letter.hw.336006.2001-05-11.Fish.Study.2001-05-10-2001-04.pdf

ARCADIS GERAGHTY & MILLER

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Michael Mason, P.E.
New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Construction Services
50 Wolf Road
Albany, New York 12233-7010

ENVIRONMENTAL

Subject:
New York State Department of Environmental Conservation-Fish Study Response
Harriman Inactive Waste Disposal Site, #336006
ARCADIS Geraghty & Miller Project No. NJ000389.0009

MAHWAH
11 May 2001

Dear Mr. Mason:

Contact:
Tom C. Eng

ARCADIS Geraghty & Miller, Inc., on behalf of the Maybrook and Harriman Environmental Trust (Trust), is providing this response to the NYSDEC Fish Study that will be performed in the Ramapo River.

Extension:
110

The Trust has committed to performing an Erosion Evaluation under the site remediation program, per the Record of Decision (ROD), to determine if mercury is impacting the west branch of the Ramapo River. The Erosion Evaluation (a minimum of two rounds) is currently being performed and the results will be used to determine if any measures are necessary to mitigate mercury migration into the river. The first round, performed in September 2000, indicated that while mercury was detected in groundwater, the river was in a losing stage and therefore, groundwater was not flowing into the river. The second round was performed in April 2001 and the results will be available shortly.

Nepera has committed to an extensive five-year monitoring program under the SPDES permit program. This program requires monitoring of an exhaustive list of parameters including mercury on a bi-weekly basis. Quarterly mercury reports will be submitted to the NYSDEC. The SPDES permit also requires an effluent toxicity study on vertebrates and invertebrates that will be performed this year. The results of this study will be available in early 2002. As a voluntary action, Nepera is also installing an ion exchange treatment system on Outfall 002C, as part of the pollutant minimization program. The performance of this system will be monitored by Nepera to determine system effectiveness.

So, after very careful evaluation and consideration, the Trust and Nepera has decided not to participate in the NYSDEC Fish Study. However, having had the opportunity to review the draft NYSDEC Fish Study work plan, the Trust would like to offer the following observations in the spirit of cooperation:

1. In general, the work plan does not contain sufficient detail to fully evaluate the appropriateness of the experimental design, methodology, and usability of the collected data. For example, there is no information presented on how the fish will

be collected. There is no information presented on specific sampling locations, except for a general description of each segment. Will the samples be collected from the same location or throughout the entire segment. Will the ecological samples (whole-body fish samples) be collected from areas of significant habitat? What piscivorous wildlife are being evaluated? The target size class and species will vary between mammalian and avian receptors. Will the human health samples be collected near potential fishing locations? Is public access restricted or do fishers primarily use boats? How will the data be used in a risk assessment?

2. It is not clear if several types of important information will be collected during this effort. A copy of the field data collection forms should be included in the work plan. Lengths, widths, and mass should be measured for all captured fish. A visual description of each fish should be made to evaluate the occurrence of DELT anomalies (deformities, eroded fins, lesions, and tumors). Water quality data should be collected at each location (e.g., dissolved oxygen, conductivity, pH, temperature, turbidity). A description of habitat quality and the characteristics of the water body and shoreline should be made at each location (e.g., depth, width, current velocity, substrate type, riparian zone, physical habitat characteristics, riparian zone). Also, presence of additional inputs (point or non-point sources) should be recorded.

3. A preferred species list should be included in the work plan, including target and backup species. What ecological niche will be sampled (e.g., bottom feeders/scavengers, predators, forage)? What trophic level will be sampled (e.g., tropic level III or IV)?

4. No details are presented to assess the appropriateness of the quality assurance measures. Will any duplicates be measured? How will the duplicates be prepared? Will the sampling gear be decontaminated between locations? Will the laboratory report the results of a matrix spike/matrix spike duplicate sample (MS/MSD)? Will a temperature blank be included with the samples? Should dry ice be used to ship the samples to the laboratory?

5. Lipid content and percent solids should be measured for each sample.

6. To assess the bioavailability of mercury, surface water samples should be collected for total and dissolved mercury. The "ultra-clean" sampling method should be used to collect water samples (USEPA Method 1669).

7. Reservoirs, lakes and flooded impoundments (e.g., wetlands) could be an important source of mercury to the Ramapo River. Bacterial processes in these areas, even with low mercury concentrations, may result in a high fraction of "bioavailable mercury. For example: Additional sample collection should be considered in Sapphire Lake or the wetlands near Segments C and D.

8. Wastewater treatment plants are significant sources of mercury to the environment. Are there plans to collect/compile data from the treatment plant effluent?

9. Depending on the data quality objectives (DQOs) for this study, caged fish studies may be a better experimental design. Reducing the movement of fish can remove a significant source of uncertainty in this type of study.

10. Segments G and H are well removed from the Nepera facility. How will these results help NYSDEC identify other potential sources?

11. There is no information provided on adjacent land use. Without an evaluation of other point and non-point sources, it is not possible to determine the appropriateness of the selected reference area. Also, physical habitat characteristics should be considered when selecting a reference area.

Based on the response to these comments, the Trust may have additional comments regarding the appropriateness of NYSDEC's experimental design and the usability of the data. If you should have any questions or comments, please contact Tom Eng.

Sincerely,

ARCADIS Geraghty & Miller, Inc.

Tom C. Eng
Project Manager

GM Consulting Engineers, P.C.

Frank Lenzo, P.E.
Vice President

copies:

E. Pfeiffer
S. Levine
G. Hollerbach

New York State Department of Environmental Conservation

FACT SHEET

RAMAPO RIVER FISH SAMPLING
JUNE/JULY 2001

In June/July 2001, the NYSDEC conducted a fish sampling investigation in the Ramapo River near Harriman, New York.

What was the purpose of the investigation? The purpose of the fish investigation was to determine mercury levels in fish in the Ramapo River and evaluate the results in relation to potential sources of mercury in the river. These potential sources include the Orange County Sewer District (OCSD) outfalls 001 and 002, and the Nepera Chemical Plant.

Why is NYSDEC studying mercury in fish? Mercury from the environment can accumulate in fish and can cause health problems is people and wildlife that eat fish.

Where were the samples taken? Samples were taken from nine locations in the Ramapo River. Two locations were upstream of the dam that forms the pond in Harriman Park. The dam acts as a barrier to fish such that fish from below that dam do not go upstream of the dam. This means that any mercury found in fish upstream of the dam could not come from the potential sources noted above. Fish were also taken adjacent to the Nepera Plant and at six other locations downstream of the plant. The furthest location was in Sloatsburg, 12 miles downstream of the Route 17 bridge.

What species of fish were caught? Ninety samples of thirteen different species were taken. The most numerous species was White Sucker which made up 61% of the samples. The next two most numerous species were Yellow Bullhead (10%) and Smallmouth Bass (8%).

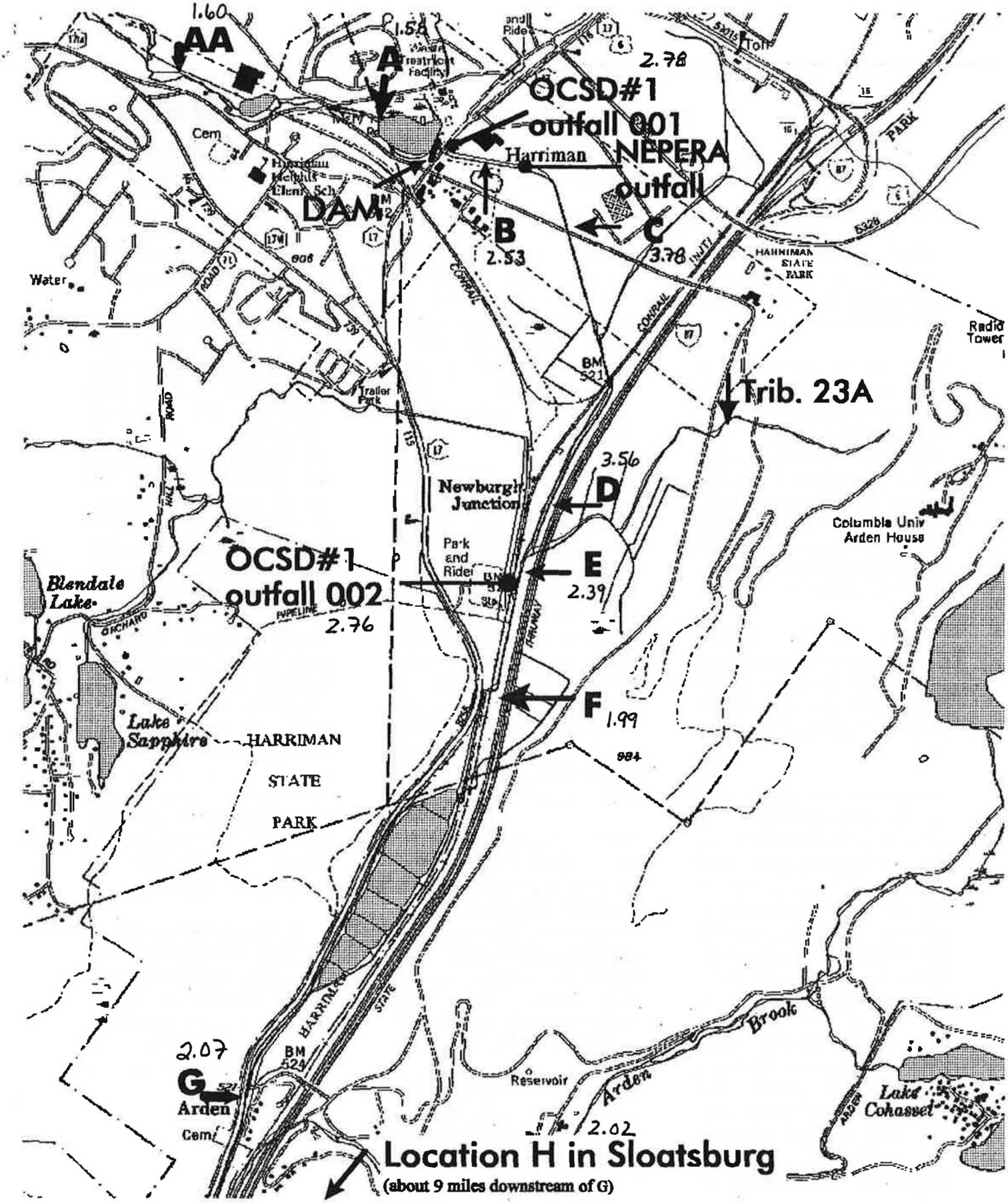
What were the results of the chemical analysis? The average concentration of mercury in the 90 samples was 183 ng/g. The samples upstream of the dam averaged 109 ng/g. The samples from the seven downstream locations averaged 196 ng/g. There was a significant difference between the upstream and downstream samples. The most notable difference was the higher levels found in the samples from the Sloatsburg sampling location which averaged 412 ng/g.

Are the fish safe to eat? None of the samples had mercury above the concentration that the New York State Department of Health uses to issue fish consumption advisories (1000 ng/g). The highest concentration was 609 ng/g. Based on this, SPACE HERE FOR THE DOH TO PUT IN ITS TWO CENTS.

Is there an ecological risk? Fish concentrations above 100 ng/g can cause reproductive problems in fish-eating birds and wildlife. Seventy percent of the samples exceeded this level of concern indicating a potential risk to birds and wildlife using the river.

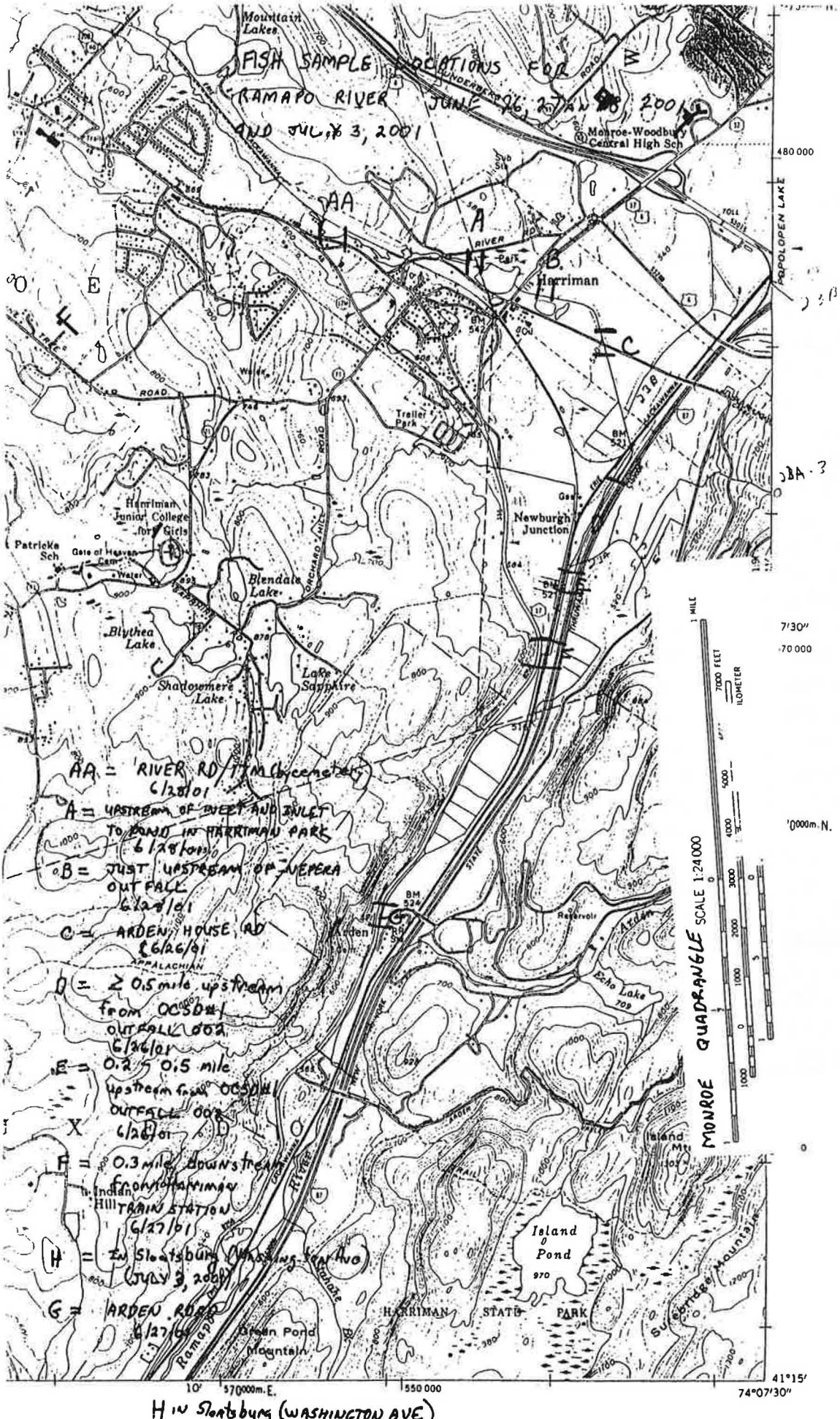
Did the investigation show that the potential sources were affecting mercury concentrations in fish? Analysis of the results shows an increase in mercury concentrations at locations near the potential sources relative to the upstream samples. The average mercury concentration at three of the five locations near the outfalls was significantly different than the upstream average. Analysis of surface water samples shows higher mercury concentrations near the outfalls than at the upstream locations. Currently, there is not enough information to tell whether the higher concentrations at the Sloatsburg location are related to the OCSD or the Nepera Chemical plant or some other environmental factor. Variations in the types of fish caught at each location can also effect the interpretation of the results.

Public Meeting: On June 24th, the NYSDEC and NYSDOH will give a presentation on the results of the investigation at the quarterly meeting of the CAC - what's the group called??. For additional information on this study, contact ???



