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. §§1251 et seq.; the "CWA"), and the Massachusetts Clean Water Act, as amended (M.G.L. Chap. 21, §§ 26-53),

Mirant Kendall, LLC

is authorized to discharge from the facility located at

Mirant Kendall Station
265 First Street
Cambridge, MA 02142

to receiving water named

Charles River in the Boston Harbor Watershed

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

This permit shall become effective on **(See ** below)**

This permit and the authorization to discharge expire at midnight, five (5) years from the effective date.

This permit supersedes the permit issued on August 17, 1988.

This permit consists of 38 pages in Part I including effluent limitations, monitoring requirements, and state permit conditions, **Attachments A through I**, and 35 pages in Part II including General Conditions and Definitions.

Signed this day of , 2004

_____	_____
Director Office of Ecosystem Protection Environmental Protection Agency Boston, MA	Director Division of Watershed Management Department of Environmental Protection Commonwealth of Massachusetts Boston, MA

** This permit will become effective on the date of signature if no comments are received during public notice. If comments are received during public notice, this permit will become effective 60 days after signature.

PART I.A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning on the Effective Date of the permit and lasting through expiration, the permittee is authorized to discharge through any combination of **outfall serial numbers 001, 002, 003 and 004: once-through condenser cooling water, ultrafilter and reverse osmosis (UF & RO) treatment system reject waters and boiler blowdown**(1). Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations		Monitoring Requirements	
	Average Monthly	Maximum Daily	Measurement Frequency	Sample Type
Flow Rate (million gallons per day)	70(2,3)	80	Continuous	Recorder: Pump capacity curve and operational hours (4)
Total Residual Chlorine (5) (mg/l) as an instantaneous maximum	Report	0.1	1/Chlorination event	Grab during chlorination event
Temperature (°F), Discharge	Report	105 (6)	Continuous	Recorder
Temperature (°F), Instream	Report	Various (7,8)	Continuous	Recorder
Facility Temperature Rise (9); Discharge °F minus Inlet °F	Report	20	Continuous	Recorder
pH, standard units, instream (8)	See footnote 8	See footnote 8	Various	Recorder
Conductivity, instream (8)	Report	Report	Various	Recorder
Dissolved oxygen, mg/l, instream (8)	Report	Report	Continuous	Recorder
Chlorophyll *a*, ug/l, instream (10)	Report	Report	Continuous	Recorder

Heat Load, in millions of BTUs [11]	Report	Report	Hourly and Daily	Calculated
Electricity generation, in megawatts	Report	Report	Hourly and Daily	Recorder
Whole Effluent Toxicity Testing, [12] LC50, C-NOEC, % [13,14,15]	Report	Report	1/Quarter	24 hour composite

Footnotes:

1. There have been separate permit conditions established for the discharge of reject waters and boiler blowdown from internal Outfall 009. See Part I.A.3.

2. For flow, report maximum and minimum daily rates and total flow for each operating date. The limit of 70 million gallons per day (MGD) is an annual average limit, which shall be reported for every consecutive twelve (12) month period, as a rolling average. The first rolling average value will be calculated using the monthly average flow for the first full calendar month ending after the effective date of the permit and the eleven previous monthly average flows (e.g. if the permit is effective on 7/1/04, the first annual average value will be reported on the July 2004 discharge monitoring report (DMR) and be calculated from the July 2004 average flow and the average flows from the previous eleven months). Each subsequent month's DMR will report the annual average flow for the preceding 12 months.

3. For the months of April, May and June only, a monthly average limit of 70 MGD applies for each month.

4. The flow rate may be estimated from pump capacity curves. This flow rate is the total condenser cooling water flow, blowdown from the new heat recovery steam generator (HRS) unit and reject waters from the new UF & RO water treatment units.

5. The quantity of total residual chlorine (TRC) discharged in once-through cooling water from any combination of these outfalls shall not exceed 0.1 mg/l as an "instantaneous maximum concentration" at the point of discharge into the Charles River. TRC may not be discharged from any generating unit for more than two hours in any one day. For this permit, the minimum level (ML) for TRC is defined as 20 ug/l. This value is the minimum level for chlorine using EPA-approved methods found in the most currently approved version of Standard Methods for the Examination of Water and Wastewater, Method 4500 CL-E and G, or USEPA Manual of Methods of Analysis of Water and Wastes, Method 330.5. One of these methods must be used to determine TRC. Sample results of 20 ug/l or less shall be reported as zero on the discharge monitoring report. The ML is not the minimum level of detection, but rather the level at which the entire analytical system shall give recognizable signal and acceptable calibration points. Chlorine may be used as a biocide. Sampling shall be conducted only during periods of chlorination at the Facility, when chlorine is being discharged. No other biocide shall be used without explicit approval from the Regional Administrator and the Commissioner. The term "Regional Administrator" means the Regional Administrator of Region I of the U. S. Environmental Protection Agency (EPA) and the term "Commissioner" means the Commissioner of the Massachusetts Department of Environmental Protection (MADEP) or their designees.

6. The instantaneous discharge temperature shall not exceed 105 ^{o}F at any time.

7. See Section 14.b and **Attachments A and B** of this permit for instream temperature limits and locations, which are based on the protection and propagation of a balanced and indigenous population of resident and anadromous fish species. The permittee will make these instream temperature data available for viewing on a web site as described in Section 14.a.4 of this permit.

8. See **Attachment B** of this permit for instream monitoring locations and Section 14 of this permit for detailed water quality monitoring requirements, including establishment of a real-time data web site. The pH shall not be less than 6.5 standard units and not more than 9.0 standard units

9. Facility Temperature Rise is the difference between the discharge temperature and intake temperature. The intake and discharge temperatures will be recorded by instruments or computers. The Facility Temperature Rise, Daily Maximum Temperature and flow shall be calculated as hourly averages based upon readings every fifteen (15) minutes. These hourly average values will be tabulated for each month and attached to the monthly Discharge Monitoring Reports (DMR), as well as made available on a real-time continuous basis on a website as described in Section 14.a.4 of this permit. The hourly average discharge temperature shall be measured by temperature probes representing all once-through condenser cooling water and shall not exceed a 20 ^{o}F rise over the average temperature of the intakes on the Broad Canal at any time.

10. See Page 21 for chlorophyll *a* monitoring requirements.

11. The Heat Load shall be calculated on an hourly basis using the following equation: $Q = C_p m(\Delta T)$

Where Q = Heat Load, British Thermal Units (BTU)/Day
C_p = Heat Capacity (Specific Heat) of water = 1.0 BTU/pound°F
m = mass of water = cooling water flow rate (MGD) x density of river water = cooling water flow rate (MGD) x 8.34 pounds/gallon
ΔT = discharge temperature - intake temperature, °F, hourly average (See footnote 9 above)

The monthly heat load shall be calculated by adding together each day's heat load for that month. Each day's heat load shall be calculated by adding together each hour's heat load for that day.

12. The permittee shall conduct chronic (and modified acute) toxicity tests four times per year. The chronic test may be used to calculate the acute LC_{50} at the 48-hour exposure interval. The permittee shall test the daphnid, Ceriodaphnia dubia, and the fathead minnow, Pimephales promelas. Toxicity test samples shall be collected during the calendar quarters ending March 31, June 30, September 30 and December 31. The test results shall be submitted by the last day of the month following the completed quarter, April 30, July 31, October 31 and January 31, respectively. The tests must be performed in accordance with test procedures and protocols specified in **Attachment C** of this permit, follow the conditions set forth in the table below

and be conducted during normal operating conditions.

Day 1	**Day 3**	**Day 5**
(Acute and sample #1 for chronic)	**(sample #2 for chronic)**	**(sample #3 for chronic)**
Discharge of Sodium Bisulfite	HRSG Blowdown	HRSG Blowdown
HRSG Blowdown	UF and RO Water Treatment Reject Water	UF and RO Water Treatment Reject Water
UF and RO Water Treatment Reject Water		

After submitting one year and a minimum of four consecutive sets of WET test results (one per quarter), the permittee may request a reduction or elimination of the WET testing requirements, based upon the test results. The permittee is required to continue testing at the frequency specified in the permit until notice is received by certified mail from the EPA that the WET testing requirement has been changed. Days 3 and 5 may or may not include the discharge of sodium bisulfite.

13. The LC_{50} is the concentration of effluent which causes mortality to 50% of the test organisms.

14. C-NOEC (chronic-no observed effect concentration) is defined as the highest concentration of toxicant or effluent to which organisms are exposed in a life cycle or partial life cycle test which causes no adverse effect on growth, survival, or reproduction at a specific time of observation as determined from hypothesis testing where the test results exhibit a linear dose-response relationship. However, where the test results do not exhibit a linear dose- response relationship, the permittee must report the lowest concentration where there is no observable effect.

