0.016 U	0.0067 J	0.030 J	0.014 J	0.030
Merphos (1 & 2)	0.025 U	0.024 UJ	0.024 U	0.025 U	0.025 UJ	0.025 U
Ethion	0.015 U	0.014 U	0.014 U	0.014 U	0.015 U	0.015 U
Carbophenothion	0.021 U	0.020 U	0.020 U	0.020 U	0.021 U	0.021 U
EPN	0.021 U	0.020 U	0.020 U	0.020 U	0.021 U	0.021 U
Azinphos Ethyl	0.033 U	0.033 U	0.032 U	0.033 U	0.033 U	0.033 U
Ethoprop	0.017 UJ	0.016 UJ	0.016 U	0.016 UJ	0.017 UJ	0.017 U
Phorate	0.015 U	0.014 U	0.014 U	0.014 U	0.015 U	0.015 U
Dimethoate	0.017 UJ	0.016 UJ	0.016 UJ	0.016 UJ	0.017 UJ	0.017 UJ
Diazinon	0.35 J	2.0 J	0.036 J	0.71 J	0.71 J	0.18 J
Methyl Parathion	0.015 U	0.014 U	0.014 U	0.014 U	0.015 U	0.015 U
Ronnel	0.015 U	0.014 U	0.014 U	0.014 U	0.015 U	0.015 U
Fenthion	0.015 U	0.014 UJ	0.014 U	0.014 U	0.015 UJ	0.015 U
Parathion	0.017 U	0.016 U	0.016 U	0.016 U	0.017 U	0.017 U
Fensulfothion	0.021 UJ	0.020 U	0.020 UJ	0.020 UJ	0.021 U	0.021 UJ
Bolstar (Sulprofos)	0.015 U	0.014 U	0.014 U	0.014 U	0.015 U	0.015 U
Imidan	0.023 UJ	0.022 UJ	0.022 UJ	0.023 UJ	0.023 UJ	0.0047 J
Azinphos-Methyl	0.020 J	0.23 J	0.30 J	0.15 J	0.012 J	0.0067 J
Coumaphos	0.025 U	0.024 U	0.024 U	0.025 U	0.025 U	0.025 U
Dichlorvos (DDVP)	0.017 UJ	0.016 UJ	0.016 U	0.016 UJ	0.017 UJ	0.017 U
Mevinphos	0.021 UJ	0.020 UJ	0.020 U	0.020 UJ	0.021 UJ	0.021 U
Dioxathion	0.035 UJ	0.035 U	0.034 U	0.035 UJ	0.035 U	0.035 UJ
Propetamphos	0.042 U	0.041 UJ	0.040 U	0.041 U	0.042 U	0.042 U
Methyl Paraoxon	0.038 UJ	0.037 U	0.036 U	0.037 UJ	0.038 U	0.038 UJ
Phosphamidán	0.050 UJ	0.049 UJ	0.048 UJ	0.049 UJ	0.050 UJ	0.050 U
Tetrachlorvinphos	0.042 UJ	0.041 U	0.040 U	0.041 UJ	0.042 U	0.042 U
Fenamiphos	0.031 UJ	0.030 UJ	0.030 U	0.031 UJ	0.031 UJ	0.031 U
Tribufos (DEF)	0.029 U	0.028 U	0.028 UJ	0.029 U	0.029 U	0.029 UJ
Abate (Temephos)	0.13 U	0.12 UJ	0.12 UJ	0.12 UJ	0.13 UJ	0.13 UJ

U – The analyte was not detected at or above the reported result.

J – The analyte was positively identified. The associated numerical result is an estimate.

UJ – The analyte was not detected at or above the reported estimated result.

Bolding is used for analytes positively identified as a visual reference.

Table D1 cont'd. Organophosphorous Pesticides Results for the Grayland Ditches, July-August, 2002 (ug/L).

Field ID Sample Number 02... Date	<u>Larkin Road</u>			<u>Jacobson Road</u>		
	278705 07/02/02	298705 07/18/02	318705 08/01/02	278706 07/02/02	298706 07/18/02	318706 08/01/02
Demeton-O	0.014 UJ	0.015 UJ	0.014 U	0.015 UJ	0.014 UJ	0.015 U
Sulfotepp	0.012 U	0.013 U	0.012 U	0.013 U	0.0046 J	0.0013 J
Demeton-S	0.014 U	0.015 UJ	0.014 U	0.015 U	0.014 UJ	0.015 U
Fonofos	0.012 U	0.013 U	0.012 U	0.013 U	0.012 U	0.013 U
Disulfoton (Di-Syston)	0.012 UJ	0.013 U	0.012 U	0.013 UJ	0.012 U	0.013 U
Methyl Chlorpyrifos	0.016 U	0.017 U	0.016 U	0.017 U	0.017 U	0.017 U
Fenitrothion	0.014 U	0.015 U	0.014 U	0.015 U	0.014 U	0.015 U
Malathion	0.016 U	0.017 U	0.016 U	0.017 U	0.017 U	0.017 U
Chlorpyrifos	0.033 J	0.015 J	0.036 J	0.034 J	0.59 J	0.56 J
Merphos (1 & 2)	0.024 U	0.025 UJ	0.024 U	0.026 U	0.025 UJ	0.025 U
Ethion	0.014 U	0.015 U	0.014 U	0.015 U	0.014 U	0.015 U
Carbophenothion	0.020 U	0.021 U	0.020 U	0.022 U	0.021 U	0.021 U
EPN	0.020 U	0.021 U	0.020 U	0.022 U	0.021 U	0.021 U
Azinphos Ethyl	0.033 U	0.033 U	0.032 U	0.034 U	0.033 U	0.033 U
Ethoprop	0.016 UJ	0.017 UJ	0.016 U	0.017 UJ	0.017 UJ	0.017 U
Phorate	0.014 U	0.015 U	0.014 U	0.015 U	0.014 U	0.015 U
Dimethoate	0.016 UJ	0.017 UJ	0.016 UJ	0.017 UJ	0.017 UJ	0.017 UJ
Diazinon	0.60 J	0.64 J	0.20 J	0.12 J	0.69 J	0.11 J
Methyl Parathion	0.014 U	0.015 U	0.014 U	0.015 U	0.014 U	0.015 U
Ronnel	0.014 U	0.015 U	0.014 U	0.015 U	0.014 U	0.015 U
Fenthion	0.014 U	0.015 UJ	0.014 U	0.015 U	0.014 UJ	0.015 U
Parathion	0.016 U	0.017 U	0.016 U	0.017 U	0.017 U	0.017 U
Fensulfothion	0.020 UJ	0.021 UJ	0.020 UJ	0.022 UJ	0.021 U	0.021 UJ
Bolstar (Sulprofos)	0.014 U	0.015 U	0.014 U	0.015 U	0.014 U	0.015 U
Imidan	0.022 UJ	0.023 UJ	0.0074 J	0.024 UJ	0.023 UJ	0.023 U
Azinphos-Methyl	0.13 J	0.013 J	0.0061 J	0.22 J	0.0079 J	0.014 J
Coumaphos	0.024 U	0.025 U	0.024 U	0.026 U	0.025 U	0.025 U
Dichlorvos (DDVP)	0.016 UJ	0.017 UJ	0.016 U	0.017 UJ	0.017 UJ	0.017 U
Mevinphos	0.020 UJ	0.021 UJ	0.020 U	0.022 UJ	0.021 UJ	0.021 U
Dioxathion	0.035 UJ	0.035 U	0.034 UJ	0.037 UJ	0.035 U	0.035 U
Propetamphos	0.041 U	0.042 UJ	0.040 U	0.043 U	0.041 UJ	0.042 U
Methyl Paraoxon	0.037 UJ	0.038 U	0.036 U	0.039 UJ	0.037 U	0.038 U
Phosphamidán	0.049 UJ	0.050 UJ	0.048 U	0.052 UJ	0.050 UJ	0.050 UJ
Tetrachlorvinphos	0.041 UJ	0.042 U	0.040 U	0.043 UJ	0.041 U	0.042 U
Fenamiphos	0.030 UJ	0.031 UJ	0.030 U	0.032 UJ	0.031 UJ	0.031 U
Tribufos (DEF)	0.028 U	0.029 U	0.028 UJ	0.030 U	0.029 U	0.029 UJ
Abate (Temephos)	0.12 UJ	0.13 UJ	0.12 UJ	0.13 U	0.12 UJ	0.13 UJ

U – The analyte was not detected at or above the reported result.

J – The analyte was positively identified. The associated numerical result is an estimate.

UJ – The analyte was not detected at or above the reported estimated result.

Bolding is used for analytes positively identified as a visual reference.

Table D1 cont'd. Organophosphorous Pesticides Results for the Grayland Ditches, July-August, 2002 (ug/L).

