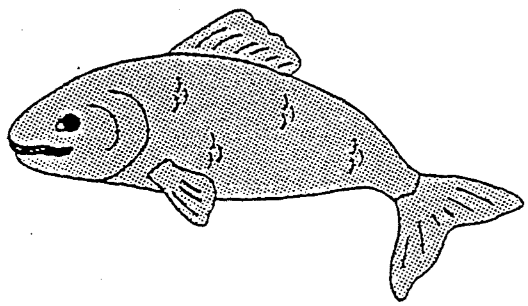
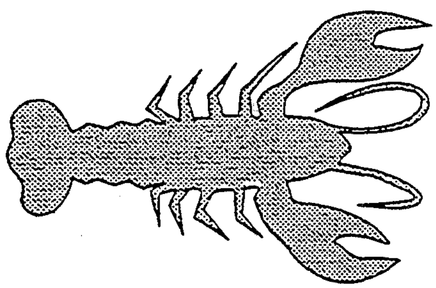
DEPLW98-14

DIOXIN MONITORING PROGRAM

STATE OF MAINE

1996





BY

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

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Acknowledgements

Successful collection of most of the samples was due to long hours and diligence of DEP conservation aide John Reynolds assisted by Dana Valleau, Francis Brautigam, Greg Beane and other DEP personnel. The assistance of Acheron Inc., specifically Mark Hein, on behalf of many of the facilities, also made the collection of fish possible in 1996. The help of Scott Davis of the Maine Department of Inland Fisheries and Wildlife in providing brown trout from the Kennebec River was invaluable. The Penobscot Nation supplied fish from Grindstone and South Lincoln, which was greatly appreciated. Also, the assistance of the Department of Marine Resources and Department of Inland Fisheries and Wildlife in collection of samples and providing nets was very helpful.

EXECUTIVE SUMMARY

Statutory Requirements

The goal of Maine's Dioxin Monitoring Program, established in 1988, is "to determine the nature of dioxin contamination in the waters and fisheries of the State". Charged with administration of the program, the Department of Environmental Protection (DEP) is required to sample fish once a year below no more than 12 bleached pulp mills, municipal wastewater treatment plants, or other known or likely sources of dioxin. DEP is also required to sample sludge from the same facilities once each quarter as one aid in the identification of sources of dioxin.

The Dioxin Monitoring Program is coordinated with other ongoing programs conducted by the Department, the US Environmental Protection Agency and dischargers of wastewater. DEP is advised by the Surface Water Ambient Toxics (SWAT) Monitoring Program Technical Advisory Group in implementation of the program. DEP required to incorporate the results of all studies into a report to the Legislature's Joint Standing Committee on Natural Resources during the following March of each sample year. Costs of sample collection and analysis are assessed to the selected facilities. In 1996, sample collection for this program was coordinated with that of the SWAT Program to facilitate sample collection for both programs. This year was the second year of the new two year schedule in which, to reduce costs, only one species is sampled at a site each year making two year's data necessary to complete a sampling schedule.

Fish Consumption Advisories

Based on monitoring results through 1995, the Maine Bureau of Health revised the fish consumption advisories and issued a `General Consumption Advisory for All Inland Surface Waters due to Mercury Contamination' in March 1997 (Appendix 1). In addition more restrictive Specific Freshwater Fish Consumption Advisories were issued for the Androscoggin River, Kennebec River below Madison, Penobscot River below Lincoln, Salmon Falls River below Berwick, East Branch of Sebasticook River below Corinna, and West Branch of Sebasticook River below Hartland due to PCBs and dioxins. An advisory on lobster tomalley was contiuned from 1994 along the entire coast of Maine due to PCBs and dioxins. In most of these waters dioxin concentrations alone would result in an advisory, which was made more restrictive due to the presence of substantial levels of PCBs.

Findings of the 1996 Program

1. In 1996, the second year of the new 2 year monitoring cycle, concentrations of dioxin toxic equivalents (TEQh) in fish from the Androscoggin River and East Branch of the Sebasticook River exceeded the Maine Bureau of Health's Fish Tissue Action Level for cancer (FTALc=1.5 ppt).

2. Concentrations of 2378-TCDD (TCDD) and TEQh in all fish samples collected below point source discharges to the Androscoggin River, Kennebec River, Penobscot River, Salmon Falls River, and East Branch and West Branch of the Sebasticook River exceeded DEP's Fish Monitoring Threshold (FMT=0.15 ppt) and were significantly greater than those at reference stations unimpacted by industrial sources.

3. The concentration of TCDD in fish below the industrial discharge to the Presumpscot River was greater than in fish from its reference site, but TEQh were not. Fish from the reference site had concentrations of TEQh significantly higher than all the other reference sites in the state for the forth consecutive year, suggesting another local source.

4. Of 22 stations, concentrations of TEQh in fish were generally similar to concentrations when last measured except for a significant decrease in concentrations in white suckers at 2 stations, Livermore Falls and Lisbon Falls. TCDD concentrations were significantly lower than when last measured at 6 stations, including 3 on the Androscoggin River, and 1 each on the Kennebec River, Penobscot River, and East Branch of the Sebasticook River. TCDD and/or TEQh at most stations remained considerably lower than when first measured during the period from 1984-1990.

5. As in previous years, TCDD and TEQ concentrations were highest in fish from the Androscoggin River compared to fish from other rivers.

6. Concentrations of TEQh in brown trout and smallmouth bass from Androscoggin Lake exceeded the Maine Bureau of Health's Fish Tissue Action Level (FTALc=1.5 ppt).

7. TEQh concentrations in lobster tomalley at all stations remain above levels which prompted the Bureau of Health to issue a lobster tomalley consumption advisory in 1994 (Appendix 1). Concentrations in the St. Croix Estuary, Penobscot Estuary, Kennebec Estuary, and Presumpscot Estuary were significantly higher (in increasing amounts) than at their respective reference sites, Brave Boat Harbor in Kittery for southern Maine and Corea in Gouldsboro for Downeast. Concentrations of TCDD were significantly lower in the Kennebec River estuary and Penobscot River estuary than in 1995, but concentrations of DTEh were similar to those in 1995 at all stations.

INTRODUCTION

Maine's Dioxin Monitoring Program, established in 1988, was amended in 1995 and reauthorized through 1997 by the Maine legislature. The goal of the program is "to determine the nature of dioxin contamination in the waters and fisheries of the State". Charged with administration of the program, the Department of Environmental Protection (DEP) is required to sample sludge once a quarter from no more than 12 bleached pulp mills, municipal wastewater treatment plants, or other known or likely sources of dioxin. The Department is also required to sample fish once a year below the same facilities.

The monitoring program is coordinated with other ongoing programs conducted by the Department, US Environmental Protection Agency (EPA), or dischargers of wastewater. The proposed annual monitoring plan must be submitted to the Surface Water Ambient Toxics (SWAT) Technical Advisory Group (TAG), created under 38 MRSA section 420-B, for review and advice. The selected facilities must be notified of their inclusion in the proposed program at least 30 days prior to submittal to the TAG. The Department must incorporate the results of all studies into a report due the Natural Resources Committee by 1 December of each year. A draft of the report is reviewed by the TAG before completion of the final report. Costs of sample collection and analysis are assessed as a fee to the selected facilities. Payment of the fees is a condition of the waste discharge license granted by the state for continued operation and discharge of wastewater to waters of the State. However, if the selected facility is a publicly owned treatment works (POTW), then the fees may be assessed to the known or likely industrial generator of dioxin and payment will not be a condition of the waste discharge license of the POTW.

Due to continuing controversy over the effects of dioxin on human and ecological health, the US Environmental Protection Agency (EPA), announced that in 1991 it would begin a thorough scientific reassessment of dioxin. EPA proposed that the process would be open to the public and consequently held several meetings to share information and receive comments. Draft reports on a wide range of issues were available in 1992, 1993, and 1994. Initial results indicate that dioxin may exhibit reproductive and developmental effects, immuno-toxic effects, and neuro-toxic effects at concentrations nearly as low or lower than commonly thought to promote cancer (Frakes, 1992; Graham, 1992; Hughes, 1992; Silbergeld, 1992). In 1995 EPA's Scientific Advisory Board published its review of the draft reports recommending some revisions. New drafts scheduled for 1996 have not yet been released.

DEP has determined, from fish collected since 1984, that concentrations of dioxins and furans in fish from locations unaffected by certain industrial discharges are normally less than 0.15 ppt, while concentrations in fish below those sources of dioxin and furans are always greater than that. Consequently, as one method of determining known or likely sources of dioxin, a Fish Monitoring Threshold (FMT=0.15 ppt) is used by DEP as a monitoring threshold to determine sites that will be retained in the annual program.

For informing the public about potential risk from consuming fish contaminated with dioxin, the BOH publishes fish consumption advisories based on a comparison of a Fish Tissue Action Level (FTAL) for dioxin equivalent concentrations (TEQ) with the TEQ in fish tissue. There are two FTALs, both developed using standard USEPA risk assessment methods. For potential carcinogenic effects associated with long-term exposure, BOH has developed a FTALc of 1.5 ppt. For Reproductive and developmental effects potentially arising from shorter exposure durations, BOH has developed a FTALr of 1.8 ppt (Frakes, 1990). The FTALr for reproductive and developmental effects is relevant to women of child bearing age, pregnant women, and lactating women. The FTALs are compared to edible portions of the fish, skinless filet data. Where whole fish data are reported, the TEQ concentration is divided by a factor of 3.5, determined from previous studies with white suckers, to estimate skinless filet concentration. In this report all comparisons with TEQ in fish are made with FTALc, since that is the lower of the two and protective of both effects.

OBJECTIVES

Given the fact that beginning in 1991, concentrations of dioxins and furans have declined at some sites, but not others, the primary objective of the 1996 program was to complete the two year cycle and collect fish samples from the appropriate sites and species from each river such that accurate, complete, and current data are available to meet the overall goal of the program. The program design included sampling at least one site below each major source to document trends and sampling of historic sites that showed dioxin above the FMT, whether or not any fish consumption advisories were issued. Another criterion was to sample fish from any new sites or important species suspected of being contaminated with dioxin.

At sites affected by a single discharger, sampling will continue until there are at least two consecutive cycles for each species where dioxin is below the FMT and is not increasing. At sites affected by more than one discharger where fish concentrations are not below the FMT, each discharger will continue to be included in the annual sampling program until enough evidence has been gathered to demonstrate that dioxin is no longer present in the discharge in significant quantities. Such evidence must include, but not be limited to (1) at least 8 consecutive sludge analyses equally distributed over all seasons for a minimum of two years that show no 2378-TCDD (TCDD) detected at a suitably low detection level, (2) full congener analysis for all 2378 substituted dioxins and furans, (3) other pertinent information such as process changes, changes in hook-ups that show reductions in the level of dioxins being discharged to insignificant levels.

PROGRAM DESIGN

The 1996 program was initially drafted by DEP, BOH, the Department of Marine Resources (DMR) and the Department of Inland Fisheries and Wildlife (DIFW) according to the objectives listed above. Following a meeting with representatives of the participating facilities, the draft program was presented to the SWAT TAG and finalized in May 1996.

In 1995, the annual program was modified from a 1 year cycle to a two year cycle, thereby reducing costs roughly by half. Prior to 1995, both predator fish (game fish) and omnivorous fish (suckers or bullheads) were collected at each site each year. Beginning in 1995, one species was collected at each site each year. Consequently it will take two years to complete sample collection of both predators and omnivores at each site. Collection of predators and omnivores was alternated sequentially among sites on each river that has more than one site, so that there were samples for both predators and omnivores on each of those rivers. In 1996, the second year of the two year cycle was completed. At South Lincoln and Veazie on the Penobscot River, both species were collected at the request of the pulp and paper mills. As part of International Paper Company's hydropower relicensing process at Livermore Falls, 20 suckers were collected at the usual station in the Otis Impoundment and below the Livermore Falls dam to determine any differences in concentration attributable to the presence of a dam.

There was one reference station for each river. At reference stations on each river with multiple test sites, both species were collected. On rivers with only one test site, only one species was collected at reference stations.

Station locations along with specified fish species are shown in Table 1. Station location maps show exact locations of collections (Appendix 6). Test stations were similar to those in 1995.

Table 1. Sample stations, facilities, and species for the 1996 Dioxin Monitoring Program

STATION	FACILITY	SPECIES
Androscoggin R		
Gilead (ref)	All Andr R sources	bass, sucker
Rumford	Mead	sucker
Jay (Bean Is)	Mead	bass
Liv Fls(Otis imp)	International Paper	sucker
Turner (GIP)	International Paper	bass
Lisbon Falls	BC & IP	sucker
Kennebec R		
Madison (ref)	All Ken R sources	bass, sucker
Shawmut Dam	SD Warren	sucker
Sidney	Scott Paper	bass
Augusta	KSTD	sucker
Phippsburg	All: Andy and Ken	lobster tomalley
Penobscot R		
E.Branch (ref)	All Pen. R sources	bass, sucker
S Lincoln	Lincoln P&P	bass, sucker
Bangor	Brewer	eel
Veazie	James River Co	bass,sucker
Stockton Springs	JR & LP&P	lobster tomalley
Presumpscot R		
Windham (ref)	SD Warren	bass
Westbrook	SD Warren	bass
Portland	SD Warren	lobster tomalley
Salmon Falls R		
Acton (ref)	Town of Berwick	sucker
S Berwick	Town of Berwick	sucker
Sebasticook R		
E Br		
Corinna (ref)	Town of Corinna	white perch, sucker
Newport	Town of Corinna	white perch, sucker
W Br		
Hartland (ref)	Town of Hartland	sucker
Palmyra	Town of Hartland	sucker
Lobster reference stations		
Brave Boat (S Me)	all	lobster tomalley
Corea (E Me)	all	lobster tomalley

The preferred sampling time is late in the summer when fish are likely to be more contaminated after being exposed to higher concentrations of dioxin during low river flows and after significant growth has occurred. At some locations there has been a problem collecting enough fish later in the summer. Here sampling began in mid-May to try to insure that a suitable sample was collected. These sites were also visited after the beginning of July. If fish were captured during the later period, those samples were submitted for analyses. Otherwise, the fish collected during the early period were used. Sampling at other sites began in July (Appendix 8).

As in previous years, ten game fish and ten bottom feeders were collected at most stations. For historic sites, predators were combined into 5 two-fish composites of skinless fillets, while the omnivores were combined into 2 five-fish composites of whole fish. On the East Branch of the Sebasticook River two composites of five white perch were analyzed. For reference sites, fish were combined into the type of composite used at the test sites for that river. At some stations we were unable to collect ten fish of each species. Consequently, the fish collected were analyzed individually or combined into composites adjusted to be as close as possible to the number and size initially targetted (Appendix 7). Each fish was ground and stored separately. Half of the ground sample of each fish was combined into the composites and the remaining tissue was archived in a freezer at WRI.

Since concentrations of dioxins and furans in the lobster meat was below a level of concern for 2 consecutive years, 1993 and 1994, no meat has been tested since. Since concentrations in tomalley, however, were high in all samples in both years, the tomalley has been analyzed in 1995 and 1996. Twenty lobsters were captured from each of two reference sites and three test sites (table 1). The tomalleys from the lobsters were combined into 4 composites of 5 tomalleys each and analyzed. In 1996, reference stations for lobsters were Brave Boat Harbor in Kittery for the third year for southern Maine and Corea for the first time for Downeast Maine. All samples in the 1996 program were analyzed for all the 2378 substituted congeners.

SAMPLING PROCEDURES

Fish were collected by DEP with assistance of representatives of the participating facilities, state agencies and the Penobscot Indian Nation. Upon capture, fish were immediately killed, weighed and measured, rinsed in river water, wrapped in aluminum foil with the shiny side out, labelled, and placed in a cooler on ice for transport to the lab. Lobsters were purchased directly from commercial fishermen at each site and placed in plastic garbage bags in a cooler on ice for transport to the lab. Chain of custody forms were used to record all field information and document all transfers. In the lab, all fish samples were frozen and later transported whole to the analytical lab. Lobster tomalleys were removed from the lobster by DEP personnel and shipped to the lab. All other procedures generally followed EPA's Sampling Guidance Manual for the National Dioxin Study (July 1984). A laboratory log was kept for an inventory of samples in the lab at any time and final disposition.

Most of the facilities in the program already sample sludge or effluent as part of their Maine Sludge Spreading Permit or Waste Discharge License or Federal NPDES permit. Data from those programs provide adequate information about sources of dioxin. Therefore, no additional sludge samples were collected as part of this program.

ANALYTICAL LABORATORY

In 1996, at the request of the Maine Legislature's Natural Resources Committee, DEP switched from use of a commercial lab, Midwest Research Institute (MRI) of Kansas City, Missouri, to the Water Research Institute (WRI) at the University of Maine in Orono, Maine for analytical services, including dioxin analyses of fish tissue. Beginning early in 1996 and continuing through 1997, staff at WRI underwent extensive hands-on training and a quality assurance and quality control program to ensure that the transition between labs would be smooth and uneventful and that WRI could provide accurate data. Elements included the following 5 actions.

(1) A detection level study was performed to ensure that WRI could meet the minimum detection level (MDL) of 0.1 ppt for 2378-TCDD required by DEP. The MDL was achieved as were slightly higher but acceptable MDLs for other congeners (Appendix 9). Blender and grinder blanks were also evaluated to ensure there was no contamination above the MDL.

(2) A CIL certified contaminated natural reference fish was analyzed to determine the ability of WRI to accurately measure known quantities of seventeen 2378-substituted dioxins and furans. Measured concentrations were well within the desired 95% confidence inteval for all congeners except 12378-PeCDD, 123478-HxCDD, 1123789-HxCDF, and OCDF which were each slightly out of range but considered acceptable(Appendix 9).

(3) A soil sample contaminated with dioxin was analyzed by WRI and the toxic equivalents (TEQs) compared to those measured by Alta Analytical (Appendix 9). The results showed that TEQs measured by both labs were similar.

(4) Ten percent of the 1996 fish samples were analyzed by both WRI and MRI. Five smallmouth bass skinless filets with expected low levels of dioxin and 6 whole white suckers with expected moderate to high levels of dioxin were ground at WRI. Separate aliquots were analyzed by each lab. An average of 30% relative percent difference (RPD) was set as the data quality objective for the split samples. Results from both labs showed concentrations for smallmouth bass below the nominal MDL such that RPD could not be calculated (Appendix 9). Results for suckers showed that WRI measured concentrations were consistently below those from MRI. After discussions with MRI and EPA, WRI determined that the samples were not properly extracted. An improved extraction procedure was instituted and the samples were re-extracted and analyzed. For this run WRI concentrations were higher than the first run with a RPD=42%. Following continued discussions and improved procedures, a second round was initiated in which 6 different whole white suckers were ground. An aliquot was analyzed by each lab. Results for 4 of the 6 samples showed good agreement between labs, but two, with surrogate recoveries less than 50%, did not. All samples were re-extracted and quantitated. Surrogate recoveries were greater than 50% and the results were equally distributed above and below those from MRI with RPD=27%.

(5) All QA/QC data were then sent to Andrew Beliveau, Quality Assurance Document Review Assistance Team, EPA Region I for independent review. Mr. Beliveau reviewed the history of the transition and the data, noted past and continued problems, and in December 1997 approved the use of WRI for these analyses(Appendix 9).

NON-DETECTS

A persistent issue with dioxin monitoring and reporting nationwide has been how to accurately report a finding where dioxin is suspected to be present but has not been detected in a sample at a given detection limit, i.e.non-detects. Such a finding may mean that the dioxin concentration approaches zero or, conversely, may approach the detection limit. Some states report non-detects as zero, while some use the full detection limit, and still others use 1/2 of the full detection limit as recommended by EPA in its draft Dioxin Reassessment.

DEP has investigated a number of probabilistic modelling approaches, (Iterative, Bias corrected, Helsel's Robust Method) for estimating concentrations for censured data, those with some non-detects. To be useful these approaches require a minimum number of measureable concentrations, which does not always occur in our data. Unless this requirement is met, these methods do not result in estimated values much different than occur when non-detects are calculated at 1/2 the full detection limit. The procedures are also long and involved. Therefore, in this report, TEQ are shown as a range with non-detects calculated at zero (TEQo) and at the detection limit (TEQd) as a mean for all samples of a given species at each station (Table 2). For comparison with the FMT and FTALc, and comparison between years and stations, TEQh were used as calculated using non-detects at 1/2 the detection limit. In some cases (reference sites) TEQo were also discussed since those were below the FMT while TEQh exceeded the FMT, which shows the importance of low detection limits and the treatment of non-detects. For the other sites both TEQo and TEQh were above the FMT, and TEQo were not discussed.

A related issue is that of EMPCs, estimated maximum possible concentrations. Some coumpounds, particularly hydroxydiphenyl ethers (DPEs) are coextracted with furans. Various steps have successfully been taken to minimize these interferences, but some DPE remains. Unlike previous years when EMPCs were considered measured quantities, in the 1996 data, EMPCs were treated as non-detects. Efforts will continue in future years to further reduce these interferences.

This issue of non-detects is an important one given that many of the cogeners are often below detection. DEP will continue to work with WRI which will now be conducting these analyses, to achieve better detection limits for the congeners. This will minimize the non-detect problem in future years.

STATISTICAL ANALYSES

Statistical analyses of differences in TCDD and TEQh between stations and between years were performed using the parametric Students t-test or non-parametric Mann-Whitney test as appropriate at $p=0.05$. Where sample size was small (e.g. $n=2$ for suckers) only large differences will calculate as significant and only those will be discussed in this report. Where $n=2$, samples reporting no significant difference may in fact have relatively large differences that are undetectable due to low statistical power and will not be discussed here. In this report only differences that are statistically significant will be reported as significant.

TEFs

Toxicity equivalency factors (TEFs) for dioxins, furans, and dioxin-like PCBs have been recently reviewed and modified by an expert panel convened in 1997 by the World Health Organization (Van den Berg et al, 1998)(Appendix 10). The only changes for dioxin TEFs are 1. an increase from 0.5 to 1.0 for 12378-PeCDD and 2. a decrease from 0.001 to 0.0001 for OCDD. Practically, this change for OCDD does not matter since concentrations of OCDD are too low to affect TEQ as reported to two decimal places in this report. The new TEF for the 12378 PeCDD was used for the 1996 data in this report. Data from earlier years shown in Table 2 have not been recalculated using the new TEF. Nevertheless, for comparison of 1996 data with earlier data for each station and species, TEQh were recalculated using the new TEF, although they are not shown in this report.

RESULTS AND DISCUSSION

Not all species and numbers of fish targeted were able to be collected (Appendix 2). A description of fish collected and analytical results follows for each sample location.

Androscoggin River

Gilead Four brown trout, eight rainbow trout, and ten white suckers were collected near Peabody Island (Appendix 7). This site is upstream of and serves as an upstream reference for all Maine mills on the river, but as it is downstream of the Crown Vantage bleached kraft mill in Berlin, New Hampshire, it is therefore not a true reference station unimpacted by direct discharge of dioxin. No bass were captured at this station, but comparisons between brown trout and bass from other rivers has shown both to have generally similar concentations of dioxins and furans. TEQh in rainbow trout exceeded the FTALc, but TEQh in brown trout and suckers were slightly less than the FTALc, although well above the FMT (Table 2). Every year measured, TCDD and TEQ in fish have been significantly higher at this station than in fish from true reference stations in Maine. No comparisons can be made with previous years for any of these species due to small sample sizes.

Rumford Ten white suckers were collected from the river reach beginning just below the discharge from Mead's bleached kraft pulp and paper mill in Rumford and extending downstream about 4 miles to Dixfield (Appendix 7). Concentrations of TEQh in the suckers were slightly below the FTALc but well above the FMT (Table 2). No sludge data have been reported since 1989. Concentrations of TCDD and TCDF in effluent were all reported at <10 ppq in 1995, which is a higher reporting level than used since 1989, making it impossible to determine how concentrations in effluent compare to previous years (Appendix 4).

Jay Ten smallmouth bass were collected from the river near Bean Island in the Jay Impoundment, which is about 20 miles below Mead and in the impoundment into which International Paper Company's bleached kraft mill discharges about 1 mile downstream (Appendix 7). Fish in this impoundment may or may not be exposed to the discharge from International Paper Company's mill depending whether or not they travel up and down the impoundment. Concentrations of TEQ_h in the bass were slightly below the FTALc for the first time ever (Table 2). Concentrations of TCDD and TEQh in the bass were not significantly different from those in 1994.

Livermore Falls In conjunction with another study, twenty white suckers were captured in the Otis Impoundment, approximately 2 miles below the discharge from International Paper Company's Jay mill (Appendix 7). Concentrations of TEQh in the suckers were below the FTALc but well above the FMT (Table 2). Concentrations of TCDD and TEQh in the suckers were significantly lower than in 1994 when last measured. Concentrations of TCDD and TCDF in sludge (Appendix 3) are lower than reported in 1989, the last year with much data. Concentrations of TCDF in effluent were lower in 1996 than in previous years (Appendix 4).

As part of a study to determine if there was any difference in TCDD or TEQh in impoundments compared to free flowing waters for a hydropower relicensing effort, twenty white suckers were also captured in a free flowing reach below the Livermore Falls dam, two dams and about 1 mile below the Otis impoundment. Concentrations of TCDD in the suckers were not significantly different between the two sites, but concentrations of TCDF and TEQh in the suckers were significantly higher in the Otis impoundment.

Auburn-GIP Ten smallmouth bass were collected in Gulf Island Pond (GIP) near the deep hole at Seagull Island, pproximately 30 miles below International Paper Company (Appendix 7). Concentrations of TEQh in the bass were above the FTALc (Table 2). TCDD concentrations in the bass were similar to those at Jay but concentrations of TEQh in the bass were significantly higher than those at Jay. Concentrations of TCDD in the bass were significantly lower than in those from 1994, when last measured, but concentrations of TEQh in bass were not significantly different between the two years.

Lisbon Falls Ten white suckers were captured in the Pejepscot Impoundment, pproximately 45 miles below International Paper Company (Appendix 7). Concentrations of TEQh in the suckers were above the FMT but well below the FTALc (Table 2). TCDD concentrations in the suckers were similar to those in suckers at other stations on the Androscoggin River, but TEQh concentrations were the lowest of all Androscoggin River stations. Concentrations of TCDD and TEQ_h in the suckers were significantly lower than in suckers in 1994.

TABLE 2. DIOXIN AND FURAN LEVELS IN MAINE FISH AND SHELLFISH (pg/g)

			NDS/NBS	MAINE	DIOXIN MONITORING PROGRAM				
			1984-86	1988-1990		1991		1992	
WATER/STATION	SPECIES	TYPE	TCDD	TCDD	TEQ	TCDD	TEQ	TCDD	TEQ
ANDROSCOGGIN LAKE									
Wayne	brown trout	f							
	bass	f							
	sucker	w							
ANDROSCOGGIN R									
Gilead	rainbow trout								
	brown trout								
	bass								
	sucker	w	1.8f/6.5w						
Rumford	bass	f				1.4	2.3-2.8	0.6	1.0-1.2
	sucker	w						3.0	7.4-8.0
Riley	sucker	w	<2.1f/13w						
Jay	bass	f		17.6	24.0-29.1			1.2	1.9-2.3
	sucker	w						5.4	12.9-13.9
Livermore Falls	bass	f				2.4	3.1-3.3	1.1	1.4-1.5
	sucker	w						3.8	7.4-8.0
N Turner	sucker	w	6.2f/30w						
Auburn-GIP	bass sm	f	3.7f/24w					1.7	2.6-2.8
	bass lm	f						1.1	1.6-1.8
	sucker	w	8.3f/29w					5.6	14.3-15.4
	bullhead	w	7.8f/29.6w						
Lisbon Falls	trout	f		5.3	6.5-6.9				
	bass	f		4.5	5.5-5.8			0.7	1.0
	sucker	w	5.1f/12w					3.4	8.1-8.7
Brunswick	sucker	w	19.0						
	carp	f	11.0						
BEARCE LAKE									
Baring	pickerel	f	<0.1						
BRAVE BOAT HARBOR									
Kittery	lobster	m							
	lobster	t							
BROOKLYN	lobster	m							
	lobster	t							
COREA	lobster	t							
JONES CREEK									
Scarborough	clam	m						<0.1	0.02-0.3
KENNEBEC R									
Madison	trout	f							
	bass	f						<0.1	0.02-0.1
	sucker	w						0.1	0.3
Fairfield	trout	f		6.2	6.9-8.0			1.4	1.6-1.8
	bass	f				1.4	1.6-1.7	0.6	0.6-0.7
	sucker	w	6.4	10.3	16.8-18.1			2.0	3.1-3.3
Sidney	bass	f	20.3w			1.0	1.4-2.4	0.4	0.6-1.0
	sucker	w	1.2f/11.4w					2.7	4.4-4.8
Augusta	trout	f		2.2	2.9-4.9			1.9	2.5-4.3
	bass	f						0.4	0.6-1.0
	sucker	w		5.0	7.3-8.4			1.5	2.6-2.8
Hallowell	smelt	c						0.2	0.5-0.8
Richmond	eel	f							
Phippsburg	clam	m						0.3	0.6-0.9
	lobster	m							
	lobster	t							

TABLE 2. DIOXIN AND FURAN LEVELS IN MAINE FISH AND SHELLFISH (pg/g)

WATER/STATION	SPECIES	TYPE	1993 TCDD	1993 TEQ	1994 TCDD	1994 TEQ	1995 TCDD	1995 TEQ	1996 TCDD	1996 TEQ
ANDROSCOGGIN LAKE										
Wayne	brown trout	f							0.7	1.1-2.3
	bass	f							0.6	1.2-2.2
	sucker	w							0.4	1.4-2.5
ANDROSCOGGIN R										
Gilead	rainbow trout						1.2	2.4-2.9	0.9	2.0-2.6
	brown trout								0.4	1.0-1.5
	bass						0.9	3.8-4.1		
	sucker	w					1.7	6.1-6.7	0.7	4.4-5.3
Rumford	bass	f	2.9	4.5-5.4	3.8	5.7-6.2	2.2	3.5-4.1		
	sucker	w	5.8	13.6-14.6	4.0	11.4-11.9			0.8	4.1-5.2
Riley	sucker	w								
Jay	bass	f	1.4	1.8-2.2	1.6	2.2-2.8			0.5	1.3-1.4
	sucker	w	4.5	10.9-11.8	4.7	11.5-12.3	2.3	6.9-7.6		
Livermore Falls	bass	f	1.4	1.6-1.8	1.4	1.6-2.3	0.5	0.8-1.3		
	sucker	w	3.6	6.8-7.3	2.2	4.8-5.3			0.6	3.4-3.9
N Turner	sucker	w								
Auburn-GIP	bass sm	f	1.2	1.8-1.9	1.3	2.0-2.7			0.6	2.1-2.5
	bass lm	f								
	sucker	w	3.7	9.0-9.8	1.6	4.4-5.4	1.4	3.8-5.0		
	bullhead	w	2.1	3.0-3.3	1.3	2.3-2.8				
Lisbon Falls	trout	f								
	bass	f	1.2	1.7-1.8	0.6	0.8-1.7	0.9	1.4-2.4		
	sucker	w	2.7	6.1-6.6	2.4	5.8-6.2			0.7	1.6-2.8
Brunswick	sucker	w								
	carp	f								
BEARCE LAKE										
Baring	pickerel	f								
BRAVE BOAT HARBOR										
Kittery	lobster	m			<0.1	<0.1-1.2				
	lobster	t			1.3	9.7-11.5	1.6	6.7-9.9	1.7	13.8-15.5
BROOKLYN	lobster	m					0.8	4.9-8.2		
	lobster	t								
COREA	lobster	t							0.6	6.6-7.3
JONES CREEK										
Scarborough	clam	m								
KENNEBEC R										
Madison	trout	f					<0.1	0.1-0.7		
	bass	f							<0.1	0.1-0.8
	sucker	w					0.1	0.3-1.0	<0.1	0.3-1.0
Fairfield	trout	f	1.4	1.6-1.9	2.2	2.5-3.8	1.6	1.7-2.5		
	bass	f	1.5	1.7-2.0	0.9	1.1-1.8				
	sucker	w	1.6	2.2-2.6	2.2	2.9-3.8			1.6	2.1-2.7
Sidney	bass	f	0.6	0.8-1.4	0.3	0.4-1.3			0.2	0.4-1.0
	sucker	w	1.5	2.5-2.7	2.3	3.0-4.0	1.2	1.7-2.5		
Augusta	trout	f					1.0	1.3-3.5		
	bass	f	0.6	0.9-1.5	1.0	1.3-3.7				
	sucker	w	1.9	3.3-3.6	2.3	4.0-5.8			2.2	2.6-3.3
Hallowell	smelt	c								
Richmond	eel	f	0.6	0.8-1.4						
Phippsburg	clam	m								
	lobster	m	0.2	0.3-1.2	<0.1	<0.1-1.6				
	lobster	t	7.9	27.5-27.6	6.5	23.4-26.6	4.6	13.5-17.1	3.6	16.7-18.6

TABLE 2. (cont.)

