Duke Power Company
Catawba Nuclear Generation Department
4800 Concord Road
York, SC 29745

D. L. Rehn
Vice President
(803)831-3205 Office
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DUKE POWER

April 25, 1994

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Subject: Catawba Nuclear Station
Docket Nos. 50-413 and 50-414
Annual Environmental Operating Report
Calendar Year 1993

Attached is the 1993 Annual Environmental Operating Report which is required by the Environmental Protection Plan (Appendix B to the Catawba Facility Operating License). The report consists of the following enclosures:

Enclosure I "Summaries and Analysis of Results of Activities Required by the Environmental Protection Plan (EPP)", and

Enclosure II "Final Report On The Effects Of Cooling Tower Drift On Vegetation At Catawba Nuclear Station", and

Enclosure III "Copy of Non-routine Event Reports Sent to the South Carolina Department of Health and Environmental Control".

Very truly yours

D. L. Rehn

Attachment

JTH/AEOR 1993

Photo to: RegFiles

IE25
1/1

xc w/o attachment: S. D. Ebneter
Regional Administrator, Region II

R. J. Freudenberger
Senior Resident Inspector

R. E. Martin, ONRR

bxc w/o attachment: C. T. Peed
Z. L. Taylor
J. S. Carter
ELL - EC050
Group File: 801.01
Catawba Document Control: 801.01

ENCLOSURE I

Summaries and Analysis of Results of Activities Required by the Environmental Protection Plan (EPP)

Summaries and Analysis of Results of Activities Required by the Environmental Protection Plan (EPP)

Section 4.2.1 - Aerial Remote Sensing

Pre-operational infrared photographs were obtained in 1983 and 1984. Operational data was obtained again in 1985, 1986, 1987, 1990, 1991, and 1993. The report is included as Enclosure II and the photographs as Attachment A. Monitoring in 1993 revealed chlorine damage to both coniferous and deciduous trees within one hundred seventy five (175) meters of the cooling tower yard. All damage is restricted to this area of the plant site and does not extend beyond the site boundary.

This monitoring and report completes the requirements of the EPP Section 4.2.1 - Aerial Remote Sensing.

Section 5.4.1(1) - EPP Non-Compliance and Corrective Actions

No noncompliance's of the EPP for Catawba Nuclear Site in 1993.

Section 5.4.1(2) - Changes in Station Design or Operation, Tests, and Experiments Which Involve a Potentially Significant Unreviewed Question

No station changes were identified that involved a potentially significant unreviewed environmental question.

Section 5.4.1(3) - Non-routine Reports Submitted in Accordance with Subsection 5.4.2 of the EPP

A copy of all items listed is included in Enclosure III.

1. A request to conduct a test using sodium bromide as a treatment chemical in the cooling towers was submitted May 27, 1993.

2. A request to conduct a test using a floating aerator in the sanitary waste system was submitted June 1, 1993.

3. Approval to discharge Clam-Trol 1 was received from South Carolina Department of Health and Environmental Control (SCDHEC) June 8, 1993.

4. A report documenting the release of Clam-Trol 1 above permitted levels was submitted July 20, 1993.

5. Approval to modify the sanitary waste treatment system to remove chlorine prior to discharge to Lake Wylie was received from SCDHEC June 28, 1993.

6 A Toxicity Evaluation Plan was submitted to SCDHEC July 28, 1993 in response to a test failure which occurred April 4, 1993.

7. A request to drain the site cooling towers to the yard drain system was submitted August 31, 1993.

8. A request to use sodium molybdate as a maintenance chemical in closed cooling systems was submitted August 31, 1993.

9. A request to reduce the frequency for toxicity testing from monthly to quarterly was submitted September 30, 1993.

10. Approval to reduce the frequency for toxicity testing from monthly to quarterly was received from SCDHEC November 5, 1993.

11. A Toxicity Evaluation Plan was submitted to SCDHEC November 19, 1993 in response to a test failure which occurred October 4, 1993.

12. Approval to use sodium molybdate as a corrosion inhibitor was received from SCDHEC November 22, 1993.

13. A request to perform a chemical metal cleaning on the Unit 2 steam generators was submitted December 28, 1993.

14. Approval to perform a chemical metal cleaning was received from SCDHEC February 16, 1994.

15. An additional request to use sodium bromide as a maintenance chemical in the cooling towers was submitted April 20, 1994.

Section 5.4.1(4) - NPDES Reports Related to Matters Identified in Section 2.1 of the EPP

1. Discharge Monitoring Reports Submitted to SCDHEC

Date Submitted	Period Covered
February 26, 1993	January, 1993
March 26, 1993	February, 1993
April 28, 1993	March, 1993
May 28, 1993	April, 1993
June 28, 1993	May, 1993
July 28, 1993	June, 1993
August 27, 1993	July, 1993
September 28, 1993	August, 1993
September 28, 1993	July, 1993 (Amended)
October 28, 1993	September, 1993
November 29, 1993	October, 1993
December 28, 1993	November, 1993
January 28, 1994	December, 1993

ENCLOSURE II

Final Report On The Effects Of Cooling Tower Drift On Vegetation At Catawba Nuclear Station

FINAL REPORT ON THE EFFECTS OF COOLING TOWER DRIFT ON VEGETATION AT CATAWBA NUCLEAR STATION

INTRODUCTION

The Catawba Nuclear Station Non-Radiological Environmental Protection Plan requires that the Catawba site be monitored for possible effects of cooling tower drift on vegetation. This monitoring began the first September following operation of Unit 1 and encompassed a 9-year period from the time Unit 1 began operating. Unit 1 generation began in January 1985; Unit 2 generation began in July 1986. This report describes the final results of the monitoring program and satisfies the requirements of the operating license in regard to the effects of cooling tower drift on terrestrial vegetation.

The Catawba Environmental Report (ER) indicated that the area within the NE and SW sectors approximately 300 m from the center of the cooling tower yard would receive maximum drift deposition. Total dissolved solids (TDS) in the drift were projected to be in the range of 350 to 500 mg/l, based on the influent makeup water TDS of 60 mg/l and an operating range of 7 to 10 cycles of concentration.

Drift deposition rate calculations in the Catawba ER predicted total solids deposition rates of 2-3 kg/ha/month (2-3 lb/acre/month) based on 350 to 500 mg/l of TDS in drift. The Catawba Final Environmental Statement indicated that thresholds for visible leaf damage in sensitive plants fall in the range of 10 to 20 kg/ha/month (9-18 lb/acre/month). Since the predicted solids deposition rates at the Catawba site were less than the vegetative thresholds by factors of approximately 3- to 10-fold, drift from the Catawba cooling towers was not expected to result in adverse impacts on site vegetation within or beyond the cooling tower yard or plant boundaries.

With current operating conditions, the actual concentration of TDS in cooling water typically ranges from 60 to 400 mg/l. On average, less than 3 cycles of concentrations are reached in cooling water before more makeup water is added.

Sodium hypochlorite, organic biocides, and dispersants have been periodically used to treat cooling water in the past. Current procedures rely on a dispersant (Calgon PCL-4000) and sodium hypochlorite treatments which attain a concentration of about 0.5 mg/l of chlorine in the cooling water. These treatments occur on alternate days during summer and twice per week during winter.

METHODS

The condition of Catawba Nuclear Station site vegetation has been monitored by color infrared (IR) aerial photography, supplemented by annual ground level visual inspection of site vegetation, since 1983. Aerial photography was performed in September 1983 and 1984 (preoperational), in September 1986 (first operational growing season for both units), in September 1987 (second operational growing season), in January 1990 (due to Hurricane Hugo), September 1991 (fifth operational growing season), and in September 1993 (seventh operational growing season). Ground level observations were made to

support aerial photography. Conclusions based on inspections of the IR photographs and ground level observations through 1991 were presented in the Catawba 1991 Annual Environmental Operating Report. The present report summarizes all information collected with emphasis on data collected from 1992-94.

Aerial IR photography was obtained using Kodak IR Type 2443 film at 1:6000 (1 in = 500 ft) scale on 6 September 1983, on 2 September 1984, on 14 September 1986, on 23 September 1987, on 3 January 1990, on 14 September 1991, and on 23 September 1993. Vegetation shown in the photographs within a radius of approximately 1 km of the cooling tower yard was inspected for evidence of dead or damaged foliage and compared with photographs remote from the plant. Photographs were interpreted using Murtha (1972, 1984) as a guide. Intensive field inspections were performed on 26 March 1992, 12 May 1992, 10 and 17 September 1992, 15 July 1993, and 10 January 1994, for preparing this final report.

RESULTS AND DISCUSSION

Forested areas located within 1 km of the towers consist of mixed pine-hardwoods, loblolly pine plantations, mixed shortleaf-Virginia pine stands, and mixed hardwoods. These stands are described in Duke Power (1975).

Analysis of the 1993 IR photography revealed no vegetation anomalies that could be attributed to operation of the cooling towers. Small openings in the forest canopies, individual tree mortalities, and vegetation discoloration were apparent inside the study area and at areas remote from the plant. Color variations were primarily associated with premature leaf senescence in some deciduous trees (primarily tulip poplar) due to drought conditions. As discussed later, the primary sign of vegetation stress from cooling tower drift that was present at the time of the photography was thin crowns of pines and leaf anomalies on deciduous trees. This could not be distinguished in the photographs.

Ground inspection of vegetation in the 1-kilometer study area revealed several types of vegetation damage:

- Needle-tip necrosis associated with cooling tower drift.
- Cupped, flecked, and necrotic leaves associated with exposure to cooling tower drift.
- Pine and deciduous tree mortality attributed to exposure to cooling tower drift.
- Pine mortalities caused by Southern pine beetles.
- Remnants of damage from Hurricane Hugo.
- Pine tip moth damage to the apical stem of young pines.

Needle-tip necrosis or "needle scorch" was observed on loblolly pines in 1987 on the north side of the cooling towers and at a distance of about 60 m from the edge of the towers. This condition was only apparent on pines closest to the towers, and new growth did not exhibit these signs. Newly formed needles of these trees examined later in the growing season were healthy. In 1991, needle scorch was observed in all yellow pines (loblolly, Virginia, and shortleaf) and eastern red cedar in areas bordering the cooling tower yard. Browning of about one-half of the terminal portion of the needle and the terminal

vegetation of cedars was observed on trees that were within 150 m of the edge of the closest tower. Conifers on the north to northeast side of the towers were largely affected, whereas trees immediately behind them that did not occupy the canopy or were in the sheltered understory did not normally exhibit signs.

In March 1992, needle-tip necrosis was again observed on the majority of loblolly pines, and to a lesser extent on Virginia and shortleaf pines. Necrosis was widespread on pines within 150 meters of the edge of the towers (Figure 1). By May 1992, needle cast had prematurely begun, and some of necrotic vegetation was gone; new vegetation was healthy. In September, the needles of pines appeared healthy with only rare signs of necrosis. The crowns of affected pines appeared thin due to the premature casting of needles. Recent pine mortality was evident within the 150 meter affected area; some were attributable to Southern pine beetles and some were attributable to cooling tower drift. Many pines within the 150 meter area appeared very healthy, especially young pines which were screened from drift by taller vegetation. No signs of thin crowns or necrosis was apparent outside of 175 m of the edge of the cooling towers. This same cycle appeared in field inspections in July 1993 and January 1994. It is concluded that pines within the immediate area of the towers that are directly exposed to drift experience needle-tip necrosis after being exposed to drift for one growing season. This results in premature casting of needles. Needle-tip necrosis apparently results from translocation of chlorine to the tip of the needle where the greatest injury is manifested. Necrosis varies annually, probably based on weather conditions and plant operating characteristics. USEPA (1978) indicates that high soil moisture conditions may exacerbate symptoms. Effects to pines outside the 175 m area is not apparent, probably due to dispersal of the plume. Pine regeneration within the affected area is abundant, and mortalities to all but very mature pines is not apparent.

Vegetation of deciduous trees within 150 m of the cooling towers is experiencing damage (Figure 1), apparently due to chlorine. The damage results in thin crowns, mortality, and anomalous vegetation. Deciduous vegetation was cupped due to stress during leaf growth, exhibited marginal necrosis because of translocation of chlorine to the margins, and was flecked on the upper-leaf surface apparently resulting from chronic chlorine exposure. The species common in this area are white oak, post oak, Southern red oak, water oak, sweetgum, winged elm, black gum, dogwood, and tulip popular. Mortality is uncommon and is restricted to an area within 100 m of the edge of the cooling towers. All of the above-mentioned symptoms were only observed in the 100 m area next to the towers; deciduous vegetation outside this area is healthy.

Damage to coniferous and deciduous vegetation is characteristic of chlorine damage (USEPA 1978). Site vegetation has experienced drift from full two-unit operation since the 1987 growing season, except during outages (Tables 3, 4, 5, and 6). Operation of cooling towers began in January 1985 (Tables 1 and 2). It is hypothesized that vegetation exposure to the cooling tower plume results in the observed vegetation damage, as vegetation screened from the plume is unaffected.

Southern pine beetle mortalities are common throughout the Piedmont of South Carolina. It is not uncommon to see small pockets of dead or dying yellow pines (loblolly, shortleaf, and Virginia pines) resulting from infestations of Southern pine beetles. In 1987, a large stand of mature yellow pines on the eastern perimeter of the 1-km study area suffered extensive mortalities. This area was subsequently logged to control the infestation and to salvage the timber. It is extremely unlikely that this infestation was associated with cooling tower drift. The stand was remote from the cooling towers, while other mature stands, which experienced little or no infestation of Southern pine beetles, exist within 300 m of the cooling towers. Some mature pines within 150 m from the cooling towers continue to experience limited mortality from Southern pine beetle, but no widespread infestation has occurred. The majority of these occurred following Hurricane Hugo and the drought of 1986. It is unlikely that there is a relationship between Southern pine beetle infestations and cooling tower drift.

In September 1989, Hurricane Hugo passed through the study area, leaving up-rooted, crown-damaged, and trunk-broken yellow pines and deciduous trees. Snags and broken trunks remain from this damage, leaving open canopies with an abundance of regeneration in the understory.

In 1990, insect damage to the main apical twigs of young pines was observed in an area to the southeast (100-370 m from the cooling towers), and to a lesser extent in the north (400-600 m). The cause of this damage is believed to be pine tip moth which rarely kills young pines, but causes the injured tree to be crooked and loose height growth. Young pines eventually outgrow the attacks when they attain a height of about 6 m. The prevalence of the infestation appeared to be about 5% in 1992-93, a significant decrease from 1990 when the prevalence appeared to be about 90%. The pines in the area are now approaching the height where they are no longer susceptible to infestations. While these areas are not sheltered from cooling tower drift, it is postulated that the infestation is unrelated to cooling tower drift. Young pines are abundant throughout the study area and the pine tip moth was present in only two areas, both occurring on poor soils of a spoil area and a construction staging area. Signs of cooling tower drift damage were rarely observed in the areas of pine tip moth infestation.

CONCLUSIONS

Damage to coniferous and deciduous trees that is symptomatic of chlorine damage is restricted to the land immediately adjacent to the cooling towers. After eight growing seasons, since the cooling towers have operated (nine years of two-unit operation), it is clear that the vegetation impacts of cooling tower drift are restricted to an area 175 m from the cooling towers.

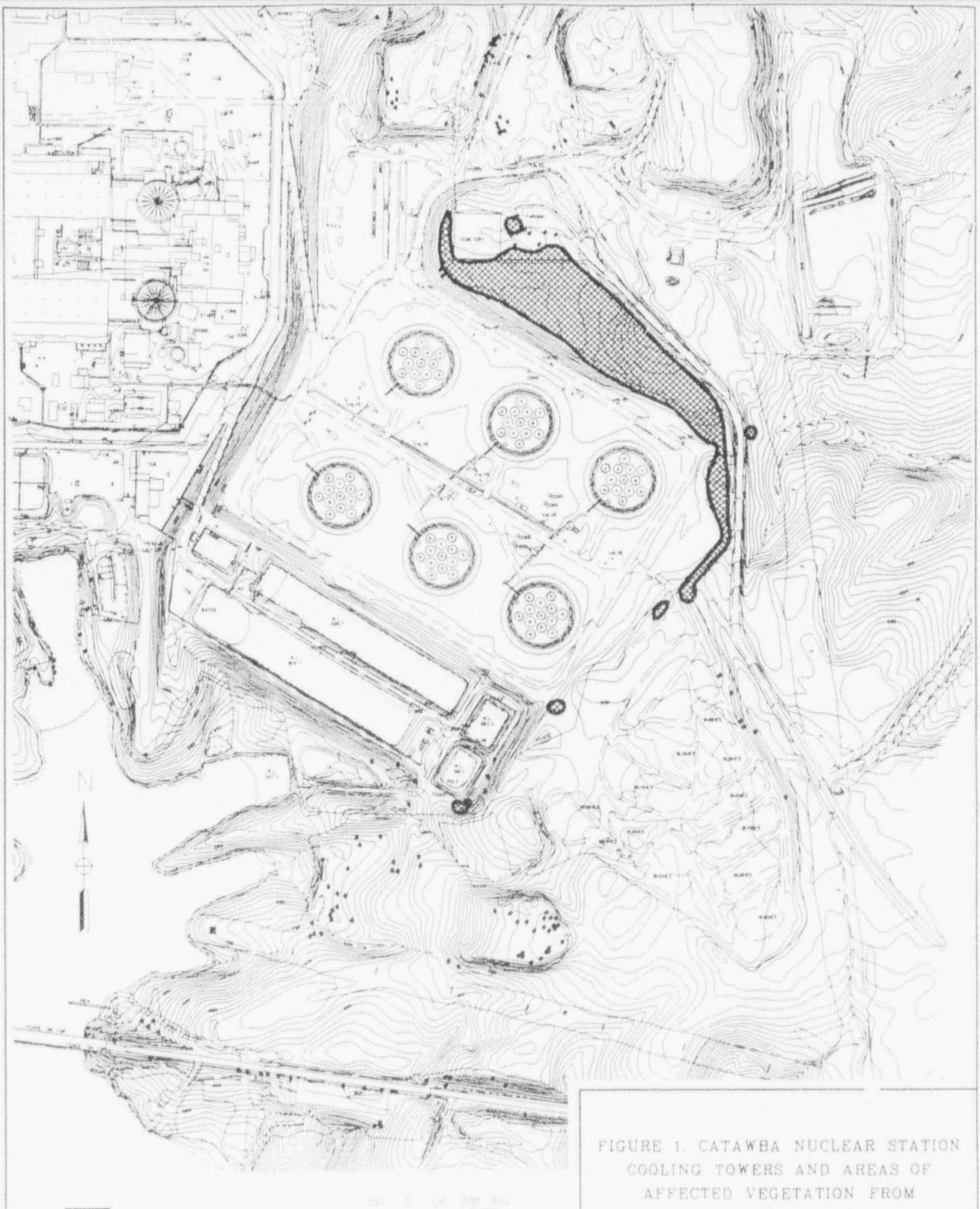

FIGURE 1. CATAWBA NUCLEAR STATION COOLING TOWERS AND AREAS OF AFFECTED VEGETATION FROM COOLING TOWER DRIFT.

Table 1. Evaporative losses for Catawba Nuclear Station cooling towers, 1985 (millions of gallons, MG).

MONTH	UNIT 1, MG
January	26.64
February	32.58
March	247.09
April	215.71
May	0.19
June	160.87
July	459.48
August	548.03
September	563.83
October	240.42
November	108.54
December	427.60

Table 2. Evaporative losses for Catawba Nuclear Station cooling towers, 1986 (millions of gallons, MG).

MONTH	UNIT 1, MG	UNIT 2, MG
January	455.1	
February	518.4	
March	462.1	
April	524.1	
May	492.9	
June	97.1	
July	322.0	48.2
August	71.2	395.2
September	0.0	0.0
October	0.0	0.0
November	159.0	149.0
December	547.4	620.0

Table 3. Evaporative losses for Catawba Nuclear Station cooling towers, 1987 (millions of gallons, MG).

MONTH	UNIT 1, MG	UNIT 2, MG
January	407.1	539.6
February	512.5	441.4
March	294.0	468.9
April	530.1	359.5
May	502.0	575.3
June	550.2	627.2
July	435.5	600.8
August	502.5	179.5
September	554.6	471.9
October	13.2	665.8
November	1.8	501.7
December	6.6	317.6

Table 4. Evaporative losses for Catawba Nuclear Station cooling towers, 1988 (millions of gallons, MG).

MONTH	UNIT 1, MG	UNIT 2, MG
January	296.3	0.0
February	478.5	31.3
March	450.7	233.3
April	554.6	435.4
May	566.2	481.9
June	552.3	477.4
July	568.7	494.9
August	122.5	640.0
September	536.5	515.1
October	573.1	631.9
November	356.5	511.3
December	0.0	649.0

Table 5. Evaporative losses for Catawba Nuclear Station Cooling Towers, 1989-1991 (millions of gallons, MG).

Month	Unit 1, MG			Unit 2, MG		
	1989	1990	1991	1989	1990	1991
Jan	3.1	434.0	330.1	538.1	569.5	538.5
Feb	309.4	0.0	493.6	502.8	583.1	593.7
Mar	503.2	6.7	232.0	97.7	652.6	657.3
Apr	449.5	37.0	0.0	17.1	624.8	460.3
May	573.1	575.4	1.9	46.6	640.9	613.1
Jun	449.9	296.9	171.1	318.5	113.4	559.1
Jul	580.1	580.1	513.4	655.7	0.0	582.4
Aug	566.1	575.4	603.5	631.6	37.5	608.2
Sep	525.1	552.3	530.8	593.2	59.3	352.2
Oct	499.1	480.6	573.1	610.5	601.1	205.3
Nov	347.4	554.6	565.9	606.9	636.1	0.0
Dec	551.3	582.4	528.6	631.6	648.9	94.8

Table 6. Evaporative losses for Catawba Nuclear Station Cooling Towers, 1992 and 1993 (millions of gallons, MG).

	UNIT 1, MG		UNIT 2, MG	
MONTH	1992	1993	1992	1993
JANUARY	589.5	570.8	619.5	663.9
FEBRUARY	547.1	507.1	601.8	1.0
MARCH	559.1	544.9	673.7	22.4
APRIL	575.0	534.2	651.9	613.0
MAY	589.5	566.1	694.7	671.3
JUNE	565.9	279.8	647.4	656.5
JULY	171.3	494.5	665.6	666.7
AUGUST	-5.8	612.9	666.7	680.7
SEPTEMBER	-17.0	579.5	550.6	600.4
OCTOBER	95.6	559.1	609.0	692.4
NOVEMBER	536.5	0.0	364.8	665.5
DECEMBER	545.6	12.6	570.6	697.1

REFERENCES

Duke Power Company. 1975. Catawba Nuclear Station Terrestrial Studies (Submitted to U.S. Atomic Energy Commission Directorate of Licensing, January 31, 1975).

U.S. Environmental Protection Agency. 1978. Diagnosing Vegetation Injury Caused by Air Pollution. USEPA - 450/3-78-005, Research Triangle Park, NC.

Murtha, P. A. 1972. A Guide to Air Photo Interpretation of Forest Damage in Canada. Canadian Forestry Service Publication No. 1292. Canadian Forestry Service, Ottawa. 62 pp.

Murtha, P. A. 1984. Vegetation Damage Detection and Assessment: The Photographic Approach. Pp. 337-354 in: Renewable Management Application of Remote Sensing. Proceedings of the RNRF Symposium on the Application of Remote Sensing to Resource Management, Seattle, Washington, American Society of Photogrammetry, Falls Church, VA.

