AUTHORIZATION TO DISCHARGE UNDER THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Clean Water Act, as amended, (33 U.S.C. Sections 1251 et seq.; the "CWA"),

North Atlantic Energy Service Corporation
P.O. Box 300
Seabrook, NH 03874

is authorized to discharge from a facility located at

North Atlantic Energy Service Corporation
Seabrook Station
Route 1
Seabrook, NH

to receiving water named

Atlantic Ocean

in accordance with effluent limitations, monitoring requirements and other conditions set forth herein.

This permit shall become effective on April 1, 2002.

This permit and the authorization to discharge expire at midnight, five years from the effective date.

This permit supersedes the permit issued on September 30, 1993.

This permit consists of 30 pages in Part I including effluent limitations, monitoring requirements, etc., 19 pages in Part II including General Conditions and Definitions, 5 pages in Attachment A, 1 page in Attachment B, 11 pages in Attachment C, and 18 pages in Attachment D.

Signed this 12 day of February, 2002

Director, Office of Ecosystem Protection
U.S. Environmental Protection Agency
Region I

PART I

A. Effluent Limitations and Monitoring Requirements

1. This permit shall be modified, revoked or reissued to comply with any applicable effluent standard or limitation issued or approved under Sections 301(b)(2)(C) and (D), 304(b) (2), and 307(a) (2) of the CWA, if the effluent standard or limitation so issued or approved:

   a. contains different conditions or is otherwise more stringent than any effluent limitation in this permit; or

   b. controls any pollutant not limited by this permit.

   If the permit is modified or reissued, it shall be revised to reflect all currently applicable requirements of the CWA.

2. The design, construction and capacity of all components of the cooling water system seaward of the inlets to the main condensers or other heat exchangers ("Cooling Water System") of Seabrook Station shall comply with the following:

   a. The permittee shall use and maintain an anti-fouling protective coating on all appropriate components of the intake structures. The permittee shall perform manual cleaning of the intake structures twice per year.

   b. The velocity of water as it enters the intake structures shall at no time exceed 1.0 foot per second.

   c. The intake structures shall incorporate such behavioral or other deterrents or barriers as the Regional Administrator determines to be appropriate. This determination will be made under Section 316(b) of the Clean Water Act after reviewing the results of any studies or other information provided by the permittee.

   d. The Regional Administrator has determined that the Cooling Water Intake System, as presently designed, employs the best technology available for minimizing adverse environmental impact. Therefore, no change in the location, design or capacity of the present system can be made without prior approval of the Regional Administrator and the Director. The present design shall be reviewed for conformity to regulations pursuant to Section 316(b) when such are promulgated.

3. Should the intake tunnel and/or discharge tunnel require dewatering during an emergency condition, the permittee shall submit to the Regional Administrator and the Director an Emergency Dewatering Plan for their approvals as required in Paragraphs II.B.4 and II.B.5 of this permit which define "Bypass" and "Upset" operating conditions.

4. All material shall be removed from the traveling screens and disposed of in accordance with all existing Federal, State, and/or Local laws and regulations that apply to waste disposal. Such material shall not be returned to the receiving waters.

5. Chlorine and/or EVAC™ may be used as a biocide. No other biocide shall be used without explicit approval from the Regional Administrator and the Director.

6. The permittee shall submit an annual Chlorine Minimization Report to the Regional Administrator and the Director. The objective of this chlorination report is to document the amount of chlorine used to maintain suitable biofouling control of the intake cooling water system and thereby maintaining a high condenser efficiency. The Chlorine Minimization Report should include, at a minimum:

   a. The seasonal chlorination cycle employed during the reporting period: the months the system was chlorinated, the sodium hypochlorite dosage level, the TRO reported in the Discharge Monitoring Reports, an evaluation of the chlorine demand of the marine water, and the results of any inspections of the intake structures by divers or robots.

   b. The permittee shall report on the likelihood that the thermal backflushing operation will be needed to compliment the continuous chlorination program in the ensuing year (frequency and reason for the backflushing).

   The data developed for this report shall be incorporated into the statistical hydrological and biological data base for future operational data comparison.

7. The discharge shall not jeopardize any Class B use of the nearshore Atlantic Ocean and shall not violate State Water Quality Standards of the receiving water.

8. The permittee shall not at any time, either alone or in conjunction with any person or persons, cause directly or indirectly, the discharge of any waste into the receiving waters except waste that has been treated in such a manner as will not lower the Class B quality or interfere with the uses assigned to said waters by the New Hampshire Legislature (Chapter 311, Laws of 1967).

9. There shall be no discharge of polychlorinated biphenyl compounds such as commonly used for transformer fluid.

10. The discharge of radioactive materials shall be in accordance with the Nuclear Regulatory Commission requirements (10 CFR 20 and the Seabrook Station Operating License, Appendix A, Technical Specifications).

PART I

A. Effluent Limitations, Conditions, and Monitoring Requirements (Continued)

11. During the period beginning the Effective Date and lasting through the Expiration Date, the permittee is authorized to discharge from outfall serial number **001**, Circulating Water System Discharge.

a. Such discharge shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations		Monitoring Requirements	
	Avg. Monthly	Max. Daily	Measurement Frequency	Sample Type
Flow, MGD	720	720	Continuous[1]	Estimate
Temperature Rise, (Delta-T), °F[2]	39	41	Continuous [2]	Recorder
Temperature Rise, (Delta-T), °F[2,3]	45	47	Continuous [2]	Recorder
Temperature (Maximum), °F	Report	Report	Continuous	Recorder
Total Residual Oxidants (TRO), mg/l	0.15	0.20	1/day[4]	Grab
pH, s.u.[5]	6.5 to	8.0	1/week	Grab
Whole Effluent Toxicity[6]	Report	Report	1/Quarter	24-Hour Composite
EVAC, mg/l	--------	3.0[7]	When in Use	Grab
EVAC, mg/l	--------	4.3[8]	When in Use	Calculation

[1]The flow rate may be estimated from pump capacity curves.

[2]Temperature Rise is the difference between the discharge temperature (Discharge Transition Structure) and intake temperature (Intake Transition Structure). The intake and discharge temperatures will recorded by instruments or computers. The Temperature Rise and Maximum Temperature shall be calculated as a hourly average based upon at least twelve readings per hour (12 times per hour). These hourly average values will then be reported in the monthly DMRs.

[3]These average monthly and maximum daily temperature values are allowed up to a maximum of 15 days per year and only when one circulating water pump has been taken out-of-service for corrective or preventative maintenance. The Delta-T limits of 39 °F and 41 °F (average monthly and maximum daily, respectively) shall remain in effect at all other times of the year.

[4]Samples to be taken once per day at approximately the same time period. See Subparagraph "b" below for additional TRO requirements.

[5]See Part I.D.1 of this permit for State pH requirements.

[6]See Part I.A.22 of this permit for WET testing requirements.

[7]See Part I.A.11.f of this permit for EVAC use requirements.

[8]This limit may apply after the permittee has demonstrated that 4.3 ppm at the DTS is equivalent to 3.0 ppm or lower EVAC concentration at the Diffuser Nozzles. See Part I.A.11.f of this permit.

b. Total Residual Oxidants shall be tested using the Amperometric Titration Method, Method 4500-CL D in Standard Methods for the Examination of Water and Wastewater, 18th or subsequent edition(s), as approved in 40 CFR Part 136, or Method 330.1 in the EPA Manual of Methods of Analysis of Water and Wastes.

c. Samples taken for compliance with the monitoring requirements as specified in I.A.11.a above shall be taken at the Discharge Transition Structure, except for the intake water temperature, prior to the cooling water entering the discharge tunnel. See Part I.A.11.f of this permit for EVAC sampling requirements.

d. The discharge plume from the Seabrook Station shall:

(1) not block zones of fish passage,

(2) not interfere with spawning of indigenous populations,

(3) not change the balanced indigenous population of the receiving water,

(4) not contact surrounding shorelines, and,

(5) not violate Section 1707 of the State of New Hampshire Surface Water Quality Regulations.

e. The thermal component of the discharge shall in all aspects be in accordance with the discharge described in the permittee's NPDES Permit Application No. NH0020338, dated August 1, 1974, as modified in the reapplication dated April 1998, except as specifically modified below.

(1) The thermal component of the discharge from the Seabrook Station shall not cause a monthly mean temperature rise of more than 5 °F in the "near-field jet mixing region." The 5 °F monthly limit shall apply only at the surface of the receiving waters. For the purposes of this paragraph the "near-field jet mixing region" means that portion of the receiving waters within 300 feet of the submerged diffuser in the direction of discharge.

Permit compliance with this requirement shall be demonstrated by comparing the temperature difference between sampling point DS, (inside the mixing region) and sampling point T7 (reference sampling station). The locations of sampling points DS and T7 are shown in Attachment B. No change in the location of the sampling point is allowed without prior approval from the Regional Administrator and the Director. Temperature measurements shall be taken and recorded every fifteen minutes. The daily temperature shall be the arithmetic average of these measurements. The monthly mean temperature shall be determined by the arithmetic average of the daily temperature. Delta T shall be determined by taking the difference of the monthly mean temperature between DS and T7.

This paragraph shall apply only to temperature rises caused by the addition of heat to the receiving waters by the permittee. This temperature requirement does not apply during the cooling water flow reversal (thermal backflushing) used for biological control.

This monthly temperature limit constitutes the need for a CWA 316(a) thermal variance. See Attachment A.

(2) During operation of Seabrook Station, the permittee shall conduct additional thermal plume prediction studies as determined by the Regional Administrator and/or the Director. Such studies will be for the purpose of evaluating the accuracy of the thermal plume predictions the permittee has submitted to EPA in support of the

NPDES Permit Application No. NH0020338. Any such studies may apply to both the normal operation and thermal back-flushing operation at Seabrook Station.

(3) During operation of Seabrook Station, the permittee shall conduct biological/environmental studies as determined by the Regional Administrator and/or the Director. The purpose of any such studies shall be to evaluate the effects of Seabrook Station's discharge on the balanced, indigenous population of shellfish, fish and wildlife in and on the Atlantic Ocean.

(4) This NPDES permit may be modified to contain additional or different thermal limitations if the above studies and/or other available information indicates such modifications are necessary to assure the protection and propagation of a balanced indigenous population of shellfish, fish and wildlife in and on the receiving waters.

(5) The effluent limitations of this permit shall apply to all thermal components of the discharge from the Seabrook Station including, but not limited to, discharge during normal station operation and discharge during cooling water flow reversal for bio-fouling control.

(6) The permittee is allowed to discontinue temperature monitoring, for a period of up to 48 hours, during non-power operations and when the nuclear reactor is shutdown. The permittee may perform maintenance on the temperature monitoring equipment and/or other equipment sharing common power supplies during these non-monitoring periods.

f. The molluscicide EVAC may be applied twice per year, in late spring and late summer. Each application shall occur over a period not to exceed 48 hours. The discharge concentration shall not exceed 3.0 mg/l, at the Diffuser Nozzles. The discharge concentration shall be determined by grab sample at the Diffuser Nozzles after the concentration has reached a steady state condition throughout the plant. This steady state application concentration is expected to be approximately 4.3 ppm. Seabrook shall also sample and analyze for EVAC at the Discharge Transition Structure concurrently with the grab sample at the Diffuser Nozzles.

At least 3 months prior to the first application, the permittee shall submit the result of hydrological modeling which demonstrates the dissipation of EVAC. This model shall show the expected dissipation of EVAC concentration, until its concentration is undetectable (include EVAC half-life). Results of the modeling shall be submitted to the Regional Administrator and the Director.

At least 30 days prior to each planned use of EVAC, the permittee shall notify the EPA and the NH DES. Such notification shall include the dates over which the application is expected to occur, the amount (in pounds) of the molluscicide to be used, and the calculated discharge concentration. After the initial dosing with EVAC, the permittee shall also include, in the notification, an estimate of the effectiveness of EVAC.

The permittee may request that compliance be determined at the DTS, by calculation, after demonstration that a calculated 4.3 ppm DTS EVAC concentration results in a 3.0 ppm or lower discharge EVAC concentration at the Diffuser Nozzles. At least 4 consecutive EVAC applications and sampling events must occur prior to the permittee requesting such a change in compliance sampling point.

PART I

A. Effluent Limitations, Conditions, and Monitoring Requirements (Continued)

12. During the period beginning on the Effective Date and lasting through the Expiration Date, the permittee is authorized to discharge from outfall serial numbers: **022**, **023**, and **024**. These outfalls are Secondary Plant Leakage and Drainage, Vault #1; Secondary Plant Leakage and Drainage, Vault #2; and Plant System Leakage and Drainage, Vault #3; respectively.

a. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations		Monitoring Requirements	
	Avg. Monthly	Max Daily	Measurement Frequency	Sample Type
Flow, gpd	Report	122,400	Monthly	Estimate
Oil and Grease, mg/l	15	20	Weekly	Grab
Total Suspended Solids(TSS), mg/l	30	100	Weekly	Grab

b. The samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point prior to mixing with any other waste stream.

PART I

A. Effluent Limitations, Conditions, and Monitoring Requirements (Continued)

13. During the period beginning on the Effective Date and lasting through the Expiration Date, the permittee is authorized to discharge from outfall serial number **025A**, Steam Generator Blowdown.

a. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations		Monitoring Requirements	
	Avg. Monthly	Max. Daily	Measurement Frequency	Sample Type
Flow, gpd	Report	425,000	Continuous[1]	Estimate
Oil and Grease, mg/l	15	20	1/Quarter[1]	Grab
Total Suspended Solids, mg/l	30	100	1/Week[1]	Grab

[1]This discharge is considered continuous, although the frequency and duration may vary depending on plant operation. Therefore the frequency of measurement for flow is continuous when in use. The measurement frequency for TSS is once per discharge, and weekly if the discharge continues for more than seven days. The discharge may be interrupted and restarted but will still be considered continuous, as long as the discharge is reinitiated within four hours of interruption.

b. Samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point prior to mixing with any other waste stream.

PART I

A. Effluent Limitations, Conditions, and Monitoring Requirements (Continued)

14. During the period beginning on the Effective Date and lasting through the Expiration Date, the permittee is authorized to discharge from outfall serial number **025B**, Steam Generator Blowdown Demineralizer Rinse.

a. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations		Monitoring Requirements	
	Avg. Monthly	Max. Daily	Measurement Frequency	Sample Type
Flow, gpd	Report	210,000	Continuous[1]	Estimate
Oil and Grease, mg/l	15	20	1/Quarter[1]	Grab
Total Suspended Solids, mg/l	30	100	1/Week[1]	Grab

[1]This discharge is considered continuous, although the frequency and duration may vary depending on plant operation. Therefore the frequency of measurement for flow is continuous when in use. The measurement frequency for TSS is once per discharge, and weekly if the discharge continues for more than seven days. The discharge may be interrupted and restarted but will still be considered continuous, as long as the discharge is reinitiated within four hours of interruption.

b. Samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point prior to mixing with any other waste stream.

PART I

A. Effluent Limitations, Conditions, and Monitoring Requirements (Continued)

15. During the period beginning on the Effective Date and lasting through the Expiration Date, the permittee is authorized to discharge from outfall serial number **025C**, Waste Holdup Sump.

a. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations		Monitoring Requirements	
	Avg. Monthly	Max. Daily	Measurement Frequency	Sample Type
Flow, gpd	Report	60,000	1/Batch	Estimate
Oil and Grease, mg/l	15	20	1/Batch	Grab
Total Suspended Solids, mg/l	30	100	1/Batch	Grab

b. Samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point prior to mixing with any other stream.

PART I

A. Effluent Limitations, Conditions, and Monitoring Requirements (Continued)

16. During the period beginning on the Effective Date and lasting through the Expiration Date, the permittee is authorized to discharge from outfall number serial **025D**, Waste Test or Recovery Test Tanks.

a. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations		Monitoring Requirements	
	Avg. Monthly	Max. Daily	Measurement Frequency	Sample Type
Flow, gpd	Report	100,000	1/Batch	Estimate
Oil and Grease, mg/l	15	20	1/Batch	Grab
Total Suspended Solids, mg/l	30	100	1/Batch	Grab

b. Samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point prior to mixing with any other waste stream.

PART I

A. Effluent Limitations, Conditions, and Monitoring Requirements (Continued)

17. During the period beginning on the Effective Date and lasting through the Expiration Date, the permittee is authorized to discharge from outfall serial number **026**, Metal Cleaning Wastes from stationary or portable treatment equipment.

a. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations		Monitoring Requirements	
	Avg. Monthly	Max. Daily	Measurement Frequency[1]	Sample Type
Flow, gpd	Report	450,000	1/Batch	Estimate
Oil and Grease, mg/l	15	20	1/Batch	Grab
Copper, mg/l	1.0	1.0	1/Batch	Grab
Iron, mg/l	1.0	1.0	1/Batch	Grab
Total Suspended Solids, mg/l	30	100	1/Batch	Grab
pH, s.u.	6.0 to 9.0		1/Batch	Grab

[1]Sample frequency is once per batch prior to release when treated chemical cleaning waste is being discharged from either stationary or portable holding tanks.

b. A minimum of one Circulating Water System pump shall be in operation when the Treated Chemical Cleaning Wastes are discharged.

c. The samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point from stationary or portable holding tanks and prior to mixing with any other stream. The ultimate discharge shall be through the Circulating Water System, Outfall 001.

d. The permittee shall notify the Regional Administrator and the Director in writing, at least 72 hours prior to the discharge from any chemical cleaning operations and provide an estimate of the duration of the operation, the chemicals to be used, and the point or location of wastewater release into the discharge tunnel.

PART I

A. Effluent Limitations, Conditions, and Monitoring Requirements (Continued)

18. During the period beginning on the Effective Date and lasting through the Expiration Date, the permittee is authorized to discharge from outfall serial number **027**, Cooling Tower Blowdown.

a. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations			Monitoring Requirements	
	Daily Max.	Avg. Concentration	Max. Concentration	Measurement Frequency	Sample Type
Flow, gpd	-----	Report	Report	Daily[1]	Estimate
Total Residual Oxidants	-----	-----	0.5[2] mg/l	Daily[1]	Grab
Total Residual Oxidants	2.6[3] pounds	Report	-----	Daily[1]	Calculation[3]
pH, s.u.	6.0 to 9.0			Daily[1]	Grab

[1]Sample frequency is once daily when the Cooling Tower has a discharge.
[2] This limit is an instantaneous maximum concentration, mg/l.
[3] This is calculated over a single period of chlorine release, not to exceed two hours per day. The following equation shall be used: Mass TRO (pounds/event) = [Flow of outfall 027 (gallons per minute)] x [average TRO concentration (mg/l)] x [3.78 liters/gallon] x [120 minutes/event] ÷ [454,000 mg/pound].

b. None of the 126 priority pollutants shall be used for cooling tower maintenance chemicals.

c. The samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point prior to mixing with any other stream.

d. See Section I.A.11.b for Total Residual Oxidants analytical requirements.

PART I

A. Effluent Limitations, Conditions, and Monitoring Requirements (Continued)

19. During the period beginning on the Effective Date and lasting through the Expiration Date, the permittee is authorized to discharge from outfall serial number **003**, Thermal Back-flushing Operation.[1]

a. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations		Monitoring Requirements	
	Avg. Monthly	Max. Daily	Measurement Frequency	Sample Type
Flow, gpm	Report	500,000	When in use	Estimate[2]
Temperature, Maximum (T_{MAX})°F	Report	120	Continuous when in use	Recording Max. Temp.

[1]During the back-flushing operation, the diffuser serves as the intake and the intake structure is the discharge point.
[2]Flow rate may be estimated from pump curves.

b. The permittee shall perform back-flushing (cooling water flow reversal for bio-fouling control) only during times when hydrological and meteorological conditions are such that the plume flows off-shore and/or temperature increases are minimized at the Outer Sunk Rocks.

c. The multiport diffuser shall be maintained free of marine fouling organisms. The permittee has coated the external surfaces of the diffuser with a material approved by the Regional Administrator and the Director. The permittee may propose alternate chemicals or methods for minimizing biological growth on the diffuser nozzles to the Regional Administrator and the Director for approval.

d. The pH shall not be less than 6.5 standard units nor greater than 8.0 standard units or as naturally occurs in the receiving water, Par. I.D.1.a (Sampling not required.)

e. There shall be no visible discharge of oil sheen, foam, or floating solids in the vicinity of the discharge (the intake structures). Naturally occurring sea foam in the intake transition structure is allowed.

f. The continuous back-flushing flow shall not exceed 120 °F maximum and the duration at the maximum temperature shall not exceed 2 hours. The total back-flushing cycle shall not exceed 6 hours.

g. The permittee shall not conduct more than 4 back-flushing cycles per calendar year unless prior approval is obtained from the Regional Administrator and the Director.

h. There shall be no chlorination operations during the thermal backflushing process except for safety related functions, i.e.: Service Water System Chlorination.

i. The permittee shall notify the Regional Administrator and the Director, in writing, 15 days before each back-flushing operation is initiated.

j. The permittee shall include the date, maximum temperature, and duration in the monthly submittal of the Discharge Monitoring Report each time Discharge 003 is used.

k. Should the permittee propose to use thermal backflushing, then the December 16, 1994, thermal backflushing report entitled "Alternatives to Thermal Backflushing", shall be expanded to include the environmental impact and technical feasibility of each alternative, including EVAC. The report shall describe seasonal impacts on fish migration and spawning, endangered species, initial dilution, and plume dispersion. This report shall define the hydrological and meteorological conditions that would minimize the thermal impact on the biologically rich Sunk Rocks. Data shall be collected for a period of at least one year prior to submittal to EPA.

The updated study shall be submitted to the EPA and the NH DES at least 6 months before thermal backflushing is used.

20. The chemicals listed in Attachment C are approved, with limits, for water discharge. The permittee may propose to conduct feasibility studies involving new chemicals not currently approved for water discharge. The permittee shall gain approval from the Regional Administrator and the Director before any such studies take place. A report summarizing the results of any such studies shall be submittted to the Regional Administrator and the Director regarding discharge frequency, concentration, and the impact, if any, on the indigenous populations of the receiving water. The Regional Administrator or the Director may require Whole Effluent Toxicity testing as part of feasibility studies.

    The permittee may substitute or add laboratory chemicals that are discharged in de minimis amounts without conducting feasibility studies. The permittee shall submit, to the Regional Administrator and the Director, relevant information on the proposed addition/substitution regarding toxicity, frequency of discharge, concentration, and anticipated impacts. This submittal shall include a certification that the proposed chemical(s) is not carcinogenic, mutagenic, teratogenic or will bioaccumulate..

    Prior approval from the Regional Administrator and the Director is not necessary before any such addition/substitution of laboratory chemicals takes place. The permittee will continue to employ its Best Management Practice procedures entitled "Disposal of Laboratory Chemicals and Reagents" for laboratory chemicals. The permittee may not use any laboratory chemicals that are carcinogenic, mutagenic, teratogenic or that will bioaccumulate.

    No increase in chemical discharge concentrations, chemical substitution, or the use of additional chemicals is allowed without written approval by the Regional Administrator and the Director or their designees. Laboratory chemical use is excluded from this requirement.

    No use of chemicals that bioaccumulate is allowed.

21. There shall be no visible discharge of oil sheen, foam, or floating solids in the vicinity of the diffuser ports. Naturally occurring sea foam in the discharge transition structure is allowed. Except in cases of condenser leak seeking and sealing, use of a reasonable amount of biodegradable and non-toxic material may be used to the extent necessary to locate and/or seal any condenser leak. The permittee shall report in the appropriate monthly DMR the occasions wherein this material was used giving the date(s) of the incident, the type of materials used and the amount of materials discharged.

22. The permittee is required to report the results of chronic (and modified acute) WET tests using Inland Silverside (Menidia beryllina), acute WET tests using Mysid Shrimp (Mysidopsis bahia) and chronic Sea Urchin (Arbacia punctulata) WET tests on a quarterly basis. A 24-Hour composite sample is the required "sample type" for WET testing. If after eight consecutive sampling periods (two

years), no toxicity is found, the permittee may request a reduction in toxicity testing to twice per year. The permittee shall use the procedures and protocols contained in Attachement D to this permit when conducting the WET testing.

The toxicity tests shall be performed at times when various chemicals and waste tanks are discharged at the facility. The permittee shall document and submit to EPA the various scenarios under which the toxicity test has been performed. The permittee shall conduct quarterly toxicity testing as outlined below:

Administrative controls shall be in-place to control these discharges according to the following restrictions:

(a) NPDES Permit Outfalls 025 (A, B, C & D) will not be discharged during EVAC, mollusicide applications (expected frequency to be twice per year with a duration of up to about two days).

(b) When Outfall 025B (Steam Generator Blowdown rinses) is being discharged, none of the other Outfall 025 can be discharged.

Quarter #1 WET Testing (January - March)

Day 1	**Day 3**	**Day 5**
(Acute and sample #1 for chronic)	**(sample #2 for chronic)**	**(sample #3 for chronic)**
Outfalls 025A and 025C and 025D or EVAC	Outfalls 025A and 025B or Outfalls 025C and 025D	Outfalls 025A and 025B or Outfalls 025C and 025D

Note: If EVAC is not applied during the quarter, then 025A, 025C, and 025D shall be discharged and sampled. Day 3 and Day 5 cover both "or" conditions. For example: if Day 3 samples were obtained with 025A and 025B being discharged, then Day 5 samples should be obtained with 025C and 025D being discharged.

Quarter #2 WET Testing (April - June)

Day 1	**Day 3**	**Day 5**
(Acute and sample #1 for chronic)	**(sample #2 for chronic)**	**(sample #3 for chronic)**
Outfalls 025A and 025B (These discharges shall not be concurrent) or EVAC	Outfalls 025C or 025D	Outfalls 025C or 025D

Note: If EVAC is not applied during the quarter, then 025A and 025B shall be discharged and sampled. Day 3 and Day 5 cover both "or" conditions. For example: if Day 3 samples were obtained with 025C being discharged, then Day 5 samples shall be obtained with 025D being discharged.