WATER/STATION	SPECIES	TYPE	NDS/NBS 1984-86 TCDD	MAINE DIOXIN MONITORING PROGRAM 1988-1990 TCDD	TEQ	1991 TCDD	TEQ	1992 TCDD	TEQ
MACHIAS BAY									
Machias	lobster	m							
	lobster	t							
MESSALONSKEE LAKE									
Belgrade	bass					<0.09	0.04-0.3		
NARRAGUAGUS R									
Cherryfield	fallfish	w	<1.0						
NORTH POND									
Chesterfield	sucker	w	0.4						
	pickerel	f	<0.1						
PENOBSCOT R									
E Br Grindstone	bass	f		<0.1	0.09-0.2				
	sucker	w		<0.4	0.02-0.6				
E Millinocket	bass	f		<0.2	0.4-0.8				
	sucker	w		0.7	3.6-4.2				
N Lincoln	bass	f		<0.4	0.2-0.8				
	sucker	w		<0.5-20.	2.0-41.6				
S Lincoln	bass	f	5.0	1.7	2.3-2.7	0.9	1.2-1.3	0.7	1.0-1.2
	sucker	w		37.0	66.4-67.2			3.3	6.8
Passadumkeag	bass	f		1.8	2.9				
	sucker	w		2.8	7.6-7.7				
Milford	bass	f		0.9	1.4-1.7			0.3	0.4-0.5
	sucker	w		9.7	19.9-20.1			2.2	4.6
Veazie	bass	f	4.6w	1.9	2.4-2.6	1.2	1.5-1.7	0.4	0.6
	sucker	w	2.6f/7.6w	5.9	9.8-9.9	2.5	4.9-5.0	2.2	4.8-4.9
Bangor	eel	f							
Bucksport	clam	m						0.1	0.8-0.9
Stockton Springs	lobster	m							
	lobster	t							
OWLS HEAD	mussel	m	<0.8						
PISCATAQUIS R									
Sangerville	bass	f				<0.2	0.03-0.3		
	trout	f				<0.4	0.03-0.4		
	sucker	w				0.26	0.6-0.7		
Howland	bass	f		<0.2	0.02-0.6				
PRESUMPSCOT R									
Windham	bass	f							
	sucker	w							
Westbrook	bass	f		1.8	2.4-4.5	0.2	0.2-0.4	0.1	0.2-0.4
	pickerel	f		<2.6	0.06-5.9				
	w perch	f		1.2	2.5-3.1	0.4	0.9-1.0		
	sucker	w	5.2	5.1	8.2-9.6	0.6	1.6-1.7	0.3	0.8-0.9
Falmouth	clam	m						<0.1	0.2-0.4
Portland	lobster	m							
	lobster	t							

TABLE 2. (cont.)

WATER/STATION	SPECIES	TYPE	1993 TCDD	1993 TEQ	1994 TCDD	1994 TEQ	1995 TCDD	1995 TEQ	1996 TCDD	1996 TEQ
MACHIAS BAY										
Machias	lobster	m			<0.1	<0.1-0.6				
	lobster	t			0.7	6.1-7.4				
MESSALONSKEE LAKE										
Belgrade	bass									
NARRAGUAGUS R										
Cherryfield	fallfish	w								
NORTH POND										
Chesterfield	sucker	w								
	pickerel	f								
PENOBSCOT R										
E Br Grindstone	bass	f					<0.1	0.1-0.7	<0.1	0.1-0.8
	sucker	w					<0.1	0.1-0.6	<0.1	0.1-0.8
E Millinocket	bass	f								
	sucker	w								
N Lincoln	bass	f								
	sucker	w								
S Lincoln	bass	f	1.2	1.6-1.8	0.4	0.4-1.7	0.5	0.7-1.3	0.3	0.5-1.2
	sucker	w	1.7	3.5-3.6	2.2	5.8-6.1			1.6	2.2-3.2
Passadumkeag	bass	f								
	sucker	w								
Milford	bass	f								
	sucker	w								
Veazie	bass	f	0.6	0.8-1.0	0.2	0.2-1.3	0.3	0.4-1.9	0.3	0.3-1.5
	sucker	w	1.1	2.7-3.0	0.6	1.6-2.8	0.5	1.4-2.5	0.4	0.9-2.0
Bangor	eel	f	1.0	1.1-1.2					0.3	0.4-1.5
Bucksport	clam	m								
Stockton Springs	lobster	m	0.1	0.3-1.1	<0.1	0.1-1.0				
	lobster	t	4.0	28.0	2.3	18.1-27.9	1.3	7.2-14.6	0.9	12.5-13.2
OWLS HEAD	mussel	m								
PISCATAQUIS R										
Sangerville	bass	f								
	trout	f								
	sucker	w								
Howland	bass	f								
PRESUMPSCOT R										
Windham	bass	f	<0.1	<0.1-0.3	<0.1	<0.1-1.1			<0.1	0.5-1.5
	sucker	w	0.3	0.7-0.8	0.2	1.4-2.4	0.3	2.4-7.7		
Westbrook	bass	f	<0.2	0.1-0.5	0.2	0.3-1.2			0.2	0.4-0.9
	pickerel	f								
	w perch	f								
	sucker	w	1.1	1.8-2.3	0.9	2.1-3.7	0.8	1.6-2.6		
Falmouth	clam	m								
Portland	lobster	m	<0.1	0.1-0.8	<0.1	0.2-1.0				
	lobster	t	3.4	18.5-18.7	2.5	17.2-21.3	2.2	9.5-12.8	2.7	18.9-21.6

TABLE 2. (cont.)

			NDS/NBS	MAINE	DIOXIN MONITORING PROGRAM				
			1984-86	1988- 1990		19 91		19 92	
WATER/STATION	SPECIES	TYPE	TCDD	TCDD	TEQ	TCDD	TEQ	TCDD	TEQ
ST CROIX R									
Woodland	bass	f		0.3	0.5-1.0	<0.1	0.04-0.3		
Calais	sucker	w	<0.7	0.6	1.0-1.1				
Robbinston	lobster	t							
ST JOHN R									
Frenchville	sucker	w							
Madawaska	y perch	f		<0.5	0.08-0.8				
	brook trout	f							
	sucker	w							
SACO R									
Dayton	sucker	w	<0.3						
SACO BAY									
Scarborough	lobster	m							
	lobster	t							
SALMON FALLS R									
Acton	bass lm								
	sucker								
S Berwick	bass sm	f		0.4	0.5-0.6				
	pickerel	f		0.2	0.3				
	sucker	w		1.5	2.1-2.2			2.4	3.4-3.6
SANDY P									
	bass	f	<1.0						
SEBAGO L									
Naples	bass	w	<0.6						
SEBASTICOOK R									
E Br Corinna	bass lm								
	sucker								
Newport	bass sm	f						0.1	0.3-0.4
	bass lm	f	<0.2					<0.2	0.2-0.4
	w perch	f		1.0	1.6-2.1				
W Br Harmony	bass								
	sucker								
W Br Palmyra	bass	f		1.2	1.4-1.8			0.4	0.5-0.6
	pickerel	f	<0.1					0.2	0.2
	sucker	w	1.6	3.3	4.3-4.6			1.1	1.4-1.6
WEBBER POND									
Vassalboro	bass	f				<0.08	0.04-0.4		

f=fillet
m=meat
t=tomalley
w=whole

TEQ= dioxin toxic equivalents using WHO 98 toxic equivalency factors (TEF).
Range shown at nd=0 and nd=mdl, ie TEQo-TEQd

TABLE 2. (cont.)

WATER/STATION	SPECIES	TYPE	1993 TCDD	1993 TEQ	1994 TCDD	1994 TEQ	1995 TCDD	1995 TEQ	1996 TCDD	1996 TEQ
ST CROIX R										
Woodland	bass	f								
Calais	sucker	w								
Robbinston	lobster	t							1.0	10.2-11.2
ST JOHN R										
Frenchville	sucker	w			0.1	0.2-1.0				
Madawaska	y perch	f								
	brook trout	f			<0.3	<0.1-2.3				
	sucker	w			<0.1	0.2-0.8				
SACO R										
Dayton	sucker	w								
SACO BAY										
Scarborough	lobster	m	<0.1	0.1-0.8	<0.1	<0.1-0.8				
	lobster	t	2.0	11.3-14.6	1.3	9.7-12.0				
SALMON FALLS R										
Acton	bass lm						<0.1	<0.1-0.7		
	sucker								<0.1	0.1-1.0
S Berwick	bass sm	f	0.2	0.2-0.9	0.5	0.7-3.3	0.4	0.4-4.0		
	pickerel	f								
	sucker	w	1.9	3.6-3.8	2.1	4.7-6.1			2.0	3.2-4.5
SANDY P										
	bass	f								
SEBAGO L										
Naples	bass	w								
SEBASTICOOK R										
E Br Corinna	bass lm						0.1	0.2-1.1		
	sucker									
Newport	bass sm	f								
	bass lm	f					0.3	1.1-2.0		
	w perch	f							0.3	1.6-2.3
W Br Harmony	bass						<0.1	0.1-0.8		
	sucker								0.1	0.1-1.2
W Br Palmyra	bass	f	0.9	1.2-1.6	0.4	0.4-1.3	0.8	1.7-2.2		
	pickerel	f								
	sucker	w	1.0	2.6-2.7	1.2	4.0-4.3			1.2	2.2-3.6
WEBBER POND										
Vassalboro	bass	f								

f=fillet
m=meat
t=tomalley
w=whole

TEQ= dioxin toxic equivalents using WHO 98 toxic equivalency factors (TEF).
Range shown at nd=0 and nd=mdl, ie TEQo-TEQd

Androscoggin Lake

Wayne Androscoggin Lake in Wayne and Leeds is a 4000 acre 38 foot deep meso-trophic lake with a unique reverse delta at the outlet formed by centuries of periodic backflow from the Androscoggin River via the Dead River into the lake. There is a dam on the Dead River that reduces but does not prevent the backflow into the lake, which usually occurs every year. To determine if fish in the lake are contaminated with dioxins and furans from the river, 2 brown trout, 10 smallmouth bass, and 6 white suckers were collected from the lake. Concentrations of TEQh in brown trout and smallmouth bass exceeded the FTALc, but concentrations in white suckers did not (Table 2). Concentrations of TCDD and TEQh were significantly greater in all species than in similar species from all other lakes (n=8) that have been sampled and higher than in fish from all river reference sites. Concentrations are similar to those found at contaminated sites in the river, which is most likely the source.

Brave Boat Harbor

Kittery Twenty lobsters were collected from a lobster fisherman at Brave Boat Harbor in Kittery. This site has been used as a reference site for southern Maine since 1994. The hepatopancreas or "tomalleys" from all lobsters were combined into 4 samples of 5 tomalleys each. Concentrations of TEQh in tomalley were greater than those that prompted the Maine Bureau of Health to issue a coastwide lobster tomalley consumption advisory in 1994 (Appendix 1). Concentrations of TCDD and TEQh at this site have historically been significantly greater than the Downeast Maine reference sites. Concentrations of TCDD and TEQh in tomalley were slightly but not significantly higher than in 1994 or 1995 (Table 2). These concentrations may represent background in Southern Maine as affected by long-range transport and deposition of dioxin generated by regional or national sources or some unidentified local source.

Corea

Gouldsboro Twenty lobsters were collected from a lobster fisherman near Corea in Gouldsboro. This site was added as a reference site for Downeast Maine in 1996 in place of Machias (1994) and Brooklyn (1995) to serve as a regional reference for the Penobscot River and St Croix River also sampled in 1996. The hepatopancreas or "tomalley" from all lobsters were combined into 4 samples of 5 tomalleys each. Concentrations of TEQh in tomalley were greater than those that prompted the Maine Bureau of Health to issue a coastwide lobster tomalley consumption advisory in 1994

(Appendix 1). Concentrations of TCDD and TEQ_h in tomalley were similar to those from the Machias and Brooklyn stations from previous years but significantly lower than the southern Maine reference site at Brave Boat Harbor in Kittery (Table 2). These concentrations may represent background in Downeast Maine as affected by long-range transport and deposition of dioxin generated by regional or national sources or some unidentified local source.

Kennebec River

Madison

Ten smallmouth bass and ten white suckers (Appendix 7) were collected from the river upstream of the dam in Madison. Since there are no known point sources of dioxin upstream of this station, it is a reference station for the Kennebec River as it has been since 1992. Concentrations of TCDD were below the FMT in both species. While concentrations of TEQ_h slightly exceeded the FMT for both species, concentrations of TCDD and TEQo did not in bass, demonstrating the impact of treatment of non-detects (Table 2). In suckers TCDD was below the FMT but TEQo was slightly above the FMT. These levels are similar to those at other reference sites. Concentrations of TEQh in bass were slightly higher than in 1992, again due to treatment of non-detects, as concentrations of TCDD and TEQo was similar to that of previous years. The trace amount of TEQ measured in these fish is thought to represent long-range transport and atmospheric deposition from remote sources.

Fairfield Ten white suckers (Appendix 7) were collected from the river between the Shawmut Dam and the I-95 bridge, approximately 7-8 miles below SAPPI Somerset's bleached kraft pulp and paper mill in Skowhegan. Concentrations of TEQh in the suckers were above the FMT but well below the FTALc (Table 2). Concentrations of TCDD and TEQh in the suckers were significantly greater than in those from the reference station at Madison. Concentrations of TCDD and TCDF in sludge from the SAPPI mill were similar to those from 1995 (Appendix 3), while concentrations of TCDF in effluent were similar to those in 1994 and lower than in 1995 (Appendix 4). These conflicting trends in the two different media confound the determination of recent trends in discharge levels.

Sidney Ten smallmouth bass (Appendix 7) were collected from the river within one mile of the Sidney boat landing, approximately 25 miles below the SAPPI Somerset mill in Skowhegan and approximately 9-10 miles below the discharges from the Kimberly-Clark mill in Winslow and the Kennebec Sanitary Treatment District's discharge in Waterville. Concentrations of TEQh in the bass were slightly above the FMT but well below the FTALc (Table 2). Concentrations of both TCDD and TEQh in the bass were significantly greater than at the reference site at Madison. Concentrations of TCDD and TEQh in the bass were significantly lower than in 1994. In 1994 and 1995 concentrations of TCDD in sludge from Kimberly-Clark and Kennebec Sanitary Treatment District were slightly lower than previously. In contrast TCDD concentrations were higher in sludge from the SAPPI Somerset mill in 1996 than in 1995.

Augusta In addition to the upstream sources at the Sidney site, Statler Tissue Company discharged effluent contaminated with dioxin just above the Edwards Dam in Augusta until closing in early 1995. Reopened in 1996 as Tree-Free Fiber Co., the mill, like Statler, was a recycle tissue mill, re-pulping white paper (but not bleaching) until it too closed in 1997. As such it received dioxins and furans in its furnish and passed some through to the river, although it may have created little of its own. Ten white suckers (Appendix 7) were collected from the river just below the dam. Concentrations of TEQh in suckers were above the FMT but well below the FTALc (Table 2). Concentrations of both TCDD and TEQ_h in the suckers were significantly higher than at the reference station at Madison and were the highest of all stations on the Kennebec River. Results of a sludge test at Tree-Free in November 1997 showed concentrations of TCDD below 1 ppt. Additional data would be needed, as discussed in the beginning of this report, to determine whether or not Tree-Free would be a continuing source of dioxin when they re-open.

Phippsburg Twenty lobsters were collected from a lobster fisherman fishing the estuary near Cox Head, approximately 45 miles below Augusta. This site is downstream of all the sources on the Androscoggin and Kennebec Rivers. The hepatopancreas or "tomalleys" from all lobsters were combined into 4 samples of 5 tomalleys each. Concentrations of TEQh in tomalley were greater than those that prompted the Maine Bureau of Health to issue a coastwide lobster tomalley consumption advisory in 1994 (Appendix 1). Concentrations of TCDD in tomalley were significantly higher than in tomalley from the southern Maine regional reference site, Brave Boat Harbor in Kittery, but concentrations of TEQh were not. As concentrations of TEQh in tomalley at Brave Boat Harbor, however, were slightly higher in 1996 than in 1995, concentrations of TEQh in tomalley from Phippsburg in 1996 were significantly higher than from Brave

Boat Harbor in 1994 or 1995 and from all other reference sites ever sampled. Phippsburg has the highest level of TCDD in tomalley among all sites sampled. Concentrations of TCDD in tomalley were significantly lower in 1996 than in 1995, but concentrations of TEQh in 1996 were similar to those in 1995.

Penobscot River

Grindstone

Ten smallmouth bass and ten white suckers (Appendix 7) were captured from the East Branch of the Penobscot River just above Grindstone Falls. This station was selected as a reference for the Penobscot River since there are no known point sources of dioxin upstream. In both species concentrations of TEQh slightly exceeded the FMT, but concentrations of TCDD and TEQo did not, demonstrating the impact of treatment of non-detects (Table 2). Concentrations of TCDD and TEQh in bass were similar to those of the reference station at Madison on the Kennebec River. Concentrations of TCDD and TEQ in the bass were similar to those of 1995. The trace amount of TEQ measured in these fish is thought to represent long-range transport and atmospheric deposition from remote sources.

South Lincoln Ten smallmouth bass and ten white suckers (Appendix 7) were collected from the river near the boat ramp in South Lincoln, approximately 4 miles below Lincoln Pulp and Paper Company's bleached kraft mill in Lincoln. Concentrations of TEQh were above the FMT but below the FTALc for both species (Table 2). This was the third consecutive year that concentrations of TEQh were below the FTALc for bass, but only the first for suckers. Concentrations of TCDD and TEQh in bass were significantly higher than at the reference station at Grindstone. Concentrations of TCDD and TEQh in bass were similar to those in 1994. Recent data from Lincoln Pulp and Paper Co.(Appendix 4) show concentrations in effluent were similar to those in 1995, but concentrations in sludge (Appendix 3) are lower than in 1994 when last measured.

Veazie Ten smallmouth bass and ten white suckers (Appendix 7) were collected from the Veazie Impoundment about 7-8 miles below Fort James' bleached kraft mill in Old Town. Concentrations of TEQh were above the FMT but below the FTALc for both species as has been the case since 1990 (Table 2). TCDD and TEQh concentrations in bass and suckers were significantly greater than those at the reference station at Grindstone. Concentrations of both TCDD and TEQh in bass were similar to those in 1995. In 1996 TCDF in effluent samples from the mill was slightly lower than in previous years.

Bangor Ten eels were collected from an eel fisherman from the estuary downstream of the Town of Brewer's sewage treatment plant outfall and combined into 2 composites of 5 fish each. The Brewer treatment plant treats wastewater from the Eastern Fine Paper mill which uses pulp made at Lincoln Pulp and Paper Co in Lincoln. Concentrations of TEQh exceeded the FMT but were below the FTALc (Table 2). Concentrations of TCDD and TEQh were similar to those in bass at Veazie but were significantly higher than bass at Grindstone. Concentrations of TCDD were significantly lower than in 1993 when last measured, but concentrations of TEQh were not lower. Effluent TCDD concentrations from Brewer were mostly below variable detection limits making it difficult to detect trends, but a significant amount was detected in 1994 (Appendix 4). Measurable concentrations of TCDD and TCDF in sludge from single samples in 1995 and 1996 were slightly lower than in previous years (Appendix 3).

Stockton Springs Twenty lobsters were collected from a lobsterman fishing near Fort Point, about 40 miles below the Fort James mill in Old Town. The hepatopancreas or "tomalleys" from all lobsters were combined into 4 samples of 5 tomalleys each. Concentrations of TEQh in tomalley (Table 2) were greater than those that prompted the Maine Bureau of Health to issue a coastwide lobster tomalley consumption advisory in 1994 (Appendix 1). Concentrations of TCDD and TEQh in tomalley were significantly higher than at the eastern Maine reference station at Corea. Concentrations of TCDD were significantly lower than in 1995. Although concentrations of TEQh were similar to those of 1995, concentrations of TEQo were significantly higher than in 1995, demonstrating the impact of the treatment of non-detects. Since discharges from the mills and concentrations in fish have not increased, the increase in tomalley is curious.

Presumpscot River

Windham Ten smallmouth bass (Appendix 7) were collected from the river below North Gorham Pond in Windham. This site has been used as a reference station since 1993 since there are no known point sources of dioxin upstream. Concentrations of TEQh in the bass were above the FMT but well below the FTALc (Table 2). These concentrations may represent background from long range transport and atmospheric deposition from remote sources. However, concentrations from this site have been higher every year than any other reference station in the program. These results suggest that there are other local sources of dioxin which have not yet been discovered. Concentrations of TCDD and TEQh in the bass were similar to those from 1994.

Westbrook Nine smallmouth bass (Appendix 7) were collected from the river near the US Route 302 bridge about 1.5 miles downstream of the discharge from SAPPI Westbrook's bleached kraft pulp and paper mill. Concentrations of TEQh in the bass were above the FMT but well below the FTALc (Table 2). Concentrations of TCDD in the bass were significantly greater than at the reference site at Windham. While concentrations of TEQh in the bass were significantly lower than at the reference station at Windham, concentrations of TEQo were similar, demonstrating the impact of treatment of non-detects. Concentrations of TCDD in the bass were similar to those in 1994. Concentrations of TEQh in bass were significantly lower than in 1994, but concentrations of TEQo were slightly higher than in 1994 demonstrating the influence of non-detects. Concentrations of TCDF in sludge from the mill appear to have increased since 1995 (Appendix 3). No new effluent data have been reported by SAPPI Westbrook since 1995.

Portland Twenty lobsters were collected from a lobster fisherman fishing at the mouth of the estuary off East End Beach about 10-11 miles below the SAPPI Westbrook discharge. The hepatopancreas or "tomalleys" from all lobsters were combined into 4 samples of 5 tomalleys each. Concentrations of TEQh in tomalley (Table 2) were greater than those that prompted the Maine Bureau of Health to issue a coastwide lobster tomalley consumption advisory in 1994 (Appendix 1). Concentrations of TCDD in tomalley were significantly higher than those at the southern Maine reference station, Brave Boat Harbor, but concentrations of TEQh were not. As concentrations of TEQh in tomalley from Brave Boat Harbor, however, were slightly higher in 1996 than in 1995, concentrations of TEQh from Portland in 1996 were significantly higher than at Brave Boat Harbor in 1994 or 1995 and from all other reference sites ever sampled. This station had the highest concentrations of TEQh of all stations sampled in 1996. Concentrations of TCDD and TEQh in tomalley were similar to those of 1995.

Salmon Falls River

Acton Four white suckers (Appendix 7) were collected from Great East Lake and combined into two samples. This site was selected as a reference station for the Salmon Falls River since it is at the headwaters of the river with no known point sources of dioxin. While concentrations of TEQh in the suckers were slightly above the FMT, concentrations of TCDD and TEQo were not, demonstrating the impact of non-detects (Table 2). These concentrations were similar to those at other reference stations. The trace amount of TEQ measured in these fish is thought to represent long-range transport and atmospheric deposition from remote sources.

South Berwick Ten white suckers were collected from the Rollinsford Impoundment about 2 miles below the discharge from the Berwick Sewer District in Berwick, whose discharge is 85% effluent from Prime Tanning. Concentrations of TEQh in the suckers were well above the FMT but below the FTALc (Table 2). Concentrations of TCDD and TEQh in the suckers were significantly greater than those at the reference station at Great East Lake. There are no new effluent or sludge data from the Berwick Sewer District to aid interpretation of these results, but it appears nothing has changed.

Sebasticook River

East Branch at Newport Ten white perch (Appendix 7) were collected from the river just above the County Road Bridge, a popular fishing spot at the inlet to Sebasticook Lake. This station is approximately 2 miles below the Corinna Sewer District discharge, 80% of which was from the Eastland Woolen Mill. Although the mill ceased operation in 1996, groundwater and river sediments are contaminated with a number of pollutants from the mill. Concentrations of TEQh in the perch exceeded the FTALc (Table 2). No white perch were captured at any reference station to compare to those at this station, but TCDD and TEQh concentrations were significantly higher in these white perch than in bass from a reference station on the West Branch of the Sebasticook River in 1995. Concentrations of TCDD in perch were significantly lower than in white perch collected in 1990, but concentrations of TEQh were similar. These results document a local source of dioxin to this reach of the river, most likely the Eastland Woolen Mill. Measurable amounts of furan have been found in sludge from the Corinna Sewer District for a number of years, although single samples in 1995 and 1996 have shown lower concentrations than in previous years (Appendix 3).

West Branch at Hartland Ten white suckers (Appendix 7) were collected from Great Moose Lake in Hartland. This site was selected to serve as a reference station for the West Branch of the Sebasticook River since there are no known point sources of dioxin upstream. While concentrations of TEQh in the suckers were slightly above the FMT, concentrations of TCDD and TEQo were not, demonstrating the impact of treatment of non-detects (Table 2). Concentrations of TCDD and TEQ_h in the suckers were similar to those at other reference stations. The trace amount of TEQ measured in these fish is thought to represent long-range transport and atmospheric deposition from remote sources.

West Branch at Palmyra Ten white suckers were collected from the river near the US Route 2 bridge about 3-4 miles below the discharge from the Town of Hartland, whose effluent is about 85% effluent from Irving Tanning Company. Concentrations of TEQh in the suckers were well above the FMT but below the FTALc (Table 2). Concentrations of TCDD and TEQh in the suckers were significantly higher at this station than at the reference station at Great Moose Lake. These results document a local source of dioxin to this reach of the river most likely the Irving Tanning discharge. Although the only sample result reported (1996) showed no detectable amount of dioxin in effluent (Appendix 4), low solubility and high biocentration of dioxin make effluent data less meaningful than sludge data. Sludge data from 1989 show measurable levels of TCDF (Appendix 3), but there are no newer sludge data to aid interpretation of current levels of discharge.

St. Croix Estuary

Robbinston

Twenty lobsters were collected from a lobster fisherman fishing in the St. Croix estuary in Robbinston, approximately 20 miles downstream of Georgia Pacific Corporation's bleached kraft pulp and paper mill in Baileyville. The hepatopancreas or "tomalleys" from all lobsters were combined into 4 samples of 5 tomalleys each. Concentrations of TEQh in tomalley (Table 2) were greater than those that prompted the Maine Bureau of Health to issue a coastwide lobster tomalley consumption advisory in 1994 (Appendix 1). Concentrations of TCDD and TEQh in the tomalley were significantly higher than those at the Downeast Maine reference station, Corea, and were generally similar to those at Stockton Springs in the Penobscot River estuary.

CONCLUSIONS

With one exception, no TCDD or TEQo were found above a detection level of 0.1 ppt at river reference stations. Although TEQh exceeded the FMT (0.15 ppt) at all reference stations, this was due to the effect of treatment of non-detects and not significant quantities of any dioxin congeners. In contrast, measurable levels of TCDD and TEQo were found at all stations below certain industrial discharges. Concentrations of TCDD and TEQo were significantly greater at these stations than their respective reference stations.

At the the one exception, the Presumpscot River reference station at Windham, no TCDD was detected but other 2378 substituted congeners were detected such that TEQo was measurable. This was the first year that TEQo were detected in bass, although measurable amounts have been detected in suckers every year since this site was first sampled in 1993. Since this is the only reference site unaffected by industrial discharges that has measurable levels of TEQo, unidentified sources are thought to be present.

Measurable levels of TEQo were also detected in fish at Gilead on the Androscoggin River, but since this station is downstream of the Crown Vantage bleached kraft pulp and paper mill in Berlin New Hampshire, it is not truly a reference site unaffected by industrial discharge.

Since 1996 was the second year of the new 2 year sampling cycle, the most recent year with data for game fish was either 1994 or 1995 for most of the sites. Results show that in 1996, TEQh in game fish were generally similar to those in 1994 or 1995 (Table 2, Appendix 2). TCDD was significantly lower than when last sampled at six stations and TEQh was lower at four stations, although for two of those TEQo were not lower.

The tomalley of lobsters from all stations contained amounts of dioxin and furans similar to those that warranted a coastwide lobster tomalley consumption advisory to be issued by the Maine Bureau of Health in 1994. In general concentrations of TCDD and TEQh in lobster tomalley from stations downsteam of point sources were significantly higher than in tomalley from their respective reference stations. Concentrations of TEQh, however, were not significantly greater in tomalley from the Kennebec River estuary in Phippsburg and the Presumpscot River estuary in Portland than in tomalley from the southern Maine reference station at Brave Boat Harbor in 1996. But concentrations at Brave Boat Harbor had increased slightly in 1996 from earlier years. When compared to TEQh from Brave Boat Harbor in 1994 and 1995 and from any other reference station ever monitored, concentrations of TEQh were significantly higher in tomalley from the Kennebec and the Presumpscot in 1996. TCDD concentrations were significantly greater in tomalley from the Kennebec and Presumpscot from than from Brave Boat Harbor in 1996. On the other hand, concentrations of TCDD were significantly lower in the Kennebec and Penobscot than in 1995. Concentrations of TCDD and TEQh everywhere else were similar to those of 1995.

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APPENDIX 1

MAINE BUREAU OF HEALTH

FISH CONSUMPTION ADVISORY, 28 MARCH 1997

LOBSTER TOMALLEY CONSUMPTION ADVISORY, 2 FEBRUARY 1994

Maine 1997 Fish Consumption Advisories
Maine Department of Human Services - Bureau of Health

General Consumption Advisory for ALL Inland Surface Waters Due to Mercury Contamination

☞ *Pregnant women, nursing mothers, women who may become pregnant, and children less than 8 years old*, should **NOT EAT warm water fish** species (bass, pickerel, perch, sunfish, crappie) caught in any of Maine's inland surface waters; Consumption of cold waters species (trout, salmon, smelt, cusk) should be limited to 1 meal per month. The consumption of older cold water fish (e.g., a large lake trout) should be avoided.
☞ *All other individuals* should limit consumption of warm water species caught in any of Maine's inland surface waters to 2 to 3 meals per month. People who eat large (older) fish are advised to use the lower limit of 2 meals per month. There is no consumption limits for cold water species.

Specific Freshwater Fish Consumption Advisories

In addition to the general statewide advisory due to mercury contamination of fish, other chemicals (PCBs and dioxins) in fish caught in specific waters of the state have been found at levels sufficient to prompt consumption advisories for these waters. The consumption advisories listed below are more restrictive than the statewide mercury advisory for the general population, and may be more stringent than the statewide advisory intended to protect the developing fetus, infant and young child.

ADVISORY AREA		MAXIMUM CONSUMPTION LEVEL [All Species]	CHEMICALS OF CONCERN
Water Body	SEGMENT		
All Waters	Statewide	**SEE DESCRIPTION ABOVE**	mercury
Androscoggin River	Gilead to Merrymeeting Bay	6 meals per year	PCBs & dioxins
Kennebec River	Madison to Edwards Dam (Augusta)	1 to 2 meals per month*	PCBs & dioxins
	Edwards Dam (Augusta) to The Chops (Bath)	NO CONSUMPTION (freshwater fish only)	PCBs & dioxins
Penobscot River	Below Lincoln	1 to 2 meals per month*	PCBs & dioxins
Salmon Falls River	Below Berwick	6 meals per year	PCBs & dioxins
East Br. Sebasticook R.	Below Corinna	1 meal per month	PCBs & dioxins
West Br. Sebasticook R.	Below Hartland	2 meals per month	PCBs & dioxins
Little Madawaska River and all tributaries	Madawaska Dam to Grimes Mill Road	NO CONSUMPTION	PCBs
Green Pond, Chapman Pit, Greenlaw Brook	All Waters (on former Loring Air Force Base)	NO CONSUMPTION	PCBs
Red Brook	All Waters (Scarborough)	6 meals per year	PCBs

* People who eat large (older) fish are advised to use the lower consumption level, as older fish tend to accumulate PCBs, dioxins, and mercury.

Marine Fish and Shellfish Consumption Advisories

Lobster Tomalley: *Pregnant women, nursing mothers, and women who may become pregnant* should **NOT EAT tomalley** (the green substance found in the body of the lobster). *All others* should limit consumption of lobster tomalley to 1 meal per month. A tomalley meal is eating the tomalley from one lobster.
Striped Bass: *Pregnant women, nursing mothers, women who may become pregnant, and children less than 8 years old*, are advised to limit consumption of striped bass to 1 meal per month. *All others* should limit consumption to 2 to 3 meals per month, with the lower limit applying to those consuming large striped bass.
Bluefish: Consumption of bluefish should be limited to one fish meal per month.

MAINE DEPARTMENT OF HUMAN SERVICES - BUREAU OF HEALTH

1. **What is this handout about?**

- Maine fish are good for you, and good to eat. However, like most states, Maine has some consumption advisories.

- Updated fish consumption advisories are being issued for 1997 by the Maine Bureau of Health. As new data on the amounts of toxic chemicals in fish become available the Bureau of Health reassesses advisories to include the most up-to-date information.