Field ID Sample Number 02... Date	Midway Beach Road			Heather Road		
	278707 07/02/02	298707 07/18/02	318707 08/01/02	278708 07/02/02	298708 07/18/02	318708 08/01/02
Demeton-O	0.014 UJ	0.015 UJ	0.015 U	0.014 UJ	0.015 UJ	0.014 U
Sulfotepp	0.012 U	0.013 U	0.013 U	0.012 U	0.013 U	0.012 U
Demeton-S	0.014 U	0.015 UJ	0.015 U	0.014 U	0.015 UJ	0.014 U
Fonofos	0.012 U	0.013 U	0.013 U	0.012 U	0.013 U	0.012 U
Disulfoton (Di-Syston)	0.012 UJ	0.013 U	0.013 U	0.012 UJ	0.013 U	0.012 U
Methyl Chlorpyrifos	0.016 U	0.017 U	0.017 U	0.016 U	0.017 U	0.016 U
Fenitrothion	0.014 U	0.015 U	0.015 U	0.014 U	0.015 U	0.014 U
Malathion	0.016 U	0.017 U	0.017 U	0.016 U	0.017 U	0.016 U
Chlorpyrifos	0.039 J	0.025 U	0.035 J	0.039 J	0.019 J	0.023 J
Merphos (1 & 2)	0.025 U	0.025 UJ	0.025 U	0.025 U	0.025 UJ	0.024 U
Ethion	0.014 U	0.015 U	0.015 U	0.014 U	0.015 U	0.014 U
Carbophenothion	0.020 U	0.021 U	0.021 U	0.020 U	0.021 U	0.020 U
EPN	0.020 U	0.021 U	0.021 U	0.020 U	0.021 U	0.020 U
Azinphos Ethyl	0.033 U	0.034 U	0.033 U	0.033 U	0.034 U	0.032 U
Ethoprop	0.016 UJ	0.017 UJ	0.017 U	0.016 UJ	0.017 UJ	0.016 U
Phorate	0.014 U	0.015 U	0.015 U	0.014 U	0.015 U	0.014 U
Dimethoate	0.016 UJ	0.017 UJ	0.017 UJ	0.016 UJ	0.017 UJ	0.016 UJ
Diazinon	0.10 J	0.74 J	0.15 J	0.10 J	0.31 J	0.079 J
Methyl Parathion	0.014 U	0.015 U	0.015 U	0.014 U	0.015 U	0.014 U
Ronnel	0.014 U	0.015 U	0.015 U	0.014 U	0.015 U	0.014 U
Fenthion	0.014 U	0.015 U	0.015 U	0.014 U	0.015 UJ	0.014 U
Parathion	0.016 U	0.017 U	0.017 U	0.016 U	0.017 U	0.016 U
Fensulfothion	0.020 UJ	0.021 UJ	0.021 UJ	0.020 UJ	0.021 U	0.020 UJ
Bolstar (Sulprofos)	0.014 U	0.015 U	0.015 U	0.014 U	0.015 U	0.014 U
Imidan	0.023 UJ	0.023 UJ	0.023 U	0.023 UJ	0.023 UJ	0.022 U
Azinphos-Methyl	0.33 J	0.025 J	0.13 J	0.22 J	0.050 J	0.048 J
Coumaphos	0.025 U	0.024 U				
Dichlorvos (DDVP)	0.016 UJ	0.017 UJ	0.017 U	0.016 UJ	0.017 UJ	0.016 U
Mevinphos	0.020 UJ	0.021 UJ	0.021 U	0.020 UJ	0.021 UJ	0.020 U
Dioxathion	0.035 UJ	0.036 U	0.035 UJ	0.035 UJ	0.036 U	0.034 UJ
Propetamphos	0.041 U	0.042 U	0.042 U	0.041 U	0.042 U	0.040 U
Methyl Paraoxon	0.037 UJ	0.038 U	0.038 U	0.037 UJ	0.038 U	0.036 U
Phosphamidán	0.049 UJ	0.051 UJ	0.050 U	0.049 UJ	0.051 UJ	0.048 UJ
Tetrachlorvinphos	0.041 UJ	0.042 U	0.042 U	0.041 UJ	0.042 U	0.040 U
Fenamiphos	0.031 UJ	0.032 UJ	0.031 U	0.031 UJ	0.032 UJ	0.030 U
Tribufos (DEF)	0.029 U	0.030 U	0.029 UJ	0.029 U	0.030 U	0.028 UJ
Abate (Temephos)	0.12 UJ	0.13 UJ	0.13 UJ	0.12 UJ	0.13 UJ	0.12 UJ

U – The analyte was not detected at or above the reported result.

J – The analyte was positively identified. The associated numerical result is an estimate.

UJ – The analyte was not detected at or above the reported estimated result.

Bolding is used for analytes positively identified as a visual reference.

Table D1 cont'd. Organophosphorous Pesticides Results for the Grayland Ditches, July-August, 2002 (ug/L).

Field ID Sample Number 02... Date	Cranberry Museum			Duplicate – Larkin Road		
	278709 07/02/02	298709 07/18/02	318709 08/01/02	278712 07/02/02	298710 07/18/02	318710 08/01/02
Demeton-O	0.015 UJ	0.014 UJ	0.015 U	0.014 UJ	0.015 UJ	0.014 UJ
Sulfotepp	0.013 U	0.012 U	0.013 U	0.012 U	0.013 U	0.012 UJ
Demeton-S	0.015 U	0.014 UJ	0.015 U	0.014 U	0.015 UJ	0.014 UJ
Fonofos	0.013 U	0.012 U	0.013 U	0.012 U	0.013 U	0.012 UJ
Disulfoton (Di-Syston)	0.013 UJ	0.012 U	0.013 U	0.012 UJ	0.013 U	0.012 UJ
Methyl Chlorpyrifos	0.017 U	0.016 U	0.017 U	0.016 U	0.017 U	0.016 UJ
Fenitrothion	0.015 U	0.014 U	0.015 U	0.014 U	0.015 U	0.014 UJ
Malathion	0.017 U	0.016 U	0.017 U	0.016 U	0.017 U	0.016 UJ
Chlorpyrifos	0.041 J	0.016 U	0.020 J	0.035 J	0.014 J	0.021 J
Merphos (1 & 2)	0.026 U	0.024 UJ	0.025 U	0.024 U	0.025 UJ	0.024 UJ
Ethion	0.015 U	0.014 U	0.015 U	0.014 U	0.015 U	0.014 UJ
Carbophenothion	0.022 U	0.020 U	0.021 U	0.020 U	0.021 U	0.020 UJ
EPN	0.022 U	0.020 U	0.021 U	0.020 U	0.021 U	0.020 UJ
Azinphos Ethyl	0.034 U	0.033 U	0.033 U	0.032 U	0.034 U	0.032 UJ
Ethoprop	0.017 UJ	0.016 UJ	0.017 U	0.016 UJ	0.017 UJ	0.016 UJ
Phorate	0.015 U	0.014 U	0.015 U	0.014 U	0.015 U	0.014 UJ
Dimethoate	0.017 UJ	0.016 UJ	0.017 UJ	0.016 UJ	0.017 UJ	0.016 UJ
Diazinon	0.22 J	0.024 J	0.012 J	0.62 J	0.74 J	0.13 J
Methyl Parathion	0.015 U	0.014 U	0.015 U	0.014 U	0.015 U	0.014 UJ
Ronnel	0.015 U	0.014 U	0.015 U	0.014 U	0.015 U	0.014 UJ
Fenthion	0.015 U	0.014 UJ	0.015 U	0.014 U	0.015 UJ	0.014 UJ
Parathion	0.017 U	0.016 U	0.017 U	0.016 U	0.017 U	0.016 UJ
Fensulfothion	0.022 UJ	0.020 U	0.021 UJ	0.020 UJ	0.021 UJ	0.020 UJ
Bolstar (Sulprofos)	0.015 U	0.014 U	0.015 U	0.014 U	0.015 U	0.014 UJ
Imidan	0.024 UJ	0.022 UJ	0.023 U	0.022 UJ	0.023 UJ	0.022 UJ
Azinphos-Methyl	0.30 J	0.0049 J	0.0060 J	0.18 J	0.0088 J	0.032 UJ
Coumaphos	0.026 U	0.024 U	0.025 U	0.024 U	0.025 U	0.024 UJ
Dichlorvos (DDVP)	0.017 UJ	0.016 UJ	0.017 U	0.016 UJ	0.017 U	0.016 UJ
Mevinphos	0.022 UJ	0.020 UJ	0.021 U	0.020 UJ	0.021 U	0.020 UJ
Dioxathion	0.037 UJ	0.035 U	0.035 UJ	0.034 UJ	0.036 U	0.034 UJ
Propetamphos	0.043 U	0.041 U	0.042 U	0.040 U	0.042 U	0.040 UJ
Methyl Paraoxon	0.039 UJ	0.037 U	0.038 U	0.036 UJ	0.038 U	0.036 UJ
Phosphamidán	0.052 UJ	0.049 UJ	0.050 UJ	0.048 UJ	0.051 UJ	0.048 UJ
Tetrachlorvinphos	0.043 UJ	0.041 U	0.042 U	0.040 UJ	0.042 U	0.040 UJ
Fenamiphos	0.032 UJ	0.030 UJ	0.031 U	0.030 UJ	0.032 UJ	0.030 UJ
Tribufos (DEF)	0.030 U	0.028 U	0.029 UJ	0.028 U	0.030 U	0.028 UJ
Abate (Temephos)	0.13 J	0.12 UJ	0.13 UJ	0.12 UJ	0.13 UJ	0.12 UJ

U – The analyte was not detected at or above the reported result.