Quarter #3 WET Testing (July - September)

Day 1 (Acute and sample #1 for chronic)	Day 3 (sample #2 for chronic)	Day 5 (sample #3 for chronic)
Outfalls 025A and 025C and 025D or EVAC	Outfalls 025A and 025B or Outfalls 025C and 025D	Outfalls 025A and 025B or Outfalls 025C and 025D

Note: If EVAC is not applied during the quarter, then 025A, 025C, and 025D shall be discharged and sampled. Day 3 and Day 5 cover both "or" conditions. For example: if Day 3 samples were obtained with 025A and 025B being discharged, then Day 5 samples should be obtained with 025C and 025D being discharged.

Quarter #4 WET Testing (October - December)

Day 1 (Acute and sample #1 for chronic)	Day 3 (sample #2 for chronic)	Day 5 (sample #3 for chronic)
Outfalls 025A and 025C and 025D or EVAC	Outfalls 025B and 025C or Outfalls 025B and 025D (These discharges shall not be concurrent)	Outfalls 025C and 025D

Note: * If EVAC is not applied during the quarter, then 025A, 025C, and 025D shall be discharged and sampled.

23. Chlorine Transit Study. The permittee shall conduct a "chlorine transit study" a minimum of twice per year for the first three years of the permit. This study shall be based on the 1993 Chlorine Transit Study performed at Seabrook Station. The study(s) shall measure the TRO concentration at the Discharge Transition Structure and the corresponding (taking into account the transit time) TRO at the Discharge Diffuser Nozzles (DDN). The study shall be conducted during periods of low chlorine demand of the cooling water. At least one of these studies shall be conducted when the plant is shut down and the effluent is not heated.

The permittee shall submit a study proposal to the Regional Administrator and the Director 30 days after the effective date of this permit and yearly thereafter. The study shall, to the maximum extent possible, represent "worst case" situations. That is, the facility shall be discharging TRO, as measured at the Discharge Transition Structure (DTS), as close to the permitted daily maximum as possible and the cooling water shall be exerting its lowest chlorine demand. Upon approval from the Regional Administrator and the Director, the permittee shall implement the study and submit the results to the Regional Administrator and the Director.

Should any of the Chlorine Transit Study results indicate that the permitted TRO concentration, as measured at the DTS, is not sufficiently stringent to ensure that the chronic and acute water-quality standards for chlorine are met at the DDN, this permit may be reopened to incorporate stricter limits.

24. Biological and Water Quality Monitoring Program

a. The Biological and Water Quality Monitoring Program (BP) shall be submitted to EPA for approval within 30 days of the effective date of this permit. Upon approval from EPA, the BP is an enforceable element of this permit. This BP shall be based on the 1996 Biological and Water Quality Monitoring Program, except for the following alternative regimes which will replace those previously employed:

(1) Intertidal Monitoring only will be implemented if Seabrook Station decides to employ back flushing of the Cooling Water System to control macrofouling. Any such Intertidal Monitoring Program will begin at least one year prior to back flushing.

(2) The Impingement Monitoring Program will be enhanced to include: collecting two 24-hour impingement samples each week, the evaluation of screen wash efficiencies using dead fish, and a sampling protocol for high impingement events.

(3) Ichthyoplankton Entrainment Sampling Program will allow greater understanding of diel variability in ichthyoplankton densities and will include more definitive day-night sampling (4 x 2-hour samplings/week: morning, day, evening, night), increased sample volume, and decreased net mesh size.

(4) The previous reviews by EPA and NH DES and Fish & Game of the long-term studies of coastal New Hampshire have concluded that the kelp communities in the study area should not be adversely influenced by plant operation. Therefore, monitoring of kelp communities is no longer required.

b. The Contingency Plan

This Contingency Plan identifies actions that Seabrook Station may undertake when improvements to the BP are necessary. The Contingency Plan authorizes the evaluation, annually at a minimum, of the BP and associated data, and, if necessary, requires recommendations for improvements in the BP and the development of a Management Plan (See Management Plan, below).

1. BP Evaluation

At a minimum, the BP is evaluated through the following:

i. An annual review of the environmental/biological sampling and analysis plan and data,

ii. The identification of change in the aquatic or biological system,

iii. The determination of statistically significant change,

iv. The determination of biological importance,

v. The determination of the likelihood that Seabrook Station contributed to the change,

vi. A review and analysis of BP data variability and power analysis update,

vii. The identification of improved sampling and/or analysis technologies, including, but not limited to: statistical methods, sampling equipment, and modeling technologies.

2. BP Evaluation Schedule

The BP will undergo an annual review according to the following schedule:

i. Sept. 1: Permittee submits the results from the previous year's BP to the Permitting Authority.

ii. Nov. 1: Permitting Authority submits comments and questions to the Permittee.

iii. Dec. 1: Permittee schedules meeting to present data and review proposed BP for the following year.

iv. Feb. 1: Improvements reviewed and approved by the Permitting Authority.

v. Mar. 1: Permittee continues BP and implements improvements, if applicable.

3. Management Plan

The BP requires the Permittee to determine whether any adverse environmental impacts are occurring due to facility operations. If they are, then the Permittee must, in a timely manner, develop and implement a Management Plan, approved by the Permitting Authority, to prevent such impacts. A report on these efforts must be submitted to EPA and NH DES every thirty days until the issue has been resolved.

c. BP Improvements

This permit authorizes improvements, as approved by the Permitting Authority, to the BP when indicated by results and analysis of BP data (acceptable data from other sources may also be considered). Analysis of data from measured parameters such as temperature, delta T, and rates of impingement, and entrainment indicate the need for monitoring program enhancements or improvements.

The Permitting Authority will require a review, at least annually, of sampling data and protocols and an evaluation of the need for more frequent sampling. Additional sampling locations and any other justified analytical or biological program improvements may be authorized. Prior to authorization, the permittee must seek input from biologists from NHDES, NHF&G, U.S. Fish and Wildlife, and EPA. This review will be chaired by the EPA with input from NHDES, NHF&G, U.S. Fish and Wildlife, and other agencies or experts as appropriate.

Within 30 days of authorization of biological program improvements, the permittee shall update and resubmit the Biological and Water Quality Monitoring Program to include any such improvements.

Examples of BP improvements include, but are not limited to:

1. Additional sampling stations,

2. Increased sampling frequency,

3. Changes demonstrated to reduce data variability or increased analysis sensitivity,

4. Changes demonstrated to increase the power to detect statistical significance,

5. Collection of additional data demonstrated to more definitively determine Seabrook Station impacts,

6. Additional predictive models such as species-specific population, community, and/or trophic level risk.

d. Biological, hydrological, and chlorination study reports shall be submitted on a semi-annual basis with the annual report summarizing the previous year's information and conclusions. The report is due in February.

The semi-annual mid-year report shall be a letter report providing the status of the on-going programs, the expected effort in the ensuing six months, and a synopsis of the data and information obtained since the last annual report. This report shall be submitted in July.

e. Fish Mortality Monitoring and Reporting.

Any incidence of fish mortality associated with the discharge plume or of unusual number of fish impinged on the Intake Traveling Screens shall be reported to the Regional Administrator and the Director within 24-Hours by telephone report as required in Paragraph II.D.1.e of this permit. A written confirmation report is to be provided within five (5) days. This report should include the following:

1. The species, sizes, and approximate number of fish involved in the incident.

2. The time, date, and duration of the occurrence.

3. The operating mode of the station at the time of the occurrence.

4. The opinion of the permittee as to the cause of the incident.

5. The remedial action that the permittee will undertake to prevent a recurrence of the incident.

25. Requirements for Seabrook Station Discharge Diffuser Nozzles

a. The 22 submerged offshore diffuser nozzles shall be maintained when necessary to ensure proper operation. Proper operation means that the plumes from each nozzle will be balanced relative to each other and that they all have unobstructed flow. maintenance may include dredging in the vicinity of the diffuser nozzles, removal of marine growth or other solids on the interior surfaces of the diffuser nozzles or repair/replacement of the nozzle structure.

b. Any necessary maintenance dredging must be performed only during the marine construction season authorized by the New Hampshire Fish and Game Department and only after receiving all necessary permits from the DES Wetlands Bureau, U.S. Coast Guard, U.S. Army Corps of Engineers, etc.

c. To determine if maintenance will be required the diffuser nozzles will be inspected by a licensed diver or licensed marine contractor at least every 36 months. The as-found or pre-maintenance condition of the nozzles will be documented on videotape. The maintenance performed on any nozzle and the as-left or post maintenance conditions will be documented in a written report prepared by the diver or marine contractor.

d. Copies of the videotape and written report of the maintenance provided on any nozzle will be submitted to EPA and NHDES WD within 60 days of each inspection. Where it is determined that additional maintenance will be necessary, the permittee shall provide the proposed scope and schedule for the maintenance.

B. MONITORING AND REPORTING

Monitoring results obtained during the previous month shall be summarized and reported on Discharge Monitoring Report Form(s) postmarked no later than the 15th day of the month following the completed reporting period.

Duplicate signed copies of these, and all other reports required herein, shall be submitted to the Regional Administrator and one signed copy to the State at the following addresses:

Environmental Protection Agency
NPDES Program Operation Section
P. O. Box 8127
Boston, MA 02114

The State Agency is:

New Hampshire DES
Water Division
Permits and Compliance Section
6 Hazen Drive, P.O. Box 95
Concord, New Hampshire 03302-0095

C. NOTIFICATION

1. All existing manufacturing, commercial, mining, and silvicultural dischargers must notify the Director as soon as they know or have reason to believe (40 CFR §122.42):

   a. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels:"

      (1) One hundred micrograms per liter (100 μg/l);

      (2) Two hundred micrograms per liter (200 μg/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 μg/l) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (mg/l) for antimony;

      (3) Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR §122.21(g)(7); or

      (4) Any other notification level established by the Director in accordance with 40 CFR §122.44(f) and New Hampshire regulations.

b. That any activity has occurred or will occur which would result in the discharge, on a non-routine or infrequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels:"

(1) Five hundred micrograms per liter (500 μg/l);

(2) One milligram per liter (1 mg/l) for antimony;

(3) Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR §122.21(g)(7); or

(4) Any other notification level established by the Director in accordance with 40 CFR §122.44(f) and New Hampshire regulations.

c. That they have begun or expect to begin to use or manufacture as an intermediate or final product or byproduct any toxic pollutant which was not reported in the permit application.

D. State Permit Conditions

1. The permittee shall comply with the following conditions which are included as State Certification requirements:

a. "The pH for Class B waters is 6.5 to 8.0 s.u. or as naturally occurs in the receiving water. The 6.5 to 8.0 s.u. range must be achieved in the final effluent, outfall 001, unless the permittee can demonstrate to the Division: (1) that the range should be widened due to naturally occurring conditions in the receiving water or (2) that the naturally occurring source water pH is unaltered by the permittee's operations. The scope of any demonstration project must receive prior approval from the Division. In no case shall the above procedure result in pH limits less restrictive than any applicable federal effluent limitation guidelines."

b. "The permittee shall submit the Executive Summary and Section D (Surface Water) of the Seabrook Station Annual Radiological Environmental Operating Report to NH DES at the address in Par. I.B as well as to EPA, NH Fish and Game, and NMFS within 30 days of preparation."

2. This NPDES Discharge Permit is issued by the U.S. Environmental Protection Agency (EPA) under Federal and State law. Upon final issuance by the federal EPA, the New Hampshire Department of Environmental Services, Water Division, may adopt this permit, including all terms and conditions, as a State discharge permit pursuant to RSA 485-A:13.

Each agency shall have the independent right to enforce the terms and conditions of this Permit. Any modification, suspension or revocation of this Permit shall be effective only with respect to the Agency taking such action, and shall not effect the validity or status of this Permit as issued by the other Agency, unless and until each Agency has concurred in writing with such modification, suspension or revocation. In the event any portion of this Permit is declared invalid, illegal or otherwise issued in violation of State law, such permit shall remain in full force and effect under Federal law as an NPDES permit issued by the U.S. Environmental Protection Agency. In the event this permit is declared invalid, illegal or otherwise issued in violation of Federal law, this Permit, if adopted as a state permit, shall remain in full force and effect under State law as a Permit issued by the State of New Hampshire.

E. Special Conditions

1. Whole Effluent Toxicity Test Frequency Adjustment

The permittee may submit a written request to the EPA requesting a reduction in the frequency (to not less than twice per year) of required toxicity testing, after completion of a minimum of eight (8) successive toxicity tests of effluent all of which must be valid tests and must demonstrate acceptable toxicity. Until written notice is received by certified mail from the EPA indicating that the Whole Effluent Testing requirement has been changed, the permittee is required to continue testing at the frequency specified in the respective permit.

2. pH Range Adjustment

The permittee may submit a written request to the EPA requesting a change in the permitted pH limit range to no more than 6.0 to 9.0 Standard Units. The permittee's written request must include the State's approval letter containing an original signature (no copies). The State's letter shall state that the permittee has demonstrated to the State's satisfaction that as long as discharges to the receiving water from a specific outfall are within a specific numeric pH range the naturally occurring receiving water pH will be unaltered. That letter must specify for each outfall the associated numeric pH limit range.

Until written notice is received by certified mail from the EPA indicating the pH limit range has been changed, the permittee is required to meet the permitted pH limit range in the respective permit.

F. Re-opener Clause

1. This permit shall be modified, or alternatively, revoked and reissued, to comply with any applicable standard or limitation promulgated or approved under sections 301(b)(2)(C) and (d), 304 (b)(2), and 307(a)(2) of the Clean Water Act, if the effluent standard or limitation so issued or approved:

   (a) Contains different conditions or is otherwise more stringent than any effluent limitation in the permit; or

   (b) Controls any pollutants not limited in the permit.

2. This permit may be modified to incorporate necessary Total Residual Oxidant (TRO) adjustments should the results of any of the "Chlorine Transit Study(s)", as required in Part I.A.23 of this permit, indicate potential violation(s) of the water-quality standards for chlorine at the diffuser nozzles. Results of the "Chlorine Transit Study(s)" are considered "New Information" and the permit can be modified as provided in 40 CFR Section 122.62(a)(2).

ATTACHMENT A - NH0020338
316(a) variance document, Seabrook Station

I. Introduction

Section 316(a) of the Clean Water Act (CWA) addresses the thermal component of any effluent. EPA has not promulgated Best Practicable Control Technology currently available (BPT) for the thermal component of a facility's discharge. However, EPA assumes that if thermal limits satisfying BPT were developed in accordance with Section 301(b)(1)(A) of the CWA, they would be more stringent than what would be proposed by the NPDES permit applicant. This is based upon the premise that water quality criteria developed by EPA or by individual water quality standards, developed by the states, would be the limiting factor in the development of the NPDES permit. It should be noted that thermal discharges (heat content) are not subject to the technology standards required by best conventional pollutant control technology economically achievable (BCT) since heat is not identified as a toxic pollutant or a conventional pollutant as defined by the CWA and outlined at 40 CFR Section 401.15 or Section 401.16. Rather, thermal discharges (heat) are treated as a separate type of pollutant under Section 316 of the CWA.

Section 316(a) gives the Administrator of EPA the authority to impose alternative effluent limitations (i.e., a "thermal variance") for the control of the thermal component of any discharge. However, the owner or operator of the point source must demonstrate to the satisfaction of the Administrator that existing effluent limitations are more stringent than necessary to assure the protection and propagation of a balanced indigenous community of shellfish, fish and wildlife in and on the receiving water. This authority has been delegated to the Regional Administrators or their designees.

New Hampshire Water Pollution Control Law addresses thermal waste discharged in RSA485-A:8 Section VIII which states, in pertinent part, that the "division shall adhere to the water quality requirements and recommendations of the New Hampshire Fish and Game Department, the New England Interstate Water Pollution Control Commission, or the United States Environmental Protection Agency, whichever requirements and recommendations provide the most effective level of thermal pollution control."

EPA, in the "Quality Criteria for Water, 1986," (i.e., the Gold Book), has set a maximum acceptable increase in the weekly average temperature at 1.8 °F during all seasons of the year. Seabrook Station's 1993 NPDES permit allows a maximum 5 °F temperature rise at the surface in the near field jet mixing region (on a daily basis). At the time of the 1993 permit issuance, the Regional Administrator tentatively determined that this temperature limit would ensure the protection and propagation of a balanced indigenous community of fish, shellfish, and wildlife in and on the nearshore Atlantic Ocean waters. Therefore, the limits proposed in the 1993 permit constituted a Section 316(a) thermal discharge variance. The facility has sought to continue this variance in the next permit.

II. Criteria for Determining Alternative Effluent Limitations Under Section 316(a)

40 CFR Part 125, Subpart H specifies the criteria and information necessary for EPA to make a Section 316(a) thermal variance. For existing discharges, Section 125.73(c)(1) allows the demonstration to be based on the absence of prior appreciable harm in lieu of predictive studies.

Seabrook Station began commercial operation in 1990, and, therefore, is considered an existing discharger. Pursuant to 40 CFR Section 125.73(c), the determination shall be based upon the absence of prior appreciable harm in lieu of predictive studies and shall show: (i) that no appreciable harm has resulted from the normal component of the discharge (taking into account the interaction of such thermal component with other pollutants and the additive effect of other thermal sources to a balanced, indigenous community of shellfish, fish and wildlife in and on the body of water into which the discharge has been made; or (ii) that despite the occurrence of such previous harm, the desired alternative effluent limitations (or appropriate modifications thereof) will nevertheless assure the protection and propagation of a balanced, indigenous community of shellfish, fish and wildlife in and on the body of water into which the discharge is made. In determining whether or not prior appreciable harm has occurred, the director shall consider the length of time in which the applicant has been discharging and the nature of the discharge.

III. Environmental Monitoring Program

Seabrook Station environmental monitoring programs began as early as 1969. These early programs focused on plant design and siting. Later, monitoring programs were designed to assess the temporal and spatial variability during the preoperational period as a baseline. The preoperational data focused on fisheries from 1976 - 1989 and plankton and benthic from 1978 - 1989. During these years, consistent sampling regimes were developed that included data from nearfield and farfield stations to provide background information in order to address the question of operational effects. Commercial operation of Seabrook Station began in 1990 and August 1990 is considered the beginning of the operation period for the purposes of environmental assessment.

In 1975, EPA and the State jointly formed a committee of biologists from regulatory agencies which were responsible for the aquatic community in the Hampton Harbor and Seabrook area. The agencies included the EPA, the National Marine Fisheries Service (NMFS), the NH DES-Water Division, and NH Fish and Game. The committee has been responsible for assisting the permittee in developing study programs, evaluating the resulting data, reviewing program conclusions, and approving/rejecting proposed program modifications and/or remediation by the permittee. In the past , the committee has also provided EPA with recommendations for the NPDES permit that would ensure the protection of the ecological community in and on the receiving water.

In the 1993 permit renewal, the biological committee was formalized into the Technical Advisory Committee (TAC) to ensure that its effort was an official part of the permit. The TAC

was empowered to accept, reject, or modify the facility's biological monitoring program and/or schedules.

As previously noted, Seabrook Station began commercial operation in 1990 and has operated to-date with only routine outages due to refueling and maintenance needs. A review of the entire biological monitoring program was undertaken in 1996. A number of program elements were revised, with the approval of the Technical Advisory Committee (TAC). The entrainment and impingement programs were enhanced to improve the quality of the data. Programs that monitored nutrients, phytoplankton, microzooplankton, pelagic fish (gill net sampling program), surface fouling panels, and macrobenthos at the deep stations were eliminated because the TAC felt sufficient data existed to eliminate concerns for potential impacts. Data collection at Station P5 was also ended because it was determined that is was too far from the discharge to reflect potential effects and was essentially the same as data collected from the Intake Station, P2.

IV. Previous 316(a) determinations

A series of decisions and legal actions on the design and impact of the cooling system on aquatic resources led to a Decision on Remand on August 4, 1978, by the EPA Administrator. Considered in the Decision on Remand were the potential for impact from: thermal discharge, thermal backflushing, cold shock, discharge plume scouring of the ocean bottom, entrainment of plankton through the cooling system, attraction of fish to the intake structures, entrapment of fish and subsequent impingement on the traveling screens, thermal plume barriers to migrating fish, increase in nuisance species populations, and gas bubble disease of fish. The Decision on Remand concluded that: 1) the requirements of Section 316(a) and (b) of the CWA had been met, and 2) the once-through cooling system would ensure the protection and propagation of a balanced indigenous population of fish, shellfish, and wildlife in and on the receiving waters with respect to the thermal discharge.

In the July 1993 Fact Sheet for the renewal of the permit, the Regional Administrator tentatively determined that a favorable 316(a) determination could be made. The proposed permit was consistent with the Administrator's previous 316(a) determinations.

This tentative determination was made after consultation with the biological committee and was based on a review of the biological and hydrological monitoring data which showed that a once-through cooling system satisfied the State of New Hampshire thermal requirements and, as required by section 316(a) of the CWA, ensured the protection and propagation of a balanced indigenous community of fish, shellfish, and wildlife in and on Hampton Harbor and the nearshore Atlantic Ocean.

The permit specified that the operational phase biological monitoring program would continue in order to assure EPA and the State that the continued operation of Seabrook Station did not significantly impact the local biological community.

The July 1993 Fact Sheet also noted that the 316 tentative determinations were made on the data as presented by the permittee and consultants during the plant construction (17 years) and upon post-operational data since 1990.

V. Current 316(a) determination

Seabrook Station has certified that the thermal component of the discharge has not changed since last permit issuance (see April 1998 renewal application). A thermal plume comparative evaluation was submitted to the EPA in June 1991 which concluded that there was agreement between plume model predictions and field data in terms of surface temperature rise isotherms, thermocline depths and plume pattern.

As previously noted in this document, the impact of the thermal component of the discharge is assessed on an ongoing basis through the biological monitoring program. Seabrook Station's 1998 Environmental Monitoring Report (received by EPA November 1999) demonstrates that the operation of the facility has not caused "appreciable harm" to the balanced, indigenous community of shellfish, fish and wildlife in the Hampton-Seabrook area. Seabrook Station has submitted information to support the continuation of the variance based on actual operating experience.

Therefore, in accordance with 40 CFR Part 125, Section 125.73, and after consultation with members of the Technical Advisory Committee, the Regional Administrator has determined that the current biological and hydrological monitoring data shows that a once-through cooling system for Seabrook Station satisfies the thermal requirements and will ensure the protection and propagation of a balanced indigenous community of fish, shellfish, and wildlife in and on Hampton Harbor and the nearshore Atlantic Ocean. In making this determination, the Regional Administrator has taken into account the length of time and the nature of the discharge (approximately ten years and about 560 Million Gallons per Day of heated effluent).

The thermal limits proposed in the draft permit constitute a Section 316(a) thermal discharge variance. The post-operational phase of the biological monitoring program will continue in order to assure EPA and the State that the continued operations of Seabrook Station does not significantly impact the local biological community.

BIBLIOGRAPHY TO 316(a) VARIANCE DOCUMENT

1. New Hampshire Water Pollution Control Law, Chapter 485-A

2. Quality Criteria for Water, 1986, EPA 440/5-86-001, "Gold Book Criteria"

3. 40 CFR Part 125, Subpart H

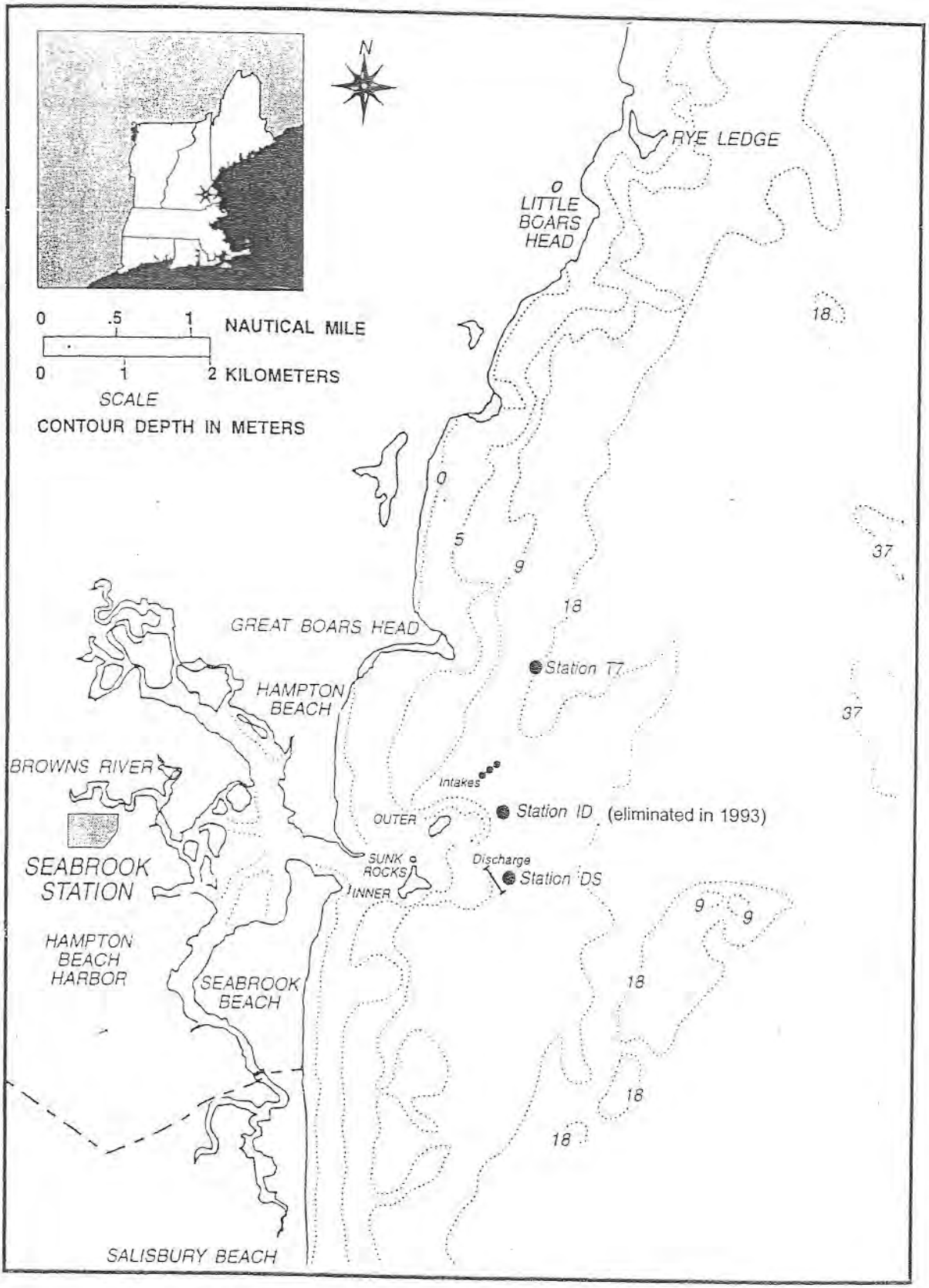
4. North Atlantic Energy Service Corporation's National Pollutant Discharge Elimination System (NPDES) Permit and Fact Sheet, 1993

5. Seabrook Station 1999 Environmental Monitoring Report, December 2000

6. Seabrook Station NPDES Permit NH0020338 Renewal Application, April 1998

ATTACHMENT: B

NH0020338



Seabrook Station Temperature Monitoring Station Locations

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
ONE CONGRESS STREET, SUITE 1100
BOSTON, MASSACHUSETTS 02114-2023

FACT SHEET

DRAFT NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT TO DISCHARGE TO WATERS OF THE UNITED STATES

NPDES PERMIT NUMBER:

NH0020338

NAME AND ADDRESS OF APPLICANT:

North Atlantic Energy Service Corporation
P. 0. Box 300
Seabrook, NH 03874

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

North Atlantic Energy Service Corporation
Seabrook Station
Route 1
Seabrook, NH

RECEIVING WATER:

Atlantic Ocean

CLASSIFICATION:

Nearshore Atlantic Ocean is Class B.

