UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND - REGION I
ONE CONGRESS STREET
BOSTON, MASSACHUSETTS 02114

FACT SHEET

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

NPDES PERMIT NO.: **MA0004928**

PUBLIC COMMENT PERIOD:

PUBLIC NOTICE NO.:

NAME AND ADDRESS OF APPLICANT:

Mirant Canal, L.L.C.
9 Freezer Road
Sandwich, MA 02563

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

Mirant Canal, L.L.C.
9 Freezer Road
Sandwich, MA 02563

SIC CODE: **4911** NAICS Code(s): **221112**

RECEIVING WATER: **Cape Cod Canal** **(Basin code 96 CAPE)**

CLASSIFICATION: **Class SB**

CURRENT PERMIT ISSUED: **6-23-1989**
EXPIRED: **6-23-1994**
RE-APPLICATION: **5-02-1994**
SUPPLEMENT TO APPLICATION: **10-30-2003**

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1.0 Proposed Action, Type of Facility, and Discharge Location

Mirant Canal, LLC, is a 1120 megawatt (MW) fossil fuel electrical generation facility (referred to hereafter as either Canal Station, the Station or the Facility). The Station is a "base-load" facility, having an average yearly capacity utilization rate of 48%. Electricity is generated by means of two 560 MW_{net} oil/gas fired steam turbine units. Unit 1 began commercial operation on July 1, 1968, and uses #6 fuel oil. Unit 2 began commercial operation on February 1, 1976, and has dual fuel capability (#6 oil or natural gas). There are also two smaller Babcock Wilcox auxiliary boilers.

Canal Station discharges pollutants to, and withdraws cooling water from, the Cape Cod Canal (the Canal) in Sandwich, MA. The Station discharges various pollutants, including heat, to the Canal. Steam turbine condenser waste heat is rejected to the Canal by means of a once-through cooling water system. Water for this cooling system in withdrawn from the Canal by the Station through two cooling water intake structures and the heated water is then discharged back to the Canal through two of the Facility's discharge outfalls. The pollutant discharges to the Canal from the Station include the following:

- once-through cooling water,
- intake screen sluice water,
- ash sluice water,
- metal cleaning waste (feed water heater chemical cleaning, equipment cleaning, precipitator wash water, air preheater wash water, boiler fireside wash water, stack and breach wash water, boiler chemical cleaning),
- low volume waste (floor drains, boiler blowdown, boiler seal water, laboratory wastewater, demineralizing and condensate waste water) and
- storm water.

Under CWA §§ 301(a), 316 and 402, Canal Station's pollutant discharges and cooling water withdrawals must receive authorization from a National Pollutant Discharge Elimination System (NPDES) permit issued by the U.S. Environmental Protection Agency (EPA). Under the Massachusetts Clean Waters Act, the Station must also obtain authorization from a state permit issued by the Massachusetts Department of Environmental Protection (MA DEP). Canal Station has in the past obtained the necessary federal and state permits. EPA and the MA DEP last reissued the Station federal and state permit number MA0004928 on June 23, 1989. This permit was scheduled to expire on June 23, 1994, but it has been administratively continued in effect pending reissuance of a new permit.

On May 2, 1994, the former owners of Canal Station applied to EPA and the MA DEP for reissuance of the Facility's NPDES permit. In response to an April 30, 2003, letter from EPA requesting information pursuant to Section 308 of the Clean Water Act (CWA), the Station supplemented its permit application with a submittal dated October 30, 2003. The submittal provided: 1) updated permit renewal application forms and data; 2) Canal Station's CWA § 316(a) thermal variance request; 3) impingement and entrainment data and an evaluation of alternative cooling water intake structure technologies; 4) a discussion of the facility's chlorination system relative to a June, 1999 impingement incident; and 5) a description of existing conditions at the plant including flow schematics and a chemical inventory.

The October 30, 2003, submittal contained a document entitled "Evaluation of Fish Protection Alternatives for the Canal Generating Station," prepared by Alden Laboratories, Inc. (Alden Labs). This report provides the most recent impingement and entrainment data for the Station and assesses a range of alternative technologies that could be used to reduce entrainment and impingement mortality. The report explains that the Station dropped several alternatives from further consideration because it believed they were ineffective. The report also provides detailed information, including conceptual designs and estimated costs, about the six remaining, potentially viable options.

EPA currently intends to reissue the Facility's NPDES permit. This Draft Permit proposes to continue to authorize the discharge of "once-through" cooling water but is based on the assumption that the facility will employ specific measures to reduce impingement mortality and entrainment. This is discussed further below, along with other aspects of the new Draft Permit.

2.0 Description of Discharge

Refer to Section 4.3 of this Fact Sheet for a description of the discharges associated with each outfall location. A schematic drawing of the flow of water at the facility and the various discharges from the facility is presented on Attachment A.

A site location plan is presented on Attachment B.

3.0 Permit Limits and Conditions

The Draft Permit's proposed effluent discharge and cooling water intake limits, monitoring requirements, and implementation schedules may be found in Part I (Effluent Limitations and Monitoring Requirements) of the Draft Permit.

4.0 Basis of Permit Limits

4.1 Permit Limits, Generally

The Clean Water Act (CWA) prohibits the discharge of pollutants from point sources to waters of the United States without authorization from a National Pollutant Discharge Elimination System (NPDES) permit, unless the CWA specifically exempts a particular type of point source discharge from requiring a permit. The NPDES permit is the mechanism used to apply the

CWA's pollution control standards and monitoring and reporting requirements directly to particular facilities. This draft NPDES permit was developed in accordance with the CWA, EPA regulations promulgated thereunder, and any other applicable federal and state legal requirements. The regulations governing the EPA NPDES permit program are generally found at 40 C.F.R. Parts 122, 124, 125, and 136.

When developing permit limits, EPA must apply both technology-based and water quality-based requirements. To the extent that both may apply, whichever is more stringent governs the permit limits. Criteria and standards for the imposition of technology-based treatment requirements in permits under Section 301(b) of the CWA, including the application of EPA-promulgated effluent limitations and case-by-case determinations of effluent limitations under Section 402(a)(1) of the CWA, are set out in 40 C.F.R. Part 125, Subpart A. Development of water quality-based permit limits is addressed in, among other provisions, CWA §§ 301(b)(1)(C) and 401, as well as 40 C.F.R. §§ 122.4, 122.44, 124.53 and 124.55.

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

In general, for facilities like Canal Station, technology-based effluent limitations must be complied with as expeditiously as practicable, but in no case later than either three years after the date such limitations were established or March 31, 1989, whichever comes first [see 40 C.F.R. §125.3(a)(2)]. Since the statutory deadline for meeting any applicable technology-based effluent limits has already passed, NPDES permits must require immediate compliance with any such limits included in the permit.

In the absence of published technology-based effluent guidelines, the permit writer is authorized under Section 402(a)(1)(B) of the CWA to establish appropriate technology-based effluent limitations (*e.g.*, BAT limits) on a case-by-case basis using best professional judgement (BPJ). [See also 40 C.F.R. § 125.3.]

Water-quality based limitations are required in NPDES permits when EPA and the State determine that effluent limits more stringent than technology-based limits are necessary to maintain or achieve state or federal water-quality standards. See CWA §§ 301(b)(1)(C) and 401. State Water Quality Standards provide a classification for all the water bodies in the state and specify the "designated uses" and numeric and narrative water quality criteria that water bodies in each classification should be able to achieve. For example, a water body might be given the "SA" classification and the designated uses and numeric and narrative criteria for SA waters might include things like providing high quality fish habitat (a designated use), maintaining natural diurnal variations in water temperature (a narrative criterion), and not raising ambient water temperatures more than 4°C (a numeric criterion). State Water Quality Standards also contain antidegradation requirements to ensure that once a use is attained it will not be degraded. Permit limits must then be devised so that discharges and cooling water withdrawals do not cause violations of these Water Quality Standards.

The permit must limit any pollutant or pollutant parameter (conventional, non-conventional, toxic and whole effluent toxicity) that is or may be discharged at a level that causes, or has the "reasonable potential" to cause or contribute to, an excursion above any water-quality criterion. See C.F.R. § 122.44(d)(1). An excursion would occur if the projected or actual in-stream concentration exceeds the applicable criterion. In determining "reasonable potential," EPA considers: (1) existing controls on point and non-point sources of pollution; (2) pollutant concentrations and variability in the effluent and receiving water as determined from the permit application, the permittee's monthly Discharge Monitoring Reports (DMRs), and State and Federal Water Quality Reports; (3) the sensitivity of the species to toxicity testing; (4) the known water quality impacts of processes on wastewater; and, where appropriate, (5) the dilution of the effluent that would be provided by the receiving water.

When using chemical-specific numeric criteria to develop permit limits, both the acute and chronic aquatic-life criteria, expressed in terms of maximum allowable in-stream pollutant concentrations, are used. Acute aquatic-life criteria are considered applicable to daily time periods (maximum daily limit) and chronic aquatic-life criteria are considered applicable to monthly time periods (average monthly limit). Chemical-specific limits are allowed under 40 C.F.R. § 122.44(d)(1) and are implemented under 40 C.F.R. § 122.45(d). In the Draft Permit for Canal Station, the Region has established, pursuant to 40 C.F.R. § 122.45(d)(1), maximum daily and average monthly discharge limits for specific chemical pollutants to satisfy Water Quality Standards.