J – The analyte was positively identified. The associated numerical result is an estimate.

UJ – The analyte was not detected at or above the reported estimated result.

Bolding is used for analytes positively identified as a visual reference.

Table D1 cont'd. Organophosphorous Pesticides Results for the Grayland Ditches, July-August, 2002 (ug/L).

Field ID Sample Number 02... Date	Reference Site			Transport Blank		
	278700 07/02/02	298700 07/18/02	318700 08/01/02	278713 07/02/02	298711 07/18/02	318711 08/01/02
Demeton-O	0.015 UJ	0.014 UJ	0.014 U	0.014 UJ	0.015 UJ	0.014 U
Sulfotepp	0.013 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U
Demeton-S	0.015 U	0.014 UJ	0.014 U	0.014 U	0.015 UJ	0.014 U
Fonofos	0.013 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U
Disulfoton (Di-Syston)	0.013 UJ	0.012 U	0.012 U	0.012 UJ	0.013 U	0.012 U
Methyl Chlorpyrifos	0.017 U	0.017 U	0.016 U	0.016 U	0.017 U	0.016 U
Fenitrothion	0.015 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U
Malathion	0.017 U	0.017 U	0.016 U	0.016 U	0.017 U	0.016 U
Chlorpyrifos	0.017 UJ	0.017 J	0.016 U	0.016 UJ	0.017 U	0.016 U
Merphos (1 & 2)	0.026 U	0.025 UJ	0.024 U	0.024 U	0.025 UJ	0.024 U
Ethion	0.015 U	0.014 U	0.014 U	0.014 U	0.015 UJ	0.014 U
Carbophenothion	0.022 U	0.021 U	0.020 U	0.020 U	0.021 U	0.020 U
EPN	0.022 U	0.021 U	0.020 U	0.020 U	0.021 U	0.020 U
Azinphos Ethyl	0.034 U	0.033 U	0.032 U	0.032 U	0.033 U	0.032 U
Ethoprop	0.017 UJ	0.017 UJ	0.016 U	0.016 UJ	0.017 UJ	0.016 U
Phorate	0.015 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U
Dimethoate	0.017 UJ	0.017 UJ	0.016 UJ	0.016 UJ	0.017 UJ	0.016 UJ
Diazinon	0.017 U	0.017 U	0.016 U	0.016 U	0.0007 J	0.016 U
Methyl Parathion	0.015 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U
Ronnel	0.015 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U
Fenthion	0.015 U	0.014 UJ	0.014 U	0.014 U	0.015 UJ	0.014 U
Parathion	0.017 U	0.017 U	0.016 U	0.016 U	0.017 U	0.016 U
Fensulfothion	0.022 UJ	0.021 U	0.020 UJ	0.020 UJ	0.021 U	0.020 UJ
Bolstar (Sulprofos)	0.015 U	0.014 U	0.014 U	0.014 U	0.015 U	0.014 U
Imidan	0.024 UJ	0.023 UJ	0.022 U	0.022 UJ	0.023 UJ	0.022 U
Azinphos-Methyl	0.034 UJ	0.033 UJ	0.032 UJ	0.032 UJ	0.033 UJ	0.032 UJ
Coumaphos	0.026 U	0.025 U	0.024 U	0.024 U	0.025 U	0.024 U
Dichlorvos (DDVP)	0.017 UJ	0.017 UJ	0.016 U	0.016 UJ	0.017 UJ	0.016 U
Mevinphos	0.022 UJ	0.021 UJ	0.020 U	0.020 UJ	0.021 UJ	0.020 U
Dioxathion	0.037 UJ	0.035 U	0.034 UJ	0.034 UJ	0.035 U	0.034 UJ
Propetamphos	0.043 U	0.041 U	0.040 U	0.040 U	0.042 U	0.040 U
Methyl Paraoxon	0.039 UJ	0.037 U	0.036 U	0.036 UJ	0.038 U	0.036 U
Phosphamidán	0.052 UJ	0.050 UJ	0.048 UJ	0.048 UJ	0.050 UJ	0.048 UJ
Tetrachlorvinphos	0.043 UJ	0.041 U	0.040 U	0.040 UJ	0.042 U	0.040 U
Fenamiphos	0.032 UJ	0.031 UJ	0.030 U	0.030 UJ	0.031 UJ	0.030 U
Tribufos (DEF)	0.030 U	0.029 U	0.028 UJ	0.028 U	0.029 U	0.028 UJ
Abate (Temephos)	0.13 UJ	0.12 UJ	0.12 UJ	0.12 UJ	0.13 UJ	0.12 UJ

U – The analyte was not detected at or above the reported result.

J – The analyte was positively identified. The associated numerical result is an estimate.

UJ – The analyte was not detected at or above the reported estimated result.

Bolding is used for analytes positively identified as a visual reference.

Table D2. Low Level Carbamate Results for the Grayland Ditches, July-August, 2002 (ug/L).

Sample Date	<u>Schmid Road</u>			<u>Larkin Road</u>			<u>Tidegate</u>		
	7/02	7/18	8/01	7/02	7/18	8/01	7/02	7/18	8/01
Aldicarb Sulfone	.12 UJ	.12 U	.12 U	.12 U	.12 U	.12 U	.12 U	.12 U	.12 U
Aldicarb Sulfoxide	.12 UJ	.12 U	.12 U	.12 U	.12 U	.12 U	.12 U	.12 U	.12 U
Oxamyl (Vydate)	.12 UJ	.12 U	.12 U	.12 U	.12 U	.12 U	.12 U	.12 U	.12 U
Methomyl	.12 UJ	.12 U	.12 U	.12 U	.12 U	.12 U	.12 U	.12 U	.12 U
3-Hydroxycarbofuran	.12 UJ	.12 U	.12 U	.12 U	.12 U	.12 U	.12 U	.12 U	.12 U
Aldicarb	.12 UJ	.12 U	.12 U	.12 U	.12 U	.12 U	.12 U	.12 U	.12 U
Baygon (Propoxur)	.12 UJ	.12 U	.12 U	.12 U	.12 U	.12 U	.12 U	.12 U	.12 U
Carbofuran	.12 UJ	.12 U	.12 U	.12 U	.12 U	.12 U	.12 U	.12 U	.12 U
1-Naphthol	.3 UJ	.3 U	.3 U	.3 U	.3 U	.3 U	.3 U	.3 U	.3 U
Carbaryl	.12 UJ	.12 U	.12 U	.09 J	.12 U	.12 U	.12 U	.12 U	.12 U
Methiocarb	.3 UJ	.3 U	.3 U	.3 U	.3 U	.3 U	.3 U	.3 U	.3 U

Sample Date:	<u>Reference Site</u>		
	7/02	7/18	8/01
Aldicarb Sulfone	.12 UJ	.12 U	.12 U
Aldicarb Sulfoxide	.12 UJ	.12 U	.12 U
Oxamyl (Vydate)	.12 UJ	.12 U	.12 U
Methomyl	.12 UJ	.12 U	.12 U
3-Hydroxycarbofuran	.12 UJ	.12 U	.12 U
Aldicarb	.12 UJ	.12 U	.12 U
Baygon (Propoxur)	.12 UJ	.12 U	.12 U
Carbofuran	.12 UJ	.12 U	.12 U
1-Naphthol	.3 UJ	.3 U	.3 U
Carbaryl	.12 UJ	.12 U	.12 U
Methiocarb	.3 UJ	.3 U	.3 U

UJ = The reporting limit is an estimate. The analyte was not detected at or above the value.

U = The reporting limit. The analyte was not detected at or above the value.

J = Associated value is an estimate.

Bolded values mean the analytes presence was confirmed.

Table D3. Chlorinated Pesticides Results for the Grayland Ditches, July 2002 (ug/L).