15. If toxicity test(s) using receiving water as diluent show the receiving water to be toxic or unreliable, the permittee shall follow procedures outlined in **Attachment C, Section IV,** of this permit in order to obtain permission to use an alternate dilution water. In lieu of individual approvals for alternate dilution water required **in Attachment C**, the permittee may use the EPA New England guidance document entitled Self-Implementing Alternative Dilution Water Guidance ("Guidance Document") to obtain automatic approval of an alternate dilution water, including the appropriate species for use with that water. If the Guidance Document is revoked, the permittee shall revert to obtaining approval as outlined in **Attachment C.** The Guidance Document has been sent to all permittees with their annual set of DMRs and Revised Updated Instructions for Completing EPA's Pre-Printed NPDES Discharge Monitoring Report (DMR) Form 3320-1 and is not intended as a direct attachment to this permit. Any modification or revocation to the Guidance Document will be transmitted to the permittees as part of the annual DMR instruction package. However, at any time, the permittee may choose to contact EPA New England directly using the approach outlined in **Attachment C.**

Part I.A.1. (continued)

a. Effluent samples shall be taken prior to mixing with other waste streams through Outfalls 001, 002, 003 and/or 004.

b. The results of sampling for any parameter beyond its required frequency must be reported.

c. There shall be no discharge of floating solids, oil sheen or visible foam in other than trace amounts.

d. During operation of the Mirant Kendall Station (Facility), the permittee shall conduct biological/environmental studies and water quality monitoring as determined by the Regional Administrator and/or the Commissioner and as described in Section 14. The purpose of these studies shall be to evaluate the effects of the Facility's discharge on the balanced, indigenous population of shellfish, fish and wildlife in and on the Charles River, to evaluate the effectiveness of cooling water intake structure (CWIS) technologies to minimize adverse environmental impacts and to ensure the attainment of water quality standards.

e. This NPDES permit may be modified pursuant to 40 CFR 122.62 to contain additional or different thermal limitations or other requirements if these biological/environmental studies, water quality monitoring efforts and/or other available information indicate that such modifications are necessary for the attainment of water quality standards and/or the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the receiving waters.

f. The permittee shall report the date(s) that the intake barrier nets are installed with the DMR for that month.

2. During the period beginning on the Effective Date and lasting through expiration, the permittee is authorized to discharge intake screen backwash water from **outfall serial numbers 005, 006 and 007 at a total daily maximum flow rate not to exceed 0.1 MGD for each outfall.**

Effluent Characteristic	Discharge Limitations		Monitoring Requirements	
	Average Monthly	Maximum Daily	Measurement Frequency	Sample Type
Flow Rate (million gallons/day)	0.1	--------	When being used	Estimate
Temperature (^{o}F), Discharge	Report	Report	Hourly, when in use	Meter
pH, standard units	See part c.	See part c.	Daily, when in use	Meter

a. There shall be no discharge of floating solids, oil sheen or visible foam in other than trace amounts.

b. The temperature of the discharge shall at no time exceed the temperature of the intake water used for this discharge.

c. The pH shall not be less than 6.5 standard units and not more than 9.0 standard units

d. The traveling screens at Units 1, 2, and 3 for any intake structure shall be rotated three times per day and backwashed as the screens are rotated, whenever any such intake structure's barrier net or other physical barrier is not in use or not properly functioning for at least four (4) consecutive hours. This screen rotation shall continue until the barrier nets are restored in front of such intake structure.

e. All live fish, shellfish, and other aquatic organisms collected or trapped on the intake screens or any barrier net shall be returned back to the receiving water in a manner that prevents re-impingement on the intake screen, except for those that need to be enumerated as part of the impingement sampling detailed in Section 14.e.9. All other material shall be removed from the intake screens and barrier net 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.

3. During the period beginning on the Effective Date and lasting through expiration, the permittee is authorized to discharge low- volume waste from **outfall serial number 009: UF & RO water treatment system reject waters, other low-volume waste streams and boiler blowdown from the new HRSG.**

Effluent Characteristic	Discharge Limitations		Monitoring Requirements	
	Average Monthly	Maximum Daily	Measurement Frequency	Sample Type
Flow Rate (million gallons per day)	Report	3.73	Daily	Estimate
Total Suspended Solids (mg/l)	30	100	Daily	24 hour composite
Oil and Grease, mg/l	15	20	Daily	Grab
Total Residual Chlorine (mg/l)	Report	Report	Daily, when in use	Grab during chlorination event[1]
126 Priority pollutants [2]	Report	Report	1/Year [3]	Grab

Footnotes:

1. See Footnote 4 on Page 3.
2. The list of these may be found at 40 CFR 423, Appendix A.
3. These shall be sampled for during the first month of discharge from this system under the permit and annually thereafter during the period of July through September.

    a. There shall be no discharge of floating solids, oil sheen or visible foam in other than trace amounts.

    b. The results of sampling for any parameter above its required frequency must be reported.

    c. The combination of these streams will be monitored prior to joining the condenser cooling water stream.

    d. The monitoring of this outfall must coincide with the approximate time period of the maximum use of the chemicals

listed in Table 1 at the end of this permit.

Part I.A. (continued)

4. The chemicals listed in Table 1 are approved 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 (RA) and the Commissioner before any such studies take place. A report summarizing the results of any such studies shall be submitted to the Regional Administrator and the Commissioner regarding discharge frequency, concentration, and the impact, if any, on the indigenous populations of the receiving water. The Regional Administrator or the Commissioner may require Whole Effluent Toxicity testing as part of feasibility studies.

5. The discharges shall not cause a violation of any applicable water quality standards or degrade the aquatic habitat quality.

6. Any change in the location, design or capacity of the present cooling water intake structures shall be approved by the Regional Administrator and the Commissioner.

7. This permit shall be modified, revoked or reissued to comply with any applicable effluent standard or limitation issued or approved under Sections 30l(b)(2)(C) and (D), 304(b) (2), and 207(a) (2) of the 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 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 Act.

8. Any thermal plume in the receiving water resulting from the discharges from the Facility shall not block or severely restrict fish passage, in accordance with the Zone of Passage and Habitat (ZPH) requirements of **Attachment A;** a depiction of the ZPH is included in **Attachment D.**

9. There shall be no discharge of polychlorinated biphenyl (PCB) compounds such as those commonly used for transformer fluid. The permittee shall dispose of all known PCB equipment, articles, and wastes in accordance with 40 CFR Part 761. The permittee shall certify that this disposal has been accomplished.

10. All existing manufacturing, commercial, mining, and silvicultural dischargers must notify the RA 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 (as defined at 40 CFR §122.2) 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 ug/L);

(2) Two hundred micrograms per liter (200 ug/L) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/L) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 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 RA of EPA in accordance with 40 CFR §122.44(f).

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 ug/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 of EPA in accordance with 40 CFR §122.44(f).

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.

11. Barrier Net Requirements

There is a detailed discussion of CWA Section 316(b) issues in EPA's document entitled "Clean Water Act NPDES Permitting Determinations for Thermal Discharge and Cooling Water Intake from Mirant Kendall Power Station in Cambridge, MA ". Based on available information, EPA has made the determination that the installation of barrier nets in front of the Facility's intake structures which meet performance standards for reducing impingement mortality, entrainment and through screen velocity represents one component of the Best Technology Available (BTA) for this facility to

satisfy CWA Section 316(b). The other two components of BTA are (1) non-contact cooling water flow is restricted to a monthly average rate of 70 MGD during each of the primary spawning months of April, May and June and (2) the intake structures remain located in the Broad Canal.

The through screen velocity at these nets shall be 0.5 feet per second (fps) or less. The barrier nets shall be installed prior to or upstream of all three intake structures and shall be installed in a manner that will preclude any pass through of water around, over or under the nets. Each barrier net shall have several sections or panels, each one of which shall be capable of removal for cleaning or replacement. Before a section of barrier net is removed for cleaning or replacement, an impermeable panel shall be put in place behind this section so as to limit the amount of flow that may come through the intake without passing through the barrier net. The nets shall be designed to allow for impinged eggs and larvae to be freed in a manner that would maximize their survival. If the permittee wants to change any aspect of its barrier net design, it must obtain the prior, written approval of the Regional Administrator and the Commissioner.

The barrier nets shall be in place in front of all three intake structures from at least February 15 to November 1 of each year. If icing conditions in the Broad Canal inhibit the proper deployment of these nets, they may be installed later than February 15, but as soon as possible after icing conditions allow. This time period is believed to encompass the spawning seasons of all major indigenous fish species that may be present in the lower Charles River Basin. The permittee shall install these barrier nets no later than **sixty (60) days after the effective date of the permit**, unless this sixtieth day falls outside of the time period of February 15 to November 1, in which case they shall be installed no later than February 15th of the following year, or as icing conditions allow. The permittee shall report the barrier net installation date with the cover letter of the subsequent DMR that the permittee submits.

Except as provided below, all intake water must pass through these nets for this entire period. If the permittee encounters unforeseen clogging or other operational difficulties with the nets, the permittee may pass water through its intakes without the use of nets for the shortest period of time sufficient to alleviate the problem, but not more than 10% of the time the facility is drawing intake water in any calendar month for all intake structures combined. For any continuous period during which intake water does not pass through any of the barrier nets for any intake structure for more than four hours, the permittee shall operate the traveling screens for such structure once per eight-hour shift, per the former standard operating procedure, until the barrier nets are again installed. This procedure is described in footnote d. on Page 7. With each DMR for this time period, the permittee shall report the percentage of time that any part of the nets for each intake structure were not in place during operation of the intake, a description of technical problem(s) requiring partial or total removal of the barrier, the percent of barrier removed for each affected intake, the proposed solution to technical problem(s) and the projected time to cure such problem(s).