Fish Sample Locations for Ramapo River

Figure 1. June 26-28 and July 3, 2001



H in Sloatsburg (WASHINGTON AVE)

Nepera Inc., SPDES Permit No. NY0006670

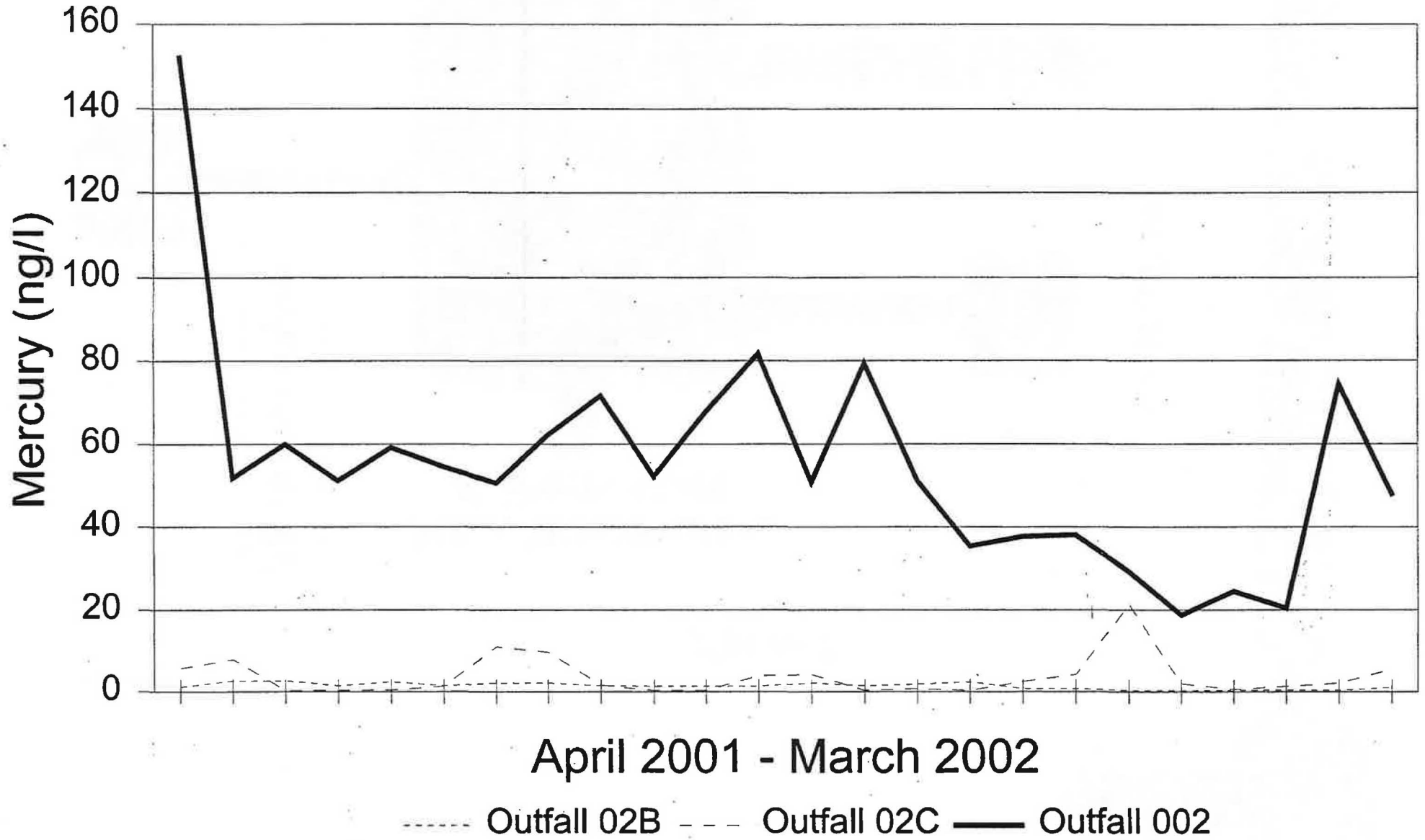
Summary of SPDES Permit Mercury Monitoring Data

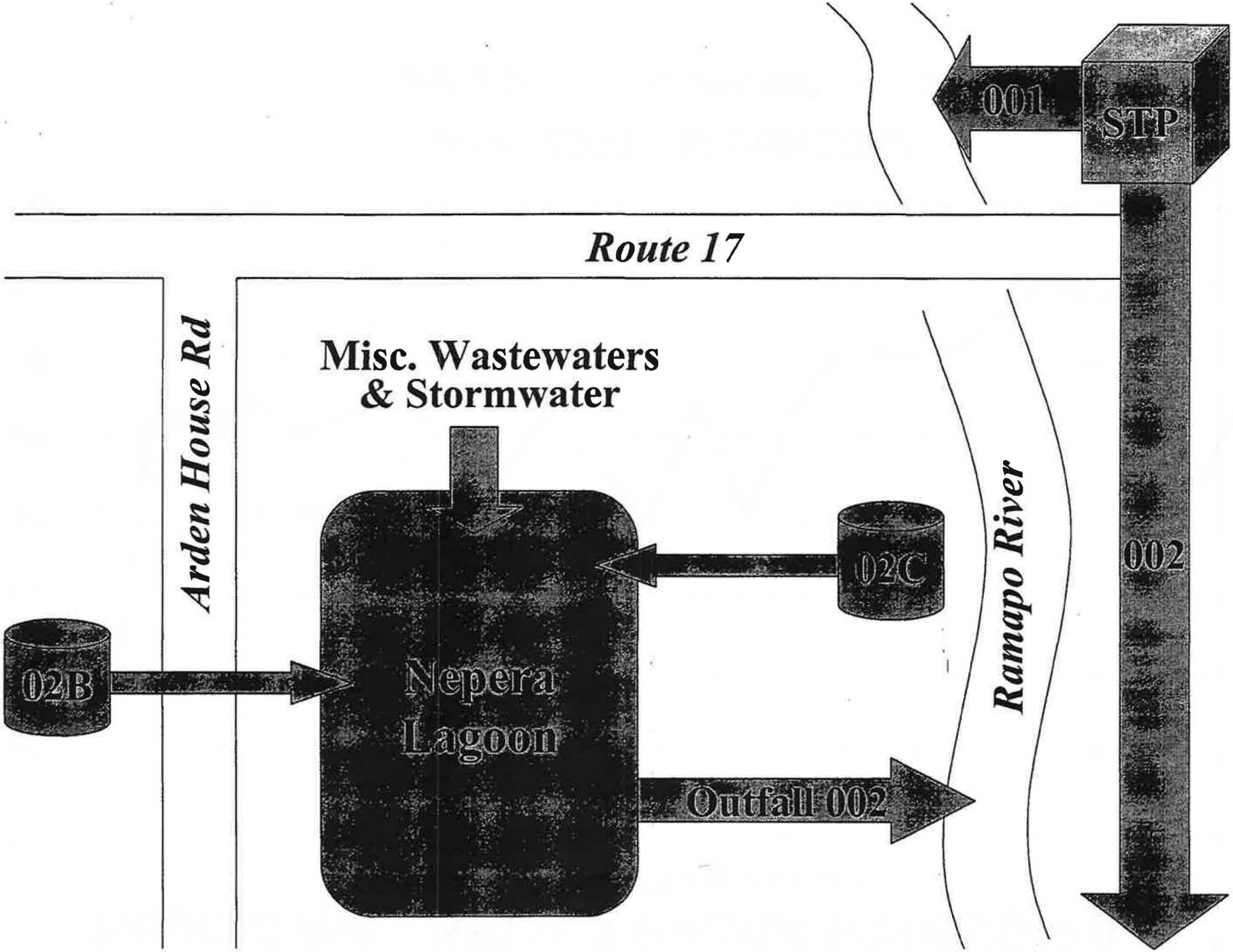
Sample results are for "Total" Mercury and are reported in nanograms/liter (ng/l). All samples collected by Nepera.
Analytical method detection limits (MDLs) are 0.2 ng/l for EPA Method 1631 and 200 ng/l for EPA Method 245.
Analytical practical quantitation limits (PQLs) are 0.5 ng/l for EPA Method 1631 and 800 ng/l for EPA Method 245.

	Outfall 02B		Outfall 02C		Outfall 002	
Date	EPA Method 1631	EPA Method 245	EPA Method 1631	EPA Method 245	EPA Method 1631	EPA Method 245
04/12/01	1.1	< 200	5.6	< 200	152	200
04/26/01	2.61	< 200	7.81	< 200	51.8	200
05/10/01	2.6	300	< 0.2	< 200	59.9	300
05/24/01	1.37	< 200	< 0.2	< 200	51.2	200
06/07/01	2.35	< 200	0.329	< 200	59.1	< 200
06/21/01	1.45	< 200	1.23	< 200	54.5	< 200
07/05/01	2.05	< 200	10.9	< 200	50.7	< 200
07/19/01	2.04	< 200	9.71	< 200	62.1	< 200
08/03/01	1.36	< 200	1.49	< 200	71.7	< 200
08/16/01	1.33	< 200	< 0.2	< 200	52.2	200
09/06/01	1.25	< 200	0.306	< 200	67.8	< 200
09/20/01	1.23	< 200	3.89	< 200	81.7	< 200
10/04/01	2.07	< 200	4.18	< 200	50.8	< 200
10/18/01	1.4	< 200	< 0.2	< 200	79.3	< 200
11/01/01	1.76	< 200	0.611	< 200	51.2	< 200
11/15/01	2.34	< 200	< 0.2	< 200	35.4	< 200
12/06/01	0.785	200	2.39	< 200	37.7	< 200
12/20/01	0.836	< 200	4.1	< 200	38.1	< 200
01/10/02	0.22	< 200	21.2	< 200	29.2	< 200
01/24/02	no discharge		1.98	< 200	18.6	< 200
02/07/02	0.272	< 200	0.574	< 200	24.5	< 200
02/21/02	0.414	< 200	1.34	< 200	20.3	< 200
03/07/02	< 0.2	< 200	2.12	< 200	74.3	< 200
03/21/02	0.976	< 200	5.45	< 200	48	< 200
minimum	< 0.2	< 200	< 0.2	< 200	18.6	< 200
average	1.39	204	3.59	< 200	55.1	204
maximum	2.61	300	21.2	< 200	152	300

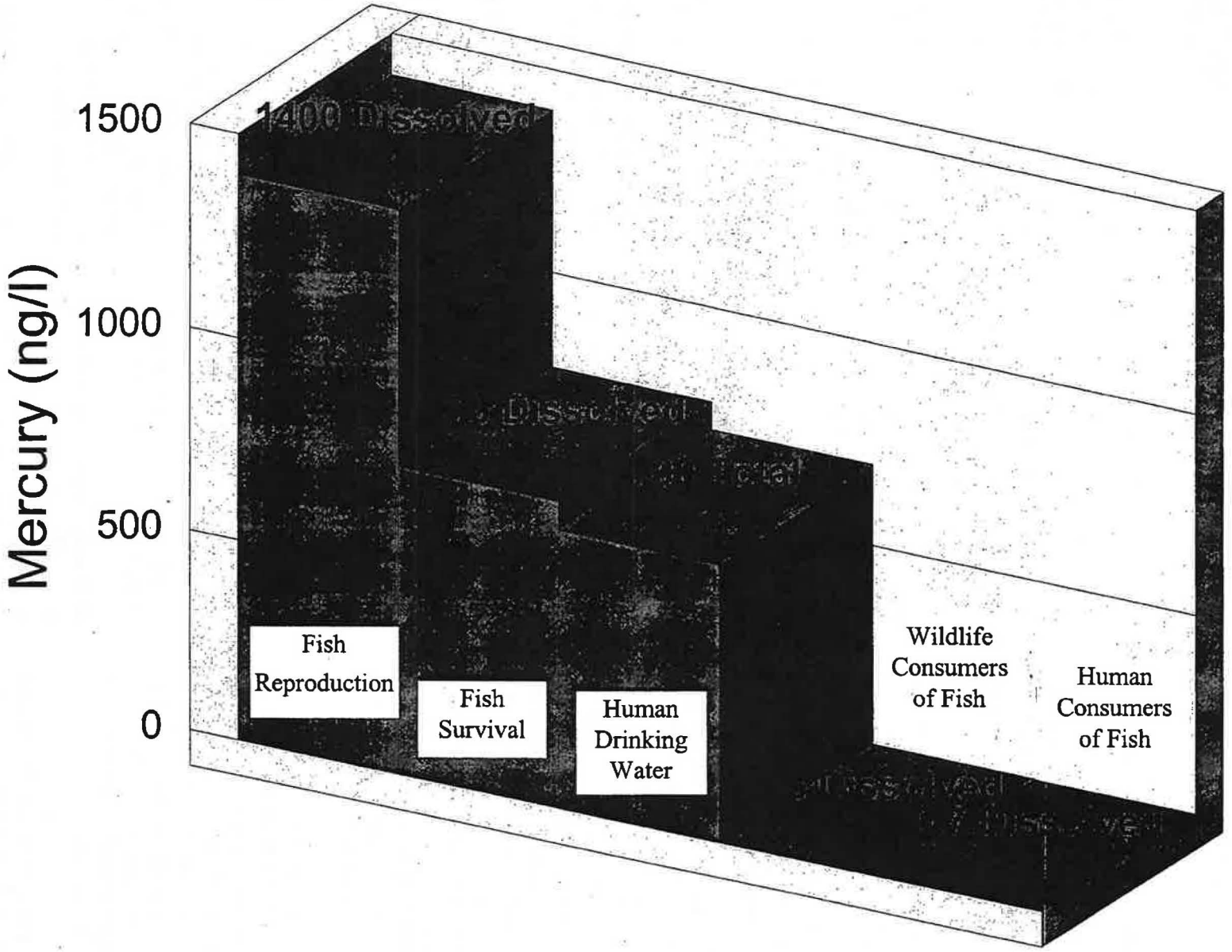
Nepera Inc - SPDES Permit NY0006670

Outfall Mercury Data (EPA Method 1631)




001
STP
Route 17
Arden House Rd
Misc. Wastewaters
& Stormwater
02C
002
Ramapo River
02B
Nepera
Lagoon
Outfall 002

Mercury Water Quality Standards



New York State Department of Environmental Conservation

FACT SHEET

NEPERA INC - SPDES PERMIT NY0006670 & MERCURY ISSUES

In April 2001, the NYSDEC modified Nepera's SPDES permit to control the amount of mercury which the company can discharge into the Ramapo River. In April 2002 the SPDES permit was again modified to provide further controls.

What is a SPDES permit? SPDES is an acronym for the State Pollutant Discharge Elimination System. A SPDES permit is a legal document issued by the NYSDEC which regulates Nepera's *wastewater* and *stormwater* discharges.

What does Nepera discharge? Nepera is authorized to discharge: groundwater from two remedial pump-and-treat systems known as *Outfalls 02B & 02C*, stormwater runoff, cooling tower and boiler blowdown, water intake backwash, steam condensate, and non-contact cooling water. All of these are combined in an on-site lagoon which then discharges to the river via *Outfall 002*. Each outfall has its own monitoring requirements and discharge limitations.

Why was mercury added to Nepera's SPDES permit in 2001? The past disposal of mercury at the site has caused some contamination to leave the site through Nepera's SPDES permit outfalls. The Department determined that these discharges should be controlled to protect the Ramapo River.

How much mercury is Nepera discharging? Average Outfall 002 discharge is 55 nanograms per liter (ng/l) or approximately 0.03 grams (0.0007 lbs) per day. One nanogram per liter equals one part per trillion (ppt). Mercury data for Nepera's outfalls is summarized in the attached graph and table.

How much mercury is Nepera authorized to discharge? The maximum concentration allowed in each outfall is 800 ng/l.

What level of mercury in the Ramapo River is safe? At very low concentrations, mercury can accumulate in fish and can cause health problems in people and wildlife that eat fish. At higher concentrations, mercury can also be toxic to fish and cause health problems in people that drink contaminated water. New York has mercury water quality standards which vary from 0.7-1400 ng/l depending on use. The standards also vary by the form of mercury, i.e. *Total* versus *Dissolved*. Total is the sum of the undissolved (particulate) and dissolved fractions of the metal. The dissolved fraction is thought to be more bioavailable. Specific standards are displayed on the attached figure.

What level of mercury may be safely discharged to the Ramapo River? The river exceeds the 0.7 ng/l water quality standard both up and downstream of the site. Therefore, Nepera's discharge goal is equal to the 0.7 ng/l standard.

If Nepera's discharge goal is 0.7 ng/l, why are they allowed to discharge 800 ng/l? The state is currently relying on EPA Method 245 for making SPDES permit mercury limit compliance determinations. The 800 ng/l value represents the *Practical Quantitation Limit (PQL)* for analysis using this method. A relatively new method is available which is much more sensitive than the older method but we are phasing in its use (EPA Method 1631, 0.5 ng/l PQL). There are several other important factors involved in the state's decision to authorize a higher level than the discharge goal. These factors include: (1) atmospheric deposition can cause standard violations, (2) at these extremely low levels it appears that mercury is ubiquitous, (3) even "clean" discharges may violate, (4) the Orange County Sewer District discharge also appears to exceed the goal, and, (5) the limits of treatment technology are unknown. ***Preliminary sampling using the new analytical method has uncovered what appears to be a nation-wide mercury problem.***

What else can be done to reduce Nepera's mercury discharge to the Ramapo River? Nepera is required to sample their outfalls twice per month using both "old" and "new" analytical methods. Nepera also must perform an internal trackdown and *Pollutant Minimization Program* with the goal of achieving 0.7 ng/l through identification and elimination of mercury sources. The state is currently studying what levels can be achieved via source elimination and treatment. As we learn more we may modify Nepera's SPDES permit to incorporate improved mercury control requirements.