Field ID	Schmid Road	Grange Road	County Line Road	Tidegate	Larkin Road
Sample Number 02...	278701	278702	278703	278704	298705
Date	07/02/02	07/02/02	07/02/02	07/02/02	07/02/02
Alpha-BHC	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U
Beta-BHC	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U
Gamma-BHC (Lindane)	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U
Delta-BHC	0.012 UJ	0.012 UJ	0.012 UJ	0.011 UJ	0.011 UJ
Heptachlor	0.012 UJ	0.012 UJ	0.012 U	0.011 UJ	0.011 UJ
Aldrin	0.012 UJ	0.012 UJ	0.012 U	0.011 UJ	0.011 UJ
Heptachlor Epoxide	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U
Trans-Chlordane (Gamma)	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U
Cis-Chlordane (Alpha-Chlordane)	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U
Endosulfan I	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U
Dieldrin	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U
4,4'-DDE	0.012 U	0.012 U	0.0067 J	0.011 U	0.011 U
Endrin	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U
Endosulfan II	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U
4,4'-DDD	0.012 UJ	0.012 UJ	0.0067 J	0.011 UJ	0.011 UJ
Endrin Aldehyde	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U
Endosulfan Sulfate	0.012 UJ	0.012 UJ	0.012 UJ	0.011 UJ	0.011 UJ
4,4'-DDT	0.012 UJ	0.012 UJ	0.012 UJ	0.011 UJ	0.091 J
Endrin Ketone	0.012 UJ	0.012 UJ	0.012 UJ	0.011 UJ	0.011 UJ
Methoxychlor	0.012 UJ	0.012 UJ	0.012 UJ	0.011 UJ	0.011 UJ
Alpha-Chlordene	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U
Gamma-Chlordene	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U
Oxychlordane	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U
DDMU	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U
Cis-Nonachlor	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U
Kelthane	0.047 U	0.047 U	0.047 U	0.046 U	0.046 U
Captan	0.032 UJ	0.032 UJ	0.032 UJ	0.031 UJ	0.031 UJ
2,4'-DDE	0.012 UJ	0.012 UJ	0.012 UJ	0.011 UJ	0.011 UJ
Trans-Nonachlor	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U
2,4'-DDD	0.012 UJ	0.012 UJ	0.012 UJ	0.011 UJ	0.011 UJ
2,4'-DDT	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U
Captafol	0.058 UJ	0.058 UJ	0.058 UJ	0.057 UJ	0.057 UJ
Mirex	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U

U – The analyte was not detected at or above the reported result.

J – The analyte was positively identified. The associated numerical result is an estimate.

UJ – The analyte was not detected at or above the reported estimated result.

Bolding is used for analytes positively identified as a visual reference.

Table D3 cont'd. Chlorinated Pesticides Results for the Grayland Ditches, July 2002 (ug/L).

Field ID	Jacobson Road	Midway Beach Rd	Heather Road	Cranberry Museum	Duplicate Larkin Rd
Sample Number 02...	278706	278707	278708	278709	298712
Date	07/02/02	07/02/02	07/02/02	07/02/02	07/02/02
Alpha-BHC	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U
Beta-BHC	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U
Gamma-BHC (Lindane)	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U
Delta-BHC	0.012 UJ	0.011 UJ	0.011 UJ	0.012 UJ	0.011 UJ
Heptachlor	0.012 UJ	0.011 UJ	0.011 UJ	0.012 UJ	0.011 UJ
Aldrin	0.012 UJ	0.011 UJ	0.011 UJ	0.012 UJ	0.011 UJ
Heptachlor Epoxide	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U
Trans-Chlordane (Gamma)	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U
Cis-Chlordane (Alpha-Chlordane)	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U
Endosulfan I	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U
Dieldrin	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U
4,4'-DDE	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U
Endrin	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U
Endosulfan II	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U
4,4'-DDD	0.012 UJ	0.011 UJ	0.011 UJ	0.012 UJ	0.0065 J
Endrin Aldehyde	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U
Endosulfan Sulfate	0.012 UJ	0.011 UJ	0.011 UJ	0.012 UJ	0.011 UJ
4,4'-DDT	0.069 J	0.011 UJ	0.026 J	0.086 J	0.011 UJ
Endrin Ketone	0.012 UJ	0.011 UJ	0.011 UJ	0.012 UJ	0.011 UJ
Methoxychlor	0.012 UJ	0.011 UJ	0.011 UJ	0.012 UJ	0.011 UJ
Alpha-Chlordene	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U
Gamma-Chlordene	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U
Oxychlordane	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U
DDMU	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U
Cis-Nonachlor	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U
Kelthane	0.048 U	0.046 U	0.046 U	0.048 U	0.045 U
Captan	0.033 UJ	0.031 UJ	0.031 UJ	0.033 UJ	0.030 UJ
2,4'-DDE	0.012 UJ	0.011 UJ	0.011 UJ	0.012 UJ	0.011 UJ
Trans-Nonachlor	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U
2,4'-DDD	0.012 UJ	0.011 UJ	0.011 UJ	0.012 UJ	0.011 UJ
2,4'-DDT	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U
Captafol	0.060 UJ	0.057 UJ	0.057 UJ	0.060 UJ	0.056 UJ
Mirex	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U

U – The analyte was not detected at or above the reported result.

J – The analyte was positively identified. The associated numerical result is an estimate.

UJ – The analyte was not detected at or above the reported estimated result.

Bolding is used for analytes positively identified as a visual reference.

Table D3 cont'd. Chlorinated Pesticides Results for the Grayland Ditches, July 2002 (ug/L).

Field ID	Reference <u>Site</u>	Transport <u>Blank</u>
Sample Number 02...	278700	278713
Date	07/02/02	07/02/02
Alpha-BHC	0.012 U	0.011 U
Beta-BHC	0.012 U	0.011 U
Gamma-BHC (Lindane)	0.012 U	0.011 U
Delta-BHC	0.012 UJ	0.011 UJ
Heptachlor	0.012 UJ	0.011 UJ
Aldrin	0.012 UJ	0.011 UJ
Heptachlor Epoxide	0.012 U	0.011 U
Trans-Chlordane (Gamma)	0.012 U	0.011 U
Cis-Chlordane (Alpha-Chlordane)	0.012 U	0.011 U
Endosulfan I	0.012 U	0.011 U
Dieldrin	0.012 U	0.011 U
4,4'-DDE	0.012 U	0.011 U
Endrin	0.012 U	0.011 U
Endosulfan II	0.012 U	0.011 U
4,4'-DDD	0.012 UJ	0.011 UJ
Endrin Aldehyde	0.012 U	0.011 U
Endosulfan Sulfate	0.012 UJ	0.011 UJ
4,4'-DDT	0.012 UJ	0.011 UJ
Endrin Ketone	0.012 UJ	0.011 UJ
Methoxychlor	0.012 UJ	0.011 UJ
Alpha-Chlordene	0.012 U	0.011 U
Gamma-Chlordene	0.012 U	0.011 U
Oxychlordane	0.012 U	0.011 U
DDMU	0.012 U	0.011 U
Cis-Nonachlor	0.012 U	0.011 U
Kelthane	0.048 U	0.045 U
Captan	0.033 UJ	0.030 UJ
2,4'-DDE	0.012 UJ	0.011 UJ
Trans-Nonachlor	0.012 U	0.011 U
2,4'-DDD	0.012 UJ	0.011 UJ
2,4'-DDT	0.012 U	0.011 U
Captafol	0.060 UJ	0.056 UJ
Mirex	0.012 U	0.011 U

U – The analyte was not detected at or above the reported result.

J – The analyte was positively identified. The associated numerical result is an estimate.

UJ – The analyte was not detected at or above the reported estimated result.

Table D4. Nitrogen-Containing Pesticides Results for the Grayland Ditches, July-August, 2002 (ug/L).