2. **What is new in 1997?**

- Consumption advisories due to **mercury** contamination were first issued in 1994, and applied to consumption of fish from all lakes and ponds. This year, mercury advisories are being modified in two ways. First, separate consumption advisories are being issued for warm water (bass, pickerel, perch, sunfish, crappie) and cold water (trout, salmon, smelt, cusk) fish species (details are listed on the flip side of this handout). Second, consumption advisories are being expanded to include all inland surface waters of the state, including rivers and streams.

- New data on levels of PCBs (suspected cancer causing chemicals) in fish caught in specific waters are prompting the issuance of new and expanded advisories on striped bass, bluefish and certain Maine rivers (details listed on reverse).

- Sampling results show that dioxin levels in fish have declined substantially since the mid-1980s. Some rivers still have levels of dioxin that have prompted fish consumption advisories. In addition, new data on coplanar PCBs must be calculated with dioxin in issuing advisories. Coplanar PCBs are found both above and below industrial discharges on some of Maine's rivers. The exact source of these chemicals is not known (see PCBs below).

3. **Some Background:**

- **Why do we care about mercury, where does it come from?**
  Mercury causes toxic effects on the nervous system. The unborn child and young children are more susceptible than adults due to their developing nervous systems. Toxic effects of mercury depend on the amount to which you are exposed. Some fish caught in Maine have been found to have levels of mercury that may be harmful to health. Mercury occurs naturally in the environment at low levels. Mercury levels are increased in the environment when mercury is released into the air from coal fired power plants, municipal/medical waste incinerators, and other industrial facilities. There are currently 34 states with mercury advisories.

- **Why do we care about PCBs, where do they come from?**
  PCBs have been shown to cause cancer in laboratory animals and may cause cancer in humans.
  PCBs were once widely used in electrical transformers. Because these chemicals were used extensively, accidental leaks and spills were likely to occur, and disposal of consumer electronic products into landfills would cause PCBs to be released into the environment. Municipal waste incinerators are also suspected sources of PCBs. There are currently 31 states and the District of Columbia with fish consumption advisories for PCBs.

- **How are advisories issued?**
  The Maine Department of Environmental Protection (DEP) collects and monitors fish for toxic pollutants throughout the State. The Surface Water Ambient Toxic Monitoring Program (SWAT) allows the DEP to perform these studies. Data are given to the Bureau of Health for consideration of possible health effects if certain amounts of fish are consumed. The advisories are updated as the Bureau of Health receives and assesses the new data and the Maine Departments of Environmental Protection, Inland Fisheries and Wildlife and Marine Resources have been consulted.

- **For more information:**
  For information concerning the Surface Water Ambient Toxic Monitoring Program call the Maine Department of Environmental Protection, Office of Land and Water Quality at 287-3901. For information concerning fish consumption advisories contact the Maine Department of Human Services, Bureau of Health at 287-6455.

APPENDIX 2

DIOXIN AND FURAN CONCENTRATIONS IN FISH AND SHELLFISH

1996

CODES

STATIONS

AGL	ANDROSCOGGIN RIVER AT GILEAD
ARF	ANDROSCOGGIN RIVER AT RUMFORD
AJY	ANDROSCOGGIN RIVER AT JAY
ALV	ANDROSCOGGIN RIVER AT LIVERMORE FALLS
AGI	ANDROSCOGGIN RIVER AT GULF ISLAND POND, AUBURN
ALS	ANDROSCOGGIN RIVER AT LISBON FALLS
ALW	ANDROSCOGGIN LAKE AT WAYNE
BBK	BRAVE BOAT HARBOR AT KITTERY
COR	COREA AT GOULDSBORO
KMD	KENNEBEC RIVER AT MADISON
KFF	KENNEBEC RIVER AT SHAWMUT, FAIRFIELD
KSD	KENNEBEC RIVER AT SIDNEY
KAG	KENNEBEC RIVER AT AUGUSTA
KRP	KENNEBEC RIVER AT PHIPPSBURG
PBG	PENOBSCOT RIVER AT GRINDSTONE
PBL	PENOBSCOT RIVER AT SOUTH LINCOLN
PBV	PENOBSCOT RIVER AT VEAZIE
PBB	PENOBSCOT RIVER AT BANGOR
PBS	PENOBSCOT RIVER AT STOCKTON SPRINGS
PWD	PRESUMPSCOT RIVER AT WINDHAM
PWB	PRESUMPSCOT RIVER AT WESTBROOK
PRP	PRESUMPSCOT RIVER AT PORTLAND
SFA	SALMON FALLS RIVER AT ACTON
SFS	SALMON FALLS RIVER AT SOUTH BERWICK
SEN	SEBASTICOOK RIVER E BR AT NEWPORT
SWH	SEBASTICOOK RIVER W BR AT HARTLAND
SWP	SEBASTICOOK RIVER W BR AT PALMYRA

SPECIES

BNT	BROWN TROUT
BUL	BROWN BULHEAD
LMB	LARGEMOUTH BASS
LOB	LOBSTER
SMB	SMALLMOUTH BASS
WHS	WHITE SUCKER

Appendix 2. 1996 Dioxin and Furan Concentrations in Fish and Shellfish (pg/g)

1996 DEP ID		AGI-SMB-1	AGI-SMB-2	AGI-SMB-3	AGI-SMB-4	AGI-SMB-5	AGL-BNT-01	AGL-RBT-1	AGL-RBT-2	AGL-WHS-1	AGL-WHS-2
WRI ID		HM-225	HM-226	HM-227	HM-229	HM-230	HM-136	HM-131	HM-133	HM-139	HM-141
Compound	DL										
2378-tcdf	0.11	8.3	10.2	8.9	9.5	11.5	4.4	8.9	11.3	19.5	20.6
12378-pecdf	0.25	5.1	4.6	4.2	3.5	5.2	1.3	0.95	1.5	1.2	2.6
23478-pecdf	0.25	0.41	0.26	0.31	0.32	0.45	<DL	<DL	<DL	2.9	3.1
123478-hxcdf	0.25	1.2	0.95	0.75	1.1	1.8	<DL	<DL	<DL	<DL	<DL
123678-hxcdf	0.25	0.74*	0.52*	0.61*	0.52*	0.61*	0.41*	0.35*	<DL*	4.5*	5.2*
234678-hxcdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123789-hxcdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
1234678-hpcdf	0.5	2.8*	4.1*	3.5*	2.5*	3.1*	0.25*	1.05*	0.92*	6.3*	8.8*
1234789-hpcdf	0.5	0.63	0.44	0.51	0.8	1.3	<DL	<DL	<DL	<DL	<DL
ocdf	0.5	3.1	2.8	3.6	4.7	1.8	<DL	<DL	<DL	<DL	<DL
2378-tcdd	0.10	0.45	0.62	0.48	0.51	0.68	0.45	0.87	1.0	0.65	0.82
12378-pecdd	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123478-hxcdd	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123678-hxcdd	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.35	<DL
123789-hxcdd	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
1234678-hpcdd	0.5	1.1	0.91	0.86	1.2	0.95	1.2	<DL	<DL	<DL	<DL
ocdd	0.5	0.95	1.1	1.8	1.5	2.2	2.1	<DL	<DL	0.96	1.5
98DTEo		1.9	2.1	1.8	1.9	2.5	1.0	1.8	2.2	4.1	4.6
98DTEd		2.4	2.6	2.3	2.4	3.0	1.5	2.4	2.8	5.0	5.6
98DTEh		2.1	2.3	2.1	2.2	2.8	1.3	2.1	2.5	4.6	5.1
% Lipids		0.40	0.35	0.41	0.51	0.41	2.2	1.8	1.9	4.6	7.1
Sample weight (g)		49.9	49.7	50.4	50.3	49.8	50.4	49.5	50.8	49.7	49.2
Values less than the established MDLs are to be considered estimated values.											
* = Values are influenced by the presence of diphenyl ethers and are estimated maximum concentrations.											
rck - Samples were originally done as splits and have been reanalyzed.											

Appendix 2. 1996 Dioxin and Furan Concentrations in Fish and Shellfish (pg/g)

1996 DEP ID		AJY-SMB-1	AJY-SMB-2	AJY-SMB-3	AJY-SMB-4	AJY-SMB-5	ALS-WHS-1	ALS-WHS-2	ALW-BNT-1	ALW-WHS-1	ALW-SMB-1
WRI ID		HM-1	HM-2	HM-4	HM-6	HM-7	HM-104	HM-106	HM-616	HM-114	HM-120
Compound	DL										
2378-tcdf	0.11	2.7	3.0	2.1	2.5	2.6	5.2	6.6	2	4.4	2.85
12378-pecdf	0.25	0.12	0.17	0.1	0.2	0.2	0.85	0.66	<DL	0.5	<DL
23478-pecdf	0.25	0.42	0.54	0.36	0.68	0.4	0.53	0.62	0.4	0.7	0.3
123478-hxcdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123678-hxcdf	0.25	0.3*	0.17*	0.34*	0.19*	0.24*	4.8*	5.9*	5.1*	6.6*	5.4*
234678-hxcdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123789-hxcdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
1234678-hpcdf	0.5	0.38*	0.52*	0.44*	0.34*	0.62*	15.6*	20.2*	14.0*	18.4*	16.7*
1234789-hpcdf	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
ocdf	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2378-tcdd	0.10	0.46	0.42	0.38	0.56	0.48	0.71	0.63	0.7	0.5	0.68
12378-pecdd	0.25	0.26	0.36	0.3	0.2	0.22	<DL	<DL	<DL	<DL	<DL
123478-hxcdd	0.25	0.3	0.44	0.3	0.26	0.32	<DL	<DL	<DL	<DL	<DL
123678-hxcdd	0.25	<DL	<DL	<DL	<DL	<DL	0.51	0.74	<DL	<DL	<DL
123789-hxcdd	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
1234678-hpcdd	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.3	<DL	0.24
ocdd	0.5	0.26	0.42	0.36	0.24	0.24	5.6	7.1	2.1	4.4	1.55
98DTEo		1.2	1.4	1.1	1.4	1.2	1.6	1.7	1.1	1.4	1.3
98DTEd		1.4	1.6	1.3	1.5	1.4	2.6	2.9	2.3	2.5	2.2
98DTEh		1.3	1.5	1.2	1.5	1.3	2.1	2.3	1.7	2.0	1.7
% Lipids		0.35	0.71	0.47	0.53	0.48	5.9	6.2	1.8	7.0	0.46
Sample weight (g)		50.1	49.4	49.4	51.2	34.0	49.8	49.8	49.3	49.6	49.6
Values less than the establis											
* = Values are influenced by											
rck - Samples were originall											

Appendix 2. 1996 Dioxin and Furan Concentrations in Fish and Shellfish (pg/g)

1996 DEP ID		ALW-SMB-2	ARF-WHS-1	ARF-WHS-2	KAG-WHS-1	KAG-WHS-2	KFF-WHS-1	KFF-WHS-2	KMD-SMB-1	KMD-SMB-2	KMD-SMB-3
WRI ID		HM-122	HM-11	HM-13	HM-339	HM-342	HM-324	HM-325	HM-265	HM-267	HM-268
Compound	DL										
2378-tcdf	0.11	2.1	16.2	18.9	3.6	3.4	3.9	3.5	0.25	0.19	0.21
12378-pecdf	0.25	<DL	1.3	1.8	<DL	<DL	<DL	<DL	<DL	<DL	<DL
23478-pecdf	0.25	0.46	3.1	2.8	<DL	<DL	0.26	<DL	0.26	<DL	<DL
123478-hxcdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123678-hxcdf	0.25	5.8*	5.1*	6.8*	1.0*	2.1*	1.4*	0.98*	0.65*	1.2*	0.55*
234678-hxcdf	0.25	<DL	<DL	<DL	0.31	0.42	0.51	0.47	<DL	<DL	<DL
123789-hxcdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
1234678-hpcdf	0.5	19.3*	10.5*	6.2*	0.65*	0.91*	0.74*	0.54*	1.2*	1.6*	0.95*
1234789-hpcdf	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
ocdf	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2378-tcdd	0.10	0.58	0.78	0.86	2.1	2.4	1.8	1.4	<DL	<DL	<DL
12378-pecdd	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123478-hxcdd	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123678-hxcdd	0.25	<DL	<DL	<DL	<DL	<DL	0.31	<DL	<DL	<DL	<DL
123789-hxcdd	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
1234678-hpcdd	0.5	<0.28	<DL	<DL	0.51	0.64	0.85	0.62	0.25	<DL	<DL
ocdd	0.5	2.4	1.3	1.9	1.1	1.5	2.6	1.4	0.95	0.54	0.61
98DTEo		1.1	4.0	4.2	2.5	2.8	2.4	1.8	0.2	0.0	0.0
98DTEd		2.2	5.0	5.4	3.1	3.5	2.9	2.4	0.8	0.8	0.7
98DTEh		1.7	4.5	4.8	2.8	3.2	2.7	2.1	0.5	0.4	0.4
% Lipids		0.30	8.4	10.4	3.3	3.2	6.1	4.9	1.7	0.53	0.84
Sample weight (g)		50.2	49.1	49.4	49.4	49.5	49.4	49.3	50.6	48.4	49.6
Values less than the establis											
* = Values are influenced by											
rck - Samples were originall											

Appendix 2. 1996 Dioxin and Furan Concentrations in Fish and Shellfish (pg/g)

1996 DEP ID		KMD-SMB-4	KMD-SMB-5	KMD-WHS-1	KMD-WHS-2	KSD-SMB-1	KSD-SMB-2	KSD-SMB-3	KSD-SMB-4	KSD-SMB-5	PBB-EEL-1
WRI ID		HM-270	HM-271	HM-275	HM-276	HM-94	HM-95	HM-97	HM-100	HM-103	HM-681
Compound	DL										
2378-tcdf	0.11	0.15	0.26	0.95	1.1	1.2	0.95	2.1	1.3	1.8	0.85
12378-pecdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
23478-pecdf	0.25	<DL	0.25	0.26	0.34	<DL	<DL	0.28	<DL	<DL	<DL
123478-hxcdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123678-hxcdf	0.25	0.78*	2.5*	1.9*	2.3*	1.2*	1.6*	0.95*	0.80*	1.1*	5.2*
234678-hxcdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123789-hxcdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
1234678-hpcdf	0.5	0.81*	1.0*	2.1*	1.4*	0.31*	0.26*	0.64*	0.29*	0.27*	10.8*
1234789-hpcdf	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
ocdf	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2378-tcdd	0.10	<DL	<DL	<DL	<DL	0.11	0.18	0.24	0.26	0.12	0.31
12378-pecdd	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123478-hxcdd	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123678-hxcdd	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123789-hxcdd	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
1234678-hpcdd	0.5	0.24	<DL	0.35	0.41	0.46	0.21	0.33	0.41	0.35	<DL
ocdd	0.5	0.47	0.93	1.2	1.6	0.95	0.85	1.0	0.98	0.81	0.96
98DTEo		0.0	0.2	0.2	0.3	0.2	0.3	0.6	0.4	0.3	0.4
98DTEd		0.7	0.9	1.0	1.0	0.9	1.0	1.1	1.0	1.0	1.6
98DTEh		0.4	0.5	0.6	0.7	0.6	0.6	0.9	0.7	0.6	1.0
% Lipids		0.53	1.0	4.8	4.3	0.38	0.38	0.84	0.42	0.53	5.3
Sample weight (g)		49.1	49.7	49.2	49.7	49.1	50.0	50.6	50.3	50.7	47.9
Values less than the establis											
* = Values are influenced by											
rck - Samples were originall											

Appendix 2. 1996 Dioxin and Furan Concentrations in Fish and Shellfish (pg/g)

1996 DEP ID		PBB-EEL-2	PBG-SMB-1	PBG-SMB-2	PBG-SMB-3	PBG-SMB-4	PBG-SMB-5	PBG-WHS-1	PBG-WHS-2	PBL-SMB-1	PBL-SMB-2
WRI ID		HM-682	HM-618rck	HM-619rck	HM-620rck	HM-621rck	HM-622rck	HM-628	HM-629	HM-638	HM-639
Compound	DL										
2378-tcdf	0.11	0.74	0.38	0.28	0.38	0.29	0.19	0.41	0.52	1.3	1.5
12378-pecdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
23478-pecdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123478-hxcdf	0.25	<DL	<DL	<DL	<DL	0.51	<DL	<DL	<DL	<DL	<DL
123678-hxcdf	0.25	4.8*	1.5*	0.95*	1.9*	0.85*	1.6*	0.96*	1.2*	1.1*	1.2*
234678-hxcdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123789-hxcdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
1234678-hpcdf	0.5	12.6*	0.35*	0.51*	0.44*	0.25*	0.67*	0.85*	0.62*	0.75*	0.32*
1234789-hpcdf	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
ocdf	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2378-tcdd	0.10	0.26	<DL	<DL	<DL	<DL	0.16	<DL	<DL	0.21	0.14
12378-pecdd	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123478-hxcdd	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123678-hxcdd	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123789-hxcdd	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
1234678-hpcdd	0.5	<DL	<DL	<DL	<DL	<DL	<DL	0.32	0.46	<DL	<DL
ocdd	0.5	1.3	0.51	0.62	0.48	0.35	0.66	0.98	1.1	2.6	1.2
98DTEo		0.3	0.0	0.0	0.0	0.1	0.2	0.0	0.1	0.3	0.3
98DTEd		1.5	0.8	0.8	0.9	0.8	0.9	0.8	0.8	1.0	1.0
98DTEh		0.9	0.4	0.4	0.5	0.4	0.5	0.4	0.4	0.7	0.6
% Lipids		5.2	0.24	0.61	1.3	1.2	0.46	8.0	7.5	0.90	0.46
Sample weight (g)		44.8	49.6	46.6	43.5	50.0	51.6	48.6	49.2	49.8	50.0
Values less than the establis											
* = Values are influenced by											
rck - Samples were originall											

Appendix 2. 1996 Dioxin and Furan Concentrations in Fish and Shellfish (pg/g)

1996 DEP ID		PBL-SMB-3	PBL-SMB-4	PBL-SMB-5	PBL-WHS-1	PBL-WHS-2	PBV-SMB-1	PBV-SMB-2	PBV-SMB-3	PBV-SMB-4	PBV-SMB-5
WRI ID		HM-641	HM-642	HM-645	HM-648	HM-649	HM-658	HM-660	HM-661	HM-662	HM-664
Compound	DL										
2378-tcdf	0.11	2.1	2.4	1.6	5.8	4.6	0.62	0.78	0.93	0.65	0.57
12378-pecdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
23478-pecdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123478-hxcdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123678-hxcdf	0.25	0.95*	0.75*	2.3*	1.5*	4.9*	6.3*	4.5*	6.8*	3.5*	3.8*
234678-hxcdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123789-hxcdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
1234678-hpcdf	0.5	0.50*	0.31*	0.69*	8.3*	7.2*	13.6*	15.2*	10.3*	5.2*	6.9*
1234789-hpcdf	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
ocdf	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2378-tcdd	0.10	0.58	0.46	0.26	1.9	1.4	0.32	0.41	0.22	0.18	0.24
12378-pecdd	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123478-hxcdd	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123678-hxcdd	0.25	<DL	<DL	<DL	0.56	0.67	<DL	<DL	<DL	<DL	<DL
123789-hxcdd	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
1234678-hpcdd	0.5	<DL	<DL	<DL	1.2	0.98	<DL	<DL	<DL	<DL	<DL
ocdd	0.5	1.1	1.5	0.96	3.5	2.5	1.2	0.98	0.84	0.96	1.4
98DTEo		0.8	0.7	0.4	2.5	1.9	0.4	0.5	0.3	0.3	0.3
98DTEd		1.4	1.3	1.2	3.3	3.0	1.7	1.6	1.6	1.2	1.3
98DTEh		1.1	1.0	0.8	2.9	2.5	1.0	1.1	1.0	0.7	0.8
% Lipids		1.1	0.88	0.82	3.4	3.2	1.1	0.62	0.72	0.70	0.85
Sample weight (g)		49.5	50.3	50.7	49.8	48.9	49.7	49.7	49.9	50.7	49.4
Values less than the establis											
* = Values are influenced by											
rck - Samples were originall											

Appendix 2. 1996 Dioxin and Furan Concentrations in Fish and Shellfish (pg/g)

1996 DEP ID		PBV-WHS-1	PBV-WHS-2	PWB-SMB-1	PWB-SMB-2	PWB-SMB-3	PWB-SMB-4	PWB-SMB-5	PWD-SMB-1	PWD-SMB-2	PWD-SMB-3
WRI ID		HM-669	HM-670	HM-701	HM-703	HM-704	HM-705	HM-709	HM-691	HM-692	HM-693
Compound	DL										
2378-tcdf	0.11	4.2	3.1	2.3	1.6	1.9	1.5	1.2	1.2	1.6	2.1
12378-pecdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
23478-pecdf	0.25	0.22	0.31	0.28	0.29	0.21	0.31	0.25	0.27	0.20	0.26
123478-hxcdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123678-hxcdf	0.25	5.2*	6.9*	0.48*	0.39*	0.57*	0.51*	0.65*	8.2*	6.1*	5.0*
234678-hxcdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123789-hxcdf	0.25	0.26	0.22	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
1234678-hpcdf	0.5	9.6*	8.4*	0.85*	0.76*	0.89*	0.96*	0.72*	10.3*	12.6*	9.6*
1234789-hpcdf	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
ocdf	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
2378-tcdd	0.10	0.31	0.46	0.21	0.16	0.14	<DL	0.16	<DL	<DL	<DL
12378-pecdd	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.22	0.19	0.17
123478-hxcdd	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123678-hxcdd	0.25	0.19	0.26	<DL	<DL	<DL	<DL	<DL	0.41	0.30	0.26
123789-hxcdd	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
1234678-hpcdd	0.5	<DL	<DL	0.31	0.24	0.35	0.18	0.25	0.47	0.35	0.52
ocdd	0.5	1.8	2.0	0.35	0.55	0.48	0.61	0.54	1.0	0.92	0.88
98DTEo		0.9	1.0	0.6	0.5	0.4	0.3	0.4	0.5	0.5	0.5
98DTEd		1.9	2.1	1.1	0.9	0.9	0.9	0.9	1.7	1.5	1.4
98DTEh		1.4	1.5	0.8	0.7	0.7	0.6	0.7	1.1	1.0	1.0
% Lipids		8.0	11.7	0.50	0.24	0.93	0.67	0.55	0.45	0.30	0.29
Sample weight (g)		49.7	50.0	51.6	50.0	51.7	47.6	53.2	50.0	50.1	49.7
Values less than the establis											
* = Values are influenced by											
rck - Samples were originall											

Appendix 2. 1996 Dioxin and Furan Concentrations in Fish and Shellfish (pg/g)

1996 DEP ID		PWD-SMB-4	PWD-SMB-5	SEN-WHP-1	SEN-WHP-2	SFA-WHS-1	SFA-WHS-2	SFS-WHS-1	SFS-WHS-2	SWH-WHS-1	SWH-WHS-2
WRI ID		HM-696	HM-699	HM-724	HM-727	HM-710	HM-712	HM-714	HM-715	HM-537	HM-539
Compound	DL										
2378-tcdf	0.11	1.8	1.1	0.95	1.3	0.35	0.52	6.2	7.8	0.32	0.26
12378-pecdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
23478-pecdf	0.25	0.21	0.31	0.31	0.47	<DL	0.12*	0.58*	0.74*	0.96*	1.3*
123478-hxcdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
123678-hxcdf	0.25	4.9*	6.8*	4.2*	5.3*	3.5*	3.2*	6.9*	8.1*	0.89*	0.95*
234678-hxcdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	0.54	0.61	<DL	<DL
123789-hxcdf	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
1234678-hpcdf	0.5	14.0*	12.1*	6.2*	7.1*	5.3*	6.1*	12.5*	15.2*	3.8*	4.1*
1234789-hpcdf	0.5	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
ocdf	0.5	<DL	<DL	<DL	<DL	<DL	0.61	2.1	2.6	0.8	0.61
2378-tcdd	0.10	<DL	<DL	0.25	0.41	<DL	<DL	1.8	2.1	0.11	0.09
12378-pecdd	0.25	0.21	0.26	0.95	0.74	<DL	<DL	0.45	0.31	<DL	<DL
123478-hxcdd	0.25	<DL	<DL	0.26	0.38	<DL	<DL	0.65	0.59	<DL	<DL
123678-hxcdd	0.25	0.24	0.31	1.0	0.85	<DL	<DL	0.84	0.81	<DL	<DL
123789-hxcdd	0.25	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
1234678-hpcdd	0.5	0.46	0.41	0.82	0.65	<DL	0.29	0.31	0.38	<DL	0.52
ocdd	0.5	0.96	0.78	0.71	0.96	0.91	0.85	1.7	1.5	1.1	1.3
98DTEo		0.5	0.6	1.6	1.6	0.0	0.1	3.1	3.4	0.1	0.1
98DTEd		1.4	1.6	2.2	2.4	1.1	1.0	4.3	4.8	1.1	1.3
98DTEh		1.0	1.1	1.9	2.0	0.6	0.5	3.7	4.1	0.6	0.7
% Lipids		0.25	0.49	2.11	2.80	12.0	10.3	2.5	2.4	3.03	3.4
Sample weight (g)		50.7	50.6	50.5	51.1	49.3	49.7	48.3	50	50.7	50.1
Values less than the establis											
* = Values are influenced by											
rck - Samples were originall											

Appendix 2. 1996 Dioxin and Furan Concentrations in Fish and Shellfish (pg/g)

1996 DEP ID		SWP-WHS-1	SWP-WHS-2	ALV-WHS-01	ALV-WHS-02	ALV-WHS-03	ALV-WHS-04	ALV-WHS-05	ALV-WHS-06	ALV-WHS-07	ALV-WHS-08
WRI ID		HM-166	HM-154	HM-21	HM-22	HM-23	HM-24	HM-25	HM-26	HM-27	HM-28
Compound	DL										
2378-tcdf	0.11	0.45	0.31	11.90	15.2	15.1	12.5	14.2	13.6	11.6	9.51
12378-pecdf	0.25	<DL	<DL	0.73	<DL	<DL	0.35	0.68	0.41	0.35	0.26
23478-pecdf	0.25	3.1*	1.9*	1.82*	0.87	1.19	0.95*	3.26*	1.65*	0.88	0.84
123478-hxcdf	0.25	<DL	<DL	0.78	<DL	<DL	0.45	0.66	0.51	0.41	0.58
123678-hxcdf	0.25	1.2*	2.6*	0.79	<DL	<DL	0.25	<DL	0.53	0.59	0.6
234678-hxcdf	0.25	<DL	<DL	1.04	2.51	2.23	1.95*	2.15*	1.86*	1.06*	0.95
123789-hxcdf	0.25	<DL	<DL	1.52	<DL	<DL	0.56	<DL	0.48	0.37	0.26
1234678-hpcdf	0.5	4.2*	4.8*	1.19*	2.69	<DL	0.88*	1.32*	1.06*	0.99	0.78
1234789-hpcdf	0.5	0.51	0.36	0.35	0.31	<DL	0.4	<DL	0.61	0.49	0.54
ocdf	0.5	1.4	1.1	4.89	2.75	<DL	1.65	4.46	2.25	2.11	1.95
2378-tcdd	0.10	1.3	1.0	0.90	0.88	0.58	0.65	0.59	0.39	0.41	0.32
12378-pecdd	0.25	0.62	0.75	0.74	<DL	<DL	0.81	1.61	1.02	0.95	0.88
123478-hxcdd	0.25	0.61	0.58	1.37	3.15	<DL	0.95	<DL	0.65	0.44	0.51
123678-hxcdd	0.25	2.3	3.1	0.77	3.22	<DL	1.25	<DL	0.95	0.87	0.78
123789-hxcdd	0.25	<DL	<DL	0.93	<DL	<DL	0.54	0.23	0.48	0.32	0.45
1234678-hpcdd	0.5	1.5	2.1	0.39	2.64	0.60	0.87	0.39	0.68	0.31	0.39
ocdd	0.5	2.6	2.8	3.04	3.05	0.34	0.51	3.80	1.26	0.75	0.98
98DTEo		2.3	2.2	3.5	3.8	2.9	3.1	3.8	3.2	3.2	3.0
98DTEd		3.7	3.5	4.5	4.5	3.8	3.8	5.8	4.2	3.4	3.0
98DTEh		3.0	2.9	4.0	4.1	3.3	3.5	4.8	3.7	3.3	3.0
% Lipids		5.8	7.0	4.9	3.7	3.8	8.1	7.2	6.7	6.2	6.5
Sample weight (g)		49.7	52.0	49.2	49.3	49.8	49.2	49.7	49.7	50	49.6
Values less than the establis											
* = Values are influenced by											
rck - Samples were originall											

Appendix 2. 1996 Dioxin and Furan Concentrations in Fish and Shellfish (pg/g)

1996 DEP ID		ALV-WHS-09	ALV-WHS-10	ALV-WHS-11	ALV-WHS-12	ALV-WHS-13	ALV-WHS-14	ALV-WHS-15	ALV-WHS-16	ALV-WHS-17	ALV-WHS-18
WRI ID		HM-29	HM-30	HM-31	HM-32	HM-33	HM-34	HM-35	HM-36	HM-37	HM-38
Compound	DL										
2378-tcdf	0.11	11.6	10.4	12.5	10.1	9.85	10.6	18.6	11.6	16.2	12.3
12378-pecdf	0.25	0.39	0.47	0.51	0.25	0.48	0.36	0.62	0.54	0.61	0.45
23478-pecdf	0.25	0.91*	0.69	0.87	0.98	1.10*	0.75	1.39	0.91	1.52*	0.98
123478-hxcdf	0.25	0.51	0.87	0.65	0.45	0.61	0.48	0.69	0.54	0.52	0.35
123678-hxcdf	0.25	0.41	<DL	0.35	0.25	0.31	0.48	<DL	0.62	0.54	0.45
234678-hxcdf	0.25	1.25*	2.01*	2.89*	1.58*	0.96	0.99	1.65*	1.05*	1.56*	1.02*
123789-hxcdf	0.25	0.61	0.57	0.41	0.58	0.71	0.45	<DL	0.51	0.61	0.45
1234678-hpcdf	0.5	0.84	1.75*	1.29	0.85	0.96	1.21*	<DL	1.02*	1.45*	1.1
1234789-hpcdf	0.5	0.57	0.32	0.44	0.51	0.35	0.24	0.40	0.31	0.31	0.25
ocdf	0.5	2.01	1.17	2.36	1.96	2.85	1.15	0.40	1.05	1.52	1.65
2378-tcdd	0.10	0.45	0.56	0.58	0.65	0.48	0.51	1.25	0.65	0.51	0.35
12378-pecdd	0.25	0.95	2.15	2.15	1.12	0.95	0.88	<DL	0.32	0.45	0.74
123478-hxcdd	0.25	0.25	<DL	0.45	0.31	0.58	0.47	0.59	0.45	0.31	0.51
123678-hxcdd	0.25	0.36	0.56	0.61	0.58	0.32	0.45	0.23	0.51	0.54	0.68
123789-hxcdd	0.25	0.78	0.96	0.74	0.66	0.45	0.69	<DL	0.41	0.31	0.44
1234678-hpcdd	0.5	0.41	0.78	0.51	0.54	0.52	0.68	0.89	0.73	0.56	0.51
ocdd	0.5	2.48	3.13	1.68	1.25	2.1	1.58	3.07	2.1	2.65	1.85
98DTEo		2.9	4.4	4.8	3.6	2.9	3.3	4.0	2.9	2.9	3.1
98DTEd		3.5	4.8	5.1	3.8	3.4	3.3	4.8	3.0	3.8	3.2
98DTEh		3.2	4.6	4.9	3.7	3.1	3.3	4.4	3.0	3.4	3.2
% Lipids		5.1	6.4	7.2	5.6	5.9	3.8	2.8	2.9	3.1	3.5
Sample weight (g)		49.5	50	49.6	49.5	49.6	49.9	49.6	49.5	50	49.8
Values less than the establis											
* = Values are influenced by											
rck - Samples were originall											

Appendix 2. 1996 Dioxin and Furan Concentrations in Fish and Shellfish (pg/g)