EPA has set impingement mortality and entrainment (I/E) reduction goals for this permit along with ongoing reporting and changes as necessary which will lead towards the attainment of these goals. The nets shall be designed to meet these goals. For impingement mortality, this permit sets a goal of a minimum of 80% of impingement mortality reduction as compared to the baseline condition. Organisms that become impinged on intake screens are assumed to not survive. For entrainment, this permit sets a goal of a minimum of 60% entrainment reduction as compared to the baseline condition. Baseline conditions will be derived through adult fish and ichthyoplankton sampling conducted each year by the permittee. It will be assumed that without the barrier net, all organisms sampled in the immediate vicinity of the intake structure would have been impinged or entrained.

With each Annual Monitoring Report (AMR) described in Section 14.a.3 and together with the barrier net study and I/E monitoring detailed in Section 14.e. of this permit, the permittee will estimate the total I/E at the Facility as well as the percentage of I/E that the barrier nets have excluded. Any such exclusion percentage shall be discounted by the percent of time over the season that any net was inoperable and bypassed. The permittee shall calculate a baseline of aquatic species of every life stage to use in calculating the I/E values in each AMR at a minimum. If these nets are not meeting the I/E goals set forth in this permit, the permittee shall propose in the AMR net design changes or alternative screening devices that would improve on I/E reduction levels and meet the I/E reduction goals. The permittee shall also provide a schedule for these changes or alternatives in the AMR. If these are not disapproved by EPA or DEP within sixty (60) days of AMR submittal, the permittee shall implement these changes or alternatives.

In addition, the permittee shall conduct an operational study of these barrier nets as described in Section 14.e.7 of this permit. To ensure maximum survival of the fish and larvae entering the Broad Canal and to meet the I/E reduction goals, the Regional Administrator and the Commissioner may direct the permittee to alter the barrier nets: (1) by changing the design of nets installed; (2) by changing the net mesh size; (3) by modifying the existing nets; (4) by changing the location of the nets, or (5) by removing nets on either a short-term (experimental or seasonal) basis or on a permanent basis.

The installed barrier nets shall be inspected daily from April 1 through September 30 and repaired as required. They shall be inspected weekly for the remainder of the year that they are installed and replaced or repaired as required. The cleanliness of these barrier nets will be monitored by plant personnel and/or by contracted divers on a monthly basis. The nets will be checked for any condition(s) that may affect their performance relative to the I/E goals described earlier.

The nets shall be designed so that if a net or a portion of it is found to be operating improperly, sections may be removed and replaced. The permittee shall have available spare barrier net sections for immediate replacement of installed barrier net sections that are badly damaged or otherwise not operating as designed or not consistent with permit goals. As stated above in this Section, before a section of barrier net is removed, an impermeable panel shall be put in place behind this section so as to limit the amount of

flow that may come through the intake without passing through the barrier net. The removed portions can be washed onsite. Attempts must be made to evaluate the condition of eggs and larvae that may be impinged on the barrier net. When the potential exists that impinged organisms could survive if returned to the lower Basin, they must be removed and returned to the river with a minimum of stress. During the process of removal and replacement, the permittee must minimize the amount of time that a barrier net is not in place, as described above. The permittee shall remove one barrier net section at a time under normal replacement and maintenance conditions, because the placement of multiple impermeable panels in front of an intake structure may tend to increase the intake velocity through the remaining screens. For any occasion when a barrier net is replaced, except for routine maintenance, the permittee shall prepare a report explaining why the barrier net(s) was ineffective, how long the net(s) was operating in such condition and what actions or changes in operation the permittee undertook as a result. This report shall be submitted to EPA and DEP no later than 30 days following such an occurrence and mailed together with the DMR, but under a separate cover letter.

12. Fish Mortality Requirements

The permittee shall visually inspect the (1) Broad Canal, (2) the area of the Charles River impacted by any thermal plume resulting from the discharge from the Facility and (3) the barrier nets daily, throughout the year, for dead fish. A fish shall be considered dead if it exhibits a loss of equilibrium.

a. Initial Notification and Response

1. If the permittee observes 25 or more dead fish within any 24-hour period, it shall provide telephone notification to the Massachusetts Division of Marine Fisheries (DMF), the EPA Office of Ecosystem Protection, and the DEP, within four hours of such observation. See contact names and phone numbers for the EPA and DEP in the fact sheet. If dead fish are observed during weekend, holiday or evening periods, the permittee shall notify the DMF, EPA and DEP on the next business day.

2. On observation of fish mortalities sufficient to require notification, the permittee shall make a concerted effort to collect all dead fish and immediately initiate a separate hourly record showing: (1) the Facility discharge temperatures; (2) the dissolved oxygen levels and river temperatures at the monitoring stations; (3) the dissolved oxygen levels and river temperature at the approximate location of the fish kill and (4) the number of dead fish observed, by species. The total length of each fish shall also be recorded. If more than 100 dead fish are collected, a representative subset of the fish may be measured for total length. A necropsy or tissue analysis may be required of certain individual fish in order to determine the cause of the fish kill event. The record shall be maintained until advised by DMR or EPA to change or to discontinue the effort.

Some of this required monitoring is already recorded on a continuous basis and would be sufficient to partly meet this requirement. This record shall be included in the written report documenting the event, as required in Section 12.d, below.

3. On observation of fish mortalities sufficient to require notification, the permittee shall suspend all unit chlorination operations, and if the discharge temperature is greater than 95 °F, the permittee shall reduce the discharge temperature to no more than 95 °F within two hours of such observation.

4. If, at the end of the 24-hour period from the initial observation, fish mortalities are no longer occurring and EPA or the DEP do not advise otherwise, the permittee shall cease monitoring under this section of the permit and return to normal station operation (including unit chlorination).

b. In the event of fish mortalities in the thermal plume, the permittee will begin removing all dead fish within four hours after the fish mortalities have been observed. The dead fish shall be enumerated in accordance with Section c, below.

c. The dead fish shall be sampled as follows:

1. All dead fish shall be enumerated and recorded by species.

2.. All dead fish shall be measured to the nearest millimeter in total length.

d. The permittee shall make a written report of any documented fish mortalities to DMF, EPA, and DEP, within ten (10) business days of the event. Included in this report shall be (1) the status of operation at the Facility before and during the event, including records required in 12.a.2 of this permit, (2) any meteorological or other environmental conditions that may have contributed to the event, (3) the opinion of the permittee as to the cause of the event, and (4) what actions the Facility shall take in the future to reduce the recurrence of fish kills (if applicable). The DEP and EPA addresses to be used are found in Section B of this permit.

13. The permittee shall report all "unusual impingement events" at the Facility. An "unusual impingement event" is the impingement of a school of fish or a large number of a single species that exceeds normal, historical impingement for the screens as developed through the statistical review of previous impingement data. Until such a review is completed and approved by EPA, an unusual impingement event shall be any event resulting in 15 or more total fish of all species impinged per hour. Such unusual impingement

events will be reported to EPA, DEP and MADMF designees by telephone no later than twelve (12) hours after the permittee is aware of or has reason to believe an unusual fish impingement event has occurred. If the unusual impingement event is observed during weekend, holiday or evening periods, the permittee shall notify the EPA, DEP and DMF on the next business day. The permittee shall prepare and submit a written report on the fish impingement incident within ten (10) business days to EPA, DEP and DMF. The DEP and EPA addresses to be used are found in Section B of this permit. The report must contain the requirements listed in Section 14.e 7 of this permit.

14. **Temperature, Water Quality and Biological Monitoring Program**

a. **General and Reporting**

1. The permittee shall conduct the sampling, monitoring and reporting described in this Section, also referred to as the "Monitoring Program" (MP). Where ever appropriate, sampling time, frequency, location, and methods used shall be the same as the sampling effort documented in past sampling conducted by the permittee in 1999, 2000, 2002 and 2003. Sampling effort may be modified from historical programs if EPA and DEP agree in writing that the change would be an improvement to the MP.

2. Unless otherwise specified, the results of all sampling and monitoring shall be reported in an **Annual Monitoring Report (AMR)**. The first Report shall be submitted no later than ninety (**90) days after the effective date of the permit** and cover any related monitoring performed between the permit application and the effective date of the permit, provided this information has not already been summarized, statistically analyzed and submitted by the permittee. Subsequent AMRs shall be submitted ninety (90) days after the anniversary of the effective date of the permit. All of these reports shall be sent to the same address as the DMR reports, under separate cover letter and as provided at the end of this permit. In the case where the permit expires before reissuance, the Monitoring Program will continue and the Annual Monitoring Report submittals will be made each year.