Field ID Sample Number 02... Sample Date:	<u>Schmid Road</u>			<u>Grange Road</u>		
	278701 07/02/02	298701 07/18/02	318701 08/01/02	278702 07/02/02	298702 07/18/02	318702 08/01/02
Dichlobenil	1.4	0.047	0.027 J	1.1	0.14	0.033 J
Tebuthiuron	0.031 U	0.031 UJ	0.031 U	0.031 U	0.030 UJ	0.030 U
Propachlor (Ramrod)	0.050 U	0.050 U	0.050 UJ	0.050 U	0.047 U	0.048 UJ
Ethalfuralin (Sonalan)	0.031 U	0.031 UJ	0.031 UJ	0.031 U	0.030 UJ	0.030 UJ
Treflan (Trifluralin)	0.031 U	0.031 UJ	0.031 UJ	0.031 U	0.030 UJ	0.030 UJ
Simazine	0.021 U	0.021 U	0.021 U	0.021 U	0.020 U	0.020 U
Atrazine	0.021 U	0.021 UJ	0.021 U	0.021 U	0.020 UJ	0.020 U
Pronamide (Kerb)	0.083 U	0.083 UJ	0.083 UJ	0.083 U	0.079 UJ	0.081 UJ
Terbacil	0.063 UJ	0.063 U	0.063 UJ	0.063 UJ	0.059 U	0.060 UJ
Metribuzin	0.021 U	0.021 UJ	0.021 U	0.021 U	0.020 UJ	0.020 U
Alachlor	0.075 U	0.075 U	0.075 U	0.075 U	0.071 U	0.073 U
Prometryn	0.021 U	0.021 UJ	0.021 UJ	0.021 U	0.020 U	0.020 UJ
Bromacil	0.083 U	0.083 UJ	0.083 UJ	0.083 U	0.079 UJ	0.081 UJ
Metolachlor	0.083 U	0.083 UJ	0.083 UJ	0.083 U	0.079 UJ	0.081 UJ
Diphenamid	0.063 U	0.063 UJ	0.063 U	0.063 U	0.059 UJ	0.060 U
Pendimethalin	0.031 U	0.031 U	0.031 U	0.031 U	0.030 UJ	0.030 U
Napropamide	0.067	0.065 J	0.066 J	0.033	0.010 J	0.014 J
Oxyfluorfen	0.083 UJ	0.083 UJ	0.083 UJ	0.083 U	0.079 UJ	0.081 UJ
Norflurazon	0.21	0.062 J	0.013 J	0.22	0.074 UJ	0.023 J
Fluridone	0.13 UJ	0.13 UJ	0.13 UJ	0.13 UJ	0.12 UJ	0.12 UJ
Eptam	0.042 UJ	0.042 U	0.042 UJ	0.042 UJ	0.039 U	0.040 UJ
Butylate	0.042 UJ	0.042 UJ	0.042 U	0.042 UJ	0.039 UJ	0.040 U
Vernolate	0.042 UJ	0.042 U	0.042 U	0.042 UJ	0.039 U	0.040 U
Cycloate	0.042 U	0.042 UJ	0.042 U	0.042 U	0.039 UJ	0.040 U
Benefin	0.031 U	0.031 U	0.031 U	0.031 U	0.030 U	0.030 U
Prometon (Pramitol 5p)	0.021 U	0.021 U	0.021 U	0.021 U	0.020 U	0.020 U
Propazine	0.021 U	0.021 U	0.021 UJ	0.021 U	0.020 U	0.020 UJ
Chlorothalonil (Daconil)	0.080 J	0.050 U	0.050 UJ	0.050 UJ	0.047 U	0.048 UJ
Triallate	0.063 U	0.063 U	0.063 U	0.063 U	0.059 U	0.060 U
Ametryn	0.021 UJ	0.021 U	0.021 U	0.021 UJ	0.020 U	0.020 U
Terbutryn (Igran)	0.021 UJ	0.021 U	0.021 UJ	0.021 UJ	0.020 U	0.020 UJ
Hexazinone	0.031 UJ	0.031 UJ	0.031 U	0.031 UJ	0.030 U	0.030 U
Pebulate	0.042 U	0.042 UJ	0.042 U	0.042 U	0.039 UJ	0.040 U
Molinate	0.042 U	0.042 UJ	0.042 U	0.042 U	0.039 UJ	0.040 U
Chlorpropham	0.083 U	0.083 UJ	0.083 U	0.083 U	0.079 UJ	0.081 U
Atraton	0.031 U	0.031 UJ	0.031 U	0.031 U	0.030 UJ	0.030 U
Triadimefon	0.054 U	0.054 U	0.054 U	0.054 U	0.051 U	0.052 U
MGK264	0.17 UJ	0.17 UJ	0.17 U	0.17 UJ	0.16 UJ	0.16 U
Butachlor	0.13 U	0.13 U	0.13 U	0.13 U	0.12 U	0.12 U
Carboxin	0.13 U	0.13 U	0.13 U	0.13 U	0.12 U	0.12 U
Fenarimol	0.063 U	0.063 UJ	0.063 U	0.063 U	0.059 UJ	0.060 U
Diuron	0.13 UJ	0.13 U	0.13 U	0.13 UJ	0.12 U	0.12 U
Di-allate (Avadex)	0.15 UJ	0.15 U	0.15 U	0.15 UJ	0.14 U	0.14 U
Profluralin	0.050 U	0.050 U	0.050 UJ	0.050 U	0.047 U	0.048 UJ
Metalaxyl	0.13 U	0.13 U	0.13 U	0.13 U	0.12 U	0.12 U
Cyanazine	0.031 UJ	0.031 UJ	0.031 U	0.031 U	0.030 UJ	0.030 U
Benzamide, 2,6,-dichloro-	-	0.30 J	0.19 J	-	0.22 J	0.13 J
Caffeine	-	0.10 J	0.050 J	-	-	-

U – The analyte was not detected at or above the reported result.

J – The analyte was positively identified. The associated numerical result is an estimate.

UJ – The analyte was not detected at or above the reported estimated result.

Bolding is used for analytes positively identified as a visual reference.

Table D4 cont'd. Nitrogen-Containing Pesticides Results for the Grayland Ditches, July-August, 2002 (ug/L).

Field ID Sample Number 02... Sample Date:	County Line Road			Tidegate		
	278703 07/02/02	298703 07/18/02	318703 08/01/02	278704 07/02/02	298704 07/18/02	318704 08/01/02
Dichlobenil	3.0	0.13	0.063	0.48	0.17	0.094
Tebuthiuron	0.031 U	0.030 UJ	0.030 U	0.031 U	0.031 UJ	0.031 U
Propachlor (Ramrod)	0.050 U	0.049 U	0.048 UJ	0.049 U	0.050 U	0.050 UJ
Ethalfuralin (Sonalan)	0.031 U	0.030 UJ	0.030 UJ	0.031 U	0.031 UJ	0.031 UJ
Treflan (Trifluralin)	0.031 U	0.030 UJ	0.030 UJ	0.031 U	0.031 UJ	0.031 UJ
Simazine	0.021 U	0.020 U	0.020 U	0.020 U	0.021 U	0.021 U
Atrazine	0.021 U	0.020 UJ	0.020 U	0.020 U	0.021 UJ	0.021 U
Pronamide (Kerb)	0.083 U	0.081 UJ	0.080 UJ	0.082 U	0.083 UJ	0.083 UJ
Terbacil	0.063 UJ	0.061 U	0.060 UJ	0.061 UJ	0.063 U	0.063 UJ
Metribuzin	0.021 U	0.020 UJ	0.020 U	0.020 U	0.021 UJ	0.021 U
Alachlor	0.075 U	0.073 U	0.072 U	0.074 U	0.075 U	0.075 U
Prometryn	0.021 U	0.020 UJ	0.020 UJ	0.020 U	0.021 U	0.021 UJ
Bromacil	0.083 U	0.081 UJ	0.080 UJ	0.082 U	0.083 UJ	0.083 UJ
Metolachlor	0.083 U	0.081 UJ	0.080 UJ	0.082 U	0.083 UJ	0.083 UJ
Diphenamid	0.063 U	0.061 UJ	0.060 U	0.061 U	0.063 UJ	0.063 U
Pendimethalin	0.031 U	0.030 UJ	0.030 U	0.031 U	0.031 UJ	0.031 U
Napropamide	0.080	0.061 U	0.060 U	0.056	0.017 J	0.017 J
Oxyfluorfen	0.083 UJ	0.081 UJ	0.080 UJ	0.082 U	0.083 UJ	0.083 UJ
Norflurazon	0.37	0.066 J	0.014 J	0.34	0.20 UJ	0.067 J
Fluridone	0.13 UJ	0.12 U	0.12 UJ	0.12 UJ	0.13 UJ	0.13 UJ
Eptam	0.042 UJ	0.041 U	0.040 UJ	0.041 UJ	0.042 U	0.042 UJ
Butylate	0.042 UJ	0.041 UJ	0.040 U	0.041 UJ	0.042 UJ	0.042 U
Vernolate	0.042 UJ	0.041 U	0.040 U	0.041 UJ	0.042 U	0.042 U
Cycloate	0.042 U	0.041 UJ	0.040 U	0.041 U	0.042 UJ	0.042 U
Benefin	0.031 U	0.030 U	0.030 U	0.031 U	0.031 U	0.031 U
Prometon (Pramitol 5p)	0.021 U	0.020 U	0.020 U	0.020 U	0.021 U	0.021 U
Propazine	0.021 U	0.020 U	0.020 UJ	0.020 U	0.021 U	0.021 UJ
Chlorothalonil (Daconil)	0.050 U	0.049 U	0.048 UJ	0.049 UJ	0.050 U	0.050 UJ
Triallate	0.063 U	0.061 U	0.060 U	0.061 U	0.063 U	0.063 U
Ametryn	0.021 UJ	0.020 U	0.020 U	0.020 UJ	0.021 U	0.021 U
Terbutryn (Igran)	0.021 UJ	0.020 U	0.020 U	0.020 UJ	0.021 U	0.021 UJ
Hexazinone	0.031 UJ	0.030 U	0.030 U	0.031 UJ	0.031 U	0.031 UJ
Pebulate	0.042 U	0.041 U	0.040 U	0.041 U	0.042 UJ	0.042 U
Molinate	0.042 U	0.041 U	0.040 U	0.041 U	0.042 UJ	0.042 U
Chlorpropham	0.083 U	0.081 U	0.080 U	0.082 U	0.083 UJ	0.083 U
Atraton	0.031 U	0.030 U	0.030 U	0.031 U	0.031 UJ	0.031 U
Triadimefon	0.054 U	0.053 U	0.052 U	0.053 U	0.054 U	0.054 U
MGK264	0.17 UJ	0.16 U	0.16 U	0.16 UJ	0.17 UJ	0.17 U
Butachlor	0.13 U	0.12 U	0.12 U	0.12 U	0.13 U	0.13 U
Carboxin	0.13 U	0.12 U	0.12 U	0.12 U	0.13 U	0.13 U
Fenarimol	0.063 U	0.061 U	0.060 U	0.061 U	0.063 UJ	0.063 U
Diuron	0.13 UJ	0.12 U	0.12 U	0.12 UJ	0.13 U	0.13 U
Di-allate (Avadex)	0.15 UJ	0.14 U	0.14 U	0.14 UJ	0.15 U	0.15 U
Profluralin	0.050 U	0.049 U	0.048 UJ	0.049 U	0.050 U	0.050 UJ
Metalaxyl	0.13 U	0.12 U	0.12 U	0.12 U	0.13 U	0.13 U
Cyanazine	0.031 UJ	0.030 UJ	0.030 U	0.031 UJ	0.031 UJ	0.031 U
Benzamide, 2,6,-dichloro-	0.12 J	0.13 J	0.070 J	0.075 J	0.14 J	0.0012 J
Caffeine	-	-	0.050 J	-	-	-

U – The analyte was not detected at or above the reported result.