For additional information on SPDES permit issues: Contact NYSDEC, 625 Broadway, Albany, New York 12233-3505 or call Shayne Mitchell at 518-402-8125.

Is the problem getting worse? - To the best of my knowledge the one word answer to this question is "no." There also isn't much evidence that things are getting better in terms of mercury levels in fish. Progress has been made however on a number of fronts to reduce mercury releases to the environment, and these efforts are continuing. As a result of the Clean Air Act Amendments, mercury emissions have been reduced from numerous sources including municipal waste combustors, medical waste incinerators, sewage sludge incinerators and industrial sources. Emissions of mercury from coal-fired power plants however are yet to be regulated. Reductions in acidic deposition over the past decade have resulted in small increases in pH in some lakes, which will hopefully lead to lower mercury levels in fish. Our DEC staff in the Office of Air and Waste Management have made significant progress in reducing mercury air emissions, reducing mercury in the waste stream and in pollution prevention. There are also efforts under way in most northeastern states to pass legislation to restrict the use of mercury in new products and require labeling of products which contain mercury. Additional DEC information on mercury is available on our website:

http://www.dec.state.ny.us/website/dshm/redrecy/mercury.htm

Hope this information is helpful. If anyone has any specific questions please give me a call (315/337-0910) or email, and I'll try to answer or give you someone else to call.

cc: Doug Stang
Steve Sanford
Gerry Barnhart
Peter Duncan
Mercury Task Team

Acidic conditions (made worse by acid rain) also facilitate mercury methylation. The methylmercury then bioaccumulates up the food chain from bacteria and algae up to predatory fish, loons and humans.

Where have we sampled/studied mercury? - More than 200 lakes and ponds in NYS have been sampled to collect fish for mercury analysis, approximately half of these in the Adirondacks or Catskills. Many more need to be sampled. DEC is continuing to sample at least 10 additional lakes a year from a listing of priority waters. Mercury in Cranberry Lake was studied intensively in the late 1970s, and monitoring studies of brook trout and yellow perch in the Adirondacks have also been conducted. The Sunday Pond watershed (near Stillwater Reservoir) is the site of an ongoing intensive mercury project by Syracuse University researchers. A study of the NYC reservoirs and mercury levels in these watersheds is currently being conducted by DEC Division of Fish, Wildlife and Marine Resources and the Division of Water. Other mercury studies related to pollution prevention, air emissions control and solid waste management are also underway.

What fish, mammals and birds are most affected? - As methylmercury bioaccumulates up the food chain, the top level predators in long food chains accumulate the most (sometimes 100,000 to a million times the water concentration). Fish do not have a good mechanism to rid themselves of mercury, so what they accumulate they retain, and older aged fish have higher mercury levels. Piscivorous fish such as bass, walleye, pike, and large perch have been found to have the highest mercury levels and in general, sunfish, bullhead and trout have relatively low levels. In most cases lake trout do not have mercury levels as high as bass or walleyes from the same lake. Otters and mink from the Adirondacks have been found with moderate levels of mercury. Additional samples from the Hudson River watershed and statewide are awaiting analysis for mercury, lead and cadmium. More than 100 adult loons from Adirondack waters have been sampled over the last four years to document mercury levels in their feathers and blood. Studies in New Brunswick, Nova Scotia and Wisconsin have shown behavioral problems in loons with high mercury levels. In the Adirondacks the loons with higher mercury levels were found to be from lakes with high mercury in the fish (the more acidic lakes). So these findings are consistent with what we would expect based on food chain bioaccumulation. Behavioral and fecundity studies of those Adirondack loons with high mercury levels have not yet been conducted.

Human health effects? - This is not my field, but from what I have read and heard, I am concerned that some people are being affected by mercury in the fish they eat. The methylmercury in fish is not concentrated in the fat like organochlorine chemicals, but it is spread throughout the fish and cannot be trimmed off a fillet. The National Academy of Sciences concluded in 2000 that as many as 60,000 newborn infants a year in the US may develop neurological problems, including learning disabilities, because of low-level mercury contamination through their mothers prior to birth. There appears to be very little, if any margin of safety between the toxicological effect level in sensitive individuals and the actual exposure level. Individuals who consume large amounts of fish are at greatest risk. The USFDA action level for commercial fish is 1 ppm methylmercury and our NYS Dept. of Health uses this value in its determination of whether or not to issue a fish consumption advisory. There are at present 30 waters in NYS with fish consumption advisories due to mercury. The USFDA also has a fish consumption advisory for commercially sold shark and swordfish because of the high mercury levels in these fish. Canada and several New England states use a lower advisory level of 0.5 ppm mercury, and the new (Jan. 2001) USEPA criterion for freshwater fish consumption is 0.3 ppm methylmercury to protect the health of all human consumers.

New York State Department of Environmental Conservation
Division of Fish, Wildlife and Marine Resources, Region 6
Rome Field Station, Aquatic Toxicant Research Unit
8314 Fish Hatchery Road, Rome, New York 13440-7530
Phone: (315) 337-0910 • **FAX:** (315) 337-0988
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

MEMORANDUM

TO: Regional Fisheries Staffs, Cape Vincent Fish Research Station, Lake Erie Fisheries Unit
FROM: Howard Simonin, Bureau of Habitat, Rome Field Station
RE: Mercury Update

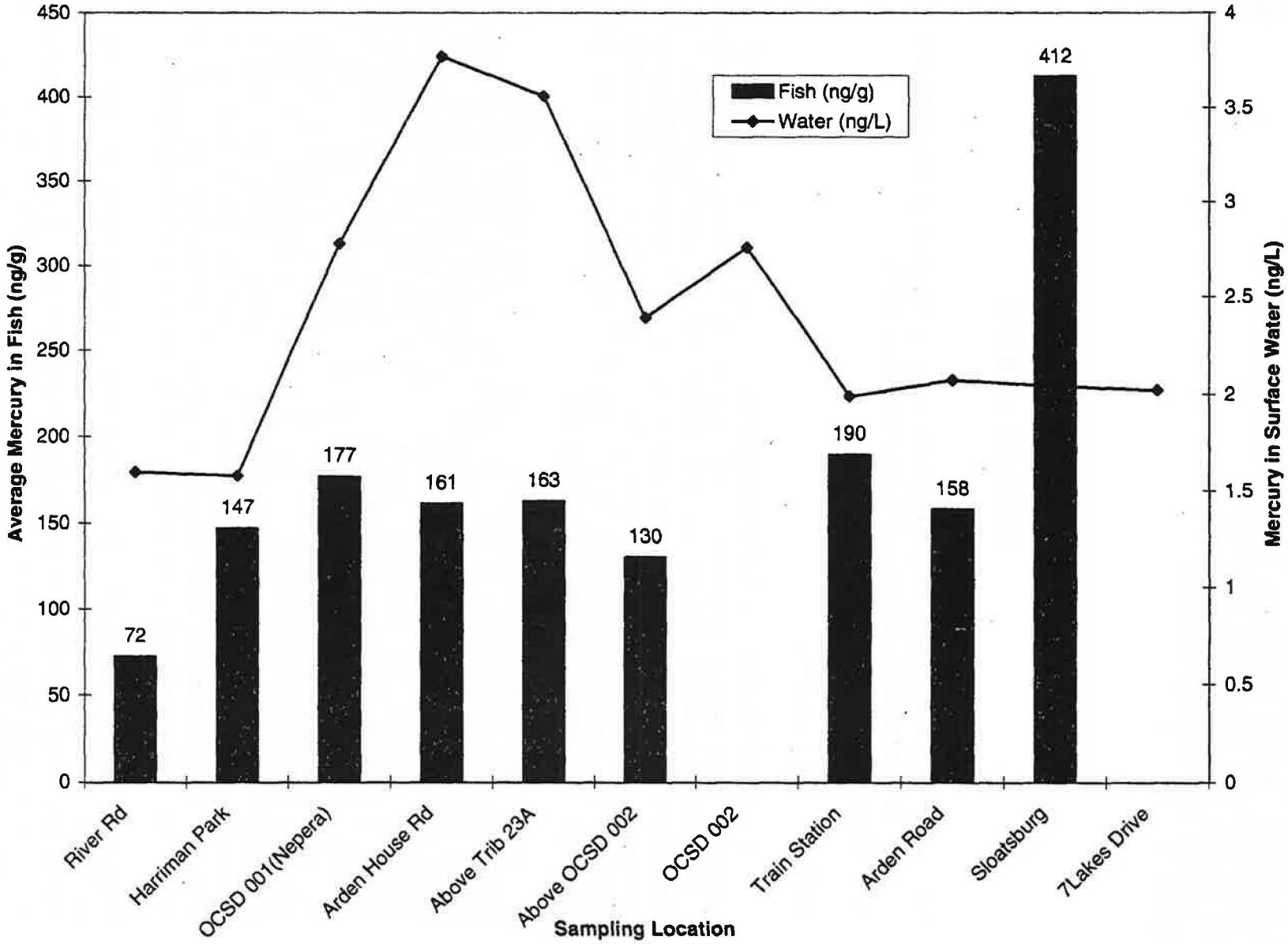
DATE: February 22, 2002

I was recently asked by Bill Gordon to provide some information to Fisheries staff on the status of mercury research, monitoring, control, and general understanding. Regional staffs are evidently being asked more frequently about the mercury problem, and also for input to Unit Management Plans. I am the Division representative on the DEC Mercury Task Team and have also been on several interstate panels evaluating the mercury problem and am familiar with the ongoing aquatic and loon research. Anyhow, I will try to boil down what we know and what we think is true as it relates to mercury in the environment.

Uses and Sources - Mercury is a very useful element and has been used in a great many products. Mercury was (but is no longer) used in batteries, paints and fungicides, and is still used in dental fillings, fluorescent lights, silent switches, thermostats, manometers, soaps, and quite a few other products. There is also a ritual usage of raw mercury (which is being discouraged) by certain ethnic groups in NYC. The chlor-alkali industry was a large user and source of mercury, although most of these facilities have now closed or changed their methods. Mercury at one time was relatively common in industrial wastewater effluents. However, the Clean Water Act of 1970 and subsequent cleanup of industrial discharges have greatly reduced these sources. Today, mercury is found in most coal (burned primarily by power plants), and in municipal waste, medical waste and sewage sludge. When these materials are burned or incinerated, the mercury is released to the atmosphere, and eventually deposited onto watersheds. Scrubbers and other emission control technologies help to remove mercury from air emissions. The primary source of the mercury in our wilderness lakes and ponds is probably atmospheric deposition, either past or present.

What makes mercury bioavailable? - The chemical form of mercury which bioaccumulates is methylmercury. Most of what falls on watersheds is in a particulate or inorganic form and is not readily taken up by organisms until it is converted to methylmercury. The methylation of mercury occurs more readily under certain environmental conditions, such as under anaerobic conditions, in acidic environments and when sulfate reducing bacteria are present. Wetlands, marshes and anaerobic sediments seem to be "good" locations in the watershed for mercury methylation.

Mercury in Fish vs. Mercury in Surface Water



Summary of Fish Data collected from Ramapo River

June 26-28, and July 2, 2001

Species	Species code	Number of samples	% of total samples	# of stations caught	Average Mercury Concentrations (ng/g)	Range of Mercury Concentrations (ng/g)
Bluegill	BGILL	3	3	2	64.7	41.7- 80.2
Brown Trout	BT	1	1	1	47.0	47.0 - 47.0
Carp	CARP	3	3	1	189.9	103.9 - 259.5
Common Shiner	COSH	2	2	2	72.4	58.5 - 86.3
Eastern Mudminnow	EMUD	2	2	2	104.2	97.7 - 110.6
Largemouth Bass	LMB	4	4	2	230.0	58.3 - 324.2
Pumpkinseed	PKSD	1	1	1	109.8	109.8 - 109.8
Rock Bass	RB	1	1	1	190.2	190.2 - 190.2
Redfin Pickerel	RFP	3	3	3	150.1	50.7 - 205.8
Rainbow Trout	RT	3	3	2	95.1	56.4 - 117.0
Smallmouth Bass	SMB	5	6	1	423.2	340.5 - 608.8
White Sucker	WS	54	61	8	176.6	26.9 - 512.5
Yellow Bullhead	YB	8	10	3	211.6	73.9 - 465.8
Totals	13 species	90	100%	9 stations	182.9 ng/g	26.9 - 608.8 ng/g

Ramapo River Fish Sampling Locations

Location code	Common name	Approximate distance from NEPERA (miles)	Description
AA	River Road	0.84 upstream	Intersection of River Road and Rte.17M by the cemetery
A	Harriman Park	0.3 upstream	Upstream of the inlet and in the inlet to the pond in Harriman Park
B	NEPERA	0	Just upstream of Nepera outfall and downstream of Orange County Sewer District #1 outfall 001
C	Arden House Road	0.31 downstream	Arden House Road, downstream of Nepera outfall
D	Above Trib. 23A	0.95 downstream	Greater than 0.5 mile upstream from Orange County Sewer District #1 outfall 002 and upstream of confluence of Trib. 23A and Ramapo River
E	Above OCSD#1 outfall 002	1.24 downstream	0.2- 0.5 mile upstream from Orange County Sewer District #1 outfall 002 and downstream of Trib. 23A
F	Train Station	1.5 downstream	0.3 mile downstream from Harriman Train Station and downstream of Orange County Sewer District #1 outfall 002
G	Arden Road	2.66 downstream	Arden Road
H	Sloatsburg	11.1 downstream	Sloatsburg (Washington Ave.)

Analytical Results for Mercury Analyses (WATER)

Frontier Geosciences Inc.

Case Numbers: HRL01 **Units:** ng/L

SDG Number: F10301

Sample ID	Dissolved Mercury
BBN-1661	2.78
BBS-1661	1.04
C-1661	4.36
H-1661	2.02
HH-1661	2.04
G-1661	2.07
F-1661	1.99
FF-1661	2.76
E-1661	2.39
D-1661	3.56
CD-1661	3.19
B-1661	2.53
A-1661	1.58
AA-1661	1.60

Analytical Results for Mercury Analyses (SEDIMENT)

Frontier Geosciences Inc.

Case Number: HRL01 **SDG Number:** D10301 **Units:** ng/g DB

Sample ID	Total Mercury	
BBS-SED	175	0.0175 mg/kg
BBN-SED	91.6	0.0916 mg/kg

Nepera, NY0006670 Summary of SPDES Permit Mercury Monitoring Data

	Outfall 02B			Outfall 02C			Outfall 002		
Date	1631		245	1631		245	1631		245
4/12/01	1.1	<	200	5.6	<	200	152		200
4/26/01	2.61	<	200	7.81	<	200	51.8		200
5/10/01	2.6		300	< 0.2	<	200	59.9		300
5/24/01	1.37	<	200	< 0.2	<	200	51.2		200
6/7/01	2.35	<	200	0.329	<	200	59.1	<	200
6/21/01	1.45	<	200	1.23	<	200	54.5	<	200
min	1.1		200	0.2		200	51.2		200
avg	1.9133		216.67	2.5615		200	71.417		216.67
max	2.61		300	7.81		200	152		300
ln95%ile	3.3564		280.95	14.277		200	130.11		280.95
ln99%ile	4.3368		314.48	43.952		200	173.04		314.48

All units ng/l. Refer to Nepera submission for analytical notes, etc.

Table 1 (Continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

JUNE 1998

SUBSTANCE (CAS No.)	WATER CLASSES	STANDARD (ug/L)	GUIDANCE VALUE (ug/L)	TYPE	BASIS CODE
Linear alkyl benzene sulfonates (LAS) (CAS No. Not Applicable)	A, A-S, AA, AA-S, B, C	40*		A(C)	
Remarks: * LAS with side chains greater than 13 carbons only; applies to the sum of these substances. * For the waters of the Great Lakes System, the Department will substitute a guidance value for the aquatic Type standard if so determined under 702.15 (c).					
Magnesium (CAS No. Not Applicable)	A, A-S, AA, AA-S	35,000		H(WS)	B
	GA		35,000	H(WS)	B
Malathion (121-75-5)	GA	7.0		H(WS)	F
	A, A-S, AA, AA-S, B, C	0.1*		A(C)	
	SA, SB, SC	0.1		A(C)	
	I		0.1	A(C)	
Remark: * For the waters of the Great Lakes System, the Department will substitute a guidance value for the aquatic Type standard if so determined under 702.15 (c).					
Mancozeb (8018-01-7)	GA	1.8		H(WS)	F
Maneb (12427-38-2)	GA	1.8		H(WS)	F
Manganese (CAS No. Not Applicable)	A, A-S, AA, AA-S	300		E	G
	GA	300*		E	F
Remark: * Also see entry for "Iron and Manganese."					
Mercaptobenzothiazole (149-30-4)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
Mercury (CAS No. Not Applicable)	A, A-S, AA, AA-S	0.7		H(WS)	B
	GA	0.7		H(WS)	B
	A, A-S, AA, AA-S, B, C, D	7×10^{-4}* = 0.7 ng/l		H(FC)	B
	SA, SB, SC, I, SD	7×10^{-4}*		H(FC)	B
	A, A-S, AA, AA-S, B, C	0.77*		A(C)	
	A, A-S, AA, AA-S, B, C, D	1.4*		A(A)	
	A, A-S, AA, AA-S, B, C, D	0.0026*		W	
	SA, SB, SC, I, SD	0.0026*		W	
Remark * Applies to dissolved form.					
Methacrylic acid (79-41-4)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
Methacrylonitrile (126-98-7)	A, A-S, AA, AA-S		5*	H(WS)	I
	GA	**		H(WS)	J
Remarks: * This substance did not receive a review beyond determining that it is in a principal organic contaminant class and that it does not have a more stringent Specific MCL. ** The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.					