PUBLIC NOTICE DATE:

TABLE OF CONTENTS:

1 Proposed Action, Type of Facility, and Discharge Location

On April 23, 1998, North Atlantic Energy Services Corporation ("North Atlantic") applied to the U.S. Environmental Protection Agency for reissuance of its NPDES permit to discharge into the Atlantic Ocean. The application was supplemented with submittals on August 3, 1998, September 18, 1998, August 11, 1999, April 26, 2000, and most recently on June 7, 2001.

EPA intends to reissue the facility's NPDES permit. A draft NPDES permit has been prepared and should be referred to when reading this fact sheet.

Seabrook Station is an 1158 megawatt nuclear power electrical generation facility. The discharge consists of once-through cooling water, process wastewater, and stormwater. The facility is located in Seabrook, New Hampshire and discharges its effluent to the Atlantic Ocean.

2 Description of Discharge

Attachment A contains:

Figure 1A - station site and location
Figure 2A - station water use
Figure 3A - station system flow diagram showing reactor coolant water, feedwater and steam cycle, and circulating water

Attachment B contains a quantitative description of the discharge in terms of significant effluent parameters based on permit reapplication and operational data.

Attachment C contains three separate spreadsheets containing chemical use information. The first spreadsheet contains information on bulk chemical use, the second contains process chemical information, and the third contains information on chemicals used in the laboratory. These spreadsheets are discussed in more detail in section 4.6 of this fact sheet.

3 Limitations and Conditions

The effluent limitations of the draft permit, the monitoring requirements, and any implementation schedule (if required) may be found in Part I (Effluent Limitations and Monitoring Requirements) of the draft NPDES permit.

4 Permit Basis and Explanation of Effluent Limitations Derivation

4.1 General Requirements

The Clean Water Act (CWA) prohibits the discharge of pollutants to waters of the United States without a National Pollutant Discharge Elimination System (NPDES) permit unless such a discharge is otherwise authorized by the CWA. The NPDES permit is the mechanism used to implement technology and water quality-based effluent limitations and other requirements including monitoring and reporting. This draft NPDES permit was developed in accordance with various statutory and regulatory requirements established pursuant to the CWA and any applicable State regulations. The regulations governing the EPA NPDES permit program are generally found at 40 CFR Parts 122, 124, 125, and 136.

When developing permit limits, EPA must consider the most recent technology-based treatment and water quality-based requirements. Subpart A of 40 CFR §125 establishes criteria and standards for the imposition of technology-based treatment requirements in permits under Section 301(b) of the CWA, including the application of EPA promulgated effluent limitations and case-by-case determinations of effluent limitations under Section 402(a)(1) of the CWA. EPA is required to consider technology and water quality-based requirements as well as all limitations and requirements in the current/existing permit when developing permit limits.

Technology-based treatment requirements represent the minimum level of control that must be imposed under Sections 301(b) and 402 of the CWA (see 40 CFR §125 Subpart A) to meet best practicable control technology currently available (BPT) for conventional pollutants and some metals, best conventional control technology (BCT) for conventional pollutants, and best available technology economically achievable (BAT) for toxic and non-conventional pollutants. Effluent limitations guidelines for the Steam Electric Power Generating Point Source Category are found at 40 CFR Part 423.

In general, the statutory deadline for non-POTW, technology-based effluent limitations must be complied with as expeditiously as practicable but in no case later than three years after the date such limitations are established and in no case later than March 31, 1989 [see 40 CFR §125.3(a)(2)]. Compliance schedules and deadlines not in accordance with the statutory provisions of the CWA can not be authorized by a NPDES permit.

In the absence of published technology-based effluent guidelines, the permit writer is authorized under Section 402(a)(1)(B) of the CWA to establish effluent limitations on a case-by-case basis using best professional judgement (BPJ).

Water-quality based limitations are required in NPDES permits when EPA and the State determine that effluent limits more stringent than technology-based limits are necessary

to maintain or achieve state or federal water-quality standards. See Section 301(b) (1)(C) of the CWA. Receiving stream requirements are established according to numerical and narrative standards adopted under state law for each stream classification. When using chemical-specific numeric criteria to develop permit limits both the acute and chronic aquatic-life criteria, expressed in terms of maximum allowable in-stream pollutant concentration, are used. Acute aquatic-life criteria are considered applicable to daily time periods (maximum daily limit) and chronic aquatic-life criteria are considered applicable to monthly time periods (average monthly limit). Chemical-specific limits are allowed under 40 CFR 122.44 (d)(1) and are implemented under 40 CFR §122.45(d). The Region has established, pursuant to 40 CFR 122.45 (d)(2), a maximum daily limit and average monthly discharge limits for specific chemical pollutants.

The facility's design flow is used when deriving constituent limits for daily and monthly time periods as well as weekly periods where appropriate. Also, the dilution provided by the receiving water is factored into this process. Narrative criteria from the state's water-quality standards are often used to limit toxicity in discharges where: (1) a specific pollutant can be identified as causing or contributing to the toxicity but the state has no numeric standard; or (2) toxicity cannot be traced to a specific pollutant.

EPA regulations require NPDES permits to contain effluent limits more stringent than technology-based limits where more stringent limits are necessary to maintain or achieve state or federal water-quality standards. A water-quality standard consists of three elements: (1) beneficial designated use or uses for a water body or a segment of a water body; (2) a numeric or narrative water-quality criteria sufficient to protect the assigned designated use(s); and (3) an antidegradation requirement to ensure that once a use is attained it will not be eroded.

The permit must limit any pollutant or pollutant parameter (conventional, non-conventional, toxic and whole effluent toxicity) that is or may be discharged at a level that causes or has "reasonable potential" to cause or contribute to an excursion above any water-quality criterion. See CFR Section 122.44(d)(1). An excursion occurs if the projected or actual in-stream concentration exceeds the applicable criterion.

In determining reasonable potential, EPA considers: (1) existing controls on point and non-point sources of pollution; (2) pollutant concentration and variability in the effluent and receiving water as determined from permit's application, Monthly Discharge Monitoring Reports (DMRs), and State and Federal Water Quality Reports; (3) sensitivity of the species to toxicity testing; (4) known water-quality impacts of processes on wastewater; and, where appropriate, (5) dilution of the effluent in the receiving water.

The ACT requires that EPA obtain state certification confirming that all water-quality standards will be satisfied. The permit must conform to the conditions established pursuant to a State Certification under Section 401 of the ACT (40 CFR §124.53 and §124.55). EPA regulations pertaining to permit limits based upon water-quality standards

and state requirements are contained in 40 CFR §122.44(d). The CWA requires that EPA obtain State certification which declares that all water quality standards will be satisfied.

The conditions of the permit reflect the goal of the CWA and EPA to achieve and then to maintain water quality standards. To protect the existing quality of the State's receiving waters, the New Hampshire Department of Environmental Services, Water Division (NHDES-WD) adopted Antidegradation requirements in their December 10, 1999, Surface Water Quality Regulations (Env-Ws 1701). Hereinafter, New Hampshire's Surface Water Quality Regulations are referred to as the NH Standards.

The effluent monitoring requirements have been established to yield data representative of the discharges under the authority of Section 308(a) of the Clean Water Act, according to regulations set forth at 40 C.F.R. 122.41(j), 122.44(i) and 122.48. The monitoring program in the permit specifies routine sampling and analysis which will provide continuous general information on the reliability and effectiveness of the installed pollution abatement equipment. The approved analytical procedures are to be found in 40 CFR 136 unless other procedures are explicitly required in the permit.

4.2 Facility Information

Seabrook Station is owned by 11 New England Utilities, the "Joint Owners." The Joint Owners have established North Atlantic Energy Service Corporation (North Atlantic or NAESCO) as the managing agent for Seabrook Station. North Atlantic is a wholly owned subsidiary of Northeast Utilities, a Connecticut based utility holding company.

Seabrook Station consists of one pressurized-water nuclear reactor with an electrical output of approximately 1200 megawatts (gross) of electrical energy. The plant is located on about 715 acres of land located off of Route 1 in Seabrook, New Hampshire.

The plant siting, including the locations of the Intake Structure and the Discharge Diffuser, is shown on Figure 1A in Attachment A .

4.3 Internal Waste Streams

This draft permit addresses the discharges listed below (see also the Station Water Use diagram, Figure 2A in Attachment A). Outfall 001 is the facility's point source. The other discharges listed are internal waste streams which eventually discharge through Outfall 001.

Discharge Number	Average Flow Rate[1]	Discharge Description
001	580 Million Gallons Day (MGD)	Circulating Water System Discharge (Combined Circulating Water condenser Cooling and Service Water Cooling), Stormwater
002B	6.1 MGD[2]	Stormwater (General Permit)
003	500,000 Gallons Per Minute (170 MGD)	Thermal Backflush[3]
022	19,949 Gallons Per Day (GPD)	Oil/Water Separator Vault #1
023	14,452 GPD	Oil/Water Separator Vault #2
024	873 GPD	Oil/Water Separator Vault #3
025A	152,000 GPD	Steam Generator Blowdown
025B	48,500 GPD	Steam Generator Blowdown Demineralizer Rinses
025C	15,500 GPD	Waste Holdup sump
025D	16,500 GPD	Waste Test Tank /Recovery Test Tank
026	450,000 GPD	Chemical Cleaning
027	0.5 MGD	Cooling Tower Discharge

Footnotes:

[1] Taken from Form 2C of permit application

[2] Two-year, 24-hour storm event.

[3] The thermal backflushing operation will have a duration of about 6 hours at a flow rate of 471,000 gallons per minute or a total of about 170 million gallons of heated marine water for each backflush operation.

Fresh water uses at the station include: potable water, make-up water for the auxiliary cooling towers, make-up water for the demineralization water system, and make-up water for the fire protection system. Refer to Figure 2A.

The Town of Seabrook supplies an average of about 125,000 gallons per day (GPD) of fresh water to Seabrook Station (from the municipal well system). A maximum supply of 320,000 gpd is possible. North Atlantic owns wells on site and in the Town of Hampton Falls. Therefore, a maximum yield of approximately 500,000 GPD can be obtained if necessary.

The internal fresh water waste streams are discussed below:

4.3.1. Outfalls 022, 023, 024, Secondary Plant Leakage, Vaults 1, 2, and 3

The make-up water to the secondary system (power generation, see Figure 3A, part B "Feedwater and Steam Cycle) constitutes the greatest need for demineralized water during Seabrook Station operation. An estimated 68,000 gallons per day (maximum of 367,000 gpd) is needed. The portion of the flow that leaks or drains from the system is collected in floor drains and passed through oil/water separators prior to discharge. Each separator has been designed to discharge a maximum of 122,400 gpd.

Wastewater is piped to a gravity settling section with a tilted plate which separates the oil from the water. The gravity settling section reduces suspended solid loading into the oil separation section to 20 ppm. The down flow tilted plate separator is designed to process an oil/water solution such that the effluent conforms to EPA guidelines. The effluent is pumped to a holding tank with a coalescing filter capable of reducing the oil content from about 15 mg/L to less than 10 mg/L. Separated oil is collected in a holding tank and removed periodically, as are solids which have settled in the gravity separator.

The wastewater sources to the oil/water separators are listed below:

a. Oil/Water Separator #l, Outfall 022 - Emergency Feedwater Pump House drainage, the Turbine Building sump, the Lube Oil Building sump, and the Lube Oil Storage Room sump. Oil/Water Separator #1 services the Diesel Generator Building and Auxiliary Boiler Room when Oil/Water Separator #2 is not in service.

b. Oil/Water Separator #2, Outfall 023 - Diesel Generator Building sumps and the Auxiliary Boiler Room drainage. Oil/Water Separator #2 services the source to Oil/Water Separator #1 when it goes off line.

c. Oil/Water Separator #3, Outfall 024 - Auxiliary Boiler Fuel Oil Storage Tank area, the Fire Pumphouse Drains, the Fire Protection Diesel Pump Fuel Oil Tank

areas, and the Vehicle Maintenance Shop Sump.

The processed effluents are monitored and then discharged to the Atlantic Ocean via the Circulating Water System, Outfall 001. All of the oil/water separators are batch discharge, although they are treated as continuous discharges because they discharge many times over the period of a day. The outfalls will have monthly and daily limits, as well as monitoring and reporting requirements for flow, oil and grease, and total suspended solids.

4.3.2 Outfall 025A, Steam Generator Blowdown

The Steam Generator Blowdown system is designed to remove dissolved impurities and suspended solids from the secondary side of the steam generators. This is accomplished by continuous blowdown of liquid from each of the four steam generators. The blowdown flow is processed to recover and recycle as much of this water as possible. Processing may involve evaporation, filtration or demineralization. The non-recycled effluent stream is then discharged to the Circulating Water System and eventually through outfall 001 to the ocean.

The Steam Generator Blowdown subsystems are put into operation when the reactor is started up after a shutdown. Initial blowdown rates are set at maximum to establish, as rapidly as possible, the steam generator secondary water chemistry requirements. Once steady state conditions are reached, the controls are placed in automatic operation.

The proposed maximum daily flow limit for internal Outfall 025A is 425,000 GPD. This reflects an increase over the previous permit flow limit of 300,000 GPD. This change is associated with a plant design change that increases the maximum blowdown rate to approximately 100 gallons per minute from each of the four steam generators. These maximum flow rates would normally be used only during plant startups, shutdowns or chemical upsets.

The draft permit contains limits, monitoring, and reporting requirements for flow, oil and grease, and total suspended solids. The monitoring frequency for flow and total suspended solids is once per discharge and weekly if the discharge continues for more than seven days. Seabrook Station has submitted two years of oil and grease monitoring data for this discharge which indicates the absence of oil and grease. Therefore, EPA believes it is unlikely that this outfall will contain oil and grease, and, therefore is only requiring quarterly monitoring and reporting for this parameter in the draft permit.

4.3.3 Outfall 025B, Steam Generator Blowdown Demineralizer Rinse

The discharge from internal Outfall 025B consists of rinse water after regeneration of the demineralizers. The demineralizers are regenerated using sulfuric acid and sodium

hydroxide. After regeneration is complete, the demineralizer beds are rinsed with water to remove impurities. The wastewater is normally directed to outfall 001. Before the demineralizer beds are placed in service, a pre-service rinse of the beds is performed with the wastewater being directed to the Turbine Building Sump, where it is processed by Oil/Water Separator Vault #1 (Outfall 022). Rinse wastewater may also be directed to the Waste Holdup Sump (Outfall 025C).

The proposed maximum daily flow limit for internal Outfall 025B is 210,000 GPD. This is a proposed increased in flow rate for the outfall. The draft permit contains limits, monitoring, and reporting requirements for flow, oil and grease, and total suspended solids for the discharge prior to mixing with outfall 001. The duration of the discharge is variable. Seabrook Station has submitted two years of oil and grease monitoring data for this discharge which indicates the absence of oil and grease. Therefore, EPA believes it is unlikely that this outfall will contain oil and grease, and, therefore is only requiring quarterly monitoring and reporting for this parameter in the draft permit.

4.3.4 Discharge 025C, Waste Holdup Sump Discharge

The Waste Holdup Sump is a 30,000 gallon sump designed to contain fluid from the regeneration of the demineralizer beds. The sump also captures some of the floor drains from the demineralizer room. There is a recirculation system on the sump which allows for mixing and sampling prior to discharge. The Waste Holdup Sump is recirculated and discharged as a batch when necessary. Several batch discharges may occur during a week. The discharge of 025C more than once per day is infrequent. The proposed maximum daily discharge rate for the Waste Holdup Sump is 60,000 GPD.

4.3.5 Discharge 025D, Waste Test Tanks and Recovery Test Tanks Discharge

The Waste Test Tanks receive inputs from many sources throughout the plant. Floor drains within the Radiologically Controlled Area are directed to the Waste Test Tanks. Most of the inputs to the tanks are normally processed through a treatment system supplied and run by a vendor. The Waste Test Tanks are discharged through the Waste Liquid System to Outfall 001. The tanks have recirculation capability and are limited to a discharge rate of 150 GPM.

The Recovery Test Tanks may receive inputs from the same sources as the Waste Test Tanks as well as the Steam Generator Blowdown System Recovery Subsystem evaporators and Waste Liquid System evaporators. These tanks may also be discharged through the Waste Liquid System to Outfall 001. The maximum discharge rate is limited by pump design capacity to150 GPM.

The proposed maximum daily flow limit for Outfall 025D is 100,000 GPD. Several batch discharges may occur during the week. The Waste Test Tank or the Recovery Test

Tank may occasionally discharge more than once per day.

4.3.6 Discharge 026, Treated Chemical Cleaning Wastes

Treated Chemical Cleaning Wastes from either stationary or portable treatment facilities are used to facilitate cleaning of plant systems. The permit will require that the EPA Regional Administrator and the Director of the New Hampshire Department of Environmental Services be notified at least 72 hours prior to the discharge of chemical cleaning wastes from stationary or portable facilities. The types of chemical cleaning activities vary widely with application. The chemicals used in the processes will depend upon a number of variables including: environmental impact, system materials, fueling characteristics, availability of materials, residual effects on materials, operational considerations, and other factors.

The discharge of wastes from chemical cleaning equipment is ultimately discharged to Outfall 001. The draft permit contains limits, monitoring and reporting requirements for flow, oil and grease, copper, iron, total suspended solids, and pH (see section 4.5.4).

4.3.7 Discharge 027, Cooling Tower Blowdown

A mechanical draft cooling tower, part of the Service Water System, is designed to provide cooling water to plant systems. During normal operation, extended use of the cooling tower is infrequent, as cooling water for plant systems is supplied by the ocean service water pumps. However, the cooling tower is occasionally placed into service.

The facility's operating license requires that the cooling tower be placed into service on a quarterly basis to verify that it is functioning properly. The cooling tower also may be operated to allow maintenance on the ocean cooling water pumps or during winter months to warm the fresh water supply in the tower basin. The cooling tower provides a safety-related source of cooling water in the event that the ocean cooling water supply is unavailable due to collapse and/or blockage of the water tunnels. The cooling tower can supply cooling water to plant systems required for a safe shutdown. The cooling tower storage basin holds approximately 3,900,000 gallons of fresh water. This volume of water is sufficient to dissipate the design heat loads for seven days without the addition of makeup water to the basin.

Normal makeup water is supplied from the potable water system. Water may also be supplied from other sources if potable water is not available or if a more rapid makeup is desired. Other sources include: seawater from the forebays, fire protection main water, water from the Brown's river, or seawater from Hampton harbor.

Although the cooling tower can operate on seawater, it is prudent to maintain the salinity and total dissolved solids of the basin water as low as possible during normal operation.

Cooling tower blowdown is a discharge of a portion of the cooling tower water to Outfall 001. This blowdown is typically performed to reduce tower salinity and/or total dissolved solids following extended operation. Blowdown may also be performed to prevent overflow of the basin if the cooling tower water level reaches a high level as a result of rainfall.

Cooling tower water is treated to minimize biofouling and scaling of the system components. Sodium hypochlorite is normally added to the cooling tower during summer months. A silica based antiscalant is also added, on an as-needed basis, to minimize scaling in the tower.

As noted in Section 4.5.5, the draft permit requires that outfall 027 be monitored for flow and limits the concentration of total residual oxidants that may be discharged to Outfall 001. The draft permit limits the range of the pH and prohibits the use of any of the 126 priority pollutants for cooling tower maintenance chemicals.

4.3.8 Storm Water Runoff, Outfall 002B

The permittee has applied for, and obtained, coverage under the Multi-Sector General Stormwater Permit. The general permit addresses the discharge of stormwater from the facility. Therefore, this draft permit does not address stormwater and outfall 002B is no longer contained in the permit.

4.4 Cooling Water System

4.4.1 Outfall 001, Circulating Water System

There are two primary ocean water uses: 1) for condensing steam (the "Circulating Water System"), and; 2) for cooling various heat generating equipment throughout the facility (the "Service Water System").

Ocean water is drawn from three intake structures, through a 19-foot diameter tunnel, and into the intake transition structure. The circulating water portion of the pumphouse contains three, 14 foot wide, traveling screens and three circulating water pumps. The circulating water is pumped through an 11 foot diameter pipe to the condensers and is returned through a 10 foot diameter pipe. A reinforced concrete wall separates the circulating water portion from the service water portion of the pumphouse. Water to the service water section of the pumphouse is supplied by two pipes branching off each of the tunnel transition structures.

Wastewater from the facility is pumped from the Discharge Transition Structure (DTS), through the discharge tunnel to the multiport diffuser, and is discharged to the ocean. There is no sampling point between the DTS and the diffuser. Therefore, wastewater

samples are collected at the DTS. Other internal process wastewater streams mix with the circulating cooling water prior to discharge, but compliance monitoring for these streams occurs internally, before the streams mix with the circulating water.

A major concern of the facility is potential fouling of various components and pipes by marine organisms contained in the seawater. This biofouling is controlled by adding low-levels of chlorine to the circulating cooling water during certain times of the year. The typical annual sequence of events with respect to chlorine dose is shown below:

January - Chlorination is terminated.

March - Chlorination resumes, excluding the 3 mile intake tunnel.

April - September - Chlorination of the entire Cooling Water System. Chlorine dose rates are based on condenser efficiency.

October - December - Chlorine levels are reduced as biofouling is less due to declining water temperatures.

Chlorine (sodium hypochlorite) is injected at the offshore intake structures and at additional locations within the station, as needed. A Chlorine Minimization Program has been implemented at Seabrook Station, with the goal of minimizing chlorine use while maintaining suitable biofouling control of the intake cooling water system. The facility has requested the use of a new biocide, namely, EVAC™. Seabrook Station expects to use EVAC™ in conjunction with chlorine. The use of EVAC™ is discussed later in this fact sheet (see section 5.3, Biofouling Control).

4.4.2 Outfall 003, Thermal Backflush

In addition to chlorination, thermal backflushing of the intake tunnel may be employed to control biofouling of system components. Thermal backflushing involves the reversal of the normal cooling water flow such that the three intake structures serve as the discharge points (Discharge 003) and the diffuser ports, conversely, function as the intake structure.

During thermal backflushing, the water temperature in the intake tunnel will be elevated to a maximum of 120 °F for a maximum of 2 hours. The entire flow reversal and heat treatment cycle will occur over a six-hour period at a cooling water flow rate of 500,000 gallons per minute. There will be no chlorination of the condenser cooling water during the thermal backflushing treatment. The thermal backflushing operation has not been used in the past. However, it remains in the permit as an option for sessile organism control (see section 5.3, Biofouling Control for further information.)

4.5 Requirements for Steam Electric Power Generation

Regulations for "Steam Electric Power Generation Point Source Category" are found at 40 CFR Part 423.

4.5.1 Chlorine: Once Through Cooling Water System

4.5.1.a Acute

In the effluent guideline for "Steam Electric Power Generation Point Source Category", EPA has established a technology-based maximum daily discharge concentration of 0.20 mg/l for total residual oxidants, as defined in 40 CFR 423.11, based on the best available technology economically achievable (BAT). This technology based effluent limit applies to plants with a total generating capacity of more than 25 megawatts and once-through cooling water systems. Each individual generating unit is not allowed to discharge chlorine for more than two hours per day, unless the discharger demonstrates to the permitting authority that a longer duration is necessary in order to control macroinvertebrate growth.

The applicant has made such a demonstration for the cooling water system. Therefore, continuous chlorination of the cooling water system is allowed.

The State of New Hampshire Surface Water Quality Regulations set the marine acute water-quality standard for total residual chlorine at 0.013 mg/l. EPA and the State of New Hampshire have determined that the dilution provided by the receiving water in the mixing zone is 10 to 1. Therefore, the calculated maximum daily discharge concentration, based on the water-quality standard is:

Maximum Daily Chlorine Concentration = (0.013 mg/l) x 10 = 0.13 mg/l

EPA regulations require NPDES permits to contain effluent limits more stringent than technology-based limits where more stringent limits are necessary to maintain or achieve state or federal water-quality standards. The calculated water-quality standard limit of 0.13 mg/l is more stringent than the technology-based limit of 0.20 mg/l. However, the existing permit and this draft permit, allow a maximum daily chlorine concentration of 0.20 mg/l. The rational for this limit is provided below.

During the public comment period for the 1993 permit, Seabrook Station requested that the maximum daily total residual oxidant concentration be increased to 0.20 mg/l. This request was based on past operating experience which showed increased TRO concentrations (0.15 and 0.17 mg/l) during plant shutdown or load reduction transient conditions.

The permittee proposed that the water-quality standard for chlorine would be met at the discharge diffuser nozzles (DDN) due to the continued chlorine demand of the cooling water as it traveled from the Discharge Transition Structure (DTS, the sampling point) to the diffuser nozzles. That is, a wastewater maximum TRO concentration of 0.20 mg/l measured at the Discharge Transition Structure would result in an acceptable water-quality standard of 0.13 mg/l or less by the time it was discharged to the ocean. To support this, Seabrook Station provided a "Chlorine Transit Study." This study indicated substantial reduction of chlorine between the DTS and diffuser nozzles. The TRO of the DTS sample was 0.12 mg/l while the corresponding (approximately 70 minute delay to allow transit time) diffuser nozzle sample was less that the detection limit of 0.05 mg/l.