For this and other power plants, the facility's design flow is used when deriving constituent limits for daily and monthly time periods, as well as weekly periods where appropriate. Also, the dilution provided by the receiving water is factored into this process. Narrative criteria from the State's Water Quality Standards often provide a basis for limiting toxicity in discharges where: (1) a specific pollutant can be identified as causing or contributing to the toxicity but the state has no numeric standard; or (2) toxicity cannot be traced to a specific pollutant. See 40 C.F.R. § 122.44(d)(1).

Under CWA § 401, EPA may not issue a NPDES permit unless it first obtains a certification from the state confirming that all water-quality standards will be satisfied or the state waives its certification rights. If the state issues a certification with conditions, then the permit must conform to the conditions. See 40 C.F.R. §§ 124.53 and 124.55.

As stated above Water Quality Standards include: (1) designated uses for a water-body or a segment of a water-body; (2) numeric and/or narrative water quality criteria to protect the designated use(s); and (3) antidegradation requirements to ensure that once a use is attained it will not be degraded. The Massachusetts Surface Water Quality Standards, found at 314 C.M.R. 4.00, include these elements. The State will limit or prohibit discharges of pollutants and associated cooling water withdrawals to assure that the applicable Water Quality Standards for the receiving waters are satisfied. These standards also include requirements for the control of toxic constituents and require that EPA criteria, established pursuant to Section 304(a) of the CWA, shall be used unless site-specific criteria are established. EPA has determined that the conditions of the proposed Draft Permit will satisfy Water Quality Standards.

The Draft Permit's effluent monitoring requirements have been established under the authority of CWA §§ 308(a) and 402(a)(2) and in accordance with 40 C.F.R. §§ 122.41(j), 122.44(i) and 122.48. The monitoring program in the permit specifies routine sampling and analysis which will provide continuous, representative information on the levels of regulated materials in the waste water discharge streams. The approved analytical procedures are to be found in 40 C.F.R. Part 136 unless other procedures are explicitly required in the permit.

The CWA's anti-backsliding requirements prohibit a NPDES permit from being renewed, reissued or modified with less stringent limitations or conditions than those contained in the previous permit unless an exception to the anti-backsliding requirements applies. See CWA §§ 402(o) and 303(d)(4) and 40 C.F.R. §122.44(l)(1) and (2). EPA's anti-backsliding provisions found at 40 C.F.R. §122.44(l) generally prohibit the relaxation of permit limits, standards, and conditions. The Draft Permit's limits for Total Suspended Solids (TSS) and Oil and Grease for sampling locations 011 and 012 and the maximum daily limit for chlorine at location 001 are in part based on anti-backsliding requirements.

In addition to technology-based and water quality-based requirements, limits for thermal discharges may potentially be based on a variance from such requirements under CWA § 316(a). Furthermore, permit limits on cooling water withdrawals may be imposed in a NDPES permit under CWA § 316(b). The requirements of CWA § 316(a) and (b) are discussed in further detail in Section 5 of this Fact Sheet.

The permit must also satisfy the requirements of the Endangered Species Act (ESA) and the essential fish habitat (EFH) provisions of the 1996 Amendments (PL 104-297) to the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801 et seq. (1998)). These requirements are discussed further in Section 7 and Section 6, respectively.

4.2 Facility Information

The Station is located on the east bank of the Cape Cod Canal in Sandwich, Massachusetts. There are two intake flumes used to withdraw canal water for condenser cooling. One intake structure is dedicated to the Unit 1 condenser and the other is dedicated to the Unit 2 condenser. Each intake has two intake pumps. Unit 1 has two 85,000 gallons per minute (gpm) pumps and Unit 2 has two 95,500 gpm pumps. A total intake flow of 361,000 gpm (a flow equivalent to 518 million gallons per day (mgd)) may be attained with both Units operating. Both of the intake screen washes discharge to a return flume located between the intake flumes. Boiler makeup water and other non-potable process water needs are obtained by ground water wells.

There are five permitted discharges at the Station. Three discharges, Outfall locations 010, 011 and 012, are internal process waste locations (See Section 4.3 of this Fact Sheet (Permitted Outfalls) for more information) which flow to the main discharge flume (Outfall 001). The main plant discharge location (Outfall 001) is a 750-foot long, 25-foot wide, open flume which runs parallel to the Cape Cod Canal. The end of the flume is equipped with a buried conduit leading to a submerged slot diffuser and wastewater exits the flume through the diffuser into the Cape Cod Canal. Most of Canal Station’s condenser cooling water and internal plant process wastewater, and some of its storm water, discharge through this location.

The other discharge location into the Canal (Outfall 002) is actually the former Unit 1 discharge flume which is located between the Unit 1 and 2 intake flumes. Intake screen wash water from both the Unit 1 and Unit 2 intakes discharge to the Canal through this flume (Outfall 002) along with approximately 3 mgd of condenser cooling water from the main discharge flume described above (Outfall 001). The facility maintains that the condenser water discharge through Outfall 002 is needed to remove debris that accumulates in the Outfall 002 flume.

Storm water from the Station discharges either to the Cape Cod Canal through the main discharge flume or to the soil from on-site swales. During heavy rains, the swales may discharge directly to the Cape Cod Canal. The Station continues to operate its stormwater system under the current Multi-Sector General Permit for Industrial Activities (MAR05B927).

4.2.1 Discharge Requirements in the Current Permit

Canal Station’s current permit (issued June 23, 1989) contains monitoring requirements for the following outfall locations:
Outfall 001 - condenser cooling water
Outfall 002 - intake screen sluice water and condenser cooling water for flushing the flume
Outfall 010 - Unit 1 floor and equipment drains
Outfall 011 - equipment washes, chemical cleaning, ash sluice water
Outfall 012 - demineralizer and condensate polisher wastes and Unit 2 floor drains

Table 4.1: Current Permit Effluent Limitations

Parameter	Discharge Limitation	Outfalls				
		001	002	010	011	012
Flow (mgd)	Ave Monthly Max Daily	--- 518.0	2.5 4.4	0.072 0.144	0.25 0.40	0.07 0.12[3]
TRC (mg/L)	Ave Monthly Max Daily	--- 0.1				
Max Temp (°F)	Max Daily	86[1]	90[2]			
TSS (mg/L)	Ave Monthly Max Daily				30.0 100.0	30.0 100.0
O&G (mg/L)	Ave Monthly Max daily			10.0 15.0	10.0 15.0	 15.0
Cu (mg/L)	Ave Monthly Max Daily				1.0 1.0	
Fe (mg/L)	Ave Monthly Max Daily				1.0 1.0	
pH (s.u.)		6.5-8.5	6.5-8.5	6.5-8.5	6.0-9.0	6.5-8.5

[1] This temperature limit applies to the upper 15 feet of the water column above the discharge diffuser.

[2] Water temperature at the mouth of the former discharge flume of Unit 1 shall be maintained at 90°F or below.

[3] Flow rate of regeneration waste shall not exceed 600 gpm.

Table 4.2: Current Permit Monitoring Frequencies

		Outfalls				
Parameter	Monitoring Requirements	001	002	010	011	012
Flow (mgd)	Frequency: Sample Type:	Continuous Daily Ave & Range	Estimate Daily	Continuous Daily Ave & Range	Continuous Daily Ave & Range	Continuous Daily Ave & Range
TRC (mg/L)	Frequency: Sample Type:	1X/day except weekends grab				
Max Temp (°F)	Frequency: Sample Type:	Continuous [1] Instantaneous Max.	Continuous			
TSS (mg/L)	Frequency: Sample Type:				Weekly Grab	1X/ 2 weeks 24hr. Comp
O&G (mg/L)	Frequency: Sample Type:			Weekly Grab	Weekly Grab	1X/ 2 weeks Grab
Cu (mg/L)	Frequency: Sample Type:				Weekly Grab	
Fe (mg/L)	Frequency: Sample Type:				Weekly Grab	
pH (s.u.)	Frequency: Sample Type:			Weekly Grab	[2]	1X/ 2 weeks grab

[1] The current permit requires that the temperature is "continuously recorded at the last accessible point prior to discharge in the Cape Cod Canal."

[2] The current permit indicates that pH "shall be monitored at a point prior to discharge into the Cape Cod Canal."

Table 4.3: Summary of Discharge Data from 1/31/02 through 3/31/05

Parameter	Discharge Limitation	Outfalls				
		001	002	010[1]	011	012
Flow (MGD)	Ave Monthly Max Daily	--- 357 - 507	2.5 4.4	ND ND	0.08 - 0.86[2] 0.13 - 0.31	0.01 - 0.03 0.021 - 0.07
TRC (mg/L)	Ave Monthly Max Daily	--- 0.07 - 0.09				
Max Temp (°F)	Max Daily	66 - 111[3]	40 - 75			
TSS (mg/L)	Ave Monthly Max Daily				12.5 - 28 20 - 63	5.0 - 24.8 10.0 - 32.0
O&G (mg/L)	Ave Monthly Max daily			ND ND	0.01 - 0.3 0.02 - 0.4	 0.3 - 3.4
Cu (mg/L)	Ave Monthly Max Daily				0 - 0.369 0.01 - 0.613	
Fe (mg/L)	Ave Monthly Max Daily				0.2 - 0.84 0.2 - 0.96	
pH (s.u.)		7.5 - 8.3	7.6 - 8.3	ND	6.7 - 8.4	6.7 - 8.4

1 No discharge occurred at this location during the time frame specified.
2 There was an average monthly flow exceedence on 7/31/03.
3 Temperature taken at end of discharge flume prior to diffuser (this is not the location where the permit limit applies - see footnote 1 for Table 4.1).