FROM TSMP DATA BASE
7/20/01

Hudson River Basin 1998 Summary Table - Hg - Spring

Location	Species (Age/Prep)	Number Analyzed	Length (mm)	Weight (g)	Hg (ppm)
Neversink Reservoir	Brown bullhead	4	298 (271 - 341)	385 (290 - 540)	0.17 (0.13 - 0.23)
	Brown trout	10	439 (377 - 530)	1052 (650 - 1960)	0.49 (0.27 - 1.16)
	Atlantic salmon(landlocked)	4	361 (302 - 445)	520 (290 - 920)	0.26 (0.23 - 0.31)
	Smallmouth bass	6	338 (270 - 386)	508 (210 - 750)	1.31 (0.79 - 1.88)
	White sucker	12	473 (411 - 523)	1253 (720 - 1800)	0.50 (0.3 - 0.63)
	Yellow perch	11	210 (174 - 244)	122 (60 - 190)	0.33 (0.18 - 0.5)
Rondout Reservoir	Brown bullhead	2	334 (332 - 335)	650 (580 - 720)	0.30 (0.11 - 0.48)
	Brown trout	7	433 (326 - 658)	1239 (315 - 4000)	0.25 (0.05 - 0.61)
	Carp	1	736	5980	0.18
	Chain pickerel	1	512	1000	0.87
	Lake trout	10	432 (290 - 558)	846 (150 - 1600)	0.33 (0.11 - 0.55)
	Smallmouth bass	13	344 (256 - 475)	663 (240 - 1800)	0.78 (0.48 - 1.47)
	White sucker	15	434 (384 - 474)	859 (580 - 1190)	0.27 (0.13 - 0.36)
	Yellow perch	1	232	130	0.26
Schroon Lake	Lake trout	20	499 (462 - 574)	1177 (920 - 1750)	0.54 (0.41 - 0.71)
	Smallmouth bass	20	376 (327 - 439)	743 (500 - 1120)	1.07 (0.64 - 1.98)
	Yellow perch	20	318 (293 - 351)	423 (300 - 580)	0.81 (0.46 - 1.38)
Mohawk River- Above Lock 7	Brown bullhead	2	379 (373 - 384)	809 (795 - 822)	0.24 (0.22 - 0.25)
	Carp (3)	2	502 (483 - 520)	1796 (1631 - 1960)	0.1 (0.1 - 0.1)
	Carp (4)	1	506	2033	0.10
	Carp (11)	1	599	3471	0.23
	Largemouth bass (4)	1	400	1060	0.28
	Largemouth bass (7)	3	430 (420 - 445)	1289 (1267 - 1332)	0.32 (0.3 - 0.33)
	Largemouth bass (8)	2	430 (416 - 444)	1304 (1095 - 1513)	0.30 (0.27 - 0.33)
	Largemouth bass (9)	1	443	1425	0.50
	Largemouth bass (10)	1	453	1603	0.52
Mohawk River- Below Lock 7	Blueback herring	30	246 (219 - 286)	130 (100 - 220)	0.04 (0.02 - 0.08)
George Washington Bridge (11)	Striped bass	40	628 (425 - 912)	2897 (750 - 10740)	0.27(0.07 - 0.68)
Tappan Zee Bridge (27)	Striped bass	42	708 (543 - 921)	3911 (1910 - 9080)	0.26 (0.1 - 0.53)
Stony Point (40)	Striped bass	40	663 (493 - 889)	3496 (1400 - 7770)	0.33 (0.07 - 0.93)
Bear Mountain Bridge (48)	Atlantic sturgeon (Abdominal Fat)	1	1600	21319	0.03
	Atlantic sturgeon (Brain)	1	1600	21319	0.04
	Atlantic sturgeon (Brain Fat)	1	1600	21319	0.02
	Atlantic sturgeon (Heart)	1	1600	21319	0.12
	Atlantic sturgeon (Liver)	1	1600	21319	0.57
	Atlantic sturgeon (Second Scute Steak)	1	1600	21319	0.15
	Atlantic sturgeon (Sixth Scute Steak)	1	1600	21319	0.15
	Atlantic sturgeon (Gonad)	1	1600	21319	0.03
Newburgh (60)	Atlantic sturgeon (Brain Cavity)	3	720 (701 - 743)	1660 (1460 - 1820)	0.02 (0.01 - 0.02)
	Atlantic sturgeon (Heart)	3	720 (701 - 743)	1660 (1460 - 1820)	0.04 (0.04 - 0.04)
	Atlantic sturgeon (Liver)	3	720 (701 - 743)	1660 (1460 - 1820)	0.19 (0.18 - 0.2)
	Atlantic sturgeon (Muscle)	3	720 (701 - 743)	1660 (1460 - 1820)	0.07 (0.06 - 0.08)
	Atlantic sturgeon (Spleen)	3	720 (701 - 743)	1660 (1460 - 1820)	0.06 (0.05 - 0.07)
	Atlantic sturgeon (Stomach Contents)	1	743	1700	0.02
	Atlantic sturgeon (Gonad)	3	720 (701 - 743)	1660 (1460 - 1820)	0.03 (-0.03 - 0.03)
	Shortnose sturgeon (Brain Cavity)	1	631	1660	0.03

Mean 0.51 ppm 510ppb

0.38 ppm 380ppb

Hudson River Basin 1998 Summary Table - Hg - Spring

Location	Species (Age/Prep)	Number Analyzed	Length (mm)	Weight (g)	Hg (ppm)
	Shortnose sturgeon (Gonad Fat)	1	631	1660	0.02
	Shortnose sturgeon (Heart)	1	631	1660	0.1
	Shortnose sturgeon (Intestinal Tract Growth)	1	631	1660	0.07
	Shortnose sturgeon (Liver)	1	631	1660	0.2
	Shortnose sturgeon (Muscle)	1	631	1660	0.16
	Shortnose sturgeon (Spleen)	1	631	1660	0.06
	Shortnose sturgeon (Stomach Contents)	1	631	1660	0.09
	Shortnose sturgeon (Gonad)	1	631	1660	0.07
Poughkeepsie (76)	American eel	16	436 (266 - 754)	249 (34 - 1186)	0.22 (0.08 - 0.44)
	Brown bullhead	20	253 (212 - 270)	242 (166 - 315)	0.42 (0.01 - 0.88)
	Carp (3)	5	489 (441 - 623)	1856 (1385 - 3350)	0.06 (0.03 - 0.09)
	Carp (4)	2	533 (530 - 535)	2302 (2088 - 2515)	0.05 (0.04 - 0.05)
	Carp (5)	1	510	1859	0.05
	Carp (6)	3	602 (595 - 615)	3107 (2988 - 3265)	0.10 (0.07 - 0.12)
	Carp (7)	3	560 (485 - 603)	2467 (1655 - 3100)	0.11 (0.08 - 0.17)
	Carp (8)	3	617 (601 - 650)	3641 (3176 - 4300)	0.13 (0.05 - 0.23)
	Carp (9)	1	613	3483	0.14
	Carp (10)	2	713 (695 - 730)	5629 (5357 - 5900)	0.07 (0.06 - 0.07)
	Carp (11)	2	646 (575 - 717)	4110 (2780 - 5440)	0.09 (0.05 - 0.12)
	Largemouth bass (2)	1	265	220	0.09
	Largemouth bass (3)	2	323 (300 - 345)	469 (400 - 538)	0.12 (0.08 - 0.16)
	Largemouth bass (4)	3	335 (321 - 355)	519 (454 - 584)	0.23 (0.16 - 0.3)
	Largemouth bass (5)	1	403	997	0.31
	Largemouth bass (6)	2	423 (400 - 445)	1036 (915 - 1156)	0.37 (0.28 - 0.46)
	Largemouth bass (8)	1	475	1708	0.59
	Smallmouth bass (2)	1	280	399	0.23
	Smallmouth bass (3)	3	298 (261 - 338)	328 (227 - 458)	0.32 (0.12 - 0.71)
	Smallmouth bass (4)	3	354 (345 - 360)	556 (510 - 597)	0.27 (0.19 - 0.34)
	Smallmouth bass (5)	1	296	366	0.16
	Striped bass	41	681 (550 - 927)	3755 (1930 - 9020)	0.34 (0.16 - 0.8)
	White catfish	2	349 (344 - 353)	696 (672 - 719)	0.31 (0.28 - 0.34)
	White perch	20	171 (145 - 260)	76 (44.9 - 235)	0.22 (0.1 - 0.38)
Hyde Park (78)	Atlantic sturgeon (Abdominal Fat)	2	1865 (1800 - 1930)	34020 (33566 - 34473)	0.02 (0.01 - 0.02)
	Atlantic sturgeon (Brain)	2	1865 (1800 - 1930)	34020 (33566 - 34473)	0.02 (0.01 - 0.02)
	Atlantic sturgeon (Brain Fat)	2	1865 (1800 - 1930)	34020 (33566 - 34473)	0.01 (0.01 - 0.01)
	Atlantic sturgeon (Heart)	2	1865 (1800 - 1930)	34020 (33566 - 34473)	0.08 (0.07 - 0.09)
	Atlantic sturgeon (Liver)	2	1865 (1800 - 1930)	34020 (33566 - 34473)	0.26 (0.21 - 0.3)
	Atlantic sturgeon (Second Scute Steak)	2	1865 (1800 - 1930)	34020 (33566 - 34473)	0.12 (0.1 - 0.13)
	Atlantic sturgeon (Sixth Scute Steak)	2	1865 (1800 - 1930)	34020 (33566 - 34473)	0.12 (0.11 - 0.13)
	Atlantic sturgeon (Testes)	2	1865 (1800 - 1930)	34020 (33566 - 34473)	0.02 (0.01 - 0.02)
Catskill (112)	American eel	26	382 (294 - 612)	138 (45 - 450)	0.14 (0.06 - 0.45)
	Brown bullhead	22	228 (0 - 315)	314 (196 - 576)	0.06 (0.04 - 0.1)
	Carp	1	542	2280	0.13
	Carp (2)	5	487 (425 - 534)	1621 (1119 - 1962)	0.07 (0.02 - 0.14)
	Carp (3)	9	496 (420 - 544)	2037 (954 - 2867)	0.10 (0.08 - 0.15)
	Carp (6)	1	593	2890	0.13
	Carp (8)	2	642 (635 - 649)	3403 (3339 - 3466)	0.21 (0.18 - 0.23)
	Carp (10)	2	694 (664 - 724)	4294 (3672 - 4915)	0.27 (0.26 - 0.27)
	Largemouth bass (3)	3	313 (250 - 350)	451 (0 - 686)	0.21 (0.16 - 0.26)
	Largemouth bass (4)	6	337 (133 - 410)	780 (498 - 1145)	0.30 (0.22 - 0.35)
	Largemouth bass (5)	3	382 (323 - 413)	920 (572 - 1112)	0.413(0.28 - 0.58)
	Largemouth bass (6)	4	435 (420 - 456)	1132 (176 - 1720)	0.63 (0.36 - 0.92)
	Largemouth bass (8)	1	490	1650	0.76

Mean 0.227
227ppb

Hudson River Basin 1998 Summary Table - Hg - Spring

Location	Species (Age/Prep)	Number Analyzed	Length (mm)	Weight (g)	Hg (ppm)
	Smallmouth bass (3)	2	271 (251 - 290)	278 (235 - 320)	0.22 (0.21 - 0.22)
	Smallmouth bass (4)	2	289 (262 - 315)	327 (252 - 402)	0.23 (0.22 - 0.24)
	Smallmouth bass (5)	2	335 (315 - 354)	675 (545 - 804)	0.46 (0.42 - 0.49)
	Smallmouth bass (6)	1	342	652	0.35
	Striped bass	20	658 (478 - 935)	3396 (1100 - 9647)	0.37 (0.19 - 0.81)
	White catfish	10	307 (0 - 445)	721 (0 - 1400)	0.26 (0.16 - 0.41)
	White perch	20	187 (132 - 227)	98 (70 - 190)	0.29 (0.18 - 0.89)
	Yellow perch	20	189 (160 - 242)	85 (55 - 175)	0.09 (0.05 - 0.2)
Albany/Troy (147)	American eel	10	418 (299 - 662)	153 (50 - 494)	0.25 (0.07 - 0.59)
	Brown bullhead	4	330 (271 - 386)	494 (306 - 716)	0.30 (0.07 - 0.82)
	Blueback herring	4	245 (226.8 - 267.8)	119 (87.3 - 169)	0.06 (0.05 - 0.07)
	Carp	1	640	3726	0.13
	Carp (3)	7	469 (428 - 505)	1623 (1423 - 1934)	0.10 (0.06 - 0.17)
	Carp (5)	2	609 (580 - 638)	3588 (2810 - 4365)	0.16 (0.08 - 0.24)
	Carp (6)	2	581 (553 - 609)	3032 (2934 - 3130)	0.20 (0.09 - 0.31)
	Carp (7)	2	613 (582 - 644)	3645 (3321 - 3968)	0.26 (0.17 - 0.34)
	Carp (8)	4	683 (621 - 715)	5641 (3353 - 7257)	0.17 (0.11 - 0.24)
	Carp (9)	1	782	8732	0.25
	Carp (13)	1	690	6123	0.33
	Carp (14)	1	701	5783	0.21
	Largemouth bass (3)	1	304	425	0.16
	Largemouth bass (4)	1	315	365	0.35
	Largemouth bass (5)	1	424	916	0.61
	Largemouth bass (7)	1	409	934	0.46
	Largemouth bass (8)	1	460	1453	0.98
	Largemouth bass (9)	1	454	1062	1.30
	Smallmouth bass (2)	1	275	260	0.18
	Smallmouth bass (3)	3	278 (270 - 285)	263 (256 - 270)	0.42 (0.2 - 0.84)
	Smallmouth bass (4)	2	351 (318 - 383)	542 (384 - 700)	0.39 (0.35 - 0.43)
	Smallmouth bass (5)	9	344 (307 - 390)	461 (260 - 657)	0.48 (0.32 - 0.7)
	Smallmouth bass (6)	5	395 (369 - 440)	738 (604 - 956)	0.48 (0.09 - 0.84)
	Smallmouth bass (7)	1	438	1056	0.74
	Striped bass	10	572 (484 - 700)	2060 (1216 - 3416)	0.39 (0.16 - 0.75)
	White catfish	8	435 (398 - 475)	1307 (1040 - 1614)	0.34 (0.11 - 0.54)
	White perch	20	188 (164 - 212)	94 (52 - 136)	0.24 (0.1 - 0.45)
Waterford (155)	Brown bullhead	17	323 (239 - 371)	502 (235 - 797)	0.19 (0.09 - 0.44)
	Carp (2)	1	500	1873	0.21
	Carp (4)	1	499	2202	0.17
	Carp (5)	2	571 (542 - 599)	2650 (2649 - 2650)	0.27 (0.24 - 0.29)
	Carp (6)	3	571 (535 - 618)	2955 (2518 - 3727)	0.31 (0.28 - 0.34)
	Carp (7)	6	617 (583 - 648)	3839 (3105 - 5604)	0.27 (0.13 - 0.37)
	Carp (8)	2	652 (611 - 692)	4132 (3133 - 5130)	0.20 (0.15 - 0.24)
	Carp (9)	1	712	5400	0.24
	Carp (10)	2	618(615 - 620)	3579 (3416 - 3742)	0.33 (0.28 - 0.38)
	Carp (12)	2	620 (613 - 626)	3617 (3568 - 3665)	0.29 (0.26 - 0.32)
	Largemouth bass (5)	1	365	744	0.39
	Largemouth bass (7)	2	404 (397 - 411)	953 (950 - 955)	0.53 (0.5 - 0.55)
	Smallmouth bass	1	320	386	0.24
	Smallmouth bass (3)	6	286 (260 - 329)	286 (199 - 434)	0.23 (0.16 - 0.3)
	Smallmouth bass (4)	6	323 (304 - 360)	434 (299 - 606)	0.23 (0.15 - 0.31)
	Smallmouth bass (5)	6	372 (335 - 426)	540 (411 - 721)	0.38 (0.29 - 0.48)
Stillwater-Coveville (168)	Brown bullhead	21	335 (250 - 386)	587 (223 - 905)	0.16 (0.08 - 0.28)
	Carp (5)	2	643 (580 - 706)	2580 (0 - 5160)	0.17 (0.13 - 0.21)