3. Each Annual Monitoring Report shall summarize the previous year's information and conclusions

a. The Annual Monitoring Report will indicate the trends of the various parameters that were sampled. In order to identify trends, tables and graphs created for the most recent year's submittal must incorporate data from all past years' monitoring efforts, when appropriate. In addition, the report shall identify any anomalies that appear in the annual historical data comparison. The report must offer possible reasons for the differences will be offered, along with supporting

information, if available. The permittee will make recommendations for any remediation considered necessary or for any programs to better understand the anomaly.

b. The AMR will provide the status of the present sampling and monitoring programs, the expected effort for the following twelve months, and an alert to EPA and DEP of any anomalies that may be evident in the previous twelve months of data collection.

c. In its AMR, the permittee shall provide estimates of the Facility's impingement mortality and entrainment for all species documented through impingement and entrainment sampling. Impingement mortality and entrainment estimates must include both raw numbers and adult equivalents, as well as estimates of the impingement mortality and entrainment reduction rates experienced at the Facility as a result of the installation of the barrier net . Reduction rates will be calculated by using baseline impingement mortality and entrainment values, calculated by the permittee. The Facility's baseline entrainment value will be calculated as follows: A baseline multiplication factor will be determined by dividing available Broad Canal ichthyoplankton density values documented when the barrier net was not in place by the Facility entrainment estimate for the same time period during the same year. This baseline multiplication factor will be applied to ichthyoplankton densities measured in the Broad Canal during a year when the barrier net is in place to estimate potential entrainment (assuming no barrier net was in place). Potential entrainment will be compared with actual entrainment measured with the barrier net installed to estimate reduction rates. Another method may be substituted for this way of determining baseline Facility entrainment rates, based on comments received during the public comment period. These I/E estimates and other factors (such as maximizing the survival of impinged eggs and larvae) shall be compared to the I/E goals in Section 11 of the permit. If the permittee is not meeting the I/E reduction goals set forth in permit Section 11, then it shall propose to EPA (in the AMR or more frequently) alternative barrier net designs and/or additional barrier nets or other devices to further reduce I/E rates to attain the I/E goals in this permit, as described in Section 11. Upon a notice of acceptance by EPA, the permittee shall implement these changes as modified by EPA's comments.

d. The AMR will also estimate the population size of, at a minimum, alewife, blueback herring, and yellow perch, based on field data collected that year. The technique used to estimate population size must be consistent across years to allow meaningful comparison of population size from year to year. If sampling

techniques to estimate population size are changed, a site-specific calibration factor must be determined so results from the two different methods can be meaningfully compared.

4. Real-time water quality data treatment

   a. Real-time, continuous water quality data will be summarized and, together with an electronic copy of the raw data, be included in the Annual Monitoring Report. Any electronic information must be compatible with a generally available spreadsheet program.

   b. In addition, to the yearly submittal, real-time water quality information will be continuously transmitted to a web-based data reporting system, with a minimum of one reading taken each hour at each Monitoring Point for each parameter. For each four hour time period listed as follows (00:00 [midnight]-03:59, 04:00-07:59, 08:00-11:59, 12:00-15:59, 16:00-19:59, 20:00-23:59), data will be averaged for each Monitoring Point for each parameter and compared with temperature limits in effect at that time. This information shall also be transmitted to a web-based data reporting system. At least EPA and MADEP shall have continuous access to this web site and be able to inspect water quality data at any time. In addition, applicable temperature limits, some historical data, certain basic calculations, and the clear identification of the Monitoring Stations and Monitoring Points where the data was collected will be incorporated into this website. Upon request by EPA or DEP, an electronic record of the continuous water quality data must be made available, within a reasonable time period. A series of charts depicting one way to configure the four hour data at each location on the web site is presented in **Attachment E**. Real-time hourly water quality data shall also be presented on this web site as part of a (30) day trend analysis for each Monitoring Station and Monitoring Point. **Attachment F** depicts one way to present this data. While **Attachments E and F** present only one possible format for this data presentation, all data points and calculations specified in these attachments must be included on this website in a logical format. When continuous temperature data violate any temperature limit in effect at the time, this information must be included with that month's DMR submittal. **Attachment G** contains the forms that will be used as part of the DMR submission to report any violation of this type.

5. Where practicable, sampling plans will be designed to test a hypothesis using accepted statistical design related to sampling frequency and site location.

6. Quality Assurance Project Plan **(**QAPP**)**

   a. The permittee shall develop and submit a Quality Assurance Project Plan (QAPP) within sixty (60) days after the effective date of the permit in conformance with the applicable requirements of the EPA QA/R-5 document, published in March of 2001. This document is available at EPA's web site at "www.epa.gov/quality1/qa_docs.html". The QAPP shall encompass all measurements made in compliance with this permit. The permittee shall also develop and submit documentation implementing of regular reporting requirements of an acceptable quality assurance/quality control (QA/QC) plan within sixty (60) days after the effective date of the permit. The QA/QC plan must describe how the permittee will regularly validate data to ensure that the water chemistry results are representative of nutrient and metal concentrations and transmissivity in the river.

   b. The permittee will have no more than thirty (30) days after receipt of EPA or DEP comments on the original QAPP or QA/QC plan submittal or any revised QAPP or QA/QC plan to address such comments. The EPA and DEP reserve the right to conduct field audits during the monitoring program. Failure to comply with the QAPP or QA/QC plans, or EPA's comments on such plans, shall be considered a permit violation.

   c. The QA/QC data will be reported and summarized in the Annual Monitoring Report, including a detailed Materials and Methods section, describing the results of the monitoring with specific attention focused on any impacts (positive or negative) attributable to diffuser operation, if approved and operable.

b. **Continuous Temperature and Dissolved Oxygen Monitoring**

1. As indicated in Section I.A.1., instream water temperatures and dissolved oxygen (DO) shall be monitored continuously and reported as described in **Attachment A** for the effective period of the permit for compliance with permit limits. EPA and DEP may entertain an alternative monitoring method to obtain dissolved oxygen information without continuous real-time monitoring for DO.
2. The permittee shall maintain continuous Water Quality Monitoring Stations for temperature and dissolved oxygen at the locations described below and shown in **Attachment B.**

Station 1 (Background). One fixed monitoring station downstream of the BU Bridge to access ambient river conditions. This station shall be placed near mid-river at the downstream location closest to the bridge where there is a water depth of at least 15 feet. Efforts will be made to position the station where it will reduce the risk of interference with boat traffic, if possible.

Station 2 (Zone Boundary Station). One fixed monitoring station, spaced about 50% across the river from the Boston side and along the transect that coincides with the location of the upstream edge of the Zone of Dilution, as indicated in the permittee's predictive model.

Stations 3, 4, 5 and 6 (In Zone Transect). Four fixed monitoring stations, spaced at equidistant points along a bank-to-bank transect that coincides with the location where the thermal plume impacts the greatest cross-section with a delta T of 5 degrees Fahrenheit or greater, as indicated by the permittee's predictive model. Stations 3 through 6 will be equally spaced along the transect, with Station 3 being closest to the Boston side and Station 6 being on the Cambridge side (see **Attachment B**).

Station 7 . A fixed monitoring station at the midpoint of the Boston Museum of Science Lock. To avoid impeding boat traffic, the Monitoring Points at this station will be attached to the concrete wall of the lock. A floating buoy will not be necessary.

Station 8. A fixed monitoring station just upstream of the New Charles River Dam, at a location near the lock used to transfer an attractant flow of Charles River water to Boston Harbor during anadromous fish in-migration.

Station 9. A fixed monitoring station just downstream of the New Charles River Dam, in Boston Harbor. This Monitoring Station must be outside the direct influence of Charles River water and be positioned to gather water quality data representative of Boston Harbor.

3. For each **Monitoring Station**, with the exception of **Station 1,** temperature and dissolved oxygen will be monitored continuously with **Monitoring Points** at discrete depths, including 2 feet, 6 feet, 12 feet, 24 feet (where depth allows), and near bottom (approximately 3 feet above the bottom, where depth allows). **Station 1** will have Monitoring Points at 2 feet, 6 feet and 12 feet only. Thus, there will be a total of 4 or 5 points at Stations 2, 3, 4, 5 and 6 depending on the depth at each location.

4. Monitoring **Stations 1, 2, 3, 4, 5 and 6** will record continuous, real-time temperature and dissolved oxygen values year-round while the permit is in effect (a minimum of one reading per hour for each parameter), and must be in operation within sixty (60) days of the effective date of the permit. Monitoring **Stations 7, 8 and 9** will record continuous, real-time temperature and dissolved oxygen (a minimum of one reading

per hour for each parameter), from April 1 through October 31 and must be in operation (1) within 60 days of the effective date of the permit, if the effective date is between February 1 and August 31 or (2) no later than April 1 if the effective date is between September 1 and January 31.