J – The analyte was positively identified. The associated numerical result is an estimate.

UJ – The analyte was not detected at or above the reported estimated result.

Bolding is used for analytes positively identified as a visual reference.

Table D4 cont'd. Nitrogen-Containing Pesticides Results for the Grayland Ditches, July-August, 2002 (ug/L).

Field ID Sample Number 02... Sample Date:	<u>Larkin Road</u>			<u>Jacobson Road</u>		
	278705 07/02/02	298705 07/18/02	318705 08/01/02	278706 07/02/02	298706 07/18/02	318706 08/01/02
Dichlobenil	0.47	0.17	0.12	0.50	0.22	0.054
Tebuthiuron	0.030 U	0.031 UJ	0.030 U	0.032 U	0.031 UJ	0.031 U
Propachlor (Ramrod)	0.049 U	0.050 U	0.048 UJ	0.052 U	0.050 U	0.050 UJ
Ethalfuralin (Sonalan)	0.030 U	0.031 UJ	0.030 UJ	0.032 U	0.031 UJ	0.031 UJ
Treflan (Trifluralin)	0.030 U	0.031 UJ	0.030 UJ	0.032 U	0.031 UJ	0.031 UJ
Simazine	0.020 U	0.021 U	0.020 U	0.022 U	0.021 U	0.021 U
Atrazine	0.020 U	0.021 UJ	0.020 U	0.022 U	0.021 UJ	0.021 U
Pronamide (Kerb)	0.081 U	0.083 UJ	0.081 UJ	0.086 U	0.083 UJ	0.083 UJ
Terbacil	0.061 UJ	0.063 U	0.060 UJ	0.065 UJ	0.062 U	0.063 UJ
Metribuzin	0.020 U	0.021 UJ	0.020 U	0.022 U	0.021 UJ	0.021 U
Alachlor	0.073 U	0.075 U	0.073 U	0.078 U	0.074 U	0.075 U
Prometryn	0.020 U	0.021 U	0.020 UJ	0.022 U	0.021 U	0.021 UJ
Bromacil	0.081 U	0.083 UJ	0.081 UJ	0.086 U	0.083 UJ	0.083 UJ
Metolachlor	0.081 U	0.083 UJ	0.081 UJ	0.086 U	0.083 UJ	0.083 UJ
Diphenamid	0.061 U	0.063 UJ	0.060 U	0.065 U	0.062 UJ	0.063 U
Pendimethalin	0.030 U	0.031 UJ	0.030 U	0.032 U	0.031 UJ	0.031 U
Napropamide	0.12	0.015 J	0.021 J	0.083	0.062 U	0.0067 J
Oxyfluorfen	0.081 UJ	0.083 UJ	0.081 UJ	0.086 UJ	0.083 UJ	0.083 UJ
Norflurazon	0.40	0.19 J	0.069 J	0.30	0.065 J	0.021 J
Fluridone	0.12 UJ	0.13 U	0.12 UJ	0.13 UJ	0.12 UJ	0.13 UJ
Eptam	0.041 UJ	0.042 UJ	0.040 UJ	0.043 UJ	0.041 U	0.042 UJ
Butylate	0.041 UJ	0.042 UJ	0.040 U	0.043 UJ	0.041 UJ	0.042 U
Vernolate	0.041 UJ	0.042 U	0.040 U	0.043 UJ	0.041 U	0.042 U
Cycloate	0.041 U	0.042 UJ	0.040 U	0.043 U	0.041 UJ	0.042 U
Benefin	0.030 U	0.031 U	0.030 U	0.032 U	0.031 U	0.031 U
Prometon (Pramitol 5p)	0.020 U	0.021 U	0.020 U	0.022 U	0.021 U	0.021 U
Propazine	0.020 U	0.021 U	0.020 UJ	0.022 U	0.021 U	0.021 UJ
Chlorothalonil (Daconil)	0.023 J	0.050 U	0.048 UJ	0.052 UJ	0.050 U	0.050 UJ
Triallate	0.061 U	0.063 U	0.060 U	0.065 U	0.062 U	0.063 U
Ametryn	0.020 UJ	0.021 U	0.020 U	0.022 UJ	0.021 U	0.021 U
Terbutryn (Igran)	0.020 UJ	0.021 U	0.020 UJ	0.022 UJ	0.021 U	0.021 UJ
Hexazinone	0.030 UJ	0.031 U	0.030 UJ	0.032 UJ	0.031 U	0.031 UJ
Pebulate	0.041 U	0.042 UJ	0.040 U	0.043 U	0.041 UJ	0.042 U
Molinate	0.041 U	0.042 UJ	0.040 U	0.043 U	0.041 UJ	0.042 U
Chlorpropham	0.081 U	0.083 UJ	0.081 U	0.086 U	0.083 UJ	0.083 U
Atraton	0.030 U	0.031 UJ	0.030 U	0.032 U	0.031 UJ	0.031 U
Triadimefon	0.053 U	0.054 U	0.052 U	0.056 U	0.054 U	0.18 J
MGK264	0.16 UJ	0.17 UJ	0.16 U	0.17 UJ	0.17 UJ	0.17 U
Butachlor	0.12 U	0.13 U	0.12 U	0.13 U	0.12 U	0.13 U
Carboxin	0.12 U	0.13 U	0.12 U	0.13 U	0.12 U	0.13 U
Fenarimol	0.061 U	0.063 UJ	0.060 U	0.065 U	0.062 UJ	0.063 U
Diuron	0.12 UJ	0.13 U	0.12 U	0.13 UJ	0.12 U	0.13 U
Di-allate (Avadex)	0.14 UJ	0.15 U	0.14 U	0.15 UJ	0.14 U	0.15 U
Profluralin	0.049 U	0.050 U	0.048 UJ	0.052 U	0.050 U	0.050 UJ
Metalaxyl	0.12 U	0.13 U	0.12 U	0.13 U	0.12 U	0.13 U
Cyanazine	0.030 UJ	0.031 UJ	0.030 U	0.032 UJ	0.031 UJ	0.031 U
Benzamide, 2,6,-dichloro-	0.098 J	-	0.093 J	0.11 J	0.089 J	0.11 J
Caffeine	-	-	-	-	-	-
Carbofuran	0.029 J	-	-	-	-	-
Diethyltoluamide	-	-	-	-	-	0.021 J

U – The analyte was not detected at or above the reported result.

UJ – The analyte was not detected at or above the reported estimated result.

J – The analyte was positively identified. The associated numerical result is an estimate.

Bolding for identified analytes as a reference.

Table D4 cont'd. Nitrogen-Containing Pesticides Results for the Grayland Ditches, July-August, 2002 (ug/L).