ENCLOSURE III

Copy of Non-routine Event Reports Sent to the
South Carolina Department of Health and Environmental Control

Duke Power Company
Generation Services Department
13339 Hagers Ferry Road
Huntersville, NC 28078-7929

DUKE POWER

May 27, 1993

To: Mr. Timothy Eleazer
Division of Industrial & Agricultural Wastewater
Bureau of Water Pollution Control
South Carolina Department of Health and Environmental Control
2600 Bull Street
Columbia, SC 29201

Subject: Catawba Nuclear Station
NPDES Permit No. SC0004278
Notification of Maintenance Chemical Use
File: CN-702.13

Dear Mr. Eleazer:

With reference to our recent telephone conversation, Duke Power Company (DPC) requests permission to begin this summer on a trial basis the use of sodium bromide at the subject facility. Catawba Nuclear Station is a two unit steam electric generating station, with each unit having a cooling tower system. One of the primary maintenance activities for the cooling towers is the control of biological growth. Historically, the biological growth has been greatest in the warmer months. During this trial period DPC proposes that sodium bromide will be used in one unit with the results of its effectiveness being compared to the other unit.

At present the biological growth is treated by the use of sodium hypochlorite. However sodium hypochlorite is not as effective when the water pH increases above 8 Standard Units. Thus the addition of sulfuric acid is needed to readjust the pH. Sodium bromide is effective in higher pH water. By using approximately 100 gallons of 40 to 46 % liquid sodium bromide solution (normally every two days) ~~of sodium bromide~~ it is anticipated that the current sodium hypochlorite dose will be reduced to more than half of its present dose requirements and also the need for sulfuric acid should almost be completely eliminated.

In order to evaluate this product it is advantageous to begin its usage during the warmer months. Attached are the items as required by the subject permit Part III Item 9. We apologize for requesting this approval in such a short time, however we think that the proposed restrictions (Attachment 1) will ensure that the environment is adequately protected.

Please advise if you need additional information. You may contact me at (704) 875-5970. If possible DPC would like to begin using this product by July 1, 1993. Your cooperation is appreciated.

Sincerely,

Robert R. Wylie

Robert R. Wylie, Engineer
Environmental Division
Generation Services Department

cc: NRC Distribution

ATTACHMENT 1

CATAWBA NUCLEAR STATION

PROPOSED SODIUM BROMIDE USAGE

MAY 27, 1993

NPDES PERMIT SC0004278
PART III ITEM 9 REQUIREMENTS

1) NAME AND GENERAL COMPOSITION OF THE MAINTENANCE CHEMICAL

a) Liquid Sodium Bromide (40 to 46% solution)

2) QUANTITIES TO BE USED

Approximtely 100 gallons of product.

2) FREQUENCY OF USE

Every two days.

4) PROPOSED DISCHARGE CONCENTRATION

Since chlorine and bromide are both oxidants it is proposed that the current limits on Outfall 005 of 0.2 mg/l monthly average and 0.5 mg/l daily maximum for Free Available Chlorine be changed to Free Available Oxidant. (Outfall 005 is an internal outfall that discharges upstream of Outfall 001. Flow through Outfall 001 typically allows for an approximate 9 to 1 dilution ratio.)

5) EPA REGISTRATION NUMBER

The EPA Registration Number for one of the sodium bromide products under evaluation is 1706-168. Once the actual manufacturer/supplier is selected an update can be provided if needed.

6) AQUATIC TOXICITY INFORMATION

a) SODIUM BROMIDE

96 hour static acute LC 50 to Fathead Minnow = 16,479 ppm.
96 hour static acute LC 50 to Poecilia reticulata = 225 ppm.
48 hour static acute LC 50 to Daphnia magna = 7,900 ppm.

b) HYPOBROMOUS ACID (acid generated from Sodium Bromide)

96 hour static acute LC50 to Bluegill Sunfish = 0.52 ppm (as Br_2)
96 hour NOEC for Bluegill Sunfish is 0.30 ppm based on no mortality.

48 hour static acute LC50 to Daphnia Magna = 0.71 ppm (as Br_2)
48 hour NOEC for Daphnia magna is 0.41 ppm based on no mortality.

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Duke Power Company
Generation Services Department
13339 Hagers Ferry Road
Huntersville, NC 28078-7929

DUKE POWER

June 1, 1993

South Carolina Department of Health
and Environmental Control
Attn: Mr. Timothy M. Eleazar
Industrial and Agricultural Wastewater
2600 Bull Street
Columbia, SC 29201

Re: Duke Power Company Catawba Nuclear Station
Floating Aerator Test for Sanitary Treatment System
File: CS-0702.13

Dear Mr. Eleazar:

Catawba Nuclear Station (NPDES Permit #SC0004278) currently treats its sanitary wastes in a 4 cell lagoon aearated through perforated headers on the bottoms of the cells. The station, desiring to improve performance and increase treatment efficiency, is considering replacing this system with one of floating aerator units. Before we pursue such a change, we would like to perform a test on the first of the four cells. This test would involve floating a 1 to 2 horsepower aerator in the cell and turning off the air to the perforated header in that cell. This test would be performed in the July or August time frame and would last no longer than 6 weeks. If this test is successful, we will pursue formal approval to permanently replace the system of perforated headers with floating aeartors.

For your review, a layout of the lagoon with Cell 1 designated for the aerator test is included, as well as manufacturer's information on the floating aerator to be used. Your prompt consideration of our request to perform this test would be greatly appreciated. If you have any questions or need further information, please contact me at (704) 875-5966.

Sincerely,

Timothy L. Huffman, PE
GSD Environmental Division

attachments

cc w/o att: J.S. Carter, R.R. Wylie, M.A. Lascara, [redacted]
G.W. Sain, P.W. Downing, File

South Carolina
DHEC
Department of Health and Environmental Control
2600 Bull Street, Columbia, SC 29201

June 28, 1993

Mr. Timothy L. Huffman, P.E.
Duke Power Company
Generation Services Department
13339 Hagers Ferry Road
Huntersville, N.C. 28078-7929

Re: Floating Aerator Test for
Sanitary Treatment System
Duke Power Co./Catawba Nuclear Station
York County

Dear Mr. Huffman:

Our Office has received your June 1, 1993 letter requesting approval to conduct a floating aerator test in cell 1 of the existing four (4) cell aerated sanitary lagoon system at the Duke Power Company Catawba Nuclear Station in York County. We understand this test will involve floating a 1 to 2 horsepower aerator in the first of the four cells, and that the air to the perforated header for this cell will be turned off. The aeration of the other three cells will not be changed. Based on a review of the information provided, our Office approves your request with the following conditions:

1) The floating aerator test is approved for a period of six (6) weeks.

2) Please contact our District Office at (803)285-7461 in regards to the specific start date of the test.

If you should have any questions, please call me at (803)734-5247.

Sincerely,

Timothy M. Eleazer

Timothy M. Eleazer
Environmental Engineer Associate
Industrial and Agricultural
Wastewater Division

TME/ebs

cc: Al Williams, Catawba EQC

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USED TO SEPARATE ITEMS

South Carolina
DHEC
Department of Health and Environmental Control
2600 Bull Street, Columbia, SC 29201

June 8, 1993

Mr. Robert R. Wylie, Engineer
Environmental Division
Duke Power Company
13339 Hagers Ferry Road
Huntersville, N.C. 28078-7929

Re: Biocide: Betz Clam-Trol CT-1 Approval
Duke Power Co./Catawba Nuclear Station
York County

Dear Mr. Wylie:

Our Office has received your March 4, 1993 letter concerning the use of the Betz biocide Clam-Trol CT-1 at the Duke Power Company Catawba Nuclear Station in York County. The data supplied by Betz Laboratories on the toxicity of Clam-Trol CT-1 to Ceriodaphnia dubia indicates that a 12-hour exposure to 0.40 mg/l is not toxic. Based on a review of the information provided, our Office approves your request to use the biocide Clam-Trol at the Catawba Nuclear Station for Outfalls 001 and 002 with the following conditions:

1) The Clam-Trol CT-1 shall be limited to a daily maximum of 0.40 mg/l, at least three (3) samples shall be taken during a 24-hour period when the Clam-Trol CT-1 is expected to be present (detectable) in the outfalls.

2) To ensure that the CT-1 has been detoxified from the discharge, Duke Power Company shall perform a 100% effluent three-brood pass/fail Ceriodaphnia dubia chronic toxicity test. Toxicity shall be limited to no statistically significant evidence at the 0.05 α level that the percentage of tests failed is greater than 5%. As has been discussed with Mr. Vernon Beaty, Water Quality Monitoring Section, the toxicity test solutions will be allowed to be renewed daily with a new sample taken daily during the early part of the test. Renewing daily samples will make the test a better approximation to CT-1 that organisms in Lake Wylie will receive. The samples collected shall be 24-hour composite samples. Also, a minimum of three (3) samples must be used, and all other USEPA and SCDHEC test protocols must be followed.

If you should have any questions, please call me at (803)734-5247.

Sincerely,

Timothy M. Eleazer

Timothy M. Eleazer
Environmental Engineer Associate
Industrial and Agricultural
Wastewater Division

TME/ebs

cc: Al Williams, Catawba EQC
Vernon Beaty, Water Quality Monitoring

Duke Power Company
Catawba Nuclear Generation Department
4800 Concord Road
York, SC 29745

D. L. Rehn
Vice President
(803)831-3205 Office
(803)831-3426 Fax

DUKE POWER

June 23, 1993

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Subject: Catawba Nuclear Station
Docket Nos. 50-413 and 50-414
Environmental Protection Plan Reporting

The Environmental Protection Plan (Appendix B to the Catawba Facility Operating License) requires that changes to the NPDES Permit or State Certification be reported to the NRC within thirty (30) days following the date the change is approved.

Attached please find approval for the discharge of Betz Clam-Trol 1 issued by the South Carolina Department of Health and Environmental Control June 8, 1993.

Very truly yours

D. L. Rehn

Attachments

JTH/EPP 1993

xc: S. D. Ebneter
Regional Administrator, Region II

R. J. Freudenberger
Senior Resident Inspector
Catawba Nuclear Station

R. E. Martin, ONRR

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USED TO SEPARATE ITEMS

Duke Power Company
Generation Services Department
13339 Hagers Ferry Road
Huntersville, NC 28078-7929

DUKE POWER

July 20, 1992

Mr. Robert Knauss
Water Quality Assessment
and Enforcement Division
South Carolina Department of Health
and Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

Subject Catawba Nuclear Station- NPDES Permit #SC0004278
Exceedance of a Maintenance Limit
File: CN-702.00, CN-702.15
Certified: P 623 739 359

Dear Mr. Knauss:

Pursuant to Part II B. 2. a. of the subject permit, this is a follow up written report for the recent exceedance at Catawba Nuclear Station. Verbal notifications were made to you and also Mr. Lanny Robinson of the DHEC Catawba District by Mr. Gerry Parker of Duke Power Company on the morning of the exceedance (July 15, 1993).

On June 8, 1993 Catawba Nuclear Station received permission to use a biocide called Clam-trol with concentrations at the outfall not to exceed a daily maximum of 0.40 mg/l. Several industries have used Clam-trol to control the populations of Corbicula (Asiatic Clams) in systems that use raw water from lakes and rivers. Clam-trol has five ingredients: N-alkyl dimethyl benzyl ammonium chloride, dodecylguanidine hydrochloride,isopropyl alcohol, ethyl alcohol, and ethylene glycol. The EPA registration number for Clam-trol is 3876-145.

The injection of Clam-trol began on the afternoon of July 14, 1993 at 1655. A slurry of bentonite (clay) was being injected just prior to discharge to detoxify the Clam-Trol. Duplicate samples of the discharge were being taken hourly and results averaged to verify the injection / detoxification process was working properly. At 0055 July 15th it was determined there would not be enough bentonite to complete the proposed 12 hour injection.

The Clam-Trol additions were halted at 0100 and the bentonite injection continued in order to detoxify the remaining Clam-trol that was still in the system. It was believed at that time there was enough bentonite remaining to detoxify for an hour or more to make sure the system was thoroughly flushed free of Clam-Trol.

At 0105 July 15th the concentration of Clam-Trol was averaged at 0.26 mg/l. The 0210 samples were 0.74 and 0.67 mg/l which exceeded the permitted limit of 0.4 mg/l. At this time the bentonite material had run out. At 0250 the samples indicated the concentration had returned to less than 0.2 mg/l.

Therefore, for a certain time period between the hours of 0105 and 0250 the concentration of Clam-Trol exceeded the permitted level of 0.4 mg/l. The discharge area was inspected immediately after the exceedance was determined with no adverse impacts being observed. Due to some surfactants contained in Clam-trol, some slight foaming was observed. Efforts were made to control this by use of a defoamer which was approved for usage.

Results of biomonitoring performed on a 24-hour composite sample collected during the Clam-trol injection failed. A three-brood Ceriodaphnia survival and reproduction test was initiated on Friday July 16, 1993 using a 24-hour composite sample. The composite sample was composed of hourly samples collected from 1800 July 14, 1993 until 1800 July 15, 1993. Following 24-hours of exposure to the composite sample, all of the Ceriodaphnia exposed to the effluent were dead, all 20 control animals were alive.

A second 24 hour composite sample was collected from 1800 July 15th to 1800 July 16th, 1993 from the same outfall. This sample was intended for use as second day exposure solutions for the initial test began on July 16, 1993. However, the initial test was terminated after 24-hours, and is considered a failure based on EPA and SCDHEC criteria. One possible cause for the test failure is the presense of bentonite clay in the sample. This and other factors are being investigated.

The second sample was, however, used as a normal monthly NPDES sample. The initial results from our toxicity laboratory indicate that the second composite sample will pass the three-brood Ceriodaphnia survival and reproduction test.

An investigation has begun to determine why the bentonite slurry ran out prematurely. To prevent recurrence of this event, additional measures will be taken to ensure that the appropriate flow rate for the detox system exists and that a sufficient supply of bentonite material is on site.

If you have any questions concerning this matter or need additional information please contact either Robert Wylie at (704) 875-5970 or John Estridge at (704) 875-5965.

Sincerely,

J S Carter

John S. Carter, Technical System Manager
Environmental Division, Water Protection

xc: Lanny Robinson, DHEC - Catawba District
Timothy Eleazer, DHEC - Columbia Office
U.S. Nuclear Regulatory Commission - Document Control Desk
John Zieler - Catawba Nuclear Station, NRC Resident Inspector

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USED TO SEPARATE ITEMS

Duke Power Company
Catawba Nuclear Generation Department
4800 Concord Road
York, SC 29745

D. L. Rehn
Vice President
(803)831-3205 Office
(803)831-3426 Fax

DUKE POWER

July 26, 1993

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Subject: Catawba Nuclear Station
Docket Nos. 50-413 and 50-414
Environmental Protection Plan Reporting

The Environmental Protection Plan (Appendix B to the Catawba Facility Operating License) requires that certain changes or modifications to the environmental treatment systems be reported to the NRC.

Attached please find approval from the South Carolina Department of Health and Environmental Control to modify the Sanitary Waste system by constructing a system to dechlorinate the effluent prior to release to Lake Wylie.

Very truly yours

D. L. Rehn

Attachments

JTH/EPP 1993

xc: S. D. Ebneter
Regional Administrator, Region II

R. J. Freudenberger
Senior Resident Inspector
Catawba Nuclear Station

R. E. Martin, ONRR

South Carolina
DHEC
Department of Health and Environmental Control
2600 Bull Street, Columbia, SC 29201

June 28, 1993

Mr. M.S. Tuckman, Vice President
Duke Power Company
13339 Hagers Ferry Road
Huntersville, N.C. 28078-7929

Re: Construction Permit #17,521-IW
Duke Power Co./Catawba Nuclear Station
York County

Dear Sir:

Enclosed is a State Construction Permit for the above-referenced wastewater treatment facility. The conditions of the permit are explicitly stated: construction is to be performed in accordance with this permit and the supporting engineering report, plans and specifications approved by this Office.

Your EQC District contact from this Department is Al Williams (address below). He, along with this Division of the SC Department of Health and Environmental Control, should be notified when construction has begun and when the facility is ready for operation. A final inspection must be made before the treatment facility is placed in operation. At the time of this inspection, you must submit a letter from a registered engineer certifying that the construction has been completed in accordance with the approved plans and specifications.

In accordance with State Law, your facility will be required to have an operator-in-charge who has been certified by the SC Environmental Certification Board. Your facility has been classified in Group II-B, necessitating an operator holding a Grade B-B or higher certificate. You will not be given permission to operate your facility until a properly qualified operator(s) has been obtained. Questions in this matter should be directed to William R. Moore, SC Environmental Certification Board, 2221 Devine Street, Suite 320, Columbia, SC 29205.

Sincerely,

Marion F. Sadler, Jr., Acting Director
Industrial & Agricultural
Wastewater Division

Address of District Engineer:
P.O. Box 100
Fort Lawn, S.C. 29714

MFS/TME/ebs

cc: Al Williams, Catawba EQC
David Lee Ward, P.E.
David R. Kulla, P.E.
Timothy L. Huffman, Duke Power Co.

SPECIAL CONDITIONS

1. This permit is in addition to Construction Permit #16,492, 14,260, 9,166, and 6,583.

2. The permittee shall maintain at the permitted facility a complete Operations and Maintenance Manual for the waste treatment plant. The manual shall be made available for on-site review during normal working hours. The manual shall contain operation and maintenance instructions for all equipment and appurtenances associated with the waste treatment plant. The manual shall contain a general description of the treatment process(es), operating characteristics that will produce maximum treatment efficiency and corrective action to be taken should operating difficulties be encountered.

3. The permittee shall modify and maintain a Best Management Practice (BMP) Plan to identify and control the discharge of significant amounts of oils and the hazardous and toxic substances listed in 40 CFR, Part 117 and Tables II and III of Appendix D to 40 CFR, Part 122. The plan shall include a listing of all potential sources of spills or leaks of these materials, a method of containment. a description of training, inspection and security procedures, and emergency response measures to be taken in the event of a discharge to surface waters or plans and/or procedures which constitute an equivalent BMP. Sources of such discharges may include materials storage areas; in-plant transfer, process and materials handling areas; loading and unloading operations; plant site runoff; and sludge and disposal areas. The BMP plan shall be updated in accordance with good engineering practices, shall be documented in narrative form, and shall include any necessary plot plans, drawings, or maps. The BMP plan shall be modified no later than six months after issuance of the Construction Permit and any changes implemented no later than one year after issuance of the Construction Permit. The BMP plan shall be maintained at the plant site and shall be available for inspection by Department personnel.

4. All sludges, waste oil and solid and hazardous waste shall be properly disposed of in accordance with the rules and regulations and specific, written approval of the S.C. DHEC Bureau of Solid and Hazardous Waste Management.

South Carolina
DHEC
Department of Health and Environmental Control
2600 Bull Street
Columbia, SC 29201

Bureau of Water Pollution Control
Permit To Construct

Permission is hereby granted to: Duke Power Company
Catawba Nuclear Station
Highway 274
Clover, South Carolina

for the construction of a wastewater collection system in accordance with the construction plans, specifications, engineering report and Construction Permit Application signed by David R. Kulla and David L. Ward, Registered Professional Engineer, S. C. Registration Number: 11340 and 10765.

Project Name: Duke Power Co./Catawba Nuclear Sta. - Dechlorination System County: York

Project Description: The addition of a dechlorination system, and associated piping and appurtenances to the existing sanitary wastewater treatment system.

The wastewater will be discharged to Big Allison Creek, Lake Wylie, NPDES Permit #SC0004278, Outfall 003 at a daily rate not to exceed 80,000 gallons per day.

The effluent concentrations of those constituents the wastewater treatment system is designed to remove or reduce are contained in NPDES Permit SC0004278.
Treatment Plant Classification: Group II-B.

Special Conditions:

(See Attachment)

Permit Number: 17,521-IW Date of Issue: June 28, 1993

Expiration Dates: Unless construction begins prior to June 28, 1994
and construction is completed prior to June 28, 1995
this permit will expire.

In accepting this permit, the owner agrees to the admission of properly authorized persons at all reasonable hours for the purpose of sampling and inspection.

THIS IS A PERMIT FOR CONSTRUCTION ONLY AND DOES NOT CONSTITUTE STATE DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL APPROVAL, TEMPORARY OR OTHERWISE, TO PLACE THIS SYSTEM IN OPERATION.

Bureau of Water Pollution Control

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USED TO SEPARATE ITEMS

Duke Power Company
Generation Services Department
13339 Hagers Ferry Road
Huntersville, NC 28078-7929

DUKE POWER

July 28, 1993

Mr. Robert Knauss
Enforcement Division
Bureau of Water Pollution Control
South Carolina Department of
Health and Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

Subject: Catawba Nuclear Station
NPDES Permit #SC0004278
Toxicity Evaluation Plan
File: CN-702.20, 702.20-1

Dear Mr. Knauss,

In accordance with Part III.A.13(c) of the subject permit, a Toxicity Evaluation Plan for a test failure that occurred at outfall 002 for the subject facility is enclosed (Attachment 2). A retest was promptly conducted in April with a pass test resulting. Additionally subsequent tests conducted in May and June both resulted in passes. Attachment 1 is a copy of results of the April retest.

This is the first and the only biomonitoring failure to occur at Outfall 002 for the subject facility. Duke Power Company believes that the April toxicity represents a non-persistent event. Duke Power plans to continue to review relevant wastewater data along with future biomonitoring tests. If any test failures do occur this will help to better determine the cause.

With DHEC's approval, DPC requests that the attached TEP serve as the final report for the April toxicity event. If you have any questions are need additional information please contact either Robert Wylie at (704) 875-5970 or John Estridge at (704) 875-5970.

Sincerely,

J S Carter

John S. Carter, Technical System Manager
Water Protection
Environmental Division

cc: Timothy Eleazer - DHEC Columbia
Vernon Beaty - DHEC Columbia
John Velte - DPC ASC
Robert Wylie - DPC ASC
Tim Harris - DPC CNS
Tony Jackson - DPC CNS

ATTACHMENT 1

CB0493K2

Facility: Catawba Nuclear Station NPDES No.: SC0004278 County: York
Sampling Point: 002 (Conventional Waste Treat. Sys.) Receiving Stream: Lake Wylie
Laboratory: Duke Power Biomonitoring Cert. No.: 99005 Exp. Date: 12/31/93

Test Organism: Ceriodaphnia dubia Temp. Range: 24.6 to 25.7 °C IWC: 100%
Test Type: ( ) hr acute; (6) d chronic; ____ static ✔ daily-renewal
Started (date/time): 04-23-93 / 1117 Ended (date/time): 04-29-93 / 1018

Dilution Water Source	Alk	Hard	Cond
20% Perrier® in Milli-Q			
DPC Lot# PER- 168	62.3	75.3	162

Sample Type: ____ grab (24) hr comp.