5. Data will be collected in real-time and presented on a web site made available by the permittee (see Section 14.a.4.b and **Attachments E** and **F** for examples), as well as stored electronically, to demonstrate compliance with the thermal limits for the Zone Of Passage and Habitat, as specified in **Attachment A** of the permit. Basic calculations necessary for the raw data to be compared with compliance limits are also specified in **Attachment A.** In general, continuous temperature and DO data will be taken at a minimum of once an hour. Temperature data will be averaged within six established, four hour periods during every calendar day, before being compared with maximum temperature limits in effect at the time (00:00 [midnight]-03:59, 04:00-07:59, 08:00-11:59, 12:00-15:59, 16:00-19:59, 20:00-23:59). If more than one reading is taken within an hour, each hour within the prescribed four hour block must have the same number of readings, evenly spaced within the hour (e.g. every 15 minutes) and taken with the same frequency. A 24 hour block average temperature will be used (00:00 [midnight]-23:59] to calculate one number at Station 1, which will be compared with appropriate Station Monitors over the same 24 hour period to document compliance with Delta T requirements. Delta T compliance is specified in **Attachment A**

6. Instrument calibration and maintenance will be done in accordance with the manufacturers' recommendations and accepted water quality data collection practices and with the QAPP described in Section14.a.6. Instrument calibration and maintenance logs will be maintained for a minimum of five years and be made available for agency review upon request. Calibration or maintenance problems that have the potential to impact the accuracy of the data will be reported in the monthly DMR and also noted in the Annual Monitoring Report.

7. Monitoring Station exceptions:

   a. During conditions of icing over of the receiving water surface, the fixed stations may be removed and replaced with vertical profile water quality monitoring for the same parameters, when practicable. A minimum of once daily sampling is required during such periods, if possible.

   b. During special recreational events in the receiving water body, the fixed stations may be removed and be replaced with vertical profile water quality monitoring for the same parameters. A minimum of twice daily sampling is required during such periods, with one sample taken between 6 to 8 A.M. and one other sample taken

between 2 to 4 P.M.

8. In the event that any one or a series of water quality monitoring stations is damaged, lost, or moved away from its designated location and the Facility becomes aware of the situation during the period of 9 AM to 5 PM, the permittee shall notify EPA (G. Papadopoulos, ph: 617-918-1579) and DEP (G. Szal, ph: 508-767-2789) immediately by telephone. If a monitor is damaged, lost or moved away from its designated location and the Facility becomes aware of the situation at any other time, the permittee must notify EPA and DEP as early as practicable on the following business day. The permittee will have five (5) days from the discovery of the damage, loss or move event to reestablish the collection of continuous data at the missing locations. Periodic vertical profile water quality monitoring consistent with Parts 7.a. and b. shall be done in these locations where practicable, until the continuous monitoring has been reestablished.

9. The following parameters of Facility operation data, collected in accordance with Part I.A.1 of this permit, shall be collected continuously, with at least one reading per hour, for the same time intervals and reported as described in **Attachment F**: intake temperature, discharge temperature, Facility temperature rise (intake versus discharge), discharge flow rate and Facility megawatt generation (related to heat load to the river).

10. Meteorological Data affecting water quality. To assess the effects of air temperature, precipitation, wind and sunlight penetration on water temperature and other water quality parameters, the permittee shall collect basic meteorological data approximately every hour at a location in or adjacent to the lower Charles River Basin. This “real time” meteorological data shall be reported with the continuous water quality monitoring data specified in **Attachment F**, if practicable. The data collected shall include air temperature, precipitation, wind speed and direction and sunlight penetration. Upon request by EPA or DEP, a record of the continuous meteorological data must be made available, within a reasonable time period. A summary of this data, along with an electronic copy of the information, compatible with a generally available spreadsheet program, will be submitted as part of the Annual Monitoring Report.

c. **Other Continuous Monitoring**

1. Chlorophyll Monitoring -

The permittee shall perform continuous monitoring for chlorophyll *a* between May 1 through September 30 every year. Continuous monitoring shall be conducted using in-situ instrumentation that records chlorophyll *a* data at least every 15 minutes.

Continuous Monitors

(1) Station A: Centerline of Basin about 2700 feet upstream of the Harvard Bridge.

(2) Station B: Centerline of Basin about 1000 feet upstream of the Longfellow Bridge. This is also Station 2 described earlier.

(3) Station C: In-Zone: Near centerline of Basin on Boston side. This is also Station 4 as described earlier.

Monitoring Parameters: Chlorophyll *a* by fluorometric method (Chl a -F),

Monitoring Method: Continuous in-situ monitoring of Chlorophyll *a* by fluorometric instrumentation at a 2 feet depth from surface.

Monitoring QA/QC: As described in Section 14.a.6, the permittee shall develop and submit to EPA a Quality Assurance Project Plan (QAPP) that documents implementation of an acceptable quality assurance/quality control plan. EPA and MA DEP will reserve the right to conduct field audits during the monitoring program. The permittee must maintain an ongoing quality assurance/quality control (QA/QC) program that would maintain monitoring equipment and regularly validate data to ensure the observations are representative of chlorophyll *a* concentrations in the river.

Data Averaging Period: **Continuous Monitoring** 12 hours (6 am to 6 pm)

Reporting Requirements: The following information will be reported both in the discharge monitoring reports (DMR) for the facility on a web site accessible to EPA and MADEP.

(1) Chl a_A - Daily 12-hour average Chlorophyll *a* value from Station A

(2) Chl a_{B} - Daily 12-hour average Chlorophyll *a* value from Station B

(3) Chl a_{C} - Daily 12-hour average Chlorophyll *a* value from Station C

(4) Chl $a_{ZONE\text{-}12\text{-}hr}$ - Average of (Chl $a_{B\ 12\text{-}hr}$ + Chl $a_{C\text{-}12\text{-}hr}$)

(5) Real time in-situ Chlorophyll *a (*fluorometric*)* for all locations (on Web site only)

d. **Non-Continuous Water Quality Monitoring**

1. Periodic Water Quality Monitoring for Contour Mapping**.** Boat-mounted towed water quality surveys will be conducted, sufficient to produce complete, periodic water quality contour maps of the lower basin from the BU Bridge to the New Charles River Dam. Temperature, dissolved oxygen, pH and conductivity parameters will be collected by the boat-mounted, towed water quality survey. These surveys will be conducted on a monthly basis, beginning within sixty (60) days of the effective date of the permit to obtain background data. Corresponding Facility operating conditions at the time of sampling will be included with the towed water quality profiling data. After two full years of monthly mapping, the permittee shall conduct these surveys at least once per calendar quarter. During periods of icing conditions when boats cannot safely or adequately conduct this mapping, such mapping will not be required.

2. Nutrients and Other Sampling

Nutrient sampling will be collected at three locations, Stations A, B and C as shown in **Attachment B**. At each station, grab or in-situ samples will be collected at three (3) feet below the surface, three (3) feet above the thermocline, and three (3) feet above the bottom of the water column, in the hypolimnion. If no thermal stratification is observed, samples will be collected at three (3) feet below the surface, mid-depth and three (3) feet above the bottom of the water column. Samples will be analyzed for pH, turbidity, conductivity, salinity, dissolved oxygen, transmissivity, BOD_5, COD, nitrogen-ammonia, nitrogen-nitrate, nitrogen- nitrate+nitrite, nitrogen-nitrite, total nitrogen, Total Kjeldahl Nitrogen, total and dissolved phosphorus, orthophosphate, sulfate, sulfide, sulfite, and oxidation reduction potential. In addition, samples will be analyzed for **dissolved** metals, including copper, lead, zinc, cadmium, chromium, and nickel. At the time of sample collection, temperature, dissolved oxygen, pH, and conductivity (salinity) measurements will be taken at 3.0 ft. intervals from surface to bottom, as well as at the corresponding sample depths in the water column. Monitoring will begin within sixty (60) days of the effective date of the permit. The schedule for monitoring will be one sampling event at all stations some time during the last two weeks of January, the first two weeks of April, the last two weeks of July, and the first two weeks of November. Sampling at all stations must be completed on the same day. In

addition, the permittee must conduct once a week sampling of the above parameters, with the exception of metals sampling) from June 1 through September 30, coinciding with phytoplankton field sampling (see Section 14.e.10). Sampling will continue as long as the permit is effective.

3. Instream Total Residual Chlorine (TRC) Monitoring

The permittee shall monitor for instream TRC once per month. Sampling shall be conducted at the surface at Stations 2, 4 and 7 and consistent with other conditions in footnote 4 of Part 1. of this permit. This sampling shall be conducted concurrently with the effluent TRC monitoring, during or immediately after periods of chlorination at the Facility. The EPA reserves the right to waive this requirement after at least one year of sampling.

e. **Biological Monitoring**

An annual biological sampling program will begin no later than sixty (60) days after the effective date of the permit and occur annually for the effective period of the permit. The goals and objectives of the biological sampling program include (1) to expand the baseline biological studies, conducted in 1999, 2000, 2002 and 2003 by the permittee, including the fish sonic tagging studies, (2) to identify any changes in fish populations and migration patterns resulting from Facility operation; (3) to define the extent of habitat and tolerance temperatures for yellow perch; (4) to determine the efficiency of the fine mesh barrier surrounding the Facility water intakes; (5) to refine the understanding of the timing of and temperatures associated with the Charles River anadromous fish runs; and (6) to refine the understanding of the occurrence and nature of nuisance phytoplankton blooms.

