

(Mary)

1987

Wrightstown Sanitary District #1
- Greenleaf Ammonia Sample Results -
By Mary Gansberg
Department of Natural Resources

Wrightstown Sanitary District #1 has proposed that the effluent ditch from the Sewage Treatment Plant outfall to the confluence of the unnamed tributary of the East River has a sufficient distance to assimilate the ammonia-nitrogen effluent, thus meeting the water quality based limits for East River Tributary.

The Sewage Treatment Plant discharges to an effluent ditch and is classified as Marginal Surface Water. This ditch drains into an unnamed tributary of the East River which is classified as Intermediate aquatic life stream. Under Wisconsin Administrative Code NR 104.02 Marginal Surface Water, an effluent channel, has no surface water quality criteria for ammonia. But an Intermediate stream must meet a weekly average ammonia-nitrogen limit at all points in the receiving water not greater than 3 mg/L April through September nor greater than 6 mg/L November through March to minimize the zone of toxicity and to reduce dissolved oxygen depletion caused by oxidation of the ammonia.

To test the districts proposal, water quality data was collected four times during the summer. Water samples were analyzed for ammonia, dissolved oxygen, pH, and temperature. Stream flows were also taken. The data is summerize in Table 1.

Ammonia-nitrogen concentrations were reviewed in three ways.

First, we can compare the ammonia concentration at the outfall (GL-1) to the ammonia concentration of the effluent at the end of the ditch (GL-4). (See Table 1 and Diagram A). On one occasion there was no change. The ammonia concentration from GL-1 to GL-4 remained equal. On two other occasions there was only a slight decrease in ammonia from GL-1 to GL-4. And on one occasion a considerable decrease in ammonia concentration from the outfall to the end of the effluent ditch occurred. This suggests that under these conditions the distance of the ditch is not long enough to significantly decrease the ammonia concentration.

Second, we can compare the ammonia concentrations of the samples to the requirements in NR 104. Ammonia concentrations were below the limits for all four samples upstream of the tributary before confluence with the effluent ditch (GL-2). But at two separate times the ammonia concentrations were above the 3 mg/L limit (7.3 mg/L on August 5, 1987, and 3.7 mg/L on June 18, 1987) for the downstream site (GL-3). This indicates that the sewage treatment plant effluent is contributing to the high concentrations of ammonia in the tributary.

Third, we can determine the maximum or critical concentration ammonia-nitrogen can be at a specific pH and temperature before it becomes toxic to fish and aquatic life. (See chart #1). The principle toxicity problem is from ammonia in the molecular form (NH₃) which can adversely affect fish life in receiving waters. A slight increase in pH may cause a great increase in toxicity as the

ammonia ion (NH_4^+) is transformed to ammonia. These values were determined for the receiving water. The data shows the ammonia concentrations were always below the critical toxicity level in the upstream site (GL-2) but were over the toxic level two different times in the downstream site (GL-3). Again, this shows that the sewage treatment plant effluent is significantly increasing the ammonia levels of the receiving water to a concentration that is greater than the toxic limit.

To conclude, looking at this tributary in a biological perspective, I feel there is a significant decrease in water quality of the tributary to the East River by the ammonia concentration in the effluent from the Wrightstown Sanitary District #1 Greenleaf Plant.

(Total Ammonia vs Temperature at various pH values)
 Ammonia Toxicity - Warm Water Fishery (Chart #1)