(-) denotes detection limit

"U" for Unknown

Hudson River Basin 1998 Summary Table - Hg - Spring

Location	Species (Age/Prep)	Number Analyzed	Length (mm)	Weight (g)	Hg (ppm)
	Carp (6)	2	704 (683 - 724)	7020 (5239 - 8800)	0.23 (0.21 - 0.24)
	Carp (8)	1	740	5304	0.41
	Carp (10)	1	915	U	0.25
	Carp (11)	3	244 (0 - 733)	2400 (U - 7200)	0.36 (0.26 - 0.45)
	Carp (12)	3	835 (800 - 868)	11167 (9500 - 14500)	0.39 (0.36 - 0.41)
	Carp (13)	1	900	9500	0.33
	Largemouth bass	1	301	380	0.13
	Largemouth bass (3)	1	275	282	0.21
	Largemouth bass (4)	4	307 (270 - 340)	435 (282 - 614)	0.32 (0.27 - 0.39)
	Largemouth bass (5)	4	339 (317 - 368)	604 (488 - 790)	0.36 (0.33 - 0.4)
	Largemouth bass (6)	2	378 (361 - 395)	732 (517 - 947)	0.50 (0.48 - 0.52)
	Largemouth bass (7)	4	530 (391 - 895)	850 (371 - 1097)	0.46 (0.37 - 0.61)
	Largemouth bass (8)	2	434 (422 - 445)	1127 (977 - 1276)	0.53 (0.46 - 0.6)
	Largemouth bass (9)	1	420	1070	0.52
	Largemouth bass (12)	1	455	1446	0.79
	Largemouth bass (13)	1	453	1452	0.78
	Yellow perch	15	164 (110 - 296)	71 (14.2 - 324)	0.12 (0.05 - 0.43)
Griffin Island (189)	Brown bullhead	26	314 (210 - 649)	397 (140 - 688)	0.15 (0.05 - 0.25)
	Carp (2)	3	403 (388 - 432)	1314 (1028 - 1705)	0.11 (0.09 - 0.15)
	Carp (3)	5	460 (361 - 585)	1307 (311 - 2174)	0.12 (0.08 - 0.15)
	Carp (4)	1	582	2767	0.25
	Carp (5)	1	530	2203	0.28
	Carp (7)	2	633 (580 - 687)	4153 (3298 - 5008)	0.23 (0.2 - 0.25)
	Carp (8)	1	620	4692	0.18
	Carp (10)	1	770	9752	0.39
	Carp (13)	1	725	6010	0.43
	Largemouth bass (3)	2	141 (0 - 282)	148 (0 - 295)	0.17 (0.16 - 0.18)
	Largemouth bass (4)	6	317 (228 - 355)	493 (438 - 675)	0.27 (0.15 - 0.36)
	Largemouth bass (5)	1	359	744	0.37
	Largemouth bass (6)	2	401 (382 - 420)	911 (762 - 1060)	0.67 (0.61 - 0.73)
	Largemouth bass (7)	6	463 (435 - 480)	1391 (722 - 1768)	0.69 (0.61 - 0.87)
	Largemouth bass (8)	2	426 (420 - 431)	1291 (1134 - 1448)	0.56 (0.46 - 0.65)
	Largemouth bass (9)	2	448 (440 - 455)	1530 (1390 - 1670)	0.59 (0.52 - 0.66)
	Largemouth bass (10)	1	426	1242	0.59
	Largemouth bass (11)	1	430	1314	0.92
	Yellow perch	4	261 (154 - 318)	326 (220 - 418)	0.36 (0.18 - 0.59)
Above Feeder Dam (201)	Brown bullhead	20	308 (248 - 348)	445 (265 - 622)	0.30 (0.17 - 0.56)
	Carp (7)	1	661	4874	0.14
	Carp (8)	4	749 (720 - 800)	7031 (6123 - 8732)	0.30 (0.18 - 0.44)
	Carp (9)	2	716 (696 - 735)	5674 (4431 - 6917)	0.40 (0.21 - 0.58)
	Carp (11)	3	773 (745 - 820)	7976 (6464 - 8732)	0.40 (0.22 - 0.50)
	Carp (12)	1	757	6350	0.33
	Carp (13)	1	810	11793	0.34
	Carp (14)	2	781 (761 - 800)	7201 (6690 - 7711)	0.33 (0.22 - 0.44)
	Carp (15)	1	757	6804	0.38
	Carp (16)	1	770	7031	0.46
	Largemouth bass	1	372	773	0.41
	Largemouth bass (2)	2	274 (260 - 287)	263 (260 - 265)	0.41 (0.37 - 0.45)
	Largemouth bass (3)	2	307 (281 - 333)	490 (338 - 641)	0.31 (0.2 - 0.42)
	Largemouth bass (4)	2	333 (315 - 350)	543 (459 - 626)	0.41 (0.39 - 0.43)
	Largemouth bass (6)	1	400	945	0.71
	Largemouth bass (7)	1	424	1132	0.67
	Smallmouth bass (4)	4	245 (215 - 278)	185 (130 - 243)	0.39 (0.19 - 0.73)
	Smallmouth bass (5)	8	265 (250 - 300)	227 (190 - 301)	0.48 (0.38 - 0.56)

(-) denotes detection limit

"U" for Unknown

Hudson River Basin 1998 Summary Table - Hg - Spring

Location	Species (Age/Prep)	Number Analyzed	Length (mm)	Weight (g)	Hg (ppm)
	Smallmouth bass (6)	2	297 (274 - 320)	340 (244 - 415)	0.54 (0.43 - 0.65)
	Yellow perch	20	232 (180 - 305)	181 (72 - 393)	0.22 (0.09 - 0.5)
Queensbury (208)	Northern pike	4	592 (481 - 722)	680 (-9 - 1286)	0.67 (0.35 - 1.2)
	Rock bass	2	170 (158 - 181)	99 (90 - 107)	0.35 (0.24 - 0.46)
	Smallmouth bass	1	245	177	0.44
	Walleye	10	323 (207 - 391)	304 (236 - 488)	0.85 (0.58 - 1.28)
	Yellow perch	8	259 (223 - 292)	267 (158 - 399)	0.34 (0.2 - 0.57)
	Yellow perch (3)	2	231 (218 - 244)	169 (127 - 211)	0.25 (0.15 - 0.35)
	Yellow perch (4)	2	267 (261 - 273)	292 (261 - 322)	0.29 (0.25 - 0.32)
Luzerne (219)	Brown bullhead	1	222	144	0.12
	Carp (6)	1	549	2637	0.45
	Carp (7)	2	520 (515 - 525)	2308 (2201 - 2415)	0.44 (0.33 - 0.55)
	Carp (8)	6	583 (533 - 615)	2983 (2371 - 3875)	0.30 (0.25 - 0.39)
	Carp (9)	4	562 (526 - 610)	2841 (2609 - 3234)	0.28 (0.23 - 0.33)
	Carp (10)	3	501 (435 - 591)	2606 (1481 - 3229)	0.32 (0.26 - 0.38)
	Carp (12)	1	571	2879	0.27
	Carp (15)	1	670	4108	0.31
	Largemouth bass (4)	2	259 (240 - 277)	227 (180 - 274)	0.28 (0.19 - 0.37)
	Smallmouth bass	1	275	265	0.73
	Smallmouth bass (3)	2	225 (210 - 240)	147 (127 - 166)	0.19 (0.09 - 0.28)
	Smallmouth bass (4)	6	273 (264 - 293)	238 (209 - 284)	0.34 (0.23 - 0.45)
	Smallmouth bass (5)	8	239 (0 - 305)	285 (164 - 374)	0.34 (0.26 - 0.42)
	Smallmouth bass (6)	4	319 (265 - 339)	434 (295 - 529)	0.40 (0.31 - 0.62)
	Smallmouth bass (7)	3	318 (300 - 349)	377 (247 - 534)	0.61 (0.39 - 1.00)
	Smallmouth bass (8)	1	365	520	0.69

Hudson River Basin 1998 Summary Table - Hg - Fall

Location	Species (Age/Prep)	Number Analyz	Length (mm)	Weight (g)	Hg (ppm)
Kinderhook Reservoir	American eel	2	567 (349 - 785)	450 (60 - 840)	0.09 (0.03 - 0.14)
	Largemouth bass	13	372 (308 - 449)	773.8 (420 - 1330)	0.22 (0.06 - 0.45)
	Smallmouth bass	2	326 (320 - 332)	510 (510 - 510)	0.09 (0.08 - 0.1)
	White perch	20	199 (177 - 237)	104 (70 - 170)	0.15 (0.09 - 0.31)
Ashokan Reservoir - East Basin	Brown bullhead	8	243 (215 - 297)	196 (125 - 360)	0.26 (0.15 - 0.47)
	Black crappie	5	255 (235 - 270)	292 (220 - 350)	0.14 (0.12 - 0.21)
	Brown trout	7	495 (435 - 630)	1546 (1160 - 2780)	0.37 (0.24 - 0.54)
	Chain pickerel	1	530	1010	0.46
	Largemouth bass	1	410	1220	0.45
	Rock bass	11	215 (174 - 267)	208 (105 - 400)	0.51 (0.2 - 0.7)
	Rainbow trout	7	385 (295 - 467)	665 (300 - 1190)	0.24 (0.08 - 0.67)
	Smallmouth bass	12	340 (295 - 410)	505 (320 - 915)	0.49 (0.27 - 0.74)
	Walleye	4	558 (540 - 575)	2350 (2260 - 2460)	0.98 (0.77 - 1.39)
Ashokan Reservoir - West Basin	Brown bullhead	5	243 (227 - 270)	204 (160 - 300)	0.33 (0.24 - 0.5)
	Brown trout	8	505 (436 - 570)	1639 (1000 - 2240)	0.54 (0.35 - 0.68)
	Chain pickerel	1	528	1030	0.68
	Rock bass	16	188 (165 - 225)	146 (100 - 240)	0.51 (0.25 - 0.71)
	Rainbow trout	3	316 (304 - 325)	320 (280 - 340)	0.20 (0.11 - 0.33)
	Smallmouth bass	20	364 (300 - 490)	666 (330 - 1670)	0.91 (0.45 - 1.64)
	Yellow perch	4	183 (139 - 302)	96 (15 - 300)	0.40 (0.12 - 0.87)
Tappan Zee Bridge (27)	Striped bass	1	547	1960	0.12
Stony Point (40)	Striped bass	23	593 (504 - 761)	2370 (1280 - 4260)	0.23 (0.07 - 0.83)
Newburgh (60)	Pumpkinseed (0)	1	72	4	0.02
	Pumpkinseed (1)	8	115 (89 - 127)	24 (15 - 40)	0.03 (0.02 - 0.04)
	Pumpkinseed (2)	4	143 (135 - 150)	56 (40 - 70)	0.04 (0.02 - 0.05)
Roseton at Danskammer Point (65)	Atlantic sturgeon (Whole)	1	199	25	0.02
Albany/Troy (147)	Pumpkinseed (1)	27	107 (91 - 127)	25 (12 - 45)	0.05 (0.03 - 0.08)
	Pumpkinseed (2)	2	113 (99 - 126)	30 (20 - 40)	0.08 (0.07 - 0.08)
	Pumpkinseed (3)	1	136	50	0.12
	Smallmouth bass	4	323 (259 - 359)	404 (200 - 515)	0.50 (0.39 - 0.69)
	White perch	5	181 (146 - 225)	95 (45 - 190)	0.23 (0.11 - 0.43)
	Yellow perch	10	151 (121 - 203)	38 (20 - 80)	0.11 (0.08 - 0.16)
Stillwater-Coveville (168)	Bullfrog (Muscle)	10	94 (70 - 130)	96 (36.5 - 289)	0.06 (0.03 - 0.11)
	Pumpkinseed	22	63 (32.5 - 110)	8 (1 - 25)	0.04 (0.02 - 0.06)
	Pumpkinseed (0)	1	60	4	0.03
	Pumpkinseed (1)	21	108 (75 - 130)	24 (7 - 37)	0.06 (0.04 - 0.08)
	Yellow perch	5	104 (90 - 111)	12 (8 - 14)	0.05 (0.02 - 0.06)
	Turtle (Fat)	4	32.3 (27.9 - 36.8)	9.8 (5.5 - 14.1)	0.025 (0.01 - 0.04)
	Turtle (Kidney)	5	30.4 (22.9 - 36.8)	8.4 (2.7 - 14.1)	1.232 (0.32 - 2.39)

(-) denotes detection limit

"U" for Unknown

Hudson River Basin 1998 Summary Table - Hg - Fall

Location	Species (Age/Prep)	Number Analyz	Length (mm)	Weight (g)	Hg (ppm)
	Turtle (Liver)	5	30.4 (22.9 - 36.8)	8.4 (2.7 - 14.1)	1.28 (0.18 - 2.57)
	Turtle (Muscle)	5	30.4 (22.9 - 36.8)	8.4 (2.7 - 14.1)	0.25 (0.07 - 0.42)
Thompson Island Pool (189)	Pumpkinseed	1	172	116	0.09
	Pumpkinseed (1)	13	105 (91 - 129)	23 (13 - 43)	0.06 (0.04 - 0.07)
	Pumpkinseed (2)	3	150 (149 - 150)	73 (65 - 80)	0.07 (0.07 - 0.08)
	Pumpkinseed (3)	2	169 (153 - 184)	108 (86 - 129)	0.09 (0.07 - 0.11)
	Redbreast sunfish (0)	31	33 (29 - 35)	2 (0.4 - 6.1)	0.02 (0.02 - 0.02)
	Redbreast sunfish (1)	7	82 (78 - 89)	9 (7 - 12)	0.07 (0.06 - 0.09)
	Redbreast sunfish (2)	9	109 (80 - 126)	26 (8 - 46)	0.08 (0.06 - 0.09)
	Redbreast sunfish (3)	2	140 (136 - 144)	47 (40 - 54)	0.09 (0.08 - 0.1)
	Smallmouth bass	1	290	200	0.33
	Yellow perch	33	111 (82.2 - 190)	20 (6 - 77)	0.06 (0.02 - 0.14)
Bakers Falls (196)	Pumpkinseed	2	188 (186 - 190)	190 (180 - 200)	0.13 (0.1 - 0.15)
	redbreast Sunfish	1	209	240	0.11
	Rockbass	2	220 (218 - 222)	220 (200 - 240)	0.24 (0.15 - 0.32)
	Smallmouth bass	18	304 (216 - 345)	414 (160 - 620)	0.17 (0.05 - 0.33)
	Yellow perch	2	252 (245 - 258)	210 (200 - 220)	0.14 (0.12 - 0.15)
Above Feeder Dam (201)	Pumpkinseed (1)	11	97 (76 - 115)	22 (9 - 39)	0.08 (0.06 - 0.13)