1. Beach Seine Sampling

Beach seine collections will be made at four locations, designated Hyatt (S4), Storrow (S3), Lagoon (S2), and Feidler (S1) as shown on Attachment H.

Finfish will be sampled in the lower Charles River using a 100 foot by 6 foot, ¼-inch mesh nylon beach seine. Since previous sampling showed that the bottom at the Hyatt Station was generally free of obstructions during previous sampling events, two hauls will be made there while a single haul will be made at the remaining sites. To improve collection efficiency at the rocky collection sites, particularly Feidler Station, an electroshocker will be used inside the beach seine. Each haul will be standardized to the extent possible by walking one-third of the net perpendicular to shore, turning parallel to shore while deploying the middle third, then returning to shore while deploying the final one-third.

Sampling will begin during July of each year and will continue weekly through the end of November or until river herring are not collected for two consecutive weeks. For the first year, if the effective date of the permit is after August 31, the permittee

will initiate this sampling the following July. The sampling shall continue while the permit is effective.

All fish collected by beach seine will be identified, counted, and measured to the nearest millimeter in total length. When large collections of a single species are obtained, a subsample of 30 to 50 fish will be measured. The aggregate weight of this subsample shall also be recorded. In such cases, an attempt will be made to select the largest and smallest fish of the entire sample and record their lengths before obtaining a representative subsample.

Temperature, dissolved oxygen, pH and conductivity data will be collected at approximately two foot intervals from the surface to the bottom at each beach seine sampling event as part of the fish collection program.

2. Gill and/or Fyke Net Sampling

Station G1. Net samples will be collected to obtain information on fishes entering or residing in the Broad Canal, for comparison with those impinged on the Facility intake screens or barrier nets (**Attachment H**).

Station B1. Additional subsurface net collections will be taken in the Charles River lower basin, boat traffic permitting, to determine if fish are utilizing relatively deep areas (**Attachment H**).

Gill nets, each 100-ft long, 8-ft deep and consisting of four 25-ft monofilament panels constructed with ½, 3/4, 1, and 1.5-inch bar mesh, will be used unless successfully supplanted by fyke nets. Nets will be set for approximately 24 to 30-hour periods on each occasion.

In addition to gill net samples, fyke nets will be anchored on the bottom of the Charles River to provide additional information on deep-water habitation by Charles River fish. These nets will measure 3.5 feet in diameter at the mouth with two throats and 25 foot wings. They will be constructed of 0.5-inch bar mesh. Like the gill nets, they will be set for single overnight periods ranging in length from 24 to 30 hours. Fyke nets will be substituted for gill nets if program results indicate that equivalent data can be obtained.

Sampling will begin during the first full week of March of each year and will be conducted every week through November for the first year and then every two weeks for each following year. For the first year, if the effective date of the permit is after August 31, the permittee will initiate this sampling the following March. Sampling will continue while the permit is effective.

All fish obtained in the gill nets will be identified, counted, measured to the nearest millimeter total length, and weighed to the nearest gram. Approximate depth of capture will be determined by noting the position of each fish entangled in the net.

Temperature, dissolved oxygen, pH and conductivity (salinity) data will be collected at approximately meter intervals from surface to bottom during at each net location during initial deployment and retrieval of the nets.

3. Yellow Perch: Treatment of Captured Fish.

Any sampling of at least 30 large juvenile and adult perch collected in the beach seine and gill nets (if in good condition) will be tagged using individually numbered t-bar anchor tags.

From each individual, total length (mm), weight (g), sex and reproductive condition (when possible), and tag information will be recorded. Scale samples will be obtained for age determination. These data will provide information on growth in length and weight as well as mortality rates in the lower Charles River basin. As a component of the Annual Monitoring Report, this information will be compared with data from other locations in New England and elsewhere to assess if Charles River perch appear to grow slowly, suffer high mortality, or otherwise appear stressed.

To provide information on the depth at which yellow perch occur at different times of year and at different locations, the permittee will explore the feasibility of using boat-mounted, side scanning hydroacoustics to characterize location and make-up of fish in the areas of the lower Charles River basin. Limited deployment of gill nets or Fyke nets would be needed to validate the sonar targets. EPA will consider, as a sampling substitute, the use of such a hydroacoustic method to characterize the location and make-up of yellow perch (as well as other populations of fish) as described above in order to reduce the frequency of net sampling. Any proposal to substitute hydroacoustic sampling must be submitted in writing.

4. Ichthyoplankton Sampling

Ichthyoplankton sampling will be conducted at the five following stations in the Lower Charles River basin:

Station I7 (Soldiers Field), Station I5 (MIT), Station I4 (Charles River), Station I3 (Old Channel) and Station I2 (Museum of Science) (**Attachment H**)**.**

Each station will be made up of two to three transects, oriented parallel to the shore (spaced equally near the Cambridge bank, at mid-river and near the Boston bank), with two discrete depths sampled per transect (20% depth from the surface and 80% depth from the surface).

At each depth of each transect for a station, duplicate samples will be collected with 33-cm diameter paired “bongo” nets constructed of 0.333-mm nylon mesh. Tow speeds will be maintained at 1 to 1.3 m/sec (2 to 2.5 knots), each tow covering a

straight-lined transect. Each tow will be approximately 6 to 9 minutes in length depending on the abundance of phytoplankton, inorganic debris, and detritus. Filtration volumes will be determined for each tow using calibrated General Oceanics 2030R flow meters or equivalent, mounted in each net mouth; these will average 100 m^3 of water.

Following each tow, the nets will be washed and the contents of the cod end transferred to a one-liter jar containing sufficient Formalin to provide a 5-10% Formalin-to-sample solution. Information regarding time of day, flow meter readings, station, and date will be recorded on waterproof tags placed in each jar and in the field logbook. In addition, water temperature, pH, conductivity, and dissolved oxygen will be measured and recorded at each transect of each station at the surface and at one-meter intervals to the bottom.

Weekly sampling will begin on the effective date of the permit if the effective date falls within the March - August time frame, or otherwise begin in the first week of March of the following year. Ichthyoplankton sampling for this period will continue for the effective period of the permit.

Temperature, dissolved oxygen, pH and conductivity (salinity) data will be collected at approximately meter intervals from surface to bottom in the immediate vicinity of the ichthyoplankton transect.

All fish eggs and larvae will be identified and counted to the lowest possible taxonomic level. Counts will be expressed as numbers of individuals per 100 m^3 of water. Larval river herring will be examined for condition to provide qualitative information on the general probability of survival.

For the Monitoring Plan, ichthyoplankton entrained through the barrier nets will be enumerated separately, once per week during the period of April 15 through August 30, using a trash pump or equivalent to pump water on the inside of the barrier net through a 0.333 mm mesh, 60-centimeter plankton nets. Two samples will be collected. Each pumped sample will require 60 minutes to collect and consist of approximately 100-125 m^3 of water. Sample volume will be determined with a Signet flowmeter, or equivalent, mounted in the discharge line and wired to an analog readout unit with digital volume accumulator. For each 60 minute sample, the intake hose will sample for approximately 30 minutes at a near-surface location inside the barrier net, and 30 minutes at a near-bottom location. To reduce net extrusion and abrasion of larvae, the plankton net receiving water from the pump will be partially submerged in the Broad Canal. Results from each year of sampling will be reviewed as a measure of the barrier net's exclusion effectiveness. This requirement may be waived by EPA, in writing, during the permit term.

5. River Herring Spawning Migration Monitoring

Lock Number 3 of the New Charles River Dam is the large lock that is used to pass anadromous fish. This station will be used to monitor the passage of anadromous fish into the Charles River.

A **Watertown Dam Station** will also be monitored to estimate the numbers and duration of anadromous fish runs past that station.

At **Lock Number 3**, fish will be collected with continually attended small mesh gill nets or trammel nets set for reasonable periods of time. The passage of fish at the New Charles River Lock and Dam and the Watertown Dam Stations may also be monitored using hydroacoustics or other techniques agreed to by EPA and DEP, in writing. A program, including suggested refinements and quality assurance of the hydroacoustic sampling methods described by the permittee in Exhibit A (River Herring Run Size Estimation) of the July 23, 2003 letter submitted to EPA by the permittee, would be acceptable.

When net sampling is conducted, the stations will be sampled three times per week, beginning in April and continuing through June, or until river herring are not collected for an entire week. This phase of the monitoring studies is scheduled to be conducted annually for the effective period of the permit because of the expected variability in the size and occurrence of each year's migration.

Data will be collected (1) to establish when different anadromous species enter the river, (2) to allow subsamples to be examined for the ratio between alewives and blueback herring, (3) to determine when the alewife in-migration is complete, and (4) to gather information on the timing and volume of anadromous fish that reach the Watertown Dam.

6. Treatment of Captured Fish (River Herring)

The river herring sonic tracking program conducted in 2001 and 2003 by the permittee will be repeated annually as part of the monitoring program. The tracking program will begin within sixty (60) days of the effective date of the permit and be conducted during April through June each year for the effective period of the permit.