EPA, in its 1993 response to comments, accepted this study and referenced the work of P. Hostgaard-Jensen et al., Journal WPDF of August 1977 "Chlorine Decay in Cooling Water and Discharge into Seawater." Therefore, the increased TRO permit limit was allowed.

This draft permit maintains the higher 0.20 mg/l maximum daily TRO limit. In order to ensure that the water-quality standard of 0.13 mg/l will to be met at the discharge diffuser nozzles, EPA is requiring that the permittee repeat the chlorine transit study during "worst case" situations. EPA believes this condition will occur when the chlorine concentration at the DTS is at the allowable maximum concentration of 0.20 mg/l and the seawater is exerting its lowest chlorine demand, typically during the winter months of January and February. Although Seabrook Station would not ordinarily chlorinate its cooling water during this period, EPA believes requiring such study conditions is justified and appropriate, since the permit allows a TRO limit of 0.20 mg/l regardless of the time of the year.

EPA will require that the permittee submit a study proposal for EPA and NH DES approval. The permit will require that at lease two studies are performed each year for the first three years of the permit. Should any of these results indicate that the permitted limit of 0.20 mg/l at the DTS does not result in the water-quality limit of 0.13 mg/l at the diffuser nozzles, the permit will be modified to include a more stringent limit. A reopener clause has been placed in the draft permit to address this potential.

Pursuant to the definition of total residual chlorine found in 40 CFR 423.11, total residual oxidants is used in place of total residual chlorine since Seabrook Station's intake water is marine water and, therefore, contains bromides.

4.5.1.b Chronic

There is no published technology-based chronic (average monthly) limit for

chlorine for steam electric power point sources that generate over 25 megawatts.

New Hampshire Surface Water Quality regulations contain a marine chronic criteria of 0.0075 mg/l for chlorine. Using the 10:1 dilution factor of the receiving water, the calculated water-quality based limit is:

Average Monthly Chlorine Concentration = (0.0075 mg/l) x 10 = 0.075 mg/l

Since there is no published technology-based limit and the facility has a reasonable potential to cause or contribute to an excursion above the chronic water-quality standard for chlorine, the water-quality limit applies.

However, similar to the maximum daily limit, EPA is allowing a higher average monthly limit as measured at the Discharge Transition Structure. The limit in this draft permit remains the same as it is in the existing permit of 0.15 mg/l. Should the information from the chlorine transit study indicate that this limit is not protective, EPA may reopen the permit and modify the chronic chlorine limit.

Both the acute and chronic chlorine limits will be expressed in terms of Total Residual Oxidants and shall be obtained using the amperometric method for total residual chlorine described in 40 CFR Part 136. Unless otherwise specified, TRO shall be measured at the discharge transition structure.

For the draft permit, chlorine may be used as a biocide. Except for chlorine and/or EVAC™, no other biocide shall be used without written approval from the Regional Administrator and the Director. See Section 5.3 for further discussion of biofouling control.

4.5.2 pH

The pH range for Class B marine waters is from 6.5 to 8.0 standard units (s.u.) as defined in the New Hampshire Statute RSA: 485-A8,"Classification of Waters." Unless otherwise specified, pH shall be measured at the discharge transition structure.

The existing permit deleted pH limits from several internal fresh water streams (low volume waste streams). Page 23 of the 1993 fact sheet states "...the reaction of these streams with the chemicals inherent in marine waters is considered to be an acceptable treatment system (the chemical buffering capacity of marine waters). This type of treatment has been approved nationwide for many shoreline power plants." The fact sheet provides further calculations showing that the internal waste streams will be neutralized by the circulating water system.

A February 24, 1986 memorandum from EPA's National Expert on Stream

Electric/Water entitled "Stream Electric Generating Point Source Guidelines (40 CFR Part 423) pH Limitations for Low Volume Wastes Commingled with Once Through Cooling Water" supports this interpretation.

Therefore, this draft permit will maintain the pH limits at 001, but does not require pH limits on certain low volume waste streams, prior to commingling with the circulating water system (outfalls 022, 023, 024, 025A-D).

4.5.3 Polychlorinated Biphenyl Compounds

Pursuant to 40 CFR Part 423, discharge of polychlorinated biphenyl compounds (PCBs) is prohibited.

4.5.4 TSS, Oil and Grease, Copper, and Iron: Metal Cleaning Waste

The regulations for the steam electric power generation point source category limit the quantity of Total Suspended Solids (TSS), Oil and Grease, Copper, and Iron that can be discharged from metal cleaning operations (See Section 4.3.6 for description of metal cleaning operation and outfall).

4.5.4.a Total Suspended Solids

Total Suspended Solids from metal cleaning wastes will be limited in the draft permit to 100 mg/l maximum for any one day and to 30 mg/l average 30 day value as specified at 40 CFR Part 423.

4.5.4.b Oil and Grease

Oil and Grease from metal cleaning wastes will be limited in the draft permit to 20 mg/l maximum for any one day and to 15 mg/l average 30 day value per 40 CFR Part 423. EPA believes this limit is consistent with the State's narrative criteria for Oil and Grease which states that "Class B waters shall contain no oil or grease in such concentrations that would impair any existing or designated uses."

4.5.4.c Copper

The effluent guideline technology copper limit is based on the concentration of copper in the metal cleaning waste flow. In the case of Seabrook Station, this is internal outfall 026. The water-quality standards are based on the concentration of copper in the receiving water. Therefore, in order to determine which limit is more stringent, the technology and water-quality limits have been converted to mass based limits at the end of the pipe. This eliminates the need to account for the dilution of the metal cleaning waste flow, internal outfall 026, into the cooling

water system, outfall 001. The same methodology is used to compare all technology and water-quality limits of internal waste streams.

The effluent limitation guidelines set a maximum daily limit of 1.0 mg/l and a 30 day average value of 1.0 mg/l. A mass limit can be derived by multiplying the concentration by the flow of the chemical metal cleaning waste as follows:

Mass limit = (1.0 mg/l) x 0.45 MGD x 8.43 (lbs/MG)/(mg/l) = 3.79 lbs/day

The water-quality chronic value is more stringent than the acute value, so for purposes of comparing effluent guidelines to state water-quality standards, the chronic will be used. The chronic State Water Quality Standard for Copper is 0.0037 mg/l (Total Recoverable Metal). Since this limit applies to the end of the pipe, a mass limit can be derived as follows:

Mass limit = (0.0037 mg/l) x 720 MGD x 8.34 (lbs/MG)/(mg/l) = 22.43 lbs/day

Mass limit x dilution = 22.43 lbs/day x 10 = 224.3 lbs/day

Since the effluent limitation guideline is more stringent, the draft permit will limit copper to 1.0 mg/l. Sampling for copper from chemical metal cleaning will be taken at a representative location prior to outfall 026 mixing with any other waste stream.

4.5.4.d Iron

The effluent limitation guidelines set a maximum daily limit of 1.0 mg/l and a 30 day average value of 1.0 mg/l.

There is no marine acute or chronic water-quality criteria for iron, so the effluent limitation guideline shall be used. Sampling for iron from chemical metal cleaning will be taken at a representative location prior to outfall 026 mixing with any other stream.

4.5.5 Chlorine: Cooling Tower System

Seabrook Station has a cooling tower to provide a safety-related source of cooling water in the event that the ocean cooling water supply is unavailable due to collapse and/or blockage of the water tunnels. During normal operation, extended use of the cooling tower is infrequent. However, the cooling tower is occasionally placed into service in order to control solids concentration and to ensure its proper operation.

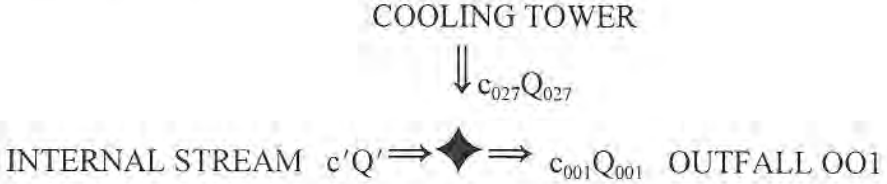
EPA has established limits for free available chlorine in the effluent limitation guidelines for cooling tower blowdown at 40 CFR 423.13(d)(1). These limits are 0.2 mg/l free available chlorine on a daily average (single period of chlorine release, not to exceed two hours) and 0.5 mg/l free available chlorine on a maximum basis ("instantaneous maximum"). These limits apply to the flow of the blowdown, prior to mixing with any other waste stream.

As previously discussed, Total Residual Oxidants is the appropriate analytical method to measure oxidants in once-through cooling marine water systems. Free Available Chlorine is measured for blowdown from cooling tower systems, since these systems typically use fresh water. Water-quality standards for chlorine are expressed in terms of Total Residual Chlorine.

During the operation of Seabrook Station, seawater may also be present in the cooling tower basin. Seabrook Station estimates that the cooling tower basin is comprised of a mixture of about 10% seawater and 90% potable water. Seabrook Station has requested that the permit limit and analytical method for chlorine in cooling tower blowdown be expressed as Total Residual Oxidant. Since Total Residual Oxidant includes free available chlorine and therefore is a more stringent method of measurement, EPA is allowing this change. For purposes of comparing technology-based limits to water-quality based limits, TRO will be used.

With regard to cooling tower operation and chlorine limits, 3 scenarios exist. These are:1) the cooling tower operates and discharges without the circulating water system working; 2) the cooling tower operates and discharges with the circulating water system operating, but only the cooling tower discharge contains chlorine, or; 3) the cooling tower operates and discharges with the circulating water system operating, with both the cooling tower blowdown and the circulating water containing chlorine. These scenarios should be evaluated to determine the chlorine limit at outfall 027, i.e., whether the technology or water-quality based limit should apply. However, as outlined in section 4.5.1.a above, EPA is allowing a water-quality based limit of 0.20 mg/l (maximum daily) as measured at the Discharge Transition Structure (DTS). Therefore, the water-quality based limit equals the technology based limit and no comparison is required. However, for explanatory purposes, the derivations are provide below.

In order to evaluate these scenarios, with regard to chlorine limits, a mass balance of chlorine will be used as shown below:



Equation 1. $$c'Q' + c_{027}\,Q_{027} = c_{001}Q_{001}$$

where c' = chlorine concentration of circulation water prior to mixing with cooling tower
Q' = flow rate of circulation water prior to mixing with cooling tower
c_{027} = chlorine concentration of cooling tower blowdown
Q_{027} = flow rate of cooling tower blowdown
c_{001} - chlorine concentration at outfall 001, as measured at the Discharge Transition Structure
Q_{001} = flow rate of outfall 001

1. In this case, with just the cooling tower operating, $c'Q' = 0$ and $Q_{027} = Q_{001}$, therefore, c_{027} must equal c_{001}. As previously discussed in section 4.5.1.a above, EPA is allowing a water-quality based limit of 0.20 mg/l as measured at the transition structure for TRO. Since both the water-quality based limit and the technology limit are 0.20 mg/l, this will be the limit in the permit. The limit will be an average daily limit as measured over the 2 hour period of chlorine release.

2. With the cooling tower operating and the circulating system containing no chlorine, $c' = 0$. The boundary, or "worst case", condition for this scenario will be maximum blowdown and only one circulating pump working (168,300 gallons per minute), solving equation 1 for c_{027}, with $c' = 0$:

$$c_{001} = c_{027}\,Q_{027}/Q_{001}$$

where: c_{027} = 0.20 mg/l (average concentration technology limit)
Q_{027} = 26,000 gallons per minute (both cooling tower pumps in operation at design maximum
$Q_{001} = Q' + Q_{027}$ = 168,300 gpm + 26,000 gpm = 194,300 gpm

c_{001} = 0.2 mg/l (26,000/194,300) = 0.027 mg/l

Since this concentration is below the water-quality derived limit of 0.2 mg/l (as measured at the DTS), the technology based limit will be used for this scenario.

3. With the cooling tower operating with the circulating system containing chlorine, the water-quality limit of 0.20 mg/l will be used since, solving equation 1 for c_{027} shows:

$$c_{027} = (c_{001}Q_{001} - c'Q')/Q_{027}$$

where : c_{001} = 0.20 mg/l (water-quality limit)
c' = 0.20 mg/l (maximum circulation water concentration)

$Q_{001} = Q' + Q_{027} = 168{,}000$ gpm + 26,000 gpm = 194,300 gpm
Q_{027} = 26,000 gallons per minute (both cooling tower pumps in operation at design maximum

$$c_{027} = [(0.20 \text{ mg/l})(194{,}300 \text{ gpm}) - (0.2 \text{ mg/l})(168{,}300 \text{ gpm})]/26{,}000 \text{ gpm}$$

$$c_{027} = 0.20 \text{ mg/l}$$

The effluent guidelines allow a maximum ("instantaneous") concentration of 0.5 mg/l. Although using the 0.5 mg/l instantaneous chlorine concentration in scenarios number 1 and 3 above could result in a temporary excursion of the water-quality derived limit, EPA does not believe reasonable potential exists for a violation of the acute water-quality standard. The permit restricts the permittee to an average chlorine concentration, taken over a two hour period of 0.20 mg/l. The permit prohibits the discharge of chlorine for more than two hours in any one day. These conditions ensure an average daily limit at or below the acute water-quality standard. Therefore, the permit allows a maximum TRO concentration of 0.5 mg/l.

As discussed in section 4.3.7 of this fact sheet, the cooling tower is infrequently placed into service. EPA believes the is no reasonable potential for this discharge to violate the State's chronic water-quality standard for chlorine. Therefore, the permit does not contain an average monthly chlorine limit for this discharge.

4.5.6 126 Priority Pollutants: Cooling Tower Blowdown

40 CFR Section 423.13(d)(1) prohibits the discharge of any of the 126 priority pollutants in detectable amounts except for chromium and zinc. Seabrook Station's expired permit specifies that none of the 126 priority pollutants shall be used for cooling tower maintenance chemicals. This prohibition is continued in the draft permit.

EPA has determined that the proposed permit limitations satisfy all water-quality and technology requirements of the Clean Water Act, including the 1984 BAT requirements for toxic pollutants and BCT for conventional pollutants.

4.6 Chemical Use

The facility will use a variety of water treatment chemicals in the cooling water system, the service water system, the steam generators, the condensate polishing system, as well as in other areas of the plant, such as the laboratory. It is not practical for EPA to assess the potential environmental impact for each chemical the permittee may use throughout the life of the permit. Assessing individual chemicals also does not take into account the interaction of these chemicals with each other, i.e., the additive, antagonistic, or synergistic effects.

In order to evaluate chemical use at the facility, EPA has organized the chemicals into three categories; bulk chemicals, process chemicals, and laboratory chemicals. The categories are based on the amount of chemical used. See Attachment C to this fact sheet.

In the expired permit, EPA set limits for certain chemicals used at the facility. For this round of permitting, EPA will carry over the expired permit limits, set limits for additional chemicals used by the permittee, and require that the permittee conduct regular (quarterly) Whole Effluent Toxicity (WET) testing.

The permittee is required to identify each chemical used and its concentration prior to conducting each quarterly toxicity test. The quarterly toxicity testing will also be timed around the discharge of certain holding tanks in order that the WET test represent a "worst case" situation. This information will be submitted to EPA with that quarter's toxicity test.

If toxicity is shown, monitoring frequency and testing requirements may be increased. The permit may also be modified, or alternatively, revoked and reissued to incorporate additional toxicity testing requirements or chemical specific limits.

The permitted chemical limits will apply mostly to bulk and process chemicals. Laboratory chemical discharge is permitted in de minimis amounts.

The permittee may propose to conduct feasibility studies involving new chemicals not currently listed. The Regional Administrator and the Director will approve the studies before any such studies take place. The permittee will then be required to summarize the results of any such studies and submit the summary to the Regional Administrator and the Director. The studies will address the discharge frequency, concentration, and the impact, if any, on the indigenous populations of the receiving water. The Regional Administrator or the Director may require Whole Effluent Toxicity testing as part of feasibility studies.

The chemicals used at the facility are organized as follows:

4.6.1 Bulk Chemicals

These chemicals are used in plant systems in quantities greater than 55 gallons per year (one drum). A short description of each bulk chemical follows:

1. Hydrazine

Hydrazine is used as an oxygen scavenger in the secondary steam cycle system which minimizes corrosion. This chemical is commonly used throughout the

industry as a corrosion preventative because of its non-toxic chemical reaction products. The hydrazine concentration in the secondary system is 0.5 mg/l during normal operation. During maintenance and shut-down periods, the concentration may be as high as 225 mg/l. At the temperatures and pressure of the secondary steam cycle, the hydrazine reacts quickly with the dissolved oxygen in the water to produce the by-products of ammonia and nitrogen. The amount of hydrazine discharged is negligible.

2. Ammonia

Ammonia as ammonium hydroxide maintains pH control in the steam cycle to minimize corrosion. The ammonia concentration in the secondary system may vary up to 3 mg/l during normal operation. Approximately 6,000 pounds of ammonia are discharged per year. Ammonia is discharged as the result reaction of hydrazine, as described above.

3. Boron

Boron as boric acid is used in the primary system to control the ability of the uranium fuel to fission by absorbing neutrons. The concentration of boron in plant systems vary from 0 to 20,000 mg/l. Boron is a naturally occurring element and is present in nearly all fresh and marine waters. Normally marine waters have boron concentrations of 3 to 4.5 mg/l. Therefore, the maximum possible concentrations will not cause a detectable impact on the aquatic community. Even though boron is used to moderate the neutron flux, it does not become radioactive. Approximately 5,000 pounds of boron are discharged annually.

4. Sodium Hypochlorite

Sodium Hypochlorite is used as a biocide to control fouling of system components. Approximately 41,000 pounds are discharged annually, measured as total residual oxidants.

5. Hypersperse AS 120

Hypersperse is a liquid antiscalant product used in the makeup water treatment system (MWTS). The MWTS supplies the demineralized water to the station. Approximately 363 pounds are discharged per year.

6. Sodium Hydroxide

Sodium Hydroxide is used in the regeneration of the blowdown demineralizers. The pH of the sump is between 6 and 9 at discharge. This mid-range pH is

maintained as a result of the mixing of sulfuric acid with the sodium hydroxide.

7. Sulfuric acid

Sulfuric acid is also used in the regeneration of the blowdown demineralizers. As stated above, the sulfuric acid mixes with the sodium hydroxide resulting in a pH in the 6 - 9 range.

8. Methoxypropylamine (MPA) and Ethanolamine (ETA)

MPA and ETA are used for corrosion inhibition in the secondary systems. Approximately 2,000 pounds of ETA and 3,000 pounds of MPA are used annually at the station.

Seabrook Station has asked for an increase in MPA concentration, at outfall 001, from 0.5 mg/l to 5 mg/l. This increase is associated with the planned design change that will implement a Condensate Polishing System (CPS). When the CPS is not in operation, the limit would remain at 0.5 mg/l.

The CPS will be placed in service to expedite secondary system cleanup as necessary after a refueling or maintenance outage. The CPS will be placed into service if a small condenser tube leak occurs during plant operation to remove seawater contamination and thus allowing continued full power under the leak can be isolated and repaired. The CPS will also be operated for short periods during the year for operator training. Seabrook Station estimates that the CPS would be placed into service for up to three weeks each year. However, in the event that a condenser tube leak occurs during peak demand, it is possible that the CPS would be operated for up to two months.

Toxicity information supplied by Seabrook Station indicates that this proposed increase would not have any observable toxic effects on marine species.

9. Morpholine

Morpholine is commonly used throughout the industry for pH and corrosion control in boiler systems. This chemical is not currently used at Seabrook Station. However, the permittee has requested approval for future use of morpholine.

10. Bulab 9328

Buckman Laboratory product 9328 is a corrosion inhibitor (used in auxiliary cooling tower). This compound has been used in the past but is not currently in use.

11. Bulab 6002

Buckman Laboratory product 6002 is a biocide (used in auxiliary cooling tower). This compound also has been previously used but is not currently used.

12. Cat Floc TL

Calgon product "Cat Floc TL" is used as a flocculent in the liquid radwaste system to enhance the removal of any particulate matter made radioactive by neutron activation. This material is used to aggregate those activation products and, thereby, improve the decontamination capability of the demineralizers. This is not currently used.

13. Cat Floc L

Calgon product "Cat Floc L" is also used as a flocculent as noted above and is not currently in use at the station.

14. Nalcolyte 7134

Nalcolyte product 7134 is used as a coagulant for the same purpose as the two Calgon products indicated above.

15. Muriatic Acid

Muriatic acid, also known as hydrochloric acid, is used in the water treatment plant. Approximately 2 million gallons goes into the reject stream each year. As it mixes with the brackish concentrate, the actual molecules of product are not discernable due to the pH of the reject stream.

16. Ethylene diamine

Proposed for future use, 3000 - 5000 lbs/year.

17. 1,2-diaminoethane 3-Hydroxyquinuclide

Proposed for future use, 4100 lbs/year.

18. 2-Amino, 2-methylpropanol

Proposed for future use, 3000 lbs/year

19. 2-methyl-2-amino-1-propane

Proposed for future use, 3000 - 5000 lbs/year.

20. EVAC™

Used as a biocide. Proposed for future use, 25,000 lbs/year.

21. 2,2'-dipyridyl

Proposed for future use, 3000 -5000 lbs/year.

22. 2,9-Dimethyl-1,10-phenanthroline

Proposed for future use, 3000 -5000 lbs/year.

23. 4,4'-dypridyl

Proposed for future use, 3000 -5000 lbs/year.

24. 4,7-dimethyl-1,10-phenanthroline

Proposed for future use, 3000 -5000 lbs/year.

25. 5-aminopentanol

Proposed for future use, 3361 lbs/year.

26. Terpyridine

Proposed for future use, 3000 -5000 lbs/year.

27. Dynacool 1385, (formally Thruguard 300)

Proposed for future use, 18,000 lbs/year.

28. Pyrolidine

Proposed for future use, 2350 lbs/year.

29. Pyrolidone

Proposed for future use, 3000 -5000 lbs/year.

30. Carbohydrazine

Proposed for future use, 200 lbs/year.

31. Grease

Grease is used to lubricate the Circulating Water System and Service Water System Traveling Screen chains. Some of this grease is gradually released into the Circulating Water and Service Water forebays and is subsequently discharged through outfall 001. Approximately five pounds of grease is used each month. Assuming that all the grease is discharged uniformly during the course of a month, the approximate discharge concentration would be about 0.00004 mg/l. EPA considers this negligible and has not placed any oil and grease limit at outfall 001. Approximately 60 pounds will be used yearly.

32. Dynacool 1385

Dynacool 1385 is an antiscalant for use in controlling the buildup of calcium carbonate in the Circulating Water System chlorination line. Approximately 10 gallons per day would be injected into the chlorination line each day. Dynacool 1385 would only be used when chlorine is in use at the facility, typically March through early December. The calculated discharge concentration would be less than 0.1 mg/l, which is well below the level of toxic effects of Dynacool 1385 on marine species tested (*Menidia beryllina* and *Mysidopsis bahia*).

In the past, about 4,000 gallons of hydrochloric acid was used to dissolve the calcium carbonate which had built up in the chlorination line. The use of the scale inhibitor will avoid or postpone another chlorination line cleaning.

33. BetzDearborn DA6801

This product consists of poly acrylic acid and ethanlolamine and is an antiscalant intended to be used in the steam generator. The permittee plans to apply this antiscalant in the feedwater to the plant's steam generators at very low concentrations, about 1-10 parts per billion (ppb). The expected concentration at outfall 001 would be about 0.007 ppb.

4.6.2 Process Chemicals

Used at the facility in quantities ranging from one pint to one gallon.

1. Diisopropylamine

Approximately 82 lbs per year split between the three discharge points based on the number of sodium analyzers feeding into each stream.

2. Molybdate-3 reagent and Amino F reagent

These two materials are used in the process silica analyzers. About 16 pounds per year is used.

3. Lithium hydroxide

Lithium hydroxide neutralizes the effects of boric acid in the primary system. This chemical helps to maintain a constant pH in the primary system, thereby minimizing corrosion processes. The lithium hydroxide in the primary system will be less than 2.4 mg/l.

4. Hydrogen Peroxide

Hydrogen peroxide is used during annual refueling outages (once every 18 months) to help remove corrosion products. By removing radioactive corrosion products from internal piping surfaces the radiation exposure of workers is minimized. Hydrogen peroxide may also be used for disinfection of stainless steel systems. The concentration of hydrogen peroxide in the primary system is less that 5 mg/l. This would normally be consumed within the system being converted to oxygen and water before release.

5. Ethylene Glycol and Propylene Glycol

Ethylene and propylene glycol are used to prevent ice formation in outdoor water systems that are not heat traced. Any discharges of these two chemicals would be inadvertent because the permittee is establishing reclamation and reuse procedures for these chemicals.

6. Sodium nitrite

Sodium nitrite is used as a corrosion inhibitor for some of the piping systems.

7. Sodium molybdate

Sodium molybdate is used as a corrosion inhibitor for some of the piping systems.

8. Sodium Silicate

Sodium silicate is used as a scale inhibitor or preservative in some of the piping systems.

4.6.3 Laboratory Chemicals

These chemicals are used for laboratory analysis and in quantities ranging from one gram to one gallon. The number of laboratory chemicals used is too numerous to list here. Water-quality standards do not exist for most, if not all, of the laboratory chemicals. Laboratory chemicals are used in de minimis amounts. Therefore, EPA does not consider that reasonable potential exists to cause or contribute to violations of water-quality standards. EPA's approach to addressing the potential impacts will be through routine toxicity testing (see Section 4.7 below). Seabrook is allowed to discharge laboratory chemicals in de minimis quantities as listed in Attachment C.

4.7 Whole Effluent Toxicity

EPA's **Technical Support Document for Water Quality-based Toxics Control, March 1991, EPA/505/2-90-001**, recommends using an "integrated strategy" containing both pollutant specific (chemical) approaches and whole effluent (biological) toxicity approaches to better detect toxics in effluent discharges. Such information may then be used to control the entrance of those toxic pollutants into the nation's waterways. Pollutant-specific approaches, such as those in the Gold Book and State regulations, address individual chemicals, whereas, whole effluent toxicity approaches evaluate interactions between pollutants, i.e., the "Additivity", "Antagonistic" and/or "Synergistic" effects of pollutants. In addition, the presence of an unknown toxic pollutant can be discovered and addressed through this process.