Sample #	date/time collected	Alk	Hard	Cond	Cl2	# renewals
CN049307	04-21-93 / 1605	20.0	39.5	252	NM	2
CN049308	04-23-93 / 1100	13.4	29.9	273	NM	4

Control

Day		1	2	3	4	5	6	7
Temp	(°C)	25.1	24.8	24.8	25.2	25.7	24.7	25.2
D.O.	initial	8.2	8.6	7.9	7.7	8.9	8.4	NA
	final	8.3	8.4	7.8	7.8	7.9	7.9	NA
pH	initial	8.2	8.1	8.2	8.2	8.1	8.2	NA
	final	8.5	8.5	8.2	8.2	8.2	8.2	NA

(100) % Effluent

Day		1	2	3	4	5	6	7
Temp	(°C)	24.9	25.1	24.9	25.3	25.2	24.6	24.9
D.O.	initial	8.2	8.8	8.4	7.8	8.2	8.0	NA
	final	8.1	8.2	7.3	7.3	7.4	7.3	NA
pH	initial	7.8	7.7	7.3	7.3	7.2	7.2	NA
	final	8.0	8.1	7.4	7.3	7.4	7.3	NA

Comments: **This is a retest of the NPDES-requirement for 4-93. 1st attempt failed - treatment mortality.**
Principal Analyst: B.G. Newton Procedure Number: BIO-260.0 (SC P/F Modification)
Organism Age at Initiation: 20 to 23 hours Organism Source: Duke Power Culture (Tray D&E)
Sample CN049307 Temperature at Receipt: 1.6 °C Thermometer ID: ELENV-30883
Sample CN049308 Temperature at Receipt: 3.2 °C Test Vessels: 30-mL polystyrene
Intermittent batch discharge; only two samples were available. Test Solution Volume: 15 mL
No. Organisms per Test Vessel: 1 Feeding: Daily: 0.1 mL ea. YTC and Selenastrum susp.
Aeration: None M=Male; NA=Not Applicable; NM=Not Measured; ND=Not Detected

Data checked by: David J. Lengsfeldom Date: 4/30/93

Laboratory Supervisor: Dave Vaughan Date: 7 May 93

(over)

ATTACHMENT 2

DUKE POWER COMPANY
CATAWBA NUCLEAR STATION
TOXICITY EVALUATION PLAN

BACKGROUND INFORMATION

Key Facts

Facility Name: Catawba Nuclear Station

NPDES Number: SC0004278

County: York

Outfall Number: 002

Receiving Stream: Lake Wylie

Test Organism: *Ceriodaphnia dubia*

Test Type: 3-Brood Chronic Pass/Fail

Test Schedule: Monthly

Parameter Code: TGP3B

Sample Type: 24 Hour Composite

Dilution Water: 20% Perrier[R] in Deionized Water (Milli-Q[R] Water Purification System)

Testing Laboratory: Duke Power Company, Environmental Division, Biomonitoring

Certification Number: 99005

Expiration Date: 12/31/93

System Description

Outfall 002 discharges flow from the Conventional Wastewater Treatment (WC) System into the Big Allison Creek arm of Lake Wylie. The system is composed of a concrete Initial Holdup Pond (IHP) of 300,000 gallons, two (2) clay-lined settling basins (WC A and WC B) of 5,000,000 gallons each, and a polymer lined Final Holdup Pond (FHP) of 1,500,000 gallons.

Normally the IHP will receive plant wastes from the Service Building Sump, Water Treatment Plant, Diesel Generator Room Sumps, Unit 1 & 2 Turbine Building Sumps, Transformer Base Drainage Sumps, Diesel Generator Catchment Sumps, and the Sulfuric Acid Tank Containment Sump. The IHP serves to allow for large solids removal, oil skimming, and flow surge control. Wastes flow from the IHP to either settling basins WC A or WC B. The settling basins are parallel and operated in a batch mode with one basin in service to collect waste flow and one in standby, recirculation, or discharge. Provisions for treatment (neutralization, sedimentation, oxidation and mixing) are incorporated into the operation of the settling basins as the waste is prepared for discharge.

Discharge is normally from one of the settling basins directly to Lake Wylie either by gravity at approximately 900 gpm or pumping up to 1500 gpm.

The FHP is used to collected flow from the Yard Drain Collection System. Three sumps collect site runoff and stormwater and transfer this to the FHP. The FHP allows for treatment and release of this waste in a controlled manner.

Attachment 3 provides a water flow schematic which indicates the inputs to this Outfall. Attachment 4 provides a site plan view indicating where the outfalls are physically located.

Circumstances Requiring This Toxicity Evaluation Plan

A statistically significant ($\alpha = 0.05$) mortality (50% or 10 of 20 Ceriodaphania dubia) was observed in the 100% Outfall 002 effluent treatment verses the control treatment (0% or 0 of 19 C. dubia) during biomonitoring for the month of April 1993. That test is a failure based on criteria defined in Catawba Nuclear Station's NPDES Permit.

Initial Data and Information

The monthly biomonitoring test for Outfall 002 was initiated on 04/08/93 with a 24-hour composite sample that was collected on 04/07/93. Effluent renewals for the entire 6 days of the three-brood test were made with this sample as per SCDHEC guidance in instances where additional samples are unavailable due to intermittent batch release at Outfall 002.

Site personnel reviewed the station's activities at the time of the failure and found little in the way of an event which could have attributed to this test failure. All other NPDES data for releases during this period were within permitted levels.

Analytical measurements made during this test revealed that pH and hardness were at their lowest values since biomonitoring began, 6.1 units and 16.8 mg/l as $CaCO_3$, respectively. Additionally, alkalinity was very low, only 1.8 mg/l as $CaCO_3$.

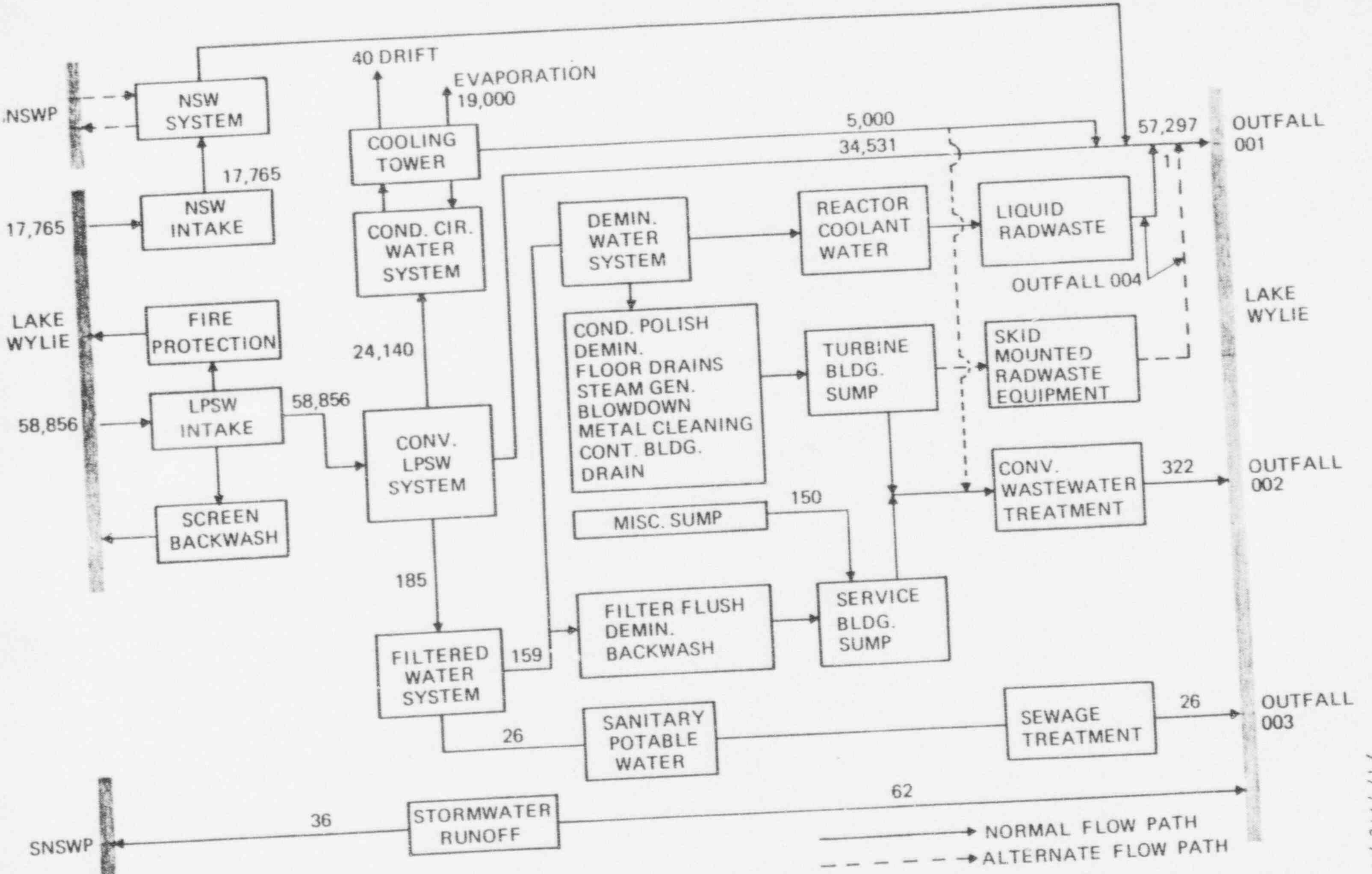
Toxicity Reduction Evaluation Plan

A retest of Outfall 002 was initiated at the earliest opportunity to verify the test failure. The retest began 04/23/93 with a sample collected on 04/21/93. A subsequent effluent sample collected on 04/23/93 was also used in the test. The retest passed.

The May 1993 monthly biomonitoring test for Outfall 002 was initiated on 05/13/93 with a sample collected on 05/12/93. Again, effluent renewals for the entire 6 days of the three-brood test were made with this sample as per SCDHEC guidance in instances where additional samples are unavailable due to intermittent batch release at Outfall 002. This test also resulted in a "pass".

The June 1993 monthly biomonitoring test for Outfall 002 was initiated on 06/10/93 with a sample collected on 06/09/93. Again, effluent renewals for the entire 6 days of the three-brood test were made with this sample as described above. This test resulted in a "pass".

Based on our inability to verify the toxicity that was observed in the first April 1993 test, Duke Power Company believes that the toxicity that was displayed represents a non-persistent event. DPC plans to continue to review relevant wastewater data at the same time of future biomonitoring in order to better determine the cause of if any future failures do occur.



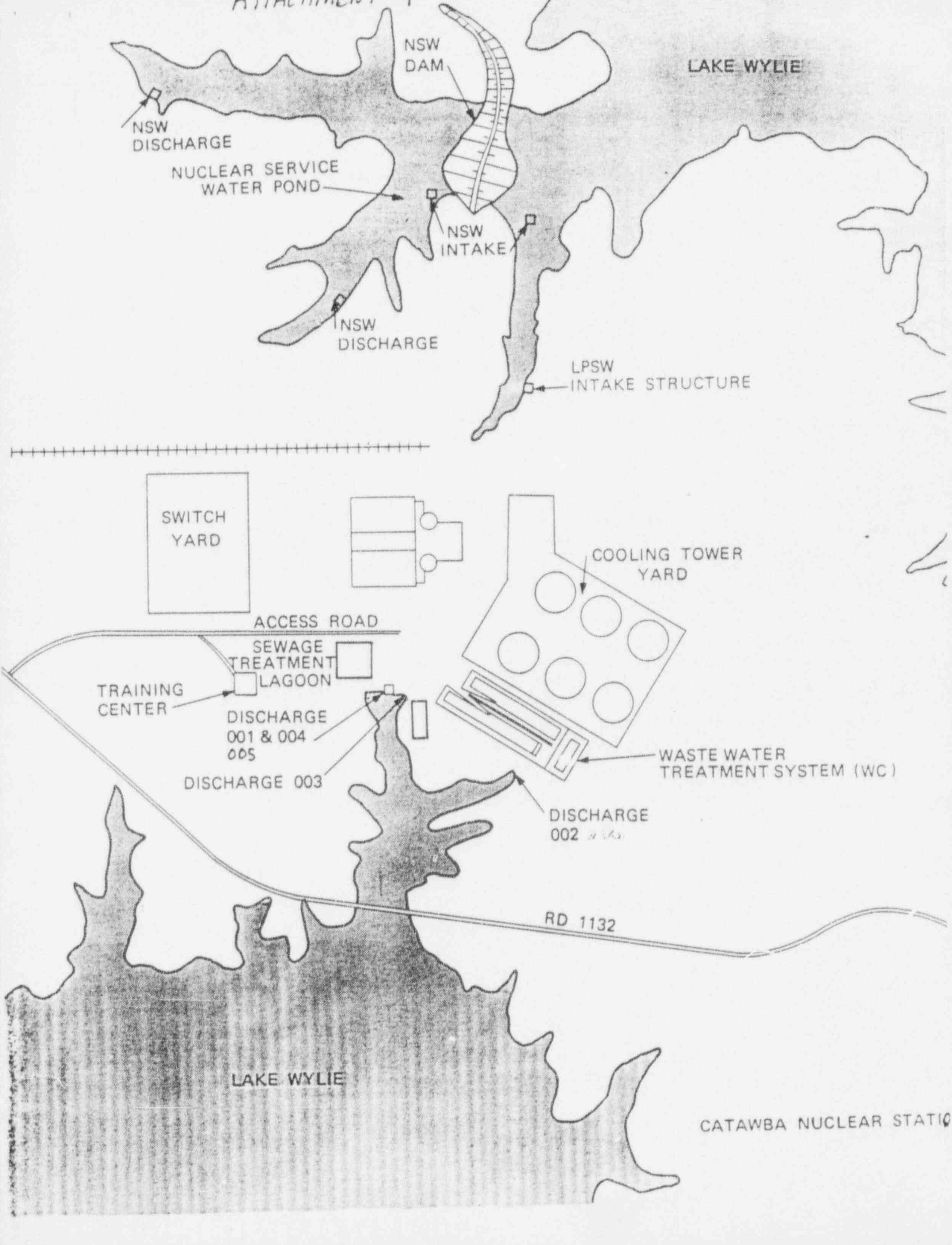
DUKE POWER COMPANY
WATER FLOW SCHEMATIC
CATAWBA NUCLEAR STATION
YORK COUNTY, SOUTH CAROLINA

NOTE: ALL FLOWS ARE IN GPM FOR AVERAGED CONDITIONS

November 7, 1988

ATTACHMENT 3

ATTACHMENT 4



CATAWBA NUCLEAR STATIO

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Duke Power Company
Generation Services Department
13339 Hagers Ferry Road
Huntersville, NC 28078-7929

DUKE POWER

August 31, 1993

Mr. Timothy M. Eleazer
Industrial and Agricultural Wastewater Division
South Carolina Department of Health
and Environmental Control
2600 Bull Street
Columbia, SC 29201

Subject: Catawba Nuclear Station- Cooling Tower Drainage
NPDES Permit No. SC0004278
File: CN-254.00

Dear Mr. Eleazer:

The purpose of this memo is to request that a trial alternate method be approved by the State for drainage of the cooling towers at the Catawba Nuclear Station. At the start of each nuclear refueling outage, one of the first tasks which must be accomplished is to drain the water out of the cooling towers and condenser cooling system. Presently, this task requires approximately 36 hours to accomplish. If the proposed method is approved, the task will be reduced to approximately 12 hours.

Present Method of Drainage

The cooling water contained in the towers and plant condenser cooling system consists of approximately 7.5 million gallons of raw water from Lake Wylie per unit. There are three cooling towers per each nuclear unit for a total of six cooling towers at the Catawba site containing approximately 15 million gallons of water.

Upon the start of an outage the water contained in the cooling system is removed as follows: For the unit 1 cooling towers, approximately 5 million gallons is discharged via outfall 005-001 at a flow rate of approximately 15,000 GPM. The remaining water is drained to the turbine building sump and pumped to the conventional waste treatment system (WC) and discharged via outfall 002.

For Unit 2 the process is similar but the volumes are slightly different. Approximately 3 million gallons discharge via outfall 005-001 and 4.5 million gallons to the turbine building sump.

Proposed Method of Drainage

In order to expedite the removal of water from the cooling towers and cooling system, the following method is requested. The cooling towers will be drained in three phases. The three phases refer to the different elevations from which the water will be drained.

The initial phase will consist of draining the water out of the cooling towers by means of the blow down line, outfall 005, and outfall 001 using the normal method of water removal. This phase would bring the water to approximate elevation 619 - the yard elevation of the cooling towers.

The second phase would begin after the water has reached elevation 619. At this point a manway will be removed from the condenser cooling piping system (RC). The RC piping is 14 feet in diameter and runs between the cooling towers and the condenser. Water will be pumped from the RC piping into a storm drainage yard drain. The yard drain flows toward and discharges to Lake Wylie near the intake structure.

The total volume of water to be discharged during the second phase is approximately 1.8 million gallons at a flow rate of 18,000 gallons per minute.

The third phase would be very similar to the second phase, however, it would be at a lower elevation. The third phase would begin at approximate elevation 593 - the yard elevation next to the plant within the protected area boundary.

Once the water elevation reaches 593, a manway would be removed and the water will be pumped from the RC piping to a yard drain. This yard drain flows toward outfall 001 and discharges to Lake Wylie in the general vicinity of outfall 001.

The total volume of water to be discharged during the third phase is approximately 3.7 million gallons at a flow rate of 60,000 gallons per minute.

Erosion control will not be a problem as these storm drainage structure discharge directly to Lake Wylie. The above flow rates and volumes are only approximate volumes and were calculated based upon the flow capacity of the storm drainage system.

Please find attached a general layout sketch showing the various NPDES outfalls for the Catawba Nuclear site. This sketch also shows the proximity of the cooling towers to Lake Wylie along with other plant features.

Summary

Approval of this request will simply allow the water in the cooling towers to be removed faster. All the water within the cooling system will still discharge into Lake Wylie regardless of the method used to dewater the cooling towers. If at all possible, we would like to request approval for this be granted by September 8, 1993 in order to prepare for the next scheduled outage in late October.

Should this initial trial be successful, we will request that permanent approval be granted to dewater the cooling towers in this manner. If you need additional information or have any questions please give me a call at (704) 875-5965.

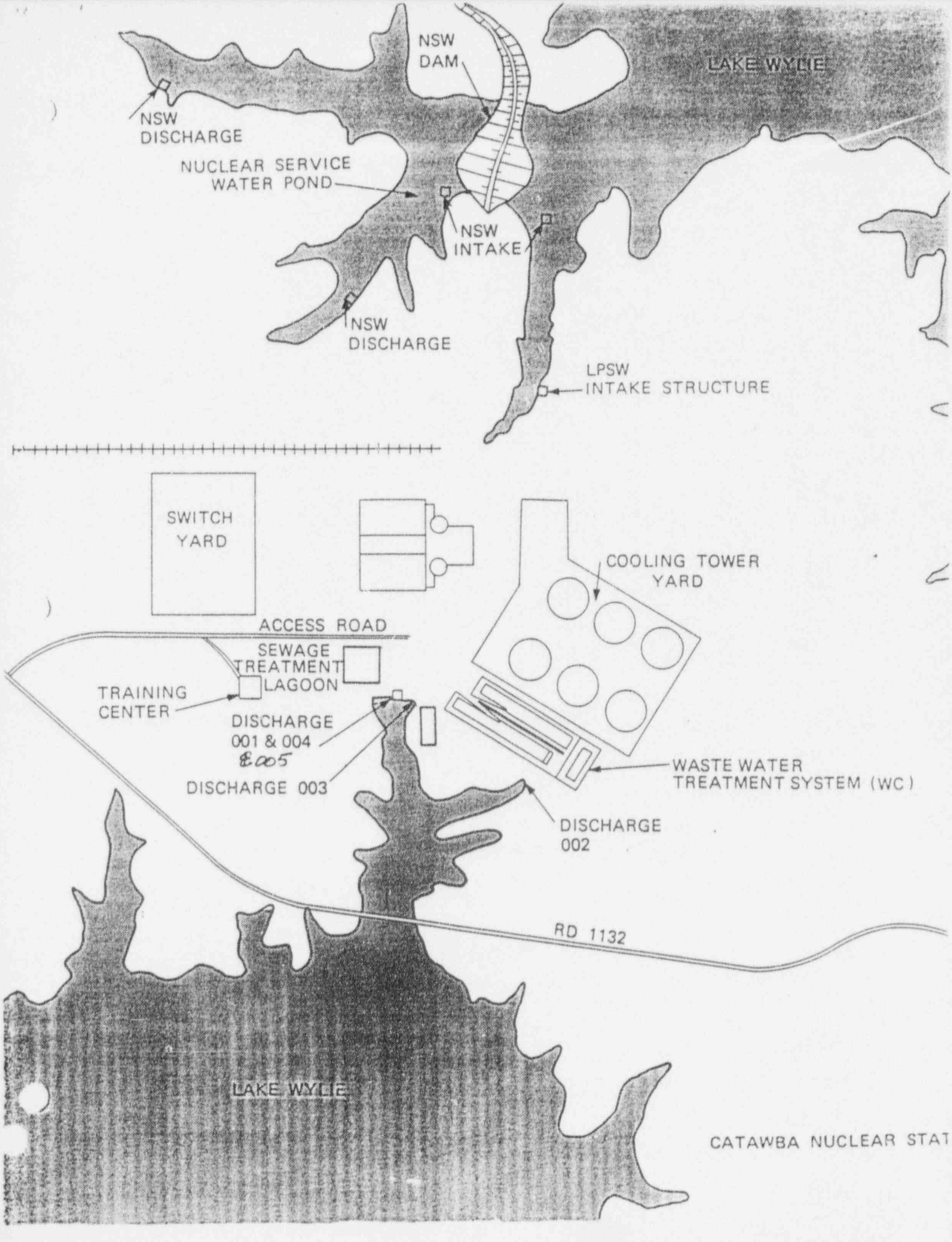
Sincerely,

John Estridge

John Estridge, Engineer
Environmental Division, Water Protection

jte/224

cc: NRC Document Distribution



CATAWBA NUCLEAR STAT

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Duke Power Company
Generation Services Department
13339 Hagers Ferry Road
Huntersville, NC 28078-7929

DUKE POWER

August 31, 1993

Mr. Timothy M. Eleazer
Industrial and Agricultural Wastewater Division
South Carolina Department of Health
and Environmental Control
2600 Bull Street
Columbia, SC 29201

Subject: Catawba Nuclear Station
NPDES Permit No. SC0004278
Notification of Maintenance Chemical
File: CN-702.13

Dear Mr. Eleazer:

Pursuant to Part III item A. 9. Catawba Nuclear Station is planning to change to a molybdate based corrosion inhibitor program. If this program is successful it will be implemented in several closed cooling water systems that currently use sodium nitrite as their main corrosion inhibitor. Once implemented this program would significantly reduce the amount of sodium nitrite that is used at Catawba Nuclear Station.

The product will be utilized in closed cooling water systems and will only be discharged on an intermittent frequency during system maintenance or possibly by leaks. It potentially could be discharged via Outfalls 001 and 002 to Lake Wylie.

The product will primarily be discharge through outfall 002- the conventional waste treatment system (WC). When cooling system maintenance is required the product would be drained to the WC system and discharged via outfall 002. The product could also be discharged through outfall 001 due to system leaks or system drainage via the liquid radwaste system.

Attachment #1 provides the information that is required by Part III A item 9 of the subject permit. Attachment #2 provides toxicity information on a typical molybdate based corrosion inhibitor product to be used - Performax 330.

Attachment #3 provides toxicity test results on nitrite. A comparison of this toxicity data indicates that nitrite is the most restrictive compound. With reference to the subject NPDES permit Part III A. item 8. the NOEC for nitrite is 4.3 mg/l (6.4 mg/l as sodium nitrite).

Attachment #4 is a copy of the Material Safety Data Sheet (MSDS) for Performax 330. Performax 330 is a typical product that is planned on being used. Different proprietary names for the same compound may be selected for use. The attached MSDS identifies the various ingredients along with their CAS numbers.

<u>Summary</u>

Based on the information provided, it is requested that the use of a molybdate based corrosion inhibitor be approved and that a limit of 4.3 mg/l (6.4 mg/l as sodium nitrite) for nitrite for Outfalls 001 and 002 be established. If approval is granted Catawba would like to begin use of this product by October 20, 1993. Please note that 4.3 mg/l of nitrite is equivalent to 1.3 mg/l NO_2-N/l or nitrite as nitrogen .

If you need additional information please give John Estridge a call at (704) 875-5965.

Sincerely,

J S Carter

John S. Carter, Technical System Manager
Environmental Division, Water Protection

jte/225

cc: NRC Document Distribution

ATTACHMENT 1

CATAWBA NUCLEAR STATION

PROPOSED MAINTENANCE CHEMICAL LIMIT

AUGUST 26, 1993

NPDES PERMIT SC0004278
PART III ITEM 9 REQUIREMENTS

1) NAME AND GENERAL COMPOSITION OF THE MAINTENANCE CHEMICAL

a) Sodium Nitrite

b) Sodium Molybdate

c) Sodium Metasilicate Anhydrous

For the general composition of the maintenance chemical please refer to the attached Material Safety Data Sheet.

2) QUANTITIES TO BE USED

Approximately 1000 pounds/year of this product are to be added to closed cooling systems.