4.2.2 Cooling Water Intake Structure

Once-through cooling water for Units 1 and 2 is withdrawn through separate intake structures located in the Cape Cod Canal and through separate circulating water systems. Both intake flumes are similar with the exception of a fish sill at the intake opening for the Unit 2 intake flume.

Each of the two screenhouses contain trash racks and two vertical-traveling screens prior to two circulating water pumps (two pumps per Unit). Each screen is 10 feet wide, has a mesh opening size of 3/8 inch, and are rotated when necessary. The spray wash system removes fish and debris from the screens and includes front and back wash headers at 80 psi. A maximum flow of 1.5 mgd can be achieved by the spray wash system with all four screens running continuously. Fish and debris from each intake structure are returned to the Canal via the old Unit 1's discharge flume located between the existing intakes, which is permitted discharge location Outfall 002. At low tide levels, the end of the fish return trough is suspended several feet over the surface of the water so that returned organisms vertically drop into the receiving water. Chlorination injection points are located in front of the intake screens. The Unit 1 condenser pumps are rated at 85,000 gpm each and Unit 2's pumps are rated at 95,500 gpm each (all four pumps combined total 361,000 gpm).

At full flow, the approach velocities at the entrance to the intake structures are 1.2 feet/second for Unit 1 and 1.1 feet/second for Unit 2. Each intake structure is approximately 135 feet long; the distance from the entrance at the Cape Cod Canal to the screens/pump wells. The approach velocities at the intake screens are 0.7 feet/second for Unit 1 and 0.8 feet/second for Unit 2. (Through screen velocities were not provided by the Facility).

Part A.1.g. of the Station's current permit indicates that the existing circulating water intake structure is considered Best Technology Available (BTA) for minimizing adverse environmental impact in conformance with Section 316(b) of the CWA. For each permit reissuance, CWA § 316(b) determinations must be revisited. The Draft Permit's § 316(b) determination is based on new biological information and the assessment of existing technologies available that minimize environmental impacts from the impingement and entrainment of organisms on intake screens. A complete discussion of this determination is found in Section 5.2.4 of this Fact Sheet. The most recent impingement (1999-2000) and entrainment (1999-2002) studies performed by MRI are discussed in Mirant's October 29, 2003, submittal and Section 5.2.2 of this Fact Sheet.

4.3 Permitted Outfalls

Outfall 001

Condenser cooling water, internal process wastewater and storm water discharge to a 25-foot wide, 750-foot long open discharge flume (Outfall 001), and then through a buried conduit leading to a submerged slot diffuser located approximately 100 feet offshore and approximately 925 feet from the intake structures. Internal process wastewater includes waste from outfalls 010 (during emergencies), 011, and 012. (See descriptions below.)

Currently, samples for pH and chlorine are taken from a foot bridge located approximately half way down the discharge flume. Temperature is continuously monitored at the end of the flume prior to the diffuser.

The Station's circulating water system provides once-through cooling water to the condensers and uses approximately 518 mgd of water from the Cape Cod Canal. Flow is estimated from pump capacity curves and operational hours of the four constant velocity speed pumps. The approximate number of service hours per year for Unit 1 is 7,000 (~65% capacity factor) and for

Unit 2 - 6,200 hours (40-45% capacity factor). The current discharge velocity from the diffuser is 3.8 feet/second with a transit time of 5.5 minutes from the condensers to the diffuser.

Three percent sodium hypochlorite injections (to prevent biofouling) begin on a daily basis when water temperature approaches and remains above approximately 50°F (i.e., primarily during summer months). The sodium hypochlorite injection system is located prior to the trash racks, in front of the intake pump bays. The chlorine operation consists of continuous injection for one hour twice per day (½ hour each pump; 2 pumps/Unit). Maximum use equals 2 hours of chlorination per Unit per day, equaling 4 hours/day total. The current permit includes a maximum daily limit for Total Residual Chlorine (TRC) of 0.1 mg/L but does not have an average monthly limit. Furthermore, the current permit only requires a grab sample to be taken once per day (with no samples on weekends). See Section 4.4.1 of the Fact Sheet for chlorine monitoring requirements for location 001 of the Draft Permit.

The temperature of cooling water passing through the condensers is increased by a maximum of about 35°F above ambient. The current permit states that the temperature limit for Outfall 001 is 86°F for the upper 15 feet of the water column above the discharge diffuser (the portion of the water column from the surface to a depth of 15'). However, temperature is being measured at the end of the discharge flume and not in the Canal above the diffuser. The 1976 report "Circulating Water Discharge Temperature Survey" by NEGEA Service Corporation shows the correlation between the discharge flume temperature and the temperature in the upper 15 feet of the water column above the diffuser. The report provides calculations indicating that a temperature of 86°F in the upper 15 feet of the water column above the diffuser corresponds to a temperature of 107°F in the discharge flume. The Draft Permit monitoring requirements will serve to verify the report's calculations. Temperature limits for both locations are included in the Draft Permit.

Thermal discharges by the Station to the Canal at the temperatures authorized by the Draft Permit would exceed the numeric temperature criteria applicable to SB waters, as specified in the Massachusetts Water Quality Standards. As a result, a variance from State Water Quality Standards under CWA § 316(a) will be needed to authorize this thermal discharge. This is discussed in more detail in Section 5.1 of this Fact Sheet.

There is no temperature differential (ΔT) limit in the current permit. Temperature differential (ΔT) in this context refers to the difference in temperature of the water between the intake and the discharge. This measurement is a reflection of the degree to which the Station's cooling system is heating up the water it withdraws from, uses, and then discharges back to, the Canal. Based on intake and discharge temperature data provided by the permittee, a temperature differential (ΔT) limit of 33°F has been established for the Draft Permit. This limit is based on a variance under CWA § 316(a). (See Section 5.1 Thermal Discharge Effluent Limits of this Fact Sheet.)

The Station performs a heated backwash treatment for removing debris from the condenser tubes. This may occur once per week for each Unit. The process takes approximately one hour (30 minutes for each side of the condenser) per Unit. There is no mention of this in the current permit. Station representatives explained that there is no discharge to the Cape Cod Canal during this process because the reverse flow is pulled into the adjacent well and intake rather than to the Canal. According to the permittee, the process is not for the control of biofouling; it is solely to remove debris from the condenser tubes. The Draft Permit specifies that no discharge shall occur from this process operation.

Internal outfall locations 010, 011, and 012 also discharge to the main discharge flume (Outfall 001). Therefore, along with chlorine and heat, the following pollutants may potentially be found in the wastewater at this location: oil and grease (O&G), copper, iron, and TSS. These materials, however, are regulated/permitted at the upstream internal outfall locations as described below.

Outfall 002

Outfall 002 is located between the Unit 1 and 2 intake structures. The former condenser discharge flume for Unit 1 is now used to discharge the intake screen wash water (including impinged fish) for both Units 1 and 2, along with approximately 3 mgd of condenser water from the main discharge flume which is used to flush debris from the flume. Heated condenser cooling water flows from the 001 flume through two pipes in the back wall of the 002 flume.

The current permit limits flow at this site to 2.5 mgd (ave. monthly) and 4.4 mgd (max. daily), and limits pH to between 6.5 and 8.5 standard units (s.u.). In addition, the current permit requires that the temperature “at the mouth of the former discharge flume of Unit No. 1 shall be maintained at 90°F or below.” This temperature limit, which exceeds the maximum temperature criterion for SB waters under the State Water Quality Standards is retained in the Draft Permit and is based on a variance under CWA § 316(a). Section 5.1 (Thermal Discharge Effluent Limits) of this Fact Sheet includes a discussion of the variance determination. A temperature differential limit of 33°F was also added to the Draft Permit for the discharge from Outfall 002 and is also a variance-based limit.

The screen washing operation is intermittent. The condenser cooling water discharges continuously at this location through two 10" pipes located at the back of the flume, at a rate of approximately 1000 gpm per pipe (3 mgd - total). The cooling water is heated, periodically chlorinated and at times contains internal waste streams. TRC monitoring at Outfall 002 is not required by the Station’s current permit and temperature monitoring is conducted at the mouth of the flume.

As previously mentioned, the chlorine injection system is located prior to the trash racks, in front of the intake pump bays. For the protection of impinged organisms, the Draft Permit requires that the injection points be moved. In addition, the discharge of heated and chlorinated condenser water into the 002 flume is prohibited during times when the screen wash is in operation until upgrades can be made to the fish return system. The required upgrades to the intake structure fish return systems are discussed in Section 5.2.4 of this Fact Sheet. Furthermore, the Draft Permit requires that there shall be no condenser water discharge at this location during the chlorination of any Unit condensers, thereby obviating the need for TRC monitoring.

Outfall 010

Outfall 010 is used for the discharge of wastewater from Unit 1 floor drains after it has passed through an oil/water separator. Sources of wastewater include vacuum and pump seal water, fuel heater room discharges, and boiler leaks. The company wants this location to remain on their permit although they currently divert this wastewater to the Unit 1 precipitator pump house for reuse in the precipitator ash sluice system. Station representatives indicate that this discharge would only occur if there were an emergency situation, such as a massive boiler leak. This last occurred in 1994 and samples were collected. These waste sources are considered low volume waste according to 40 C.F.R. 423 and TSS and Oil and Grease are required sampling parameters. Sampling frequency during any periods of discharge has been changed to daily in the Draft Permit to reflect the need for increased sampling during emergencies.