Section 101(a)(3) of the CWA specifically prohibits the discharge of toxic pollutants in toxic amounts as does New Hampshire State law N.H. RSA 485-A:8, VI and the N.H. Code of Administrative Rules, PART Env-WS 1703.21(a) which state, in part that, "all classes of waters shall be free from toxic pollutants or chemical constituents in concentrations or combinations that injure or are inimical to plants, animals, humans, or aquatic life." The NPDES regulations under 40 CFR §122.44(d)(1)(v) require whole effluent toxicity (WET) limits in a permit when a discharge has a "reasonable potential" to cause or contribute to an excursion above the State's narrative criterion for toxicity.

Region I adopted this "integrated strategy" on July 1, 1991, for use in permit development and issuance. EPA Region I modified this strategy to protect aquatic life and human health in a manner that is both cost effective as well as environmentally

protective.

Seabrook Station discharges wastewater which has an unknown potential for causing toxicity to organisms. Presently, there is inadequate information for EPA to base a "reasonable potential" determination concerning this discharge's toxicity potential to cause or contribute to an excursion of the State's narrative water quality criterion. Thus, an inclusion of a WET testing monitoring requirement in the draft permit is necessary, reasonable and appropriate to gather this information in order to make a technically-based "reasonable potential" determination regarding whether or not this discharger is unknowingly contributing toxics to the receiving water. This approach is consistent with that recommended in **Technical Support Document for Water Quality-based Toxics Control, March 1991, EPA/505/2-90-001,** page 60.

This WET test is a proactive method of protecting the environment so as to properly carry out EPA's Congressional mandate to prevent the discharge of toxic substances into the Nation's waterway. EPA cannot make a "reasonable potential" determination on an individual discharge without first evaluating WET tests results obtained from a given facility's discharge.

Therefore, the draft permit is conditioned to require the permittee to report the results of chronic (and modified acute) WET tests using Inland Silverside (Menidia beryllina), acute WET tests using Mysid Shrimp (Mysidopsis bahia) and chronic Sea Urchin (Arbacia punctulata) WET tests on a quarterly basis. A 24-Hour composite sample is the required "sample type" for WET testing. If after eight consecutive sampling periods (two years), no toxicity is found, the permittee may request a reduction in toxicity testing to twice per year.

The toxicity tests shall be performed at times when various chemicals and waste tanks are discharged at the facility. The permittee will be required to document and submit to EPA the various scenarios under which toxicity testing has been performed (i.e., identify internal outfall discharges during testing). At a minimum, EPA will require the following toxicity testing schedule:

Administrative controls shall be in-place to control these discharges according to the following restrictions:

(a) NPDES Permit Outfalls 025 (A, B, C & D) will not be discharged during EVAC, mollusicide applications (expected frequency to be twice per year with a duration of up to about two days).

(b) When Outfall 025B (Steam Generator Blowdown rinses) is being discharged, none of the other Outfall 025 can be discharged.

Quarter #1 WET Testing (January - March)

Day 1 (Acute and sample #1 for chronic)	Day 3 (sample #2 for chronic)	Day 5 (sample #3 for chronic)
Outfalls 025A and 025C and 025D or EVAC	Outfalls 025A and 025B or Outfalls 025C and 025D	Outfalls 025A and 025B or Outfalls 025C and 025D

Note: If EVAC is not applied during the quarter, then 025A, 025C, and 025D shall be discharged and sampled. Day 3 and Day 5 cover both "or" conditions. For example: if Day 3 samples were obtained with 025A and 025B being discharged, then Day 5 samples should be obtained with 025C and 025D being discharged.

Quarter #2 WET Testing (April - June)

Day 1 (Acute and sample #1 for chronic)	Day 3 (sample #2 for chronic)	Day 5 (sample #3 for chronic)
Outfalls 025A and 025B (These discharges shall not be concurrent) or EVAC	Outfalls 025C or 025D	Outfalls 025C or 025D

Note: If EVAC is not applied during the quarter, then 025A and 025B shall be discharged and sampled. Day 3 and Day 5 cover both "or" conditions. For example: if Day 3 samples were obtained with 025C being discharged, then Day 5 samples shall be obtained with 025D being discharged.

Quarter #3 WET Testing (July - September)

Day 1 (Acute and sample #1 for chronic)	Day 3 (sample #2 for chronic)	Day 5 (sample #3 for chronic)
Outfalls 025A and 025C and 025D or EVAC	Outfalls 025A and 025B or Outfalls 025C and 025D	Outfalls 025A and 025B or Outfalls 025C and 025D

Note: If EVAC is not applied during the quarter, then 025A, 025C, and 025D shall be discharged and sampled. Day 3 and Day 5 cover both "or" conditions. For example: if Day 3 samples were obtained with 025A and 025B being discharged, then Day 5 samples should be obtained with 025C and 025D being discharged.

Quarter #4 WET Testing (October - December)

Day 1 (Acute and sample #1 for chronic)	Day 3 (sample #2 for chronic)	Day 5 (sample #3 for chronic)
Outfalls 025A and 025C and 025D or EVAC	Outfalls 025B and 025C or Outfalls 025B and 025D (These discharges shall not be concurrent)	Outfalls 025C and 025D

Note: * If EVAC is not applied during the quarter, then 025A, 025C, and 025D shall be discharged and sampled.

If these WET tests detect toxicity, the Regional Administrator and the Director may decide to modify the permit. Such modifications may include a toxicity and/or additional pollutant limits to adequately protect the State's Surface Water Quality during the remaining life of the permit. Results of these toxicity tests will be considered "new information not available at permit development"; therefore, the permitting authority is allowed to use this information to modify an issued permit under authority in 40 CFR §122.62(a)(2).

Upon successful completion of 8 consecutive WET tests, the permittee may request a reduction in toxicity testing to a minimum of twice per year. If a reduction is granted, the remaining two toxicity tests shall be conducted to coincide with the use of EVAC (quarters three and four).

5 Technical and Regulatory Explanations

5.1 Significant Changes to Permit

The existing NPDES permit was issued on September 30, 1993 and expired on September 30, 1998.

The most significant changes since last permit issuance are: a) the decommissioning of both the stormwater Settling Basin (Outfall 002A) and the Sewage Treatment Plant (Outfall 021A) and subsequent diversion of stormwater to outfall 001 and untreated sanitary wastewater to the Town of Seabrook POTW. The stormwater discharge is now covered under the Stormwater Multi-Sector General Permit for Industrial Activities; b) the elimination of the Technical Advisory Committee (TAC) as a formal component of the permit; c) the modification to the intake structures to prevent the taking of marine mammals (seal deterrent system); d) provisions for alternatives to chlorine as the primary

biocide (i.e., use of the biocide EVAC™); e) the splitting of outfall 025 into four distinct outfalls (025A-025D); f) reduced biological monitoring; g) a design change that will install a Condensate Polishing System. These changes are discussed below:

a. Discharge of stormwater from the Settling Basin, Outfall 002A, to the Browns River (receiving water) was terminated in April 1994. This date was referred to as the "Diversion Date" in the expired permit because the discharge was diverted from the Browns River to Outfall 001 on that date. Operation of the Sewage Treatment Plant was discontinued in January 1997, with sanitary waste streams being rerouted to the Town of Seabrook, NH, Publicly Owned Treatment Works (POTW).

The expired permit contains effluent limits and monitoring requirements for outfall 002B, effective April 13, 1994. The permittee has submitted a Notice of Intent and obtained coverage to discharge stormwater pursuant to the provisions of the Multi-Sector General Stormwater Permit for the electric generating facility industrial category.

Sanitary waste effluent limits, monitoring and reporting requirements have likewise been removed from this draft permit. The permittee is required to comply with the Town of Seabrook POTW Class 1 and Class 2 Industrial Wastewater Discharge Permit (expires March 8, 2002).

b. The Technical Advisory Committee (TAC) requirements have been eliminated from the draft permit. The expired permit formally established a TAC to coordinate, review, and comment upon the biological, hydrological, and chlorination program at Seabrook Station. The TAC was comprised of biologists from New Hampshire Department of Environmental Services (NH DES), New Hampshire Fish and Game Department (NH F&GD), United State National Marine Fisheries Service (NMFS), and the EPA. The elimination of the TAC is based on, in part, its inability to fully comply with the provisions of the Federal Advisory Committee Act (FACA). However, the draft permit does contain provisions for input from members of the former TAC before significant changes in the biological, hydrological, and chlorination monitoring programs can be implemented.

c. Seabrook Station began taking seals through its intake structure in 1993. The facility sought, and subsequently received, a Letter of Authorization (LOA) from the National Marine Fisheries Service to take a small number of seals. The LOA required that the facility investigate mitigation measures for minimizing impacts on the seals. The facility consulted a number of specialists in marine biology and conducted studies through the New England Aquarium in order to design the most effective seal deterrent system. In August 1999, Seabrook Station installed Seal Deterrent Barriers on the offshore intake structures. No seals have been entrapped since the installation of the barrier system.

d. Seabrook Station requested the approval to demonstrate the feasibility of using an alternative to sodium hypochlorite (chlorine) for the control of macrofouling in the cooling water system. Seabrook Station proposed a one-time study using a small amount of the molluscicide EVAC™. EPA commented on the study and requested additional information to evaluate any possible adverse impacts of the biocide on marine organisms. After an evaluation of all the information, EPA is allowing the use of EVAC™ in this round of permitting. The permit will specify the amounts and concentration that may be used, as well as continued toxicity testing of the discharge in order to ensure that the biocide is not having an adverse impact on marine life.

e. The expired permit identified outfall 025 as one discharge, the "Steam Generator Blowdown and Liquid Waste Distillate Stream." For this draft permit, outfall 025 is split into four discrete outfalls, 025A-025D. The effluents from these four streams are distinct in terms of constituents and type of discharge (batch versus continuous), therefore, four individual outfalls, with separate effluent limits and monitoring requirements are proposed in the draft permit.

f. A modified ambient biological monitoring program is proposed for this draft permit.

g. This draft permit incorporates a design change that will install a Condensate Polishing System (CPS). The CPS will be placed in service to expedite secondary system cleanup as necessary after a refueling or maintenance outage. The CPS may be placed in service to remove potential seawater contaminants should a small leak from the condenser tube into the secondary system occur. The operation of the CPS will necessitate the increase in Methoxypropylamine (MPA) from the current limit of 0.5 ppm to 5 ppm. The proposed limit is supported by aquatic toxicity which indicates that the aquatic community will not be impacted.

5.2 Section 316 of the Clean Water Act

Each time the permit is reissued (not to exceed 5 years), the 316(a) and (b) determinations are reviewed. The permittee must certify any changes in: (1) the facility discharge characteristics; (2) the waterway characteristics, and (3) resident or transient aquatic community. The permittee must then explain any differences identified and their impact on the local ecological community.

5.2.1 316(a) Thermal Limitations

Section 316(a) of the Clean Water Act (CWA) addresses the thermal component of any discharge. EPA has not developed the Best Practicable Control Technology currently available (BPT) for thermal discharges from point sources. However, EPA assumes that if thermal limits satisfying BPT were developed in accordance with Section 301(b)(1)(A) of the CWA, they would be more stringent than what would be proposed by the NPDES

Permit applicant. This is based upon the premise that the water quality criteria developed by states would be the limiting factor in the development of the NPDES Permit. It should also be noted that thermal discharges (heat) are not subject to the technology standards required by Best Conventional Pollutants Control Technology Economically Achievable (BCT) since heat is not identified as a toxic pollutant or a conventional pollutant as defined by the CWA and outlined in 40 CFR §401.15 and §401.16. Rather, thermal discharges (heat) are treated as a separate type of pollutant under §316 of the CWA.

Section 316(a) of the CWA gives the Administrator of the EPA the authority to impose alternative effluent limitations for the control of the thermal component of any discharge. However, the owner or operator of the point source must demonstrate to the satisfaction of the Administrator that existing effluent limitations are more stringent than necessary to assure the protection and propagation of a balanced indigenous community of shellfish, fish and wildlife in and on the receiving water. The criteria for determining alternative effluent limitations under Section 316(a) of the CWA are found at 40 CFR Part 125, Subpart H.

The temperature change of the effluent above the influent temperature, or delta T, is limited to 39 °F on an average monthly basis and 41 °F as a daily maximum. Additionally, the permit requires that the temperature at the nearfield surface waters remain within 5 °F of the ambient (farfield) water temperature.

In the June 6, 2001, NPDES application supplement, Seabrook Station requested an increase in discharge temperature for a period not to exceed 15 days per year. This request was made to allow the taking out of service of one of the three circulating water system pumps for corrective or preventative maintenance. Seabrook requested that the limit for average monthly be increases from 39 to 45 °F and the daily maximum be increased from 41 to 47 °F, during this maximum 15 day per year period.

The draft permit allows this short duration increase in delta T. This decision is based on the following: 1) the 5 °F of the ambient water temperature increase will remain in effect at all times during the year; 2) the permit will continue to require that thermal plume shall not block zones of fish passage, not interfere with spawning of indigenous populations, not change the balanced indigenous populations of the receiving water, and not contact surrounding shorelines; 3) since the thermal plume shall be slightly smaller, although warmer, during these periods, no environmental impacts are expected at the Inner and Outer Sunk rocks.

EPA has reviewed the impact potential to aquatic resources from operation of the Seabrook Station cooling system under Section 316(a) and (b) of the Clean Water Act. A series of decisions and legal actions on the design and impact of the cooling system led to an August 4, 1978 Decision on Remand by the EPA Administrator. Considered in the Decision on Remand were the potentials for an impact from: thermal discharges; thermal

5.3 Biofouling Control

Originally, the permittee had anticipated that macroinvertebrates would be controlled solely through the use of the thermal backflushing technique. During thermal backflushing, the cooling water discharge temperature would be increased to a maximum of 120 °F for a maximum of 2 hours. Thermal backflushing would be conducted only when meteorological and hydrological conditions are such as to minimize thermal impact to the Outer and Inner Sunk Rocks areas.

The permittee has shown through experimental testing and plant operations that continuous low levels of sodium hypochlorite introduced at the cooling water intake structures, during certain times of the year, can control most of the macroinvertebrate growth. The facility expects that the thermal backflushing operation will be used very infrequently, if ever. To date, the facility has not used thermal backflushing.

See Section 4.5.1 of this fact sheet for a discussion of the development of chlorine permit limits.

Seabrook Station has instituted a chlorine minimization program with the goal of minimizing the seasonal usage of chlorine at Seabrook Station. The draft permit allows the permittee to submit proposed changes to the approved Chlorination Management Program annually. This permit condition allows for potential changes in dosage levels to control different organisms, seasonal variation in organisms, or greater population of some organism.

In addition to chlorination to control macroinvertebrates, the permittee has requested that it be allowed to use the molluscicide EVAC. The draft NPDES permit allows the use of this molluscicide on a limited basis. Seabrook estimates that two applications of EVAC in the Circulating Water System will control the growth of molluscs (late spring and late summer). The dose required would be about 4.3 ppm over a period of 36 - 48 hours. Seabrook estimates that the discharge concentration would be about 3.0 ppm, which is further diluted 10:1 within 300 feet of the diffuser nozzles, resulting in an ambient concentration of about 0.3 ppm.

EPA has reviewed the toxicity data submitted by the permittee and has concluded that the use of this molluscicide for the proposed timeframes and concentrations will not cause an adverse impact to native biological communities in the area of the discharge. Therefore, the draft permit allows for the use of EVAC twice per year and at levels which would result in discharge concentrations not to exceed 3.0 ppm.

The permittee estimates that if EVAC proves to be effective, its use will reduced the amount of chlorine use by an estimated 10 to 20 percent, or about 3,000 - 6,000 pounds annually. Actual reductions will be quantified and submitted to EPA in the annual Chlorine Minimization Report.

EPA is requiring, in the permit, that the permittee submit the results of hydrological modeling which shows how the EVAC concentrations dissipates over time in the receiving water. The permittee is also required to conduct whole effluent toxicity testing when EVAC is in use at the facility.

5.4 Essential Fish Habitat (EFH)

Under the 1996 Amendments (PL 104-297) to the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801 et seq. (1998)), EPA is required to consult with the National Marine Fisheries Service (NMFS) if EPA's actions, or proposed actions that EPA funds, permits, or undertakes, "may adversely impact any essential fish habitat." 16 U.S.C. § 1855(b). The Amendments broadly define essential fish habitat as, "... those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." 16 U.S.C. § 1802(10). Adverse effect means any impact which reduces the quality and/or quantity of EFH. 50 C.F.R. § 600.910(a). Adverse effects may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey, reduction in species' fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions. Id.

EFH is only designated for species for which federal Fishery Management Plans exist (16 U.S.C. § 1855(b)(1)(A)). EFH designations were approved for New England by the U.S. Department of Commerce on March 3, 1999.

As the federal agency charged with authorizing the discharge from this facility, EPA is in the process of consulting with the National Marine Fisheries Service (NMFS) under section 305 (b)(2) of the Magnuson-Stevens Act for essential fish habitat (EFH). This consultation will be completed before the permit is finalized.

5.5 Section 403(c) Evaluation

EPA has determined that Seabrook Station's outfall is seaward of the territorial sea baseline and, therefore, is subject to the requirements of Section 403(c) of the Clean Water Act. Pursuant to Section 403(c) of the CWA, EPA has assessed the facility's impact on the diversity, productivity, and stability of the ocean's ecosystem in the vicinity of the outfall. EPA has determined that the plant's discharge, as limited by the draft permit, should not cause unreasonable degradation of the marine environment. This determination was made in accordance with 40 CFR 125, Subpart M (Ocean discharge Criteria). The "CWA 403(c) Ocean Discharge Criteria Information Report for Seabrook Station" formed the basis of the determination and is included in the permit file at EPA's Region I office.

6 Biological Monitoring Program

Under section 316 of the Clean Water Act and the National Pollutant Discharge

Elimination System (NPDES), as well as the approved biological monitoring program, the Permittee is required to determine if any adverse environmental impacts are occurring due to station operations.

To accomplish this, a Biological Monitoring Program (BP) has been established. The purpose of the BP is to detect and evaluate the significance of water quality and biological impacts to the receiving water from Seabrook Station. A detailed description of the BP is beyond the scope of this document, however, it is comprehensively discussed in the Monitoring Program Document and the Standard Operating Procedures Document (MPDs). These documents are available and part of the permit file in the regional office of EPA.

The Biological Monitoring Program (BP), as approved in 1996, is an enforceable element of the permit, except as modified below:

1. Intertidal Monitoring will only be implemented if Seabrook Station decides to employ back flushing of the Cooling Water System to control macrofouling. Any such Intertidal Monitoring Program will begin at least one year prior to back flushing.

2. The Impingement Monitoring Program will be enhanced to include collecting two 24-hour impingement samples each week, the evaluation of screen wash efficiencies conducted using moribund fish, and a sampling protocol for high impingement events.

3. Ichthyoplankton Entrainment Sampling Program will allow greater understanding of diel variability in ichthyoplankton densities and will include more definitive day-night sampling (4 x 2-hour samplings/week: morning, day, evening, night), increased sample volume, and decreased net mesh size.

4. The previous reviews by EPA and NH DES and Fish & Game of the long-term studies of coastal New Hampshire have concluded that the kelp communities in the study area should not be adversely influenced by plant operation.

The draft permit sets forth a Contingency Plan to allow the Permitting Authority the opportunity to respond in a timely manner to new information and to implement, when necessary, improvements in the BP.

The primary objectives of the BP are:

1. Testing for Compliance with NPDES permit requirements (i.e., toxicity, chlorine, temperature, etc.);

2. Testing for significant biological impact related to the intake and discharge of

cooling water, and;

3. Establishing historical understanding of the variability of biological monitoring data in coastal New Hampshire and the Gulf of Maine system.

After examining 25 years of BP data, the EPA has determined that there are no significant water quality or biological impacts associated with the intake and discharge of cooling water from the facility.

The Contingency Plan identifies action that Seabrook Station may undertake when improvements to the BP are necessary. The Contingency Plan authorizes the annual evaluation of the BP and associated data, and, if necessary, requires recommendations for improvements to the BP and the development of a Management Plan. At a minimum, the BP and BP data are evaluated through the following:

1. An annual review of the environmental/biological sampling and analysis plan and data;

2. The identification of change in the aquatic or biological system;

3. The determination of statistically significant change;

4. The determination of biological importance;

5 The determination of the likelihood that Seabrook Station contributed to the change;

6. A review and analysis of BMP data variability and power analysis update; and,

7. The identification of improved sampling and/or analysis technologies, including, but not limited to: statistical methods, sampling equipment, and modeling technologies.

The Permitting Authority is responsible for overseeing the implementation of improvements to the BP by the permittee. With extensive interactions among water quality and ecological parameters it is normal to detect substantial natural variability in complex systems. The ability to establish relationships between station operations and statistically significant changes in the system is essential. In addition, a process for determining biological importance of statistically significant change is identified in the MPDs.

The actions defined by the Contingency Plan have these steps in mind and are implemented when appropriate. Indications of Contingency Plan implementation include, but are not limited to, exceedences of permit limits, observations divergent from baseline conditions, changes in population assemblages, changes in data variability, and non-

attainment of state and/or federal water quality criteria. Best professional judgement and environmental risk as well as population impact assessments tools will be employed in the evaluation of BP data.

The BP will undergo an annual review according to the following schedule:

1. Sept. 1: Permittee submits the results from the previous year's BP to the Permitting Authority;

2. Nov. 1:Permitting Authority submits comments and questions to the Permittee;

3. Dec. 1:Permittee schedules meeting to present data and review proposed BP for the following year;

4. Feb. 1:Improvements Reviewed and approved by the Permitting Authority;

5. Mar. 1:Permittee continues BP or implements improvements.

The Clean Water Act and the NPDES permit place the burden of proof on the Permittee to show that it is not contributing to any environmental problems. The BP requires the Permittee to determine whether any adverse environmental impacts are occurring due to its operation. If they are, then the Permittee must, in a timely manner, develop and implement a Management Plan, approved by the Permitting Authority, to prevent such impacts. A report on these efforts must be submitted to EPA and NH DES every thirty days until the issue has been resolved.

In many instances in the past 25 years of monitoring, changes in data variability have been observed in the absence of adverse impacts. This Plan authorizes implementation of improvements, approved by the Permitting Authority, to the BP when warranted. Acceptable changed may be indicated by results and analysis of BP data. Changes may also be considered based on acceptable data from other sources. Analysis of data from measured parameters such as temperature, delta T, and rates of impingement, and entrainment may indicate the need for monitoring program enhancements or improvements.

The Permitting Authority will require annual review of sampling data and protocols and evaluate the need for more frequent sampling. Additional sampling locations and any other justified analytical or biological program improvements may be authorized. This review will be conducted by the EPA. Only improvements to the BP will be considered.

The draft permit allows for BP improvements, when justified. Examples of BP improvements include, but are not limited to:

1 Additional sampling stations;

2. Increased sampling frequency;

3. Changes demonstrated to reduce data variability or increased analysis sensitivity;

4. Changes demonstrated to increase the power to detect statistical significance;

5. Collection of additional data demonstrated to more definitively determine the facility's impacts, and;

6. Additional predictive models such as species-specific population, community, and/or trophic level risk assessments.

7 State Certification Requirements

EPA may not issue a permit unless the State Water Pollution Control Agency with jurisdiction over the receiving water(s) either certifies that the effluent limitations and/or conditions contained in the permit are stringent enough to assure, among other things, that the discharge will not cause the receiving water to violate State's Surface Water Quality Regulations or waives its right to certify as set forth in 40 CFR §124.53.

Upon public noticing of the draft permit, EPA is formally requesting that the State's certifying authority make a written determination concerning certification. The State will be deemed to have waived its right to certify unless certification is received within 60 days of receipt of this request.

The New Hampshire Department of Environmental Services, Water Division, Wastewater Engineering Bureau, is the certifying authority. EPA has discussed this draft permit with the staff of the Wastewater Engineering Bureau and expects that the draft permit will be certified. Regulations governing state certification are set forth in 40 CFR §§124.53 and 124.55.

The State's certification should include the specific conditions necessary to assure compliance with applicable provisions of the Clean Water Act, Sections 208(e), 301, 302, 303, 306, 307, and with appropriate requirements of State law. In addition, the State should provide a statement of the extent to which each condition of the draft permit can be made less stringent without violating the requirements of State law. Since certification is provided prior to permit issuance, failure to provide this statement for any condition waives the right to certify or object to any less stringent condition which may be established by EPA during the permit issuance process following public notice as a result of information received during that noticing. If the State believes that any conditions more stringent than those contained in the draft permit are necessary to meet the requirements of either the CWA or State law, the State should include such conditions and, in each case, cite the CWA or State law reference upon which that condition is based. Failure to provide such a citation waives the right to certify as to that condition.

The sludge conditions implementing section 405(d) of the CWA are not subject to the 401 certification requirements.

Reviews and appeals of limitations and conditions attributable to State certification shall be made through the applicable procedures of the State and may not be made through the applicable procedures of 40 CFR Part 124.

8 Comment Period, Hearing Requests, and Procedures for Final Decisions.

All persons, including applicants, who believe any condition of the draft permit is inappropriate must raise all issues and submit all available arguments and all supporting material for their arguments in full by the close of the public comment period, to the U.S. EPA, Office of Ecosystem Protection, New Hampshire State Program Unit, 1 Congress Street, Suite 1100, Mail Code CNH, Boston, Massachusetts 02114-2023. Any person, prior to such date, may submit a request in writing for a public hearing to consider the draft permit to EPA and the State Agency. Such requests shall state the nature of the issues proposed to be raised in the hearing. A public hearing may be held after at least thirty (30) days public notice whenever the Regional Administrator finds that response to this notice indicates significant public interest. In reaching a final decision on the draft permit, the Regional Administrator will respond to all significant comments and make these responses available to the public at EPA's Boston office.