3) FREQUENCY OF USE

Product will be added to plant systems as needed to maintain concentration levels of between 1000 and 3000 mg/l.

4) PROPOSED DISCHARGE CONCENTRATION

Based on toxicity information as referenced in Part III A. Item 8, the NOEC for nitrite is 4.3 mg/l.(6.4 mg/l as sodium nitrite) Therefore a daily maximum limit of 4.3 mg/l Nitrite per an occurrence is requested for Outfalls 001 and 002. Sampling to confirm compliance with this limit would be required whenever maintenance activities or leaks occur that have the potential to exceed the value of 3.5 mg/l.

5) EPA REGISTRATION NUMBER

unknown

6) AQUATIC TOXICITY INFORMATION

See Attachments #2 and #3.

Attachment 2

PERFORMAX™ 330 CORROSION INHIBITOR

AQUATIC TOXICITY

96 HOUR LC_{50} RAINBOW TROUT:	1,581.1 mg/l
(CONFIDENCE LIMITS 95%:	1,000 - 2,500 mg/l)
*NOEC RAINBOW TROUT:	1,000 mg/l
96 HOUR LC_{50} FATHEAD MINNOW:	812.3 mg/l
(CONFIDENCE LIMITS 95%:	682 - 968 mg/l)
NOEC FATHEAD MINNOW:	500 mg/l
48 HOUR LC_{50} DAPHNIA MAGNA:	526.8 mg/l
(CONFIDENCE LIMITS 95%:	381 - 738 mg/l)
NOEC DAPHNIA MAGNA:	125 mg/l

*NOEC - No observed effect concentration.

Attachment 3

Memo to: Mitch C. Griggs

Date: 24 January 1990

Subject: Acute and Chronic Toxicity of Nitrite (as $NaNO_2$) to <u>Ceriodaphnia dubia</u>

Data reported previously regarding chronic toxicity of nitrite to <u>C. dubia</u> (memo from J.S. Velte to M.C. Griggs dated 10 January 1990) is in error and should not be used. I was notified by our chemists this morning that the results of prior nitrite analyses had been reported erroneously to me as "mg NO_2/L" when, in fact they were "mg NO_2-N/L". In other words, the concentrations that I had been provided represented only the mass of the nitrogen component of the nitrite ion, not the entire ion. This problem is easily corrected by multiplying the values reported previously by 3.28. A revised analysis of the chronic toxicity test is reported here, as are the results of a recently completed and "properly" analyzed acute toxicity test with <u>C. dubia</u>. Please accept my apologies for any confusion this has caused you. On the bright side, we no longer need be concerned about the mysterious disappearance of nitrite in lake water (we've recovered essentially 100% of what was added). And, nitrite has proven even less toxic to <u>C. dubia</u> than we had originally thought!

Here are the revised chronic test results, based on measured NO_2 concentrations (see Table 1). The raw data are attached.

NOEC = 4.3 mg NO_2/L

LOEC = 8.5 mg NO_2/L

Chronic Value (CV) = $\sqrt{4.3 \times 8.5} = 6.0$ mg NO_2/L

A Moving Average-Angle (MAA) analysis of the 48-hour static acute test data gave the following LC50 and associated 95% confidence limits (again, the raw data sheet, and a graph of the nominal vs. measured exposure concentrations -- Figure 2, are attached).

LC50 = 28 mg NO_2/L

Lower and Upper 95% Confidence Limits = 21 and 39 mg NO_2/L

If you have questions, concerns, or need additional information, please call me at 875-5237. Again, I'm sorry for the confusion.

John

John S. Velte
Scientist

cc w/attachments: R. Biswas
K. Finley
G. Vaughan

CN1289C

CERIODAPHNIA DUBIA CHRONIC TOXICITY TEST DATA SHEET

Industry/Toxicant: Nitrite (as $NaNO_2$)

Address: NA

NPDES Permit No: NA

Effluent Serial No: NA

Diluent: Lake Wylie (fm. Mt. Island Hydro tailrace)

Carrier Solvent: (No) Yes

Test Vessel Composition: Polystyrene (Anchor Hocking PI-1)

Test Vessel Capacity: 30 mL

Test Solution Volume: 15 mL

Test Solution Renewal Frequency:

(Daily) Days

Beginning Date 12/8/89 Time: 1046

Ending Date 12/15/89 Time: 1110

Test Conducted by: J.S. Yelte (DPC)

Location of Test: DPC/ASC/BIOASSAY

Incubator ID: A

Organism Age: 22 h-6 min to 23 h-12 min

Organism Source: DPC Culture (NCDEM C. dub

Diet: #1 YTC-28/YTC-29 (beg. 12-11-89) Amount 100 µL

#2 SC-15/SC-16 (beg. 12-12-89) Amount 100 µL

#3 Amount

PROCEDURE NUMBERS

BIO- 200.0 Temperature

Temp. Device: ELENV- 3CS90

BIO- 214.0 (Dissolved O_2)

BIO- 210.0 (pH)

BIO- 217.0 (Spec. Cond.)

BIO- NA (TRC)

BIO- 215.0 (Total Alk.)

BIO- 216.0 (Total Hard.)

BIO- —

CHEMISTRY DATA

	Control	High Conc.	Control	High Conc.	Control	High Conc.	Control	High Conc.	Control	High Conc.	Control	High Conc.
D.O.	8.0	8.4										
pH	7.4	7.4										
Spec. Cond. (µS/cm)	62	99										
TRC (mg/L)	NA	NA										
Total Alk. (mg/L)	12.3	12.5										
Total Hard. (mg/L)	11.3	11.5										
Date:	12/8/89	12/8/89	/ /	/ /	/ /	/ /	/ /	/ /	/ /	/ /	/ /	/ /
Time:	1400-1500	1400-1500										
Initials:	JSV	JSV										

~~EFFLUENT COLLECTION DATA~~

Grab Collected: / / Time: By: (crossed out)

Grab Collected	Time	By
/ /		
/ /		
/ /		
/ /		
/ /		
/ /		
/ /		
/ /		

Composite		Time	By
Collected From:	/ /		
To:	/ /		
From:	/ /		
To:	/ /		
From:	/ /		
To:	/ /		
From:	/ /		
To:	/ /		

CN01900

TOXICITY TEST DATA

Industry/Toxicant: $NaNO_2$
Address: —
NPDES Permit No.: —
Effluent Serial No.: —
Dilution water: [redacted] MT019004
Carrier Solvent: ☐ Yes ☒ No
Test criterion: ☒ Mortality ☐ Immobility
_______ (Other)

Test Conducted By: J.S. Yelle
Testing Laboratory: DPC - BIOASSAY
Beginning Date: 01 / 22 / 90 Time: 1030
Ending Date: 01 / 24 / 90 Time:
Test Organism: Ceriodaphnia dubia
Organism Age: < 24 hr
Organism Source: DPC Culture via NXDEM via EPA, Cinn.

Test Type: ☒ Static
☐ Static with renewal at:
☐ Continuous flow
~~Sample Type:~~ ☐ Grab Collected: __ / __ / __ Time:
__ / __ / __ Time:
☐ Composite
Collected From: __ / __ / __ Time:
To: __ / __ / __ Time:

Concentration (mg NO_2/L Nominal) ~~Or % Effluent~~	Test Container Number	Number of Surviving Organisms 0 h	1 h	24	48	Temperature (°C) (ELENV- 31100) 0h	24	48	~~Dissolved Oxygen (mg/L)~~
0	0A	12	12	12	12	24.2	26.2	25.7	
0	0B	12	12	12 (5MF)	12	24.2	25.7	25.5	
8	1A	12	12	12	12	23.7	25.0	24.5	
8	1B	12	12	12	12	24.3	25.8	25.4	
16	2A	12	12	11	10	23.5	25.5	24.9	
16	2B	12	12	12	11	23.9	25.9	25.1	
32	3A	12	12	12	1	23.9	25.6	25.0	
32	3B	12	12	11	1	23.6	25.4	24.6	
64	4A	12	12	11	4	23.6	25.5	24.9	
64	4B	12	12	10	5	23.9	25.6	25.0	
128	5A	12	12	8	2	23.7	25.4	24.6	
128	5B	12	12	3	2	24.2	25.8	24.9	
Analyst Initials:		JSV	JSV	JSV	JSV	JSV	JSV	JSV	

~~Organism Length (mm):~~ Mean: S.D.:
~~Organism Weight (g):~~ Mean: S.D.:

Chemistry Data

Date: 01 / 22 / 90 Time: 1500 JSV

	Control	High Conc.
pH	7.4	7.4
~~Spec. Cond. (µS/cm)~~ DO mg/L	8.1	7.9
~~TRC (mg/L)~~	—	—
~~Total Alk. (mg/L)~~	—	—
~~Total Hardness (mg/L)~~	—	—

Procedure Numbers
BIO- 200.0 (Temperature)
BIO- 214.0 (Dissolved O_2)
BIO- 210.0 (pH)
~~BIO 217.0~~ (Spec. Cond.)
NA (TRC)
NA (Total Alk.)
~~BIO 216.0~~ (Total Hardness)

Test vessel capacity: 100 mL L
Test solution volume: 50 mL L
Feeding: ☒ No ☐ Yes:
Aeration: ☒ No ☐ Yes:

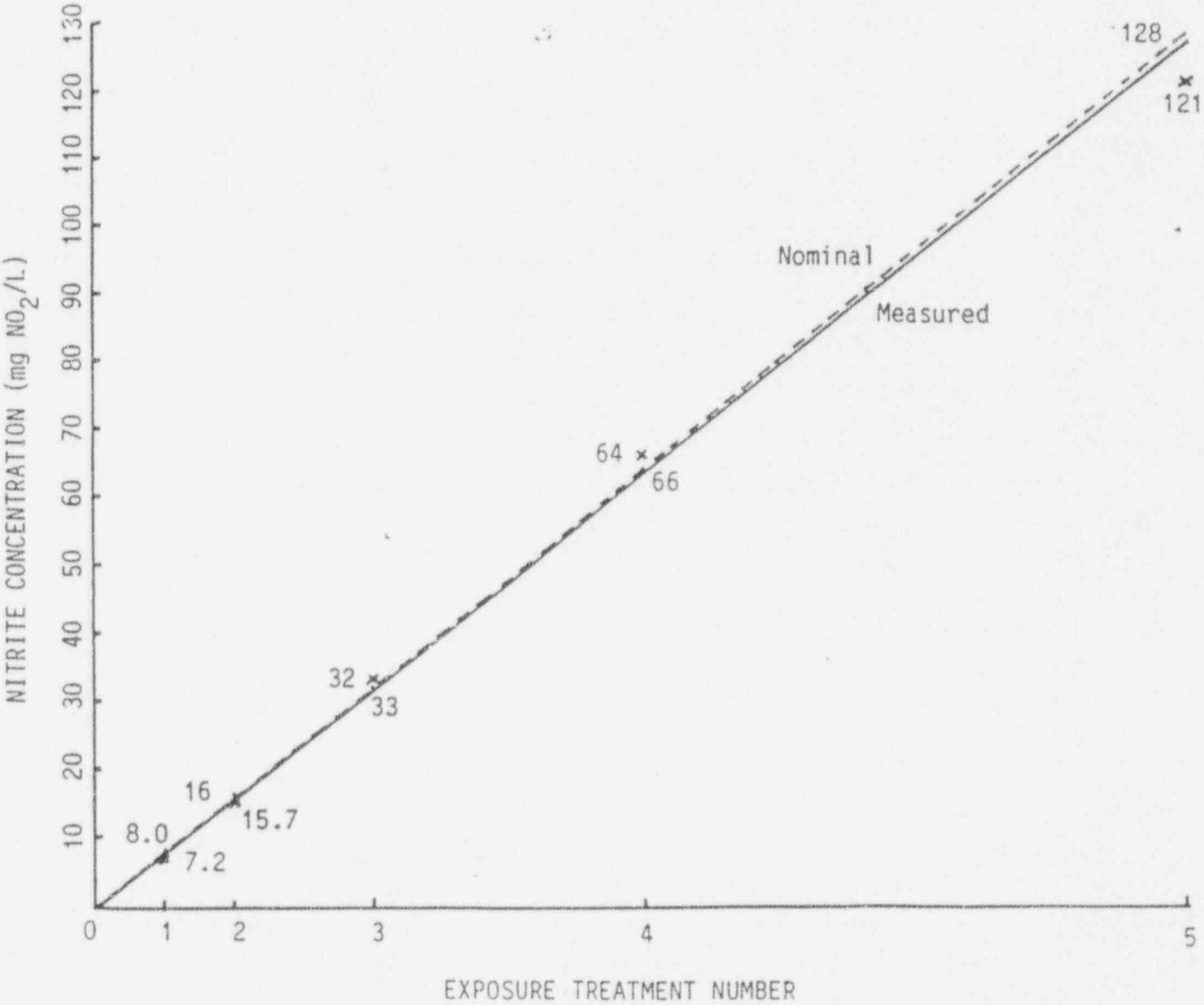
Condition of surviving organisms at end of test:

Comments: MF = Mobile Floating C. dubia

FIGURE 2

Nominal and Measured Concentrations of NO_2 in Lake Wylie Water.

(from: acute toxicity of nitrite to C. dubia test)



ASHLAND CHEMICAL INC.
One Drew Plaza, Boonton, New Jersey 07005
Phone (201) 263-7600/Telex 136444

Emergency Telephone
1(800) 274-5263 or
1(800) ASHLAND

002874

PERFORMAX(TM) 330 COOLING WATER TREATMNT

THIS MSDS COMPLIES WITH 29 CFR 1910.1200 (THE HAZARD COMMUNICATION STANDARD)

Product Name: PERFORMAX(TM) 330 COOLING WATER TREATMNT

Data Sheet No: 0231188-004
Prepared: 05/29/91
Supersedes: 04/24/91

DREW INDUSTRIAL DIVISION
500 ARCHDALE DRIVE
SUITE 115
CHARLOTTE
NC 28210

DISTRICT MANAGER

OD 10 922

PRODUCT: 4918001
INVOICE:
INVOICE DATE:
TO: DREW INDUSTRIAL DIVISION
500 ARCHDALE DRIVE
CHARLOTTE
NC 28210

SECTION I - PRODUCT IDENTIFICATION

General or Generic ID: COOLING WATER TREATMENT

DOT Hazard Classification: ORM-E

SECTION II - COMPONENTS

IF PRESENT, IARC, NTP AND OSHA CARCINOGENS AND CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA TITLE III SECTION 313 ARE IDENTIFIED IN THIS SECTION. SEE DEFINITION PAGE FOR CLARIFICATION

INGREDIENT	% (by WT)	PEL	TLV	Note
SODIUM NITRITE CAS #: 7632-00-0	10-25			(1)
SODIUM MOLYBDATE CAS #: 7631-95-0	1-10	5 MG/M3	[illegible] M3	
SODIUM NITRATE CAS #: 7631-99-4	1-10			(2)
SODIUM METASILICATE ANHYDROUS CAS #: 6834-92-0	1-10	15 MG/M3	10 MG/M3	(3)

Notes:

(1) PEL/TLV NOT ESTABLISHED FOR THIS MATERIAL

(2) PEL/TLV NOT ESTABLISHED FOR THIS MATERIAL

(3) PEL AND TLV ARE FOR TOTAL NUISANCE PARTICULATES.

SECTION III - PHYSICAL DATA

Boiling Point	for COMPONENT(55-70%)	212.00 Deg F (100.00 Deg C) @ 760.00 mm Hg
Vapor Pressure	for COMPONENT(55-70%)	17.50 mm Hg @ 68.00 Deg F (20.00 Deg C)
Specific Vapor Density		HEAVIER THAN AIR
Specific Gravity		1.250 @ 77.00 Deg F (25.00 Deg C)
Percent Volatiles		55-70%
Evaporation Rate		SLOWER THAN ETHER
pH		12.9
Appearance		CLEAR, YELLOW
State		LIQUID

SECTION IV - FIRE AND EXPLOSION INFORMATION

FLASH POINT NOT APPLICABLE

EXPLOSIVE LIMIT NOT APPLICABLE

EXTINGUISHING MEDIA: WATER FOG

HAZARDOUS DECOMPOSITION PRODUCTS: MAY FORM TOXIC MATERIALS:, NITROGEN COMPOUNDS

FIREFIGHTING PROCEDURES: WEAR SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE OPERATED IN THE POSITIVE PRESSURE DEMAND MODE AND FULL BODY PROTECTION WHEN FIGHTING FIRES.

CONTINUED ON PAGE: 2

MATERIAL SAFETY DATA SHEET

ASHLAND CHEMICAL INC.
One Drew Plaza, Boonton, New Jersey 07005
Phone (201) 263-7600/Telex 136444

Emergency Telephone
1(800) 274-5263 or
1(800) ASHLAND

Attachment 4

DEFINITIONS

This definition page is intended for use with Material Safety Data Sheets supplied by the Drew Chemical Corporation. Recipients of these data sheets should consult the OSHA Safety and Health Standards (29 CFR 1910), particularly subpart G - Occupational Health and Environmental Control, and subpart I - Personal Protective Equipment, for general guidance on control of potential Occupational Health and Safety Hazards.

SECTION I
PRODUCT IDENTIFICATION

GENERAL OR GENERIC ID: Chemical family or product description.

DOT HAZARD CLASSIFICATION: Product meets DOT criteria for hazards listed.

SECTION II
COMPONENTS

Components are listed in this section if they present a physical or health hazard and are present at or above 1% in the mixture. If a component is identified as a CARCINOGEN by NTP, IARC, or OSHA as of the date on the MSDS, it will be listed and footnoted in this section when present at or above 0.1% in the product. Negative conclusions concerning carcinogenicity are not reported. Additional health information may be found in Section V. Components subject to the reporting requirements of Section 313 of SARA Title III are identified in the footnotes in this section, along with typical percentages. Other components may be listed if deemed appropriate.

Exposure recommendations are for components. OSHA Permissible Exposure Limits (PELS) and American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) appear on the line with the component identification. Other recommendations appear as footnotes.

SECTION III
PHYSICAL DATA

BOILING POINT: Of product if known. The lowest value of the components is listed for mixtures.

VAPOR PRESSURE: Of product if known. The highest value of the components is listed for mixtures.

SPECIFIC VAPOR DENSITY: Compared to AIR = 1. If the Specific Vapor Density of a product is not known, the value is expressed as lighter or greater than air.

SPECIFIC GRAVITY: Compared to WATER = 1. If Specific Gravity of product is not known, the value is expressed as less than or greater than water.

pH: If applicable.

PERCENT VOLATILES: Percentage of material with initial boiling point below 425 degrees Fahrenheit and vapor pressure above 0.1mm Hg at 68 F.

EVAPORATION RATE: Indicated as faster or slower than ETHYL ETHER, unless otherwise stated.

SECTION IV
FIRE AND EXPLOSION DATA

FLASH POINT: Method identified.

EXPLOSION LIMITS: For product if known. The lowest value of the components is listed for mixtures.

HAZARDOUS DECOMPOSITION PRODUCTS: Known or expected hazardous products resulting from heating, burning or other reactions.

SECTION IV (cont.)

EXTINGUISHING MEDIA: Following National Fire Protection Association criteria.

FIREFIGHTING PROCEDURES: Minimum equipment to protect firefighters from toxic products of vaporization, combustion or decomposition in fire situations. Other firefighting hazards may also be indicated.

SPECIAL FIRE AND EXPLOSION HAZARDS: States hazards not covered by other sections.

NFPA CODES: Hazard ratings assigned by the National Fire Protection Association.

SECTION V
HEALTH HAZARD DATA

PERMISSIBLE EXPOSURE LIMIT: For product.

THRESHOLD LIMIT VALUE: For product.

EFFECTS OF ACUTE OVEREXPOSURE: Potential local and systemic effects due to single or short term overexposure to the eyes and skin or through inhalation or ingestion.

EFFECTS OF CHRONIC OVEREXPOSURE: Potential local and systemic effects due to repeated or long term overexposure to the eyes and skin or through inhalation or ingestion.

FIRST AID: Procedures to be followed when dealing with accidental overexposure.

PRIMARY ROUTE OF ENTRY: Based on properties and expected use.

SECTION VI
REACTIVITY DATA

HAZARDOUS POLYMERIZATION: Conditions to avoid to prevent hazardous polymerization resulting in a large release of energy.

STABILITY: Conditions to avoid to prevent hazardous or violent decomposition.

INCOMPATIBILITY: Materials and conditions to avoid to prevent hazardous reactions.

SECTION VII
SPILL OR LEAK PROCEDURES

Reasonable precautions to be taken and methods of containment, clean-up and disposal. Consult federal, state and local regulations for accepted procedures and any reporting or notification requirements.

SECTION VIII
PROTECTIVE EQUIPMENT TO BE USED

Protective equipment which may be needed when handling the product.

SECTION IX
SPECIAL PRECAUTIONS OR OTHER COMMENTS

Covers any relevant points not previously mentioned.

ADDITIONAL COMMENTS

Containers should be either reconditioned by CERTIFIED firms or properly disposed of by APPROVED firms. Disposal of containers should be in accordance with applicable laws and regulations. "EMPTY" drums should not be given to individuals. Serious accidents have resulted from the misuse of "EMPTIED" containers (drums,pails,etc.). Refer to Sections V and IX.

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USED TO SEPARATE ITEMS

Duke Power Company
Generation Services Department
13339 Hagers Ferry Road
Huntersville, NC 28078-7929

DUKE POWER

September 30, 1993

Mr. Timothy M. Eleazer
Industrial and Agricultural Wastewater Division
South Carolina Department of Health
and Environmental Control
2600 Bull Street
Columbia, SC 29201

Subject: Catawba Nuclear Station -NPDES Permit No. SC0004278
Request to Reduce Toxicity Monitoring-Outfalls 001, 002
File: CN-254.00

Dear Mr. Eleazer:

The purpose of this memo is to request a reduction in the toxicity monitoring requirements for Catawba Nuclear Station's outfalls 001 and 002. Please find a summary of the toxicity monitoring history for these two outfalls listed below:

Date	Outfall 001	Outfall 002
October 1992	Pass	Pass
November 1992	Pass	Pass
December 1992	Pass	Pass
January 1993	Pass	Pass
February 1993	Pass	Pass
March 1993	Pass	Pass1
April 1993	Pass	Fail
April 1993 Retest	N/A	Pass
May 1993	Pass	Pass
June 1993	Pass	Pass
July 1993	Pass	Pass
August 1993	Pass	Pass

Please note that in Part III, special condition #13 (e) allows for a reduction in the monitoring from monthly to quarterly after twelve consecutive months of toxicity testing has been completed.

Additionally, it is requested that Part III, special condition #14 be put into effect. This will allow pages 5 & 9 of the permit to become effective and for pages 4 & 8 to expire.

Pages 5 & 9 require that 1 sample per month be collected. Therefore, if the request to drop the frequency to quarterly is granted, these sheets will need to be revised by the State to show the new frequency of quarterly sampling. Additionally, pages 5 & 9 differ from pages 4 & 8 in that Part III, Special Condition #13 c is omitted from the requirements. This is the condition which requires that a toxicity evaluation plan be submitted following a failed toxicity test. We would like for the State to verify that this is correct.

If possible we would like a response to this request prior to the November, 1993 sampling. If you need additional information or have any questions please call John Estridge at (704) 875-5965 or Robert Wylie at (704)875-5970.