FROM TSMP DATA BASE
7/20/01

Alcove and Basic Reservoir Mercury Comparisons

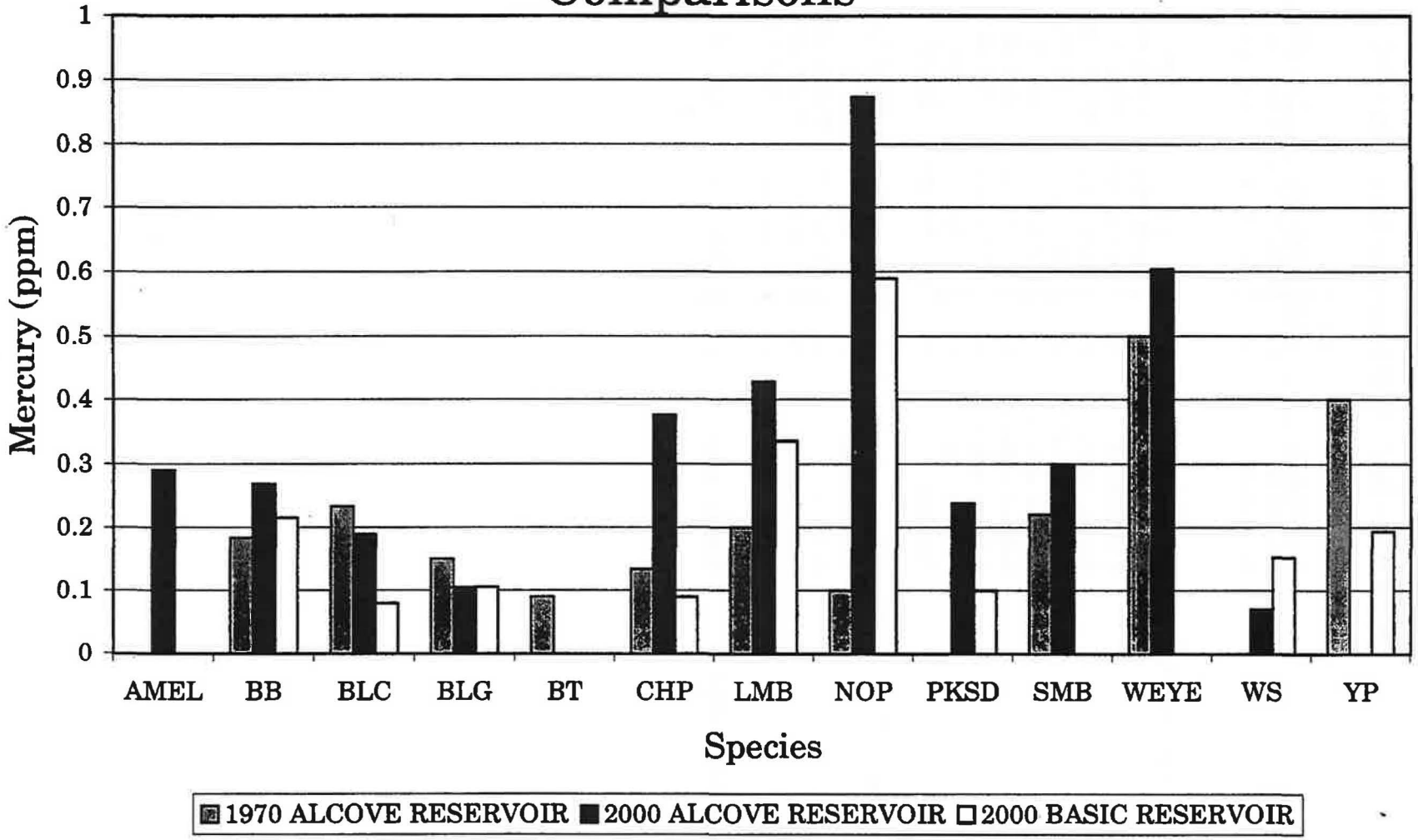
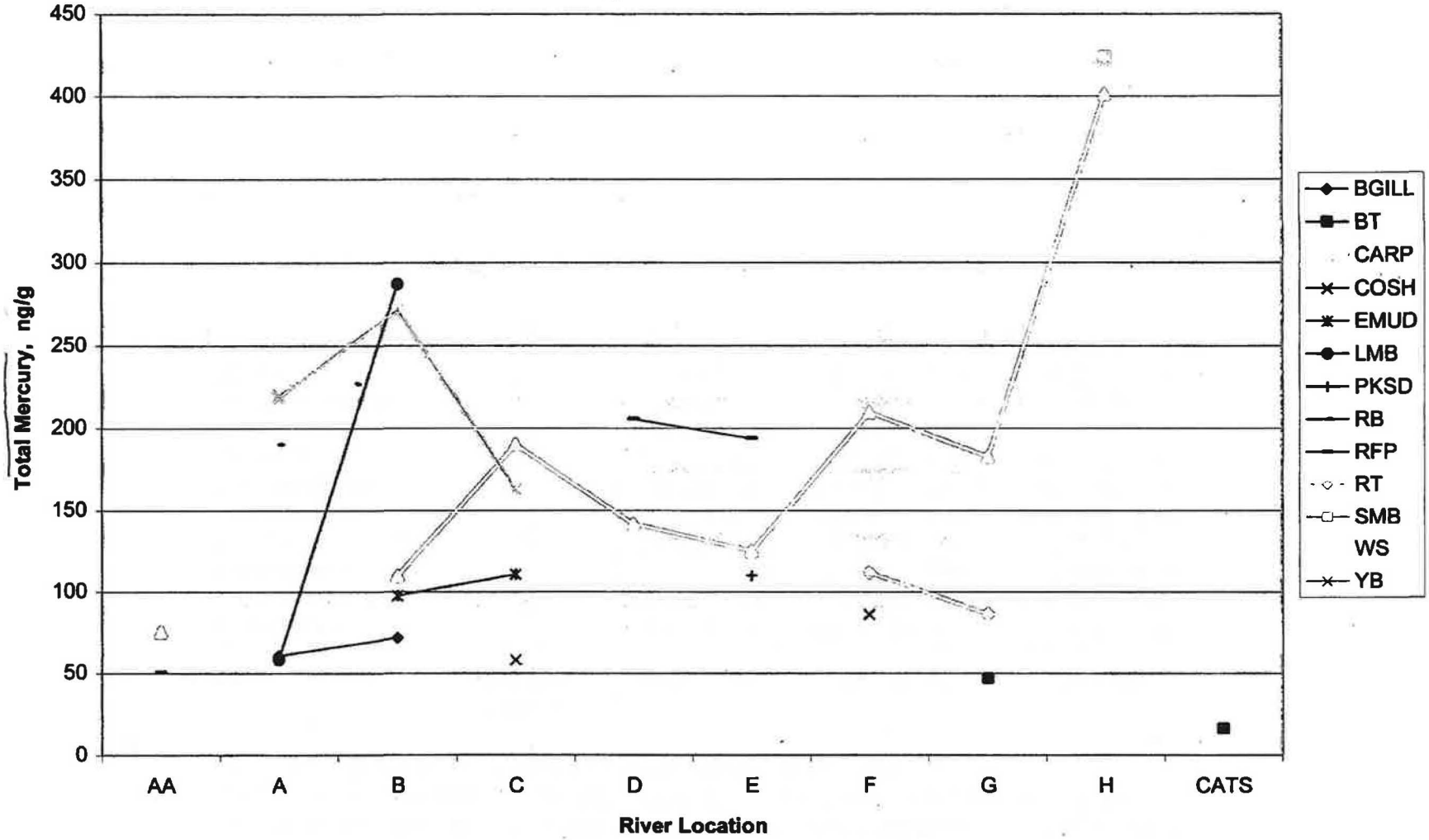


Table 1. Summary of mercury concentrations in eleven species of fish from the Alcove Reservoir, Albany County, New York collected April, 2000. The values shown are the averages for the sample set followed by the minimum and maximum values in parentheses.

Species	Number Analyzed	Length (mm)	Weight (g)	Hg (ppm)
American eel	5	929 (920 - 955)	1576 (1494 - 1670)	0.29 (0.18 - 0.35)
Brown bullhead	10	337 (297 - 398)	592 (346 - 954)	0.27 (0.04 - 0.65)
Black crappie	10	310 (241 - 368)	515 (218 - 860)	0.19 (0.04 - 0.40)
Bluegill	10	196 (164 - 249)	174 (90 - 348)	0.10 (0.05 - 0.16)
Chain pickerel	10	527 (431 - 662)	884 (488 - 1798)	0.38 (0.17 - 0.83)
Largemouth bass	6	409 (374 - 466)	1024 (774 - 1268)	0.43 (0.34 - 0.54)
Northern pike	6	845 (590 - 1037)	4622 (922 - 8392)	0.87 (0.45 - 1.27)
Pumpkinseed	10	215 (174 - 233)	241 (114 - 312)	0.24 (0.12 - 0.46)
Smallmouth bass	1	406	952	0.30
Walleye	10	484 (452 - 546)	979 (782 - 1416)	0.60 (0.45 - 0.74)
White sucker	1	455	1200	0.07

Total Mecury Concentration vs. River Location



Codes for Ramapo River Mercury Fish Data

SITE= Location on Ramapo River (See Figure)

SPP= Species

LENMM= Fish length in millimeters

THg, ng/g= Total mercury in ng/g which also is parts per billion

WGTG= Fish weight in grams

Dup= duplicate analysis

TAGNO= Fish tag number

BGILL= bluegill

LMB= largemouth bass

RB= rock bass

YB= yellow bullhead

RFP= redfin pickerel

WS= white sucker

COSH= common shiner

EMUD= eastern mudminnow

CATS= Catskill Hatchery

BT= brown trout

CARP= carp

PKSD= pumpkinseed

RT= rainbow trout

SMB= smallmouth bass

The current health advisory regarding consumption of fish containing mercury is 1000 parts per billion. There is some talk about lowering the value to 500 parts per billion.

SITE	SPP	LENMM	THg, ng/g	WGTG	Dup	TAGNO
A	BGILL	136	80.2	57		3B2061
A	BGILL	111	41.7	32		3B2055
A	LMB	142	58.3	50		3B2056
A	RB	193	190.2	140		3B2057
A	YB	263	249.0	330		3B2059
A	YB	252	224.0	280		3B2060
A	YB	218	185.5	180		3B2058
AA	RFP	161	50.7	40		3B2062
AA	WS	393	123.6	630		3B2068
AA	WS	352	127.9	450		3B2067
AA	WS	313	82.2	360		3B2066
AA	WS	253	55.5	180		3B2065
AA	WS	238	37.9	160		3B2064
AA	WS	167	26.9	60		3B2063
B	BGILL	120	72.1	36		3B2041
B	EMUD	82	97.7	8.333		3B2052
B	LMB	287	324.2	410		3B2049
B	LMB	286	280.3	400	288.5	3B2050
B	LMB	257	257.0	270		3B2051
B	WS	321	129.5	400		3B2047
B	WS	313	96.3	350		3B2044
B	WS	305	94.6	320		3B2046
B	WS	303	78.7	320		3B2048
B	WS	297	149.3	300		3B2045
B	YB	197	465.8	120		3B2053
B	YB	149	78.3	46.666		3B2054
C	COSH	101	58.5	15.714		3C2692
C	EMUD	80.5	110.6	7.142		3C2691
C	WS	416	179.6	880		3C2676
C	WS	395	314.2	740		3C2680
C	WS	335	143.3	460		3C2678
C	WS	325	176.2	390		3C2682
C	WS	300	140.0	300		3C2684
C	YB	224	316.9	200	313.0	3C2685
C	YB	178	99.5	90		3C2690
C	YB	174	73.9	90		3C2686
CATS	BT	229	12.2	150		3C2208
CATS	BT	226	24.7	180		3C2207
CATS	BT	217	11.9	180		3C2209
D	CARP	689	103.9	4800		3C2693
D	CARP	668	259.5	4000	241.6	3C2695
D	CARP	402	206.3	950		3C2694
D	RFP	165	205.8	40		3C2696
D	WS	409	186.4	280		3B2003
D	WS	396	180.5	760		3B2002
D	WS	343	168.6	550		3B2004

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(ppb)

SITE	SPP	LENMM	THg, ng/g	WGTG	Dup	TAGNO
A	BGILL	136	80.2	57		3B2061
A	BGILL	111	41.7	32		3B2055
A	LMB	142	58.3	50		3B2056
A	RB	193	190.2	140		3B2057
A	YB	263	249.0	330		3B2059
A	YB	252	224.0	280		3B2060
A	YB	218	185.5	180		3B2058
AA	RFP	161	50.7	40		3B2062
AA	WS	393	123.6	630		3B2068
AA	WS	352	127.9	450		3B2067
AA	WS	313	82.2	360		3B2066
AA	WS	253	55.5	180		3B2065
AA	WS	238	37.9	160		3B2064
AA	WS	167	26.9	60		3B2063
B	BGILL	120	72.1	36		3B2041
B	EMUD	82	97.7	8.333		3B2052
B	LMB	287	324.2	410		3B2049
B	LMB	286	280.3	400	288.5	3B2050
B	LMB	257	257.0	270		3B2051
B	WS	321	129.5	400		3B2047
B	WS	313	96.3	350		3B2044
B	WS	305	94.6	320		3B2046
B	WS	303	78.7	320		3B2048
B	WS	297	149.3	300		3B2045
B	YB	197	465.8	120		3B2053
B	YB	149	78.3	46.666		3B2054
C	COSH	101	58.5	15.714		3C2692
C	EMUD	80.5	110.6	7.142		3C2691
C	WS	416	179.6	880		3C2676
C	WS	395	314.2	740		3C2680
C	WS	335	143.3	460		3C2678
C	WS	325	176.2	390		3C2682
C	WS	300	140.0	300		3C2684
C	YB	224	316.9	200	313.0	3C2685
C	YB	178	99.5	90		3C2690
C	YB	174	73.9	90		3C2686
CATS	BT	229	12.2	150		3C2208
CATS	BT	226	24.7	180		3C2207
CATS	BT	217	11.9	180		3C2209
D	CARP	689	103.9	4800		3C2693
D	CARP	668	259.5	4000	241.6	3C2695
D	CARP	402	206.3	950		3C2694
D	RFP	165	205.8	40		3C2696
D	WS	409	186.4	280		3B2003
D	WS	396	180.5	760		3B2002
D	WS	343	168.6	550		3B2004

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SITE	SPP	LENMM	THg, ng/g	WGTG	Dup	TAGNO
D	WS	292	126.9	300		3B2007
D	WS	239	96.6	150		3B2005
D	WS	217	93.3	120		3B2006
E	PKSD	113	109.8	37.5		3B2017
E	RFP	162	193.8	33.333		3B2016
E	WS	344	149.8	490	154.3	3B2015
E	WS	343	197.7	490		3B2014
E	WS	341	186.2	500	182.3	3B2009
E	WS	265	115.1	230		3B2012
E	WS	226	111.0	150		3B2008
E	WS	223	98.1	150		3B2013
E	WS	205	66.3	110		3B2011
E	WS	186	74.6	80		3B2010
F	COSH	100	86.3	8.333		3B2018
F	RT	388	112.0	630		3B2028
F	WS	350	178.0	540		3B2025
F	WS	347	257.1	480		3B2026
F	WS	339	239.0	500		3B2024
F	WS	325	89.8	390		3B2019
F	WS	303	206.3	310		3B2022
F	WS	293	156.4	300		3B2027
F	WS	292	238.0	300		3B2020
F	WS	285	293.0	290		3B2021
F	WS	284	231.1	280		3B2023
G	BT	247	47.0	180		3B2039
G	RT	364	117.0	520		3B2042
G	RT	255	56.4	160		3B2040
G	WS	425	284.4	910		3B2032
G	WS	414	189.1	900		3B2033
G	WS	385	279.5	670		3B2030
G	WS	380	122.0	610		3B2034
G	WS	368	228.9	560		3B2029
G	WS	352	159.6	500	147.9	3B2035
G	WS	314	213.5	350		3B2031
G	WS	307	119.7	330		3B2036
G	WS	292	159.4	300		3B2037
G	WS	205	75.3	110		3B2038
H	SMB	241	608.8	160		3B2080
H	SMB	222	449.0	140		3B2084
H	SMB	209	364.4	110		3B2079
H	SMB	208	340.5	120		3B2081
H	SMB	206	353.4	110		3B2085
H	WS	451	445.9	1180		3B2069
H	WS	382	508.2	650		3B2073
H	WS	367	512.5	600		3B2076
H	WS	353	276.6	500	294.7	3B2071

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SITE	SPP	LENMM	THg; ng/g	WGTG	Dup	TAGNO
H	WS	347	264.3	480		3B2075

DRAFT

SITE	SPP	LENMM	THg, ng/g	WGTG	Dup	TAGNO
D	WS	292	126.9	300		3B2007
D	WS	239	96.6	150		3B2005
D	WS	217	93.3	120		3B2006
E	PKSD	113	109.8	37.5		3B2017
E	RFP	162	193.8	33.333		3B2016
E	WS	344	149.8	490	154.3	3B2015
E	WS	343	197.7	490		3B2014
E	WS	341	186.2	500	182.3	3B2009
E	WS	265	115.1	230		3B2012
E	WS	226	111.0	150		3B2008
E	WS	223	98.1	150		3B2013
E	WS	205	66.3	110		3B2011
E	WS	186	74.6	80		3B2010
F	COSH	100	86.3	8.333		3B2018
F	RT	388	112.0	630		3B2028
F	WS	350	178.0	540		3B2025
F	WS	347	257.1	480		3B2026
F	WS	339	239.0	500		3B2024
F	WS	325	89.8	390		3B2019
F	WS	303	206.3	310		3B2022
F	WS	293	156.4	300		3B2027
F	WS	292	238.0	300		3B2020
F	WS	285	293.0	290		3B2021
F	WS	284	231.1	280		3B2023
G	BT	247	47.0	180		3B2039
G	RT	364	117.0	520		3B2042
G	RT	255	56.4	160		3B2040
G	WS	425	284.4	910		3B2032
G	WS	414	189.1	900		3B2033
G	WS	385	279.5	670		3B2030
G	WS	380	122.0	610		3B2034
G	WS	368	228.9	560		3B2029
G	WS	352	159.6	500	147.9	3B2035
G	WS	314	213.5	350		3B2031
G	WS	307	119.7	330		3B2036
G	WS	292	159.4	300		3B2037
G	WS	205	75.3	110		3B2038
H	SMB	241	608.8	160		3B2080
H	SMB	222	449.0	140		3B2084
H	SMB	209	364.4	110		3B2079
H	SMB	208	340.5	120		3B2081
H	SMB	206	353.4	110		3B2085
H	WS	451	445.9	1180		3B2069
H	WS	382	508.2	650		3B2073
H	WS	367	512.5	600		3B2076
H	WS	353	276.6	500	294.7	3B2071