1996 DEP ID		ALV-WHS-19	ALV-WHS-20	ALF-WHS-01	ALF-WHS-02	ALF-WHS-03	ALF-WHS-04	ALF-WHS-05	ALF-WHS-06	ALF-WHS-07	ALF-WHS-08
WRI ID		HM-39	HM-40	HM-41	HM-42	HM-43	HM-44	HM-45	HM-46	HM-47	HM-48
Compound	DL										
2378-tcdf	0.11	13.6	11.8	14.2	9.64	5.78	15.2	8.25	13.5	8.57	10.2
12378-pecdf	0.25	0.52	0.35	0.21	0.41	<DL	0.35	0.51	<DL	0.41	0.35
23478-pecdf	0.25	1.32*	0.85	0.85	0.68	0.93*	0.85*	0.65*	0.73*	0.45	1.05*
123478-hxcdf	0.25	0.45	0.25	0.31	0.36	<DL	0.25	0.35	<DL	0.32	0.75
123678-hxcdf	0.25	0.51	0.65	0.65	0.51	<DL	0.51	0.41	<DL	0.66	0.44
234678-hxcdf	0.25	1.15*	1.01	2.26*	3.36	2.01*	2.65	1.95*	<DL*	2.65*	2.57*
123789-hxcdf	0.25	0.56	0.31	0.51	0.42	<DL	0.51	0.35	<DL	0.65	0.75
1234678-hpcdf	0.5	1.85*	1.25*	1.99*	<DL	1.55*	0.78	0.58	<DL	0.41	0.35
1234789-hpcdf	0.5	0.45	0.31	0.65	<DL	0.57	0.65	0.45	<DL	0.75	0.69
ocdf	0.5	2.25	1.54	1.45	<DL	0.76	0.78	0.51	0.34	0.95	1.2
2378-tcdd	0.10	0.63	0.41	0.24	0.957	0.24	0.65	0.51	0.73	0.52	0.62
12378-pecdd	0.25	0.85	0.65	0.32	<DL	<DL	0.51	0.41	<DL	0.5	0.35
123478-hxcdd	0.25	0.42	0.25	0.35	<DL	<DL	0.65	0.55	0.73	0.45	0.41
123678-hxcdd	0.25	0.49	0.51	0.85	0.79	<DL	0.25	0.62	0.71	0.62	0.75
123789-hxcdd	0.25	0.52	0.21	0.52	0.54	<DL	0.55	0.51	<DL	0.75	0.52
1234678-hpcdd	0.5	0.68	0.71	3.25	0.50	7.18	1.21	0.98	0.89	0.85	0.65
ocdd	0.5	2.58	1.55	1.25	4.17	5.52	1.35	0.87	0.47	1.21	2.2
98DTEo		3.2	3.0	2.8	2.9	0.9	3.3	2.1	2.2	2.5	2.4
98DTEd		4.0	3.0	3.0	3.4	2.4	3.7	2.6	3.4	2.8	3.2
98DTEh		3.6	3.0	2.9	3.2	1.6	3.5	2.3	2.8	2.6	2.8
% Lipids		2.6	2.8	4.9	3.9	3.4	4.1	4.7	5.5	3.2	3.6
Sample weight (g)		49.3	49.8	49.8	50.3	49.5	48.7	49.5	49.3	49.1	49.4
Values less than the establis											
* = Values are influenced by											
rck - Samples were originall											

Appendix 2. 1996 Dioxin and Furan Concentrations in Fish and Shellfish (pg/g)

1996 DEP ID		ALF-WHS-09	ALF-WHS-10	ALF-WHS-11	ALF-WHS-12	ALF-WHS-13	ALF-WHS-14	ALF-WHS-15	ALF-WHS-16	ALF-WHS-17	ALF-WHS-18
WRI ID		HM-49	HM-50	HM-51	HM-52	HM-53	HM-54	HM-55	HM-56	HM-57	HM-58
Compound	DL										
2378-tcdf	0.11	11.2	12.1	9.68	8.97	8.57	6.59	9.65	7.22	10.2	9.22
12378-pecdf	0.25	<DL	0.46	0.55	0.58	0.35	0.58	0.41	0.32	0.47	0.25
23478-pecdf	0.25	1.18*	0.95*	1.12*	0.80*	0.75	0.65	0.51	0.45	0.81*	0.63
123478-hxcdf	0.25	1.50	0.85	0.75	0.51	0.95	0.87	0.75	0.84	0.62	0.47
123678-hxcdf	0.25	<DL	0.55	0.45	0.48	0.66	0.51	0.55	0.31	0.42	0.53
234678-hxcdf	0.25	5.99*	3.63*	2.15*	2.52*	3.35*	1.86*	2.24*	2.96*	4.25*	1.50*
123789-hxcdf	0.25	1.67	0.89	0.65	0.73	0.5	1.1	0.85	0.67	0.35	0.72
1234678-hpcdf	0.5	<DL	0.65	0.98*	1.02*	0.75	1.52*	0.87	1.01*	1.53*	0.85
1234789-hpcdf	0.5	<DL	0.55	0.65	0.87	0.51	0.75	0.61	0.35	0.48	0.57
ocdf	0.5	1.51	2.87	2.65	1.53	3.32	2.24	2.94	3.87	1.64	3.58
2378-tcdd	0.10	1.53	0.41	0.55	0.58	0.35	0.41	0.45	0.39	0.54	0.51
12378-pecdd	0.25	<DL	0.35	0.45	0.56	0.41	0.35	0.52	0.48	0.31	0.58
123478-hxcdd	0.25	<DL	0.58	0.98	1.62	0.85	0.65	0.76	0.52	1.29	0.88
123678-hxcdd	0.25	1.62	1.15	0.32	1.43	1.1	0.98	0.89	1.06	0.97	1.24
123789-hxcdd	0.25	1.95	0.89	0.75	<DL	0.52	0.65	0.51	0.45	0.35	0.75
1234678-hpcdd	0.5	0.90	0.74	0.85	0.89	0.73	0.96	0.65	0.92	0.85	0.73
ocdd	0.5	7.42	2.65	1.65	1.98	2.1	1.85	2.65	2.18	1.89	3.61
98DTEo		3.3	3.2	2.4	2.6	2.5	2.3	2.7	2.2	2.3	2.8
98DTEd		5.2	3.3	3.2	3.3	2.8	2.5	2.9	2.5	3.2	3.0
98DTEh		4.3	3.3	2.8	2.9	2.7	2.4	2.8	2.4	2.7	2.9
% Lipids		5.1	4.3	3.8	3.2	5.3	5.3	3.8	5.1	5.9	5.7
Sample weight (g)		50.2	49.2	49.6	49.1	49.9	49.1	48.7	49.7	50	49.6
Values less than the establis											
* = Values are influenced by											
rck - Samples were originall											

Appendix 2. 1996 Dioxin and Furan Concentrations in Fish and Shellfish (pg/g)

1996 DEP ID		ALF-WHS-19	ALF-WHS-20	
WRI ID		HM-59	HM-60	
Compound	DL			
2378-tcdf	0.11	8.41	7.23	
12378-pecdf	0.25	0.38	0.49	
23478-pecdf	0.25	0.75*	0.55	
123478-hxcdf	0.25	0.85	0.41	
123678-hxcdf	0.25	0.51	0.35	
234678-hxcdf	0.25	1.05	1.68*	
123789-hxcdf	0.25	0.39	0.54	
1234678-hpcdf	0.5	1.25*	0.98	
1234789-hpcdf	0.5	0.69	0.58	
ocdf	0.5	2.25	1.95	
2378-tcdd	0.10	0.46	0.29	
12378-pecdd	0.25	0.35	0.43	
123478-hxcdd	0.25	0.94	0.73	
123678-hxcdd	0.25	1.03	0.85	
123789-hxcdd	0.25	0.41	0.29	
1234678-hpcdd	0.5	0.55	0.51	
ocdd	0.5	1.45	1.18	
98DTEo		2.2	1.8	2.5
98DTEd		2.6	2.3	3.1
98DTEh		2.4	2.0	2.8
% Lipids		4.3	2.2	4.4
Sample weight (g)		50	49.9	
Values less than the establis				
* = Values are influenced by				
rck - Samples were originall				

Appendix 2 .
Lobster Tomalley Native Summary Results(pg/g, wet weight)

Sample Weight	10.54	10.32	10.9	11.14	10.47	10.75	11.79
Field ID	St. Croix #1	St. Croix #2	St. Croix #3	St. Croix #4	Corea #1	Corea #2	Corea #3
Extract ID	37186	37187	37188	37189	37190	37191	37192
MS Filename	H97E192-6	H97E192-7	H97E192-8	H97E192-9	H97E192-10	H97E192-11	H97E192-12
Isomer							
2,3,7,8-TCDF(a)	14.5	14.5	12.5	15.5	18.3	11.4	12.9
1,2,3,7,8-PeCDF	U(3.56EMPC)	U(3.46EMPC)	U(03.35EMPC)	U(3.46EMPC)	U(25.8EMPC)	U(2.27EMPC)	U(2.15EMPC)
2,3,4,7,8-PeCDF	6.25	6.90	5.40	7.25	5.75	3.12	5.00
1,2,3,4,7,8-HxCDF	0.770	0.870	0.68	0.790	0.615	0.430	0.505
1,2,3,6,7,8-HxCDF	U(8.00EMPC)	U(5.25EMPC)	U(6.45EMPC)	U(5.40EMPC)	U(2.23EMPC)	U(2.40EMPC)	U(2.39EMPC)
2,3,4,6,7,8-HxCDF	1.88	2.07	1.63	1.76	1.12	0.970	1.10
1,2,3,7,8,9-HxCDF	0.575	U(0.203)	U(0.394)	U(0.119)	U(0.182)	U(0.212)	U(0.207)
1,2,3,4,6,7,8-HpCDF	U(1.26EMPC)	1.20	U(0.665EMPC)	1.13	U(0.515EMPC)	U(0.775EMPC)	U(0.395EMPC)
1,2,3,4,7,8,9-HpCDF	U(0.259)	U(0.123)	U(0.189)	U(0.131)	U(0.199)	U(0.145)	U(0.201)
OCDF	1.05	U(0.710EMPC)	1.37	0.795	0.900	0.700	U(0.535EMPC)
2,3,7,8-TCDD	1.14	0.827	U(0.785EMPC)	0.921	0.542	0.530	0.609
1,2,3,7,8-PeCDD	3.47	3.52	2.69	3.81	2.12	1.92	2.15
1,2,3,4,7,8-HxCDD	1.89	1.52	1.33	1.74	0.885	0.790	0.695
1,2,3,6,7,8-HxCDD	8.05	7.25	5.70	7.30	2.67	2.20	2.33
1,2,3,7,8,9-HxCDD	2.52	2.36	1.82	2.30	1.41	1.11	1.21
1,2,3,4,6,7,8-HpCDD	9.50	8.15	6.05	10.3	4.77	3.60	3.99
OCDD	14.1	14.7	16.5	15.6	11.8	12.3	10.1
Total TCDF	58.6	71.8	64.5	63.3	67.6	44.1	39.8
Total TCDD	21.8	25.6	25.0	18.7	8.98	6.62	7.44
Total PeCDF	48.2	48.5	37.2	50.0	39.8	19.9	24.8
Total PeCDD	23.2	26.8	6.55	24.4	10.2	9.20	8.25
Total HxCDF	29.2	23.2	19.6	22.5	8.85	7.15	7.15
Total HxCDD	42.8	39.8	29.4	39.7	19.8	15.3	15.7
Total HpCDF	0.500	1.64	1.21	1.13	0.379	0.407	0.387
Total HpCDD	24.1	20.4	15.5	25.4	12.4	9.05	9.05
98DTEo	10.9	10.8	7.8	11.4	8.1	5.7	7.2
98DTEd	11.9	11.5	9.5	12.1	9.6	6.1	7.5
98DTEh	11.4	11.1	8.7	11.8	8.9	5.9	7.4

Appendix 2 .
Lobster Tomalley Native Summary Results(pg/g, wet weight)

Sample Weight	11.42	13.2	12.09	11.41	12.17	10.97	11.98
Field ID	Corea #4	Brave Boat #1	Brave Boat #2	Brave Boat #3	Brave Boat #4	Presumpscot #1	Presumpscot #2
Extract ID	37193	37194	37195	37196	37197	37198	37199
MS Filename	H97E202-4	H97E201-1	H97E202-1	H97E202-2	H97E202-3	H97E202-9	H97E202-10
Isomer							
2,3,7,8-TCDF(a)	10.2	21.0	29.3	27.3	18.1	24.8	25.8
1,2,3,7,8-PeCDF	U(1.79EMPC)	U(3.83EMPC)	U(4.53EMPC)	U(4.44EMPC)	U(3.85EMPC)	U(11.1EMPC)	U(12.0EMPC)
2,3,4,7,8-PeCDF	4.38	6.40	11.1	10.1	7.90	10.4	8.00
1,2,3,4,7,8-HxCDF	0.370	0.895	1.18	0.795	0.477	1.11	0.830
1,2,3,6,7,8-HxCDF	U(1.49EMPC)	U(8.05EMPC)	U(5.00EMPC)	U(5.90EMPC)	U(4.22EMPC)	U(21.4EMPC)	U(29.4EMPC)
2,3,4,6,7,8-HxCDF	0.875	1.18	1.86	1.57	U(1.08EMPC)	1.32	1.56
1,2,3,7,8,9-HxCDF	U(0.281)	U(0.570)	U(0.705)	U(0.300)	U(0.172)	U(0.665)	U(0.685)
1,2,3,4,6,7,8-HpCDF	U(0.805EMPC)	U(0.825EMPC)	U(1.15EMPC)	U(0.770EMPC)	U(0.425EMPC)	U(1.21EMPC)	U(21.5EMPC)
1,2,3,4,7,8,9-HpCDF	U(0.0153)	U(0.211)	U(0.237)	U(0.285)	U(0.550)	U(0.595)	U(0.505EMPC)
OCDF	U(1.64EMPC)	0.630	0.825	0.690	0.448	0.610	1.51
2,3,7,8-TCDD	U(0.248)	U(1.21EMPC)	2.20	1.67	1.28	2.88	2.00
1,2,3,7,8-PeCDD	1.59	U(3.79EMPC)	5.45	5.25	4.18	6.30	4.82
1,2,3,4,7,8-HxCDD	0.595	U(1.61EMPC)	2.33	2.06	1.49	2.36	1.66
1,2,3,6,7,8-HxCDD	1.61	6.65	8.80	9.45	5.85	10.1	9.05
1,2,3,7,8,9-HxCDD	0.860	2.48	2.99	2.94	1.94	3.46	3.46
1,2,3,4,6,7,8-HpCDD	3.57	10.2	11.8	9.50	10.0	20.1	16.2
OCDD	19.4	19.8	18.4	15.6	16.8	24.4	26.6
Total TCDF	46.5	67.3	79.7	74.8	47.5	73.5	48.7
Total TCDD	7.88	18.2	20.0	16.3	12.4	22.1	22.2
Total PeCDF	19.4	35.7	51.5	49.3	34.3	58.5	81.0
Total PeCDD	4.86	17.6	28.2	26.5	16.7	27.5	21.8
Total HxCDF	5.25	31.6	18.7	20.6	11.8	41.8	54.5
Total HxCDD	11.35	39.0	53.5	51.5	32.3	57.5	54.5
Total HpCDF	U(0.0138)	U(0.190)	U(0.214)	U(0.257)	U(0.248)	1.21	0.615
Total HpCDD	6.15	22.9	29.6	23.6	21.8	50.0	42.1
98DTEo	5.3	8.4	18.0	16.5	12.3	18.9	15.2
98DTEd	5.8	12.8	18.8	17.3	13.1	21.7	18.9
98DTEh	5.5	10.6	18.4	16.9	12.7	20.3	17.1

Appendix 2 .
Lobster Tomalley Native Summary Results(pg/g, wet weight)

Sample Weight	12.70	11.33	10.00	10.69	10.67	10.27	10.25
Field ID	Presumpscot #3	Presumpscot #4	Kennebec #1	Kennebec #2	Kennebec #3	Kennebec #4	Fort Pt. #1
Extract ID	37200	37201	37202	37212	37213	37214	37215
MS Filename	H97E202-11	H97E202-12	H97E202-13	H97E162-1	H97E162-2	H97E162-3	H97E163-1
Isomer							
2,3,7,8-TCDF(a)	28.6	41.9	28.5	29.6	41.2	36.5	14.4
1,2,3,7,8-PeCDF	U(8.30EMPC)	U(11.2EMPC)	U(7.30EMPC)	U(8.15EMPC)	U(9.07EMPC)	U(8.90EMPC)	U(8.18EMPC)
2,3,4,7,8-PeCDF	7.20	15.2	8.00	9.13	10.20	9.40	U(0.0957)
1,2,3,4,7,8-HxCDF	0.805	1.44	U(1.12EMPC)	U(1.46)	U(0.376) J	U(1.18)	U(5.92)
1,2,3,6,7,8-HxCDF	U(15.5EMPC)	U(15.5EMPC)	U(20.9EMPC)	U(1.45)	U(0.373) J	U(1.17)	U(5.87)
2,3,4,6,7,8-HxCDF	1.46	1.81	1.90	1.43	1.40 J	1.38	U(6.07)
1,2,3,7,8,9-HxCDF	U(1.74)	U(0.453)	U(0.920)	U(1.82)	U(0.467) J	U(1.46)	U(7.36)
1,2,3,4,6,7,8-HpCDF	U(1.73EMPC)	U(2.34EMPC)	U(2.40EMPC)	U(2.01EMPC) J	U(1.90EMPC) J	U(1.56EMPC) J	U(1.57EMPC) J
1,2,3,4,7,8,9-HpCDF	U(0.205)	U(0.381)	U(0.218)	U(0.438) J	U(0.177) J	U(0.347) J	U(0.456) J
OCDF	0.342	0.655	0.875	1.390	0.54 J	0.332	1.04J
2,3,7,8-TCDD	2.19	3.69	U(2.49EMPC)	3.08	4.18	3.59	1.11
1,2,3,7,8-PeCDD	4.97	7.70	4.09	4.70	4.85	4.59	4.63 J
1,2,3,4,7,8-HxCDD	2.02	3.07	1.90	1.62 J	1.54 J	1.73 J	1.79
1,2,3,6,7,8-HxCDD	9.60	13.3	8.45	8.87 J	7.64 J	8.58 J	11.1
1,2,3,7,8,9-HxCDD	3.30	4.46	2.95	1.35 J	1.21 J	1.50 J	2.92
1,2,3,4,6,7,8-HpCDD	17.5	23.9	9.75	17.4 J	9.69 J	9.31 J	11.9 J
OCDD	21.7	37.3	14.8	30.5	10.7 J	7.96	14.3J
Total TCDF	77.7	118	78.3	54.0	76.8	71.1	36.9
Total TCDD	21.4	33.8	17.0	10.0	13.4	13.1	19.2
Total PeCDF	52.5	86.5	48.2	48.0	53.3	64.0	37.4
Total PeCDD	25.4	39.2	25.8	16.5	23.6	21.9	48.4
Total HxCDF	42.5	42.3	46.7	19.2	21.1	18.1	76.6
Total HxCDD	58.0	82.5	47.6	38.9	33.4	38.2	56.9
Total HpCDF	0.282	0.960	U(0.196)	U(0.394)	U(0.159)	U(0.312)	U(0.411)
Total HpCDD	50.5	61.0	23.6	37.9	21.1	22.3	29.3
98DTEo	15.5	25.8	12.6	16.9	19.5	18.0	8.9
98DTEd	17.7	28.0	17.7	17.7	20.1	18.8	11.9
98DTEh	16.6	26.9	15.2	17.3	19.8	18.4	10.4

Appendix 2 .
Lobster Tomalley Native Summary Results(pg/g, wet weight)

Sample Weight	10.11	10.30	10.80
Field ID	Fort Pt. #2	Fort Pt. #3	Fort Pt. #4
Extract ID	37216	37217	37218
MS Filename	H97E163-2	H97E163-7	H97E163-8
Isomer			
2,3,7,8-TCDF(a)	18.3	16.7	12.1
1,2,3,7,8-PeCDF	U(9.09EMPC)	U(10.3EMPC)	U(6.37EMPC)
2,3,4,7,8-PeCDF	8.29	7.12	5.48
1,2,3,4,7,8-HxCDF	U(1.12EMPC)	U(1.61EMPC)	U(1.14EMPC)
1,2,3,6,7,8-HxCDF	U(1.14EMPC)	U(1.47EMPC)	U(0.770EMPC)
2,3,4,6,7,8-HxCDF	1.74	1.61	1.29
1,2,3,7,8,9-HxCDF	U(0.106)	U(0.529)	U(0.383)
1,2,3,4,6,7,8-HpCDF	U(0.713EMPC)	U(1.33EMPC)	U(1.58EMPC)
1,2,3,4,7,8,9-HpCDF	U(0.484)	U(0.585)	U(0.330)
OCDF	1.41	1.28	0.632
2,3,7,8-TCDD	1.08	0.920	0.620
1,2,3,7,8-PeCDD	5.16	4.94	3.73
1,2,3,4,7,8-HxCDD	2.33	2.480	1.86
1,2,3,6,7,8-HxCDD	13.1	14.4	9.39
1,2,3,7,8,9-HxCDD	2.35	2.61	1.88
1,2,3,4,6,7,8-HpCDD	12.5	17.5	11.4
OCDD	16.9	21.9	13.7
Total TCDF	53.4	44.9	43.2
Total TCDD	24.0	22.7	17.2
Total PeCDF	56.6	34.9	41.5
Total PeCDD	42.8	42.7	35.0
Total HxCDF	15.4	18.6	15.6
Total HxCDD	62.1	71.9	37.0
Total HpCDF	0.920	U(0.526)	U(0.297)
Total HpCDD	29.5	41.6	27.3
98DTEo	14.3	13.4	9.9
98DTEd	15.0	14.3	10.4
98DTEh	14.6	13.8	10.2

Appendix 2 .

Lobster Tomalley Native Summary Results(pg/g, wet weight)

QA data

Sample Weight	10.24	10.25	11.01	12.19	10g	10g	10g
Field ID	Kennebec #2	Kennebec #2	St. Croix #1	St. Croix #1	Lab Control Spike B1	Method Blank B2	Method Blank B1
Extract ID	37230(MS1)	37231 (MSD1)	37203 (MS)	37204 (MSD)	37205 (LCS)	37235 (MB)	37206 (MB)
MS Filename	H97E174-1	H97E174-2	H97E202-14	H97E202-15	H97E202-16	H97E161-1	H97E192-4
Isomer							
2,3,7,8-TCDF(a)	41.7	41.0	20.7	20.7	9.92	U(0.083EMPC)	0.203
1,2,3,7,8-PeCDF	U(71.3EMPC)	U(72.5EMPC)	U(54.5EMPC)	U(52.5EMPC)	57.5	U(0.0283)	U(0.118)
2,3,4,7,8-PeCDF	77.8	73.8	60.5	55.0	54.5	U(0.0278)	U(0.115)
1,2,3,4,7,8-HxCDF	U(54.2EMPC)	U(65.7EMPC)	38.3	38.1	39.6	U(0.036EMPC)	0.150
1,2,3,6,7,8-HxCDF	U(59.4EMPC)	U(50.2EMPC)	U(52.0EMPC)	U(51.5EMPC)	47.0	U(0.035EMPC)	0.129
2,3,4,6,7,8-HxCDF	44.7	47.8	34.4	35.0	40.3	0.139	U(0.239EMPC)
1,2,3,7,8,9-HxCDF	40.7	49.7	30.7	32.5	37.0	U(0.00309)	U(0.0107)
1,2,3,4,6,7,8-HpCDF	54.2	58.0	44.8	40.1	50.5	U(0.0529)	U(0.341EMPC)
1,2,3,4,7,8,9-HpCDF	51.8	53.1	39.0	38.4	45.7	U(0.0646)	U(0.0137)
OCDF	112	111	98.0	91.5	112	U(0.200EMPC)	0.850
2,3,7,8-TCDD	10.9	10.9	7.96	7.80	8.29	U(0.0592)	U(0.184)
1,2,3,7,8-PeCDD	53.3	54.6	44.5	42.8	46.5	U(0.0324)	U(0.114)
1,2,3,4,7,8-HxCDD	46.7	51.3	41.0	38.7	42.4	0.024	0.090
1,2,3,6,7,8-HxCDD	60.0	64.9	49.2	50.0	47.7	U(0.045EMPC)	U(0.152EMPC)
1,2,3,7,8,9-HxCDD	32.1	33.8	37.3	37.2	45.5	0.049	U(0.159EMPC)
1,2,3,4,6,7,8-HpCDD	74.4	75.3	53.5	51.0	52.0	0.572	1.155
OCDD	136	138	99.0	92.0	111	7.156	9.15
Total TCDF	70.9	68.1	54.4	58.7	12.0	0.188	0.203
Total TCDD	18.4	17.9	24.0	23.3	8.78	0.249	0.188
Total PeCDF	186	157	151	167	118	U(0.0280)	U(0.116)
Total PeCDD	69.7	67.7	61.5	59.5	47.1	0.021	U(0.114)
Total HxCDF	212	226	169	172	164	0.139	0.402
Total HxCDD	169	168	153	153	136	0.137	0.220
Total HpCDF	106	111	84.5	79.0	96.0	0.143	0.341
Total HpCDD	94.3	93.8	64.5	63.5	53.5	1.20	2.23
98DTEo	131.7	133.3	109.4	104.7			
98DTEd	146.7	148.6	117.3	112.5			
98DTEh							

APPENDIX 3

2378-TCDD AND 2378-TCDF IN SLUDGE FROM

MAINE WASTEWATER TREATMENT PLANTS

APPENDIX 3. DIOXIN AND FURAN IN SLUDGE FROM MAINE WASTEWATER TREATMENT PLANTS (pg/g dry weight)

LOCATION	DATE	%MOIST	TCDD	TCDF
AUBURN VPS	951005		1.3	17.9
AUGUSTA SANITARY DISTRICT	900409		<1.2	1.3
	900608		<3.9	2.5
	900608		E2.1	10.2
	900914		<20.0	E20.0
	900809		<20	
	910108		<5	5.0
	910220		<1.9	0.8
	910301		<1.9	4.8
	920416		1.9	1.9
	920427		<1.0	1.9
	930223		<1.3	<1.3
	940215		<1.0	<1.0
			<0.02	0.0
			<0.23	1.8
	950227		1.9	<1
	960228		<1	<1
ANSON-MADISON SANITARY DISTRICT	910408		<1.3	2.2
	911001		1.7	4.6
BANGOR	950104		20.6	20.7
	950104		20.3	20.2
BERWICK SEWER DISTRICT	861111		<2.5	<4.0
	890301	76.4	14.0	19.9
	890927	75.3	<12.1	<12.1
	891208	87.5	1152.0	872.0
BIDDEFORD	900208		7.2	30.0
	900208		39.0	310.0
	910501		<0.86	3.7
	910703		<0.57	<0.95
	920204		<1.5	2.9
	930121		<2.4	<3.2
	940209		<0.19	<0.48
	940913		<1.0	<2.9
	950815		<.22	1.6

APPENDIX 3. (CONT.)

LOCATION	DATE	%MOIST	TCDD	TCDF
BREWER	920520		<2.1	36.0
	920901		<6.0	110.0
	921116		3.8	19.0
	930202		<3.7	11.0
	930511		1.2	9.8
	930810		4.1	24.0
	931118		3.8	26.0
	940201		3.2	24.0
	940517		<0.9	14.0
	940823		4.5	26.0
	941108		5.2	36.0
	950613		<1	18.0
	960611		2.1	17.0
BOWATER MILLINOCKET	850618		<0.4	
	880602		<1.9	7.3
	940414		<7.4	<8.9
	940506		<.9	6.7
	950316		<.6	4.0
	960711		<1	<1
			<1	4.0
	960914		<0.4	4.4
			<0.3	1.5
	960917		<1	<1
CORINNA SEWER DISTRICT	850506			
	871117		<11.9	<28.8
	880301		<3.0	8.5
	890222		<13.0	
	890510		<5.0	
	900131		2.3	127.0
	900606		<4.0	85.4
	900606		<4.9	82.2
	900919		<10.0	50.0
	901024		<8.0	
	910313		<5.0	
	910514			
	920304		<3.9	<8.4
	930405		<4.8	19.9
	930811		<9.9	68.6
	940308		<13.1	46.0
	940810		<5.6	7.8
	950321		<2.1	13.3
	960206		<1.8	12.7

APPENDIX 3. (CONT.)

LOCATION	DATE	%MOIST	TCDD	TCDF
CROWN VANTAGE BERLIN NH	88		104.0	2930.0
FORT JAMES	880801		12.0	34.0
OLD TOWN	881225	78.6	301.0	963.0
	890423	78.7	380.0	1197.0
	890718	68.8	50.6	478.0
	950103		8.8	65.0
FRASER PAPER LTD	880903	68.3	13.9	233.0
MADAWASKA	890106	79.1	E23.4	204.0
	890406	71.3	E3.83	12.9
	890930	80.1	5.0	E26.6
	940426		<.1	0.8
GARDINER WATER DISTRICT	900918		<0.87	4.6
	910401		1.4	4.4
	911002		<0.54	5.1
	920504		<3.5	9.4
	921116		<.93	<6.4
	930407		<0.13	0.9
	931115		<1.6	<18
	931115			
	931115		<0.9	
	940329		<0.2	<1.1
	941018		<1.2	<4.3
	950221		<2.8	5.2
	951003		<1.7	
	960326		4.1	27.0
	961015		0.8	11.0
GEORGIA PACIFIC CO	890113	75.8	<6.2	<3.55
WOODLAND	890424	74.7	<0.63	<4.74
	890718	66.0	<1.76	12.9
	891217		0.9	3.2
	910630		<1	2.0
	910630		<1	1.0
	910630		<1	<1
	910630		1.0	4.0
	910630		<1	<1
	910630		<1	2.0
	911231		<1	2.0
	911231		2.0	5.0
	911231		<1	3.0
	911231		<1	2.0
	930108		<1	<1

APPENDIX 3. (CONT.)

LOCATION	DATE	%MOIST	TCDD	TCDF
GEORGIA PACIFIC CO	940530		<5.0	<5.0
WOODLAND	941222		<5.0	11.9
	950331		<5.0	14.3
	950630		<5.0	<5.0
	950930		<5.0	24.5
	951231		<1.0	3.4
HARTLAND WASTEWATER	881007	65.0	<2.86	<1.71
TREATMENT PLANT	881221	65.5	<7.25	E6.09
	890312	64.3	<0.28	5.6
	890627	63.3	<1.36	6.5
HAWK RIDGE COMPOST	1989-90	mean n=6	6.6	15.9
UNITY	1991	(1.6-13)		mean n=4
(compost)	900420		2.9	15.0
	900507		3.4	6.0
	900628		3.4	31.0
	900712		5.0	40.0
	900817		3.4	31.0
	900820		3.0	30.0
	900820		5.0	40.0
	901010		<5	30.0
	910115		0.6	6.4
	910207		4.0	59.5
	910806		1.6	15.0
	920123		2.6	18.0
	920318		<1	
	920715		<2.0	34.0
	920818		<1.0	18.0
	921007		2.2	23.0
	930111		<2.2	12.0
	930406		1.7	16.0
	930629		1.7	22.0
	931213		3.4	28.0
	940101		2.6	27.0
	940422		<1.0	12.0
	940422		<1	9.1
	940725		1.6	13.0
	941024		<2.4	13.0
			4.9	33.0
	950724		<1	12.0
	951012		1.1	12.0
	960131		<1	8.8
	960501		<1	6.6
	960709		<1	7.6
	961007		1.4	10.0

APPENDIX 3. (CONT.)

LOCATION	DATE	%MOIST	TCDD	TCDF
INTERNATIONAL PAPER CO	850621		51.3W	
JAY	870115		190.0	760.0
	880218		24.0	130.0
	880219		23.0	121.0
	880223		14.0	75.0
	880225		57.0	250.0
	880226		15.0	79.0
	880227		13.0	79.0
	881231		16.6W	143W
	890124		15W	77W
	890126		28.0	112.0
	890323		7.7W	42.6W
	890417		24.0	150.0
	950712		7.2	39.0
	960125		2.6	16.0
	960126		2.8	16.0
	960227		<1.0	14.0
	960228		2.3	14.0
	961015		<1	4.0
	961016		<1	5.4
	961126		4.6	22.0
	961127		2.7	12.0
KENNEBEC SANITARY	870713			
TREATMENT DISTRICT	871105			
WATERVILLE	880118			
	880322			
	880518			
	880921			
	890711			
	891011			
	900410		E7.9	121.0
	900824		3.3	54.0
	901101		3.6	12.0
	901221		3.5	6.7
	901221		3.5	19.0
	910408		<2.3	<3.3
	910606		<2.9	<5.0
	910808		2.3	53.0
	910911		3.1	4.1
	920226		2.6	20.0
	920708		<1.0	11.0
	930914		1.1	6.3
	941021		<1.0	8.2
	951113		<1	1.3
	960924		<1	<1

APPENDIX 3. (CONT.)

LOCATION	DATE	%MOIST	TCDD	TCDF
KIMBERLY-CLARK	871008		36.0	
WINSLOW	871201		13.5	
	880331		25.0	219.0
	880630		19.0	177.0
	880930		22.0	189.0
	881231		17.0	181.0
	890331		18.0	177.0
	890628		14.0	89.0
	890927		11.0	67.0
	891231		13.0	115.0
	900201		12.0	86.0
	900628		12.0	94.0
	900928		9.4	76.0
	901231		7.2	63.0
	910411		8.3	100.0
	910630		4.6	62.0
	910930		6.5	69.0
	911203		6.3	68.1
	920225		6.5	72.1
	920623		5.2	55.0
	921006		5.1	60.0
	921228		7.2	59.0
	930317		4.7	47.0
	930629		4.2	37.0
	930917		3.9	42.0
	931231		5.2	44.0
	940101		3.5	31.0
	940401		3.7	27.0
	940909		4.9	33.0
	941231			30.0
	950331		4.4	42.0
	950608		<1	24.0
	950930		2.2	25.0
	951231		3.0	34.0
	960122	RWT	3.0	34.0
	960410		3.1	29.0
	960702		4.4	36.0
	960702D		1.6	17.0
	961030		2.4	18.0
	961030D		<1	17.0

APPENDIX 3. (CONT.)