Approximately 75-85 immigrating adult river herring will be collected in the Charles River New Dam and Lock System between April and June and tagged with 20 and 60-day sonic tags inserted orally into the stomach. Tagged herring movements will be monitored with both fixed and mobile hydrophones. Mobile gear will allow individual fish to be tracked as they move through the lower basin. Fixed receivers will record the presence of fish that are not being individually tracked at any given time, as well as their general position during times when the mobile system is not in use. The boat-mounted mobile receiver will be connected to two hydrophones, an omni-directional hydrophone used to locate the general position of specific fish and a directional hydrophone to more accurately pinpoint position. With the boat-mounted station, fish will be tracked to determine movement patterns

in the area between fixed stations. A digital global positioning system (DGPS) will be used with the mobile unit to record boat location as various fishes are monitored. A fish's location may be triangulated with the aid of a sighting compass and directional hydrophone. Information available in the literature and confirmed in 2001 indicates that anadromous herring continue to swim at night but that little directional movement occurs. To confirm this in the Charles River, several of the tracking periods will include nighttime hours.

Fixed receiver locations established in past years programs will also be used during the post- operation survey. The lower Charles River will be divided into four sections. These areas are from the New Charlestown Dam to the Museum of Science, the Museum of Science to Longfellow Bridge, Longfellow Bridge to Harvard Bridge, and upstream of the Harvard Bridge. As river herring move upstream, they will pass the fixed stations, which detect and record the signal emitted by each tag. The fish's identification number will be determined from the tag frequency and pulse interval. Direction of travel will be determined by reviewing the time each fish passed each respective hydrophone. Throughout the Lower Basin of the Charles River (New Dam to Harvard Bridge), four fixed hydrophone systems, receivers, and data loggers will be secured to bridges and piles in weather-tight boxes. Stations will include above the Museum of Science, Boston shore, above the Museum of Science, Cambridge shore, at the Longfellow Bridge, and at the Harvard Bridge. Both the Longfellow Bridge and Harvard Bridge stations will each have two hydrophones attached to dual input scanning receivers. Hydrophones between the Museum of Science and the Longfellow Bridge will face across the River to determine if river herring travel across the River toward the Facility or typically follow the old channel near the Boston side of the River to upstream locations. Fish which have moved upstream of the Harvard Bridge will be documented.

Periodically during each mobile tracking day, hydrographic data will be collected at several locations in the lower basin to record water temperature, conductivity, and dissolved oxygen. Locations will include deep areas where saline waters accumulate and dissolved oxygen is likely to be reduced. Readings will be taken at the surface and at three-foot depth intervals to bottom. Additional readings will be taken on non- tracking days in conjunction with the ichthyoplankton sampling program.

When all data from the fixed stations and the mobile station are collected, the location of each fish shall be displayed at fixed points in time and their path through the lower Basin shall be presented using mapping software such as ArcView. This will show the movement of tracked fish in the lower Charles River Basin. The objective of this monitoring will be to (1) estimate the rate of alewife and blueback herring travel through the lower Basin, (2) estimate the amount of time each fish spends in the northeast basin near the Facility, (3) determine the depth of travel for those individuals fitted with depth sensing tags, and (4) obtain the corresponding water temperature at the depths and locations where fish were documented. Mean transit

time through the river segments will be established. Deviation from the mean will be presented in tabular and graphical form for each fish. Cumulative frequency distributions can be prepared to display portions of total time in the lower basin in which fish are in the Broad Canal or the area around Kendall Station. These data will be compared with data collected in all previous years as part of the Annual Monitoring Report.

7. Fine-Mesh Barrier Study

For the first year of the permit only, the fine-mesh barrier test study completed by the applicant in 2000 (February 2001 NPDES application, Volume II of II) will be repeated beginning no later than sixty (60) days after the effective date of the permit. If this date falls between the period of May through July, the permittee is still required to conduct this sampling and increase its sampling frequency as necessary to obtain as close to the 13 samples as feasible. The results of this study shall be presented in the first AMR.

This testing will consist of the following: Ichthyoplankton samples will be taken from the Broad Canal inside and outside the fine-mesh barrier to determine exclusion factors. A technique will also be developed to enumerate and evaluate the condition of fish larvae and eggs impinged on the barrier net at this time. Sampling will be completed on 13 occasions, three times in May, six times in June, and four times in July. Six of the 13 collection periods will be conducted after sunset. On each occasion, twelve (12) sets of samples will be taken, with each set consisting of an outside-barrier, an inside-barrier, and a surface of the barrier net sample. These sampling events shall include all three intake structures and occur under a variety of operating conditions. The Facility operating conditions at the time of the sampling will be included in the report.

Samples inside and outside of the barrier nets will be collected using a Homelite gasoline-powered, 4-inch trash pump, or equivalent, discharging to a 0.333-mm mesh plankton net. Each pumped sample will require 60 minutes to collect and consist of approximately 100-125 m^3 of water. Sample volume will be determined with a Signet flowmeter, or equivalent, mounted in the discharge line and wired to an analog readout unit with digital volume accumulator. During each 30-minute interval the intake hose will sample either a near-surface or a near-bottom sample. To reduce net extrusion and abrasion of larvae, the plankton net receiving water from the pump will be partially submerged in the Broad Canal. After each sample is collected, the nets will be washed and the contents of the cod end transferred to a one-liter glass jar containing sufficient Formalin to provide a 5-10% Formalin-to-sample solution.

To estimate numbers and condition of eggs and larvae impinged on the barrier, a swimming pool vacuum fitted with a 0.333-mm mesh bag or other, more refined

sampling method will be used. Suction for the vacuum will be supplied through a standard garden hose by an electric irrigation pump. At the beginning of each day or night sampling interval, a section of the mesh barrier measuring approximately 6 by 13 feet (78 ft^2) will be cleaned. At the end of each 3 to 4-hour sampling interval, the same section will be recleaned to estimate impingement rates. A method will be developed to estimate the condition of the eggs and larvae before the samples are preserved. Impingement samples will be preserved in 5-10% Formalin-to-sample solutions as with the inside and outside samples.

All fish eggs and larvae will be identified to the lowest distinguishable taxonomic category and counted. A minimum of 20 larval fishes will be measured to the nearest 0.1 mm from each sample using an ocular micrometer.

Concurrent with this sampling to be conducted on 13 occasions, the permittee shall calculate or measure the representative through screen velocity at the barrier net, to within an accuracy of one hundredth of a foot per second. This sampling is necessary to verify that the approach velocity is about 0.05 feet per second (fps) as proposed in the permit application and that the 0.5 fps through screen velocity performance standard is being attained (see Section 11 of the permit).

8. Entrainment Sampling

In order to supplement data collected as part of the Barrier Net Study (Section 14.e.7) and to fully assess potential entrainment losses, a more comprehensive program will also be conducted to sample the entrainment of ichthyoplankton. Ichthyoplankton populations will be sampled weekly from March through August and be conducted concurrent with the impingement sampling detailed below. Single samples will be taken from the Facility discharge. Samples will be taken three times per week, separated by at least one day, with one in the morning, one in the afternoon, and one in the night. For example, Monday morning, Wednesday night, Friday afternoon could be used as sampling times. These samples will improve the understanding of the numbers of fish eggs and larvae entrained through the proposed fine-mesh barrier at the Facility.

All ichthyoplankton samples will be returned to a laboratory for microscopic analysis. All fish eggs and larvae will be identified to the lowest distinguishable taxonomic category and counted. Any juvenile fish taken in the plankton tows will be included with the ichthyoplankton counts. Common and scientific names will follow Robins et al. (1991). Counts will be converted to numbers per 100 m^3 of water using the flowmeter information.

As part of the Annual Monitoring Report, adult equivalents of the eggs and larvae estimated to be lost from Facility entrainment and barrier impingement will be calculated and submitted with the raw data. Entrainment reduction rates (barrier net performance) will be calculated by using baseline impingement and entrainment

values, calculated by the permittee. The Facility's baseline entrainment value will be calculated as follows: A baseline multiplication factor will be determined by dividing available Broad Canal ichthyoplankton density values documented when the barrier net was not in place by the Facility entrainment estimate for the same time period during the same year. This baseline multiplication factor will be applied to ichthyoplankton densities measured in the Broad Canal during a year when the barrier net is in place to estimate potential entrainment (assuming no barrier net was in place). Potential entrainment will be compared with actual entrainment measured with the barrier net installed to estimate reduction rates. Another method may be substituted for this way of determining baseline Facility entrainment rates, based on comments received during the public comment period. These I/E estimates and other factors (such as maximizing the survival of impinged eggs and larvae) shall be compared to the I/E goals in Section 11 of the permit. If the permittee is not meeting the I/E reduction goals set forth in permit Section 11, then it shall propose to EPA (in the AMR or more frequently) alternative barrier net designs and/or additional barrier nets or other devices to further reduce I/E rates to attain the I/E goals in this permit, as described in Section 11. Upon a notice of acceptance by EPA, the permittee shall implement these changes as modified by EPA's comments.