Sincerely,

J S Carter

John Carter, Technical System Manager
Environmental Division, Water Protection

jte/240

cc: NRC Document Distribution

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USED TO SEPARATE ITEMS

South Carolina
DHEC
Department of Health and Environmental Control
2600 Bull Street, Columbia, SC 29201

November 5, 1993

Mr. John S. Carter, Technical System Manager
Environmental Division
Duke Power Company
13339 Hagers Ferry Road
Huntersville, N.C. 28078-7929

Re: NPDES Permit No. SC0004278
Duke Power Co./Catawba Nuclear Station
York County

Dear Mr. Carter:

Our Office has received your September 30, 1993 request to reduce the sampling frequency of the chronic toxicity testing for Outfalls 001 and 002 required by NPDES Permit No. SC0004278 at the Duke Power Company/Catawba Nuclear Station in York County. Based on a review of the toxicity testing results submitted, we agree with your request to reduce the sampling frequency from monthly to quarterly. We will be sending the revised discharge monitoring reports (DMR) in a few weeks. Also, as requested pages 5 and 9 of the NPDES permit will become effective and pages 4 and 8 shall expire. In regard to Special Condition No. 13 Item c, when pages 5 and 9 become effective the toxicity testing becomes an enforceable part of the permit. A chronic toxicity testing failure would be considered a violation of the permit rather than a monitored and reported result.

The October 1993 chronic toxicity testing results for Outfalls 001 and 002 shall serve as the toxicity samplings for the last quarter of 1993.

If you should have any questions, please call me at (803)734-5247.

Sincerely,

Timothy M. Eleazer

Timothy M. Eleazer
Environmental Engineer Associate
Industrial and Agricultural
Wastewater Division

TME/ebs

cc: Al Williams, Catawba EQC
Bob Knauss, Enforcement BWPC
Henry Gibson, NPDES Administration
Vernon Beaty, Water Quality Monitoring

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USED TO SEPARATE ITEMS

Duke Power Company
Generation Services Department
13339 Hagers Ferry Road
Huntersville, NC 28078-7929

DUKE POWER

November 19, 1993

Mr. Robert Knauss
Enforcement Division
South Carolina Department of Health
and Environmental Control
2600 Bull Street
Columbia, SC 29201

Subject: Catawba Nuclear Station - Outfall 001
NPDES Permit No. SC0004278
Toxicity Evaluation Plan
File: CN-254.00
CERTIFIED: P 068 519 044

Dear Mr. Knause:

Part III. A. 13 O(c) of the subject permit requires that a Toxicity Evaluation Plan (TEP) be submitted when a test failure occurs. A sample collected on October 4, 1993 failed the required toxicity monitoring at outfall 001. A retest sample collected on October 18, 1993 in a passing test. Attached please find the laboratory reports for both tests.

Based upon the above information and the fact that there is no indication of routine toxicity failures, Duke Power requests that no further TEP action be required for this October 4, 1993 test failure.

Tim Eleazar, provided this office with a memo dated November 5, 1993 which replaced the monitoring and reporting requirement with a toxicity compliance limit. He also indicated in this memo that our fourth quarter 1993 sampling results have been satisfied by the above monitoring. Therefore, our next scheduled toxicity monitoring will occur during the first quarter of 1994.

If you need additional information or have any questions please contact John Estridge at (704)875-5965.

Sincerely,

J S Carter

John S. Carter, Technical System Manager
Environmental Division, Water Protection

jte/253

attachment

cc: Tim Eleazar- SCDHEC Industrial WW Division
Vernon Beaty-SCDHEC

Facility: Catawba Nuclear Station NPDES No.: SC0004278 County: York
Sampling Point: 001 (Blowdn, Serv. Water, Rad. Waste) Receiving Stream: Lake Wylie
Laboratory: Duke Power Biomonitoring Cert. No.: 99005 Exp. Date: 12/31/93

Test Organism: Ceriodaphnia dubia Temp. Range: 24.3 to 25.2 °C IWC: 100%
Test Type: ( ) hr acute; (7) d chronic; ____ static ✔ daily-renewal
Started (date/time): 10-20-93 / 1116 Ended (date/time): 10-26-93 / 1052

Dilution Water Source	Alk	Hard	Cond
20% Perrier® in Milli-Q			
DPC Lot# PER- 200	62.3	76.6	167

Sample Type: ____ grab (24) hr comp.

Sample #	date/time collected	Alk	Hard	Cond	Cl2	# renewals
CN109305	10-18-93 / 1310	13.4	22.1	222	ND	2
CN109306	10-20-93 / 1525	13.8	21.9	225	ND	2
CN109307	10-22-93 / 1300	13.9	22.5	235	ND	2

Control

Day		1	2	3	4	5	6	7
Temp	(°C)	24.3	24.8	24.9	24.9	25.0	24.7	24.8
D.O.	initial	7.8	8.0	8.3	9.0	7.9	8.1	NA
	final	7.8	8.1	8.0	8.0	7.9	8.0	NA
pH	initial	8.2	8.2	8.2	8.2	8.2	8.2	NA
	final	8.2	8.1	8.2	8.3	8.0	8.1	NA

(100) % Effluent

Day		1	2	3	4	5	6	7
Temp	(°C)	24.4	24.9	25.0	24.7	25.2	24.6	24.6
D.O.	initial	7.5	7.6	8.0	8.3	8.1	8.0	NA
	final	7.4	7.5	7.5	7.7	7.7	7.7	NA
pH	initial	7.3	7.4	7.4	7.4	7.4	7.5	NA
	final	7.4	7.3	7.4	7.5	7.6	7.5	NA

Comments:
Principal Analyst: B.N. Young Procedure Number: BIO-260.0 (SC P/F Modification)
Organism Age at Initiation: 20 to 22 hours Organism Source: Duke Power Culture (Tray C)
Sample CN109305 Temperature at Receipt: 0.7 °C **Retest of Failed Oct. NPDES Test (001)**
Sample CN109306 Temperature at Receipt: 0.3 °C Test Vessels: 30-mL polystyrene
Sample CN109307 Temperature at Receipt: 0.2 °C Test Solution Volume: 15 mL
No. Organisms per Test Vessel: 1 Feeding: Daily; 0.1 mL ea. YTC and Selenastrum susp.
Aeration: None M=Male; NA=Not Applicable; NM=Not Measured; ND=Not Detected

Data checked by: David J. Coughlan Date: 11/2/93
Laboratory Supervisor: Gene Vaughan Date: 11 Nov 93

(over)

CA1093K1

Facility: Catawba Nuclear Station NPDES No.: SC0004278 County: York

Sampling Point: 001 (Blowdn., Serv. Water, Rad. Waste) Receiving Stream: Lake Wylie

Laboratory: Duke Power Biomonitoring Cert. No.: 99005 Exp. Date: 12/31/93

Test Organism: Ceriodaphnia dubia Temp. Range: 24.3 to 25.6 °C IWC: 100%

Test Type: ( ) hr acute; (7) d chronic; ____ static ✔ daily-renewal

Started (date/time): 10-05-93 / 1215 Ended (date/time): 10-12-93 / 1215

Dilution Water Source	Alk	Hard	Cond
20% Perrier® in Milli-Q			
DPC Lot# PER- 197	60.6	79.3	183

Sample Type: ____ grab (24) hr comp.

Sample #	date/time collected	Alk	Hard	Cond	Cl2	# renewals
CN109301	10-04-93 / 1300	13.8	21.0	205	ND	2
CN109303	10-06-93 / 1530	16.7	21.9	225	ND	3
CN109304	10-08-93 / 1305	14.5	19.1	208	ND	2

Control

Day		1	2	3	4	5	6	7	8
Temp	(°C)	24.8	25.2	24.5	25.3	25.1	25.4	25.0	24.9
D.O.	initial	7.9	7.9	7.9	7.8	8.2	8.5	8.3	
	final	7.9	7.8	7.7	7.7	7.8	7.9	7.8	
pH	initial	8.1	8.3	8.3	8.3	8.2	8.2	8.2	
	final	8.2	8.2	8.2	8.2	8.2	8.2	8.3	

(100) % Effluent

Day		1	2	3	4	5	6	7	8
Temp	(°C)	24.3	25.6	25.0	25.6	25.2	25.5	24.8	24.7
D.O.	initial	8.0	7.8	7.8	7.8	7.8	7.8	8.2	
	final	7.6	7.6	7.5	7.5	7.6	7.7	7.6	
pH	initial	7.3	7.4	7.3	7.3	7.3	7.5	7.4	
	final	7.3	7.5	7.6	7.6	7.6	7.8	7.6	

Comments:

Principal Analyst: B.N.Young Procedure Number: BIO-260.0 (SC P/F Modification)

Organism Age at Initiation: 19 to 24 hours Organism Source: Duke Power Culture (Tray C&D)

Sample CN109301 Temperature at Receipt: 0.4 °C

Sample CN109303 Temperature at Receipt: 1.6 °C Test Vessels: 30-mL polystyrene

Sample CN109304 Temperature at Receipt: 0.7 °C Test Solution Volume: 15 mL

No. Organisms per Test Vessel: 1 Feeding: Daily; 0.1 mL ea. YTC and Selenastrum susp.

Aeration: None M=Male; NA=Not Applicable; NM=Not Measured; ND=Not Detected

Data checked by: Keith A. Finley Date: 10/18/93

Laboratory Supervisor: Gene Vaughan Date: 11 Nov 93

(over)

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USED TO SEPARATE ITEMS

12/08/93 ... DICO ...

South Carolina

DHEC

Department of Health and Environmental Control

2600 Bull Street, Columbia, SC 29201

Promoting Health, Protecting the Environment

November 22, 1993

Mr. John S. Carter, Technical System Manager
Environmental Division
Duke Power Company
13339 Hagers Ferry Road
Huntersville, N.C. 28078-7929

Re: Use of Molybdate
Duke Power Co./Catawba Nuclear Station
York County

Dear Mr. Carter:

Our Office has received your August 31, 1993 letter proposing the use of molybdate as a corrosion inhibitor in several of the closed cooling water systems at the Duke Power Company/Catawba Nuclear Station in York County. We understand if this program is successful the level of sodium nitrite, which is currently the main corrosion inhibitor, would significantly be reduced. The molybdate will only be discharged via outfalls 001 and 002 to Lake Wylie on an intermittent frequency during system maintenance or possible leaks. Based on a review of the information provided, we approve your request to limit nitrite at Outfalls 001 and 002 to a daily maximum of less than 4.3 mg/l, the no observed effect concentration (NOEC), per occurrence.

If you should have any questions, please call me at (803)734-5247.

Sincerely,

Timothy M. Eleazer

Timothy M. Eleazer
Environmental Engineer Associate
Industrial and Agricultural
Wastewater Division

ENVIRONMENTAL PROTECTION SECTION

NOV 29 1993

☐ FILE ____
☐ TICKLER DATE ____
☐ COPY ____ ____
☒ ROUTE JTE ____

TME/ebs

cc: Al Williams, Catawba EQC
Vernon Beaty, Water Quality Monitoring

recycled paper

Duke Power Company
Catawba Nuclear Generation Department
4800 Concord Road
York, SC 29745

D. L. Rehn
Vice President
(803)831-3205 Office
(803)831-3426 Fax

DUKE POWER

December 13, 1993

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Subject: Catawba Nuclear Station
Docket Nos. 50-413 and 50-414
Environmental Protection Plan Reporting

The Environmental Protection Plan (Appendix B to the Catawba Facility Operating License) requires that changes to the NPDES Permit or State Certification be reported to the NRC within thirty (30) days following the date the change is approved.

Attached please find approval for the discharge of Molybdate issued by the South Carolina Department of Health and Environmental Control November 22, 1993.

Very truly yours

D. L. Rehn

Attachments

JTH/EPP 1993

xc: S. D. Ebneter
Regional Administrator, Region II

R. J. Freudenberger
Senior Resident Inspector
Catawba Nuclear Station

R. E. Martin, ONRR

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USED TO SEPARATE ITEMS

Duke Power Company
Generation Services Department
13339 Hagers Ferry Road
Huntersville, NC 28078-7929

DUKE POWER

December 28, 1993

Mr. Timothy M. Eleazer
Industrial and Agricultural Wastewater Division
South Carolina Department of Health
and Environmental Control
2600 Bull Street
Columbia, SC 29201

Subject: Catawba Nuclear Station -NPDES Permit No. SC0004278
Steam Generator Chemical Metal Cleaning
File: CN-208.20
Certified: 068 519 062

Dear Mr. Eleazer:

This letter is being written to request a one time approval to discharge a maintenance compound used to chemically clean the steam generators. In May 1994 Duke Power Company will perform a steam generator chemical cleaning. Four steam generators for Catawba Unit 2 will be cleaned during this process.

Treatment Chemicals

Ethylenediamine (EDA) and ammonium carbonate $(NH_4)_2CO_3$ have been selected as the treatment chemicals to use for the cleaning. These compounds have been selected to attack the copper and iron build up within the steam generator and not to attack the base metals.

EDA is less aggressive than the more commonly used chemical of EDTA (diammonium salt). The EDTA has been commonly used for this type of cleaning and if used would yield significantly higher concentrations of copper and iron in the resulting wastewater.

Please find attached information on EDA and ammonia carbonate required by the permit (Part III, item 9) which is necessary to obtain approval.

Wastewater Treatment

Temporary treatment equipment will be used to treat this wastewater prior to discharge. A separate submittal will be made to describe

the temporary treatment in order to obtain the necessary State approvals. Prior to finalizing the temporary treatment system design, it is necessary to know if additional monitoring above the existing permit requirements is going to be imposed.

As a result of this cleaning approximately 40,000 gallons (0.04 MG) of liquid waste will be generated. The approximate composition of this waste will be 3% by weight ammonium carbonate $(NH_4)_2CO_3$, 3% by weight ethylenediamine (EDA), 400 ppm copper, 50 ppm iron, and the balanced deionized water. The wastewater will be slightly radioactive.

Prior to any treatment, the waste will be analyzed to determine if it is hazardous. Upon determining that the waste is non-hazardous it will be treated to comply with the effluent limits contained in the NPDES permit for this facility.

The liquid waste will be processed through internal outfall 004 and then to Lake Wylie by means of outfall 001. Outfall 004 has permit limits of 1 ppm for copper and 1 ppm for iron.

Precipitation by chemical coagulation coupled with filtration is the anticipated process to be used to remove the metals prior to discharge. The process would be composed of chemical addition equipment, coagulation/settling tank, filter press, and a monitor tank. Each tank would be sampled and analyzed to verify compliance prior to discharge. Along with existing limits, the pH at outfall 001 will be maintained between 6.0 and 8.0.

Attached to this memo please find a flow diagram describing the work to be performed.

Summary

Duke Power is requesting approval to use EDA and ammonium carbonate for use in chemically cleaning the steam generators for Unit 2. Additionally, it is requested that the State determine if any additional monitoring will be imposed due to this discharge. Duke Power will then finalize our treatment system and submit the necessary information to the State for review.

If you need additional information or have any questions please call John Estridge at (704) 875-5965.

Sincerely,

J S Carter

John Carter, Technical System Manager
Environmental Division, Water Protection

jte/270

cc: NRC Document Distribution

Attachments: #1 Chemical Information and MSDS Sheets
#2 Flow Diagram

ATTACHMENT 1

CATAWBA NUCLEAR STATION

PROPOSED MAINTENANCE CHEMICAL LIMIT

DECEMBER 28, 1993

NPDES PERMIT SC0004278
PART III ITEM 9 REQUIREMENTS

1) NAME AND GENERAL COMPOSITION OF THE MAINTENANCE CHEMICAL

a) Ethylenediamine (EDA)

b) Ammonium Carbonate $(NH_4)_2CO_3$

2) QUANTITIES TO BE USED

40,000 gallons of a solution of approximately 3% EDA and 3% Ammonium Carbonate will be used for the cleaning.

3) FREQUENCY OF USE

This compound will be used for a single chemical metal cleaning of the steam generators for Catawba Unit #2.

4) PROPOSED DISCHARGE CONCENTRATION

The discharge at Outfall 004 will be less than 1.0 ppm iron, and 1.0 ppm copper.

The Discharge at Outfall 001 will have a pH between 6.0 and 8.0. The EDA concentration will be less than 1.0 mg/l, Total ammonia will be maintained less than 1.0 mg/l.

5) EPA REGISTRATION NUMBER

a) Ethylenediamine. CAS# 000107-15-3

b) Ammonium Carbonate. CAS#506-87-6

6) AQUATIC TOXICITY INFORMATION

a) Ethylenediamine.
Acute LC50

Daphnia magna (water flea)	0.88-16 mg/l
Pimephales promelas (Fathead Minnow)	116-220 mg/l

b) Ammonium Carbonate.
When mixed with water, ammonium carbonate dissociates to ammonia and carbonate. Chronic Daphnid toxicity to unionized ammonia has been reported to vary from 0.3 to 1.2 mg/l.

The toxicity of total ammonia (mg/l NH_3) is typically higher than that of unionized ammonia. Please see the attached EPA

document Quality Criteria for Water 1986, EPA 440/5-86-001. This document shows a 4-day average concentrations for total ammonia at 20° C and a pH of 8.0 Std. Units to have a toxicity of 1.31 mg/l (See Table 2, section B - Salmonids and Other Sensitive Coldwater Species Absent)

MATERIAL SAFETY DATA SHEET

Dow Chemical U.S.A.* Midland, MI 48674 Emergency Phone: 517-636-4400

M282 Product Code: 30421 Page: 1

Product Name: ETHYLENEDIAMINE

Effective Date: 08/17/89 Date Printed: 11/22/90 MSDS:000161

1. INGREDIENTS: (% w/w, unless otherwise noted)

Ethylenediamine CAS# 000107-15-3 99%

This document is prepared pursuant to the OSHA Hazard Communication Standard (29 CFR 1910.1200). In addition, other substances not 'Hazardous' per this OSHA Standard may be listed. Where proprietary ingredient shows, the identity may be made available as provided in this standard.

2. PHYSICAL DATA:

BOILING POINT: 239F, 115C
VAP. PRESS: 10 mmHg @ 20C
VAP. DENSITY: 2.07
SOL. IN WATER: Mixes completely.
SP. GRAVITY: 0.893-0.906 25/25C
FREEZING POINT: 51F, 11C
APPEARANCE: Colorless liquid.
ODOR: Ammoniacal odor.

3. FIRE AND EXPLOSION HAZARD DATA:

FLASH POINT: 101F, 38C
METHOD USED: PMCC

FLAMMABLE LIMITS
LFL: 2.6% @ 100C
UFL: 14.2% @ 100C

EXTINGUISHING MEDIA: Water fog, alcohol foam, CO2, dry chemical.

FIRE & EXPLOSION HAZARDS: Not available.

FIRE-FIGHTING EQUIPMENT: Use full protective clothing (see

(Continued on Page 2)
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* An Operating Unit of The Dow Chemical Company

MATERIAL SAFETY DATA SHEET

Dow Chemical U.S.A.* Midland, MI 48674 Emergency Phone: 517-636-4400

Product Code: 30421 Page: 2

Product Name: ETHYLENEDIAMINE

Effective Date: 08/17/89 Date Printed: 11/22/90 MSDS:000161

3. FIRE AND EXPLOSION HAZARD DATA: (CONTINUED)

section 8) and a positive-pressure, self-contained breathing apparatus.

4. REACTIVITY DATA:

STABILITY: (CONDITIONS TO AVOID) Autoignition temperature in air is approximately 763F, 406C.

INCOMPATIBILITY: (SPECIFIC MATERIALS TO AVOID) Acid, oxidizing material, halogenated organic compounds, aldehydes, ketones, and acrylates. Mixture with these materials will result in a temperature and/or pressure increase.

HAZARDOUS DECOMPOSITION PRODUCTS: Nitrogen oxides when burned.

HAZARDOUS POLYMERIZATION: Will not occur.

5. ENVIRONMENTAL AND DISPOSAL INFORMATION:

ACTION TO TAKE FOR SPILLS/LEAKS: Large spill - dike up and dilute with water. Pump into appropriate containers. Small spill - dilute with water and recover or use noncombustible absorbent material/sand and shovel into suitable containers.

DISPOSAL METHOD: Large quantities could be recovered. Otherwise, incinerate in accordance with local regulations. Do not dump into sewers, on the ground or into any body of water. The Dow Chemical Company may be contacted for advice.

6. HEALTH HAZARD DATA:

EYE: May cause severe irritation with corneal injury which may result in permanent impairment of vision, even blindness. Vapors may irritate eyes.

(Continued on Page 3)

* An Operating Unit of The Dow Chemical Company

MATERIAL SAFETY DATA SHEET

Dow Chemical U.S.A.* Midland, MI 48674 Emergency Phone: 517-636-4400

Product Code: 30621 Page: 3

Product Name: ETHYLENEDIAMINE

Effective Date: 08/17/89 Date Printed: 11/22/90 MSDS:000161

6. HEALTH HAZARD DATA: (CONTINUED)

SKIN CONTACT: Short single exposure may cause severe skin burns. Has caused allergic skin reactions in humans. DOT Classification: Corrosive.

SKIN ABSORPTION: A single prolonged exposure may result in the material being absorbed in harmful amounts. The LD50 for skin absorption in rabbits is 657 mg/kg.

INGESTION: Single dose oral toxicity is low to moderate. Ingestion may cause gastrointestinal irritation or ulceration. May cause severe burns of the mouth and throat. The LD50 is 1460 mg/kg for rats and 470 mg/kg for guinea pigs.

INHALATION: Excessive vapor concentrations are attainable and could be hazardous on single exposure. Excessive exposure may cause severe irritation to the upper respiratory tract. May cause respiratory sensitization in susceptible individuals.

SYSTEMIC & OTHER EFFECTS: Repeated excessive exposures may cause liver and kidney injury. Did not cause cancer in long-term animal studies. Birth defects are unlikely. Exposures having no effect on the mother should have no effect on the fetus. Did not cause birth defects in animals; other effects were seen in the fetus only at doses which caused toxic effects to the mother. In animal studies, has shown not to interfere with reproduction. Preponderance of negative data indicates minimal or no mutagenic potential.

7. FIRST AID:

EYES: Immediate and continuous irrigation with flowing water for at least 30 minutes is imperative. Prompt medical consultation is essential.

SKIN: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician if irritation persists.

(Continued on Page 4)
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MATERIAL SAFETY DATA SHEET

Dow Chemical U.S.A.* Midland, MI 48674 Emergency Phone: 517-636-4400

Product Name: ETHYLENEDIAMINE

Effective Date: 08/17/89 Date Printed: 11/22/90 MSDS:000161

7. FIRST AID: (CONTINUED)

Wash clothing before reuse. Destroy contaminated shoes and other leather items or articles which cannot be decontaminated.

INGESTION: Do not induce vomiting. Give large amounts of water or milk if available and transport to medical facility.

INHALATION: Remove to fresh air if effects occur. Consult a physician.

NOTE TO PHYSICIAN: Corrosive. May cause stricture. If lavage is performed, suggest endotracheal and/or esophagoscopic control. If burn is present, treat as any thermal burn, after decontamination. No specific antidote. Supportive care. Treatment based on judgment of the physician in response to reactions of the patient. Excessive exposure may aggravate preexisting asthma, liver and kidney disease.

8. HANDLING PRECAUTIONS:

EXPOSURE GUIDELINE(S): ACGIH TLV and OSHA PEL are 10 ppm.

VENTILATION: Control airborne concentrations below the exposure guideline. Use only with adequate ventilation. Local exhaust ventilation may be necessary for some operations.

RESPIRATORY PROTECTION: Atmospheric levels should be maintained below the exposure guideline. When respiratory protection is required for certain operations, use an approved air-purifying respirator.

SKIN PROTECTION: Use protective clothing impervious to this material. Selection of specific items such as gloves, boots, apron, or full-body suit will depend on operation. Wear a face-shield which allows use of chemical goggles, or wear a full-face respirator to protect face and eyes when there is any likelihood of splashes. Safety shower should be located in immediate work area. Remove contaminated clothing immediately,

(Continued on Page 5)

MATERIAL SAFETY DATA SHEET

8. HANDLING PRECAUTIONS: (CONTINUED)

wash skin area with soap and water, and launder clothing before reuse. Contaminated leather items, such as shoes, belts and watchbands, should be removed and destroyed.

EYE PROTECTION: Use chemical goggles. Wear a face-shield which allows use of chemical goggles, or wear a full-face respirator to protect face and eyes when there is any likelihood of splashes. If vapor exposure causes eye discomfort, use a full-face respirator. Eye wash fountain should be located in immediate work area.