Outfalls 011 and 012

Under the current permit, low volume waste, metal cleaning waste and ash sluicing waste are allowed to be combined (in settling ponds) and discharged either through one of two treatment (neutralization) tanks or directly from the ponds. Low volume wastes consist of wastes from floor drains, water treatment (demineralizer and condensate polisher), boiler blowdown, laboratory wastewater, and boiler seal water. Metal cleaning wastes consist of wastes from air preheater wash, boiler fireside wash, precipitator wash, boiler chemical cleaning, stack and breach wash, equipment cleaning and feedwater heater chemical cleaning.

National Effluent Limitation Guidelines (technology-based) for the “Steam Electric Power Generating Point Source Category” are found at 40 C.F.R. Part 423. Effluent limitations are the same for low volume wastes and fly ash wastes, although they are independently named waste streams. Therefore, these wastes can be combined prior to sampling. However, the metal cleaning category includes different limits (i.e., copper and iron). Therefore, the metal cleaning waste sources are being separated from the low volume and fly ash waste in the Draft Permit. In other words, 40 C.F.R. Part 423 requires that the technology-based limitations of these two waste streams (combined low volume/fly ash and metal cleaning) be achieved independently. Under the current permit the permittee is allowed to dilute the metal cleaning wastes with the low volume/fly ash waste sources in the settling ponds such that metals could be discharged in excess of the discharge limitations at 40 C.F.R. Part 423. Dilution is not an acceptable means of achieving technology-based limitations. In addition, if the metal cleaning wastes are greatly diluted, removal of the pollutant metals in the metal cleaning wastes becomes more difficult and less efficient because of the dilution. The effluent guidelines at 40 C.F.R. Part 423 were developed to take advantage of the higher removal efficiencies achievable by treating a concentrated waste stream such as metal cleaning wastes. In order to fully assure compliance, separation of the two waste streams as named in the effluent guidelines at 40 C.F.R. § 423.12 is necessary. The Draft Permit achieves this by imposing separate limits at a separate compliance point, and by requiring separate monitoring for the metal cleaning wastes.

With the separate monitoring and compliance of these two waste streams, the effluent limitations applied in the Draft Permit are technology-based requirements found at 40 C.F.R. Part 423. For metal cleaning wastes (Outfall 011), the parameters limited in the Draft Permit are as follows: total suspended solids, oil and grease, copper and iron. For low volume/fly ash waste (Outfall 012), the parameters limited in the Draft Permit are: total suspended solids and oil and grease.

For this Draft Permit, Outfall 011 is the spigot on the discharge line of either of the two neutralization tanks prior to discharging into the final effluent flume and refers to metal cleaning waste streams only. As previously mentioned, metal cleaning wastes consist of wastes from air preheater wash, boiler fireside wash, precipitator wash, boiler chemical cleaning, stack and breach wash, equipment cleaning and feedwater heater chemical cleaning. Generally, most metal cleaning operations take place during Station outages. The Draft Permit prohibits the permittee from combining any low volume or fly ash wastewater with metal cleaning wastewater, including sludge dewatering filtrate, to insure that representative samples are collected for compliance with the permit limits.

Testing of boiler chemical cleaning wastewater in June, 2005 showed low levels of mercury (0.4 part per billion (ppb) and 0.2 ppb in approximately 250,000 gallons). Further investigation found that the concentration of mercury in the caustic that was used during the cleaning was 3 ppb. At these concentrations, there is no reasonable potential to exceed the national water quality criteria limit for mercury. This a toxic pollutant, however, that is known to bioaccumulate in the food chain and due to the ready availability of mercury-free caustic, it is not necessary to discharge it to the receiving water. Therefore, as a best-management-practice, the Draft Permit requires that the permittee shall certify that all caustic used for metal cleaning has no detectable levels of mercury. Furthermore, as was the case with mercury, there is a potential for other unexpected pollutants to be present in the boiler chemical cleaning effluent. Therefore, the Draft Permit requires that the composite sample of each boiler chemical cleaning event is analyzed for petroleum hydrocarbons and priority pollutant metals – as well for all pollutants addressed by specific limits in the permit – to verify that mercury and other pollutants are not present in the effluent.

The Station's existing permit specifies that Outfall 012 is for sampling only the blowdown from the Facility's demineralizers and condensate polishers (water treatment wastes). As previously mentioned, water treatment waste is considered one of several sources of low volume waste. Outfall 012 in the Draft Permit includes all low volume and ash sluice waste sources combined. Low volume waste streams include water treatment wastes (demineralizer and condensate polisher blowdown) as well as floor drain wastewater, boiler blowdown, laboratory wastewater, and boiler seal water. Low volume waste is either mixed with fly ash waste or routed directly to one of the two neutralization tanks prior to discharge into the final effluent flume.

Fly ash waste in this context consists of wastewater from the ash sluice system and is also discharged through Outfall 012. The ash sluice system collects ash from the electrostatic precipitators for Units 1 and 2 and pumps it to the ash thickener. Prior to thickening, caustic and polymer are added to the sluice water to enhance overall settling characteristics and control the pH. Effluent from the thickener is then directed to one of three settling ponds (A, B, or C). The ponds are cement with an epoxy lining. Following settling, the ash sluice water is typically returned to the clean water sump for recirculation to the ash precipitators. Periodic blowdown for the system is required to prevent the buildup of dissolved solids and to manage treatment pond levels. Blowdown and sludge dewatering filtrate is diverted to either waste pond D or directly to the neutralization tanks.

Waste pond D effluent is typically directed to neutralization tanks, although it can be discharged directly to the main discharge flume. Outfall 012 wastewater is either sampled from one of the two treatment tanks or directly from one of the waste ponds.

4.4 Derivation of Effluent Limits for Pollutants Other Than Heat

This section discusses the basis for effluent discharge limits for pollutants other than heat. Limits for heat, as well as cooling water intake requirements, are discussed further below. Effluent limits for pollutants other than heat are based on whichever is more stringent between the applicable technology standards and Water Quality Standards. National Effluent Limitation Guidelines for the "Steam Electric Power Generating Point Source Category" are found at 40 C.F.R. Part 423. The Massachusetts State Water Quality Standards are found at 314 C.M.R. 4.00.

4.4.1 Chlorine

Acute Water-Quality Based Limit (Maximum Daily), Outfall 001

The existing permit limits the Total Residual Chlorine (TRC) concentration to 0.1 mg/l (daily maximum) at Outfall 001. This limit was "established on the basis of bioassays on Menhaden"[1] and State Certification requirements. This limit is more stringent than the 0.2 mg/l technology based standard for Steam Electric Power Generating Point Sources (40 C.F.R. § 423.13). EPA believes that the 0.1 mg/l limit is also more stringent than any limit that would be derived based on the State of Massachusetts' acute water-quality standard for chlorine in marine water and the dilution provided by the receiving water.

[1] "Thermal Pollution Control in Massachusetts Coastal Waters" by John R. Elwood, Water Resources Commission Division of Water Pollution Control, January 1973, p. 12.

The Massachusetts Acute Chlorine Standard is 0.013 mg/l. To determine the dilution factor needed for the permit limit of 0.1 mg/l, the following formula is used:

$$\text{Permit Limit} = \text{Standard} \times \text{Dilution}$$
$$0.1 \text{ mg/l} = (0.013 \text{ mg/l}) \times X$$

In this case, "X" equals 7.7 which is the dilution factor which would be required to yield the 0.1 mg/l permit limit. Any greater dilution provided by the receiving water would allow for a higher permit limit and any less dilution would require a more stringent limit.

It has been determined that the currents flowing in the westward direction (ebb tide) produce an average flow of 90,000 cubic feet per second (cfs) and currents flowing in the eastward direction (flood tide) produce an average flow of 74,000 cfs.[2] In addition, the effluent is discharged through a diffuser that is 200 feet in length and contains 28 slots along the crown of the distribution pipes. Each slot is 1.5 feet wide and approximately 5 feet long. The slots direct the discharge vertically upward into the Canal, providing rapid initial dilution and mixing with Canal water.

In order for the effluent to be diluted by a factor of 7.7, 6191 cfs of dilution water is needed (6191cfs/804cfs = 7.7, where 804 cfs is the maximum permitted Station flow). This dilution will assure that the Water Quality Standard of 0.013 mg/l is met while allowing a permit limit of 0.1 mg/l, as explained above.

Considering the high current flows through the Cape Cod Canal, EPA believes there is always more than 6191 cfs of flow to dilute the effluent. Therefore, EPA is imposing a daily maximum limit of 0.1 mg/l for the Draft Permit. However, because the intake water contains bromides (i.e., saline water), the sampling parameter has been changed from total residual chlorine to total residual oxidants (TRO) in accordance with the Steam Electric Power Generating Point Source Category effluent guidelines (see 40 C.F.R. § 423.11).

The effluent guidelines allow, at the permitting authority's discretion, TRC/TRO limits to be expressed as either mass (pounds) or concentration (mg/l). The Draft Permit includes a concentration based TRO limit for Outfall 001.

Chronic Water Quality Based Limit (Average Monthly), Outfall 001

The current permit has no average monthly limit for chlorine. Massachusetts regulations contain a marine chronic criteria of 0.0075 mg/l for chlorine. EPA believes a chronic limit is unnecessary because the permit limits chlorine use to two hours per day per unit. This restricted

[2] Alden Research Laboratory, Inc., Evaluation of Fish Protection Alternatives for the Canal Generating Station, October 2003.

use of chlorine will not result in chronic exposure to aquatic life.