9. Impingement Sampling

An impingement sampling program will be established by the permittee within **ninety (90) days of the effective date of the permit**. While the barrier nets are in place, between February 15th and November 1, impingement monitoring shall take place at the barrier nets and for the rest of the year at the traveling screens. Monitoring shall be conducted once per week at one panel or section of barrier net at each of the intake screens. For the time periods when the barrier nets are not in place, a screenwash monitoring and alert program, consistent with monitoring begun in 1999 by the permittee, will resume and continue through the effective period of the permit. The purpose of the program is to provide an estimate of the number and species of finfish impinged on the barrier nets or in each of the three circulating water traveling screens at the Facility. All debris washed off the screens will be collected in a wire mesh basket and the finfish will be placed in plastic bags with a label containing information relative to date, time of day, unit number, operator, and any general comments. Samples will be frozen and processed by a trained fisheries biologist on a weekly basis. All fish will be identified to species, counted, and measured to the nearest millimeter, total length. Adult river herring will be examined internally to determine gonad condition, i.e., whether fish are in pre- or post-spawning condition. Data will be maintained separately for the three intake structures. An attempt will be made to determine the reproductive condition and sex of all fish collected, if possible.
Impingement rate per hour for each unit and the monthly rate will be calculated. This

program shall be in place for the effective period of the permit.

10. Phytoplankton Monitoring

Phytoplankton samples will be collected from the Charles River during the effective period of the permit, to investigate occurrence and nature of nuisance blooms. Once a week between June 1 and September 30, one liter phytoplankton samples will be collected at three locations, Stations A, B and C as shown on **Attachment B**. At each location, samples will be collected in duplicate at depths where the light level, relative to surface solar illumination, is 100%, 50%, 25%, 10%, 1%, and 0%. In conjunction with each collection series at each location, chlorophyll *a* will be measured with a fluorometer at each sample depth and water temperature, conductivity, and dissolved oxygen will also be recorded.

Phytoplankton samples will be preserved in Lugol's Solution and returned to a laboratory for analysis. Phytoplankton will be identified to the lowest possible taxonomic category and counted. Counts will be expressed as numbers of cells per milliliter.

Water collection for nutrient water chemistry shall be performed once a week between June 1 and September 30, concurrent with the phytoplankton sampling above. Samples will be analyzed for all of the parameters listed in Section 14.d.2. and all the sampling procedures of that section will be followed.

f. **Regular Monitoring Program Evaluation**

1. The permittee shall evaluate the Monitoring Program (MP), its collected data and protocols annually in the Annual Monitoring Report, at a minimum. The permittee may make recommendations for improvements to the Monitoring Program, including further monitoring or studies and/or reductions in monitoring or studies. Additional sampling locations and any other justified analytical or program improvements or changes may be authorized in writing by EPA.

2. The permittee's evaluation of the MP shall include the following at a minimum:

i. An annual review of the sampling and analysis plan and data;

ii. An identification of change in the aquatic or biological system;

iii. An assessment of statistically significant change;

iv. An assessment of biological importance;

v. An evaluation of the likelihood that the Facility contributed to the change; and

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

This evaluation and recommendations, if any, shall be submitted with the Annual Monitoring Report for review, approval, disapproval or modification by EPA.

3. Monitoring Program Improvements

This permit authorizes improvements, as approved by EPA, to the MP when indicated by results and analysis of monitoring data. Acceptable data from other sources may also be considered. Analysis of data from parameters such as temperature, delta T, and rates of impingement or entrainment and other biological monitoring identified in the MP may indicate the need for monitoring program enhancements or improvements.

Within thirty (30) days of authorization of MP improvements, the permittee shall update and resubmit the MP to include any such improvements.

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

1. Additional or reduced sampling stations;
2. Increased or decreased 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 Facility impacts;
6. Additional predictive models such as species-specific population, community, and/or trophic level risk, or
7. Elimination or reduction of monitoring requirements that EPA and DEP

determine are no longer necessary.

g. **Monitoring Program Summary**. A summary of monitoring requirements is included in **Attachment I.**

15. Contingency for Reopener

If any of the monitoring conducted pursuant to this permit and/or any related studies indicate that there are water quality violations, or that the BIP is not being adequately protected due to the discharges from the Facility, or a TMDL is approved for the Charles River basin, then this permit may be modified to include numerical limitations and/or requirements to address these violations. Permit modification will be conducted according to 40 CFR §122.62, 122.63, 122.64 and 124.5.

PART B. MONITORING AND REPORTING

Monitoring results obtained during the previous month shall be summarized for each month and reported on separate discharge monitoring report (DMR) forms and other forms as described in **Attachment G** and postmarked no later than the 15th day of the month following the effective date of the permit. An **Annual Monitoring Report** is also due no later than 90 days after the effective date of the permit and annually thereafter, as described in Section 14.a. In addition, a record of real-time, continuous monitoring data in an electronic format must be provided to EPA and/or DEP upon request, within a reasonable time period. The electronic format must be readable with a generally available spreadsheet software program.

Mirant Kendall, LLC., may assert a business confidentiality claim with respect to part or all of the information submitted to EPA in the manner described at 40 CFR Part 2.203(b). Information covered by such a claim will be disclosed by EPA only to the extent, and by means, of the procedures set forth in 40 CFR Part 2, Subpart B. If no such claim accompanies the information when it is submitted to EPA, it may be made available to the public by EPA without further notice to Mirant Kendall. Effluent information shall not be regarded as confidential.

Signed and dated originals of the DMRs, and all Annual Monitoring Reports (AMR) required herein, shall be submitted to the Director and the State at the following addresses:

U.S. Environmental Protection Agency
Water Technical Unit (SEW)
P.O. Box 8127
Boston, Massachusetts 02114

The State Agency is:

Massachusetts Department of Environmental Protection
Bureau of Resource Protection
Northeast Regional Office
1 Winter Street
Boston, MA 02108

In addition, copies of all DMRs only and all other notifications shall be submitted to the following address:

Massachusetts Department of Environmental Protection
Division Of Watershed Management
Surface Water Discharge Permit Program
627 Main Street, 2nd Floor
Worcester, Massachusetts 01608

Copies of all notifications, submittals, continuous monitoring data requests and QAPPS, with the exception of DMRs and AMRs shall be sent to the following address:

U.S. Environmental Protection Agency
Massachusetts Office of Ecosystem Protection (CPE)
One Congress Street
Suite 1100
Boston, Massachusetts 02114
Attention: George Papadopoulos

The Annual Monitoring Reports only will also be submitted to the following:

Massachusetts Coastal Zone Management
251 Causeway Street, Suite 800
Boston, MA 02114
Attention: Todd Callaghan

and

Massachusetts Division of Marine Fisheries
Annisquam River Marine Fisheries Station
30 Emerson Avenue
Gloucester, MA 01930
Attention: Jack Schwartz

PART C. STATE PERMIT CONDITIONS

This discharge permit is issued jointly by the U. S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (DEP) under federal and state law, respectively. All the terms and conditions of this permit are hereby incorporated into and constitute a discharge permit issued by the Commissioner of the MA DEP pursuant to M.G.L. Chap. 21, §43.

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 affect 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 a 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 shall remain in full force and effect under state law as a permit issued by the Commonwealth of Massachusetts.

TABLE 1

Treatment Chemicals Used at Mirant Kendall

Chemical Name	What Chemical is Used For	Hazardous Constituents and Chemicals of Concern	Where in Process Used	Approximate Amount Used per Year in gallons	Concentration in Process Equipment	Aquatic Protection Level
Spectrus DT1404/ Sodium Bisulfite	Dechlorination agent	Sodium bisulfite	Prior to UF reject tank and in UF permeate line prior to RO	1,534	10 to 50 ppm	125 ppm as Spectrus
Optisperse HP54439	Reduce boiler iron oxide buildup	None	Boiler Units	3,038	3.2 ppm feed rate	5,000 ppm as Optisperse
Hypersperse MDC150	Reduces scale precipitates and particulate fouling in RO system	None	RO system	1,087	5 ppm constantly in influent to RO system	3,310 ppm as Hypersperse
Steamate NA0240	Condensate system corrosion control	40% morpholine	Boiler Units	1,532	1.5 ppm feed	100 ppm as Steamate
Cortrol OS5607	Boiler oxygen scavenger	Carbonic dihydrazide	Boiler Units	770	Fed at 5 ppb	96 ppm as Cortrol
Sulfuric acid	Neutralization agent	Corrosive	Prior to UF reject tank and prior to mixed bed waste tank	Variable; depends on the buffering capacity of the river water	96% sulfuric feed rate a function of the pH	6-9 pH units
Sodium hydroxide	Cleaning agent to reduce fouling	Corrosive	In UF during backwash and prior to mixed bed waste tank	Variable; depends on the buffering capacity of the river water	50% sodium hydroxide feed rate a function of pH	6-9 pH units
Sodium hypochlorite	Biocide	Free chlorine	Influent to water treatment prior to UF and in plant intake water	Variable; depends on the chlorine demand capacity of the river water	20% solution, UF influent at 1-2 ppm, and 35-50 ppm in backflush. Also fed though each intake at a rate of 0.1 ppm free product to control biofouling	0.1 ppm free chlorine

Source: Mirant Kendall Letters, April 11 and April 24, 2002.