LOCATION	DATE	%MOIST	TCDD	TCDF
LEWISTON-AUBURN	871231		<1.0	n for year (n
TREATMENT PLANT	881031		0.0	
	900809		E10	9.0
	910306		<7.3	<7.3
	920610		<0.8	4.5
	930922		<2.7	<2.5
	950405		<2.2	0.8
	960625		<1	<1
	961202		<1	21.0
LINCOLN PULP & PAPER CO	881119		48W	223W
LINCOLN	890123	80.9	44.0	203.0
	890123		44.0	173.0
	890407	85.1	49.0	298.0
	890407		41.0	219.0
	890831	83.5	182.0	640.0
	890831		156.0	625.0
	890831		41.0	220.0
	890831		59.0	294.0
	921231		20.4	91.6
	931231		9.7	86.0
	940331	PRI SL	14.9	154.0
	940331	SEC SL	97.1	734.0
	960302		<0.4	<0.3
	960419		4.2	21.7
	960431		4.2	25.1
MEADE PAPER	850621		32.0	
RUMFORD	880602		105.0	674.0
	890108	77.1	114.0	569.0
	890407	73.1	46.5	184.0
	890628	76.8	E9.91	134.0
OAKLAND TREATMENT PLANT	910304		<2.5	10.0
	910329		<5	10.0
	920415		<1.0	<1.0
	920415		<1	<1
	930408		<1.0	<1.0
	930501		<1.0	11.0
	940426		<1.0	<1.0
OLD TOWN	880525		<3.0	<3.0
	900212		<2.2	16.7
	910918		<2.9	6.6
	910918		<2.2	

APPENDIX 3. (CONT.)

LOCATION	DATE	%MOIST	TCDD	TCDF
ORONO TREATMENT PLANT	900316		2.1	
	900412		8.5	
	901001		3.5	9.2
	901021		3.9	
	910324		<2.1	9.5
	910918		<2.9	6.6
	920323		<0.6	7.6
	920328		9.4	
	920915		<0.5	5.4
	921015		1.1	
	930427		1.3	
	930427		<0.5	3.4
	940502		<0.6	2.5
PERC	910417		<2.0	9.9
PORTLAND WATER DISTRICT	861205			
PORTLAND	870402			
	871124			
	880913			
	891206		E1.2	11.3
	891206		1.6	14.5
	901002		<3	10.0
	901002		<3	20.0
	910826		<64	<32
	910828		<66	<140
	920715		<1.1	6.4
	920715		0.9	7.6
	930719		<1	2.3
	930719		<1.1	<3.2
	940718		<1.0	0.8
	950727		0.5	1.0
	960807		<0.7	<0.1
WESTBROOK WWTF	861205			
	870402			
	871119			
	891205		E1.6	14.5
	901001		<3.0	9.0
	910826		<64	<32
	920714		<1.1	7.6
	930719		<1.0	3.2

APPENDIX 3. (CONT.)

LOCATION	DATE	%MOIST	TCDD	TCDF
REGIONAL WASTE SYSTEMS	890111	ash	5.5	28.0
PORTLAND	890112	ash	6.0	24.0
	890113	ash	10.0	50.0
	890114	ash	10.0	20.0
	890121	ash	6.0	90.0
	900211	ash	E20	210.0
ROBINSON MANUFACTURING	870113		10.1	17.5
OXFORD	880419		<0.4	<0.2
	881004		<7.3	<9.6
	890119		<0.39	<1.2
	890119D		<2.1	<1.1
	910226		<3.0	<3.0
	910305		<3	<0.3
	910308		<3	<3
	910323		<5	<5
	910323		<3	<3
	920610		<1.2	<1.0
	960216		<1	0.1
	960315		<1	4.2
SAPPI -SOMERSET	861217		<2	47.0
	870519		13.0	21.0
	870930			
	871215		60.0	
	880325		27.0	88.0
	880630	EPA	67.0	33.0
	881014		40.0	98.0
	881220		54.0	177.0
	890303		54.0	92.0
	890629		23.0	53.0
	890926		<.8	16.0
	891205		18.0	52.0
	900314		<18	23.0
	900620		35.0	73.0
	900916		45.0	86.0
	901215		39.5	115.0
	910324		23.1	51.0
	910626		39.4	146.0
	910910		69.9	260.0
	920624		33.0	856.0
	920923		20.0	39.0
	921218		15.0	45.0
	930107		11.0	31.0
	930616		23.0	73.0
	930916		56.0	170.0
	931229		42.0	110.0

APPENDIX 3. (CONT.)

LOCATION	DATE	%MOIST	TCDD	TCDF
SAPPI-SOMERSET	940108		31.0	95.0
	940627		33.0	89.0
	940926		12.0	36.0
	941212		11.0	20.0
	950313		3.6	15.0
	950510		3.3	11.0
	950914		9.6	25.0
	951120	comb	1.2	4.2
	960327		2.0	9.6
	960624		5.1	13.0
	960910		5.2	11.0
	961014		5.2	15.0
SAPPI - WESTBROOK	850620		17.2	
	870929		31.0	
	871231		21.0	135.0
	880331		5.6	21.0
	880401		8.7	3.9
	880630		13.0	55.0
	881207		19.0	127.0
			19.0	69.0
	890106		<1.8	31.0
	890600		<1.2	13.0
	890600		5.3	35.0
	890600		<.2	0.2
	890600		<.4	8.8
	890600		69.9	60.0
	891031		5.0	30.0
	891130		3.0	30.0
	891231		7.0	50.0
	900131		6.0	20.0
	900228		2.7	24.6
	900331		5.1	33.6
	900430		5.9	34.6
	900531		5.3	25.8
	900630		19.0	26.0
	900730		5.2	20.6
	900831		2.9	12.1
	900930		2.5	10.0
	901231		7.7	35.7
	910917		70.0	275.0
	910331		3.4	21.5
	910630		2.9	19.6
	910930		3.8	14.2
	911231		2.4	25.1

APPENDIX 3. (CONT.)

LOCATION	DATE	%MOIST	TCDD	TCDF
SAPPI - WESTBROOK	920331		1.2	19.4
	920505		1.6	10.8
	920821			24.5
	940131		0.9	11.6
	940324			12.3
	940728		2.1	17.3
	941213		5.3	29.2
	950329		1.2	20.0
	950602		1.0	10.1
	950911			18.3
	951120		1.1	23.3
	960304		?	68.0
	960625		4.5	49.0
	960805		?	52.0
	961210		?	32.0
S PORTLAND STP	880000		<8.65	<48
	900314		<5.3	<3.5
	900314		<2.7	<5.4
	910508			<10
	910531		<5	
	920401		<1.0	<0.8
	920428		<0.8	1.4
	920714		0.9	6.4
	930324		<2.8	<2.8
	940315		<1.0	3.9
	941005		8.7	48.0
	950405		<1	3.3
	960610		<1	5.3
TREE-FREE TISSUE CO	880930	62.6	36.9	414.0
AUGUSTA	881223	61.4	37.6	326.0
	890403	61.6	34.6	242.0
	890628	65.5	17.7	414.0
	971125		0.5	4.3

D=duplicate analysis

APPENDIX 4

2378-TCDD AND 2378-TCDF IN EFFLUENT FROM MAINE WASTEWATER TREATMENT PLANTS

Appendix 4. Dioxin and Furan in Effluent from Maine Wastewater Treatment Plants

SOURCE	DATE	TCDD (pg/l)	TCDF (pg/l)
ANSON MADISON	920408	<3	<3
	921001	<3	20
BREWER	920624	<5.9	
	930429	<3.9	
	941129	7.4	
	950503	<3.6	
	960416	<10	
FORT JAMES	880630	39	
	890131	27	120
	890222	210	340
	890223	92	290
	890224	77	340
	890320		34
	890324		24
	890325	36	73
	890405	30	110
	890410	17	52
	890411	32	89
	890824	32	94
	890831	13	150
	890911	<4.1	14
	890915	<3.3	<8.1
	890921	<5.7	13
	890927	<5.3	9.7
	891011	<3	11
	891019	<5.2	14
	891102	<6	18
	891106	6.7	22
	891114	<9.5	<7.1
	891127	<6.4	20
	891206	<8.4	13
	891213	<8.3	20
	891221	<4.7	23
	900105	<6.8	<8.3
	900111	<9	<8.5
	900118	<5.9	6.1
	900125	<6.7	10
	900207	<4.6	17
	900214	<6.6	23
	900222	<7.3	15
	900301	<6	11
	900308	<3	12
	900315	<4	16
	900329	<7.4	14
	900407	<7.2	24
	900502	<7	19
	900729	<9.9	49

Appendix 4. Dioxin and Furan in Effluent from Maine Wastewater Treatment Plants

SOURCE	DATE	TCDD (pg/l)	TCDF (pg/l)
FORT JAMES	910330	17	70
	910430	19	65
	910530	9.5	41
	910630	6.8	43
	910830	11	66
	911030		7.9
	911130	<7.7	<16
	920330	<5.7	50
	920730	16	69
	920830	<4.9	23
	921030	<3.0	
	921230	4.8	
	930130	<5.0	14
	930330	<4.9	12
	930530	<4.2	11
	930630	<2.8	15
	930830	<1.6	9.2
	930930	<3.5	7.6
	931130	<3.1	32
	931230	<3.2	19
	940230	<4.8	7.7
	940330	<4.6	12
	940530	<1.5	<4.5
	940630	<3.5	9.2
	940830	<2.0	<4.8
	940930	<4.6	<6.8
	941130	<9.5	<10
	941230	<1.1	5.8
	942730	<1.1	5.8
	950130	<2.4	8.2
	950119	<2.4	8.2
	951230	<1.1	5.8
	950430	<1.4	5.6
	950430	8	36
	950421	<1.4	5.6
	950622	<2	6.8
	950928	<3.8	8.1
	951129	<5.4	13
	951228	<1.4	6.2
	960228	<2.3	4.9
	960331	<1.8	12
	960430	<0.8	<5.1
	960630	<1.2	9.4
	960731	<1.2	15
	960930	<1.4	6.2
	961130	<1.6	<3.7
	961231	<4.0	12

Appendix 4. Dioxin and Furan in Effluent from Maine Wastewater Treatment Plants

SOURCE	DATE		TCDD (pg/l)	TCDF (pg/l)
GEORGIA PACIFIC	880101		6.8	25
	900316		<5	4
	900423		<3	<6
	900531		<8	<5
	900619		<3	<1
	900716		<1	<3
	900807		<2	<5
	910630		<10	<10
	910630		<10	<10
	910630		<11	<11
	910630		<11	<11
	910630		<11	<11
	910630		<11	<11
	910630		<10	<10
	910630		<11	<11
	910630		<11	<11
	911231		<10	<10
	911231		<10	<10
	911231		<11	<11
	911231		<11	<11
	911231		<10	<10
	911231		<11	<11
	911231		<10	<10
	911231		<11	<11
	911231		<11	<11
	930408		<10	<10
	930506		<10	<10
	930713		<10	<10
	940530		<10	<10
	941222		<10	<10
	950331		<10	<10
	950630		<10	<10
	950930		<10	<10
	951231		<10	<10
INTERNATIONAL PAPER	880101		88	420
	880715		30	150
	890307		30	100
			E6	E20
			E20	E20
	890310		16	74
	890616		<8	980
	890621		17	140
	890713		<16	50
	890720	DEP	30	150
	890818		20	110
	900413		<10	90
	910924		<10	60
	910926		<10	60
	911129		50	210
	911219		<20	<80

Appendix 4. Dioxin and Furan in Effluent from Maine Wastewater Treatment Plants

SOURCE	DATE	TCDD (pg/l)	TCDF (pg/l)
INTERNATIONAL PAPER	920125	20	110
	920126	20	110
	920127	30	100
	920128	30	100
	920129	13.7	49.9
	920312	19.3	65.6
	920320	14.8	73.9
	920423	<13.9	59.1
	920610	<5.7	29.5
	920617	<6.3	30.8
	920723	<8.4	33.6
	920819	6.6	29.7
	920923	<2.6	<2.0
	921111	<6.1	22.4
	921202	<2.6	<14.4
	930125	5.4	19.6
	930222	<5.3	25.5
	930420	<2.0	16.7
	930527	4.3	10.3
	930716	<5.2	28.9
	930826	<5.3, <6.5	21.5, 19.2
	930910	<8.6	9.4
	931022		19.5
	931119	<3.6	19.5
	931224	10.9	31.1
	940125	<4.1	21.6
	940226	7.3	38
	940422	7.7	41.1
	940520	4.1	25.6
	940722	<3.4	16.7
	940829	<7.9	31.8
	941027	<3.4	25.3
	941125	<6.8	24.4
	950126	<5.0	20.9
	950222	<3.6	21.4
	950420	<2.5	25.6
	950527	<1.8	24.1
	950724	<3.2	16.1
	950826	<4.9	7.5
	950929	<6.0	15.4
	951020	<8.5	12.9
	951122	<3.8	10.5
	960126	<3.8	12.9
	960228	<2.6	6.5
	960420	<1.1	12.8
	960530	<2.8	15.7
	960725	<9.2	18.2
	960819	<6.8	<4.1
	961014	<4.7	7.7
	961124	<7.6	<4.9

Appendix 4. Dioxin and Furan in Effluent from Maine Wastewater Treatment Plants

SOURCE	DATE	TCDD (pg/l)	TCDF (pg/l)
HARTLAND	960530	<0.06	
KIMBERLY-CLARK	930308	<10	<12
	930623	<4.6	<3.9
LINCOLN PULP AND PAPER	881130	32	130
	920817	11.2	69.8
	920908	<11	27.3
	921117	7.7	39.1
	921216	<1.9	9.5
	931230	<5.5	<17.3
	940417	1.9	7.5
	950824	1.3	8.5
	960409	1.3	8.5
MEADE PAPER	880518	120	570
	890301	25	80
	890807	<6	20
	890810	<13	20
	890814	<5	13
	890817	<5	18
	890821	<8	21
	890824	<5	10
	890829	<5	18
	890831	<11	20
	890905	<11	20
	890907	<9	18
	891023	<3	7
	891026	<5	6
	891222	<5	20
	900216	<2	6
	900216	<1	7
	900515	<10	<8
	900515	<1	5
	900627	<3	8
	900627	<3	9
	920217	<4.6	14
	920221	<4.6	13
	920311	<4.6	9.9
	920316	3.2	8.7
		3.5	12
		4.6	17
	920326	4.5	8.5
	920412	6.3	24
	920613	<4.6	6.8
	920708	<4.6	<5.8
	920831	<4.6	3.5
	920904	<3.8	

Appendix 4. Dioxin and Furan in Effluent from Maine Wastewater Treatment Plants

SOURCE	DATE	TCDD (pg/l)	TCDF (pg/l)
MEADE PAPER	921104	<3.7	
	921201	<2.4	
	930105	<2.4	
	930201	<2.4	<10
	930401	<2.8	<10
	930501	<2.4	<10
	930701	<3.9	12
	930801	<2.8	<3.4
	931001	<3.2	<10
	931101	<3.9	<3.6
	940130	<2.8	<5.2
	940219	<1.9	<1.3
	940417	<3.3	<2.4
	940509	<3.6	<1.2
	940728	<3.7	<1.7
	940829	<2.7	<2.0
	941024	<2.1	<1.1
	941205	<2.7	<1.8
	950131	<10	<10
	950229	<10	<10
	950430	<10	<10
	950531	<10	<10
	950731	<10	<10
	950831	<10	<10
	951031	<10	<10
	951130	<10	<10
	960130	<10	<10
	960330	<10	<10
	960430	<10	<10
	960530	<10	<10
	960730	<10	<10
	960830	<10	<10
	961030	<10	<10
	961130	<10	<10
SAPPI - SOMERSET	880630	16,19	63,100
	900710	<7.1	8.4
	900716	<6.1	5.9
	dup	<5.5	<7.3
	900724	<3.6	<3.9
	930105	<3.4	9.2
	930224	<4.7	15
	930311	<4.0	10
	930409	6.8	18
	930616	6.3	14
	930917	7	17
	931203	7.6	19
	940107	<3.8	9.2
	940624	<10	13
	940923	<11	8.7

SOURCE	DATE	TCDD (pg/l)	TCDF (pg/l)
	941209	<4.6	6.6
SAPPI - SOMERSET	950310	9	11.6
	950505	<10.3	6.6
	950616	<3.9	<9.4
	950807	5.8	14.5
	950911	2.8	15.3
	951124	<4.2	38.7
	951208	<7.4	29
	960112	<1.6	<2.3
	960209	<3.2	<4.8
	960405	<2.7	<2.7
	960610	<3.6	6.5
	960712	<3.0	4.2
	960809	5.8	15
	961108	<4.9	11
	961206	<4.1	9.7
SAPPI - WESTBROOK	880101	6.3	
	1989	1	
	901118	<3	8
	910425	<5	<5
	910716	<8	<5
	911203	<8	<5
	920218	<2.8	7
	920507	<1.2	4.6
	920715	<5.8	<4.9
	921114	<1.8	3.9
	930303	<7.8	16
	930617	<1.5	<6.4
	930915	<2.4	5.7
	931208	<3.4	<7.3
	940130	<6.5	<9.8
	940324		<5.9
	940727	3.6	7.8
	941212	<6.0	<15.8
	950730	<5.4	9.8
	950615	<2.8	<9.9
	950815	<4.3	<21.9

APPENDIX 5

2378-TCDD AND 2378-TCDF IN SEDIMENTS

FROM VARIOUS STATIONS ON THE ANDROSCOGGIN RIVER

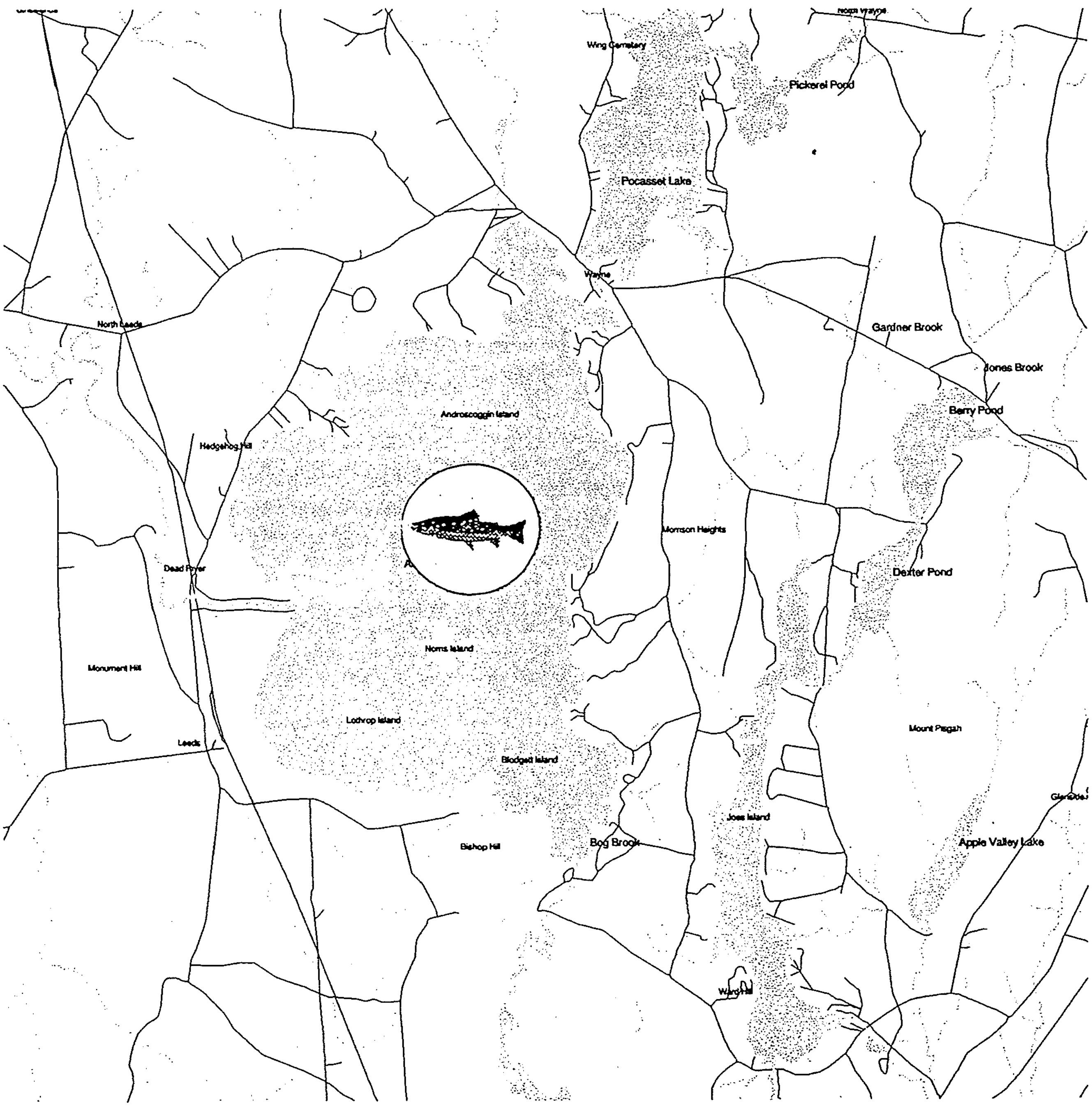
APPENDIX 5. 2378-TCDD AND 2378-TCDF IN SEDIMENTS FROM STATIONS ON THE ANDROSCOGGIN RIVER (pg/g)

LOCATION	DATE	2378-TCDD	2378-TCDF	% MOISTURE	% DOC
Virginia Impoundment Rumford N443147 W703217	910308	4.4	185		2.35
Riley Impoundment Jay N443002 W701458	910306	5.3	168		3.31
Otis Impoundment Livermore Falls N442846 W701213	910327	E6.8	162		2.85
Gulf Island Pond Turner N441520 W701050	850711	23.1			
Gulf Island Pond Turner N441420 W701125	850711	30.3			
Gulf Island Pond Turner N441225 W701210	850711	20.4			
Gulf Island Pond Greene N441040 W701240	850711	39.5 42.6dup			
Gulf Island Pond Greene N440932 W701222	910313	27.4	371		6.79
Worumbo Impound. Lisbon Falls N435950 W700405	910327	4.7	64.2		2.31
Brunswick below dam N435445 W695550	850711	2.5			
Brunswick Cow Island N435520 W695745	850711	1.7			