DRAFT

SITE	SPP	LENMM	THg, ng/g	WGTG	Dup	TAGNO
H	WS	347	264.3	480		3B2075

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From ISMP Web Site
7/20/01

Alcove and Basic Reservoir Mercury Comparisons

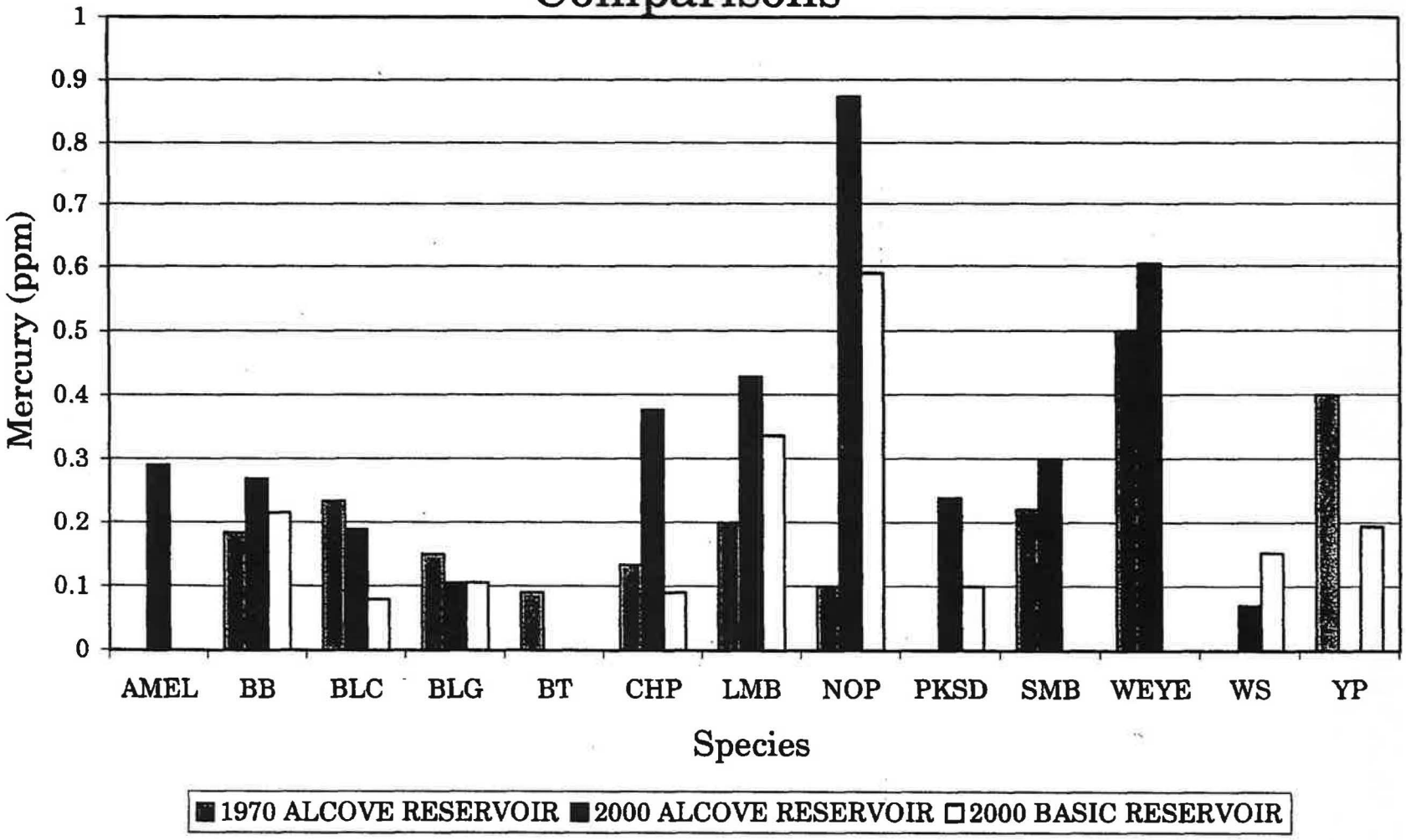

Table 1. Summary of mercury concentrations in eleven species of fish from the Alcove Reservoir, Albany County, New York collected April, 2000. The values shown are the averages for the sample set followed by the minimum and maximum values in parentheses.

Species	Number Analyzed	Length (mm)	Weight (g)	Hg (ppm)
American eel	5	929 (920 - 955)	1576 (1494 - 1670)	0.29 (0.18 - 0.35)
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Black crappie	10	310 (241 - 368)	515 (218 - 860)	0.19 (0.04 - 0.40)
Bluegill	10	196 (164 - 249)	174 (90 - 348)	0.10 (0.05 - 0.16)
Chain pickerel	10	527 (431 - 662)	884 (488 - 1798)	0.38 (0.17 - 0.83)
Largemouth bass	6	409 (374 - 466)	1024 (774 - 1268)	0.43 (0.34 - 0.54)
Northern pike	6	845 (590 - 1037)	4622 (922 - 8392)	0.87 (0.45 - 1.27)
Pumpkinseed	10	215 (174 - 233)	241 (114 - 312)	0.24 (0.12 - 0.46)
Smallmouth bass	1	406	952	0.30
Walleye	10	484 (452 - 546)	979 (782 - 1416)	0.60 (0.45 - 0.74)
White sucker	1	455	1200	0.07

Analytical Results for Mercury Analyses (WATER)

Frontier Geosciences Inc.

Case Numbers: HRL01 **Units:** ng/L

SDG Number: F10301

Sample ID	Dissolved Mercury
BBN-1661	2.78
BBS-1661	1.04
C-1661	4.36
H-1661	2.02
HH-1661	2.04
G-1661	2.07
F-1661	1.99
FF-1661	2.76
E-1661	2.39
D-1661	3.56
CD-1661	3.19
B-1661	2.53
A-1661	1.58
AA-1661	1.60

Analytical Results for Mercury Analyses (SEDIMENT)

Frontier Geosciences Inc.

Case Number: HRL01 **SDG Number:** D10301 **Units:** ng/g DB

Sample ID	Total Mercury
BBS-SED	175
BBN-SED	91.6

Shipped 10/29/01

Frontier Geosciences Inc.

Environmental Research & Specialty Analytical Laboratory

414 Pontius Avenue North, Suite B Seattle WA 98109
(206) 622-6960 fax (206) 622-6870 Info@Frontier.WA.com

Chain-of-Custody Record & Laboratory Analysis Request

Date: 10/26/01 Page: 1 of 3

Client Company: New York State DEC
Address: 625 Broadway, 12th Floor
Albany, NY 12233-7013
CONTACT: Michael Mason
Phone: (518) 402-9814 Fax: (518) 402-9819
Email: mamason@gw.dec.state.ny.us
Project Name: Nepera
Contract/PO #:

Frontier Project Manager: M.B. Miller
Guaranteed Turnaround Time:
Confirmation of Sample Arrival at Frontier: ☒ YES ☐ NO
Quality Assurance Level: ☒ Standard ☐ High
Disposal*: ☒ Frontier Dispose ☐ Return to Client ☐ Ship to 3rd Party**
*All samples are held for at least 2 months after date of receipt.
Please note that after this time they are disposed of or returned to the client.
Clients may request a longer holding time by writing to the Frontier Project Manager.
**Please discuss this with the Frontier Project Manager.
Carrier Information: FED EX ☐ UPS ☒ Other ☐
Tracking #

Engraved Bottle ID	Sample ID	Matrix[1]	# Bottles	Date/Time Sampled		Collected by	Preservation	Analysis Required/Comments
C-343	BBN-1661	FW	1	10/25/01	10:00	R/M	N/A	1631 Dissolved Hg
C-916	BBS-1661	FW	1	10/25/01	10:25	R/M	N/A	1631 Dissolved Hg
C-962	C-1661	FW	1	10/25/01	11:01	R/M	N/A	1631 Dissolved Hg
C-965	H-1661	FW	1	10/25/01	11:53	R/M	N/A	1631 Dissolved Hg
C-932	HH-1661	FW	1	10/25/01	12:12	R/M	N/A	1631 Dissolved Hg
C-948	G-1661	FW	1	10/25/01	12:35	R/M	N/A	1631 Dissolved Hg
C-581	F-1661	FW	1	10/25/01	12:53	R/M	N/A	1631 Dissolved Hg
C-052	FF-1661	FW	1	10/25/01	13:33	R/M	N/A	1631 Dissolved Hg
C-926	E-1661	FW	1	10/25/01	13:45	R/M	N/A	1631 Dissolved Hg
C-475	D-1661	FW	1	10/25/01	15:05	R/M	N/A	1631 Dissolved Hg

Sample Receipt
C.O.C. Seal Intact? ☐ YES ☐ NO ☐ N/A
Cooler Temperature: °C
Comments:
VTSR:

[1]Matrix Codes:
FW = fresh water (salinity < 0.5 ppth)
BW = brackish water
SW = seawater
WW = wastewater
SE = sediment
SO = soil
AT = animal tissue
PT = plant tissue
TR = trap
PP = petroleum product
OT = other

Relinquished by: Michael Mason	Relinquished by:
Print name: MICHAEL MASON	Print name:
Company: NYSDEC	Company:
Date: 10/29/01 Time: 11:10	Date: Time:
Received by:	Received by:
Print name:	Print name:
Company:	Company:
Date: Time:	Date: Time:

Frontier Geosciences Inc.

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Chain-of-Custody Record & Laboratory Analysis Request

Date: 10/26/01 Page: 2 of 3

Client Company: New York State DEC	Frontier Project Manager: M.B. Miller
Address: 625 Broadway, 12th Floor Albany, NY 12233-7013	Guaranteed Turnaround Time:
CONTACT: Michael Mason	Confirmation of Sample Arrival at Frontier: ☒ YES ☐ NO
Phone: (518) 402-9814 Fax: (518) 402-9819	Quality Assurance Level: ☒ Standard ☐ High
Email: mamason@gw.dec.state.ny.us	Disposal*: ☒ Frontier Dispose ☐ Return to Client ☐ Ship to 3rd Party**
Project Name: Nepera	*All samples are held for at least 2 months after date of receipt. Please note that after this time they are disposed of or returned to the client. Clients may request a longer holding time by writing to the Frontier Project Manager. **Please discuss this with the Frontier Project Manager.
Contract/PO #:	Carrier Information: FED EX ☐ UPS ☒ Other ☐
	Tracking #

Engraved Bottle ID	Sample ID	Matrix[1]	# Bottles	Date/Time Sampled		Collected by	Preservation	Analysis Required/Comments
C-072	CD-1661	FW	1	10/25/01	15:30	R/M	N/A	1631 Dissolved Hg
C-409	B-1661	FW	1	10/25/01	15:50	R/M	N/A	1631 Dissolved Hg
C-805	A-1661	FW	1	10/25/01	16:12	R/M	N/A	1631 Dissolved Hg
C-925	AA-1661	FW	1	10/25/01	16:25	R/M	N/A	1631 Dissolved Hg
		FW						
		FW						
		FW						
		FW						
		FW						
		FW						

Sample Receipt

C.O.C. Seal Intact? ☐ YES ☐ NO ☐ N/A

Cooler Temperature: °C

Comments:

VTSR:

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Relinquished by: Michael Mason	Relinquished by:
Print name: MICHAEL MASON	Print name:
Company: NYSDEC	Company:
Date: 10/29/01 Time: 11:10	Date: Time:
Received by:	Received by:
Print name:	Print name:
Company:	Company:
Date: Time:	Date: Time:

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Chain-of-Custody Record & Laboratory Analysis Request

Date: 10/26/01 Page: 3 of 3

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Phone: (518) 402-9814 Fax: (518) 402-9819	Quality Assurance Level: ☒ Standard ☐ High
Email: mamason@gw.dec.state.ny.us	Disposal*: ☒ Frontier Dispose ☐ Return to Client ☐ Ship to 3rd Party**
Project Name: Nepera	*All samples are held for at least 2 months after date of receipt. Please note that after this time they are disposed of or returned to the client. Clients may request a longer holding time by writing to the Frontier Project Manager. **Please discuss this with the Frontier Project Manager.
Contract/PO #:	Carrier Information: FED EX ☐ UPS ☑ Other ☐ Tracking #

Engraved Bottle ID	Sample ID	Matrix[1]	# Bottles	Date/Time Sampled	Collected by	Preservation	Analysis Required/Comments
N/A	BBS-SED	SE	1	10/25/01 10:29	R/M	N/A	Hg Total
N/A	BBN-SED	SE	1	10/25/01 10:00	R/M	N/A	Hg Total

Sample Receipt

C.O.C. Seal Intact? ☐ YES ☐ NO ☐ N/A

Cooler Temperature: °C

Comments:

VTSR:

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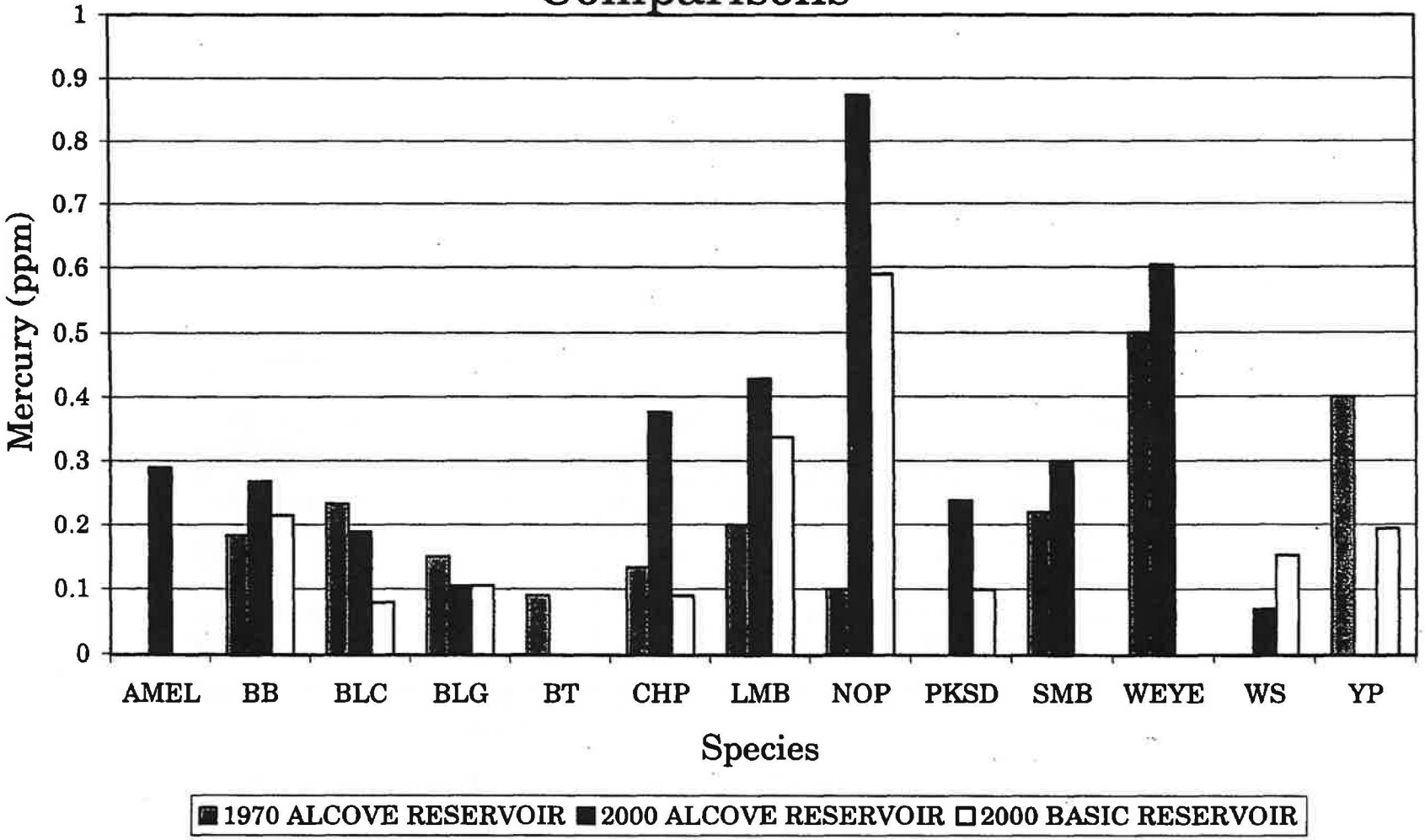
Date: 10/29/01 Time: 11:10	Date: Time:
Received by:	Received by:
Print name:	Print name:
Company:	Company:
Date: Time:	Date: Time:

7/20/01

Alcove and Basic Reservoir Mercury Comparisons



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MEMORANDUM

TO: Michael Mason, DER

FROM: Richard Koeppicus, Hazardous Waste Site Evaluation Unit, Bureau of Habitat, Division of Fish, Wildlife and Marine Resources

DATE: April 16, 2001

SUBJECT: Nepera Harriman Site 336006. Fish sampling of the Ramapo River.