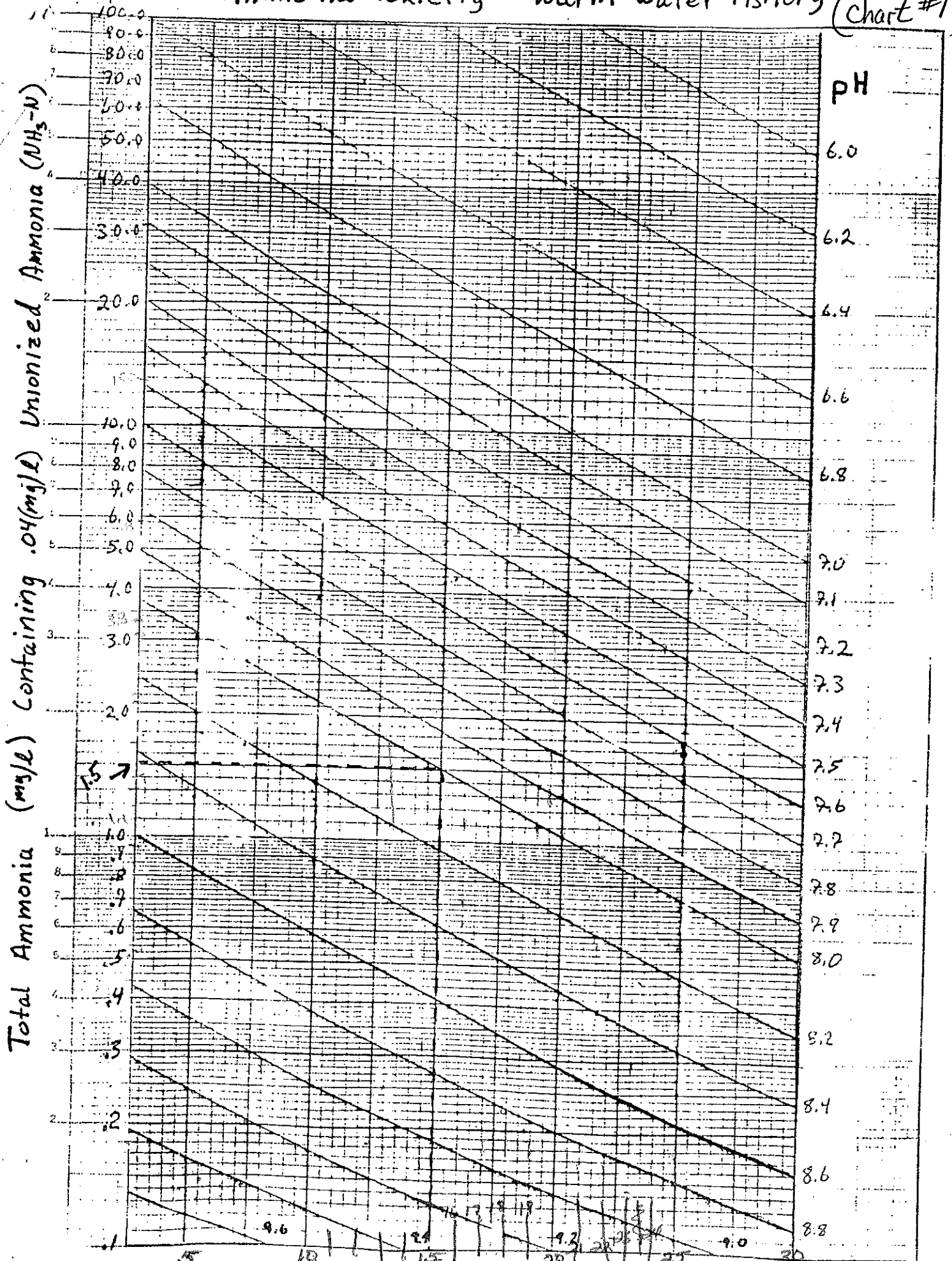


DIAGRAM A

Simplified diagram of ditch and tributary showing sample sites

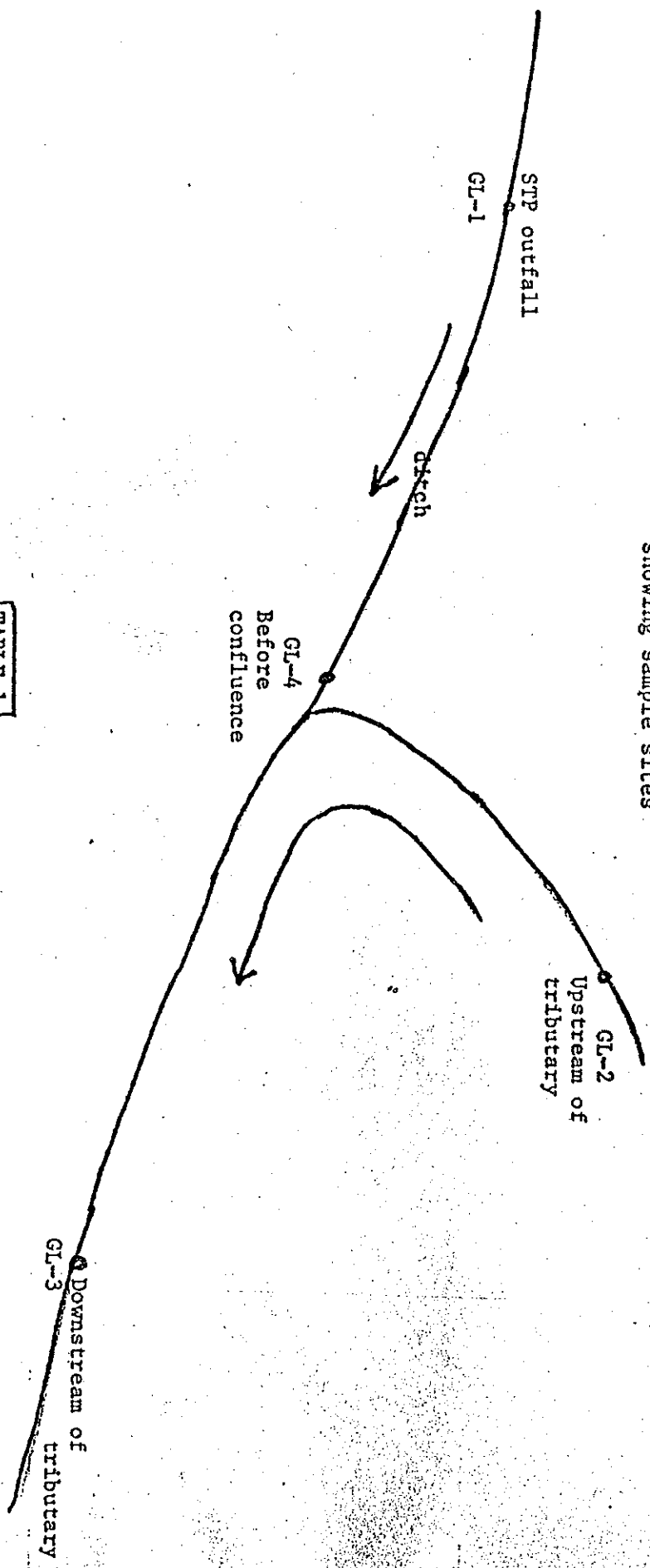


TABLE 1

DATE	(GL-1)			(GL-4)			(GL-2)			(GL-3)			
	PH	Temp. (mg/l) Deg. C	Critical NH ₃ -N (mg/l)	PH	Temp. Deg. C	Critical NH ₃ -N (mg/l)	PH	Temp. Deg. C	Critical NH ₃ -N (mg/l)	Flow CFS	PH	Temp. Deg. C	Critical NH ₃ -N (mg/l)
5/20/87	7.3	18	4.9	5.8	7.9	17.8	0.25	1.5	7.02	8.1	13	0.59	1.3
6/18/87	7.6	17.5	18	3.1	8.0	21.5	0.47	0.95	2.9	7.9	21.5	3.7	1.2
7/23/87	5.8	21	12	—	6.4	23.5	0.51	31	4.1	6.6	23	1.4	20
8/05/87	7.5	19.5	21	3.3	7.8	19.5	20	1.7	8:0	19	0.78	1.1	.98

2 above

3 above

all below

3 above

CORRESPONDENCE / MEMORANDUM STATE OF WISCONSIN

Date: October 29, 1992

File Ref: 3200

To: Bob Behrens
Linda Vogen

From: Tim Doelger *Doelger*
Mary Gansberg *Mary*

Subject: Ammonia Limits at Greenleaf

Mary and I have discussed the need for ammonia limits for this discharge and although we recognize that there may be some impact, we feel that it is insignificant when compared to the NPS contribution in the basin. At this time it is our opinion that eliminating ammonia limits at Greenleaf will not have a negative impact on water quality or the biota in the system.

However, if the implementation of BMPs in the East River Priority Watershed should significantly improve water quality in the future, we may have to reevaluate this opinion.

TD:cm

Tim;

RE: Greenleaf Ammonia Limits

Bob's comments (10/21/87) reflect the incorrect data table that was in the report. The correct table was sent to you - but evidently too late. No wonder Bob questioned the results and my conclusions! Attached is the correct data table which, in my mind, still supports my original conclusion: Ammonia concentrations in the effluent does cause a significant decrease in water quality of the tributary to the East River.

However, several considerations come to mind:

- Ammonia toxicity was only critical during the lowest flows (3+1 cfs). When flows were higher (4+7 cfs), no critical toxicity problems exists downstream of the confluence. So you could guess that ammonia is only a problem during very low flows. Also, these critical values are calculated for warmwater fisheries. I know this stream is classified as intermediate aquatic life, but is there really much of a fishery in this trib. during the very low flow periods of summer - could there be? I doubt it.

Personally, I feel the stream's potential

↑ we decided - NO ammonia limits to

is limited because of other factors (NPS/Habitat) and that this discharge only sacrifices the stream for a short distance, and for a short period of time. Is that acceptable?

I based my original conclusion on the stream classification and that the WWTP was not meeting those standards 50% of the sample period.

Hope this helps. Any questions see me.

Mary

CORRESPONDENCE / MEMORANDUM ----- STATE OF WISCONSIN

Date: October 20, 1987

File Ref: 3200

To: Linda Vogen

From: Dennis C. Weisensel

Dennis

Subject: NH₃-N Limits At Greenleaf - Wrightstown Sanitary District #1

It is my understanding that Gary Kincaid requested WRM to conduct an Impact Study at Greenleaf to determine if the NH₃-N limits for the Treatment Facility can be removed.

Monitoring was conducted on 4 different occasions during this past summer. The data clearly indicates, that on 3 of the 4 occasions, NH₃-N exceeded the critical level at the end of the effluent ditch(GL-4). It is clear that Greenleaf has an NH₃-N problem. It will be necessary to continue NH₃-N limits in the WPDES permit.

Your concern about NH₃-N problems in the upstream(GL-2) area is understandable. We are hopeful that the East River Priority Watershed will receive funding in the next year which should begin to address those kinds of non-point problems.

cc: Gary Kincaid
Bob Behrens
Tim Doelger
Mary Gansberg - SD

DEPT. OF NATURAL RESOURCES
SD HEALTH DIVISION

RECEIVED

10/23/87