APPENDIX 6

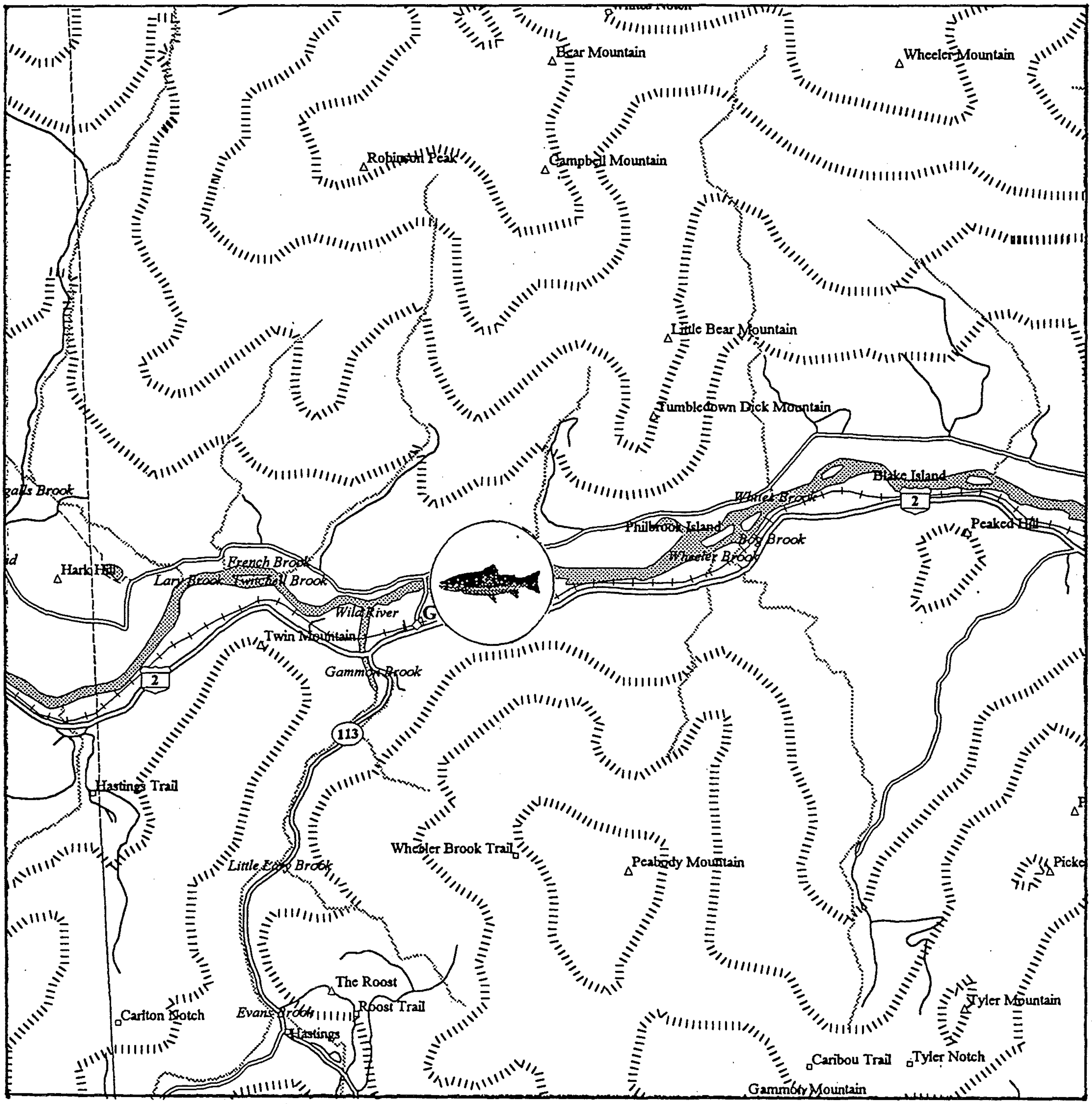
SAMPLE LOCATION MAPS

ALW Androscoggin Lake

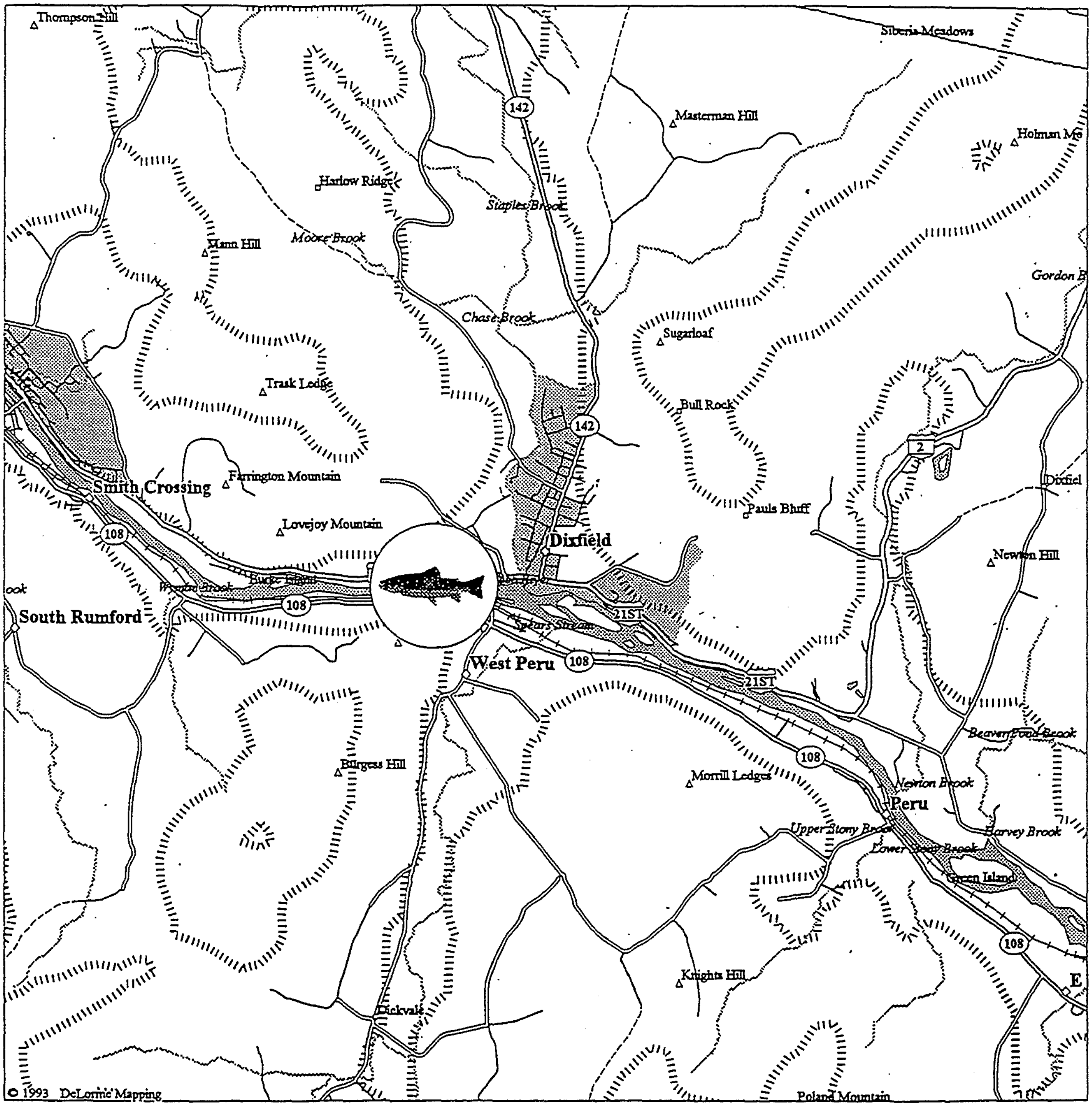


MDEP BL&WQ DEA

AGL ANDROSCOGGIN RIVER AT GILEAD

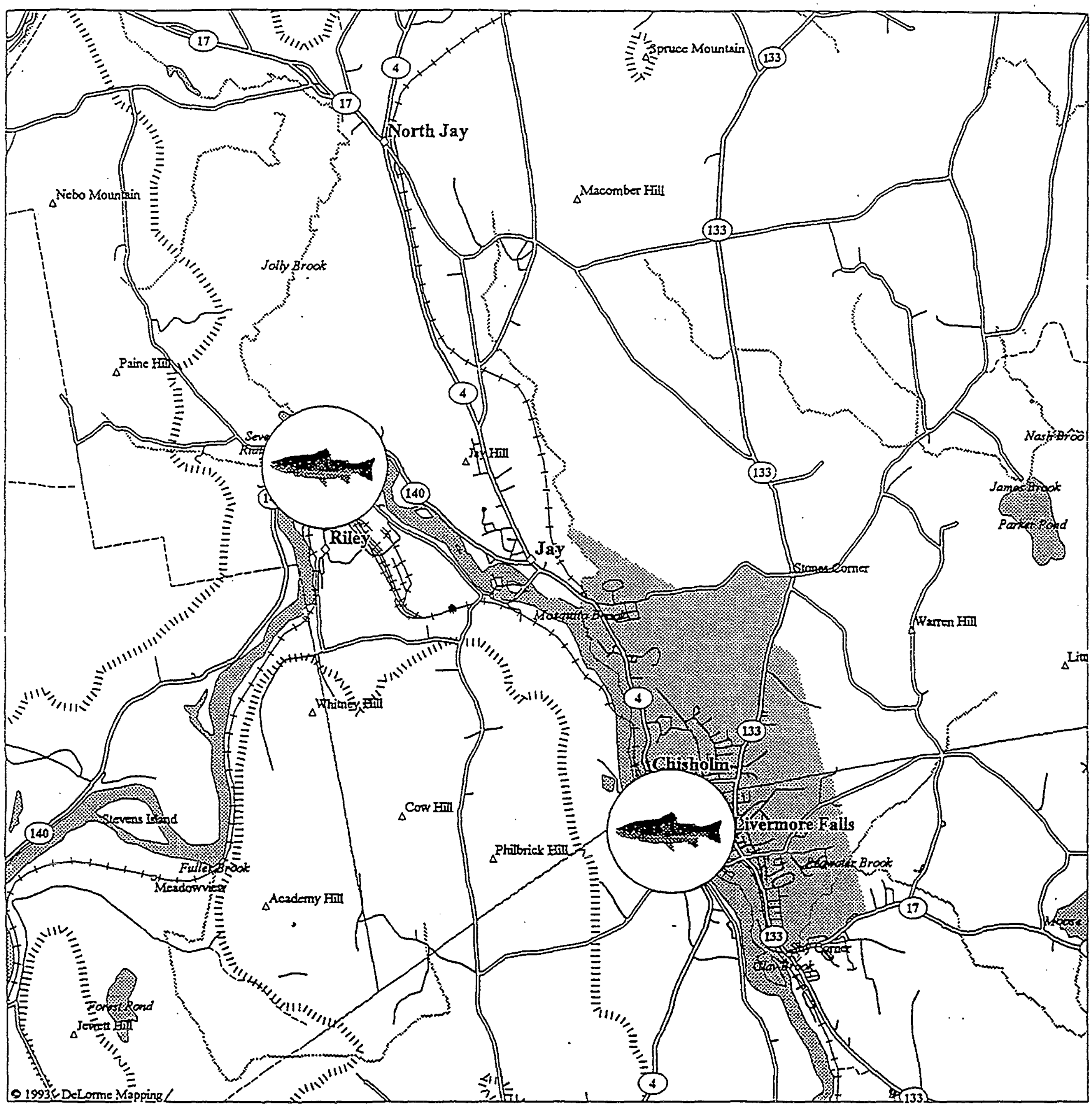


ARF ANDROSCOGGIN RIVER AT RUMFORD

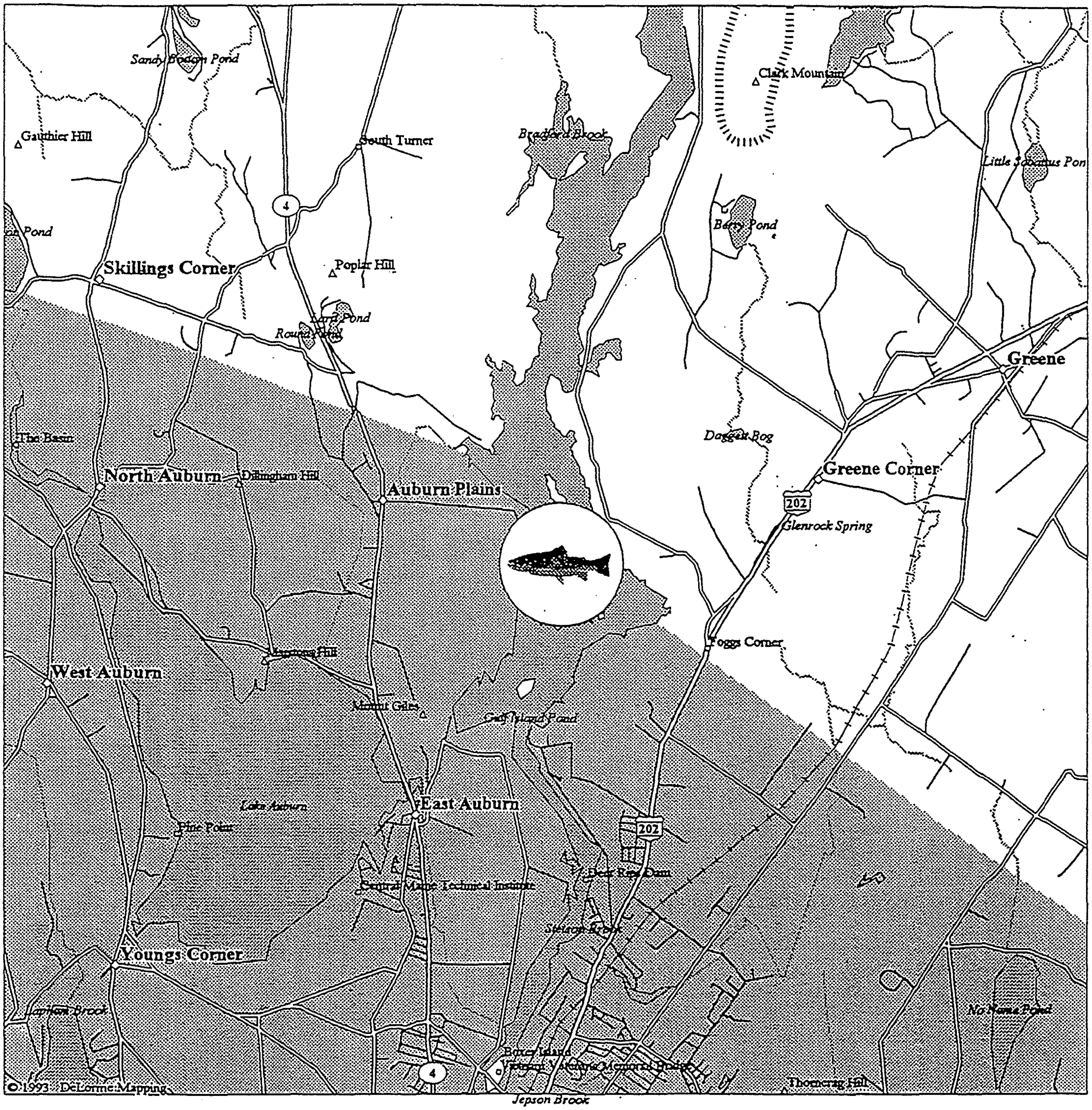


AJY ANDROSCOGGIN RIVER AT JAY

ALV ANDROSCOGGIN RIVER AT LIVERMORE FALLS

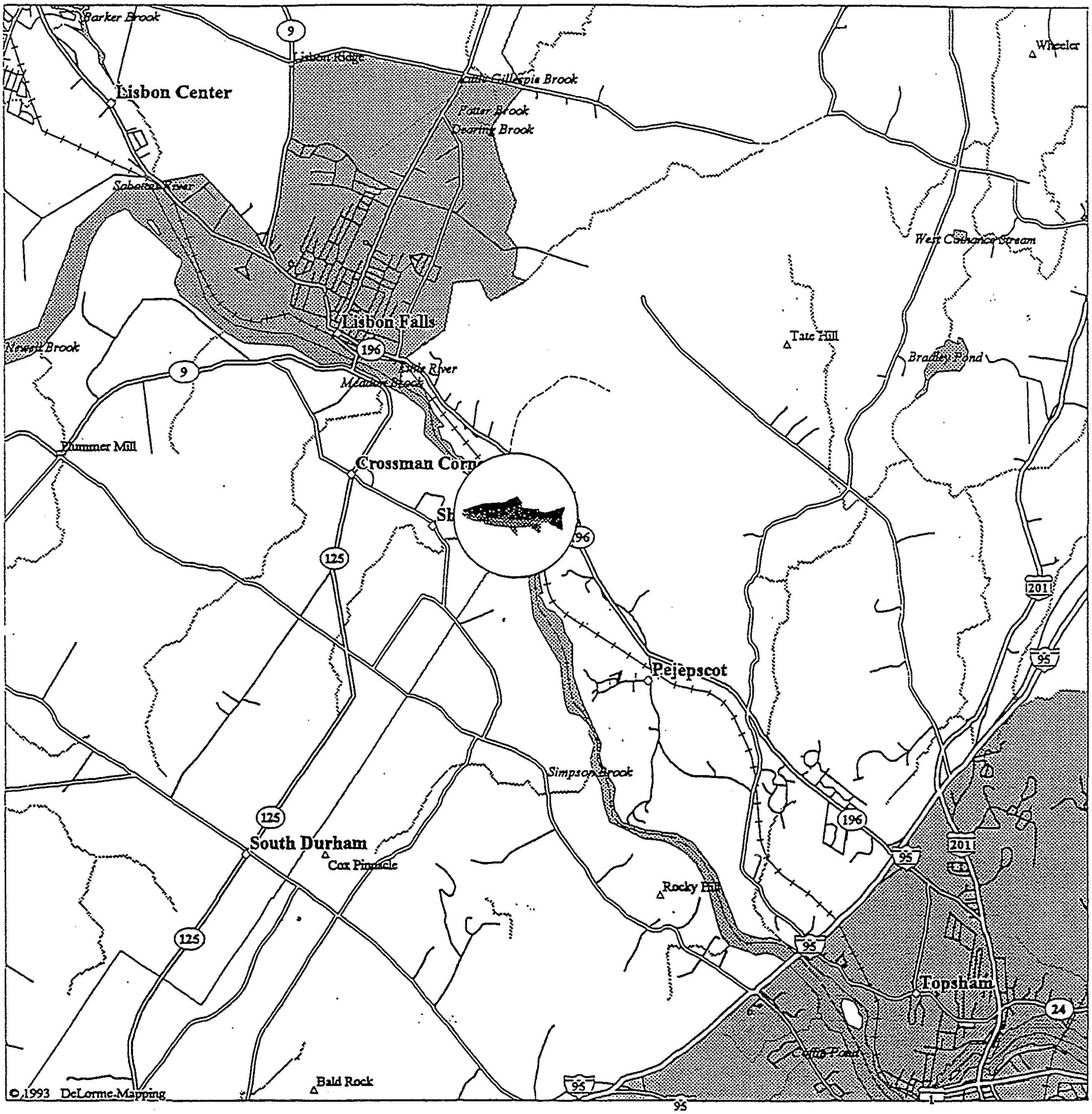


AGI ANDROSCOGGIN RIVER AT GULF ISLAND POND, AUBURN



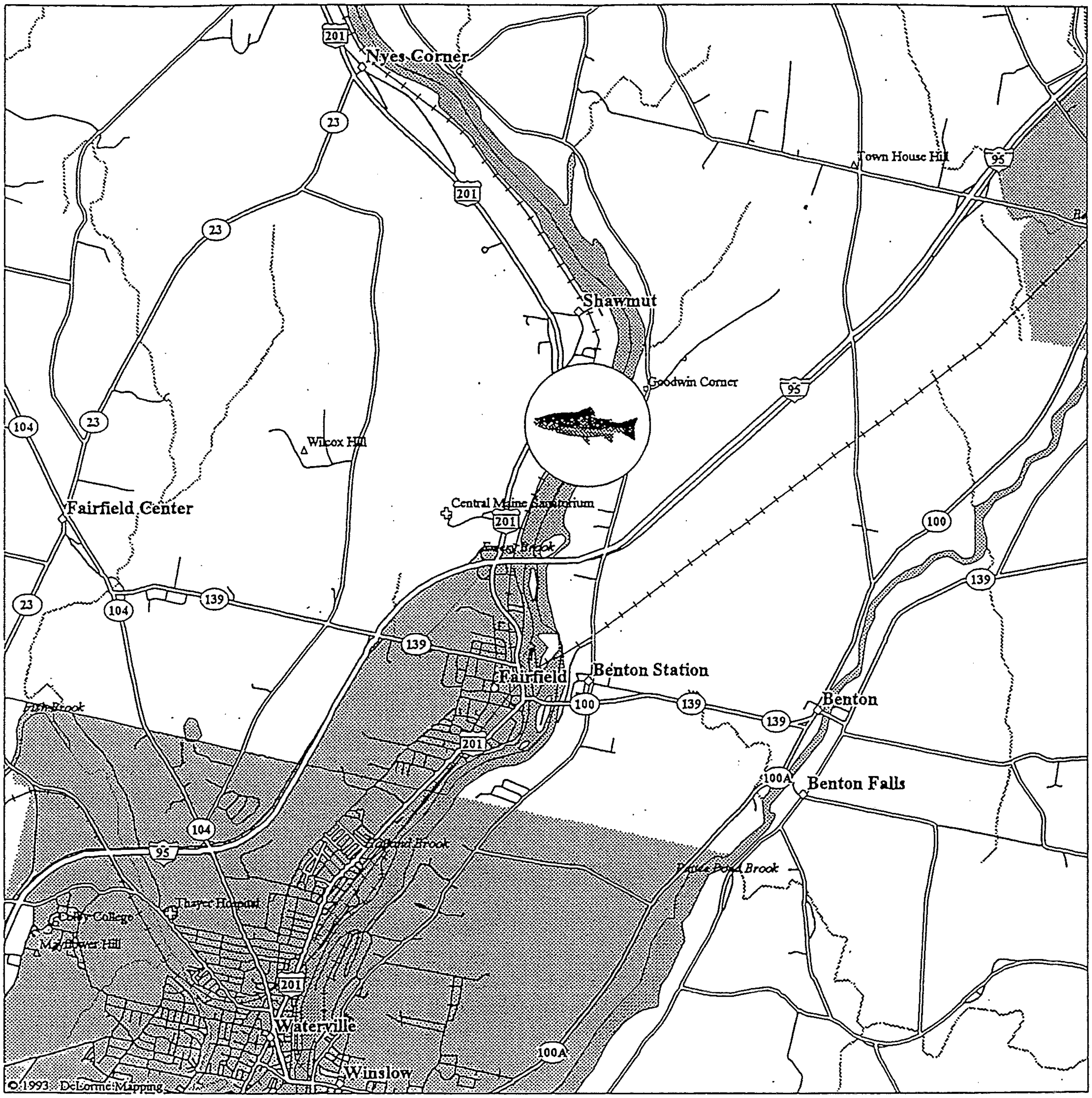
ALS

ANDROSCOGGIN RIVER AT LISBON FALLS

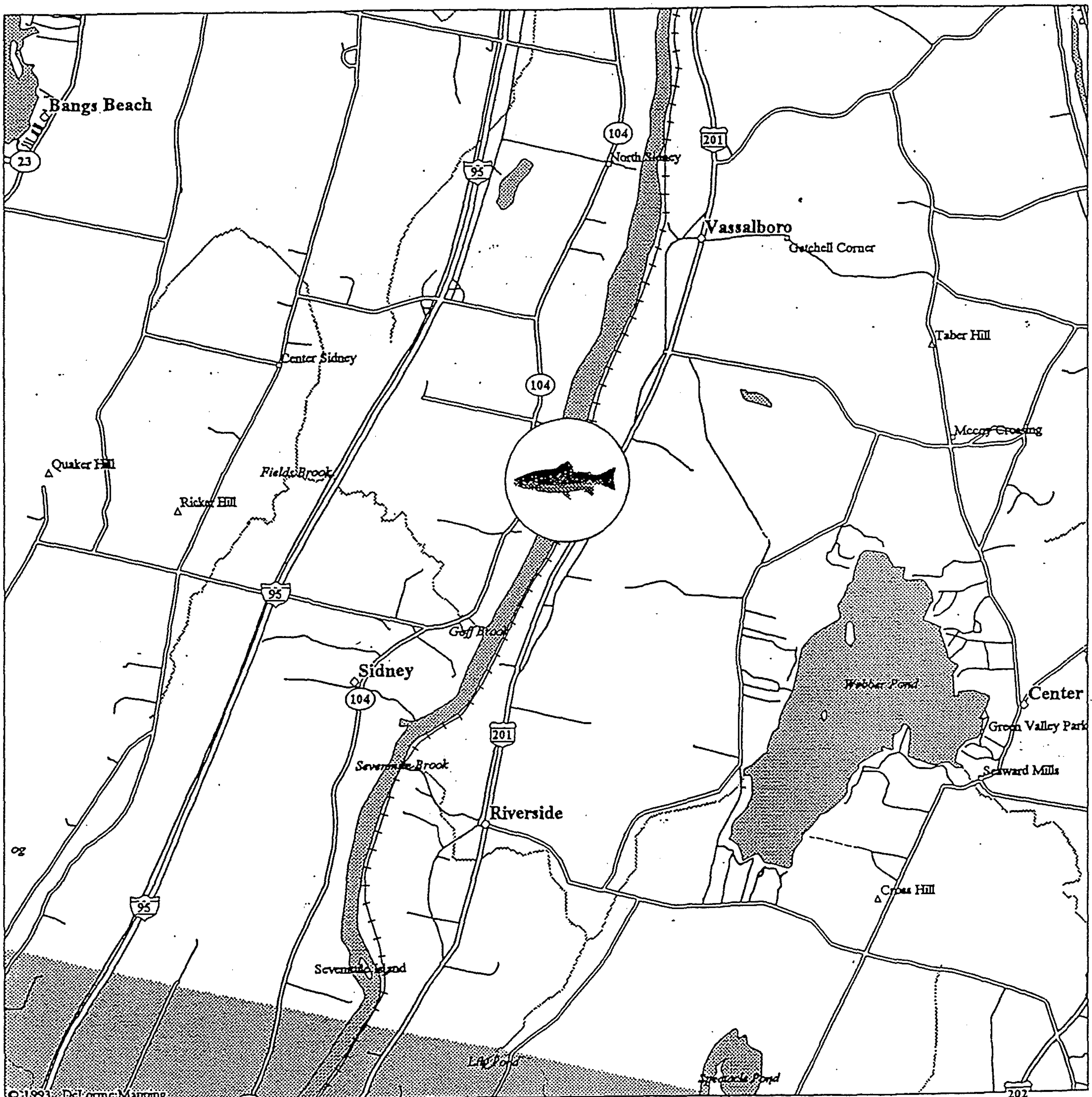


KMD KENNEBEC RIVER AT MADISON

KFF KENNEBEC RIVER AT SHAWMUT, FAIRFIELD

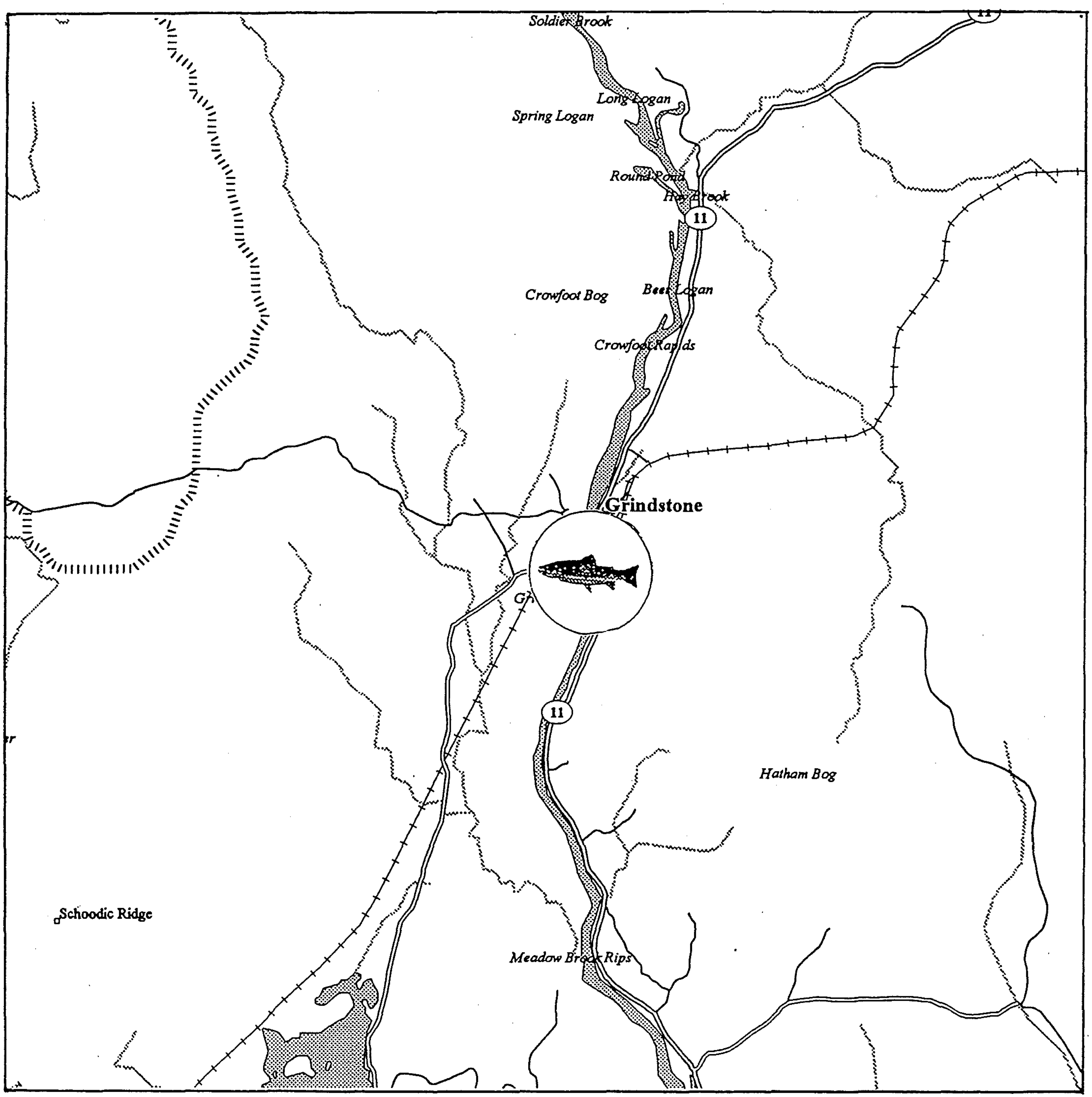


KSD KENNEBEC RIVER AT SIDNEY

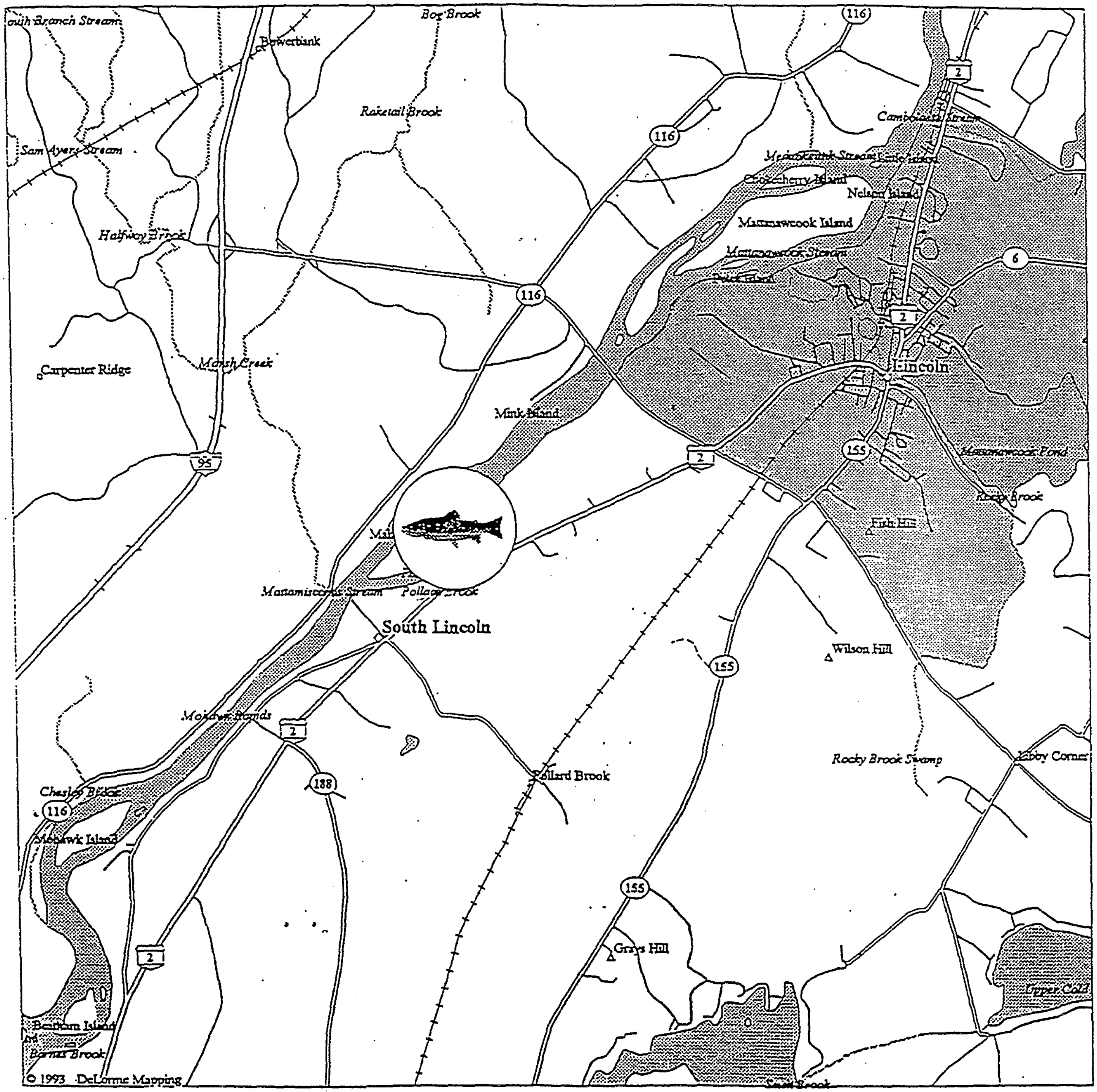


KAG KENNEBEC RIVER AT AUGUSTA

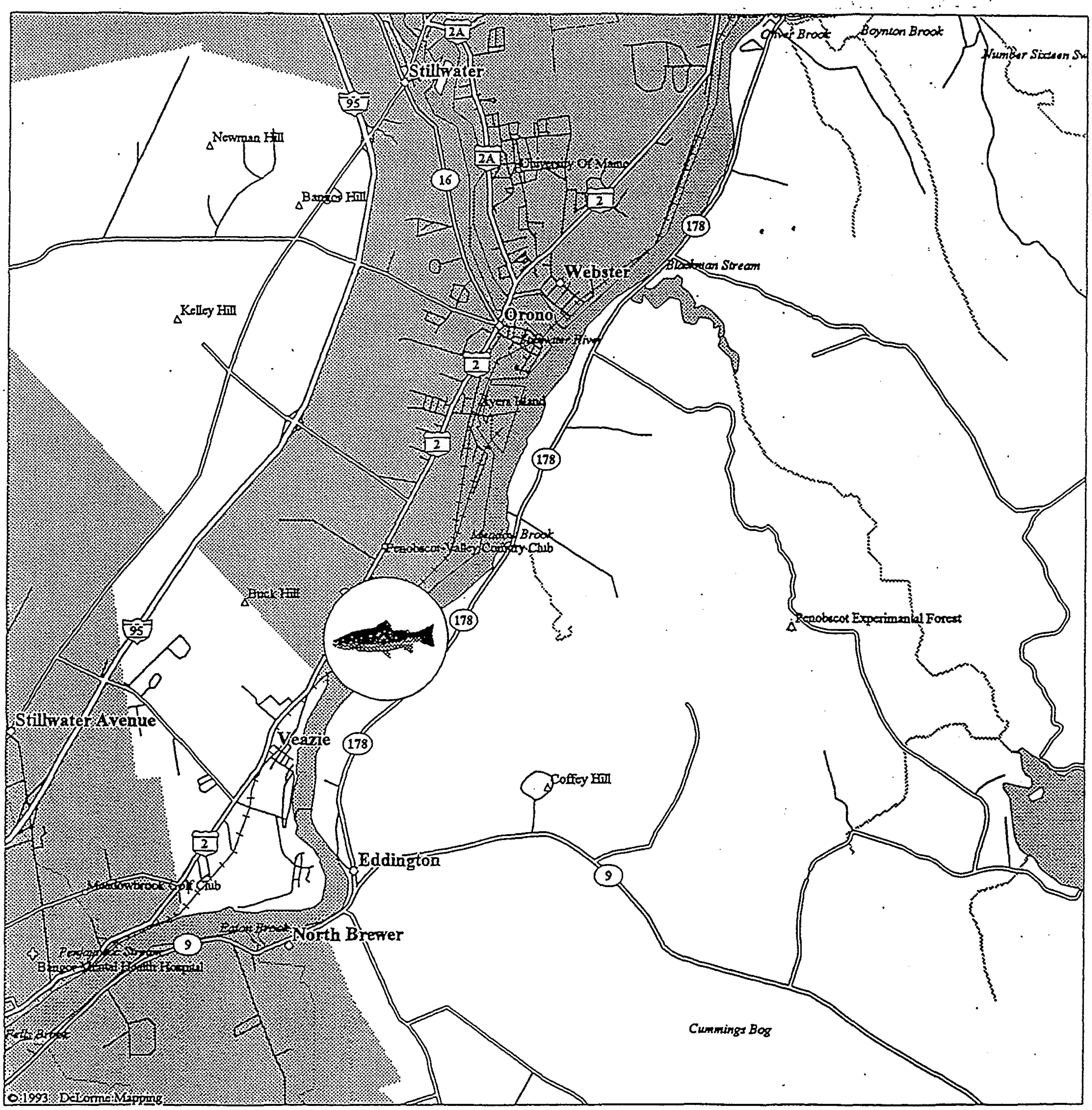
PBG PENOBSCOT RIVER AT GRINDSTONE



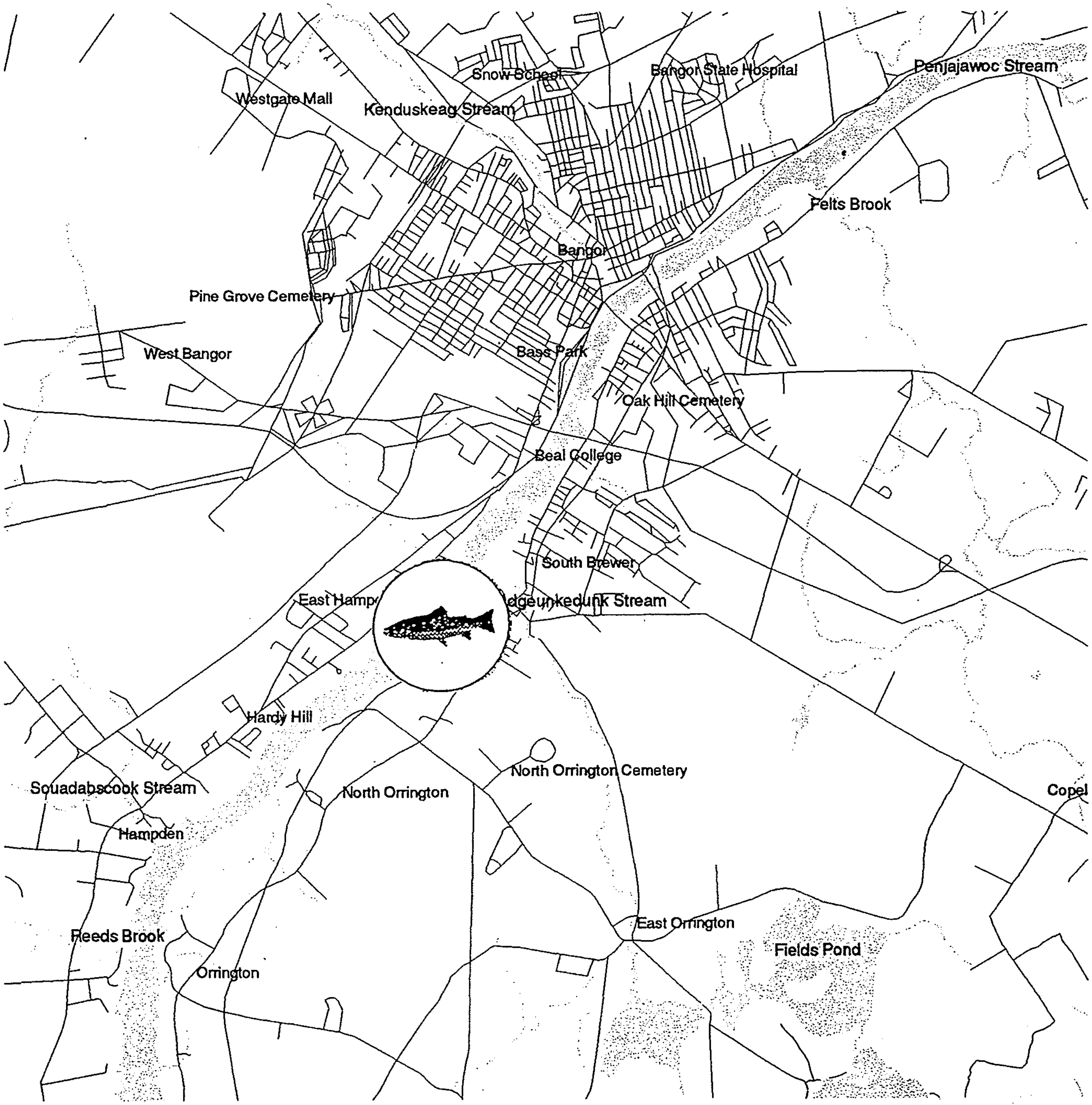
PBL PENOBSCOT RIVER AT SOUTH LINCOLN



PBV PENOBSCOT RIVER AT VEAZIE

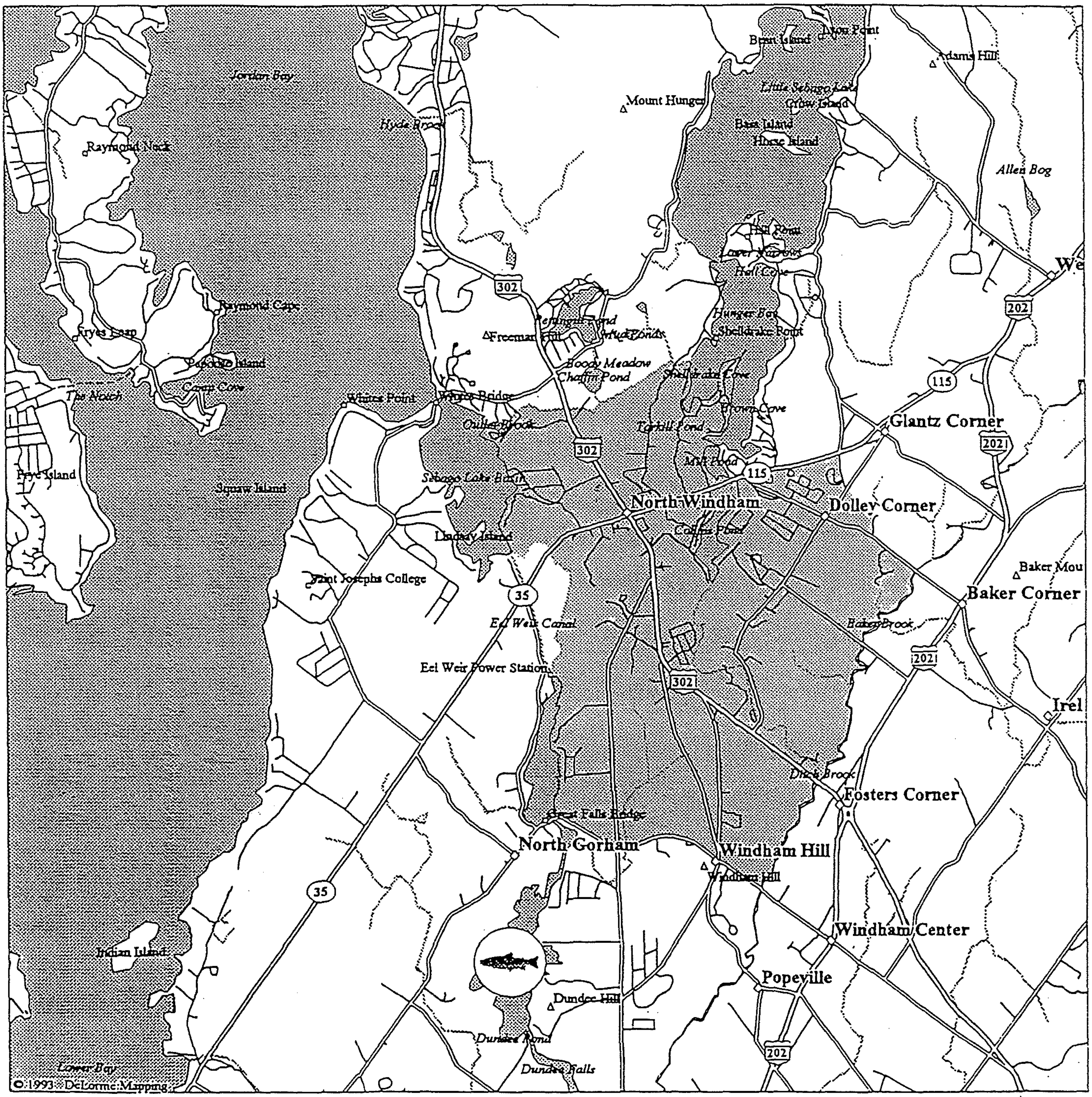


PBB Penobscot River: Bangor



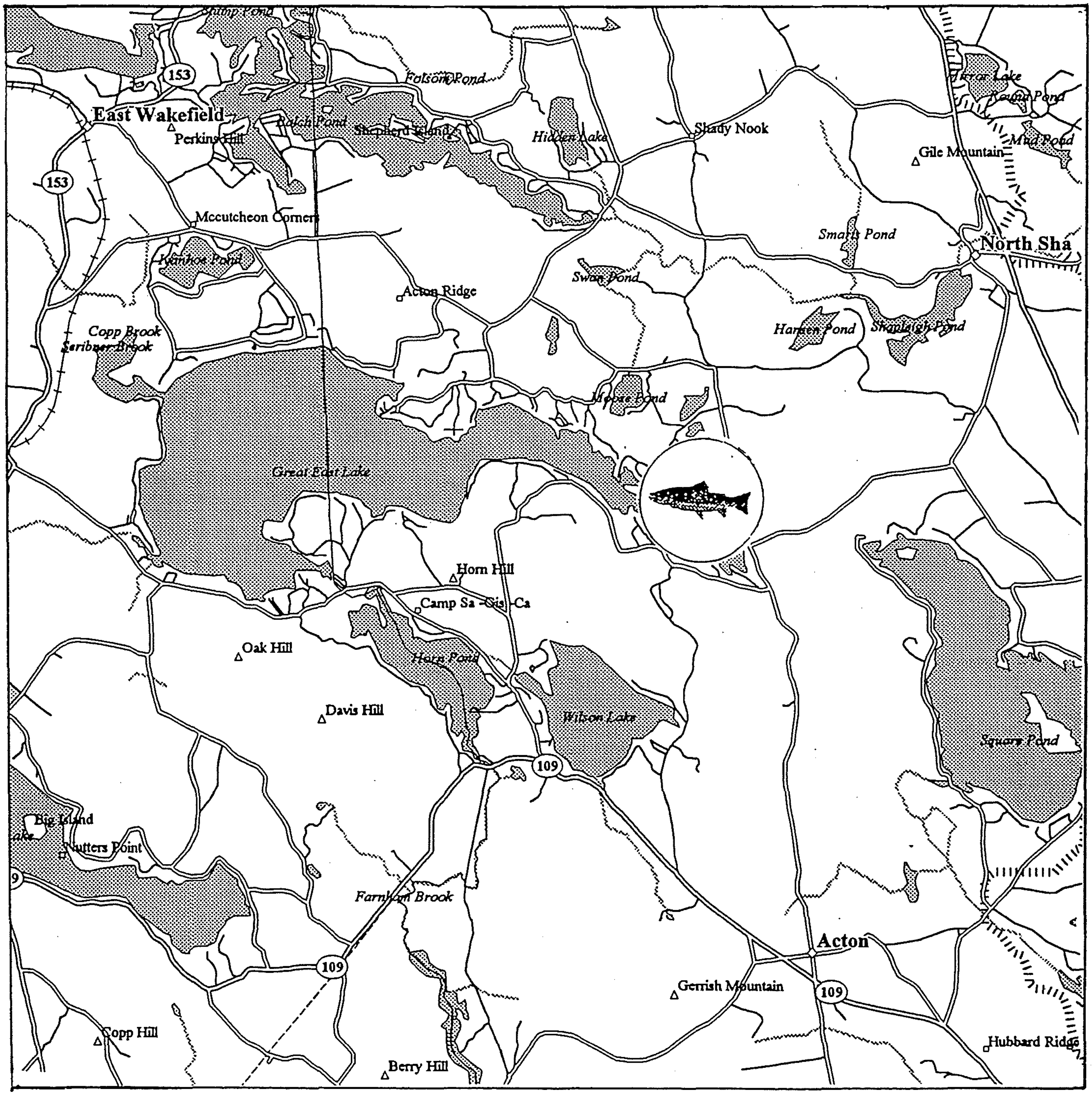
MDEP BL&WQ DEA

PWD PRESUMPSCOT RIVER AT WINDHAM

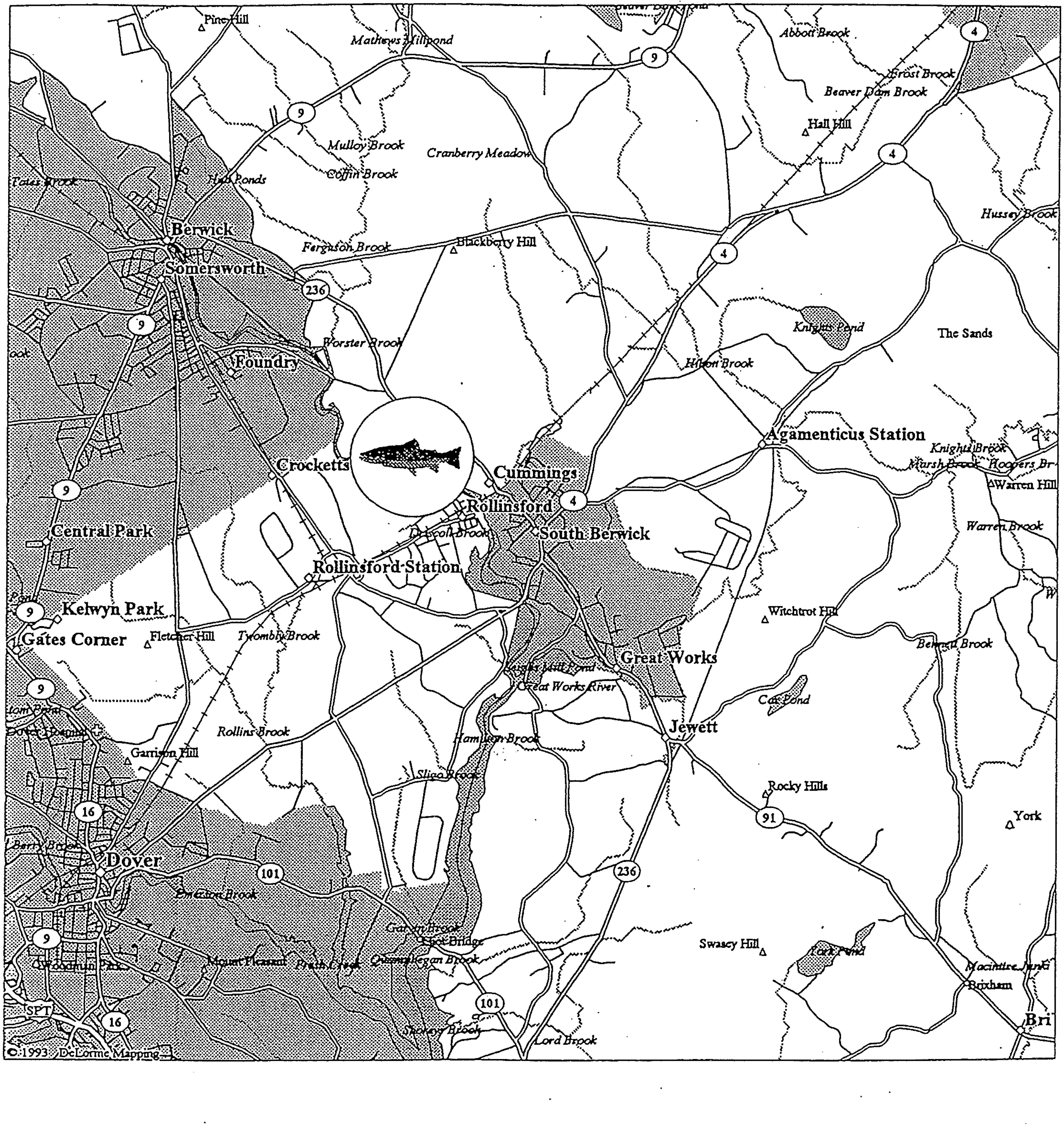


PWB PRESUMPSCOT RIVER AT WESTBROOK

SFA SALMON FALLS RIVER AT ACTON

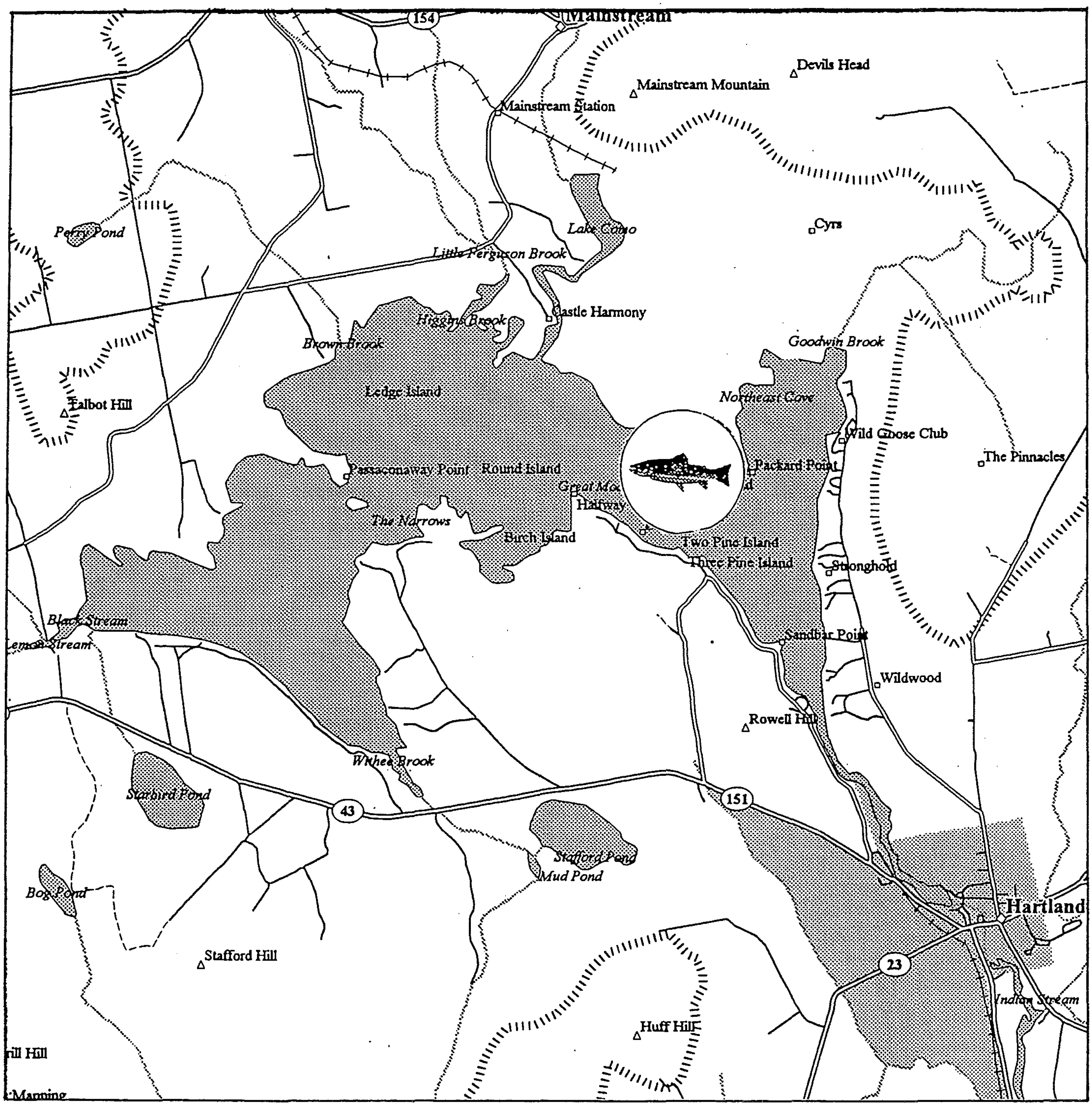


SFS SALMON FALLS RIVER AT SOUTH BERWICK



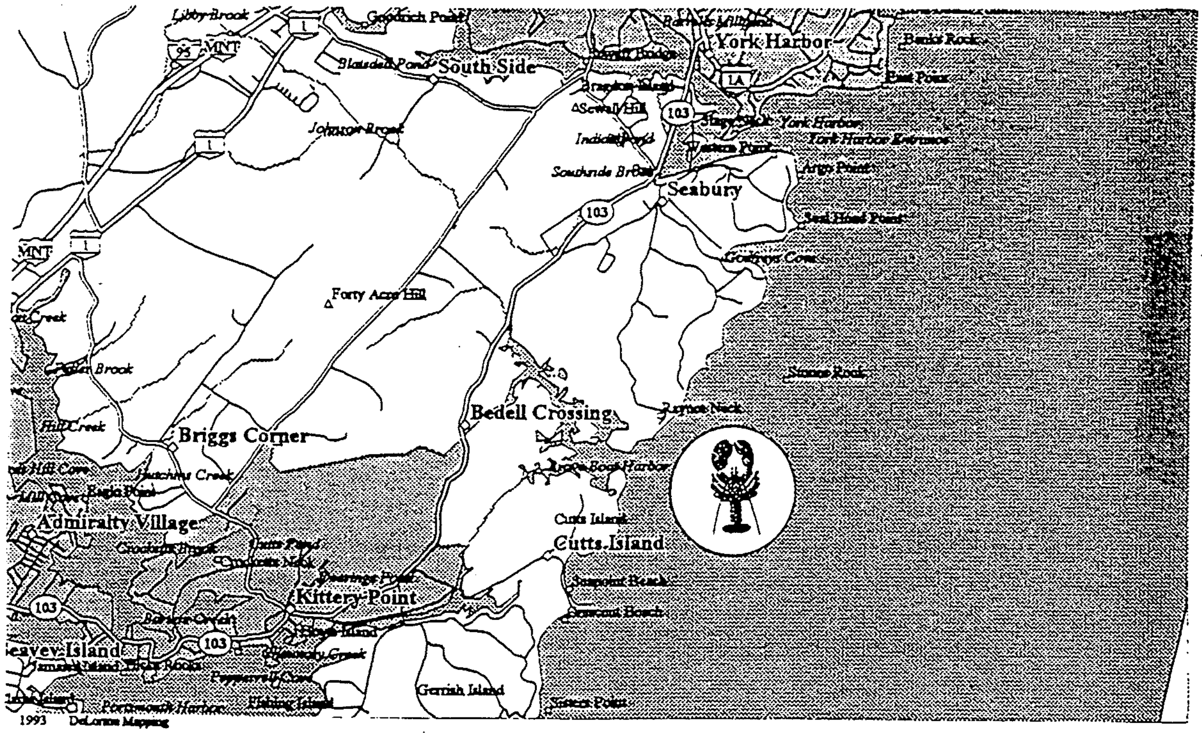
SEN E.BR.SEBASTICOOK RIVER AT NEWPORT

SWH W.BR.SEBASTICOOK RIVER AT HARTLAND

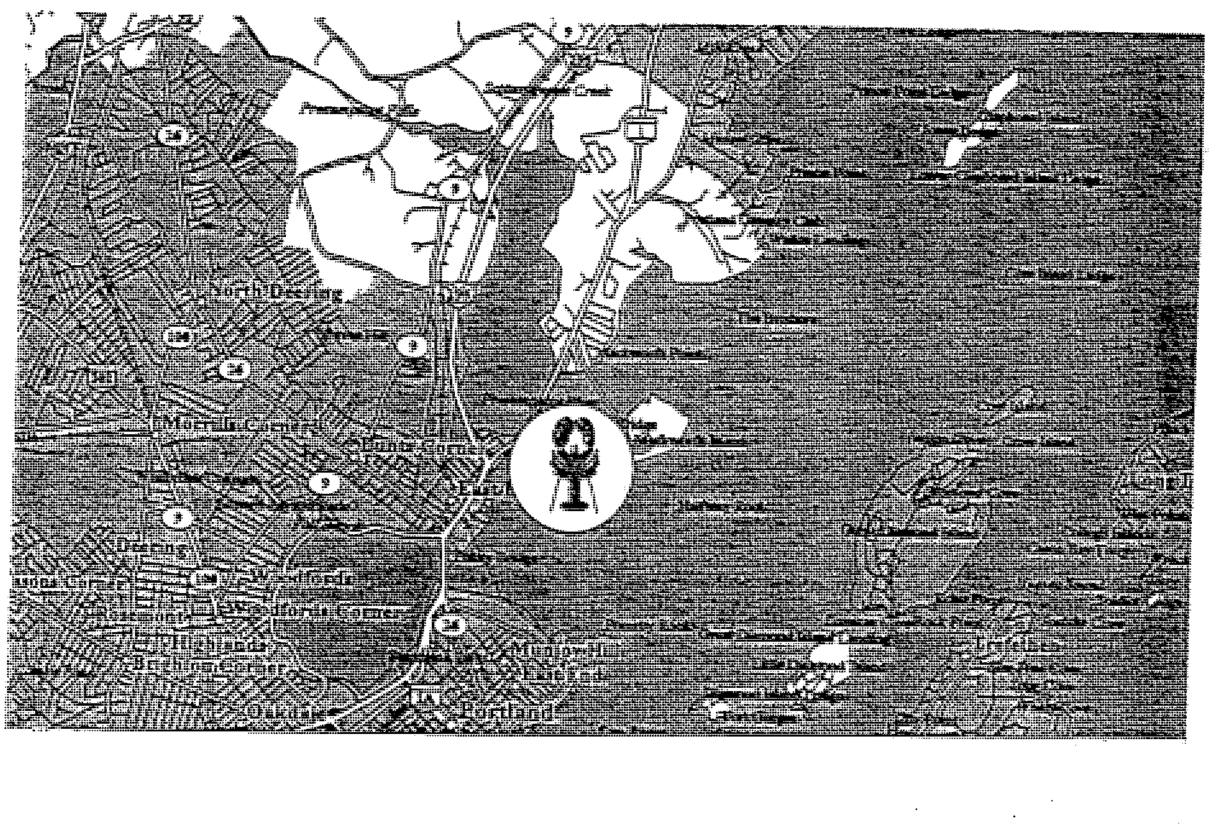


SWP W BR SEBASTICOOK RIVER AT PALMYRA

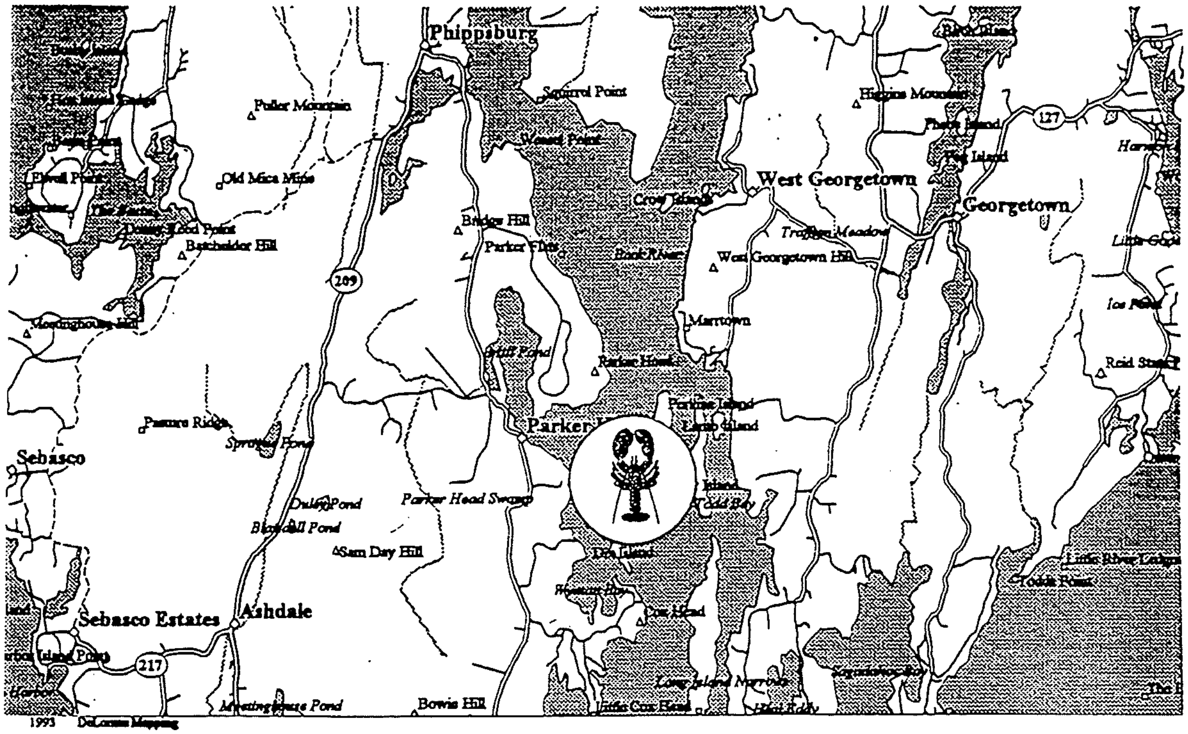
BBK BRAVE BOAT HARBOR
KITTERY - YORK



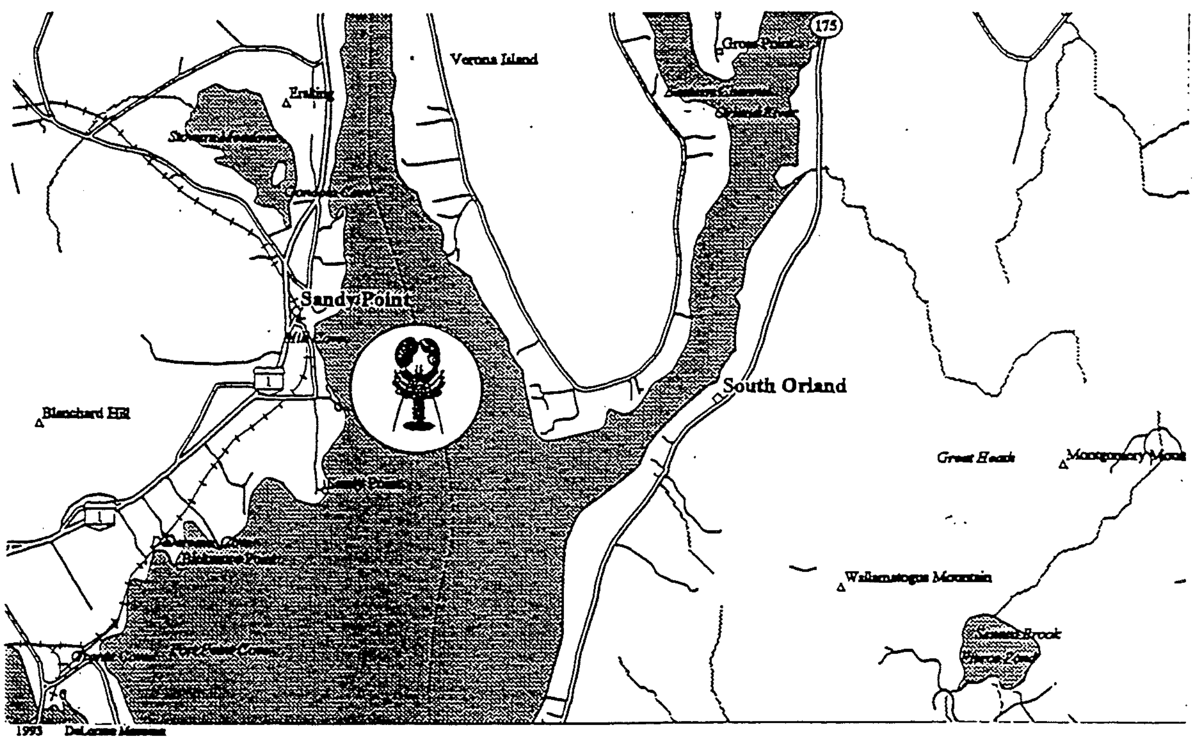