Following the close of the comment period, and after a public hearing, if such hearing is held, the Regional Administrator will issue a final permit decision and forward a copy of the final decision to the applicant and each person who has submitted written comments or requested notice. Within 30 days following the notice of the final permit decision, any interested person may submit a request for a formal evidentiary hearing to reconsider or contest the final decision. Requests for formal evidentiary hearings must satisfy the Requirements of 40 CFR §124.74. In general, the reader should reference 40 CFR 124--PROCEDURES FOR DECISION MAKING, Subparts A, D, E and F for specifics relative to this section.

9 EPA Contact

Additional information concerning the draft permit may be obtained between the hours of 9:00 A.M. and 5:00 P.M. (8:00 A.M. and 4:00 P.M. for the state), Monday through Friday, excluding holidays from:

Mr. Damien Houlihan, Environmental Engineer
U.S. Environmental Protection Agency
Office of Ecosystem Protection
New Hampshire State Program Unit, Mail Code CNH
1 Congress Street, Suite 1100
Boston, Massachusetts 02114-2023
Telephone: (617) 918-1586
FAX No.: (617) 918-1505

11-28-01
Date:

Linda M. Murphy, Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency

ATTACHMENT A
FACT SHEET, NH0020338

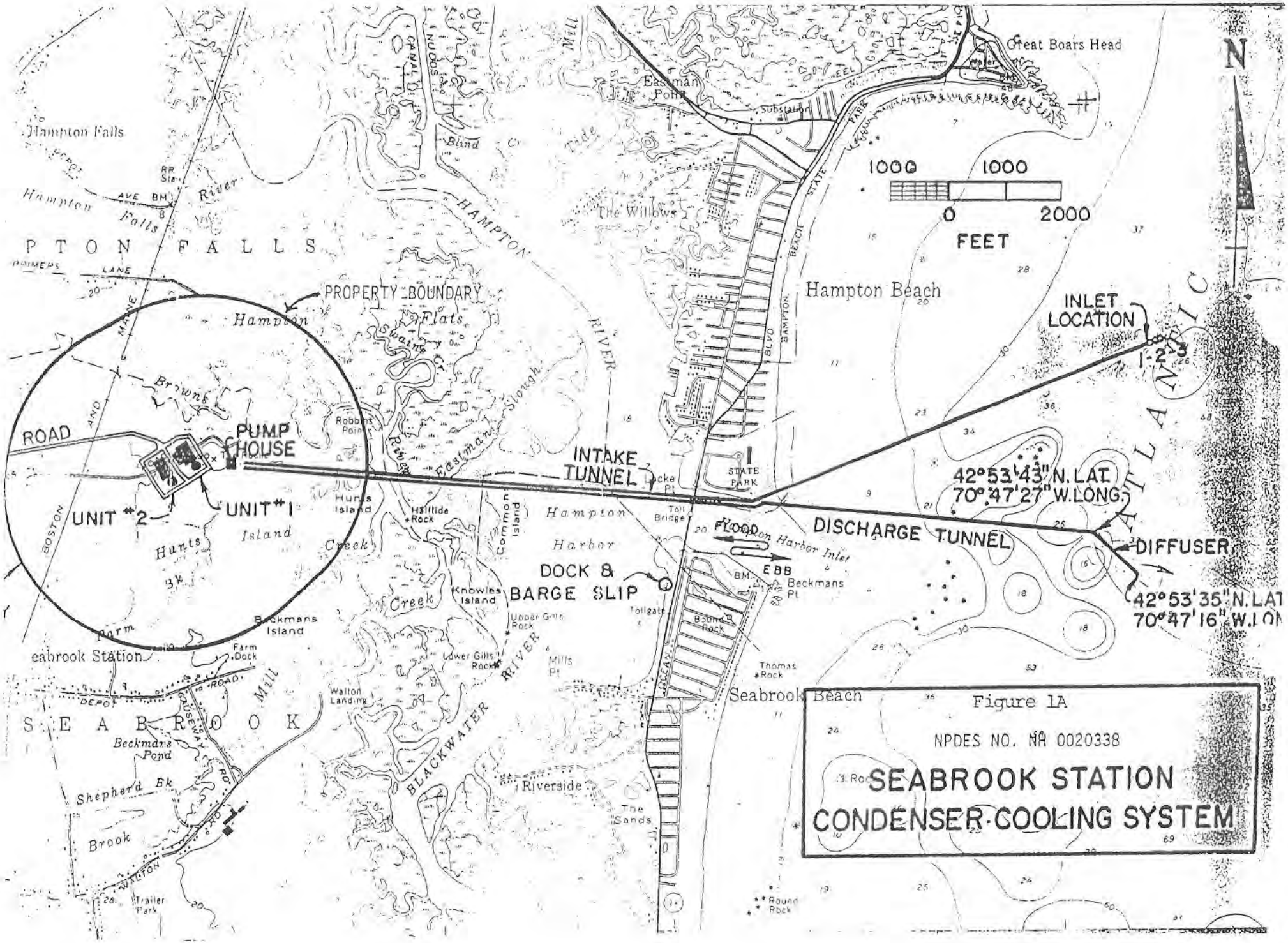
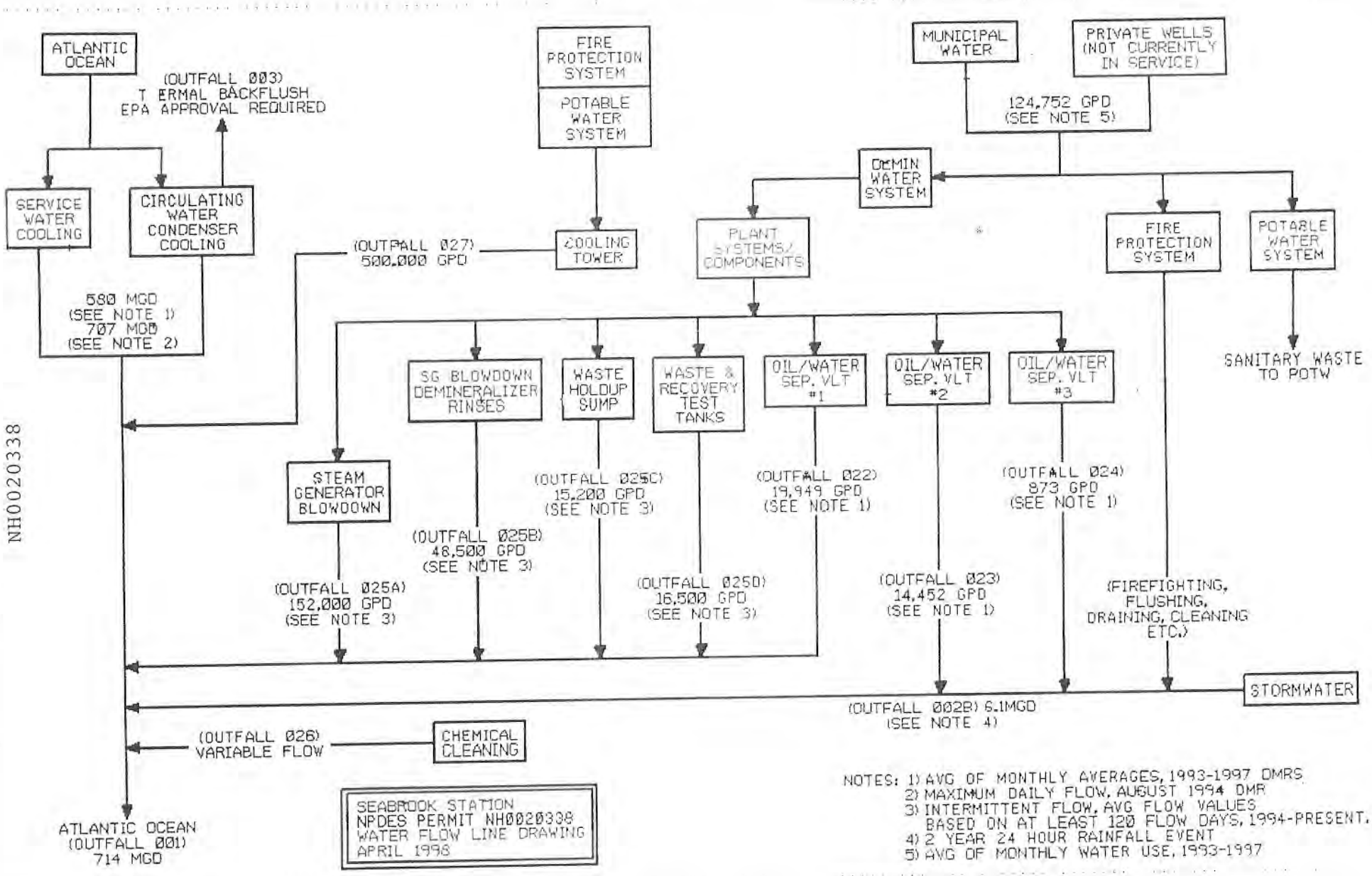

Great Boars Head
Eastman Point
Hampton Falls
Hampton River
HAMPTON
The Willows
1000 1000
0 2000
FEET
N
PROPERTY BOUNDARY
Hampton Flats
Swains Cr
Hampton Beach
INLET LOCATION
1-2-3
ROAD
PUMP HOUSE
INTAKE TUNNEL
STATE PARK
42°53'43" N. LAT.
70°47'27" W. LONG.
UNIT #2
UNIT #1
Hunts Island
Hampton Harbor
Toll Bridge
DISCHARGE TUNNEL
DIFFUSER
Flood
Ebb
DOCK & BARGE SLIP
Beckmans Pt
Knowles Island
Tollgate
Beckmans Island
Farm Dock
Upper Gills Rock
Lower Gills Rock
Mills Pt
Thomas Rock
Seabrook Beach
Walton Landing
BLACKWATER RIVER
Riverside
The Sands
Round Rock
Beckmans Pond
Shepherd Brk
Brook
Trailer Park
Figure 1A
NPDES NO. NH 0020338
SEABROOK STATION
CONDENSER COOLING SYSTEM

FIGURE 2A
NH0020338



Seabrook Station System Flow Diagram

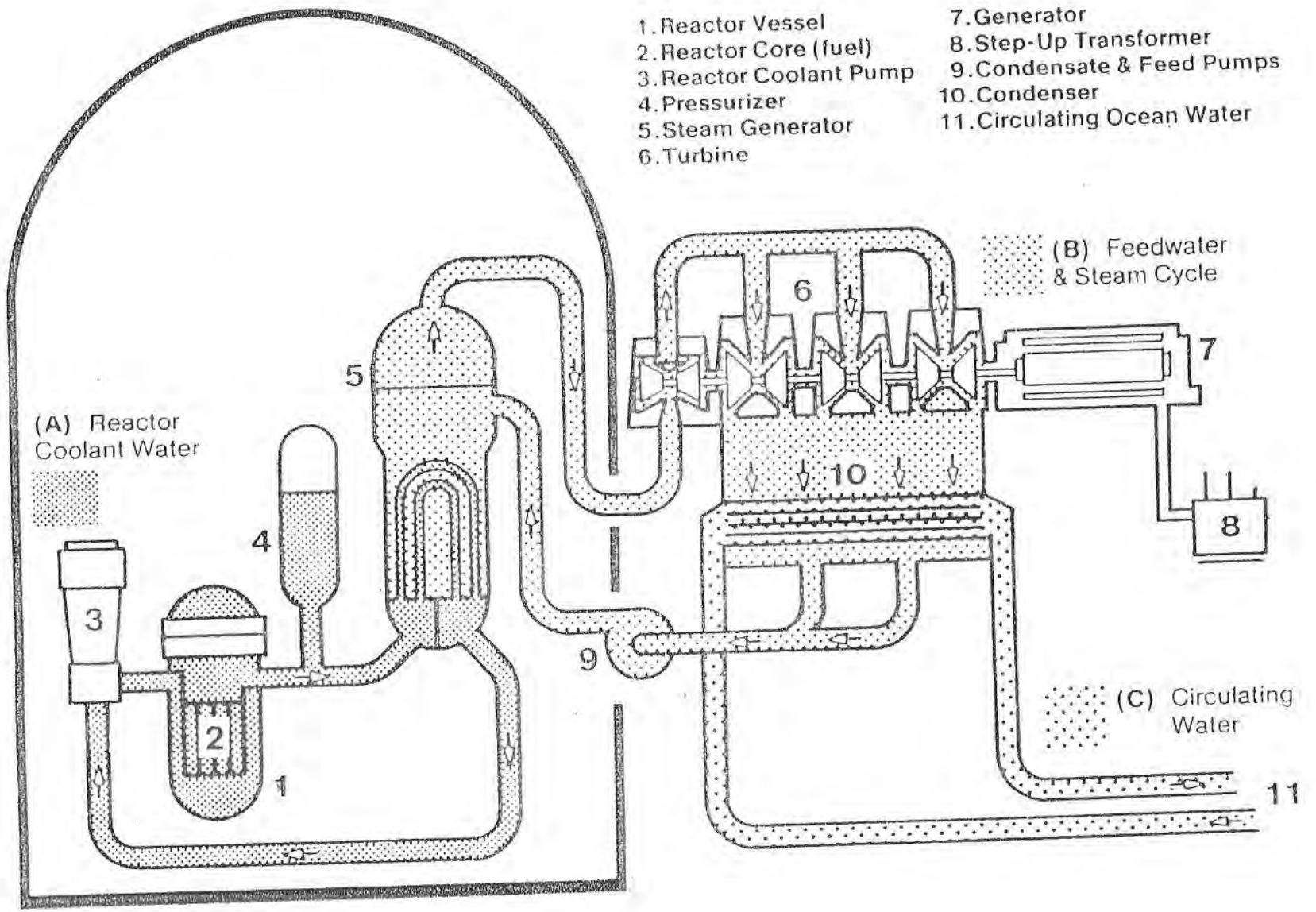


FIGURE 3A
NH0020338

ATTACHMENT B
NORTH ATLANTIC ENERGY CORPORATION
NH0020338
CONCENTRATIONS OF EFFLUENT CHARACTERISTICS

The following effluent characteristics were derived from analysis of discharge-monitoring data collected at the facility during the 25-month period March 1999 through March 2001. All these data were extracted from the monthly Discharge Monitoring Reports submitted by the Seabrook Nuclear Facility. These effluent values characterize cooling water and other industrial wastewater discharged from this facility.

OUTFALL 001:

Effluent Characteristic	Average of Average Monthly	Maximum of Maximum Daily[1]		
Flow (MGD)	570	688	688	686
pH (Standard Units)[2]	N/A	7.6	-	8.1
Total Residual Oxidants (TRO), mg/l	0.03	0.34	0.17	0.16
Delta T (ΔT) °F[3]	33	40	40	39

[1]More than one number represents the second and third highest values, except for pH (minimum and maximum values)
[2]Numbers listed are minimum and maximum daily readings.
[3]Delta T is the temperature difference, in degrees Farenheight, between the intake temperature (ocean water) and the facility's heated effluent discharge.

OUTFALL 002B, STORM WATER

Effluent Characteristic	Average of Maximum	Maximum [1]		
Flow (MGD)	0.86	1.56	1.48	0.846
pH (Standard Units)[2]	N/A	7.3	-	8.2
Total Suspended Solids, mg/l	6.6	26.2	6.5	4.8
Oil and Grease, mg/l	0	0	0	0

[1]More than one number represents the second and third highest values.
[2]Numbers listed are minimum and maximum daily readings.

OCEAN TEMPERATURE RISE, AMBIENT: **Insert 1990 - 2000 Data Figure 2.1?**

Month	Reactor Power Level	ΔT °F[1]
Jan. '99		
Jan '00	88.6	2.79
Feb '99		
Feb '00	99.9	3.61
Mar '99		
Mar '00	100	2.56
Apr '99		
Apr '00	100	1.48
May '99		
May '00	100	1.24
Jun '99		
Jun '00	89.2	-0.02
Jul '99		
Jul '00	100	-0.41
Aug '99		
Aug '00	100	-0.57
Sep '99		
Sep '00	100	1.04
Oct '99		
Oct '00	59.3	1.75
Nov '99		
Nov '00	0	0.12
Dec '99		
Dec '00	0	0.23

[1] ΔT is the monthly mean ambient ocean water temperature difference between Reference Station T7 and Monitoring Station DS. Note that a negative value indicates that Monitoring Station DS was cooler than Reference Station T7.

OUTFALL 022 - INTERNAL, OIL/WATER SEPARATOR VAULT #1

Effluent Characteristic	Average of Average Monthly	Maximum of Maximum Daily[1]		
Flow (GPD)	16116	32700	29000	28700
TSS, (mg/l)	1.04	30.6	11.2	4.9
Oil and Grease, (mg/l)	0.18[2]	7.8	5.5	5.0

[1]More than one number represents the second and third highest values
[2]22 out of 25 monthly readings were reported as zero.

OUTFALL 023 - INTERNAL, OIL/WATER SEPARATOR VAULT #2

Effluent Characteristic	Average of Average Monthly	Maximum of Maximum Daily[1]		
Flow (GPD)	2568	14700	14100	10400
TSS, (mg/l)	1.5	11.8	8.0	6.8
Oil and Grease, (mg/l)	0.21[2]	11.2	6.4	---

[1]More than one number represents the second and third highest values
[2]23 out of 25 monthly readings were reported as zero.

OUTFALL 024 - INTERNAL, OIL/WATER SEPARATOR VAULT #3

Effluent Characteristic	Average of Average Monthly	Maximum of Maximum Daily[1]		
Flow (GPD)	3210	239000	228000	30600
TSS, (mg/l)	4.5	20.3	17.5	11.7
Oil and Grease, (mg/l)	0.63[2]	31.9	16.9	7.3

[1]More than one number represents the second and third highest values
[2]20 out of 25 monthly readings were reported as zero.

OUTFALL 025 - INTERNAL, LIQUID WASTE DISTILLATE AND STEAM GENERATOR BLOWDOWN AND RECOVERY GENERATOR SUMP

Effluent Characteristic	Average of Average Monthly	Maximum of Maximum Daily[1]		
Flow (GPD)	60480	289000	289000	239000
TSS, (mg/l)	1.05	24.2	13.8	13.0
Oil and Grease, (mg/l)	0.04[2]	7.3	6.9	3.7

[1]More than one number represents the second and third highest values
[2]22 out of 25 monthly readings were reported as zero.

OUTFALL 026 - INTERNAL, CHEMICAL CLEANING WASTE

NO DISCHARGE

Effluent Characteristic	Average of Average Monthly	Maximum of Maximum Daily		
Flow (GPD)	0	0	0	0
TSS, (mg/l)	N/A	-	-	-
Oil and Grease, (mg/l)	N/A	-	-	-
pH	N/A	-	-	-
Copper	N/A	-	-	-
Iron	N/A	-	-	-

OUTFALL 027 - INTERNAL, COOLING TOWER BLOWDOWN

Effluent Characteristic	Average of Average Monthly	Maximum of Maximum Daily[1]		
Flow (GPD)	63,825	102,000	100,000	75,700
pH	N/A	8.4	--	8.2
Free Available Chlorine, mg/l	0	0	0	0

[1]More than one number represents the second and third highest values
[2]Numbers listed are minimum and maximum daily readings.

ATTACHMENT C
NH0020388
CHEMICAL USE

BULK CHEMICALS

CHEMICAL NAME	CHEMICAL FORMULA	LIMIT at 001 in mg/L	INTERNAL OUTFALL	INTERNAL CONCENTRATION	DISCHARGE FREQUENCY	TOTAL YEARLY DISCHARGE (Lbs)
Total Residual Chlorine	OCl-	See section I.A.11.a				41300
			2	< 0.18	Batch(Q)	negligible
			22	<0.18	Batch(M)	negligible
			23	< 0.18	Batch(M)	negligible
			24	<0.18	Batch(M)	negligible
			25C	< 0.18	Batch(M)	negligible
			27		Batch(Y)	10
Ammonia	NH4OH	0.5				
			2	<1 mg/l	Cont.	~2
			22	<2 mg/l	Cont.	5368
			23	<1 mg/l	Cont.	~200
			25A	~1 mg/l	Batch(M)	55.1
			25B	<.1 mg/l	Batch(M)	~2
			25C	1146 mg/l	Batch(2/M)	398.8
			25D	<.1 mg/l	Batch(3/W)	~1
CIL	Na2SiO3	5				
			27	5-7 mg/l	Batch(M)	10
Boric Acid	H3BO3	5.0 (as boron)				
			25D	<1500 mg/l	Batch(3/W)	5201
			25A	<10 ppm	Infrequent	
Hypersperse	Proprietary	0.02				
			WT Reject	0.02 mg/l	Batch(W)	363
Ethanolamine (ETA)	C2H7NO	0.5				
			2	< 0.01 mg/l	Cont.	negligible
			22	~0.1 mg/l	Cont.	negligible
			23	~0.01 mg/l	Cont.	negligible
			25A	2 mg/l	Batch(2/M)	110
			25B	<0.01 mg/l	Batch(M)	negligible
			25C	~400 mg/l	Batch(2/M)	1868
			25D	<0.01 mg/l	Batch(3/W)	negligible
Ethylene Glycol	C2H6O2	50				
			2	N/A	Accidental	negligible
			22	N/A	Accidental	negligible
			23	N/A	Accidental	negligible

			25D	N/A	Accidental	negligible
Hydrazine	N2H4	0.5				
			2	5 mg/l	Batch	negligible
			2	<0.05 mg/l	Cont.	negligible
			22	~0.1 mg/l	Cont.	negligible
			23	~0.1mg/l	Cont.	negligible
			25A	<0.05 mg/l	Batch(2/M)	1.87
			25B	<0.05 mg/l	Batch(M)	negligible
			25C	5-100 mg/l	Batch(2/M)	48.1
			25D	<0.05 mg/l	Batch(3/W)	negligible
Methoxypropylamine (MPA)	C4H11NO	0.5, 5				
			2	<0.05 mg/l	Cont.	negligible
			22	<1 mg/l	Cont.	negligible
			23	<0.01 mg/l	Cont.	negligible
			25A	~ 5 mg/l	Batch(2/M)	163
			25B	<0.01 mg/l	Batch(M)	negligible
			25C	~1500 mg/l	Batch(2/M)	2774
			25D	<0.05 mg/l	Batch(3/W)	negligible
Sodium Hydroxide	NaOH	pH, See I.A.11.a				
			25C	see comment sheet	Batch(2/M)	6255
Sulfuric Acid	H2SO4	pH, See I.A.11.a				
			25C	see comment Sheet	Batch(2/M)	14572
Nalcolyte	Proprietary	0.1 mg/l				
			25D	~0.11 mg/l	Batch(3/W)	15.2
Muriatic Acid	HCl	pH, See I.A.11.a				
			WT Reject	12 mg/l	Batch(W)	202
DC-13 (Floor Cleaner)	NonylPhenyl -Ethoxylate(15%)	0.1				
			022	2.1 mg/l	cont.	95.4
EVAC (as proposed)	C26H49NO4	3 mg/l	001	4-5 mg/l	Semi-Annual/24 hrs	2.50E+004
BetzDearborn DA6801	poly acrylic acid and ethanolamine	0.007ppb	001	1-10 ppb	Continuous	
Dynacool 1385 (Thruguard 300)	proprietary phosphonate	0.05	001	~20 mg/l (chlorination)	Continuous	18,000

Bulk Chemicals Used in the past but Currently not in Use

Morpholine	C4H9NO	0.1	025D	<0.1	<1
Bulab 6002		0.1	001	<0.1	~20
Bulab 9328		0.1	001	<0.1	~21
Cat Floc L		0.1	25D	<0.1	~20
Cat Floc TL		0.1	25D	<0.1	~20

Bulk Chemicals Proposed for Future Use

CHEMICAL NAME	CHEMICAL FORMULA	LIMIT at 001 in mg/L	OUTFALL	INTERNAL CONCENTRATION	FREQUENCY OF DISCHARGE	TOTAL YEARLY DISCHARGE
1,2-Diamino ethane(or ethylene diamine)	C2H8N2	5 5	025A 025D	1-10 mg/l 1000-5000 mg/l		3000-5000
1,2-diaminoethane 3-Hydroxyquinuclide	C11H24N3	5 5	025A 025D	1-10 mg/l 1000-5000 mg/l		4100
2-Amino, 2-methylpropanol	C4H11NO	5 5	025A 025D	1-10 mg/l 1000-5000 mg/l		3000
2-METHYL-2-AMINO-1-PROPANE	C4H11N	5 5	025A 025D	1-10 mg/l 1000-5000 mg/l		3000-5000
2,2'-Dipyridyl	C10H8N2	5 5	025A 025D	1-10 mg/l 1000-5000 mg/l		3000-5000
2,9-Dimethyl-1,10-Phenanthroline	C14H12N2	5 5	025A 025D	1-10 mg/l 1000-5000 mg/l		3000-5000
4,4'-Dipyridyl	C10H8N2	5 5	025A 025D	1-10 mg/l 1000-5000 mg/l		3000-5000
4,7-Dimethyl-1,10-phenanthroline	C14H12N2	5 5	025A 025D	1-10 mg/l 1000-5000 mg/l		3000-5000
5-AMINOPENTANOL	C5H13NO	5 5	025A 025D	1-10 mg/l 1000-5000 mg/l		3361
Terpyridine	C10H8N2	5 5	025A 025D	1-10 mg/l 1000-5000 mg/l		3000-5000
Pyrolidine	C4H9N	5 5	025A 025D	1-10 mg/l 1000-5000 mg/l		2350
Pyrolidone	C4H7NO	5 5	025A 025D	1-10 mg/l 1000-5000 mg/l		3000-5000

Carbohydrazide	CH6N4O	5	025A	50-500 mg/l	200
Sulfuric Acid (note already in use at outfall 025C)	H2SO4	pH	001		~16000
Sodium Hydroxide (note already in use at outfall 25C)	NaOH	pH	001		~32000