9. ADDITIONAL INFORMATION:

REGULATORY REQUIREMENTS:

SARA HAZARD CATEGORY: This product has been reviewed according to the EPA 'Hazard Categories' promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

An immediate health hazard
A delayed health hazard
A fire hazard

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Ground all transfer equipment. Store below 120F, 49C and above 51F, 11C. Hold bulk storage under nitrogen blanket. Copper and alloys of copper should not be used as they are quickly corroded by the product.

MSDS STATUS: Revised Section 9.

(Continued on Page 6)
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* An Operating Unit of The Dow Chemical Company

MATERIAL SAFETY DATA SHEET

Dow Chemical U.S.A.* Midland, MI 48674 Emergency Phone: 517-636-4400

Product Code: 30421 Page: 6

Product Name: ETHYLENEDIAMINE

Effective Date: 08/17/89 Date Printed: 11/22/90 MSDS:000161

Ammonium Carbonate

Technical Bulletin

Synonyms: Diammonium carbonate
Chemical formula: $(NH_4)_2CO_3$
Molecular weight: 96.09

Physical properties

Ammonium carbonate is a white, crystalline powder with a strong odor of ammonia. It decomposes into ammonia, carbon dioxide, and water at temperatures over 59°C.

Ammonium carbonate is readily soluble in water yielding slightly alkaline solutions.

Average chemical analysis

Ammonia	31.3% (30.5–32.5%)
Carbon dioxide	55.5%
Water	~13.2%
Water insolubles	0.002%
Residue on ignition (sulfate)	0.005%
Iron	0.0005%
Arsenic	<0.0001%
Lead	<0.0001%
Zinc	<0.0001%
Copper	<0.0001%
Sulfate	0.0002%
Chloride	0.0001%

BASF ammonium carbonate conforms to the purity requirements of the Food Chemical Codex.

Average grain size distribution

0.0 0.2mm	20.0%
0.2 0.5mm	60.0%
Over 0.5mm	20.0%

Bulk density is approximately 900 kg/m³.

Chemical behavior

Ammonium carbonate gives off carbon dioxide on contact with acids and gaseous ammonia on contact with alkalis.

Nickel, copper, and many of their alloys are corroded by ammonium carbonate.

Stainless steel, aluminum, glass, ceramics, rubber, and plastics are resistant to ammonium carbonate.

Ammonium carbonate reacts with nitrites, e.g., sodium nitrite at room temperature. The reaction may be accompanied by flames and be explosive.

Applications

In chemical and pharmaceutical industries it is used for analytical purposes and in the production of organic compounds, e.g., hetrocycles and in the manufacture of catalysts.

Chemical Intermediates

BASF

It is also used as a blowing agent in the manufacture of cellular plastics and foam rubber, in the manufacture of casein dyes, casein glues, and other adhesives, as well as an additive to photographic developers.

In the textile industry it is used for neutralizing in the carbonization process; in dyeing, as a base that can be readily removed by boiling; and as a neutralizing agent.

In the cosmetic industry it is used as an additive to shampoos and hair lotions as well as in smelling salts.

Ammonium carbonate is also used as a leavening agent for biscuits and cookies.

It is also used in the manufacture of strippers for removing layers of nickel and copper from steel, plastics, and zinc substrates.

Storage
Ammonium carbonate should never be stored in proximity to sodium nitrite (see chemical behavior).

Ammonium carbonate loses its free-flowing properties within a few days and tends to cake. This does not affect the chemical composition or usability.

Ammonium carbonate must be kept in tightly closed containers in a cool, dry place. If it is exposed to air, gaseous ammonia and carbon dioxide are liberated with an attendant loss in weight.

Packaging
Ammonium carbonate is sold in 50 kg bags as well as in 52 kg and 145 kg drums.

BASF Corporation
100 Cherry Hill Road
Parsippany, New Jersey 07054
(201) 316-3870
800-426-8702

BASF

MATERIAL SAFETY DATA SHEET

BASF CORPORATION CHEMICALS DIV.
100 CHERRY HILL ROAD

PARSIPPANY,, NJ 07054
(800) 669-BASF

Original Date: 02/11/1993
Revision Date: 02/11/1993

Emergency Telephone: (800) 424-9300 (CHEMTREC)
(800) 832-HELP (BASF Hotline)

BOTH NUMBERS ARE AVAILABLE DAYS, NIGHTS, WEEKENDS, & HOLIDAYS.

SECTION 1 - PRODUCT INFORMATION

Product ID: NCI 019741

AMMONIUM CARBONATE POWDER

Common Chemical Name:
Ammonium Carbonate

Synonyms:
Crystal Ammonia

Molecular Formula:
((NH)4)(2)CO(3)

Molecular Wt.: 196.1
Chemical Family: Inorganics

SECTION 2 - INGREDIENTS

Chemical Name:	CAS #:	Amount:	PEL/TLV Data:
Ammonium Carbonate HC	506-87-6	100.0 %	NOT ESTABLISHED

I - Denotes an IARC listed carcinogen
N - Denotes an NTP listed carcinogen
O - Denotes an OSHA carcinogen
H - Denotes an OSHA health hazard
P - Denotes an OSHA physical hazard
C - Denotes a CERCLA listed chemical

See section 10A for SARA-313 list.

SECTION 3 - PHYSICAL PROPERTIES

Color: Colorless
Form/Appearance: Crystalline Plates
Odor: Ammonia

	Typical	Low-RANGE-High	U. O. M.
Spc. Gravity:	NOT AVAILABLE		
Bulk Density:		800 -850	KG/CU. M
pH:	9		SU
pH method:	100 G/L H2O		

	Typical	Low-RANGE-High	Deg.	@ Pressure
Boiling Pt:	NOT AVAILABLE			
Freezing Pt:	NOT AVAILABLE			
Decomp. Tmp:	NOT AVAILABLE			

Solubility in Water Description: Soluble
Vapor Pressure: 60 MILLIBARS @ 20 DEG. C

SECTION 4 - FIRE AND EXPLOSION DATA

	Typical	Low-RANGE-High	Deg.	Method
Flash Point:	NOT AVAILABLE			
Autoignition:	NOT AVAILABLE			

Extinguishing Media:
Use water fog, foam or dry chemical extinguishing media.

Fire Fighting Procedures:
Firefighters should be equipped with self-contained breathing apparatus and turn out gear.

Unusual Hazards:
Decomposes to ammonia and CO2 at temperatures >136 F.

SECTION 5 - HEALTH EFFECTS

Routes of entry for solids and liquids include eye and skin contact, ingestion and inhalation. Routes of entry for gasses include inhalation and eye and skin contact.

Toxicology Test Data:
Rat, Oral LD50 - 2150 MG/KG
Moderately Toxic

Acute Overexposure Effects:
Contact with the eyes and skin may result in slight irritation. Severe overexposure to ammonia may cause pulmonary edema and death Airborne concentrations of 32 to 50 ppm have been reported to cause nasal dryness while nose, throat, and chest irritation have been noted at levels as low as 72 ppm.

Chronic Overexposure Effects:
There are no known chronic effects associated with this material.

First Aid Procedures - Skin:
Wash affected areas with soap and water. Remove and launder contaminated clothing before reuse. If irritation develops, get medical attention.

First Aid Procedures - Eyes:
Immediately wash eyes with running water for 15 minutes. If irritation develops, get medical attention.

First Aid Procedures - Ingestion:
If swallowed, dilute with water and immediately induce vomiting. Never give fluids or induce vomiting if the victim is unconscious or having convulsions. Get immediate medical attention.

First Aid Procedures - Inhalation:
Move to fresh air. Aid in breathing, if necessary, and get immediate medical attention.

First Aid Procedures - Notes to Physicians:
Not applicable.

First Aid Procedures - Aggravated Medical Conditions:
No data is available which addresses medical conditions that are

SECTION 5 - HEALTH EFFECTS (Cont.)

generally recognized as being aggravated by exposure to this product. Please refer to Section 5 (Effects of Overexposure) for effects observed in animals.

First Aid Procedures - Special Precautions:
Not applicable.

SECTION 6 - REACTIVITY DATA

Reactivity - Stability Data:
Unstable

Reactivity - Incompatability:
Sodium nitrite and nitrate.

Reactivity - Conditions/Hazards to Avoid:
Excessive temperatures.

Reactivity - Hazardous Decomposition/Polymerization:
Hazardous Decomposition Products: CO_2 and NH_3.
Polymerization: Does not occur.

Reactivity - Corrosive Properties:
Corrosive.

Reactivity - Oxidizer Properties:
Not an oxidizer

SECTION 7 - PERSONAL PROTECTION

Personal Protection - Clothing:
Gloves, coveralls, apron, and boots as necessary to prevent contact.

SECTION 7 - PERSONAL PROTECTION (Cont.)

Personal Protection - Eyes:
Chemical Goggles

Personal Protection - Respiration:
If dusts are generated, wear an approved dust respirator.

Personal Protection - Ventilation:
Use local exhaust to control dusts.

Personal Protection - Explosion Proofing:
See Section 4 - Fire and Explosion Data.

Other Personal Protection Data:
Eyewash fountains and safety showers must be easily accessible. Shower after handling.

SECTION 8 - SPILL-LEAK/ENVIRONMENTAL

Spill/Leak Procedures - General:
Spills should be contained and placed in a suitable container for disposal. This material contains a CERCLA ("Superfund") regulated chemical subject to reporting requirements.

Spill/Leak Procedures - Waste Disposal:
Dispose of waste in accordance with all state and local regulations. Do not discharge into waterways or sewer systems with out proper authority.

Spill/Leak Procedures - Container Disposal:
RCRA empty containers may be landfilled at a licensed facility. Recommend crushing or other means to prevent unauthorized reuse. Other containers must be disposed of in a RCRA licensed facility.

SECTION 9 - STORAGE AND HANDLING

SECTION 9 - STORAGE AND HANDLING (Cont.)

Storage and Handling - General:
Keep away from heat, sparks and open flames.

SECTION 10A - FEDERAL REGULATORY INFORMATION

TSCA Inventory Status
Listed on Inventory: YES

RCRA Haz. Waste No.: NA
CERCLA: YES **Reportable Qty.:** (If YES) 5000 LBS
EPA Registration No.:

SECTION 10C - OTHER REGULATORY INFORMATION

No applicable data for this section.

SECTION 10D - ADDITIONAL REGULATORY TEXT

No applicable data for this section.

SECTION 11 - TRANSPORTATION INFORMATION

DOT Proper Shipping Name:

NONE

DOT Technical Name:

NONE

DOT Primary Hazard Class: CLASS 9 IF ONLY SHIPPED IN IT'S RQ

DOT Secondary Hazard Class: NONE

DOT Label Required:

NONE

DOT Placard Required: NONE

DOT Poison Constituent:

BASF Commodity Codes: 354 UN/NA Code: N/A E/R Guide: N/A

SECTION 11B - INTERNATIONAL TRANSPORTATION

No available data for this section.

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END OF DATA SHEET

United States
Environmental Protection
Agency

Office of Water
Regulations and Standards
Washington, DC 20460

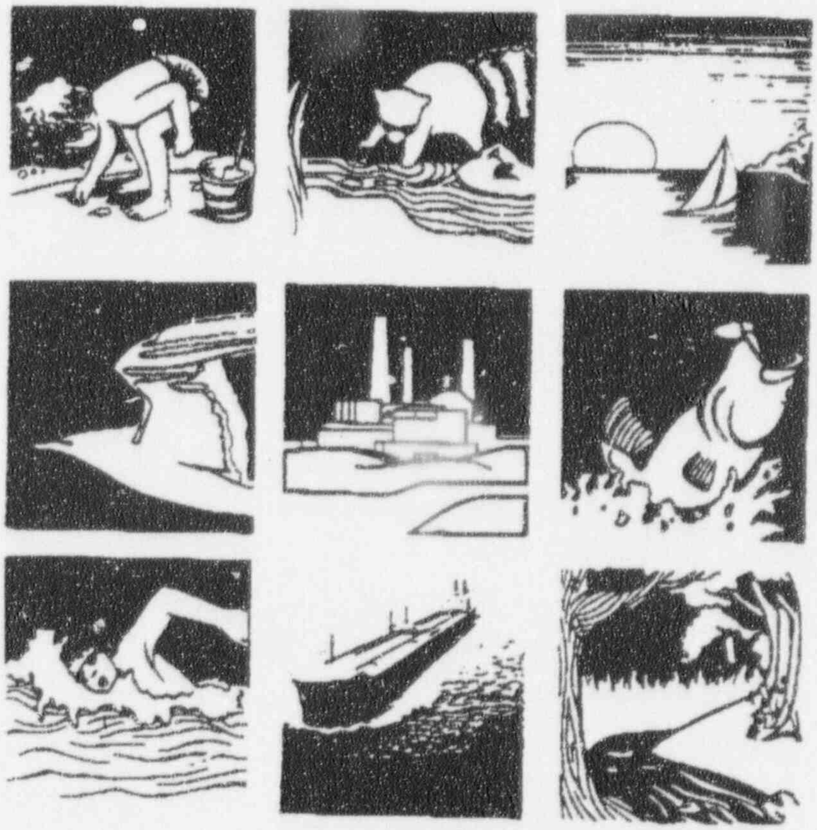
May 1, 1986

EPA

Water

EPA 440/5-86-001

QUALITY CRITERIA for WATER 1986



AMMONIA

SUMMARY:

All concentrations used herein are expressed as un-ionized ammonia (NH_3), because NH_3, not the ammonium ion (NH_4^+) has been demonstrated to be the principal toxic form of ammonia. The data used in deriving criteria are predominantly from flow through tests in which ammonia concentrations were measured. Ammonia was reported to be acutely toxic to freshwater organisms at concentrations (uncorrected for pH) ranging from 0.53 to 22.8 mg/L NH_3 for 19 invertebrate species representing 14 families and 16 genera and from 0.083 to 4.60 mg/L NH_3 for 29 fish species from 9 families and 18 genera. Among fish species, reported 96-hour LC50 ranged from 0.083 to 1.09 mg/L for salmonids and from 0.14 to 4.60 mg/L NH_3 for nonsalmonids. Reported data from chronic tests on ammonia with two freshwater invertebrate species, both daphnids, showed effects at concentrations (uncorrected for pH) ranging from 0.304 to 1.2 mg/L NH_3, and with nine freshwater fish species, from five families and seven genera, ranging from 0.0017 to 0.612 mg/L NH_3.

Concentrations of ammonia acutely toxic to fishes may cause loss of equilibrium, hyperexcitability, increased breathing, cardiac output and oxygen uptake, and, in extreme cases, convulsions, coma, and death. At lower concentrations ammonia has many effects on fishes, including a reduction in hatching success, reduction in growth rate and morphological development, and pathologic changes in tissues of gills, livers, and kidneys.

Several factors have been shown to modify acute NH_3 toxicity in fresh water. Some factors alter the concentration of un-ionized ammonia in the water by affecting the aqueous ammonia equilibrium, and some factors affect the toxicity of un-ionized ammonia itself, either ameliorating or exacerbating the effects of ammonia. Factors that have been shown to affect ammonia toxicity include dissolved oxygen concentration, temperature, pH, previous acclimation to ammonia, fluctuating or intermittent exposures, carbon dioxide concentration, salinity, and the presence of other toxicants.

The most well-studied of these is pH; the acute toxicity of NH_3 has been shown to increase as pH decreases. Sufficient data exist from toxicity tests conducted at different pH values to formulate a mathematical expression to describe pH-dependent acute NH_3 toxicity. The very limited amount of data regarding effects of pH on chronic NH_3 toxicity also indicates increasing NH_3 toxicity with decreasing pH, but the data are insufficient to derive a broadly applicable toxicity/pH relationship. Data on temperature effects on acute NH_3 toxicity are limited and somewhat variable, but indications are that NH_3 toxicity to fish is greater as temperature decreases. There is no information available regarding temperature effects on chronic NH_3 toxicity.

Examination of pH and temperature-corrected acute NH_3 toxicity values among species and genera of freshwater organisms showed that invertebrates are generally more tolerant than fishes, a notable exception being the fingernail clam. There is no clear trend among groups of fish; the several most sensitive

tested species and genera include representatives from diverse families (Salmonidae, Cyprinidae, Percidae, and Centrarchidae). Available chronic toxicity data for freshwater organisms also indicate invertebrates (cladocerans, one insect species) to be more tolerant than fishes, again with the exception of the fingernail clam. When corrected for the presumed effects of temperature and pH, there is also no clear trend among groups of fish for chronic toxicity values, the most sensitive species including representatives from five families (Salmonidae, Cyprinidae, Ictaluridae, Centrarchidae, and Catostomidae) and having chronic values ranging by not much more than a factor or two. The range of acute-chronic ratios for 10 species from 6 families was 3 to 43, and acute-chronic ratios were higher for the species having chronic tolerance below the median. Available data indicate that differences in sensitivities between warm and coldwater families of aquatic organisms are inadequate to warrant discrimination in the national ammonia criterion between bodies of water with "warm" and "coldwater" fishes; rather, effects of organism sensitivities on the criterion are most appropriately handled by site-specific criteria derivation procedures.

Data for concentrations of NH_3 toxic to freshwater phytoplankton and vascular plants, although limited, indicate that freshwater plant species are appreciably more tolerant to NH_3 than are invertebrates or fishes. The ammonia criterion appropriate for the protection of aquatic animals will therefore in all likelihood be sufficiently protective of plant life.

Available acute and chronic data for ammonia with saltwater organisms are very limited, and insufficient to derive a saltwater criterion. A few saltwater invertebrate species have been tested, and the prawn Macrobrachium rosenbergii was the most sensitive. The few saltwater fishes tested suggest greater sensitivity than freshwater fishes. Acute toxicity of NH_3 appears to be greater at low pH values, similar to findings in freshwater. Data for saltwater plant species are limited to diatoms, which appear to be more sensitive than the saltwater invertebrates for which data are available.

More quantitative information needs to be published on the toxicity of ammonia to aquatic life. Several key research needs must be addressed to provide a more complete assessment of ammonia toxicity. These are: (1) acute tests with additional saltwater fish species and saltwater invertebrate species; (2) life-cycle and early life-stage tests with representative freshwater and saltwater organisms from different families, with particular attention to trends of acute-chronic ratios; (3) fluctuating and intermittent exposure tests with a variety of species and exposure patterns; (4) more complete tests of the individual and combined effects of pH and temperature, especially for chronic toxicity; (5) more histopathological and histochemical research with fishes, which would provide a rapid means of identifying and quantifying sublethal ammonia effects; and (6) studies on effects of dissolved and suspended solids on acute and chronic toxicity.

NATIONAL CRITERIA:

The procedures described in the Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses indicate that, except possibly where a locally important species is very sensitive, freshwater aquatic organisms and their uses should not be affected unacceptably if:

(1) the 1-hour* average concentration of un-ionized ammonia (in mg/L NH_3) does not exceed, more often than once every 3 years on the average, the numerical value given by 0.52/FT/FPH/2,

where:

$$FT = 10^{0.03(20-TCAP)}; \quad TCAP \leq T \leq 30$$

$$\quad\quad 10^{0.03(20-T)}; \quad 0 \leq T \leq TCAP$$

$$FPH = 1 \quad ; \quad 8 \leq pH \leq 9$$

$$\quad\quad \frac{1+10^{7.4-pH}}{1.25} \quad ; \quad 6.5 \leq pH \leq 7.7$$

TCAP = 20 C; Salmonids or other sensitive coldwater species present

= 25 C; Salmonids and other sensitive coldwater species absent

(*An averaging period of 1 hour may not be appropriate if excursions of concentrations to greater than 1.5 times the average occur during the hour; in such cases, a shorter averaging period may be needed.)

(2) the 4-day average concentration of un-ionized ammonia (in mg/L NH_3) does not exceed, more often than once every 3 years on the average, the average* numerical value given by 0.80/FT/FPH/RATIO, where FT and FPH are as above and:

RATIO = 16 ; $7.7 \le pH \le 9$

$$= 24 \frac{10^{7.7-pH}}{1+10^{7.4pH}} \quad ;6.5 \le pH \le 7.7$$

TCAP = 15 C; Salmonids or other sensitive coldwater species present

= 20 C; Salmonids and other sensitive coldwater species absent

(*Because these formulas are nonlinear in pH and temperature, the criterion should be the average of separate evaluations of the formulas reflective of the fluctuations of flow, pH, and temperature within the averaging period; it is not appropriate in general to simply apply the formula to average pH, temperature, and flow.)

The extremes for temperature (0, 30) and pH (6.5, 9) given in the above formulas are absolute. It is not permissible with current data to conduct any extrapolations beyond these limits. In particular, there is reason to believe that appropriate criteria at pH > 9 will be lower than the plateau between pH 8 and 9 given above.

Criteria concentrations for the pH range 6.5 to 9.0 and the temperature range 0 C to 30 C are provided in the following tables. Total ammonia concentrations equivalent to each un-ionized ammonia concentration are also provided in these tables. There are limited data on the effect of temperature on chronic toxicity. EPA will be conducting additional research on the effects of temperature on ammonia toxicity in order to fill perceived data gaps. Because of this uncertainty, additional site-specific information should be developed before these

criteria are used in wasteload allocation modeling. For example, the chronic criteria tabulated for sites lacking salmonids are less certain at temperatures much below 20 C than those tabulated at temperatures near 20 C. Where the treatment levels needed to meet these criteria below 20 C may be substantial, use of site-specific criteria is strongly suggested. Development of such criteria should be based upon site-specific toxicity tests.

Data available for saltwater species are insufficient to derive a criterion for saltwater.

The recommended exceedence frequency of 3 years is the Agency's best scientific judgment of the average amount of time it will take an unstressed system to recover from a pollution event in which exposure to ammonia exceeds the criterion. A stressed system, for example, one in which several outfalls occur in a limited area, would be expected to require more time for recovery. The resilience of ecosystems and their ability to recover differ greatly, however, and site-specific criteria may be established if adequate justification is provided.

The use of criteria in designing waste treatment facilities requires the selection of an appropriate wasteload allocation model. Dynamic models are preferred for the application of these criteria. Limited data or other factors may make their use impractical, in which case one should rely on a steady-state model. The Agency recommends the interim use of 1Q5 or 1Q10 for Criterion Maximum Concentration design flow and 7Q5 or 7Q10 for the Criterion Continuous Concentration design flow in steady-state models for unstressed and stressed systems respectively.