PRP OUTER PRESUMPSCOT ESTUARY
PORTLAND



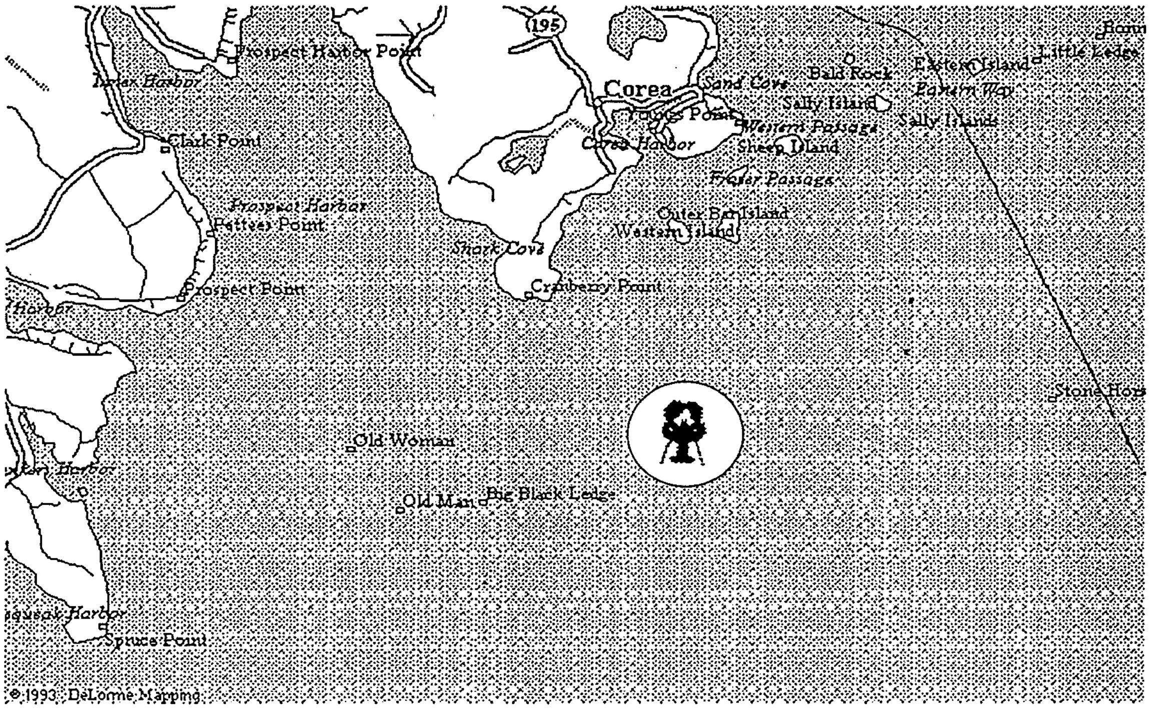
KRP LOWER KENNEBEC ESTUARY PHIPPSBURG - GEORGETOWN



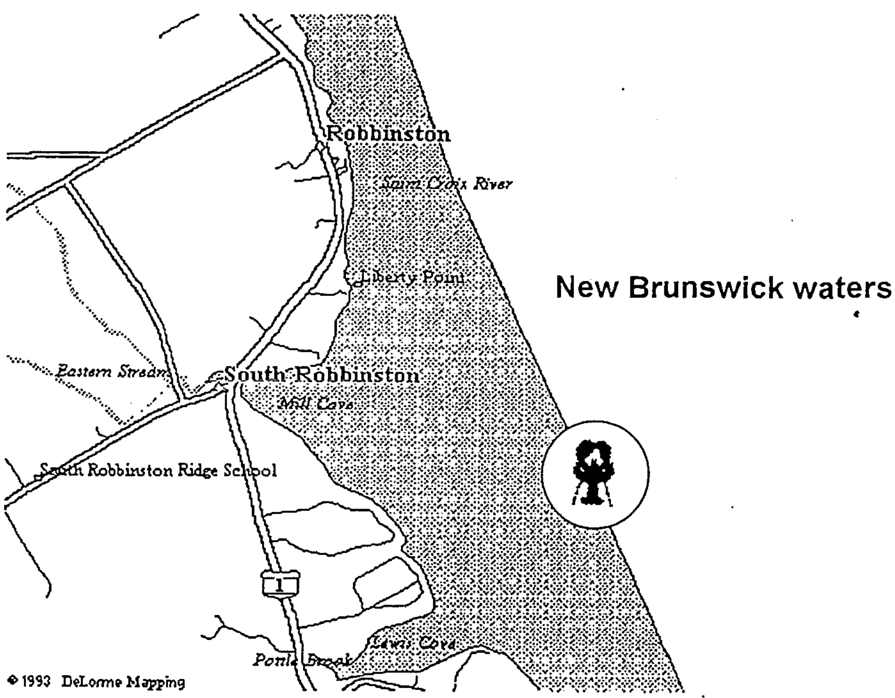
PBS UPPER PENOBSCOT ESTUARY VERONA



OFF CRANBERRY POINT
COREA (GOULDSBORO)



ST. CROIX RIVER
SOUTH ROBBINSTON



APPENDIX 7

LENGTHS AND WEIGHTS

IN 1996 FISH SAMPLES

Appendix 7. Lengths, Weights, and Composite ID in 1996 Fish Samples

field ID	date yymmdd	length mm	weight gm	composite ID
ANDROSCOGGIN LAKE				
ALW-BNT-01	7/25/96	358		1
ALW-BNT-02	7/25/96	437	830	1
ALW-SMB-01	7/22/96	447	1160	2
ALW-SMB-02	7/23/96	366	560	2
ALW-SMB-03	7/23/96	338	510	1
ALW-SMB-04	7/23/96	363	640	2
ALW-SMB-05	7/23/96	399	820	1
ALW-SMB-06	7/24/96	434	1280	1
ALW-SMB-07	7/24/96	457	1310	2
ALW-SMB-08	7/24/96	363	580	1
ALW-SMB-09	7/25/96	513	1620	1
ALW-SMB-10	7/25/96	338	410	2
ALW-WHS-01	7/24/96	437	870	1
ALW-WHS-02	7/24/96	455	940	1
ALW-WHS-03	7/24/96	437	1000	1
ALW-WHS-04	7/25/96	396	690	1
ALW-WHS-05	7/25/96	427	820	1
ALW-WHS-06	7/25/96	442	920	1
ANDROSCOGGIN RIVER				
Gilead				
AGL-RBT-01	6/7/96	300	270	1
AGL-RBT-02	6/7/96	241	130	2
AGL-RBT-03	7/2/96	290	250	2
AGL-RBT-04	7/2/96	257	160	1
AGL-RBT-05	7/2/96	353	440	1
AGL-RBT-06	7/2/96	284	280	2
AGL-RBT-07	9/9/96	274	220	1
AGL-RBT-08	9/9/96	269	200	2
AGL-BNT-01	6/11/96	335	430	1
AGL-BNT-02	6/11/96	328	380	1
AGL-BNT-03	7/2/96	292	270	1
AGL-BNT-04	9/9/96	251	150	1
AGL-WHS-01	5/31/96	434	775	2
AGL-WHS-02	5/31/96	455	1100	2
AGL-WHS-03	5/31/96	447	880	1
AGL-WHS-04	5/31/96	404	740	1
AGL-WHS-05	5/31/96	432	880	2
AGL-WHS-06	6/4/96	460	1040	1
AGL-WHS-07	6/4/96	373	540	2
AGL-WHS-11	6/7/96	470	1125	1
AGL-WHS-12	6/7/96	447	875	1
AGL-WHS-13	6/7/96	475	1030	2