Field ID Sample Number 02... Sample Date:	Midway Beach Road			Heather Road		
	278707 07/02/02	298707 07/18/02	318707 08/01/02	278708 07/02/02	298708 07/18/02	318708 08/01/02
Dichlobenil	0.25	0.094 J	0.046	0.30	0.046 J	0.076 U
Tebuthiuron	0.031 U	0.032 UJ	0.031 U	0.031 U	0.032 UJ	0.030 U
Propachlor (Ramrod)	0.049 U	0.051 U	0.050 UJ	0.049 U	0.051 UJ	0.048 UJ
Ethalfuralin (Sonalan)	0.031 U	0.032 UJ	0.031 UJ	0.031 U	0.032 UJ	0.030 UJ
Treflan (Trifluralin)	0.031 U	0.032 UJ	0.031 UJ	0.031 U	0.032 UJ	0.030 UJ
Simazine	0.020 U	0.021 U	0.021 U	0.020 U	0.0017 J	0.020 U
Atrazine	0.020 U	0.021 UJ	0.021 U	0.020 U	0.021 UJ	0.020 U
Pronamide (Kerb)	0.082 U	0.085 UJ	0.083 UJ	0.082 U	0.085 UJ	0.080 UJ
Terbacil	0.061 UJ	0.064 U	0.063 UJ	0.061 UJ	0.064 UJ	0.060 UJ
Metribuzin	0.020 U	0.021 UJ	0.021 U	0.020 U	0.021 UJ	0.020 U
Alachlor	0.074 U	0.076 U	0.075 U	0.074 U	0.076 UJ	0.072 U
Prometryn	0.020 U	0.021 U	0.021 UJ	0.020 U	0.021 UJ	0.020 UJ
Bromacil	0.082 U	0.085 UJ	0.083 UJ	0.082 U	0.085 UJ	0.080 UJ
Metolachlor	0.082 U	0.085 UJ	0.083 UJ	0.082 U	0.085 UJ	0.080 UJ
Diphenamid	0.061 U	0.064 UJ	0.063 U	0.061 U	0.064 UJ	0.060 U
Pendimethalin	0.031 U	0.032 UJ	0.031 U	0.031 U	0.032 UJ	0.030 U
Napropamide	0.11	0.064 U	0.017 J	0.098	0.025 J	0.020 J
Oxyfluorfen	0.082 UJ	0.085 UJ	0.083 UJ	0.082 UJ	0.085 UJ	0.080 UJ
Norflurazon	0.22	0.042 UJ	0.014 J	0.11	0.17 J	0.020 J
Fluridone	0.12 UJ	0.13 UJ	0.13 UJ	0.12 UJ	0.13 UJ	0.12 UJ
Eptam	0.041 UJ	0.042 U	0.042 UJ	0.041 UJ	0.042 UJ	0.040 UJ
Butylate	0.041 UJ	0.042 UJ	0.042 U	0.041 UJ	0.042 UJ	0.040 U
Vernolate	0.041 UJ	0.042 U	0.042 U	0.041 UJ	0.042 UJ	0.040 U
Cycloate	0.041 U	0.042 UJ	0.042 U	0.041 U	0.042 UJ	0.040 U
Benefin	0.031 U	0.032 U	0.031 U	0.031 U	0.032 UJ	0.030 U
Prometon (Pramitol 5p)	0.020 U	0.021 U	0.021 U	0.020 U	0.021 UJ	0.020 U
Propazine	0.020 U	0.021 U	0.021 UJ	0.020 U	0.021 UJ	0.020 UJ
Chlorothalonil (Daconil)	0.026 J	0.051 U	0.050 UJ	0.049 UJ	0.051 UJ	0.048 UJ
Triallate	0.061 U	0.064 U	0.063 U	0.061 U	0.064 UJ	0.060 U
Ametryn	0.020 UJ	0.021 U	0.021 U	0.020 UJ	0.021 UJ	0.020 U
Terbutryn (Igran)	0.020 UJ	0.021 U	0.021 UJ	0.020 UJ	0.021 UJ	0.020 UJ
Hexazinone	0.031 UJ	0.032 UJ	0.031 UJ	0.031 UJ	0.032 UJ	0.030 UJ
Pebulate	0.041 U	0.042 UJ	0.042 U	0.041 U	0.042 UJ	0.040 U
Molinate	0.041 U	0.042 UJ	0.042 U	0.041 U	0.042 UJ	0.040 U
Chlorpropham	0.082 U	0.085 UJ	0.083 U	0.082 U	0.085 UJ	0.080 U
Atraton	0.031 U	0.032 UJ	0.031 U	0.031 U	0.032 UJ	0.030 U
Triadimefon	0.053 U	0.055 U	0.054 U	0.053 U	0.055 UJ	0.052 U
MGK264	0.16 UJ	0.17 UJ	0.17 U	0.16 UJ	0.17 UJ	0.16 U
Butachlor	0.12 U	0.13 U	0.13 U	0.12 U	0.13 UJ	0.12 U
Carboxin	0.12 U	0.13 U	0.13 U	0.12 U	0.13 UJ	0.12 U
Fenarimol	0.061 U	0.064 U	0.063 U	0.061 U	0.064 UJ	0.060 U
Diuron	0.12 UJ	0.13 U	0.13 U	0.12 UJ	0.13 UJ	0.12 U
Di-allate (Avadex)	0.14 UJ	0.15 U	0.15 U	0.14 UJ	0.15 UJ	0.14 U
Profluralin	0.049 U	0.051 U	0.050 UJ	0.049 U	0.051 UJ	0.048 UJ
Metalaxyl	0.12 U	0.13 U	0.13 U	0.12 U	0.13 UJ	0.12 U
Cyanazine	0.031 UJ	0.032 UJ	0.031 U	0.031 UJ	0.032 UJ	0.030 U
Benzamide, 2,6,-dichloro-	-	0.11 J	0.12 J	0.069 J	0.17 J	0.12 J
Caffeine	-	0.057 J	-	-	-	-
Carbofuran	-	-	-	0.069 J	-	-
Diethyltoluamide	-	-	0.026 J	-	-	0.014 J

U – The analyte was not detected at or above the reported result.

UJ – The analyte was not detected at or above the reported estimated result.

J – The analyte was positively identified. The associated numerical result is an estimate.

Bolding for identified analytes as a reference.

Table D4 cont'd. Nitrogen-Containing Pesticides Results for the Grayland Ditches, July-August, 2002 (ug/L).

Field ID Sample Number 02... Sample Date:	<u>Cranberry Museum</u>			<u>Duplicate-Larkin Road</u>		
	278709 07/02/02	298709 07/18/02	318709 08/01/02	278712 07/02/02	298710 07/18/02	318710 08/01/02
Dichlobenil	2.3	0.19	0.15	0.53 J	0.17	0.093 J
Tebuthiuron	0.032 U	0.030 UJ	0.031 U	0.030 UJ	0.032 UJ	0.030 UJ
Propachlor (Ramrod)	0.052 U	0.049 U	0.050 UJ	0.048 UJ	0.051 U	0.048 UJ
Ethalfuralin (Sonalan)	0.032 U	0.030 UJ	0.031 UJ	0.030 UJ	0.032 UJ	0.030 UJ
Treflan (Trifluralin)	0.032 U	0.030 UJ	0.031 UJ	0.030 UJ	0.032 UJ	0.030 UJ
Simazine	0.022 U	0.020 U	0.021 U	0.020 UJ	0.021 U	0.020 UJ
Atrazine	0.022 U	0.020 UJ	0.021 UJ	0.020 UJ	0.021 UJ	0.020 UJ
Pronamide (Kerb)	0.086 U	0.081 UJ	0.083 UJ	0.081 UJ	0.085 UJ	0.081 UJ
Terbacil	0.065 UJ	0.061 U	0.063 U	0.060 UJ	0.064 U	0.060 UJ
Metribuzin	0.022 U	0.020 UJ	0.021 U	0.020 UJ	0.021 UJ	0.020 UJ
Alachlor	0.078 U	0.073 U	0.075 U	0.073 UJ	0.076 U	0.073 UJ
Prometryn	0.022 U	0.020 U	0.021 UJ	0.020 UJ	0.021 U	0.020 UJ
Bromacil	0.086 U	0.081 UJ	0.083 UJ	0.081 UJ	0.085 UJ	0.081 UJ
Metolachlor	0.086 U	0.081 UJ	0.083 UJ	0.081 UJ	0.085 UJ	0.081 UJ
Diphenamid	0.065 U	0.061 UJ	0.063 U	0.060 UJ	0.064 UJ	0.060 UJ
Pendimethalin	0.032 U	0.030 UJ	0.031 U	0.030 UJ	0.032 UJ	0.030 UJ
Napropamide	0.10	0.061 U	0.046 J	0.097 J	0.021 J	0.014 J
Oxyfluorfen	0.086 UJ	0.081 UJ	0.083 UJ	0.081 UJ	0.085 UJ	0.081 UJ
Norflurazon	0.30	0.041 UJ	0.015 J	0.31 J	0.20 J	0.056 J
Fluridone	0.13 UJ	0.12 UJ	0.13 UJ	0.12 UJ	0.13 U	0.12 UJ
Eptam	0.043 UJ	0.041 U	0.042 UJ	0.040 UJ	0.042 U	0.040 UJ
Butylate	0.043 UJ	0.041 UJ	0.042 U	0.040 UJ	0.042 UJ	0.040 UJ
Vernolate	0.043 UJ	0.041 U	0.042 U	0.040 UJ	0.042 U	0.040 UJ
Cycloate	0.043 U	0.041 UJ	0.042 U	0.040 UJ	0.042 UJ	0.040 UJ
Benefin	0.032 U	0.030 U	0.031 U	0.030 UJ	0.032 U	0.030 UJ
Prometon (Pramitol 5p)	0.022 U	0.020 U	0.021 U	0.020 UJ	0.021 U	0.020 UJ
Propazine	0.022 U	0.020 U	0.021 UJ	0.020 UJ	0.021 U	0.020 UJ
Chlorothalonil (Daconil)	0.12 J	0.049 U	0.050 UJ	0.087 J	0.051 U	0.048 UJ
Triallate	0.065 U	0.061 U	0.063 U	0.060 UJ	0.064 U	0.060 UJ
Ametryn	0.022 UJ	0.020 U	0.021 U	0.020 UJ	0.021 U	0.020 UJ
Terbutryn (Igran)	0.022 UJ	0.020 U	0.021 UJ	0.020 UJ	0.021 U	0.020 UJ
Hexazinone	0.032 UJ	0.030 UJ	0.031 UJ	0.030 UJ	0.032 UJ	0.030 UJ
Pebulate	0.043 U	0.041 UJ	0.042 U	0.040 UJ	0.042 UJ	0.040 UJ
Molinate	0.043 U	0.041 UJ	0.042 U	0.040 UJ	0.042 UJ	0.040 UJ
Chlorpropham	0.086 U	0.081 UJ	0.083 U	0.081 UJ	0.085 UJ	0.081 UJ
Atraton	0.032 U	0.030 UJ	0.031 U	0.030 UJ	0.032 U	0.030 UJ
Triadimefon	0.056 U	0.053 U	0.054 U	0.052 UJ	0.055 U	0.052 UJ
MGK264	0.17 UJ	0.16 UJ	0.17 U	0.16 UJ	0.17 UJ	0.16 UJ
Butachlor	0.13 U	0.12 U	0.13 U	0.12 UJ	0.13 U	0.12 UJ
Carboxin	0.13 U	0.12 U	0.13 U	0.12 UJ	0.13 U	0.12 UJ
Fenarimol	0.065 U	0.061 UJ	0.063 U	0.060 UJ	0.064 UJ	0.060 UJ
Diuron	0.13 UJ	0.12 U	0.13 U	0.12 UJ	0.13 U	0.12 UJ
Di-allate (Avadex)	0.15 UJ	0.14 U	0.15 U	0.14 UJ	0.15 U	0.14 UJ
Profluralin	0.052 U	0.049 U	0.050 UJ	0.048 UJ	0.051 U	0.048 UJ
Metalaxyl	0.13 U	0.12 U	0.13 U	0.12 UJ	0.13 U	0.12 UJ
Cyanazine	0.032 UJ	0.030 UJ	0.031 U	0.030 UJ	0.032 UJ	0.030 UJ
Benzamide, 2,6,-dichloro-	0.17 J	0.16 J	0.13 J	0.090 J	0.11 J	0.069 J
Caffeine	-	-	-	-	-	-
Carbofuran	0.028 J	-	-	0.029 J	-	-
Diethyltoluamide	-	-	-	-	-	-