(2) 4-day average concentrations for ammonia.*

pH	0 C	5 C	10 C	15 C	20 C	25 C	30 C
A. Salmonids or Other Sensitive Coldwater Species Present							
Un-ionized Ammonia (mg/liter NH_3)							
6.50	0.0007	0.0009	0.0013	0.0019	0.0019	0.0019	0.0019
6.75	0.0012	0.0017	0.0023	0.0033	0.0033	0.0033	0.0033
7.00	0.0021	0.0029	0.0042	0.0059	0.0059	0.0059	0.0059
7.25	0.0037	0.0052	0.0074	0.0105	0.0105	0.0105	0.0105
7.50	0.0066	0.0093	0.0132	0.0186	0.0186	0.0186	0.0186
7.75	0.0109	0.0153	0.022	0.031	0.031	0.031	0.031
8.00	0.0126	0.0177	0.025	0.035	0.035	0.035	0.035
8.25	0.0126	0.0177	0.025	0.035	0.035	0.035	0.035
8.50	0.0126	0.0177	0.025	0.035	0.035	0.035	0.035
8.75	0.0126	0.0177	0.025	0.035	0.035	0.035	0.035
9.00	0.0126	0.0177	0.025	0.035	0.035	0.035	0.035
Total Ammonia (mg/liter NH_3)							
6.50	2.5	2.4	2.2	2.2	1.49	1.04	0.73
6.75	2.5	2.4	2.2	2.2	1.49	1.04	0.73
7.00	2.5	2.4	2.2	2.2	1.49	1.04	0.74
7.25	2.5	2.4	2.2	2.2	1.50	1.04	0.74
7.50	2.5	2.4	2.2	2.2	1.50	1.05	0.74
7.75	2.3	2.2	2.1	2.0	1.40	0.99	0.71
8.00	1.53	1.44	1.37	1.33	0.93	0.66	0.47
8.25	0.87	0.82	0.78	0.76	0.54	0.39	0.28
8.50	0.49	0.47	0.45	0.44	0.32	0.23	0.17
8.75	0.28	0.27	0.26	0.27	0.19	0.15	0.11
9.00	0.16	0.16	0.16	0.16	0.13	0.10	0.08

pH	0 C	5 C	10 C	15 C	20 C	25 C	30 C
B. Salmonids and Other Sensitive Coldwater Species Absent†							
Un-ionized Ammonia (mg/liter NH_3)							
6.50	0.0007	0.0009	0.0013	0.0019	0.0026	0.0026	0.0026
6.75	0.0012	0.0017	0.0023	0.0033	0.0047	0.0047	0.0047
7.00	0.0021	0.0029	0.0042	0.0059	0.0083	0.0083	0.0083
7.25	0.0037	0.0052	0.0074	0.0105	0.0148	0.0148	0.0148
7.50	0.0066	0.0093	0.0132	0.0186	0.026	0.026	0.026
7.75	0.0109	0.0153	0.022	0.031	0.043	0.043	0.043
8.00	0.0126	0.0177	0.025	0.035	0.050	0.050	0.050
8.25	0.0126	0.0177	0.025	0.035	0.050	0.050	0.050
8.50	0.0126	0.0177	0.025	0.035	0.050	0.050	0.050
8.75	0.0126	0.0177	0.025	0.035	0.050	0.050	0.050
9.00	0.0126	0.0177	0.025	0.035	0.050	0.050	0.050
Total Ammonia (mg/liter NH_3)							
6.50	2.5	2.4	2.2	2.2	2.1	1.46	1.03
6.75	2.5	2.4	2.2	2.2	2.1	1.47	1.04
7.00	2.5	2.4	2.2	2.2	2.1	1.47	1.04
7.25	2.5	2.4	2.2	2.2	2.1	1.48	1.05
7.50	2.5	2.4	2.2	2.2	2.1	1.49	1.06
7.75	2.3	2.2	2.1	2.0	1.98	1.39	1.00
8.00	1.53	1.44	1.37	1.33	1.31	0.93	0.67
8.25	0.87	0.82	0.78	0.76	0.76	0.54	0.40
8.50	0.49	0.47	0.45	0.44	0.45	0.33	0.25
8.75	0.28	0.27	0.26	0.27	0.27	0.21	0.16
9.00	0.16	0.16	0.16	0.16	0.17	0.14	0.11

* To convert these values to mg/liter N, multiply by 0.822.

† Site-specific criteria development is strongly suggested at temperatures above 20 C because of the limited data available to generate the criteria recommendation, and at temperatures below 20 C because of the limited data and because small changes in the criteria may have significant impact on the level of treatment required in meeting the recommended criteria.

(1) One-hour average concentrations for ammonia.*

pH	0 C	5 C	10 C	15 C	20 C	25 C	30 C
A. Salmonids or Other Sensitive Coldwater Species Present							
Un-ionized Ammonia (mg/liter NH_3)							
6.50	0.0091	0.0129	0.0182	0.026	0.036	0.036	0.036
6.75	0.0149	0.021	0.030	0.042	0.059	0.059	0.059
7.00	0.023	0.033	0.046	0.066	0.093	0.093	0.093
7.25	0.034	0.048	0.068	0.095	0.135	0.135	0.135
7.50	0.045	0.064	0.091	0.128	0.181	0.181	0.181
7.75	0.056	0.080	0.113	0.159	0.22	0.22	0.22
8.00	0.065	0.092	0.130	0.184	0.26	0.26	0.26
8.25	0.065	0.092	0.130	0.184	0.26	0.26	0.26
8.50	0.065	0.092	0.130	0.184	0.26	0.26	0.26
8.75	0.065	0.092	0.130	0.184	0.26	0.26	0.26
9.00	0.065	0.092	0.130	0.184	0.26	0.26	0.26
Total Ammonia (mg/liter NH_3)							
6.50	35	33	31	30	29	20	14.3
6.75	32	30	28	27	27	18.6	13.2
7.00	28	26	25	24	23	16.4	11.6
7.25	23	22	20	19.7	19.2	13.4	9.5
7.50	17.4	16.3	15.5	14.9	14.6	10.2	7.3
7.75	12.2	11.4	10.9	10.5	10.3	7.2	5.2
8.00	8.0	7.5	7.1	6.9	6.8	4.8	3.5
8.25	4.5	4.2	4.1	4.0	3.9	2.8	2.1
8.50	2.6	2.4	2.3	2.3	2.3	1.71	1.28
8.75	1.47	1.40	1.37	1.38	1.42	1.07	0.83
9.00	0.86	0.83	0.83	0.86	0.91	0.72	0.58

pH	0 C	5 C	10 C	15 C	20 C	25 C	30 C
B. Salmonids and Other Sensitive Coldwater Species Absent							
Un-ionized Ammonia (mg/liter NH_3)							
6.50	0.0091	0.0129	0.0182	0.026	0.036	0.051	0.051
6.75	0.0149	0.021	0.030	0.042	0.059	0.084	0.084
7.00	0.023	0.033	0.046	0.066	0.093	0.131	0.131
7.25	0.034	0.048	0.068	0.095	0.135	0.190	0.190
7.50	0.045	0.064	0.091	0.128	0.181	0.26	0.26
7.75	0.056	0.080	0.113	0.159	0.22	0.32	0.32
8.00	0.065	0.092	0.130	0.184	0.26	0.37	0.37
8.25	0.065	0.092	0.130	0.184	0.26	0.37	0.37
8.50	0.065	0.092	0.130	0.184	0.26	0.37	0.37
8.75	0.065	0.092	0.130	0.184	0.26	0.37	0.37
9.00	0.065	0.092	0.130	0.184	0.26	0.37	0.37
Total Ammonia (mg/liter NH_3)							
6.50	35	33	31	30	29	29	20
6.75	32	30	28	27	27	26	18.6
7.00	28	26	25	24	23	23	16.4
7.25	23	22	20	19.7	19.2	19.0	13.5
7.50	17.4	16.3	15.5	14.9	14.6	14.5	10.3
7.75	12.2	11.4	10.9	10.5	10.3	10.2	7.3
8.00	8.0	7.5	7.1	6.9	6.8	6.8	4.9
8.25	4.5	4.2	4.1	4.0	3.9	4.0	2.9
8.50	2.6	2.4	2.3	2.3	2.3	2.4	1.81
8.75	1.47	1.40	1.37	1.38	1.42	1.52	1.18
9.00	0.86	0.83	0.83	0.86	0.91	1.01	0.82

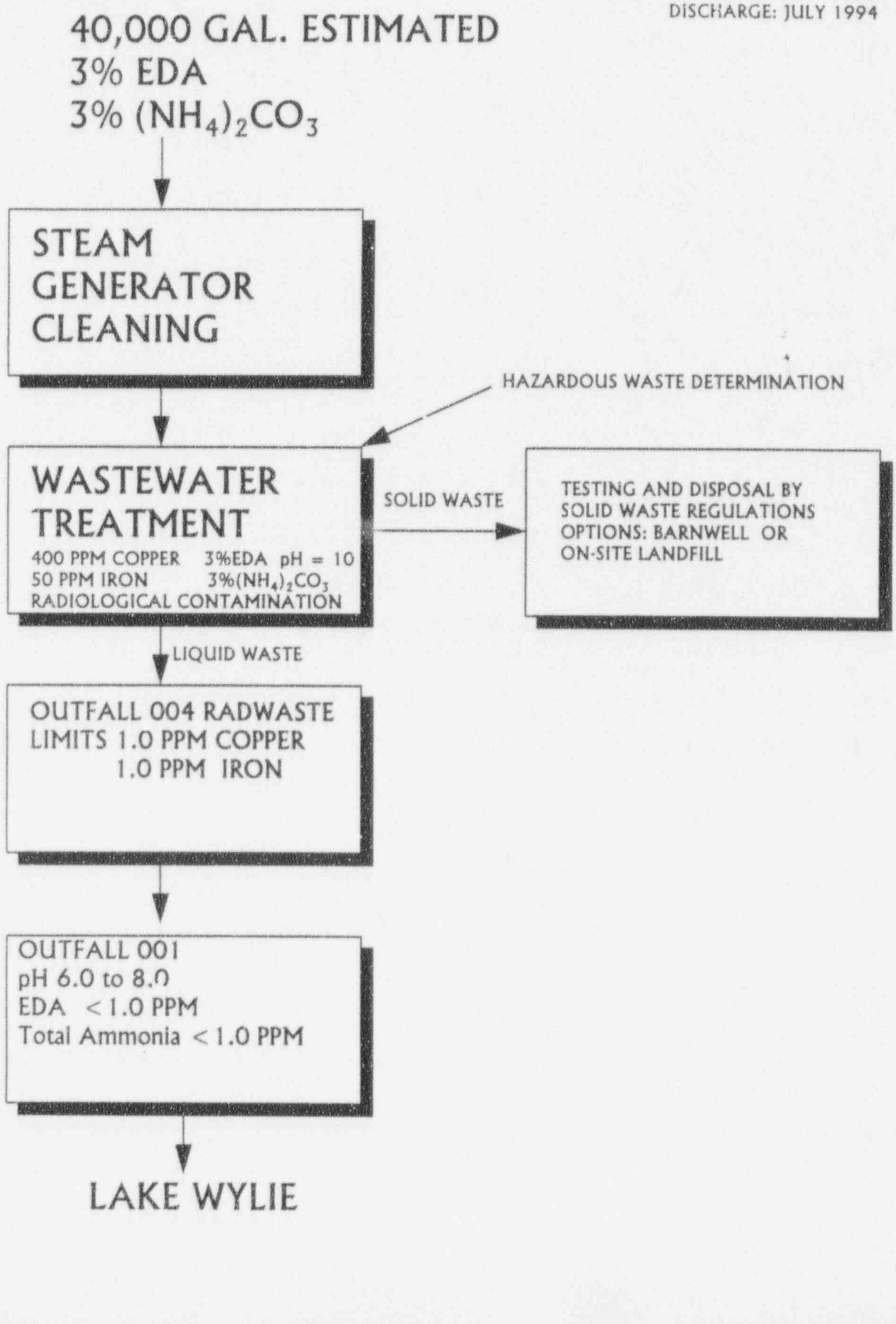
* To convert these values to mg/liter N, multiply by 0.822.

The Agency acknowledges that the Criterion Continuous Concentration stream flow averaging period used for steady-state wasteload allocation modeling may be as long as 30 days in situations involving POTWs designed to remove ammonia where limited variability of effluent pollutant concentration and resultant concentrations in receiving waters can be demonstrated. In cases where low variability can be demonstrated, longer averaging periods for the ammonia Criterion Continuous Concentration (e.g., 30-day averaging periods) would be acceptable because the magnitude and duration of exceedences above the Criterion Continuous Concentration would be sufficiently limited. These matters are discussed in more detail in the Technical Support Document for Water Quality-Based Toxics Control (U.S. EPA, 1985a).

(50 F.R. 30784, July 29, 1985)
SEE APPENDIX A FOR METHODOLOGY

CATAWBA NUCLEAR STATION
STEAM GENERATOR CLEANING
SUMMER 1994

CLEANING: MAY 1994
DISCHARGE: JULY 1994



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February 17, 1994

J.T. Harris-CN01EM
A.P. Jackson-CN03CH
G.W. Sain-EC07D
J.W. Bramblett-EC07D
C.L. Peed-CN01EM
W.J. Davis-CN01CH
J.S. Velte
D.L. Vaught
M.E. Hollis

Subjec.. Catawba Nuclear Station -NPDES Permit No. SC0004278
Steam Generator Chemical Metal Cleaning
File: CN-208.20

Attached please find an approval letter from the South Carolina Department of Health and Environmental Control to use the treatment chemicals for the steam generator chemical metal cleaning to occur later this year. No additional monitoring has been imposed above those required in our NPDES permit.

The next step will to submit a package to the State for a construction permit (or letter of approval) to treat the wastewater generated from the cleaning. If you have any questions or need additional information please give me a call at 875-5965.

Sincerely,

John Estridge

John Estridge, Engineer
Environmental Division, Water Protection

jte/296

cc: NRC Document Distribution
M.A. Lascara

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South Carolina
DHEC
Department of Health and Environmental Control
2600 Bull Street, Columbia, SC 29201

February 16, 1994

Mr. John Carter, Technical System Manager
Environmental Division, Water Protection
Duke Power Company
13339 Hagers Ferry Road
Huntersville, N.C. 28078-7929

Re: Chemical Metal Cleaning
Duke Power Co./Catawba Nuclear Station
York County

Dear Mr. Carter:

Our Office has received your December 28, 1993 letter concerning the Chemical Metal Cleaning of the four (4) steam generators at Unit 2 at the Catawba Nuclear Station in York County. Based on a review of the proposal, we agree with your request. We understand the treatment chemicals selected to remove the copper and iron build up within the steam generator are ethylenediamine (EDA) and ammonium carbonate $(NH_4)_2CO_3$. Approximately 40,000 gallons of wastewater will be generated from the metal cleaning which will be treated and discharged through the NPDES permit outfall 004.

We look forward to receiving the submittal for the wastewater treatment system associated with the chemical metal cleaning project in the near future.

If you should have any questions, please call me at (803)734-5247.

Sincerely,

Timothy M. Eleazer

Timothy M. Eleazer
Environmental Engineer Associate
Industrial and Agricultural
Wastewater Division

TME/ebs

cc: Al Williams, Catawba EQC

Duke Power Company
Generation Services Department
13339 Hagers Ferry Road
Huntersville, NC 28078-7929

DUKE POWER

April 20, 1994

Mr. Timothy M. Eleazer
Industrial and Agricultural Wastewater Division
South Carolina Department of Health
and Environmental Control
2600 Bull Street
Columbia, SC 29201

Subject: Catawba Nuclear Station -NPDES Permit No. SC0004278
Sodium Bromide Usage in RC Cooling Towers
File: CN-702.13

Dear Mr. Eleazer:

This letter is to request permission to use sodium bromide in the condenser circulating water system (RC) cooling towers at Catawba Nuclear Station on a permanent basis. To support this request please find as Attachment #1 a report titled *Toxicity of Cooling Tower Water Following 2:1 (Chlorine to Bromine) Treatment* which indicates the solution to be non-toxic.

Duke Power also requests that references made to Free Available Chlorine (FAC) be changed to Free Available Oxidant (FAO) for the RC cooling towers. The existing testing requirement for the RC cooling tower blowdown line (Outfall 005) is for FAC. (See Part III Item #16 and P. 13 or 31) To allow for the usage of sodium bromide, it is requested that references to FAC be changed to FAO within the permit. When chlorine is the only oxidant utilized, then the FAC is the same as the FAO. However, now that an additional oxidant is to be used, FAO is the more appropriate parameter to reference in the permit. Catawba is presently using the DPD Colormetric Method for determination of Free Available Chlorine. Per Standard Methods, (4500-Cl), this analytical method will detect both free chlorine and free bromine.

Background Information

Duke Power Company requested permission to begin using sodium bromide on a trial basis in one of the two RC cooling towers systems at Catawba Nuclear Station in a letter dated May 27, 1993. The State responded to this letter and requested toxicity

testing data be provided on the sodium bromide and sodium hypochlorite solutions in a letter to Duke Power dated September 16, 1993.

Duke Power then proposed to State by fax (See Attachment #2) a request to perform toxicity testing on the sodium bromide and sodium hypochlorite solution as it would be discharged to Lake Wylie. The test was then conducted and the results are provided in Attachment #1.

Please note that Attachment #1 references Calgon H-940 which is a Calgon Corporation product. This is only a typical product name and other suppliers of sodium bromide will/may be selected in the future.

For you convenience, please find as Attachment #3 the original description of sodium bromide usage. This is the information which is required in Part III Item 9 of the NPDES permit.

<u>Summary</u>

To summarize, Duke Power is requesting approval to use sodium bromide as a maintenance chemical in the RC cooling towers. The original request was for a trial usage. However, if this initial trial is considered successful, Catawba would like to immediately begin using the sodium bromide without seeking further approvals.

It is requested that references within the permit for Free Available Chlorine (FAC) be changed to Free Available Oxidant (FAO) as described above. The existing permitted limits for FAC should be applied for FAO.

The solution of sodium bromide and sodium hypochlorite will not be discharged directly to Lake Wylie. The compounds will be allowed to decay until the concentration of FAO (as measured with presently certified DPD Colormetric Method for determination of FAC) in the RC cooling tower being treated drops to less than current permit limits. Once a less-than-detectable FAO is reached in the RC cooling tower being treated, residual byproducts will be discharged to Lake Wylie via Outfall 001 by means of the cooling tower blowdown line (Outfall 005). Therefore, only the by-products of these compounds will be seen in the final discharge.

The toxicity testing provided shows these by-products to be non-toxic. The toxicity testing was performed under worst case scenarios. Typical field conditions are eight parts of once through RC cooling water to one part of RC cooling tower blowdown water (1:8). The toxicity tests performed at various ratios as low as 1:2 were not toxic.

Your approval is requested as soon as possible in order to begin using the sodium bromide within the RC cooling towers. The use of sodium bromide, if successful, will substantially reduce the volume and concentrations of maintenance chemicals used in the RC cooling towers.

Should you need additional information to support this request please feel free to call John Estridge at (704) 875-5965 or Christine Odom at (704)875-4201.

Sincerely,

John S. Carter, Technical System Manager
Environmental Division, Water Protection

jte/311

Attachments

bc: J.T. Harris
M.A. Lascara
C.T. Peed
A.P. Jackson
G.W. Sain
W.J. Davis
J.S. Velte

ATTACHMENT #1

Toxicity of Cooling Tower Water Following 2:1 (Chlorine to Bromine) Treatment

John S. Velte, Duke Power Company, Environmental Division, 13339 Hagers Ferry Rd., Huntersville, NC 28078

EXECUTIVE SUMMARY

A sample of cycled-up (i.e., concentrated via recirculation and evaporation) cooling water from a Catawba Nuclear Station (CNS) cooling tower was treated with chlorine to a free residual of 3 ppm. Half as much Bromine was then added to the sample (i.e., a ratio of 2:1). The sample was stirred at 40.6-43.3°C (105-110°F) to simulate the physicochemical conditions typical in a cooling tower, until the concentration of free available oxidant declined to less than background. The sample was then diluted with various volumes of intake (raw) water from the CNS intake (i.e., Lake Wylie) and tested for toxicity. CNS personnel have estimated that cooling tower "blowdown" waste is typically diluted with raw water to 11.2% waste (a ratio of 1:8) during discharge. This test of simulated waste demonstrated that no toxicity occurred among *Ceriodaphnia*, even when exposed to 33.4% waste (a 1:2 dilution). These test results support the proposed maintenance chemical trial of sodium bromide (Calgon H-940) in conjunction with sodium hypochlorite to control biofouling.

INTRODUCTION

A bench test designed to simulate the behavior of sodium bromide under cooling tower conditions was developed by Duke Power Company. The bench test was used to produce a simulated waste that would allow the evaluation of toxicity from sodium bromide, bromine residuals, and other waste components in the projected "worst-case" ratio of chlorine (Cl) to bromine (Br). South Carolina Department of Health and Environmental Control (SCDHEC) officials identified the need for this information (to ensure that the receiving water body would not be harmed) as a condition for approval to conduct a maintenance chemical trial with sodium bromide.

MATERIALS AND METHODS

Sample Preparation

A 4-L sample of CNS cooling tower water was collect as it spilled to ground level in a Unit-2 cooling tower. The sample had been cycled up to normal blowdown concentration but no maintenance chemicals had been added. Immediately following the collection of this sample, 10 L of subsurface CNS intake water were collected for use as control and dilution water during the planned test. Both samples were placed immediately on ice for transport, logged into the Biomonitoring Lab at < 4°C, and held in a refrigerator at 0 to 4°C thereafter.

Duke Power Company's proposal is that Br in the form of sodium bromide be added to the Cl (presently added as sodium hypochlorite) to improve biofouling control while potentially reducing the amount of Cl presently used. Bromine for this test came from a product called Calgon H-940® (Calgon Corporation) which is 40% sodium bromide.

For convenience, the Cl source was Chlorox® Bleach (Chlorox Company) which contains 5.25% sodium hypochlorite. CNS uses an industrial source of sodium hypochlorite that differs only in the percentage of active ingredient, so with appropriate dilution, no meaningful chemical difference in the lab and field situation existed.

The procedure for sample manipulation was prescribed by Duke Power Nuclear Chemistry personnel to produce a bench-scale sample of effluent that would simulate waste from the cooling towers if treated with the proposed biofouling agents. That procedure is summarized here:

1. Approximately 2.5 L of cooling tower water was warmed quickly to 43.3°C in a water bath. Exactly 2000 mL were measured from the warmed sample, and poured into a 2000 mL glass beaker.

2. The beaker was set on a magnetic stirrer and a large Teflon-coated stir bar was placed in the sample. These components were set up inside a drying oven which had previously been calibrated to operate at 43.3°C. The oven provided an air-tight, dark, and thermally stable environment.

3. A digital thermometer with remote temperature probes was installed with one probe in the sample being stirred and one measuring the air temperature within the oven.

4. The sample was dosed with 6 mL of a 1000-ppm Cl stock solution; sample temperature at this point was 40.3°C. The oven was sealed following this addition and continuously thereafter except when sample measures or manipulations were underway.

5. After 15 minutes, the free available oxidant (FAO) of the sample (i.e., chlorine) was measured with a colorimetric procedure (Hach Company). This required the removal of 25 mL of sample via pipette. The measured FAO was 3.0 ppm.

6. Three mL of a 1000-ppm Br stock solution was added. The sample was then allowed to react in the apparatus for 2 hours and 45 minutes. Another 25 mL subsample was withdrawn and FAO in that sample (i.e., chlorine and bromine) was measured at 0.2 ppm. The temperature had increased to 42.5°C.

7. Five hours and 15 minutes after Br addition, a third withdrawal of 25 mL showed that FAO had declined to 0.11 ppm; temperature was 43.1°C.

8. The sample treatment was stopped after 7 hours and 5 minutes (post Br addition) when the fourth and final 25-mL aliquot revealed that FAO was < 0.1 ppm. A simultaneous test of untreated cooling tower water gave an FAO of 0.12 ppm, so it was assumed that dissipation of Cl in the manipulated sample was complete. Achievement of this endpoint, as determined by CNS Chemistry personnel, is necessary before discharge from the cooling towers is begun. The final temperature reading was 43.3°F.

9. The manipulated sample was refrigerated (0 to 4°C) in a sealed polyethylene container, with no head space, for toxicity testing.

Toxicity Evaluation

Toxicity testing was begun the following day (i.e., the cooling tower sample was 50 hours post collection and approximately 17 hours post manipulation; the CNS intake dilution water sample was approximately 49.5 hours post collection). Toxicity test methods were those prescribed by the U.S. Environmental Protection Agency (1989) and SCDHEC (1989). The procedure was a definitive *Ceriodaphnia* Three-Brood Survival and Reproduction Toxicity Test with a control and series of four treatments. Dilutions of the simulated cooling tower waste were prepared on test days 0, 2, and 4; and solutions in test cups were renewed daily. Cooling tower water that is discharged during "blowdown" of the towers is typically diluted at a ratio of 1:8 with raw water that is pumped through the station. That ratio was used as the basis of the treatment series in an attempt to establish a "dose-response" relationship between the waste, and the test organism (*Ceriodaphnia dubia*).