Effluent Guideline Limit (Instantaneous Maximum) Outfall 001

In the effluent guidelines for the "Steam Electric Power Generating Point Source Category", EPA has established a technology-based maximum discharge concentration of 0.2 mg/l for total residual oxidants ("instantaneous maximum"), based on the best available technology economically achievable (BAT). The 0.2 mg/L "maximum concentration" limit is an "instantaneous maximum"limit, meaning that it is the value that shall not be exceeded, at any time, as clarified in EPA's July 27, 1992, Memorandum from Cynthia Dougherty, Director of the Permits Division, to the Regional Water Management Division Directors. This technology-based effluent limit applies to plants with a total generating capacity of more than 25 megawatts and once-through cooling water systems. Each individual generating unit is prohibited from discharging chlorine for more than two hours per day, unless the discharger demonstrates to the permitting authority that a longer duration is necessary in order to control macro-invertebrate growth. In addition, simultaneous multi-unit chlorination is permitted according to the effluent guidelines.

Currently, Canal Station is cooled via an open cycle system (Once-Through Cooling Water). Biofouling of the Units 1 and 2 condenser tubing is controlled by the addition of chlorine, as sodium hypochlorite (NaOCl), to the cooling water. During the summer months, the NaOCl pumps for each Unit activate for one hour two times per day. Thus, each Unit receives a total of 2 hours of chlorination per day.

The above derived, technology-based TRO limit shall be measured at Outfall 001, prior to discharge into the Cape Cod Canal. As noted above, the effluent guidelines specify that permit limits for TRO shall be set as an "instantaneous maximum." EPA is not aware of continuous chlorine monitoring equipment for use in salt or brackish water that currently satisfies the analytical requirements of 40 C.F.R. Part 136, Table 1B. Therefore, in order to more accurately determine that the concentration is below the limit for the duration of the chlorination event, EPA requires that at least one sample is collected and analyzed every half hour during chlorination.

Subject to the restrictions discussed above, the Draft Permit authorizes the use of chlorine as the biocide for the Unit 1 and 2 condensers. Except for chlorine, no other biocide shall be used without prior written approval from the EPA and MA DEP.

4.4.2 pH

The pH range for Class SB waters is from 6.5 to 8.5 standard units (s.u.) and not more than 0.2 units outside of the normally occurring range as defined in the Massachusetts Surface Water Quality Standards, found at 314 C.M.R. 4.00. Unless otherwise specified, pH shall be measured at Outfalls 001 and 002. Monitoring for pH at the internal outfalls 010, 011, and 012 is not necessary as explained in EPA's March 21, 1986, Memorandum from Charles Kaplan, EPA's National Steam Electric/Water Expert, to Regional Permit Branch Chiefs and State Directors. Using dilution to accomplish the neutralization of pH is preferable to adding chemicals.

4.4.3 Polychlorinated Biphenyl Compounds

Pursuant to 40 C.F.R. Part 423, discharge of polychlorinated biphenyl compounds (PCBs) is prohibited and any PCB's at the facility must be disposed of in accordance with 40 C.F.R. Part 761.

4.4.4 TSS

The quantity of Total Suspended Solids (TSS) that can be discharged from low volume waste streams, fly ash transport water and metal cleaning wastes is limited under 40 C.F.R. § 423.12 "by multiplying the flow of low volume waste sources times the concentration listed in the following table," which is 100 mg/l daily maximum and 30 mg/l monthly average. The Draft Permit contains TSS limits based on these requirements. In addition, 40 C.F.R. § 423.12(b)(11) states that the permitting authority has the discretion to express the limits as concentration-based as opposed to mass-based. The Draft Permit includes concentration-based TSS limits for Outfall locations 010, 011, and 012.

4.4.5 Oil and Grease

The current permit's maximum daily limit for Oil and Grease for Outfall locations 010, 011 and 012 is 15 mg/l. Although 40 C.F.R. § 423.12 sets a maximum daily limit for Oil and Grease of 20 mg/l, the current permit limits will be maintained in the Draft Permit in accordance with "anti-backsliding" provisions. Similarly, the average monthly limit is 10 mg/L in the current permit for Outfall locations 010 and 011, which will be maintained in the Draft Permit. There is no average monthly limit for O&G in the Station's current permit for Outfall 012. Therefore, in accordance with 40 C.F.R. § 423.12, the average monthly limit in the Draft Permit for location 012 is 15 mg/L.

4.4.6 Copper

The applicable technology-based national effluent limitation guideline for copper specified in 40 C.F.R. Part 423 is based on the concentration of copper in the metal cleaning waste flow. The metal cleaning waste stream is routed to one of two waste treatment tanks (Outfall 011) prior to discharge into the discharge canal. The effluent limitation guidelines set a maximum daily limit of 1.0 mg/l and a 30-day average value of 1.0 mg/l. These limits are included in the Draft Permit.

4.5.7 Iron

As in the case of copper, the effluent limitation guidelines at 40 C.F.R. Part 423 set a maximum daily limit for iron of 1.0 mg/l and a 30-day average value of 1.0 mg/l for the metal cleaning waste stream (Outfall 011).

4.5.8 Whole Effluent Toxicity

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

Section 101(a)(3) of the CWA specifically makes it national policy to prohibit the discharge of toxic pollutants in toxic amounts, and such discharges are also prohibited by the Massachusetts Water Quality Standards which state, in part that, "all surface waters shall be free from pollutants in concentrations or combinations that are toxic to humans, aquatic life or wildlife." The NPDES regulations under 40 CFR §122.44(d)(1)(v) require whole effluent toxicity (WET) limits in a permit when a discharge has a "reasonable potential" to cause or contribute to an excursion above the State's narrative criterion for toxicity.

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

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

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

Therefore, the Draft Permit is requires the permittee to report the results of chronic (and modified acute) WET tests using Inland Silverside (Menidia beryllina) and chronic Sea Urchin (Arbacia punctulata) WET tests on a quarterly basis. If after eight consecutive sampling periods (two years), no toxicity is found, the permittee may request a reduction in toxicity testing.

5.0 Cooling Water-Related Limits Under Section 316 of the Clean Water Act

With any National Pollutant Discharge Elimination System (NPDES) permit issuance or reissuance, EPA is required to evaluate compliance with applicable standards. For some permits, this includes the application of the standards stated in CWA § 316(a) regarding thermal discharges and CWA § 316(b) regarding cooling water intake structures. CWA § 316(a) applies if the permit applicant seeks a variance from technology-based and/or water quality-based effluent limits for the discharge of heat. To obtain the variance, the applicant must demonstrate to the satisfaction of the EPA (or, if appropriate, the State) that the alternative effluent limitations proposed will assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the receiving water body. 33 U.S.C. § 1326(a); 40 C.F.R. § 125.70. CWA §316(b) applies if the discharger seeks to withdraw cooling water from a water of the United States. To satisfy § 316(b), the permit applicant must demonstrate to the satisfaction of the EPA (or, if appropriate, the State) that the location, design, construction, and capacity of the facility's cooling water intake structure(s) (CWIS) reflect the Best Technology Available (BTA) for minimizing adverse environmental impacts. 33 U.S.C. § 1326(b); 40 C.F.R. §§ 401.14 and 122.44(b)(3); 40 C.F.R. Part 125, Subpart I and J.

Both CWA §§ 316(a) and 316(b) apply to this permit; § 316(a) due to the proposed thermal discharge in excess of that allowed by State Water Quality Standards and the Permittee's request for a § 316(a) variance, and § 316(b) due to the presence and operation of cooling water intake structures at Canal Station.

5.1 Thermal Discharge Limits

In developing a permit's effluent limits, EPA compares technology-based and water quality-based requirements, and whichever is more stringent governs the permit requirements. For thermal discharges, however, EPA may also consider granting a variance under CWA § 316(a) from the technology-based and/or water quality-based limits if less stringent variance-based limits will nevertheless be sufficient to "assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife" (BIP) in and on the water body receiving the discharge. As a practical matter, EPA has with some permits proceeded directly to developing permit limitations under a Section 316(a) variance if a set of limitations were determined to be sufficient to assure protection and propagation of the BIP. In such cases, determining the technology-based and water quality-based limitations would serve no practical purpose.

Mirant Canal Station discharges heated effluent via a discharge canal and a submerged slot diffuser. In addition, the old discharge canal for Unit 1 also contains some heated water discharged from the main discharge canal via two ten-inch pipes. A detailed description of this facility, its discharge canals and submerged slot diffuser may be found in Sections 1.0, 4.2 and 4.3 of this Fact Sheet.

In 1999, Canal Station conducted a detailed thermal monitoring study to measure the extent of its thermal plume. This study consisted of two separate parts: 1. a two month survey using a number of fixed thermistors; and 2. an intense one day survey using measurements from fixed thermistors and multiple observations from a boat. In addition, Canal Station has generated a hydrodynamic model to predict temperature contours within the canal. This model has been calibrated using the field results from the 1999 survey.

The work described above shows that the thermal plume from Canal Station is predominantly a surface feature with limited penetration into the water column. Surface temperatures during the monitoring in July of 1999 peaked at 24°C, while bottom water temperatures peaked at approximately 19-20°C. The thermal plume is quickly dissipated by the strong currents that wash through the Canal. There is a very limited area on the surface near the point of discharge that exhibits an increase of > 4°C over ambient temperatures. A thermal plume with a "delta-T" of 2°C can be seen over an area that does span across the canal to the opposite bank. However, even this plume, is in a fairly small geographic area (see Figure 5.1 as an example).[3]

The state classification for the receiving waters (namely, the Cape Cod Canal) of the Mirant facility's discharge is Class SB. Thus, the Water Quality Standards require that the in-stream water temperature shall exceed neither 85°F (29.4°C) nor a maximum daily mean of 80°F (26.7°C), and the rise in temperature due to a discharge shall exceed neither 1.5°F (0.8°C) during the summer months (July through September) nor 4°F (2.2°C) during the winter months (October through June). Furthermore, any mixing zone applied to this discharge to achieve Water Quality Standards, must conform to the mixing zone requirements for the Water Quality Standards.