PROCESS CHEMICALS

CHEMICAL NAME	CHEMICAL FORMULA	PROPOSED LIMIT at 001	OUTFALL	INTERNAL CONCENTRATION	FREQUENCY OF DISCHARGE	TOTAL USE LBS/YR
Diisopropylamine	C6H15N	0.5	025D 025C 022 023	0.2mg/l 1.5 mg/l 1.1 mg/l 0.89 mg/l	Batch(3/W) ^Batch(2/M) CONT CONT	32 6.3 43.7
Molybdate-3 Reagent	Mo12Na3O40P	0.5	WT Reject 025C	0.26 mg/l 1 mg/l	CONT CONT	4.3 4.3
Citric Acid	C6H8O7		WT Reject 025C 002	0.25 mg/l 0.98 mg/l N/A	CONT CONT N/A	4.2 4.2
Silica Standard		0.5	023 025C	<<1 mg/l <<1 mg/l		
Amino Acid F Reagent(sum of two part reagent)		0.5	023 025C	0.93 mg/l 1.63 mg/l		
Lithium Hydroxide	LiOH-(H2O)	0.5 (as Li)	025D	0.18 (as Li)	Batch(3/W)	44.8 (as LiOH-H2O)
Hydrogen Peroxide	H2O2	0.5	025D	0.08 mg/l	1/18months	10.6
Lysol	isopropyl alcohol o-benzyl,p-chlorophenol(10%) o-phenyl phenol(10%)	0.1	022	0.15 mg/l	Cont	6.7
Lestoil	Stoddard solvent Pine Oil sodium Hydroxide	0.1	022	1.9 mg/l	Cont	85.9

	Tall oil Fatty Acid, sodium salt					
Aqueous Fire Fighting Foam(AFFF)			002	N/A		
Caustic Soda	Na2CO3		002 025C	N/A		
Syntech Touch-it-up Spray	(2-butoxy ethanol(1%), octylphenyl polyethoxylate(1%) trisodium phosphate(1%), sodium meta silicate(1%))	0.1	025C 025D	1.25 mg/l 0.33 mg/l	batch batch	50

CHEMICAL NAME	CHEMICAL FORMULA	CONCENTRATI in 025D (MG/L)	CONCENTRATION in 001 (MG/L)	LIMIT 001	OUTFALL	DISCHARGE FREQUENCY	TOTAL LBS/YR
1-AMINO-2-NAPTHOL-4-SULFONIC ACID	C10NSO4H9	0.131393065802	8.92616E-006	0.1	025D	Batch (3/W)	2.907E-002
Acetate Standards (1000ppm)	C2H3O2	0.119448241638	8.11469E-006	0.1	025D		2.643E-002
Acetate Standards (100ppb)	C2H3O2	0.000007166894	4.86881E-010	0.1	025D		1.586E-006
Acetate Standards (100ppm)	C2H3O2	0.011944824164	8.11469E-007	0.1	025D		2.643E-003
Acetate Standards (10ppb)	C2H3O2	0.000000716689	4.86881E-011	0.1	025D		1.586E-007
Acetate Standards (10ppm)	C2H3O2	0.001194482416	8.11469E-008	0.1	025D		2.643E-004
Acetate Standards (25ppb)	C2H3O2	0.000001791724	1.21720E-010	0.1	025D		3.965E-007
Acetate Standards (25ppm)	C2H3O2	0.002986206041	2.02867E-007	0.1	025D		6.608E-004
Acetate Standards (50ppb)	C2H3O2	3.58345E-006	2.43441E-010	0.1	025D		7.930E-007
Aluminum Standards (100ppb)	AL	0.000007166894	4.86881E-010	0.1	025D		1.586E-006
Aluminum Standards (10ppb)	AL	0.000000716689	4.86881E-011	0.1	025D		1.586E-007
Aluminum Standards (10ppm)	AL	0.001194482416	8.11469E-008	0.1	025D		2.643E-004
Aluminum Standards (1ppm)	AL	0.000119448242	8.11469E-009	0.1	025D		2.643E-005
Aluminum Standards (50ppb)	AL	0.000003583447	2.43441E-010	0.1	025D		7.930E-007
Ammonia Standards (1.02ppm)	NH3	0.000121837206	8.27698E-009	0.1	025D		2.696E-005
Ammonia Standards (1.7ppm)	NH3	0.000203062011	1.37950E-008	0.1	025D		4.493E-005
Ammonia Standards (1020ppm)	NH3	0.121837206471	8.27698E-006	0.1	025D		2.696E-002
Ammonia Standards (1700ppm)	NH3	0.203062010785	1.37950E-005	0.1	025D		4.493E-002
Ammonia Standards (2.38ppm)	NH3	0.000284286815	1.93130E-008	0.1	025D		6.291E-005
Ammonia Standards (340ppb)	NH3	0.000040612402	2.75899E-009	0.1	025D		8.987E-006
Boron Standard (1ppm)	H3BO3	0.000238896483	1.62294E-008	0.1	025D		5.286E-005
Boron Standard (2ppm)	H3BO3	0.000477792967	3.24588E-008	0.1	025D		1.057E-004
Boron Standard (4ppm)	H3BO3	0.000014333789	9.73763E-010	0.1	025D		3.172E-006
Calcium Standards (100ppb)	Ca	0.000007166894	4.86881E-010	0.1	025D		1.586E-006
Calcium Standards (10ppb)	Ca	0.000000716689	4.86881E-011	0.1	025D		1.586E-007
Calcium Standards (10ppm)	Ca	0.001194482416	8.11469E-008	0.1	025D		2.643E-004
Calcium Standards (1ppm)	Ca	0.000119448242	8.11469E-009	0.1	025D		2.643E-005
Calcium Standards (50ppb)	Ca	0.000003583447	2.43441E-010	0.1	025D		7.930E-007
Chloride Standards (1000ppm)	Cl	0.119448241638	8.11469E-006	0.1	025D		2.643E-002
Chloride Standards (100ppb)	Cl	0.00000477793	3.24588E-010	0.1	025D		1.057E-006
Chloride Standards (100ppm)	Cl	0.011944824164	8.11469E-007	0.1	025D		2.643E-003
Chloride Standards (10ppb)	Cl	0.000000716689	4.86881E-011	0.1	025D		1.586E-007
Chloride Standards (1ppb)	Cl	0.000000597241	4.05735E-011	0.1	025D		1.322E-007
Chloride Standards (1ppm)	Cl	0.000119448242	8.11469E-009	0.1	025D		2.643E-005

Chloride Standards (2.5ppb)	Cl	0.000000179172	1.21720E-011	0.1 025D	3.965E-008
Chloride Standards (20ppb)	Cl	0.000000955586	6.49175E-011	0.1 025D	2.115E-007
Chloride Standards (25ppb)	Cl	0.000001194482	8.11469E-011	0.1 025D	2.643E-007
Chloride Standards (3ppb)	Cl	0.000000215007	1.46064E-011	0.1 025D	4.758E-008
Chloride Standards (3ppm)	Cl	0.000358344725	2.43441E-008	0.1 025D	7.930E-005
Chloride Standards (50ppb)	Cl	0.000002388965	1.62294E-010	0.1 025D	5.286E-007
Chloride Standards (5ppb)	Cl	0.000000358345	2.43441E-011	0.1 025D	7.930E-008
Chloride Standards (6ppb)	Cl	0.000000430014	2.92129E-011	0.1 025D	9.515E-008
Chloride Standards (0.5ppb)	Cl	0.000000035834	2.43441E-012	0.1 025D	7.930E-009
Coagulant solution (1%)		0.053751708737	3.65161E-006	0.1 025D	1.189E-002
Copper Standards (10ppm)	Cu	0.001194482416	8.11469E-008	0.1 025D	2.643E-004
Copper Standards (1ppm)	Cu	0.000119448242	8.11469E-009	0.1 025D	2.643E-005
Copper Standards (2ppm)	Cu	0.000238896483	1.62294E-008	0.1 025D	5.286E-005
Copper Standards (3ppm)	Cu	0.000358344725	2.43441E-008	0.1 025D	7.930E-005
Copper Standards (5ppm)	Cu	0.000597241208	4.05735E-008	0.1 025D	1.322E-004
Disodium EDTA (pH 10 Buf.)(<10,000ppm)	Na2C10N2O8	2.388964832769	1.62294E-004	0.1 025D	5.286E-001
Disodium EDTA (pH 10 Buf.)(<10,000ppm)	Na2C10N2O8	3.583447249154	2.43441E-004	0.1 025D	7.930E-001
Disodium EDTA (pH 10 Buf.)(<10,000ppm)	Na2C10N2O8	0.597241208192	4.05735E-005	0.1 025D	1.322E-001
Ethanolamine Standards (1.0ppm)	C2NOH7	0.000597241208	4.05735E-008	0.1 025D	1.322E-004
Ethanolamine Standards (1.2ppm)	C2NOH8	0.000086002734	5.84258E-009	0.1 025D	1.903E-005
Ethanolamine Standards (1000ppm)	C2NOH9	0.119448241638	8.11469E-006	0.1 025D	2.643E-002
Ethanolamine Standards (200ppb)	C2NOH10	0.000014333789	9.73763E-010	0.1 025D	3.172E-006
Ethanolamine Standards (3ppm)	C2NOH11	0.000215006835	1.46064E-008	0.1 025D	4.758E-005
Ethanolamine Standards (500ppb)	C2NOH12	0.000035834472	2.43441E-009	0.1 025D	7.930E-006
Fluoride Standards (1000ppm)	F	0.119448241638	8.11469E-006	0.1 025D	2.643E-002
Fluoride Standards (100ppb)	F	0.00000477793	3.24588E-010	0.1 025D	1.057E-006
Fluoride Standards (100ppm)	F	0.011944824164	8.11469E-007	0.1 025D	2.643E-003
Fluoride Standards (10ppb)	F	0.000001194482	8.11469E-011	0.1 025D	2.643E-007
Fluoride Standards (1ppm)	F	0.000119448242	8.11469E-009	0.1 025D	2.643E-005
Fluoride Standards (2.5ppb)	F	0.000001791724	1.21720E-010	0.1 025D	3.965E-007
Fluoride Standards (20ppb)	F	0.000014333789	9.73763E-010	0.1 025D	3.172E-006
Fluoride Standards (25ppb)	F	0.000017917236	1.21720E-009	0.1 025D	3.965E-006
Fluoride Standards (2ppb)	F	0.000000095559	6.49175E-012	0.1 025D	2.115E-008
Fluoride Standards (30ppb)	F	0.000021500683	1.46064E-009	0.1 025D	4.758E-006
Fluoride Standards (3ppb)	F	0.000001791724	1.21720E-010	0.1 025D	3.965E-007
Fluoride Standards (3ppm)	F	0.000358344725	2.43441E-008	0.1 025D	7.930E-005
Fluoride Standards (50ppb)	F	0.000002388965	1.62294E-010	0.1 025D	5.286E-007
Fluoride Standards (5ppb)	F	0.000000238896	1.62294E-011	0.1 025D	5.286E-008

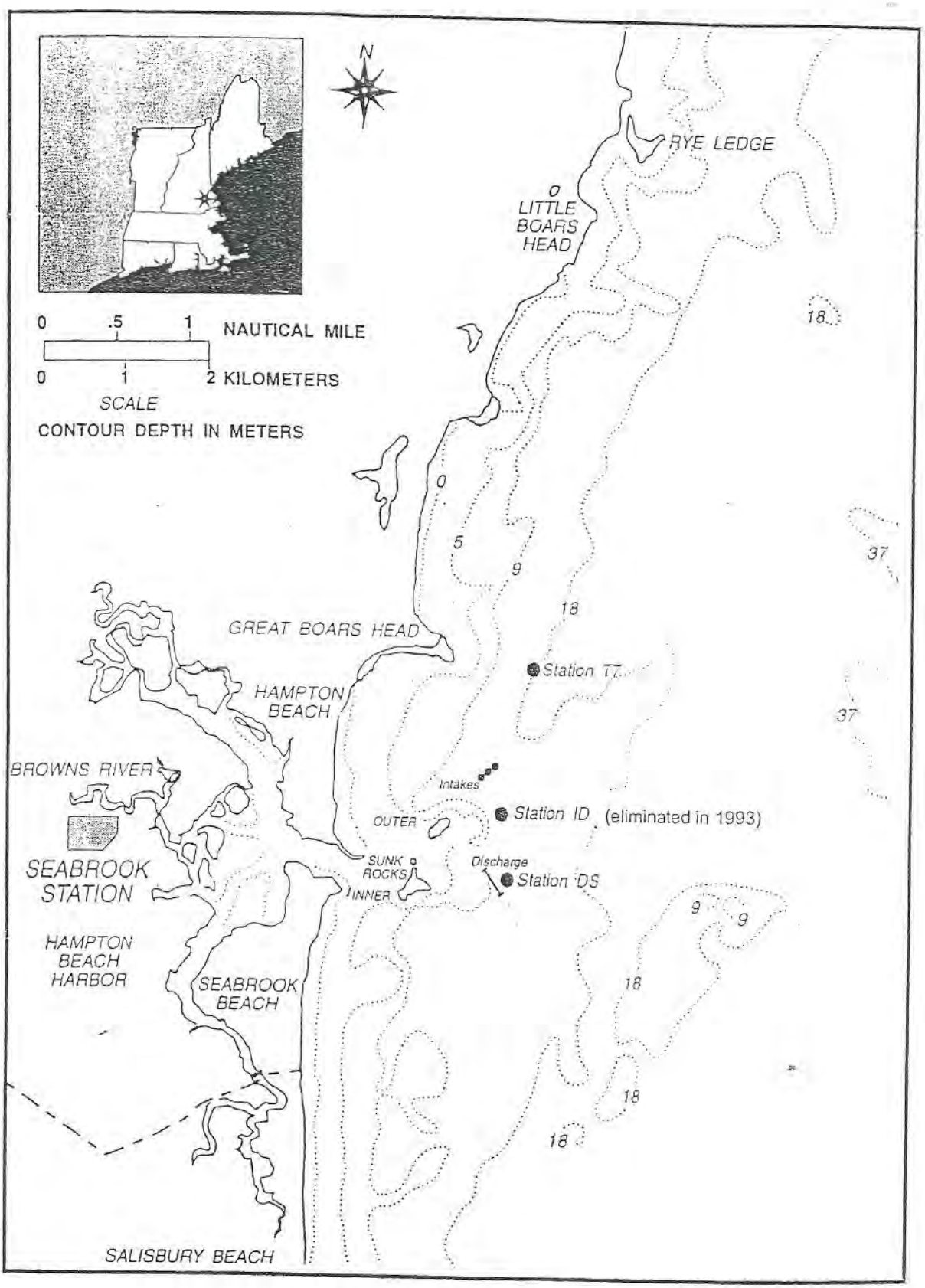
Fluoride Standards (6ppb)	F	0.000000286676	1.94753E-011	0.1 025D	6.344E-008
ormaldehyde (Formazin Turb.)(<10,000pp	CH2O	1.194482416385	8.11469E-005	0.1 025D	2.643E-001
Formaldehyde (pH 4 Buffer) (<10,000ppm)	CH2O	3.583447249154	2.43441E-004	0.1 025D	7.930E-001
Formaldehyde (pH 4 Buffer) (<10,000ppm)	CH2O	0.597241208192	4.05735E-005	0.1 025D	1.322E-001
Formate Standards (1000ppm)	CH2O2	0.119448241638	8.11469E-006	0.1 025D	2.643E-002
Formate Standards (100ppb)	CH2O2	0.000007166894	4.86881E-010	0.1 025D	1.586E-006
Formate Standards (100ppm)	CH2O2	0.011944824164	8.11469E-007	0.1 025D	2.643E-003
Formate Standards (10ppb)	CH2O2	0.000000716689	4.86881E-011	0.1 025D	1.586E-007
Formate Standards (10ppm)	CH2O2	0.001194482416	8.11469E-008	0.1 025D	2.643E-004
Formate Standards (25ppb)	CH2O2	0.000001791724	1.21720E-010	0.1 025D	3.965E-007
Formate Standards (25ppm)	CH2O2	0.002986206041	2.02867E-007	0.1 025D	6.608E-004
Formate Standards (50ppb)	CH2O2	0.000003583447	2.43441E-010	0.1 025D	7.930E-007
Glycolate Standards (1000ppm)	C2H4O3	0.119448241638	8.11469E-006	0.1 025D	2.643E-002
Glycolate Standards (100ppb)	C2H4O3	0.000007166894	4.86881E-010	0.1 025D	1.586E-006
Glycolate Standards (100ppm)	C2H4O3	0.011944824164	8.11469E-007	0.1 025D	2.643E-003
Glycolate Standards (10ppb)	C2H4O3	0.000000716689	4.86881E-011	0.1 025D	1.586E-007
Glycolate Standards (10ppm)	C2H4O3	0.001194482416	8.11469E-008	0.1 025D	2.643E-004
Glycolate Standards (25ppb)	C2H4O3	0.000001791724	1.21720E-010	0.1 025D	3.965E-007
Glycolate Standards (25ppm)	C2H4O3	0.002986206041	2.02867E-007	0.1 025D	6.608E-004
Glycolate Standards (50ppb)	C2H4O3	0.000003583447	2.43441E-010	0.1 025D	7.930E-007
amethylenetetramine(Form Turb)(<10,000p	C6H20N4	1.194482416385	8.11469E-005	0.1 025D	2.643E-001
Hydrazine Dihydrochloride (1000ppm)	N2H6Cl	0.005972412082	4.05735E-007	0.1 025D	1.322E-003
Hydrazine Dihydrochloride (1ppm)	N2H6Cl	0.000005972412	4.05735E-010	0.1 025D	1.322E-006
Hydrazine Dihydrochloride (20ppb)	N2H6Cl	0.000002388965	1.62294E-010	0.1 025D	5.286E-007
Hydrazine Dihydrochloride (80ppb)	N2H6Cl	0.000000477793	3.24588E-011	0.1 025D	1.057E-007
Hydrazine Dihydrochloride (80ppm)	N2H6Cl	0.000477792967	3.24588E-008	0.1 025D	1.057E-004
Hydrochloric Acid (.032M)	HCl	0	0.00000E+000	025D	0.000E+000
Hydrochloric Acid (.048M)	HCl	0	0.00000E+000	025D	0.000E+000
Hydrochloric Acid (6.05M)	HCl	0	0.00000E+000	025D	0.000E+000
Hydrochloric Acid (1.121M)	HCl	0	0.00000E+000	025D	0.000E+000
Hydrochloric Acid (12.1M)	HCl	0	0.00000E+000	025D	0.000E+000
Hydrochloric Acid (12.1M)	HCl	0	0.00000E+000	025D	0.000E+000
Hydrochloric Acid (12.1M)	HCl	0	0.00000E+000	025D	0.000E+000
Iron Standards (.5ppm)	Fe	0.000059724121	4.05735E-009	0.1 025D	1.322E-005
Iron Standards (10ppm)	Fe	0.001194482416	8.11469E-008	0.1 025D	2.643E-004
Iron Standards (1ppm)	Fe	0.000119448242	8.11469E-009	0.1 025D	2.643E-005
Iron Standards (2ppm)	Fe	0.000238896483	1.62294E-008	0.1 025D	5.286E-005

Iron Standards (3ppm)	Fe	0.000358344725	2.43441E-008	0.1 025D	7.930E-005
Iron Standards (5ppm)	Fe	0.000597241208	4.05735E-008	0.1 025D	1.322E-004
Isopropyl Alcohol	C3H8O	1.791723624577	1.21720E-004	0.1 025D	3.965E-001
Isopropyl Alcohol	C3H8O	0.023889648328	1.62294E-006	0.1 025D	5.286E-003
Isopropyl Alcohol	C3H8O	0.143337889966	9.73763E-006	0.1 025D	3.172E-002
Lithium Standards (1ppm)	Li	0.000119448242	8.11469E-009	0.1 025D	2.643E-005
Lithium Standards (2.5ppm)	Li	0.000298620604	2.02867E-008	0.1 025D	6.608E-005
Lithium Standards (3.5ppm)	Li	0.000418068846	2.84014E-008	0.1 025D	9.251E-005
Lithium Standards (3ppm)	Li	0.000358344725	2.43441E-008	0.1 025D	7.930E-005
Lithium Standards (4ppm)	Li	0.000477792967	3.24588E-008	0.1 025D	1.057E-004
Liquinox Soap(99% water)	Anionic Soap	0.000000281152	1.91000E-011	025D	2.500E+001
Magnesium Standards (100ppb)	Mg	0.000007166894	4.86881E-010	0.1 025D	1.586E-006
Magnesium Standards (10ppb)	Mg	0.000000716689	4.86881E-011	0.1 025D	1.586E-007
Magnesium Standards (10ppm)	Mg	0.001194482416	8.11469E-008	0.1 025D	2.643E-004
Magnesium Standards (1ppm)	Mg	0.000119448242	8.11469E-009	0.1 025D	2.643E-005
Magnesium Standards (50ppb)	Mg	0.000003583447	2.43441E-010	0.1 025D	7.930E-007
Mannitol (18%)	C6H14O6	47.30150368883	3.21342E-003	0.1 025D	1.047E+001
Mannitol (9%)	C6H14O6	21.50068349492	1.46064E-003	0.1 025D	4.758E+000
Methyl Orange	C14H14N3Na	0.023889648328	1.62294E-006	0.1 025D	5.286E-003
Methanesulfonic Acid (6.5ml/l)	CH6O3S	0.045031987098	3.05924E-006	0.1 025D	9.965E-003
Methoxypropylamine Standards (1000ppm)	C4H11NO	0.119448241638	8.11469E-006	0.1 025D	2.643E-002
Methoxypropylamine Standards (1ppm)	C4H11NO	0.000071668945	4.86881E-009	0.1 025D	1.586E-005
Methoxypropylamine Standards (3ppm)	C4H11NO	0.000215006835	1.46064E-008	0.1 025D	4.758E-005
Methoxypropylamine Standards (4000ppm)	C4H11NO	0.477792966554	3.24588E-005	0.1 025D	1.057E-001
Methoxypropylamine Standards (4ppm)	C4H11NO	0.002388964833	1.62294E-007	0.1 025D	5.286E-004
Methoxypropylamine Standards (500ppb)	C4H11NO	0.000035834472	2.43441E-009	0.1 025D	7.930E-006
Methoxypropylamine Standards (6ppm)	C4H11NO	0.00043001367	2.92129E-008	0.1 025D	9.515E-005
Methyl Alcohol	CH4O	130.4374798692	8.86124E-003	0.1 025D	2.886E+001
Methyl Alcohol (pH 4 buffer)(<10,000ppm)	CH4O	3.583447249154	2.43441E-004	0.1 025D	7.930E-001
Methyl Alcohol (pH 4 buffer)(<10,000ppm)	CH4O	0.597241208192	4.05735E-005	0.1 025D	1.322E-001
Nickel standards (.5ppm)	Ni	0.000059724121	4.05735E-009	0.1 025D	1.322E-005
Nickel standards (1.5ppm)	Ni	0.000179172362	1.21720E-008	0.1 025D	3.965E-005
Nickel standards (10ppm)	Ni	0.001194482416	8.11469E-008	0.1 025D	2.643E-004
Nickel standards (1ppm)	Ni	0.000119448242	8.11469E-009	0.1 025D	2.643E-005

Nickel standards (2ppm)	Ni	0.000238896483	1.62294E-008	0.1 025D	5.286E-005
Nickel standards (3ppm)	Ni	0.000358344725	2.43441E-008	0.1 025D	7.930E-005
Nickel standards (5ppm)	Ni	0.000597241208	4.05735E-008	0.1 025D	1.322E-004
Nitric Acid (1.59M)	HO3N	0	0.00000E+000	025D	0.000E+000
Nitric Acid (15.9M)	HO3N	0	0.00000E+000	025D	0.000E+000
Nitric Acid (15.9M)	HO3N	0	0.00000E+000	025D	0.000E+000
Nitric Acid (15.9M)	HO3N	0	0.00000E+000	025D	0.000E+000
Nitric Acid (15.9M)	HO3N	0	0.00000E+000	025D	0.000E+000
Nitric Acid (15.9M)	HO3N	0	0.00000E+000	025D	0.000E+000
Oxalic Acid (0.11M)	C2H2O4	0	0.00000E+000	025D	0.000E+000
Para-dimethylaminobenzaldehyde	C9H11NO	2.580082019391	1.75277E-004	0.1 025D	5.709E-001
Phenolphthalein (1%)	C20H14O4	0.017917236246	1.21720E-006	0.1 025D	3.965E-003
Phenolphthalein (1%)	C20H14O4	0.000238896483	1.62294E-008	0.1 025D	5.286E-005
Phenolphthalein (1%)	C20H14O4	0.0014333789	9.73763E-008	0.1 025D	3.172E-004
Phosphoric Acid (2.96M)	H3PO4	0	0.00000E+000	025D	0.000E+000
Potassium Acid Phthalate (100ppb)	C8H5O4K	0.000011944824	8.11469E-010	0.1 025D	2.643E-006
Potassium Acid Phthalate (200ppb)	C8H5O4K	0.000023889648	1.62294E-009	0.1 025D	5.286E-006
Potassium Acid Phthalate (200ppm)	C8H5O4K	0.023889648328	1.62294E-006	0.1 025D	5.286E-003
ot. Acid Phthalate (pH 4 Buf.)(<10,000ppm	C8H5O4K	3.583447249154	2.43441E-004	0.1 025D	7.930E-001
ot. Acid Phthalate (pH 4 Buf.)(<10,000ppm	C8H5O4K	0.597241208192	4.05735E-005	0.1 025D	1.322E-001
Potassium Acid Phthalate (3%)	C8H5O4K	0.071668944983	4.86881E-006	0.1 025D	1.586E-002
Potassium Acid Phthalate (3%)	C8H5O4K	0.071668944983	4.86881E-006	0.1 025D	1.586E-002
orate in formaldehyde(0.1%) (pH 10)(<1000	KH2O3B	2.388964832769	1.62294E-004	0.1 025D	5.286E-001
orate in formaldehyd(0.1%) (pH 10)(<1000	KH2O3B	3.583447249154	2.43441E-004	0.1 025D	7.930E-001
orate in formaldehyde(0.1%) (pH 10)(<1000	KH2O3B	0.597241208192	4.05735E-005	0.1 025D	1.322E-001
Pot. Carbonate (pH buf. 10) (<10,000ppm)	K2CO3	2.388964832769	1.62294E-004	0.1 025D	5.286E-001
Pot. Carbonate (pH buf. 10) (<10,000ppm)	K2CO3	3.583447249154	2.43441E-004	0.1 025D	7.930E-001
Pot. Carbonate (pH buf. 10) (<10,000ppm)	K2CO3	0.597241208192	4.05735E-005	0.1 025D	1.322E-001
Potassium Chloride (744ppm)	KCl	0.355477967116	2.41493E-005	0.1 025D	7.866E-002
Potassium Persulfate (2%)	K2S2O8	2.388964832769	1.62294E-004	0.1 025D	5.286E-001
Pot. Phosphate (pH buffer 7)(<10,000ppm)	KH2PO4	2.388964832769	1.62294E-004	0.1 025D	5.286E-001
Pot. Phosphate (pH buffer 7)(<10,000ppm)	KH2PO4	3.583447249154	2.43441E-004	0.1 025D	7.930E-001
Pot. Phosphate (pH buffer 7)(<10,000ppm)	KH2PO4	0.597241208192	4.05735E-005	0.1 025D	1.322E-001