RESULTS

The measured sample volume after manipulation was 1827 mL. Considering the starting volume of sample, Cl and Br stock solution additions, and FAO sample withdrawals, 82 mL were missing due to evaporation. The timing of additions and withdrawals complicates the interpretation of evaporative effects on the sample. Evaporation had the effect of concentrating the test sample by less than 5% under these test conditions. That effect is considered negligible for this study because ongoing evaporation is a function of full-scale cooling tower operation too. The comparability, however, of evaporation modeled in this study with that which actually occurs in the cooling towers was not determined.

The following table summarizes the survival and reproduction that occurred during the toxicity test in the control and treatments. The tested ratios of cooling tower waste to raw intake water (i.e., 1:16. 1:8, 1:4, and 1:2) are presented as waste percentages to simplify interpretation.

Percent of Cooling Tower Waste in Intake Water	# *C. dubia* Females Exposed	Percent Survival	Total Young Produced	Mean Young Per Female
0 (Control)	10	100	302	30.2
5.8	10	100	283	28.3
11.2	10	100	295	29.5
20.0	10	100	293	29.3
33.4	10	100	297	29.7

These data were evaluated as specified by USEPA for significant (alpha = 0.05) survival and reproduction effects. The lack of any mortality during the test negated the need to look for survival effects. The untransformed data were found to be normally distributed according to a Shapiro-Wilks Test. Bartlett's Test further confirmed that the data are homogeneous. Consequently, Dunnett's T-Test for determining significant differences between the reproductive mean of the control and all treatments was applied. No significant differences between the control and any treatment were found. Copies of the raw test data sheets and a printout of the statistical evaluation are attached as Appendix A.

DISCUSSION

The lack of a "dose-response" curve from this data preclude the determination of the 7-day EC20 value (as specifically requested by SCDHEC) or any other chronic endpoint. The data do, however, demonstrate that the simulated cooling tower waste was safe for *C. dubia* even at a concentration that was 3 times greater than is expected under actual station discharge conditions. There was no significant difference observed in *C. dubia* survival or reproduction between the control, which consisted of 100% intake water, and any treatment (the highest of which was 33.4% cooling tower waste). A full-scale trial of sodium bromide (used in a manner consistent with the protocol described in this report) would be environmentally compatible based on this test outcome.

REFERENCES CITED

South Carolina Department of Health and Environmental Control. 1989. South Carolina Environmental Laboratory Certification Criteria: Biological Parameters. Columbia, SC

U.S. Environmental Protection Agency. 1989. Short-term methods for estimating the chronic toxicity of effluents and receiving waters to freshwater organisms. 2nd ed. EPA/600/4-89/001. Cincinnati, OH

Appendix A

SP0394J2

Ceriodaphnia dubia Data Sheet for 2:1 Cl to Br Cooling Tower Waste Chronic Toxicity Test

Procedure Number BIO-260.0

March 1994

CONTROL (100% Raw Water)

Replicate

Day	1	2	3	4	5	6	7	8	9	10	Young	Temp	Comments
Initiation												24.7 °C	
1	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	0	25.1 °C	
2	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	0	~~25.0~~ °C	24.8 JSV 04-1-
3	L.0	L.0	L.0	L.0	L.4	L.5	L.6	L.0	L.0	L.4	19	24.4 °C	
4	L.4	L.4	L.6	L.5	L.0	L.0	L.0	L.4	L.5	L.2	30	24.3 °C	
5	L.12	L.12	L.12	L.8	L.12	L.10	L.10	L.10	L.12	L.8	114	25.4 °C	Tony 4-5-94
6	L.16	L.13	L.15	L.15	L.17	L.16	L.16	L.13	L.12	L.16	149	25.2 °C	
~~7~~												°C	
Total	32	29	33	28	33	31	32	27	29	28	302		

Tony 4-5-94

1 Part Waste : 16 Parts Raw Water

Day	1	2	3	4	5	6	7	8	9	10	Young	Temp	Comments
Initiation												24.5 °C	
1	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	0	25.4 °C	
2	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	0	~~24.8~~ °C	24.6 JSV 04-01-
3	L.0	L.0	L.0	L.0	L.5	L.5	L.6	L.0	L.0	L.5	21	24.2 °C	
4	L.4	L.6	L.5	L.0	L.0	L.0	L.0	L.4	L.5	L.0	24	24.3 °C	
5	L.8	L.10	L.11	L.9	L.11	L.8	L.11	L.8	L.8	L.10	94	25.3 °C	
6	L.4E	L.15	L.19	L.15	L.18	L.13	L.15	L.13	L.17	L.16	144	25.2 °C	
~~7~~												°C	
Total	16	31	34	24	34	26	32	25	30	31	283		

Tony 4-5-94

1 Part Waste : 8 Parts Raw Water

Day	1	2	3	4	5	6	7	8	9	10	Young	Temp	Comments
Initiation												24.6 °C	
1	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	0	25.6 °C	
2	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	0	~~24.6~~ °C	24.8 JSV 04-01-94
3	L.0	L.0	L.0	L.0	L.6	L.4	L.0	L.0	L.0	L.6	16	24.4 °C	
4	L.6	L.6	L.4	L.4	L.0	L.0	L.4	L.5	L.4	L.0	33	24.5 °C	
5	L.10	L.8	L.10	L.8	L.12	L.5	L.8	L.12	L.9	L.12	94	24.9 °C	
6	L.12	L.15	L.16	L.15	L.19	L.16	L.13	L.14	L.14	L.18	152	24.3 °C	
~~7~~												°C	
Total	28	29	30	27	37	25	25	31	27	36	295		

Tony 4-5-94

1 Part Waste : 4 Parts Raw Water

Day	1	2	3	4	5	6	7	8	9	10	Young	Temp	Comments
Initiation												24.9 °C	
1	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	0	24.9 °C	
2	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	0	24.5 °C	
3	L.0	L.0	L.0	L.0	L.4	L.4	L.5	L.0	L.0	L.5	18	24.4 °C	
4	L.3	L.6	L.5	L.4	L.1	L.0	L.0	L.5	L.4	L.1	27	24.7 °C	
5	L.10	L.10	L.10	L.8	L.7	L.9	L.10	L.9	L.12	L.11	96	25.4 °C	
6	L.15	L.14	L.16	L.13	L.15	L.14	L.13	L.15	L.15	L.17	150	24.7 °C	
~~7~~												°C	
Total	28	30	31	25	30	27	28	29	31	34	293		

Tony 4-5-94

1 Part Waste : 2 Parts Raw Water

Day	1	2	3	4	5	6	7	8	9	10	Young	Temp	Comments
Initiation												24.4 °C	
1	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	0	24.8 °C	
2	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	L.0	0	24.6 °C	
3	L.0	L.0	L.0	L.0	L.6	L.5	L.6	L.0	L.0	L.5	22	24.1 °C	
4	L.4	L.5	L.6	L.6	L.0	L.0	L.0	L.4	L.6	L.0	31	24.5 °C	
5	L.10	L.10	L.10	L.12	L.10	L.10	L.10	L.7	L.10	L.11	100	24.5 °C	
6	L.14	L.15	L.13	L.13	L.16	L.15	L.14	L.14	L.13	L.17	144	°C	
~~7~~												°C	
Total	28	30	29	31	32	30	30	25	29	33	297		
	(14)	(13)	(14)	(14)	(13)	(12)	(12)	(15)	(13)	(12)	Tony 3-30-94		

Tony 4-5-94

Numbers in parentheses indicate the originating brood sizes. All organisms in a replicate are from the same adult.

Record in order given: a) L=Alive, D=Dead; b) 0-30 = Number of live young, (0-30) = Number of dead young; c) E = Aborted embryos observed

Ceriodaphnia dubia Test Information and Activity Log for 2:1 Cl to Br Cooling Tower Waste Chronic Toxicity Test, Procedure Number BIO-260.0

Ceriodaphnia dubia Young Production Data - DPC Lab Cultures

Dilution water for adults - 20% Perrier in Milli - Q water: PER - 228   Adults segregated: Date 3/28/94 Time 1542 Initials KRM

Check adults eight hours or less after the segregation time for third or later broods of eight or more neonates.

Adults checked for neonates: Date 3/29/94 Time 2313 Initials KRM   Tray F

Number of acceptable broods 17   Number of Neonates 220

Retain extra neonates until after the one hour post-initiation mortality check has been completed.

Test Information

Test initiation: Date 3/30/94 Time 1108   Test Termination: Date / / Time ______

Test location: Duke Power Company Biomonitoring Laboratory, 13339 Hagers Ferry Rd., Huntersville, NC 28078

Age at test initiation < 20 h   Incubator ID / shelf A/2   Renewal frequency = Daily

Test vessel: Composition = Polystyrene, Anchor Hocking PI-1   Capacity = 30 mL   Solution volume = 15 mL

Day	Diluent ~~(PER -)~~ CNS RAW INTAKE H_2O	Treatment Preparation by	Treatment Delivery by	Feeding: 100 ul YTC (YTC -)/Init.	Feeding: 100 uL Algae (SC -)/Init.	Temperature: Measured by	Temperature: Recorded by	Initiation, Transfer, or Termination Time	Transfers by	Counts by	Survival & Counts Recorded by
0*	~~229~~	JSV	Bmg	263 / Bmg	93 / Bmg	Bmg	Bmg	1108	JSV - Bmg	JSV	
1	↓		Bmg	263 / Bmg	93 / Bmg	JSV	JSV	1147	JSV	JSV	JSV
2		JSV	JSV	263 / JSV	93 / JSV	JSV	JSV	1123	JSV	JSV	JSV
3			KAF	263 / Bmg	93 / Bmg	Bmg	Bmg	1047	Bmg	Bmg	Bmg
4		DJC	DJC	263 / DJC	93 / DJC	DJC	DJC	1225 EAST	DJC	DJC	DJC
5			JSV	263 / JSV	93 / JSV	JSV	JSV	1134	JSV	JSV/ DJC	DJC
6			—	— / —	— / —	JSV	JSV	1257	JSV	JSV	JSV
7											

*Neonates checked 1 h after initiation for random mortalities DJC - replace random mortalities and document in the comments section as appropriate.

NEW TEST TIME =

Diluent Cycled-Up Cooling Tower Water (recieved 03-28-94)

Toxicants Br (as 40% NaBr; Calgon H-940) and Cl (as 5.25% NaOCl; Chlorox)   Source = Nuclear Chemistry (Steve Davenport)

Cl Stock Solution Preparation: 4.0 mL product diluted to 100mL with diluent = 1000 ppm Cl stock solution

Br Stock Solution Preparation: 0.322 mL product diluted to 100mL with diluent = 1000 ppm Br stock solution

Dilution Scheme Recorded by John E. Vette 3-29-94   Checked by Keith A. Finley 3/29/94

Dilute 167 mL of treated cooling tower water to 500 mL with diluent for a final concentration of 1:2 = 333 mL Diluent 33.4%

Dilute 100 mL of treated cooling tower water to 500 mL with diluent for a final concentration of 1:4 = 400 " 20%

Dilute 56 mL of treated cooling tower water to 500 mL with diluent for a final concentration of 1:8 = 444 " 11.2%

Dilute 29 mL of treated cooling tower water to 500 mL with diluent for a final concentration of 1:16 = 471 " 5.8%

Dilute 0 mL of treated cooling tower water to 500 mL with diluent for a final concentration of 100% raw water Control = 500 " 0%

Food YTC adjusted to 1800 mg/L total solids, Procedure Number BIO-88.0, Daphnid YTC Food Preparation

Selenastrum capricornutum cell density = 3.42 x 10E7 , Procedure Number BIO-84.1, Mass Algal Culture for Daphnid Feeding

Temperature

Test temperatures measured by device: ELENV- 3H89 , Procedure Number BIO-200.0, Temperature Determination

DO NOT DISPOSE OF SOLUTIONS OR DILUENT UNTIL REPORT FORMS HAVE BEEN APPROVED

Final Data Sheet Check by Keith A. Finley Date 4/5/94

Revised 3/29/94

2:1 Cl to Br Cooling Tower Waste Toxicity Test
7-Day Ceriodaphnia Survival and Reproduction Test
Water Chemistry Data

Control

Parameter		Day 0	Initials	Day 1	Initials	Day 2	Initials	Day 3	Initials	Day 4	Initials	Day 5	Initials	Day 6	Initials	Day 7	Initials
D.O. (mg/L)	(Initial)	8.6	JSN	8.2	JSN	8.7	JSN	8.7	KAF	8.7	DJC	8.86	JSN				
	(Final)	8.1	JSN	8.3	JSN	8.3	KAF	8.4	DJC	8.3	JSN	8.5	KRm				
pH (Units)	(Initial)	7.5	JSN	7.6	JSN	7.5	JSN	7.4	KAF	7.5	DJC	7.4	JSN				
	(Final)	7.6	JSN	7.7	JSN	7.6	KAF	7.7	DJC	7.5	JSN	7.6	KRm				
Tot. Alk (mg/L)		15.8	JSN														
Tot Hard (mg/L)		15.5	JSN														
Cond. (uS/cm)		92	JSN														

1 Part Waste : 8 Parts Raw Water (expected discharge conc.)

Parameter		Day 0	Initials	Day 1	Initials	Day 2	Initials	Day 3	Initials	Day 4	Initials	Day 5	Initials	Day 6	Initials	Day 7	Initials
D.O. (mg/L)	(Initial)	8.5	JSN	8.1	JSN	8.5	JSN	8.8	KAF	8.7	DJC	8.5	JSN				
	(Final)	8.0	JSN	8.3	JSN	8.3	KAF	8.9	DJC	8.3	JSN	8.5	KRm				
pH (Units)	(Initial)	7.6	JSN	7.5	JSN	7.6	JSN	7.5	KAF	7.5	DJC	7.6	JSN				
	(Final)	7.7	JSN	7.7	JSN	7.6	KAF	7.7	DJC	7.6	JSN	7.6	KRm				
Tot. Alk (mg/L)		16.2	JSN														
Tot Hard (mg/L)		20.6	JSN														
Cond. (uS/cm)		136	JSN														

1 Part Waste : 2 Parts Raw Water (high conc.)*

Parameter		Day 0	Initials	Day 1	Initials	Day 2	Initials	Day 3	Initials	Day 4	Initials	Day 5	Initials	Day 6	Initials	Day 7	Initials
D.O. (mg/L)	(Initial)	8.4	JSN	8.1	JSN	8.6	JSN	8.8	KAF	8.?	DJC	8.4	JSN				
	(Final)	8.0	JSN	8.2	JSN	8.3	KAF	8.3	DJC	8.	JSN	8.4	KRm				
pH (Units)	(Initial)	7.7	JSN	7.7	JSN	7.7	JSN	7.4	KAF	7.5	DJC	7.6	JSN				
	(Final)	7.7	JSN	7.7	JSN	7.6	KAF	7.7	DJC	7.6	JSN	7.7	KRm				
Tot. Alk (mg/L)		19.8	JSN														
Tot Hard (mg/L)		30.5	JSN														
Cond. (uS/cm)		193	JSN														

* In the event that mass mortality makes this concentration inappropriate, monitor the next highest concentration and note when this occurs on the data sheet

2:1 Cl TO Br COOLING TOWER WASTE CHRONIC TEST 10:07 Thursday, April 7, 1994
CNS RAW (INTAKE) WATER DILUENT BY: J.S. VELTE
FILE NO.: SP0394J2

NO MORTALITY OCCURRED, THUS FISHER'S EXACT TEST FOR SIGNIFICANT MORTALITY DOES NOT APPLY.

SHAPIRO-WILKS TEST FOR NORMALITY OF UNTRANSFORMED REPRODUCTION DATA

Analysis Variable : YOUNG

TREAT=control

Minimum	Maximum	Sum	Mean	Std Dev
27.0000000	33.0000000	302.0000000	30.2000000	2.2509257

TREAT=treat1

Minimum	Maximum	Sum	Mean	Std Dev
16.0000000	34.0000000	283.0000000	28.3000000	5.5986109

TREAT=treat2

Minimum	Maximum	Sum	Mean	Std Dev
25.0000000	37.0000000	295.0000000	29.5000000	4.1699987

TREAT=treat3

Minimum	Maximum	Sum	Mean	Std Dev
25.0000000	34.0000000	293.0000000	29.3000000	2.4966644

TREAT=treat4

Minimum	Maximum	Sum	Mean	Std Dev
25.0000000	33.0000000	297.0000000	29.7000000	2.2135944

Univariate Procedure

Variable=DIFF

Moments

N	50	Sum Wgts	50
Mean	0	Sum	0
Std Dev	3.453481	Variance	11.92653
Skewness	-0.55866	Kurtosis	2.23593
USS	584.4	CSS	584.4
CV	.	Std Mean	0.488396
T:Mean=0	0	Pr>|T|	1.0000
Num ^= 0	50	Num > 0	26
M(Sign)	1	Pr>=|M|	0.8877
Sgn Rank	17.5	Pr>=|S|	0.8678
W:Normal	0.965742	Pr<W	0.2641

PROBABILITY < W (0.2641) IS GREATER THAN 0.01, SO CONCLUDE THAT UNTRANSFORMED REPRODUCTION DATA ARE NORMALLY DISTRIBUTED.

BARTLETT'S TEST FOR HOMOGENEITY OF REPRODUCTION DATA VARIANCE AMONG TREATMENTS

BARTLETT'S TEST: CHI-SQUARE=12.726632948 ALPHA=0.0126917128 .

Compare to critical B as approximated from the Chi-square distribution at (p-1) degrees of freedom at a 0.01 level of significance. If the computed B is less than the critical (Chi-square) value, the variances are equal.

ALPHA (0.01269) IS GREATER THAN 0.01, SO CONCLUDE THAT DATA ARE HOMOGENEOUS

Listing of Input Data

Data Checked By: J.S. Vette Date: 4-7-94	Total Live Young Per Replicate									
	1	2	3	4	5	6	7	8	9	10
	N	N	N	N	N	N	N	N	N	N
Treatment										
control	32	29	33	28	33	31	32	27	29	28
treat1	[illegible]	31	34	24	34	26	32	25	30	31
treat2	28	29	30	27	37	25	25	31	27	36
treat3	28	30	31	25	30	27	28	29	31	34
treat4	28	30	29	31	32	30	30	25	29	33

DUNNETT'S T-TEST FOR DETERMINING SIGNIFICANT DIFFERENCES IN REPRODUCTION BETWEEN CONTROL AND TREATMENTS

Dunnett's Test at an alpha = 0.05 level of significance
General Linear Models Procedure

Dunnett's One-tailed T tests for variable: YOUNG

NOTE: This tests controls the type I experimentwise error for comparisons of all treatments against a control.

Alpha= 0.05 Confidence= 0.95 df= 45 MSE= 12.98667
Critical Value of Dunnett's T= 2.222
Minimum Significant Difference= 3.5817

Comparisons significant at the 0.05 level are indic[illegible] by '***'.

General Linear Models Procedure

TREAT Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
treat4 - control	-4.082	-0.500	3.082
treat2 - control	-4.282	-0.700	2.882
treat3 - control	-4.482	-0.900	2.682
treat1 - control	-5.482	-1.900	1.682

SIGNIFICANT DIFFERENCES AT ALPHA = 0.05 WERE NOT OBSERVED BETWEEN THE CONTROL AND ANY OF THE FOUR TREATMENTS. THIS TEST DISPLAYED NEITHER ACUTE NOR CHRONIC TOXICITY OF THE SIMULATED COOLING TOWER WASTE TO THE TEST SPECIES, CERIODAPHNIA DUBIA, AT ANY TESTED DILUTION.

CHECKED BY: DJ Coughlan
DATE: 4/7/94

ATTACHMENT #2

CATAWBA NUCLEAR STATION
COOLING TOWER TOXICITY TEST
SODIUM BROMIDE MIXED WITH SODIUM HYPOCHLORITE

In order to simulate the field conditions after mixing the sodium hypochlorite and sodium bromide to determine the toxicity, the following steps will be performed.

1. The cooling towers at Catawba will be cycled up to normal blow down concentrations without the use of any maintenance chemicals. A sample of this cooling water would be pulled and deliverd to out toxicity laboratory at Duke Power's Environmental Center.

2. A sample of raw lake water from Lake Wylie will also be delivered to the Environmental Center at the same time.

3. The cooling water sample will be placed into a heated stirrer to approximatly 110° F to simulate the temperature of the actual cooling towers.

4. A worst case scenario of sodium hypochlorite and sodium bromide will be added to the cooling water sample. Sodium hypochlorite will be added until a free chlrorine residual of 3.5 ppm is obtained.

   Approximately 1 ppm of sodium bromide will then be added to the mixture.

5. The sample will be mixed until no free oxidant is measured.

6. At the point in which no free oxidant is measured, the sample will be mixed with the raw lake water sample in the following quantities: 8 parts raw lake water to 1 part cooling water.

   This 8 to 1 ratio will simulate the actual conditions prior to the discharge monitoring point. The cooling tower blowdown rate is approximatly 5000 gpm. This is mixed with once through cooling water of approximatly 45,000 to 50,000 gpm prior to being discharged to Lake Wylie.

7. A sample will then be pulled for toxicity testing purposes.

ATTACHMENT #3

CATAWBA NUCLEAR STATION

PROPOSED SODIUM BROMIDE USAGE

MAY 27, 1993

NPDES PERMIT SC0004278
PART III ITEM 9 REQUIREMENTS

1) NAME AND GENERAL COMPOSITION OF THE MAINTENANCE CHEMICAL

a) Liquid Sodium Bromide (40 to 46% solution)

2) QUANTITIES TO BE USED

Approximtely 100 gallons of product.

2) FREQUENCY OF USE

Every two days

4) PROPOSED DISCHARGE CONCENTRATION

Since chlorine and bromide are both oxidants it is proposed that the current limits on Outfall 005 of 0.2 mg/l monthly average and 0.5 mg/l daily maximum for Free Available Chlorine be changed to Free Available Oxidant. (Outfall 005 is an internal outfall that discharges upstream of Outfall 001. Flow through Outfall 001 typically allows for an approximate 9 to 1 dilution ratio.)

5) EPA REGISTRATION NUMBER

The EPA Registration Number for one of the sodium bromide products under evaluation is 1706-168. Once the actual manufacturer/supplier is selected an update can be provided if needed.

6) AQUATIC TOXICITY INFORMATION

a) SODIUM BROMIDE

96 hour static acute LC 50 to Fathead Minnow = 16,479 ppm.
96 hour static acute LC 50 to Poecilia reticulata = 225 ppm.
48 hour static acute LC 50 to Daphnia magna = 7,900 ppm.

b) HYPOBROMOUS ACID (acid generated from Sodium Bromide)

96 hour static acute LC50 to Bluegill Sunfish = 0.52 ppm (as Br_2)
96 hour NOEC for Bluegill Sunfish is 0.30 ppm based on no mortality.

48 hour static acute LC50 to Daphnia Magna = 0.71 ppm (as Br_2)
48 hour NOEC for Daphnia magna is 0.41 ppm based on no mortality.

ATTACHMENT A

Aerial Over flight Photography
Catawba Nuclear Station
September 1993

Vegetative Remote Sensing
Flight Lines - 3, 4, and 5
Photographs - 3/7-10, 4/6-11, 5/7-11

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CARDAN, CORP.

Proj. # 93061 Neg. # DOP 9-93

Proj. Name Duke Power/Catawba Nuclear Power Plant IR Index

C.F.L. ______ Photo Scale ______

Lay-out ______ Map Scale 1<500

Pass Points ______ Ortho Scale ______

Tie Points ______ Contour Interval ______

PHOTOGRAPHY BY:
CARDAN SYSTEMS, CORP.
ONE CARDAN COURT
FORT MILL, SC 29715
(803) 548-5927

Approx. Scale 1" = 500

Job No.: 93061

CATAWBA NUCLEAR STATION
ANNUAL ENVIRONMENTAL OPERATING REPORT
CALENDAR YEAR 1993

AERIAL OVERFLIGHT PHOTOGRAPHY
VEGETATIVE REMOTE SENSING
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