[3] Mirant Canal NPDES Permit Application No. MA0004928, October 30, 2003, Attachment B, p. 22.

Figure 5.1: Thermal Plume from Mirant Canal Station

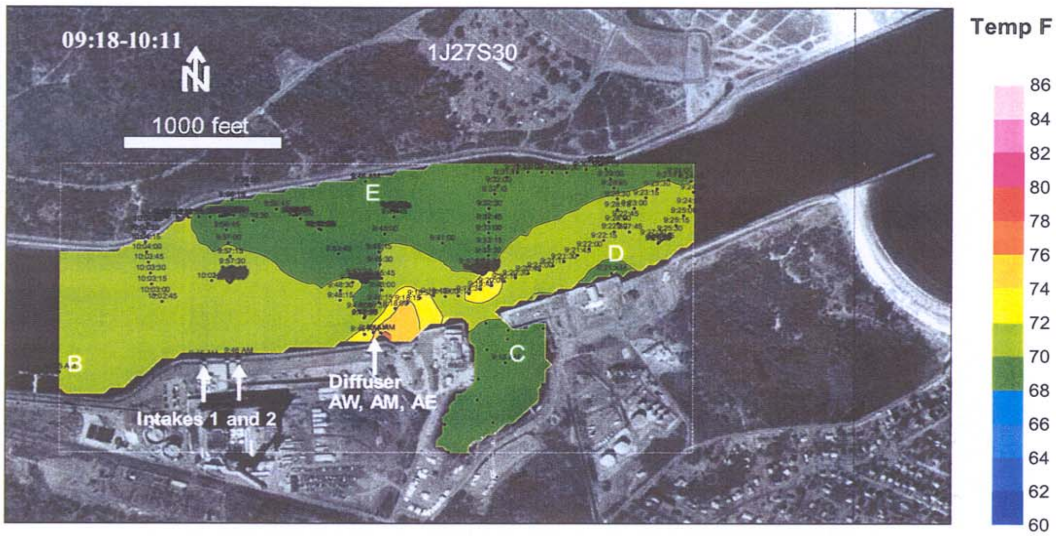

Figure 3.17 Contours of surface temperatures between 09:18 – 10:11 on 27 July 1999.

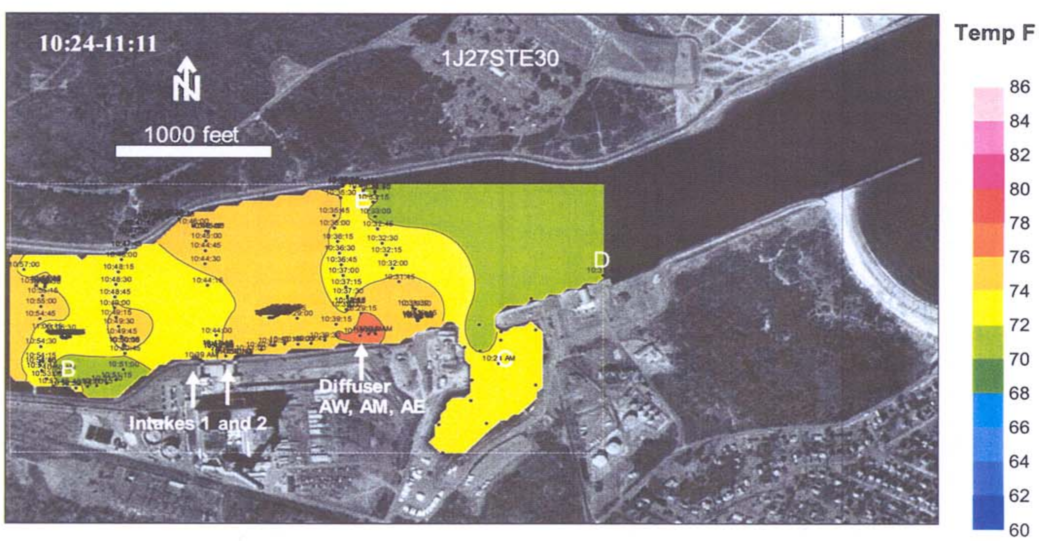

Figure 3.18 Contours of surface temperatures between 10:24 – 11:11 on 27 July 1999.

Acc

ording to CWA § 316(a), and EPA regulations promulgated thereunder at 40 C.F.R. Part 125 subpart H, thermal discharge effluent limits in permits may be less stringent than those required by otherwise applicable standards if the discharger demonstrates that such limits are more stringent than necessary to assure the protection and propagation of the BIP. This demonstration must show that the alternative thermal discharge limits desired by the discharger, considering the cumulative impact of its thermal discharge together with all other significant impacts on the species effected, *see* 40 C.F.R. § 125.73(a), will assure the protection and propagation of the BIP in and on the body of water into which the discharge is made. The thermal discharge limits in Mirant Canal's existing permit were based on a § 316(a) variance, and Mirant Canal has requested the continuation this variance based on its demonstration made in the October 30, 2003, supplement to its NPDES Permit Application, Section B.

EPA has reviewed the 1999 Thermal Monitoring Program and Hydrodynamic Modeling Study of the Cape Cod Canal at Canal Station (Mirant Canal, 2003). While EPA does not necessarily agree with all of the species-specific thermal tolerances summaries presented in this document, EPA has assessed the document's thermal plume information. Based on EPA's review of the thermal monitoring results and the hydrodynamic modeling, EPA agrees with Canal Station's conclusions that the thermal plume is primarily a surface phenomenon. It appears that the absolute temperature values in the State Water Quality Standards would be met very close to the point of discharge. However, the change in temperature would exceed the state Delta T standard. The projected exceedence would be small and again primarily limited to the surface. Based on our knowledge of the thermal plume and the thermal tolerances of aquatic species known to be present in the Cape Cod Canal (see Section 6.0, Table 6.2 of this Fact Sheet), EPA does not believe that the continued discharge from Canal Station will result in appreciable harm to the BIP. Furthermore, EPA is not aware of any biological evidence of past appreciable harm to the BIP from the Station's existing thermal discharge. As a result, EPA approves the § 316(a) variance proposed by the permittee with no increase in thermal discharge from previous permit conditions.

The Draft Permit grants a § 316(a) variance to allow the discharge of heat to the Cape Cod Canal in excess of the numeric criteria for temperature in the Massachusetts Water Quality Standards. A § 316(a) variance is issued for Outfall 001 that allows a maximum instantaneous temperature of 107°F. As mentioned in Section 4.3 - Outfall 001, water discharged at this temperature is predicted to result in a maximum temperature of 86°F (29.9°C) in the upper 15 feet of the water column above the discharge diffuser, which is 1°F above the numeric water quality criterion of 85°F.

This is evidence of the dissipation of the heat in the thermal discharge once it is mixed with Canal water via the diffuser. The Draft Permit (Part I.A.2.c.) includes a requirement to measure the temperature at this location (i.e., in the Canal, above the diffuser) in order to verify the 86°F limit is not exceeded. In addition, based on intake and discharge temperature data provided by the permittee, a temperature differential (ΔT) variance limit of 33°F has been granted for the Draft Permit at this location. It is EPA's judgement that this ΔT, in conjunction with the maximum temperature limit, is protective of the BIP.

EPA is also granting a § 316(a) variance to allow the discharge of heat at Outfall 002 in excess of the numeric criterion for temperature in the Water Quality Standards. The Draft Permit retains the previous maximum limit of 90°F at the end of the fish/debris return discharge flume. In addition, a temperature differential (ΔT) variance limit of 33°F has been granted for the Draft Permit at this location. Compared to the maximum flow for Outfall 001, which is 518 million gallons per day (mgd), the maximum flow limit at Outfall 002 is significantly smaller at 4.4 mgd. It stands to reason that if modeling showed a high heat dispersion at Outfall 001, then the relatively small discharge at Outfall 002 would have a much smaller thermal impact. Furthermore, the Draft Permit offers additional protection for impinged organisms by requiring that heated and chlorinated condenser water shall not be discharged into this flume during the operation of the current fish return system. It is EPA's judgement that this ΔT at Outfall 002, in conjunction with the maximum temperature limit, is also protective of the BIP.

EPA assumes that these variance-based effluent limits are less stringent than either water quality-based or technology-based limits would require without conducting a comprehensive derivation of such water quality-based or technology-based limits. There is no reason to engage in such a comprehensive derivation, however, given EPA's conclusion that the requested variance-based limits will assure the protection and propagation of the BIP in compliance with CWA § 316(a).

5.2 Cooling Water Intake Structure Requirements under CWA § 316(b)

5.2.1 Discussion of Legal Requirements

This section presents EPA's determination with respect to the application of CWA § 316(b), 33 U.S.C. § 1326(b), to the Draft NPDES permit for Mirant Canal. CWA § 316(b) governs requirements related to cooling water intake structures (CWISs) and requires "that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact." The operation of CWISs can cause or contribute to a variety of adverse environmental effects, such as killing or injuring fish larvae and eggs by entraining them in the water withdrawn from a water body and sent through the facility's cooling system, or by killing or injuring fish and other organisms by impinging them against the intake structure's screens.