U – The analyte was not detected at or above the reported result.

UJ – The analyte was not detected at or above the reported estimated result.

J – The analyte was positively identified. The associated numerical result is an estimate.

Bolding for identified analytes as a reference.

Table D4 cont'd. Nitrogen-Containing Pesticides Results for the Grayland Ditches, July-August, 2002 (ug/L).

Field ID Sample Number 02... Sample Date:	Reference Site			Transport Blank		
	278700 07/02/02	298700 07/18/02	318700 08/01/02	278713 07/02/02	298711 07/18/02	318711 08/01/02
Dichlobenil	0.043 U	0.041 U	0.040 U	0.040 U	0.042 U	0.040 U
Tebuthiuron	0.032 U	0.031 UJ	0.030 U	0.030 U	0.031 UJ	0.030 U
Propachlor (Ramrod)	0.052 U	0.050 U	0.048 UJ	0.048 U	0.050 U	0.048 UJ
Ethalfuralin (Sonalan)	0.032 U	0.031 UJ	0.030 UJ	0.030 U	0.031 UJ	0.030 UJ
Treflan (Trifluralin)	0.032 U	0.031 UJ	0.030 UJ	0.030 U	0.031 UJ	0.030 UJ
Simazine	0.022 U	0.021 U	0.020 U	0.020 U	0.021 U	0.020 U
Atrazine	0.022 U	0.021 UJ	0.020 U	0.020 U	0.021 UJ	0.020 U
Pronamide (Kerb)	0.086 U	0.083 UJ	0.081 UJ	0.081 U	0.083 UJ	0.080 UJ
Terbacil	0.065 UJ	0.062 U	0.060 UJ	0.060 UJ	0.063 U	0.060 UJ
Metribuzin	0.022 U	0.021 UJ	0.020 U	0.020 U	0.021 UJ	0.020 U
Alachlor	0.078 U	0.074 U	0.073 U	0.073 U	0.075 U	0.072 U
Prometryn	0.022 U	0.021 U	0.020 UJ	0.020 U	0.021 U	0.020 UJ
Bromacil	0.086 U	0.083 UJ	0.081 UJ	0.081 U	0.083 UJ	0.080 UJ
Metolachlor	0.086 U	0.083 UJ	0.081 UJ	0.081 U	0.083 UJ	0.080 UJ
Diphenamid	0.065 U	0.062 UJ	0.060 U	0.060 U	0.063 UJ	0.060 U
Pendimethalin	0.032 U	0.031 UJ	0.030 U	0.030 U	0.031 UJ	0.030 U
Napropamide	0.065 U	0.062 U	0.060 U	0.060 U	0.063 U	0.060 U
Oxyfluorfen	0.086 UJ	0.083 UJ	0.081 U	0.081 UJ	0.083 UJ	0.080 UJ
Norflurazon	0.043 U	0.041 UJ	0.040 UJ	0.040 U	0.042 U	0.040 U
Fluridone	0.13 UJ	0.12 UJ	0.12 UJ	0.12 UJ	0.13 UJ	0.12 UJ
Eptam	0.043 UJ	0.041 U	0.040 U	0.040 UJ	0.042 U	0.040 UJ
Butylate	0.043 UJ	0.041 UJ	0.040 U	0.040 UJ	0.042 UJ	0.040 U
Vernolate	0.043 UJ	0.041 U	0.040 U	0.040 UJ	0.042 U	0.040 U
Cycloate	0.043 U	0.041 UJ	0.040 U	0.040 U	0.042 UJ	0.040 U
Benefin	0.032 U	0.031 U	0.030 U	0.030 U	0.031 U	0.030 U
Prometon (Pramitol 5p)	0.022 U	0.021 U	0.020 U	0.020 U	0.021 U	0.020 U
Propazine	0.022 U	0.021 U	0.020 UJ	0.020 U	0.021 U	0.020 UJ
Chlorothalonil (Daconil)	0.052 UJ	0.050 U	0.048 UJ	0.048 UJ	0.050 U	0.048 UJ
Triallate	0.065 U	0.062 U	0.060 U	0.060 U	0.063 U	0.060 U
Ametryn	0.022 UJ	0.021 U	0.020 U	0.020 UJ	0.021 U	0.020 U
Terbutryn (Igran)	0.022 UJ	0.021 U	0.020 UJ	0.020 UJ	0.021 U	0.020 UJ
Hexazinone	0.032 UJ	0.031 UJ	0.030 UJ	0.030 UJ	0.031 UJ	0.030 UJ
Pebulate	0.043 U	0.041 UJ	0.040 U	0.040 U	0.042 UJ	0.040 U
Molinate	0.043 U	0.041 UJ	0.040 U	0.040 U	0.042 UJ	0.040 U
Chlorpropham	0.086 U	0.083 UJ	0.081 U	0.081 U	0.083 UJ	0.080 U
Atraton	0.032 U	0.031 UJ	0.030 U	0.030 U	0.031 UJ	0.030 U
Triadimefon	0.056 U	0.054 U	0.052 U	0.052 U	0.054 U	0.052 U
MGK264	0.17 UJ	0.17 UJ	0.16 U	0.16 UJ	0.17 UJ	0.16 U
Butachlor	0.13 U	0.12 U	0.12 U	0.12 U	0.13 U	0.12 U
Carboxin	0.13 U	0.12 U	0.12 U	0.12 U	0.13 U	0.12 U
Fenarimol	0.065 U	0.062 UJ	0.060 U	0.060 U	0.063 UJ	0.060 U
Diuron	0.13 UJ	0.12 U	0.12 U	0.12 UJ	0.13 U	0.12 U
Di-allate (Avadex)	0.15 UJ	0.14 U	0.14 U	0.14 UJ	0.15 U	0.14 U
Profluralin	0.052 U	0.050 U	0.048 UJ	0.048 U	0.050 U	0.048 UJ
Metalaxyl	0.13 U	0.12 U	0.12 U	0.12 U	0.13 U	0.12 U
Cyanazine	0.032 UJ	0.031 UJ	0.030 U	0.030 UJ	0.031 UJ	0.030 U
Benzamide, 2,6,-dichloro-	-	-	-	-	-	-
Caffeine	-	-	-	-	-	-
Carbofuran	-	-	-	-	-	-
Diethyltoluamide	-	-	-	-	-	-

U – The analyte was not detected at or above the reported result.

UJ – The analyte was not detected at or above the reported estimated result.

J – The analyte was positively identified. The associated numerical result is an estimate.

Table D5. Total Suspended Solids (mg/L), temperature (C°), and discharge (cfs) results for the Grayland Ditches, July-August, 2002.

Site	<u>07/02/2002</u>			<u>07/18/2002</u>			<u>08/01/2002</u>		
	TSS	T°	Q	TSS	T°	Q	TSS	T°	Q
<u>GHCDD-1</u>									
Schmid Road	2	*	3.53	3	13.9°	1.79	4	12.5°	1.14
Grange Road	2	*	0.53	4	*	*	2	13.0°	*
County Line Road	11	*	7.36	4	14.9°	0.82	4	14.0°	0.45
<u>PCDD-1</u>									
Reference	8	*	*	11	10.5°	*	20	11.0°	*
Tidegate	4	*	*	4	15.0°	*	5	14.5°	*
Larkin Road	5	*	6.16	10	14.9°	3.49	6	14.0°	2.32
Jacobson Road	18	*	*	7	15.3°	*	4	14.0°	*
Midway Beach Road	3	*	*	2	*	*	3	14.0°	*
Heather Road	6	*	2.76	7	14.1°	1.97	5	14.5°	1.47
Cranberry Museum	5	*	*	367	14.3°	*	307	12.5°	*

* No data.

Temperature not measured for 07/02/02 survey due to broken thermometer.