Attached is a Ramapo fish sampling plan to determine fish tissue concentrations of mercury, the desired role of Nepera in this sampling, fish tissue preparation procedures and a list of laboratories with which NYSDEC has had experience regarding mercury analysis in fish tissue. The packet should be sent to Nepera in order to initiate discussions with them about their desired participation in this sampling effort.

The items are brief but should be sufficient enough to provide a basis for more detailed discussions, telephone calls etc..

I have discussed the fish collection plan with the regional fisheries folks and they believe some of the sampling stations might not be suitable for sampling because of access problems or might not provide adequate samples of fish but they will do their best to reach the plan's goals. They believe sampling is likely to occur sometime between late June a nd August.

cc: via e-mail Figure to be sent by mail
C. Dowd -SS/PC
M. Moran
W. Elliot
L. Surprenant

Fish Sampling Plan in the Vicinity of Nepera Harriman Inactive Hazardous Waste Site 3-36-006, Harriman, New York for the Purposes of Determining Fish Tissue Concentrations of Mercury of Fish Resident in the Ramapo River and Potential Source Areas of Mercury Contributing to those Concentrations

Overview The Nepera Harriman Inactive Hazardous Waste Site 3-36-006 (Site) is listed, in part, as a NYS hazardous waste site because mercury was used in chemical production at the Site and was released to the environment and/or disposed at the site. Mercury is known to be present in Site soils, groundwater and SPDES outfall and is known to be the result of its use at the Site. Additionally, surface water concentrations of mercury, in the Ramapo River, adjacent to the Site (29.5 ng/l) are elevated relative to upstream concentrations (2.05 ng/l)[1,2]. Concentrations of mercury in biota in the vicinity of the Site have never been determined to see if there is risk to humans from consumption of fish or to wildlife consumers of fish[3]. The sampling proposed in this plan will be used to determine if such risks actually exist and potentially to focus on areas as source areas for mercury contributions to the Ramapo River.

Sampling Design General Principles The sampling design contained in this plan will gather information to determine the threats to human consumers of fish and wildlife consumers of fish and the magnitude of these risks by Ramapo River reach. In general, fish that are captured that are less than 6" total length and analyzed for total mercury (whole body analysis) will be used for determining risks to wildlife consumers of fish. Fish greater than 6" total length will have their fillets removed, total mercury determined and be used for determining risks to human consumers

---

[1] Memorandum to Richard E. Draper, Division of Water, from Joseph Marcogliese, Region 3 Water Engineer December 27, 2000.

[2] The Marcogliese memorandum does not specify whether total mercury or dissolved mercury was measured. If the values are total mercury then the values meet the human health water supply standard of 0.7 µg/l. However, total mercury values do not allow for any conclusions to be drawn about the water quality standards to protect human consumers of fish (.00007 µg/l), aquatic life(0.77 µg/l chronic, 1.4 µg/l acute) or protection of wildlife (0.0026 µg/l) which are dissolved mercury.

[3] The DEC Publication Technical Report 87-4 (BEP) Division of Fish and Wildlife *Toxic Substances in fish and Wildlife Analyses since May 1, 1982 Volume 6* September, 1987, New York State Department of Environmental Conservation pp 60-62, reports mercury concentrations in fish captured in Sloatsburg, NY approximately 12 miles downstream in the Ramapo River. This location, because of its distance from the Site, is considered to be of limited value for assessing mercury concentrations at the site. Regardless, it is proposed to be sampled again in this plan to be a measure of possible historic changes in mercury concentrations in fish within the Ramapo River watershed.

of fish[4]. Ideally, the same species of fish less than 6" and the same species of fish greater than 6" (the species of fish in the less than and greater than categories do not necessarily have to be the same) can be captured in sufficient quantities in river reaches A through H (see Figure 1) to eliminate inter species differences in bioaccumulation of mercury. It is considered highly unlikely that the same species of fish less than 6" and greater than 6" will be available in all reaches given that the reaches are known to be very dissimilar habitats. "Targets of opportunity" within each reach will have to be utilized, though smallmouth bass and rock bass are suggested as possibilities from the information available in the DEC 1987 report.[5]

Sampling Locations Sampling locations are approximately delineated on Figure 1 and are based on the sampling information primarily the Marcogliese memorandum (footnote 2) and other information from Site related documents. All sample reaches are from the Ramapo River proper. If the analytical data show potential for risks to wildlife or human consumers of fish then another phase of sampling may be required in tributaries adjacent to these reaches to determine potential source areas.

Reach A This reach is in the vicinity of River Road and Meadow Avenue and will serve as background. Fish from this reach cannot be influenced by discharges from the Orange County Sewer District #1 Outfall 001since an in place dam exists upstream of these potential mercury sources. This dam prevents the upstream movement of fish that could have been exposed to these potential sources from reaching Reach A. Downstream movement of fish from Reach A by passing over the dam is possible. Reach A surface water concentrations of total mercury are 2.05ng/l.

Reach B This Reach extends from the dam upstream of the Orange County Sewer District Outfall 001 to the Nepera SPDES outfall (marked by a SPDES sign). Fish tissue concentrations from this reach should reflect possible mercury contamination from the OCSD Outfall 001 and Nepera groundwater contributions to the Ramapo River. Due to the closeness of the OCSD Outfall 001 and the Nepera property and the mobility of fish it would be highly unlikely that separate collections by Outfall 001 and the Nepera property would produce unambiguous differences in fish tissue concentrations of mercury. Reach B surface water concentrations of mercury are 3..68 ng/l.

Reach C This reach extends from the Nepera SPDES outfall to a location just upstream of what appears in Figure 1 to be a manmade wetland drainage system entering on the west side of the Ramapo River, a short distance upstream of the tributary marked as 23B in Figure 1, entering the Ramapo River from the east. Fish collected from this reach will be used to evaluate potential mercury contributions from groundwater and the SPDES outfall from the Nepera site. The surface water concentration of total mercury is 29.5 ng/l.

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[4] Greater detail on preparation of fish samples of less than 6"' and greater than 6" prior to total mercury analysis are attached.

[5] See footnote 3 for citation.

Reach D This reach extends from the manmade wetland drainage system (as above) to a location just upstream of tributary 23A entering the Ramapo River from the east (see Figure 1). Fish analyzed from this reach will be used to determine potential contributions of mercury, from the manmade wetland drainage and tributary 23B to fish tissue concentrations of mercury. There is no surface water data available, with respect to mercury, for this reach.

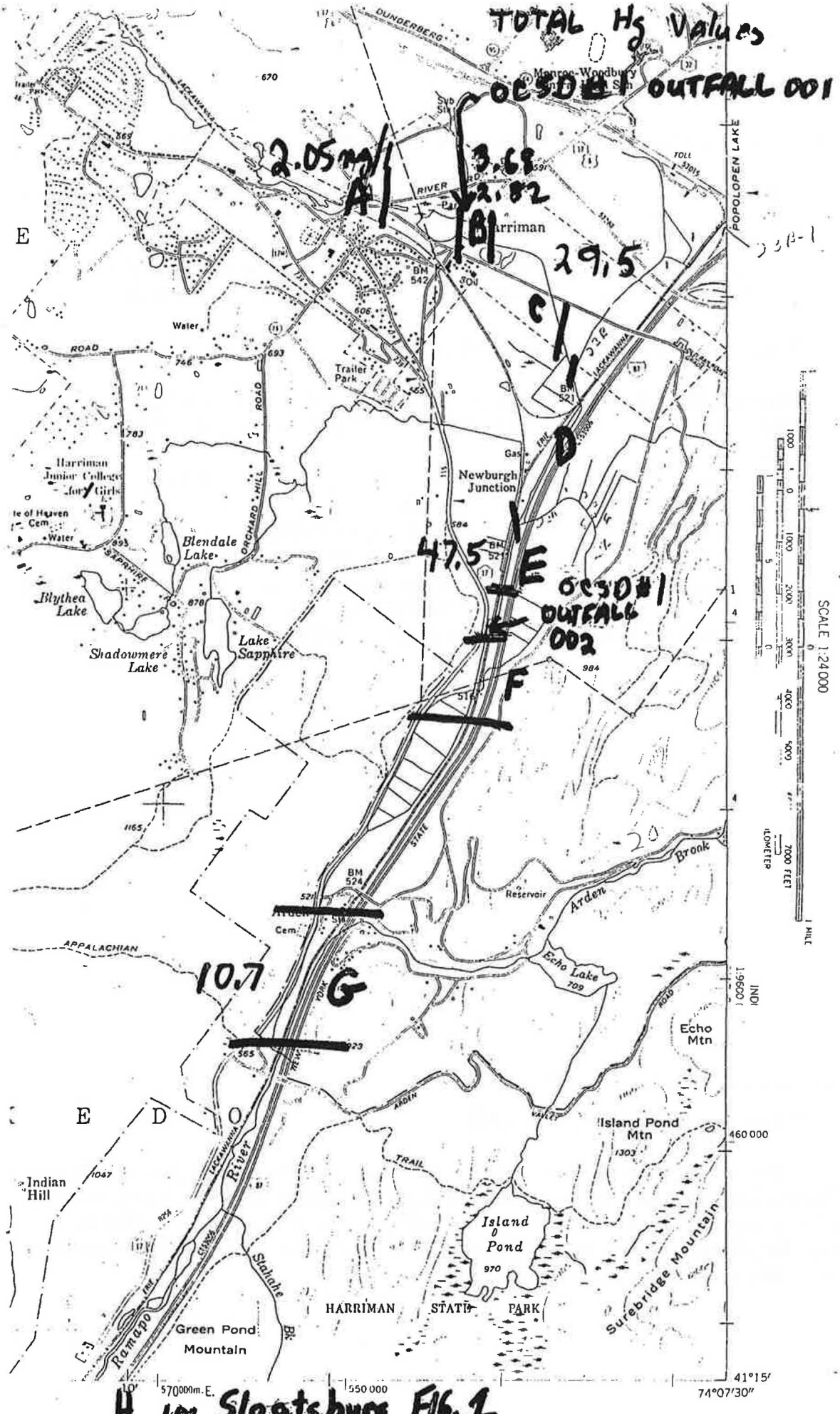
Reach E This reach extends from just downstream of tributary 23A to just upstream of the Orange County Sewer District Outfall 002. This reach will be used to measure the influence of the tributary, having its origin from Lake Sapphire, entering the Ramapo River from the west on fish tissue mercury concentrations. This reach has the highest surface water concentrations of mercury recorded by NYSDEC (see footnote 3), 47.5 ng/l.

Reach F This reach extends just downstream of the Orange County Sewer District Outfall 002 to approximately 500' downstream of the Ramapo River bifurcation. This reach will be used to measure the influence of Outfall002 on fish tissue concentrations of mercury. No surface water concentrations of mercury have been recorded in this reach.

Reach G This reach is only approximated on Figure 1. It extends from downstream of Arden Road to a distance of sufficient length to obtain the targeted fish samples. The surface water mercury concentrations in this reach are 10.7 ng/l.

Reach H This reach is in Sloatsburg and does not appear on Figure 1. Fish tissue concentrations exist for this location. Samples were taken by NYSDEC in July 1983. Though this reach is about 12 miles from the Nepera Site it is part of the sampling program and will be used for comparative purposes to see if there have been any overall changes in mercury concentrations over time in the Rampo River watershed.

Number of Chemical Analyses The number of tissue analyses from the above reaches is 80. Additional analyses to meet the quality assurance and control requirements of Table 1 are also needed. Field changes in sampling could alter this estimate.


TOTAL Hg Values
OCSD OUTFALL 001
2.05 ng/l
A
3.68
2.82
B
29.5
C
D
47.5
E
OCSD #1
OUTFALL
002
F
10.7
G
E
D
H in Sloatsburg
DUNDERBERG
Monroe-Woodbury
POPOLOPEN LAKE
RIVER
Harriman
Water
ROAD
Trailer Park
LACKAWANNA
Newburgh Junction
Harriman Junior College for Girls
Isle of Heaven Cem.
Blendale Lake
ORCHARD HILL
SAPPHIRE
Blythea Lake
Shadowmere Lake
Lake Sapphire
STATE
Reservoir
Arden
Brook
APPALACHIAN
Cem.
Echo Lake
Echo Mtn
Island Pond Mtn
TRAIL
Indian Hill
Ramapo River
Island Pond
Surebridge Mountain
HARRIMAN STATE PARK
Green Pond Mountain
Stadtahe Bk
570 000m. E.
550 000
460 000
41°15'
74°07'30"
SCALE 1:24000
1 MILE
1 KILOMETER
7000 FEET

Desired Role of Nepera In Ramapo River Determination of Mercury in Fish Tissue

1. Nepera will arrange for a chemical laboratory to prepare the fish tissue[1] and analyze it for total mercury for approximately 80 samples.

2. Nepera will arrange to receive samples from DEC field crews and provide suitable containers and holding conditions[2] for shipment to the selected chemical laboratory.

3. NYSDEC will provide Nepera with chain of custody forms.

4. Nepera will provide NYSDEC a report (a letter report is sufficient) that presents the analytical results for all fish samples delivered to Nepera by NYSDEC. In addition the report will contain
   a. Copies of the field collection sheets (to be provided by NYSDEC)
   b. Copies of the completed chain of custody
   c. A figure of fish sampling locations (to be provided by NYSDEC)
   d. A summary of analytical results by river location (includes individual sample results, average values for fish less than 6" and average values for fish greater than 6". This information should be table and figure format.
   e. Copies of all chemical laboratory analytical data sheets.

---

[1] Fish tissue preparations are attached.

[2] Keep fish samples as cool as possible. All fish must be kept at a temperature below 45°F immediately following data processing. During warm weather, keep fish on ice in a cooler and freeze later on. As soon as possible, freeze at 0°F to 10°F. Due to occasional freezer failures, daily freezer temperature logs are required. If fish are held more than 24 hours without freezing, they should not be retained or analyzed.

Fish Tissue Preparation Procedures

Tissue Preparation - Samples for determining fish consumption advisories

a. Procedures for Standard Filleting - The standard fillet is the portion of edible flesh analyzed for the purpose of obtaining information regarding **human health risks**. The methodology is slightly modified from the U.S. Food and Drug Administration procedures.
   i. Remove scales from fish. Do not remove the skin.
   ii. Make a cut along the ventral midline of the fish from the vent to the base of the jaw.
   iii. Make a diagonal cut from the base of the cranium following just behind the gill to the ventral side just behind the pectoral fin.
   iv. Remove the flesh and ribcage from one-half of the fish by cutting from the cranium along the spine and dorsal rays to the caudal fin.
   v. Score the skin and homogenize the entire fillet.

b. Modifications to Standard Filleting - The following modifications of the standard fillet procedure are designed to account for variations in fish size or known preferred preparation methods of the fish for **human consumption**.
   i. Some fish are too small to fillet by the above procedure. Fish less than approximately 6 inches long and rainbow smelt are prepared by cutting the head off from behind the pectoral fin and eviscerating the fish. Ensure that the belly flap is retained on the carcass to be analyzed. When this modification is used, it should be noted when reporting analytical results.

   ii. Some species are generally eaten by skinning the fish. The skin from these species is also difficult to homogenize in the sample. For the following list of species, skin the fish prior to filleting:
      (1) Brown, black and yellow bullhead
      (2) Atlantic sturgeon
      (3) White catfish
      (4) Channel catfish
      (5) Lake Sturgeon

   iii. Prepare American eel by removing the head, skin and viscera; do not attempt to fillet.

Fish Whole Body Analysis All fish should be analyzed whole to determine contaminant concentrations for risks to fish and wildlife. **Do not eviscerate or remove the head or scales before compositing.** Fish should be chopped and homogenized whole.

Laboratories Performing Total Mercury Analysis on Fish Tissue

Labs that are reliable for analysis of mercury include:

Cebam Analytical Inc., Seattle, WA
3927 Aurora Avenue North
Seattle, WA 98103

En Chem, Inc., Madison, WI
525 Science Drive
Madison, WI 53711-1060

Frontier Geoscience, Seattle, WA

Brooks Rand, Seatle, WA

The first two labs NYSDEC has contracts with. The Department has experience with the other two. All three Seattle firms do use ultraclean techniques for water, particle and air analyses. Fish analyses do not require such low detection limits so standard flameless atomic absorption methods are acceptable.

It is not known whether all laboratories can provide fish tissue preparation.