Appendix 7. Lengths, Weights, and Composite ID in 1996 Fish Samples

field ID	date yymmdd	length mm	weight gm	composite ID
Rumford				
ARF-WHS-01	7/29/96	404	740	2
ARF-WHS-02	7/29/96	465	1020	2
ARF-WHS-03	7/30/96	462	910	1
ARF-WHS-04	7/30/96	445	1000	2
ARF-WHS-05	7/30/96	467	1050	1
ARF-WHS-06	7/30/96	437	860	1
ARF-WHS-07	7/30/96	457	1010	1
ARF-WHS-08	7/30/96	434	940	2
ARF-WHS-09	7/30/96	450	980	1
ARF-WHS-10	7/30/96	452	870	2
Jay				
AJY-SMB-01	7/8/96	358	700	2
AJY-SMB-02	7/8/96	422	1160	1
AJY-SMB-03	7/8/96	409	1150	1
AJY-SMB-04	7/8/96	277	330	4
AJY-SMB-05	7/8/96	282	340	4
AJY-SMB-06	7/8/96	282	280	5
AJY-SMB-07	7/8/96	361	530	3
AJY-SMB-08	7/8/96	411	880	2
AJY-SMB-09	7/8/96	318	380	3
AJY-SMB-10	7/8/96	282	280	5
Livermore Falls Otis				
ALV-WHS-01	8/2/96	409	770	1
ALV-WHS-02	8/2/96	381	650	2
ALV-WHS-03	8/2/96	368	700	3
ALV-WHS-04	8/2/96	323	370	4
ALV-WHS-05	8/2/96	335	420	5
ALV-WHS-06	8/5/96	320	370	6
ALV-WHS-07	8/5/96	264	230	7
ALV-WHS-08	8/6/96	264	240	8
ALV-WHS-09	8/6/96	381	660	9
ALV-WHS-10	8/6/96	353	530	10
ALV-WHS-11	8/6/96	302	340	11
ALV-WHS-12	8/6/96	257	200	12
ALV-WHS-13	8/6/96	249	180	13
ALV-WHS-14	8/6/96	262	190	14
ALV-WHS-15	8/6/96	376	570	15
ALV-WHS-16	8/7/96	274	240	16
ALV-WHS-17	8/7/96	399	760	17
ALV-WHS-18	8/7/96	310	390	18
ALV-WHS-19	8/7/96	325	400	19
ALV-WHS-20	8/7/96	272	230	20

field ID	date yymmdd	length mm	weight gm	composite ID
Livermore Falls below dam				
ALS-WHS-01	8/8/96	437	960	1
ALS-WHS-02	8/8/96	401	580	2
ALS-WHS-03	8/8/96	358	490	3
ALS-WHS-04	8/8/96	368	540	4
ALS-WHS-05	8/8/96	330	410	5
ALS-WHS-06	8/8/96	328	380	6
ALS-WHS-07	8/8/96	315	330	7
ALS-WHS-08	8/8/96	330	370	8
ALS-WHS-09	8/8/96	338	410	9
ALS-WHS-10	8/8/96	328	400	10
ALS-WHS-11	8/8/96	310	330	11
ALS-WHS-12	8/8/96	323	370	12
ALS-WHS-13	8/8/96	307	330	13
ALS-WHS-14	8/8/96	302	320	14
ALS-WHS-15	8/8/96	318	340	15
ALS-WHS-16	8/8/96	323	340	16
ALS-WHS-17	8/8/96	290	290	17
ALS-WHS-18	8/8/96	282	240	18
ALS-WHS-19	8/8/96	290	270	19
ALS-WHS-20	8/8/96	279	230	20
Auburn				
AGI-SMB-01	6/29/96	406	750	2
AGI-SMB-02	6/29/96	312	450	5
AGI-SMB-03	6/29/96	328	420	4
AGI-SMB-04	8/12/96	330	490	4
AGI-SMB-05	6/29/96	257	220	5
AGI-SMB-06	6/29/96	399	820	1
AGI-SMB-07	6/29/96	343	550	3
AGI-SMB-08	6/29/96	386	790	2
AGI-SMB-09	6/29/96	386	670	3
AGI-SMB-10	6/29/96	427	1190	1
Lisbon Falls				
ALS-WHS-05	8/9/96	401	670	2
ALS-WHS-06	8/9/96	381	630	2
ALS-WHS-07	8/9/96	411	740	1
ALS-WHS-09	8/9/96	414	650	1
ALS-WHS-10	8/9/96	391	630	1
ALS-WHS-11	8/9/96	432	770	2
ALS-WHS-12	8/9/96	432	860	1
ALS-WHS-13	8/9/96	381	660	2
ALS-WHS-14	8/9/96	394	670	1
ALS-WHS-15	8/9/96	378	620	2

Appendix 7. Lengths, Weights, and Composite ID in 1996 Fish Samples

field ID	date yymmdd	length mm	weight gm	composite ID
KENNEBEC RIVER				
Madison				
KMD-SMB-01	8/15/96	269	280	5
KMD-SMB-03	8/21/96	262	240	5
KMD-SMB-04	8/21/96	300	320	4
KMD-SMB-05	10/8/96	368	800	2
KMD-SMB-06	10/8/96	363	720	2
KMD-SMB-07	10/8/96	381	800	1
KMD-SMB-08	10/8/96	315	480	3
KMD-SMB-09	10/9/96	384	930	1
KMD-SMB-10	10/9/96	297	400	4
KMD-SMB-11	10/9/96	305	400	3
KMD-WHS-05	8/23/96	282	220	2
KMD-WHS-06	10/8/96	366	660	1
KMD-WHS-07	10/9/96	442	1100	2
KMD-WHS-08	10/9/96	439	1120	1
KMD-WHS-09	10/9/96	457	1230	2
KMD-WHS-10	10/9/96	457	1230	1
KMD-WHS-11	10/9/96	381	740	2
KMD-WHS-12	10/9/96	396	800	1
KMD-WHS-13	10/9/96	361	560	2
KMD-WHS-14	10/9/96	323	460	1
Fairfield				
KFF-WHS-01	10/17/96	432	1100	1
KFF-WHS-02	10/17/96	333	500	2
KFF-WHS-03	10/17/96	361	680	2
KFF-WHS-04	10/17/96	386	860	1
KFF-WHS-05	10/17/96	358	660	1
KFF-WHS-06	10/17/96	399	860	2
KFF-WHS-07	10/17/96	378	800	2
KFF-WHS-08	10/17/96	376	680	1
KFF-WHS-09	10/17/96	409	940	2
KFF-WHS-10	10/17/96	396	900	1
Sidney				
KSD-SMB-01	8/19/96	315	340	3
KSD-SMB-02	8/19/96	338	470	1
KSD-SMB-03	8/19/96	363	620	1
KSD-SMB-04	8/19/96	312	370	2
KSD-SMB-05	8/19/96	310	370	2
KSD-SMB-06	8/19/96	310	360	3
KSD-SMB-07	8/19/96	295	310	4
KSD-SMB-08	8/19/96	282	290	4
KSD-SMB-09	8/19/96	274	240	5
KSD-SMB-10	8/19/96	267	250	5

field ID	date yymmdd	length mm	weight gm	composite ID
Augusta				
KAG-WHS-01	8/23/96	432	850	2
KAG-WHS-02	8/23/96	353	480	DISCARD
KAG-WHS-03	8/23/96	470	1345	2
KAG-WHS-04	8/23/96	419	900	1
KAG-WHS-05	8/23/96	437	1120	1
KAG-WHS-06	8/23/96	404	840	2
KAG-WHS-07	8/23/96	432	1020	1
KAG-WHS-08	8/23/96	414	930	2
KAG-WHS-09	8/23/96	470	1350	1
KAG-WHS-10	8/23/96	401	840	1
KAG-WHS-11	8/23/96	452	1110	2
PENOBSCOT RIVER				
Grindstone				
PBG-SMB-01	8/19/96	351	495	3
PBG-SMB-02	8/19/96	334	425	4
PBG-SMB-04	8/19/96	365	605	2
PBG-SMB-05	8/20/96	406	925	1
PBG-SMB-06	8/20/96	320	380	5
PBG-SMB-07	8/20/96	316	395	5
PBG-SMB-08	8/20/96	330	430	4
PBG-SMB-09	8/20/96	340	520	3
PBG-SMB-10	8/20/96	389	760	1
PBG-SMB-11	8/20/96	350	520	2
PBG-WHS-01	8/19/96	451	920	2
PBG-WHS-02	8/19/96	438	840	1
PBG-WHS-03	8/19/96	443	930	1
PBG-WHS-04	8/20/96	476	1190	1
PBG-WHS-05	8/20/96	462	1190	2
PBG-WHS-06	8/20/96	419	840	2
PBG-WHS-07	8/20/96	454	1020	1
PBG-WHS-08	8/20/96	462	930	2
PBG-WHS-09	8/21/96	465	1030	2
PBG-WHS-10	8/21/96	470	1100	1
Lincoln				
PBL-SMB-01	8/21/96	406	830	3
PBL-SMB-03	8/21/96	382	680	5
PBL-SMB-04	8/21/96	349	520	5
PBL-SMB-05	8/21/96	470	1340	1
PBL-SMB-06	8/22/96	380	780	4
PBL-SMB-09	8/22/96	375	700	4
PBL-SMB-10	8/22/96	435	1180	1
PBL-SMB-11	8/27/96	445	1150	2
PBL-SMB-12	8/28/96	405	870	3
PBL-SMB-13	8/30/96	404	880	2

Appendix 7. Lengths, Weights, and Composite ID in 1996 Fish Samples

field ID	date yymmdd	length mm	weight gm	composite ID
PBL-WHS-01	8/22/96	460	1100	2
PBL-WHS-02	8/22/96	505	1440	1
PBL-WHS-03	8/22/96	452	1100	1
PBL-WHS-04	8/23/96	515	1420	2
PBL-WHS-05	8/27/96	495	1310	2
PBL-WHS-06	8/28/96	453	1210	1
PBL-WHS-08	8/29/96	434	910	2
PBL-WHS-09	8/30/96	486	1360	1
PBL-WHS-10	8/30/96	430	1040	2
PBL-WHS-11	8/30/96	425	1000	1
Veazie				
PBV-SMB-01	9/4/96	320	410	5
PBV-SMB-02	9/4/96	315	380	discard
PBV-SMB-03	9/4/96	327	430	3
PBV-SMB-04	9/4/96	349	550	2
PBV-SMB-05	9/5/96	372	620	1
PBV-SMB-06	9/5/96	323	410	5
PBV-SMB-07	9/5/96	314	420	4
PBV-SMB-08	9/5/96	346	475	3
PBV-SMB-09	9/5/96	331	430	4
PBV-SMB-10	9/5/96	343	630	1
PBV-SMB-11	9/10/96	370	600	2
PBV-WHS-01	9/6/96	337	480	2
PBV-WHS-02	9/6/96	334	470	1
PBV-WHS-03	9/6/96	353	560	2
PBV-WHS-04	9/6/96	390	770	2
PBV-WHS-05	9/10/96	316	390	discard
PBV-WHS-06	9/10/96	375	685	1
PBV-WHS-07	9/10/96	424	980	1
PBV-WHS-08	9/11/96	325	410	2
PBV-WHS-09	9/11/96	305	390	discard
PBV-WHS-10	9/11/96	344	520	1
PBV-WHS-11	9/11/96	360	610	2
PBV-WHS-12	9/11/96	378	560	1
PBB-EEL-01				1
PBB-EEL-02				2
PBB-EEL-03				1
PBB-EEL-04				2
PBB-EEL-05				1
PBB-EEL-06				2
PBB-EEL-07				1
PBB-EEL-08				2
PBB-EEL-09				1
PBB-EEL-10				2

Appendix 7. Lengths, Weights, and Composite ID in 1996 Fish Samples

field ID	date yymmdd	length mm	weight gm	composite ID
PRESUMPSCOT RIVER				
Windham				
PWD-SMB-01	6/21/96	323	410	5
PWD-SMB-02	6/21/96	351	550	4
PWD-SMB-03	6/21/96	358	550	3
PWD-SMB-04	6/21/96	351	500	4
PWD-SMB-05	6/21/96	292	310	5
PWD-SMB-06	6/24/96	417	1010	1
PWD-SMB-07	6/25/96	434	1015	1
PWD-SMB-08	6/25/96	381	590	3
PWD-SMB-09	6/25/96	386	680	2
PWD-SMB-10	6/25/96	376	670	2
Westbrook				
PWB-SMB-06	6/18/96	381	690	1
PWB-SMB-07	6/18/96	351	560	1
PWB-SMB-08	6/18/96	249	190	4
PWB-SMB-09	6/18/96	251	210	2
PWB-SMB-10	6/18/96	251	200	3
PWB-SMB-11	6/18/96	244	180	4
PWB-SMB-12	6/19/96	254	200	2
PWB-SMB-13	6/19/96	251	200	3
PWB-SMB-14	6/19/96	241	160	5
SALMON FALLS RIVER				
Acton				
SFA-WHS-01	9/19/96	521	1880	2
SFA-WHS-02	9/19/96	521	1950	2
SFA-WHS-03	9/20/96	508	2000	1
SFA-WHS-04	10/29/96	442	1300	1
S. Berwick				
SFS-WHS-01	9/16/96	422	840	1
SFS-WHS-02	9/17/96	457	980	2
SFS-WHS-03	9/19/96	495	1370	1
SFS-WHS-04	9/19/96	381	730	2
SFS-WHS-05	10/29/96	470	1240	2
SFS-WHS-06	10/29/96	419	1100	1
SFS-WHS-07	10/29/96	427	1050	1
SFS-WHS-08	10/29/96	401	900	1
SFS-WHS-09	10/29/96	429	1080	2
SFS-WHS-10	10/29/96	394	820	2

Appendix 7. Lengths, Weights, and Composite ID in 1996 Fish Samples

field ID	date yymmdd	length mm	weight gm	composite ID
E.BR. SEBASTICOOK RIVER				
Great Moose				
GMH-WHS-08	10/16/96	390	650	2
GMH-WHS-09	10/16/96	480	1150	1
GMH-WHS-10	10/16/96	470	1150	2
GMH-WHS-11	10/16/96	500	2100	1
GMH-WHS-12	10/16/96	455	950	2
GMH-WHS-20	10/16/96	480	1175	2
GMH-WHS-21	10/16/96	405	800	1
GMH-WHS-22	10/16/96	406	725	2
GMH-WHS-23	10/16/96	403	725	1
GMH-WHS-24	10/16/96	480	1100	1
Newport				
SEN-WHP-01	5/28/96	254	220	1
SEN-WHP-02	5/28/96	234	180	1
SEN-WHP-03	5/28/96	229	120	1
SEN-WHP-04	5/28/96	213	110	2
SEN-WHP-05	5/29/96	229	150	1
SEN-WHP-06	5/29/96	231	175	1
SEN-WHP-07	5/29/96	246	220	2
SEN-WHP-08	5/29/96	229	140	2
SEN-WHP-09	5/29/96	231	180	2
SEN-WHP-10	5/29/96	234	165	2
Palmyra				
SWP-WHS-01	9/5/96	422	1040	2
SWP-WHS-02	9/5/96	442	1080	2
SWP-WHS-03	9/5/96	439	1040	1
SWP-WHS-04	9/5/96	429	1100	1
SWP-WHS-05	9/5/96	439	1180	2
SWP-WHS-06	9/5/96	381	700	2
SWP-WHS-07	9/5/96	424	980	1
SWP-WHS-08	9/5/96	442	1210	1
SWP-WHS-09	9/5/96	478	1320	1
SWP-WHS-10	9/5/96	457	1300	2

APPENDIX 8

SAMPLING SCHEDULE FOR THE 1996 DIOXIN MONITORING PROGRAM

Sampling schedule for the 1996 Dioxin Monitoring Program

May (early stations)

Androscoggin R at Lisbon Falls for brown trout
Kennebec R above Madison for brown trout
Kennebec R at Augusta for brown trout
Kennebec R at Fairfield for brown trout
E Br Sebasticook R at County Rd, Newport for bass/wh perch
W Br Sebasticook R at Rt 2 Palmyra for bass

JULY-AUGUST (all rivers in order, beginning at upstream stations)

Androscoggin R - July
Kennebec R - July
Penobscot R - August
Presumpscot R - August
Salmon Falls R - August
Sebasticook R (East and West Branches) - August

SEPTEMBER (lobsters)

Kennebec R estuary
Machias R estuary
Penobscot R estuary
Presumpscot R estuary
Southern Maine estuary

APPENDIX 9

LABORATORY QA/QC DATA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
Office of Environmental Measurement and Evaluation
60 West view Street, Lexington, MA 02173-3185

MEMORANDUM

DATE: December 16, 1997

SUBJ: Review of Dioxin data sets from MRI and UMO-WRI

FROM: A.F.Beliveau, Quality Assurance Chemist
Quality Assurance Document Review Assistance Team

TO: Barry Mower
Maine DEP Dioxin Monitoring Program Project Manager

Over the past months, the EPA Region 1 OEME QA office has been involved in reviewing analytical method SOPs from the Water Research Institute(WRI),at the University of Maine, Orono. The analytical methods for congener specific Polychlorinated Biphenyls and Polychlorinated Dibenzo-p-dioxins/furans have been reviewed and comments have been generated and subsequently addressed by WRI. Recently we have received an updated set of SOPs that also include the preparation of samples and SW-846 Method 8082. During this same period of time the QA Office has been involved with discussions with MEDEP around the data quality aspects of various split sample fish analyses performed at WRI and at the MidWest Research Institute (MRI). These analyses were from fish collected in Maine waters for the analysis of Dioxins and for congener specific PCBs. The most recent set of data was reviewed by the QA Office and found to be quite comparable (in most cases less than 30% RPD) between these two laboratories. WRI did have some problems initially getting started, especially with there dioxin sample extraction procedures. Those start-up problems appear to have been resolved and we expect data produced by WRI to be of consistantly acceptable quality in the future. MEDEP should be aware that some samples will be problematic and there will always be the need to have a referee laboratory to confirm data anomalies that may occur occasionally. PE (Standard Reference Materials)samples should continue to be analyzed as part of the WRI QC program.

WRI has proven that they are doing a good job with the analysis of congener/homolog specific high resolution PCBs. They were able to correctly trouble shoot the PCB data generated by MRI. We feel confident that WRI will continue to perform well in both these analyses to your satisfaction. The OEME QA Office will continue to review WRI new methods or revisions of old methods and will keep you apprised of the results.

If you have any further questions please call me at (781)-860-4607.

SUMMARY OF QA/QC GOALS FOR DEP's DMP AND SWAT PROGRAMS

BY

WATER RESEARCH INSTITUTE
SAWYER ENVIRONMENTAL RESEARCH CENTER
UNIVERSITY OF MAINE
ORONO, MAINE

- Duplicate samples to be analyzed at a minimum of 10% of total number of samples
- Duplicate sample recoveries will be between 70-130% if > 1ppt, otherwise samples will be re-extracted. If still not within window, samples will be flagged.

- Method blanks will be analyzed at a minimum of 5% of total number of samples.
- Method blank result will be less than the MDL, less than 5% of the regulatory limit, or less than 5% of the sample result for the analyte, whichever is greatest.

- Method detection levels will be determined for each year's program

- Standard reference fish (SRF)will be analyzed at a frequency of 1 per 20
- SRF samples shall be within prescribed limits or samples will be reanalyzed.

- Spiked samples to be analyzed at a minimum of 10% of total number of samples
- Spiked sample recoveries will be between 70-130%

- Surrogates will be analyzed with each sample.
- Surrogate recoveries will be between 50-150% before data are reported.

WRI DETECTION LEVEL STUDY 1996

Compounds	Blender Blank	Grinder Blank	MDL #1	MDL #2	MDL #3	MDL #4	MDL #5	MDL #6	MDL #7	Mean	Std. Dev	%RSD	Detection Limit
2378-TCDD	<DL	<DL	0.291	0.365	0.315	0.290	0.345	0.358	0.361	0.3321	0.0329	9.34	0.10
2378-TCDF	<DL	<DL	0.281	0.291	0.351	0.361	0.328	0.270	0.320	0.3146	0.0350	11.1	0.11
12378-PeDD	<DL	<DL	1.290	1.614	1.380	1.495	1.610	1.585	1.451	1.489	0.124	8.3	0.39
12378-PeDF	<DL	<DL	1.610	1.320	1.551	1.480	1.395	1.510	1.691	1.508	0.125	8.3	0.39
23478-PeDF	<DL	<DL	1.373	1.339	1.310	1.691	1.280	1.676	1.549	1.459	0.176	12.1	0.55
123478-HxDD	<DL	<DL	1.451	1.420	1.632	1.491	1.302	1.396	1.669	1.485	0.144	9.7	0.45
123678-HxDD	<DL	<DL	1.281	1.430	1.654	1.420	1.338	1.398	1.691	1.457	0.153	10.5	0.48
123789-HxDD	<DL	<DL	1.338	1.421	1.620	1.551	1.375	1.290	1.635	1.461	0.139	9.56	0.44
123478-HxDF	<DL	<DL	1.345	1.434	1.665	1.295	1.391	1.610	1.624	1.481	0.149	10.1	0.47
123678-HxDF	<DL	<DL	1.358	1.524	1.673	1.683	1.397	1.285	1.425	1.478	0.154	10.5	0.48
123789-HxDF	<DL	<DL	1.444	1.395	1.430	1.498	1.575	1.623	1.298	1.467	0.150	10.2	0.47
234678-HxDF	<DL	<DL	1.410	1.620	1.280	1.541	1.395	1.610	1.275	1.447	0.145	10.0	0.46
1234678-HpDD	<DL	<DL	1.390	1.514	1.280	1.595	1.615	1.485	1.391	1.489	0.152	10.2	0.48
1234678-HpDF	<DL	<DL	1.375	1.439	1.291	1.610	1.580	1.676	1.239	1.458	0.168	11.5	0.53
1234789-HpDF	<DL	<DL	1.351	1.420	1.632	1.591	1.402	1.296	1.569	1.466	0.130	8.87	0.41
OCDD	<DL	<DL	3.300	2.855	3.210	3.655	2.975	2.380	3.515	3.127	0.432	13.8	1.35
OCDF	<DL	<DL	2.755	3.195	3.655	3.275	3.015	2.698	2.575	3.024	0.380	12.6	1.19

Standard Reference Material Results

Sample run 10/23/96

CIL certified contaminated natural reference fish
Lot# R543

Analyte	True value (ng/kg)	95% Confidence Range	Found value (ng/kg)	Minimum Calibration Standard (ng/ml)	Predicted Method Limit (ng/kg)
2378-TCDD	17	15.6-18.4	17.2	0.5	1.0
2378-TCDF	22	20.4-23.6	22.8	0.5	1.0
12378-PCDD	4.0	3.43-4.57	4.71*	10	5.0
12378-PCDF	4.9	4.34-5.46	4.38	10	5.0
23478-PCDF	14	12.7-15.3	12.7	10	5.0
123478-HxCDD	0.77	0.50-1.04	1.09*	10	5.0
123678-HxCDD	3.0	1.8-4.2	2.21	10	5.0
123789-HxCDD	0.79	0.53-1.05	0.67	10	5.0
123478-HxCDF	8.2	4.5-11.9	5.33	10	5.0
123678-HxCDF	2.7	1.5-3.9	3.48	10	5.0
123789-HxCDF	0.76	0.11-1.11	1.29*	10	5.0
234678-HxCDF	2.3	0.4-4.2	4.16	10	5.0
1234678-HpCDD	1.4	0.87-1.93	1.66	10	5.0
1234678-HpCDF	4.4	0.0-10.4	4.84	10	5.0
1234789-HpCDF	0.63	0.40-0.86	0.84	10	5.0
OCDD	7.2	3.5-10.9	8.91	20	10.0
OCDF	2.6	1.3-3.9	1.2*	20	10.0

*out of 95% range. The SRM concentrations are below the estimated method limit given by Method 1613.

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To Barry Mower	From Steve Kahl
Co.	Co.
Dept.	Phone #
Fax # 287-7191	Fax #

ALTA

PCDD & PCDF

EPA METHOD 8290

Soil.

Sample ID:	BK-I	Date Received:	11/23/96	QC Lot:	LC1210S
Lab ID:	3113-0013-SA	Date Extracted:	12/10/96	Units:	pg/g
Matrix:	Soil	Sample Amount:	10.12 g	TEQ:	0.73
% Solids:	90				

Compound	Conc.	D.L.	Ratio	S/N Ratio	Qualifier
2,3,7,8-TCDD	ND	0.60			
Total TCDD	ND	0.60			
1,2,3,7,8-PeCDD	ND	0.48			
Total PeCDD	ND	0.48			
1,2,3,4,7,8-HxCDD	ND	0.74			
1,2,3,6,7,8-HxCDD	1.3		1.07		A
1,2,3,7,8,9-HxCDD	1.2		1.16		A
Total HxCDD	4.3		1.37		
1,2,3,4,6,7,8-HpCDD	24		0.94		B
Total HpCDD	42		1.15		B
OCDD	160		0.90		B
2,3,7,8-TCDF	ND	0.39			
Total TCDF	ND	0.71			
1,2,3,7,8-PeCDF	ND	0.70			
2,3,4,7,8-PeCDF	ND	0.52			
Total PeCDF	2.6		1.44		
1,2,3,4,7,8-HxCDF	ND	0.43			
1,2,3,6,7,8-HxCDF	ND	0.41			
2,3,4,6,7,8-HxCDF	ND	0.59			
1,2,3,7,8,9-HxCDF	ND	0.56			
Total HxCDF	4.5		1.31		
1,2,3,4,6,7,8-HpCDF	5.9		1.07		
1,2,3,4,7,8,9-HpCDF	0.75		1.16		A
Total HpCDF	16		0.94		
OCDF	16		0.86		B

Analyst: [signature]

Reviewer: [signature]

ALTA

PRELIMINARY SUMMARY OF GATEWAY, NORTH DRAINAGE AND BACKGROUND SOIL DATA
YARMOUTH POLE YARD SITE

SAMPLE	DESCRIPTION	PENTA	TOTAL DIOXINS					TEQ
			TETRA CDD	PENTA CDD	HEXA CDD	HEPTA CDD	OCTA CDD	T[illegible]
UNITS:	mg/kg	mg/kg	ng/g	ng/g	ng/g	ng/g	ng/g	ng/[illegible]
NE-3A	NE DrainageSed., 5' Outside Fence	0.68J	0.0015	0.017	0.25	1.9	8.9	0.0[illegible]
NE-3B	NE Drainage Sed., 200' Inside Fence	1.2J	0.29	2.6	37	200	670	[illegible]5
SSGN-1	Sand Outside Northern Gate	<0.9 (ND)	0.0045	0.038	0.24	1.5	6.1	0.033
SSGS-1	Sand Outside Southern Gate	<0.9 (ND)	<0.00054 (ND)	0.012	0.1	0.65	2.6	0.015
BK-A	Near MC Railroad & Residential Area	NA	<0.0009 (ND)	<0.0009 (ND)	0.0094	0.08	0.29	0.0013
BK-B	Residential Area & Transfer Station	NA	0.0038	0.007	0.019	0.09	0.35	0.0039
BK-C	Residential Area near Former Ash Disp.	NA	0.0036	0.0057	0.03	0.24	1.1	0.0059
BK-D	Field Parkland	NA	<0.00037 (ND)	<0.00053 (ND)	0.012	0.11	4	0.005
BK-E	Route 1 & I-95 Interchange	NA	0.0014	0.0033	0.02	0.094	0.54	0.0039
BK-F	Town Boat Landing on Royal River	NA	<0.00028 (ND)	0.0019	0.021	0.14	0.59	0.0031
BK-G	Near Utility Pole on Town Hall Lawn	1100	1.1	17	290	3900	4300	57
BK-H	Wooded Land Near Pole Yard	NA	0.0016	0.0048	0.026	0.17	0.72	0.0049
BK-I	Gravel Road Shoulder on Sligo Road	NA	<0.0006 (ND)	<0.00048 (ND)	0.0043	0.042	0.16	0.00073

NOTES: 1. See Figures 1 and 2 for location of samples.
2. NA = Not Analyzed; J = Value estimated, OCDD internal standard was masked by OCDD in sample; ND = Below Detection Limit Listed
3. CDD = Chlorinated dibenzo-p-dioxin. Total value is summation of isomers.
4. Penta = Pentachlorophenol.
5. TEQ = Toxic Equivalence value in relation to ng/g (ppb) of 2,3,7,8 TetraCDD.

UNIVERSITY OF MAINE

Water Research Institute

5764 Sawyer Research Center
Orono, Maine 04469 5764
Tel: 207/581-3244
Fax. 207/581-3290

Sample ID: BK-I

Date Extracted: 12/9/96 Date Analyzed: 1/9/97

Compound Name	Concentration (ng/g)*	D.L.	TEQ
2,3,7,8 - TCDD	ND	0.00050	<0.0005(ND)
Total TCDD	0.00517	-	-
1,2,3,7,8 - PeCDD	ND	0.00255	<0.0010(ND)
Total PeCDD	0.00132	-	-
1,2,3,6,7,8 - HxCDD	ND	0.00255	<0.0002(ND)
1,2,3,4,7,8 - HxCDD	0.0015	0.00148	0.00015
1,2,3,7,8,9 - HxCDD	0.0016	0.00136	0.00016
Total HxCDD	masked	0.00299	-
1,2,3,4,6,7,8 - HpCDD	0.0129	0.00121	0.000 129
Total HpCDD	0.0195	-	-
1,2,3,4,6,7,8,9 - OCDD	0.145	0.00617	0.000145
2,3,7,8 - TCDF	ND	0.00050	<0.00005(ND)
Total TCDF	0.00150	0.00050	-
1,2,3,7,8 - PeCDF	ND	0.00186	<0.0001(ND)
2,3,4,7,8 - PeCDF	ND	0.00177	<0.0005(ND)
Total PeCDF	0.0132	0.00182	-
1,2,3,6,7,8 - HxCDF	ND	0.00433	<0.0004(ND)
1,2,3,7,8,9 - HxCDF	ND	0.00476	<0.0004(ND)
1,2,3,4,7,8 - HxCDF	ND	0.00147	<0.0001(ND)
2,3,4,6,7,8 - HxCDF	ND	0.00420	<0.0004(ND)
Total HxCDF	masked	0.00347	-
1,2,3,4,6,7,8 - HpCDF	0.00944	0.00160	0.0000944
1,2,3,4,7,8,9 - HpCDF	ND	0.00130	<0.0001(ND)
Total HpCDF	0.0129	0.00146	-
1,2,3,4,6,7,8,9 - OCDF	0.0195	0.00710	0.0000195
Total TEQ			0.000698

ND = below the reported detection limit.

Total concentration values are the summation of the combined areas of all isomers within the quantitation window.

Concentrations for soil and sediment samples are calculated on a dry weight basis; fish and tissue samples on a wet weight basis. Concentrations are reported on a ng/g (ppb) basis. TEQs are calculated for the detected 2,3,7,8-isomers using NATO/CCMS equivalency factors (1989).

Analysis Method: EPA Method 1613: Tetra- Through Octa- Chlorinated Dioxins and Furans by Isotope Dilution HRGC/HRMS. EPA 821-B-94-005, October 1994, Rev. B.

APPENDIX 10

TOXIC EQUIVALENCY FACTORS FOR PCDDS AND PCDFS

TOXIC EQUIVALENCY FACTORS FOR PCDDS AND PCDFS (Van den Berg et al, 1998)

congener	TEF
2378TCDF	0.1
12378PeCDF	0.05
23478PeCDF	0.5
123478HxCDF	0.1
123678HxCDF	0.1
234678HxCDF	0.1
123789HxCDF	0.1
1234678HpCDF	0.01
1234789HpCDF	0.01
2378OCDF	0.0001
2378TCDD	1
12378 PeCDD	1
123478HxCDD	0.1
123678HxCDD	0.1
123789HxCDD	0.1
1234678HpCDD	0.01
2378OCDD	0.0001