Scintillation Cocktail(99% water)	High MW Eth	0.000000234048	1.59000E-011	025D	2.050E+001
Silica standard (1000ppm)	SiO3H2	0.119448241638	8.11469E-006	0.1 025D	2.643E-002
Silica standard (100ppb)	SiO3H2	0.000001194482	8.11469E-011	0.1 025D	2.643E-007
Silica standard (10ppm)	SiO3H2	0.001194482416	8.11469E-008	0.1 025D	2.643E-004
Silica standard (200ppb)	SiO3H2	0.000002388965	1.62294E-010	0.1 025D	5.286E-007
Silica standard (50ppb)	SiO3H2	0.000017917236	1.21720E-009	0.1 025D	3.965E-006
Silver Nitrate (48.5g/L)	AgNO3	0.00289661986	1.96781E-007	0.1 025D	6.410E-004
Sodium Bicarbonate (142.8ppmg/L)	NaHCO3	1.296347876854	8.80671E-005	0.1 025D	2.869E-001
Sodium Bisulfite	NaHSO3	7.883583948139	5.35570E-004	0.1 025D	1.744E+000
Sodium Carbonate	Na2CO3	0.000358344725	2.43441E-008	0.1 025D	7.930E-005
Sodium Carbonate (190.8ppm)	Na2CO3	1.732095062351	1.17670E-004	0.1 025D	3.833E-001
Sodium Hydroxide (0.02M)	NaOH	0	0.00000E+000	025D	0.000E+000
Sodium Hydroxide (0.05M)	NaOH	0	0.00000E+000	025D	0.000E+000
Sodium Hydroxide (19.4M)	NaOH	0	0.00000E+000	025D	0.000E+000
Sodium Hydroxide (19.4M)	NaOH	0	0.00000E+000	025D	0.000E+000
Sodium Hydroxide (19.4M)	NaOH	0	0.00000E+000	025D	0.000E+000
Sodium Standards (0.5ppb)	Na	0.000000035834	2.43441E-012	0.1 025D	7.930E-009
Sodium Standards (1000ppm)	Na	0.119448241638	8.11469E-006	0.1 025D	2.643E-002
Sodium Standards (100ppb)	Na	0.000011944824	8.11469E-010	0.1 025D	2.643E-006
Sodium Standards (10ppb)	Na	0.000000716689	4.86881E-011	0.1 025D	1.586E-007
Sodium Standards (10ppm)	Na	0.001194482416	8.11469E-008	0.1 025D	2.643E-004
Sodium Standards (1ppm)	Na	0.000119448242	8.11469E-009	0.1 025D	2.643E-005
Sodium Standards (30ppb)	Na	0.000002150068	1.46064E-010	0.1 025D	4.758E-007
Sodium Standards (3ppb)	Na	0.000001791724	1.21720E-010	0.1 025D	3.965E-007
Sodium Standards (3ppm)	Na	0.000358344725	2.43441E-008	0.1 025D	7.930E-005
Sodium Standards (5ppb)	Na	0.000000358345	2.43441E-011	0.1 025D	7.930E-008
Sodium Standards (80ppb)	Na	0.000009555859	6.49175E-010	0.1 025D	2.115E-006
Sodium Sulfate	Na2SO4	0.597241208192	4.05735E-005	0.1 025D	1.322E-001
Sodium Sulfite	Na2SO3	0.262786131605	1.78523E-005	0.1 025D	5.815E-002
Sodium Tetraborate (10.06g/l)	Na4B4O7	80.51050382916	5.46946E-003	0.1 025D	1.782E+001
Stannous Chloride	SnCl2	5.972412081924	4.05735E-004	0.1 025D	1.322E+000
Sulfate Standards (0.5ppb)	SO4	0.000000035834	2.43441E-012	0.1 025D	7.930E-009
Sulfate Standards (1000ppm)	SO4	0.119448241638	8.11469E-006	0.1 025D	2.643E-002
Sulfate Standards (100ppm)	SO4	0.011944824164	8.11469E-007	0.1 025D	2.643E-003

Sulfate Standards (1ppb)	SO4	0.000000645021	4.38193E-011	0.1	025D	1.427E-007
Sulfate Standards (1ppm)	SO4	0.000119448242	8.11469E-009	0.1	025D	2.643E-005
Sulfate Standards (20ppb)	SO4	0.000000955586	6.49175E-011	0.1	025D	2.115E-007
Sulfate Standards (25ppb)	SO4	0.000001194482	8.11469E-011	0.1	025D	2.643E-007
Sulfate Standards (3ppb)	SO4	0.000000215007	1.46064E-011	0.1	025D	4.758E-008
Sulfate Standards (50ppb)	SO4	0.000002388965	1.62294E-010	0.1	025D	5.286E-007
Sulfate Standards (5ppb)	SO4	0.000000358345	2.43441E-011	0.1	025D	7.930E-008
Sulfuric Acid (2.7M)	H2SO4	0	0.00000E+000		025D	0.000E+000
Sulfuric Acid (25mM)	H2SO4	0	0.00000E+000		025D	0.000E+000
Sulfuric Acid (6M)	H2SO4	0	0.00000E+000		025D	0.000E+000
Sulfuric Acid (18M)	H2SO4	0	0.00000E+000		025D	0.000E+000
Thioglycolic acid (14M)	C2H4SO2	0.000000001119	7.60000E-014		025D	1.000E-001
Toluene	C7H8	0.000035834472	2.43441E-009	0.1	025D	7.930E-006



Seabrook Station Temperature Monitoring Station Locations

MARINE ACUTE TOXICITY TEST PROCEDURE AND PROTOCOL

I. GENERAL REQUIREMENTS

The permittee shall conduct acceptable acute toxicity tests in accordance with the appropriate test protocols described below:

- **Mysid Shrimp (Mysidopsis bahia) definitive 48-hour test.**
- **Inland Silverside (Menidia beryllina) definitive 48-hour test.**

Acute toxicity data shall be reported as outlined in Section VIII.

II. METHODS

Methods to follow are those recommended by EPA in:

Weber, C.I. et al. Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms, Fourth Edition. Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, Cincinnati, OH, August 1993, EPA/600/4-90/027F.

Any exceptions are stated herein.

III. SAMPLE COLLECTION

A discharge sample shall be collected. Aliquots shall be split from the sample, containerized and preserved (as per 40 CFR Part 136) for the chemical and physical analyses. The remaining sample shall be dechlorinated (if detected) in the laboratory using sodium thiosulfate for subsequent toxicity testing. (Note that EPA approved test methods require that samples collected for metals analyses be preserved immediately after collection.) Grab samples must be used for pH, temperature, and total residual oxidants (as per 40 CFR Part 122.21).

Standard Methods for the Examination of Water and Wastewater describes dechlorination of samples (APHA, 1992). Dechlorination can be achieved using a ratio of 6.7 mg/L anhydrous sodium thiosulfate to reduce 1.0 mg/L chlorine. A thiosulfate control (maximum amount of thiosulfate in lab control or receiving water) should also be run.

All samples held overnight shall be refrigerated at 4°C.

IV. DILUTION WATER

A grab sample of dilution water used for acute toxicity testing shall be collected at a point away from the discharge which is free from toxicity or other sources of contamination. Avoid collecting near areas of obvious road or agricultural runoff, storm sewers or other point source discharges. An additional control (0% effluent) of a standard laboratory water of known quality shall also be tested.

If the receiving water diluent is found to be, or suspected to be toxic or unreliable, an alternate standard dilution water of known quality with a conductivity, salinity, total suspended solids, and pH similar to that of the receiving water may be substituted **AFTER RECEIVING WRITTEN APPROVAL FROM THE PERMIT ISSUING AGENCY(S)**. Written requests for use of an alternative dilution water should be mailed with supporting documentation to the following address:

Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency - New England
One Congress Street
Suite 1100 (Mail Code: CAA)
Boston, Massachusetts 02114-2023

It may prove beneficial to have the proposed dilution water source screened for suitability prior to toxicity testing. EPA strongly urges that screening be done prior to set up of a full definitive toxicity test any time there is question about the dilution water's ability to support acceptable performance as outlined in the 'test acceptability' section of the protocol.

V. TEST CONDITIONS AND TEST ACCEPTABILITY CRITERIA

EPA New England requires tests be performed using four replicates of each control and effluent concentration because the non-parametric statistical tests cannot be used with data from fewer replicates. The following tables summarize the accepted Mysid and Menidia toxicity test conditions and test acceptability criteria:

EPA NEW ENGLAND RECOMMENDED EFFLUENT TOXICITY TEST CONDITIONS FOR THE MYSID, MYSIDOPSIS BAHIA 48 HOUR TEST[1]

1. Test type	Static, non-renewal
2. Salinity	25ppt ± 10 percent for all dilutions by adding dry ocean salts
3. Temperature (°C)	20°C ± 1°C or 25°C ± 1°C
4. Light quality	Ambient laboratory illumination
5. Photoperiod	16 hour light, 8 hour dark
6. Test chamber size	250 ml
7. Test solution volume	200 ml
8. Age of test organisms	1-5 days
9. No. Mysids per test chamber	10
10. No. of replicate test chambers per treatment	4
11. Total no. Mysids per test concentration	40
12. Feeding regime	Light feeding using concentrated Artemia nauplii while holding prior to initiating the test
13. Aeration[2]	None
14. Dilution water	Natural seawater, or deionized water mixed with artificial sea salts
15. Dilution factor	≥ 0.5
16. Number of dilutions[3]	5 plus a control. An additional dilution at the permitted effluent concentration (%

	effluent) is required if it is not included in the dilution series.
17. Effect measured	Mortality - no movement of body appendages on gentle prodding
18. Test acceptability	90% or greater survival of test organisms in control solution
19. Sampling requirements	For on-site tests, samples are used within 24 hours of the time that they are removed from the sampling device. For off-site tests, samples must be first used within 36 hours of collection.
20. Sample volume required	Minimum 1 liter for effluents and 2 liters for receiving waters

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Footnotes:

1. Adapted from EPA/600/4-90/027F.

2. If dissolved oxygen falls below 4.0 mg/L, aerate at rate of less than 100 bubbles/min. Routine D.O. checks are recommended.

3. When receiving water is used for dilution, an additional control made up of standard laboratory dilution water (0% effluent) is required.

EPA NEW ENGLAND RECOMMENDED TOXICITY TEST CONDITIONS FOR THE INLAND SILVERSIDE, MENIDIA BERYLLINA 48 HOUR TEST[1]

1. Test type	Static, non-renewal
2. Salinity	25 ppt ± 2 ppt by adding dry ocean salts
3. Temperature	20°C ± 1°C or 25°C ± 1°C
4. Light quality	Ambient laboratory illumination
5. Photoperiod	16 hr light, 8 hr dark
6. Size of test vessel	250 mL (minimum)
7. Volume of test solution	200 mL/replicate (minimum)
8. Age of fish	9-14 days; 24 hr age range
9. No. fish per chamber	10 (not to exceed loading limits)
10. No. of replicate test vessels per treatment	4
11. Total no. organisms per concentration	40
12. Feeding regime	Light feeding using concentrated Artemia nauplii while holding prior to initiating the test
13. Aeration[2]	None
14. Dilution water	Natural seawater, or deionized water mixed with artificial sea salts.
15. Dilution factor	≥ 0.5
16. Number of dilutions[3]	5 plus a control. An additional dilution at the permitted concentration (% effluent) is

	required if it is not included in the dilution series.
17. Effect measured	Mortality-no movement on gentle prodding.
18. Test acceptability	90% or greater survival of test organisms in control solution.
19. Sampling requirements	For on-site tests, samples must be used within 24 hours of the time they are removed from the sampling device. Off-site test samples must be used within 36 hours of collection.
20. Sample volume required	Minimum 1 liter for effluents and 2 liters for receiving waters.

Footnotes:

1. Adapted from EPA/600/4-90/027F.

2. If dissolved oxygen falls below 4.0 mg/L, aerate at rate of less than 100 bubbles/min. Routine D.O. checks recommended.

3. When receiving water is used for dilution, an additional control made up of standard laboratory dilution water (0% effluent) is required.

VI. CHEMICAL ANALYSIS

At the beginning of the static acute test, pH, salinity, and temperature must be measured at the beginning and end of each 24-hour period in each dilution and in the controls. The following chemical analyses shall be performed for each sampling event.

Parameter	Effluent	Diluent	Minimum Quanti-fication Level (mg/L)
pH	x	x	---
Salinity	x	x	PPT(o/oo)
Total Residual Oxidants[*1]	x	x	0.05
Total Solids and Suspended Solids	x	x	---
Ammonia	x	x	0.1
Total Organic Carbon	x	x	0.5
Total Metals			
Cd	x		0.001
Cr	x		0.005
Pb	x		0.005
Cu	x		0.0025
Zn	x		0.0025
Ni	x		0.004
Al	x		0.02

Superscript:

[*1] Total Residual Oxidants

Either of the following methods from APHA (1992), Standard Methods for the Examination of Water and Wastewater, 18th or subsequent Edition(s) as approved in 40 CFR Part 136 must be used for these analyses:

-Method 4500-Cl E. Low-Level Amperometric Titration (the preferred method);

-Method 4500-Cl G. DPD Colorimetric Method, or use U.S. EPA Manual of Methods Analysis of Water or Wastes, Method 330.5.

VII. TOXICITY TEST DATA ANALYSIS

LC50 Median Lethal Concentration

An estimate of the concentration of effluent or toxicant that is lethal to 50% of the test organisms during the time prescribed by the test method.

Methods of Estimation:

- Probit Method
- Spearman-Karber
- Trimmed Spearman-Karber
- Graphical

See flow chart in Figure 6 on page 77 of EPA 600/4-90/027F for appropriate method to use on a given data set.

No Observed Acute Effect Level (NOAEL)

See flow chart in Figure 13 on page 94 of EPA 600/4-90/027F.

VIII. TOXICITY TEST REPORTING

The following must be reported:

- Description of sample collection procedures, site description;
- Names of individuals collecting and transporting samples, times and dates of sample collection and analysis on chain-of-custody; and
- General description of tests: age of test organisms, origin, dates and results of standard toxicant tests; light and temperature regime; other information on test conditions if different than procedures recommended. Reference toxicity test data must be included.
- Raw data and bench sheets.
- All chemical/physical data generated. (Include minimum detection levels and minimum quantification levels.)
- Provide a description of dechlorination procedures (as applicable).
- Any other observations or test conditions affecting test outcome.
- Statistical tests used to calculate endpoints.

MARINE CHRONIC TOXICITY TEST PROCEDURE AND PROTOCOL

I. GENERAL REQUIREMENTS

The permittee shall conduct acceptable silverside chronic (and modified acute) and sea urchin chronic toxicity tests in accordance with the appropriate test protocols described below:

- **Inland Silverside (Menidia beryllina) Larval Growth and Survival Test.**
- **Sea Urchin (Arbacia punctulata) 1 Hour Fertilization Test.**

Chronic and acute toxicity data shall be reported as outlined in Section VIII. The chronic Menidia test can be used to calculate an LC50 at the end of 48 hours of exposure when both an acute (LC50) and a chronic (C-NOEC) test is specified in the permit.

II. METHODS

Methods to follow are those recommended by EPA in:

Klemm, D.J. et al. Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters To Marine and Estuarine Organisms, Second Edition. Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, July 1994, EPA/600/4-91/003.

Any exceptions are stated herein.

III. SAMPLE COLLECTION

For each sampling event involving the Menidia beryllina, three discharge samples shall be collected. Fresh samples are necessary for Days 1, 3, and 5 (see Section V. for holding times). A single sample is necessary for the Arbacia punctulata test. The sample shall be analyzed chemically (see Section VI). The initial sample (Day 1) is used to start the tests, and for test solution renewal on Day 2. The second sample is collected for use at the start of Day 3, and for renewal on Day 4. The third sample is used on Days 5, 6, and 7. The initial (Day 1) sample will be analyzed chemically (see Section VI). Day 3 and 5 renewal samples will be held until test completion. If either the Day 3 or 5 renewal sample is of sufficient potency to cause lethality to 50 percent or more test organisms in any of the dilutions for either species, then a chemical analysis shall be performed on the appropriate sample(s) as well.

Aliquots shall be split from the sample, containerized and preserved (as per 40 CFR Part 136) for the chemical and physical analyses. The remaining sample shall be dechlorinated (if detected) in the laboratory using sodium thiosulfate for subsequent toxicity testing. (Note that EPA approved test methods require that samples collected for metals analyses be preserved immediately after collection.) Grab samples must be used for pH, temperature, and total residual oxidants (as per 40 CFR Part 122.21).

Standard Methods for the Examination of Water and Wastewater describes dechlorination of samples (APHA, 1992). Dechlorination can be achieved using a ratio of 6.7 mg/L anhydrous sodium thiosulfate to reduce 1 mg/L chlorine. A thiosulfate control (maximum amount of thiosulfate in lab control or receiving water) should also be run.

All samples held overnight shall be refrigerated at 4°C.

IV. DILUTION WATER

Grab samples of receiving water used for chronic toxicity testing shall be collected from one or several distances away from the discharge. It may be necessary to test receiving water at several distances in a separate chronic test to determine the extent of the zone of toxicity. Avoid collecting near areas of obvious road or agricultural runoff, storm sewers or other point source discharges. An additional control (0% effluent) of a standard laboratory water of known quality shall also be tested.

If the receiving water diluent is found to be, or suspected to be toxic or unreliable, an alternate standard dilution water of known quality with a conductivity, salinity, total suspended solids, organic carbon, and pH similar to that of the receiving water may be substituted **AFTER RECEIVING WRITTEN APPROVAL FROM THE PERMIT ISSUING AGENCY(S).** Written requests for use of an alternative dilution water should be mailed with supporting documentation to the following address:

Director
Office of Ecosystem Protection
U. S. Environmental Protection Agency-New England
JFK Federal Building (CAA)
Boston, MA 02203

It may prove beneficial to the permittee to have the proposed dilution water source screened for suitability prior to toxicity testing. EPA strongly urges that screening be done prior to set up of a full definitive toxicity test any time there is question about the dilution water's ability to support acceptable

performance as outlined in the 'test acceptability' section of the protocol.

V. TEST CONDITIONS AND TEST ACCEPTABILITY CRITERIA

EPA New England requires that tests be performed using four replicates of each control and effluent concentration because the on-parametric statistical tests cannot be used with data from fewer replicates. Also, if a reference toxicant test was being performed concurrently with an effluent or receiving water test and fails, both tests must be repeated.

The following tables summarize the accepted Menidia and Arbacia toxicity test conditions and test acceptability criteria:

EPA NEW ENGLAND RECOMMENDED TEST CONDITIONS FOR THE SEA URCHIN, ARBACIA PUNCTULATA, FERTILIZATION TEST[1]

1. Test type	Static, non-renewal
2. Salinity	30 o/oo ± 2 o/oo by adding dry ocean salts
3. Temperature	20 ± 1°C
4. Light quality	Ambient laboratory light during test preparation
5. Light intensity	10-20 uE/m^2/s, or 50-100 ft-c (Ambient Laboratory Levels)
6. Test vessel size	Disposal (glass) liquid scintillation vials (20 ml capacity), presoaked in control water
7. Test solution volume	5 ml
8. Number of sea urchins	Pooled sperm from four males and pooled eggs from four females are used per test
9. Number of egg and sperm cells per chamber	About 2000 eggs and 5,000,000 sperm cells per vial
10. Number of replicate chambers per treatment	4
11. Dilution water	Uncontaminated source of natural seawater or deionized water mixed with artificial sea salts
12. Dilution factor	Approximately 0.5
13. Test duration	1 hour and 20 minutes
14. Effects measured	Fertilization of sea urchin eggs
15. Number of treatments per test[2]	5 and a control. An additional dilution at the permitted effluent concentration (% effluent) is required.

16.	Acceptability of test	Minimum of 70% fertilization in controls. Effluent concentrations exhibiting greater than 70% fertilization, flagged as statistically significantly different from the controls, will not be considered statistically different from the controls for NOEC reporting.
17.	Sampling requirements	For on-site tests, samples are to be used within 24 hours of the time that they are removed from the sampling device. For off-site tests, samples must be first used within 36 hours of collection.
18.	Sample volume required	Minimum 1 liter

Footnotes:

1. Adapted from EPA/600/4-91/003, July 1994.

2. When receiving water is used for dilution, an additional control made up of standard laboratory dilution water (0% effluent) is required.

EPA NEW ENGLAND RECOMMENDED TEST CONDITIONS FOR THE INLAND SILVERSIDE, MENIDIA BERYLLINA, GROWTH AND SURVIVAL TEST[1]

1.	Test type	Static, renewal
2.	Salinity	5 o/oo to 32 o/oo ± 2 o/oo by adding artificial sea salts
3.	Temperature	25 ± 1°C
4.	Light quality	Ambient laboratory light
5.	Light intensity	10-20 uE/m^2/s, or 50-100 ft-C (Ambient Laboratory Levels)
6.	Photoperiod	16 hr light, 8 hr darkness
7.	Test vessel size	600 - 1000 mL beakers or equivalent (glass test chambers should be used)
8.	Test solution volume	500-750 mL/replicate loading and DO restrictions must be met)
9.	Renewal of test solutions	Daily using most recently collected sample.
10.	Age of test organisms	Seven to eleven days post hatch; 24 hr range in age.
11.	Larvae/test chamber	15 (minimum of 10)
12.	Number of replicate chambers	4 per treatment
13.	Source of food	Newly hatched and rinsed Artemia nauplii less than 24 hr old
14.	Feeding regime	Feed once a day 0.10 g wet wt Artemia nauplii per replicate on days 0-2; feed 0.15 g wet wt Artemia nauplii per replicate on days 3-6
15.	Cleaning	Siphon daily, immediately before test solution renewaland feeding
16.	Aeration[2]	None

17.	Dilution water	Uncontaminated source of natural seawater; or deionized water mixed with artificial sea salts.
18.	Effluent concentrations[3]	5 and a control. An additional dilution at the permitted effluent concentration (% effluent) is required.
19.	Dilution factor	≥ 0.5
20.	Test duration	7 days
21.	Effects measured	Survival and growth (weight)
22.	Acceptability of test	The average survival of control larvae is a minimum of 80%, and the average dry wt of unpreserved control larvae is a minimum of 0.5 mg, or the average dry wt of preserved control larvae is a minimum of 0.43 mg if preserved not more than 7 days in 4% formalin or 70% ethanol.
23.	Sampling requirements	For on-site tests, samples are collected daily and used within 24 hours of the time they are removed from the sampling device. For off-site tests, samples must be first used within 36 hours of collection.
24.	Sample Volume Required	Minimum of 6 liters/day.

Footnotes:

[1] Adapted from EPA/600/4-91/003, July 1994.

[2] If dissolved oxygen (D.O.) falls below 4.0 mg/L, aerate all chambers at a rate of less than 100 bubbles/min. Routine D.O. checks are recommended.

[3] When receiving water is used for dilution, an additional control made up of standard laboratory dilution water (0% effluent) is required.

VI. CHEMICAL ANALYSIS

As part of each daily renewal of the Menidia test, pH, dissolved oxygen, salinity, and temperature must be measured at the beginning and end of each 24 hour period in each dilution and in the controls. It must also be done at the start of the Arbacia test. The following chemical analyses shall be performed for each sampling event.

Parameter	Effluent	Diluent	Minimum Quanti-fication Level(mg/L)
pH	x	x	---
Salinity	x	x	PPT(o/oo)
Total Residual Oxidants[*1]	x	x	0.05
Total Solids and Suspended Solids	x	x	---
Ammonia	x	x	0.1
Total Organic Carbon	x	x	0.5
Total Metals			
Cd	x		0.001
Cr	x		0.005
Pb	x		0.005
Cu	x		0.0025
Zn	x		0.0025
Ni	x		0.004
Al	x		0.02

Superscripts:

[*1] Total Residual Oxidants
Either of the following methods from the 18th Edition of the APHA (1992) Standard Methods for the Examination of Water and Wastewater must be used for these analyses:

-Method 4500-CL E the Amperometric Titration Method (the preferred method);
-Method 4500-CL G the DPD Photometric Method.

or use USEPA Manual of Methods Analysis of Water or Wastes, Method 330.5.

VII. TOXICITY TEST DATA ANALYSIS

LC50 Median Lethal Concentration (Determined at 48 Hours)

Methods of Estimation:

- Probit Method
- Spearman-Karber
- Trimmed Spearman-Karber
- Graphical

See flow chart on page 56 of EPA/600/4-91/003 for appropriate point estimation method to use on a given data set.

Chronic No Observed Effect Concentration (C-NOEC)

Methods of Estimation:

- Dunnett's Procedure
- Bonferroni's T-Test
- Steel's Many-One Rank Test
- Wilcoxin Rank Sum Test

Reference flow charts on pages 191, 192, and 321 of EPA/600/4-91/003 for the appropriate method to use on a given data set.

In the case of two tested concentrations causing adverse effects but an intermediate concentration not causing a statistically significant effect, report the C-NOEC as the lowest concentration where there is no observable effect. The definition of NOEC in the EPA Technical Support Document only applies to linear dose-response data.

VIII. TOXICITY TEST REPORTING

A report of results will include the following:

- Description of sample collection procedures, site description;
- Names of individuals collecting and transporting samples, times and dates of sample collection and analysis on chain-of-custody; and
- General description of tests: age of test organisms, origin, dates and results of standard toxicant tests; light and temperature regime; other information on test conditions if different than procedures recommended. Reference toxicant test data should be included.
- All chemical/physical data generated. (Include minimum detection levels and minimum quantification levels.)

- Raw data and bench sheets.
- Provide a description of dechlorination procedures (as applicable).
- Any other observations or test conditions affecting test outcome.