Permit Based on Best Professional Judgement

In the absence of detailed regulations, EPA has for many years made CWA § 316(b) determinations on a case-by-case, best professional judgement (BPJ) basis, for both new and existing facilities with regulated CWISs. In December, 2001, EPA promulgated new, final § 316(b) regulations providing specific technology standard requirements for *new* power plants and other types of *new* facilities with CWISs. 66 Fed. Reg. 65255 (Dec. 18, 2001) (effective date of the regulations is January 17, 2002). These regulations do not, however, apply to *existing* facilities such as Mirant Canal.

EPA also has developed regulations applying CWA § 316(b) to large, existing power plants. The new CWA § 316(b) regulations addressing large existing power plants are referred to as the "Phase II Regulations" and were published in the Federal Register on July 9, 2004. 65 Fed. Reg. 41576 (July 9, 2004) (Final Rule). The Phase II Regulations became effective on September 7, 2004, and are promulgated at 40 C.F.R. Part 125, Subpart J. Mirant Canal is subject to the Phase II Regulations based on the applicability provisions of 40 C.F.R. § 125.91. Although it should be noted that various industry groups, environmental groups, and several states have filed currently pending litigation challenging the legality of the Phase II Regulations, the regulations currently remain in effect.

In making determinations under the CWA § 316(b) new Phase II regulation, EPA must consider environmental/ecological issues, engineering issues, economic issues related to the cost of implementing CWIS technology options, legal issues, and, ultimately, policy issues regarding the final choice of appropriate steps to minimize adverse environmental effects. These issues, as well as the permit conditions arising from EPA's CWA § 316(b) determinations for the Draft Permit for Canal Station, are addressed below.

The Phase II Regulations identify five different options from which a Phase II existing facility may choose an approach for achieving compliance with the regulations. Permit application requirements vary based on the compliance alternative(s) selected and, for some facilities, include development of a Comprehensive Demonstration Study. *See* 40 C.F.R. § 125.95. The Phase II Regulations establish performance standards for the reduction of impingement mortality and, under certain circumstances, for the reduction of entrainment (e.g., reduce impingement mortality by 80 to 95 percent, and reduce entrainment by 60 to 90 percent). The applicability of the performance standards is determined by several factors, including the type of water body on which the facility is located, the facility's capacity utilization rate, and the proportion of the volume of the source waterbody that is withdrawn by the facility. Under the Phase II Regulations, the applicable performance standards can be met by design and construction technologies, operational measures, restoration measures, or some combination thereof. *See* 40 C.F.R. § 125.94 (discussion of compliance alternatives).

The Phase II Regulations prescribe a number of interrelated decisions to be made by EPA and the permittee during a multi-step process of information collection, submission and review leading up to permit issuance. For example, the rule requires EPA to evaluate, using information submitted in the permittee's application and bi-annual status reports, and any other available information, the performance of any technologies, operational measures, and/or restoration measures the permittee may have implemented in previous permit terms. As another example, if a permittee chooses to propose restoration measures as part of its approach to satisfying the applicable performance standards under the rule, EPA would need to evaluate the proposal and determine its acceptability under the rule, as well as how it would be monitored if approved.

Clearly, working through all the potential issues could be a difficult, time-consuming process. (*See* 69 Fed. Reg. 41576, 41631 - 41633 (July 9, 2004) (discussion of time needed for application process under Phase II Regulations).)

Understandably, given the timing of this Draft Permit and the relatively recent publication of the new Phase II Regulations, the permittee has not yet submitted a complete information submission addressing all of the new requirements under the Phase II Regulations. The Phase II Regulations directly address this type of problem in a manner designed to allow ongoing permitting to continue without undue delay because of the new regulations. The Phase II Regulations provide a reasonable approach during the transition from BPJ-based permitting to permitting with limits based on the application of the new requirements in the Phase II Regulations using the information required to be submitted under 40 C.F.R.§ 125.95. This approach is to allow the permitting authority to continue issuing new permits with § 316(b) limits based on BPJ under certain circumstances. These circumstances apply in the case of the Canal Station permit. Therefore, EPA is setting CWA § 316(b) permit limits based on BPJ because doing so is consistent with the new Phase II Regulations.

Specifically, 40 C.F.R. §§ 125.95(a)(2)(i) and (ii) of the Phase II Regulations state the following (emphasis added):

> (i) You must submit your NPDES permit application in accordance with the time frames specified in 40 C.F.R. 122.21(d)(2);
>
> (ii) If your existing permit expires before July 9, 2008, you may request that the Director establish a schedule for you to submit the information required by this section as expeditiously as practicable, but not later than January 7, 2008. *Between the time your existing permit expires and the time an NPDES permit containing requirements consistent with this subpart is issued to your facility, the best technology available to minimize adverse environmental impact will continue to be determined based on the Director's best professional judgment.*

Applying this regulation to this case, one sees that the existing permit for Canal Station expired several years ago (in 1994) and that the permittee also filed its permit application several years ago. In addition, the permittee has not submitted all of the information required by the Phase II Regulations. Therefore, EPA could not presently develop a permit "containing requirements consistent with this subpart" and is, instead, currently issuing the permit to the Station with § 316(b) limits that "continue to be determined based on the Director's (i.e., permitting authority's) best professional judgment."
This approach to permitting during the period of transition from continued use of the BPJ approach to developing CWA § 316(b) permit limits using the information required in 40 C.F.R.§ 125.95 is a reasonable and appropriate scheme which seeks to prevent undue delay to

ongoing permitting as a result of the new regulations. This approach is consistent with the CWA's goal of continued progress toward achieving the restoration and maintenance of the chemical, physical and biological integrity of the Nation's water bodies. *See* 33 U.S.C. § 1251(a)(1). Moreover, if it later turns out that for some reason the Phase II Regulations are not in effect at the time this Final Permit becomes effective (e.g., they have been stayed or remanded as a result of the litigation that has been filed regarding the new regulations), then the Final Permit would still have a proper BPJ-based foundation for its § 316(b) requirements.

The above explanation of how to properly develop limits under CWA § 316(b) for the Station's Final Permit in light of the new Phase II Regulations is confirmed by the discussion provided in the August 19, 2004, set of "Questions and Answers" posted on EPA's website (www.epa.gov/waterscience/316b). In Section 2 of that document, Question & Answer No. 3 explains how to address permitting circumstances such as those of Canal Station:

> Q3: The Draft Permit is proposed after the 316(b) Phase II rule takes effect. At the time of permit issuance, the facility has not submitted the comprehensive demonstration study and other information needed to determine limitations under the 316(b) Phase II rule. What is the basis for the 316(b) limitations in the permit?
>
> A3: The 316(b) limitations in the proposed and Final Permit would be based on BPJ under authority of 40 C.F.R. § 125.95(a)(2)(ii). The permit would also need to include a schedule requiring the facility to submit the comprehensive demonstration study and other information required by 40 C.F.R. § 125.95 as expeditiously as practicable but not later than January 7, 2008.

In this case, Canal Station's permit expired June 23, 1994, and the permittee has not to date submitted all of the information required by the Phase II Regulations. Therefore, EPA may issue a Final Permit to the Station with § 316(b) limits that "continue to be determined based on the Director's best professional judgment." As a result, EPA has, in fact, determined BTA for this Draft Permit based on BPJ. The guidance further indicates that under these circumstances, "the permit would also need to include a schedule requiring the facility to submit the comprehensive demonstration study and other information required by 40 C.F.R. § 125.95 as expeditiously as practicable, but no later than January 7, 2008." Such a schedule is included in the Draft Permit in Part I.A.8. This schedule also is consistent with the schedule contained in EPA's letter of December 30, 2004, to the permittee requesting submission of the necessary information under 40 C.F.R. § 125.95, with a Proposal for Information Collection due by October 7, 2006. It is likely that information collected under the proposed requirements of the Draft Permit would be able to be used in fulfilling the permit application requirements of 40 C.F.R. § 125.95 of the 316(b) Phase II Regulation.

State Water Quality Standards

State legal requirements, including state Water Quality Standards, also may apply to the development of permit conditions for cooling water intake structures. In this case, Massachusetts Water Quality Standards apply and the Commonwealth has in the past confirmed that its Water Quality Standards, as well as other state law requirements, do, in fact, apply to regulating the adverse environmental effects of cooling water intake structures. Thus, the Draft Permit's limits under CWA § 316(b) must also be sufficiently stringent not to cause or contribute to a violation of Massachusetts Water Quality Standards, including designated uses and narrative criteria.

State Water Quality Standards set designated uses for water bodies within the state and specify narrative and numeric criteria that the water bodies must satisfy. Permit conditions must be designed to satisfy applicable criteria and protect designated uses, including those for fish habitat. CWA §§ 301(b)(1)(C) and 402(a) require that permits include "any more stringent limitation, including those necessary to meet Water Quality Standards, treatment standards, or schedules of compliance, established pursuant to any state law or regulations (under authority of section 1370 of this title [(i.e., CWA § 510)]) . . ., or required to implement any applicable Water Quality Standard established pursuant to this chapter." 33 U.S.C. § 1311(b)(1)(C). Section 301(b)(1)(C)'s mandate applies regardless of whether EPA or a state is the permit issuing authority and, for an EPA-issued permit, applies regardless of whether the state expressly demands that such conditions be placed in the permit. In addition, CWA § 510 clearly authorizes states to impose more stringent water pollution control standards than dictated by the federal statute, at least where the statute does not expressly forbid such tougher state standards. In the regulations governing the development of Water Quality Standards, 40 C.F.R. § 131.4(a) states that, "[a]s recognized by section 510 of the Clean Water Act, states may develop Water Quality Standards more stringent than required by this regulation." The Supreme Court in PUD No. 1, 511 U.S. at 705, cited to this regulation in support of the view that states could adopt water quality requirements more stringent than federal requirements. *See also* 40 C.F.R. §§ 125.90(d) and 125.94(e).

In the context of the state certification process under CWA § 401, the Supreme Court has also held that once the state certification process has been triggered by the existence of a discharge, then the state's certification may impose conditions and limitations on *the activity as a whole*, not merely on the discharge, to the extent needed to ensure compliance with state Water Quality Standards or other applicable requirements of state law. Thus, the Court stated:

> The text [of CWA § 401d)] refers to the compliance of the applicant, not the discharge. Section 401(d) thus allows the State to impose "other limitations" on the project in general to assure compliance with various provisions of the Clean Water Act and with "any other appropriate requirement of State law." . . . Section 401(a)(1) identifies the category of activities subject to certification – namely, those with discharges. And § 401(d) is most reasonably read as authorizing additional conditions and limitations on the activity as a whole once the threshold

> condition, the existence of a discharge, is satisfied. PUD No. 1, 511 U.S. at 711-12.

Thus, for example, a state could impose certification conditions related to cooling water intake structures on a permit for a facility with a discharge, if those conditions were necessary to assure compliance with a requirement of state law, such as to protect a designated use under State Water Quality Standards. *See Id.* at 713. This also confirms that in setting *discharge* conditions to achieve Water Quality Standards, a state can and should take account of the effects of *other* aspects of the activity, such as cooling water withdrawals, that may affect the discharge conditions that will be needed to attain Water Quality Standards.

In sum, the limits in EPA-issued NPDES permits that address cooling water intake structures must satisfy both CWA § 316(b) and any applicable state requirements, such as Water Quality Standards.[4] As indicated above, Canal Station withdraws water for its cooling system from the Cape Cod Canal. These waters have been classified as "SB" by the state and, as such, the designated uses for these waters include providing good quality habitat for fish and other aquatic life as well as a resource for primary and secondary contact recreation (which includes fishing). Thus, the permit's limits under CWA § 316(b) should ensure that cooling water intake operations do not cause or contribute to a failure to attain these designated uses. The Massachusetts Department of Environmental Protection (MA DEP) has primary responsibility for determining what permit limits are necessary to achieve compliance with state law requirements. (EPA's independent responsibilities under CWA § 301(b)(1)(C) are discussed above.) Since the NPDES permit that EPA expects to issue to Canal Station will be subject to state certification under CWA § 401, the permit will also need to satisfy any conditions of such a certification. EPA anticipates that the MA DEP will address its certification after issuance of this Draft Permit but before issuance of the Final Permit.

5.2.2 Biological Impacts

Section 316(b) of the Clean Water Act addresses the adverse environmental impact of cooling water intake structures at facilities requiring NPDES permits. Adverse environmental impact by cooling water intake structures results from the entrainment of fish eggs and larvae and other small forms of aquatic life through the plant's cooling system and from the impingement of fish and other larger forms of aquatic life on the intake screens. This entrainment and impingement can contribute to reductions of local species of commercial and/or recreational importance, locally important forage species, and local threatened or endangered species. Any of these losses

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[4] *See also* 40 C.F.R. §§ 125.90(d) and 125.94(e) (provisions in Phase II regulations mandating that cooling water intake structure requirements in permit also must satisfy any more stringent state requirements); and 40 C.F.R. §§ 125.80(d) and 125.84(e) (parallel provisions in the Phase I regulations).

could contribute to a decrease in the diversity of the ecosystem.[5]

In developing this permit, EPA analyzed impingement and entrainment data collected by the permittee in order to assess the adverse environmental impact on all life stages of local species of fish and invertebrates. As may be expected in this type of biological sampling data, there is considerable temporal variation in impingement and entrainment sampling results from 1999 to 2001, between particular calendar months from 1999 to 2001, and within each year.

The permittee developed a list of species considered to be a priority based upon their presence in the Cape Cod Canal in significant numbers for significant periods of time and their importance under the Essential Fish Habitat (EFH) program. This list, developed in coordination with the Massachusetts Division of Marine Fisheries and the National Marine Fisheries Service, provided a focus for the permittee to assess impingement and entrainment effects to species in the local ecosystem. The permittee further analyzed this list of species and assigned these species to several categories including Priority Species, Critical Aquatic Organisms, and Representative Important Species based upon level of impingement and entrainment, ecological and commercial importance, and availability of required life history data.

EPA acknowledges the usefulness of these specific categories for the discussion of adverse environmental impacts. However, in assessing the adverse effects of the cooling water intake structures, EPA considered not only entrainment and impingement of fish in these categories, but also all other relevant available information from Canal Station, including information about those local species listed under the EFH program, as well as the previously mentioned biological studies to determine adverse environmental impact to the local ecosystem.

5.2.2.a Entrainment

Entrainment of organisms occurs when water is withdrawn by a facility into the cooling water intake structure from an adjacent water body. Eggs and larvae are typically small enough to pass through the mesh of the intake screens and become entrained within the facility. As a result, the eggs and larvae are exposed to shear forces from mechanical pumps, physical stress or injury, elevated temperatures from waste heat removal, and, in some cases, high concentrations of chlorine or other biocides. These organisms can be killed or otherwise harmed as a result of entrainment. The extent of entrainment of fish and invertebrates in cooling water intake structures is determined by several factors, including the nature of the water body in which the cooling water intake structure is located, the particular location in the water body in which the intake structure is placed, the biological community present in the water body, the volume and velocity of the intake flow, the nature of any intake screening system or other entrainment

[5] "Final Regulations To Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities; Final Rule," Federal Register, Vol. 69, No. 131, Friday, July, 9, 2004, p. 41586.

reduction equipment used by the facility, and season. The number of organisms that become entrained is dependent upon the flow of cooling water through the plant and the concentration of organisms in the source water body that are small enough to pass through the screens of the plant's intake structure(s). Given the nature of the entrainment process and the vulnerabilities of the organisms being entrained, EPA assumes 100% mortality of entrained organisms in order to determine adverse environmental impacts to local fish and invertebrate populations, unless a permittee provides a site-specific study justifying use of a lower mortality rate.[6]

The type of water body, such as a river, ocean or estuary, on which the cooling water intake structure is located plays a role in the entrainment of organisms. Cooling water intake structures located on bodies of water with large concentrations of entrainable organisms are more likely to entrain organisms. In this type of habitat, the variety and number of species entrained in the intake structures is higher than in other ecosystems. For example, estuaries provide key spawning and nursery habitat for many species of fish and, as a result, they often contain relatively high concentrations of fish eggs and larvae and juvenile fish.

The location of the cooling water intake structure within a water body also can play a role in re-entrainment of organisms if the discharge is located close to intake structures. Particularly in a high-velocity environment, tidal flows can direct organisms back toward the intake structures.

The presence and density of vulnerable life stages, such as eggs and larvae, are affected by seasonality and, thus, seasonality also is a factor in entrainment. Additionally, the size of these eggs and larvae relative to the mesh size of any intake barriers will also play a role in entrainment because an intake barrier with very small mesh might be able to block some larger types of eggs and larvae from being entrained, whereas other eggs and larvae may be so small that no currently available barrier system technology would be capable of blocking them from being entrained. Depending upon season, different species are affected more or less than others and may peak in entrainment samples when the concentration of eggs is at a maximum. The result could be a substantial loss to a population of a particular year class. Losses due to entrainment at peak spawning times could not only affect current and future populations and their reproductive capacity, but also could affect the food source for other species.

The Cape Cod Canal supports a diverse assemblage of organisms, including a number of species that are commercially and/or recreationally important. A number of fish species, such as winter flounder, have regionally been in decline. Fishery managers have been implementing increasingly restrictive fishing limitations on a variety of stocks in hopes of stimulating a recovery. There is no evidence to suggest that stocks in the Cape Cod Canal are in worse condition than the regional stocks. However, it is important to reduce the cumulative mortality experienced by fish stocks to help stimulate recovery.

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[6] "Final Regulations To Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities; Final Rule," 69 Fed. Reg. 41620 (July, 9, 2004).

The permittee conducted entrainment sampling from February 1999 through February 2002. From March through August of each year, weekly samples were collected. From September through February, samples were collected twice per month. During each sampling week, three samples were collected, each on different days. The permittee used a 0.333-mm mesh, 60-cm diameter plankton net placed in the discharge canal approximately 20 meters downstream from the head wall for sampling. Each sample filtration volume was approximately 100 m^3 and was measured using a digital flow meter mounted in the mouth of the net. After each sample interval, the sample was transferred to a jar containing sufficient formalin to produce 5% to 10% solution. The ichthyoplankton samples collected through June 15, 2001, were analyzed in the laboratory, and the remaining samples were archived. According to the permittee, all fish eggs and larvae were identified to the lowest distinguishable taxonomic category and counted. Certain eggs, particularly the early stages of development, could not be identified to the species level. In such cases, species were grouped. These groupings are described in detail in the permittee's NPDES application.[7] The methodology used by Mirant Canal, LLC to collect entrainment data is described in more detail in Appendix 1, Section C.1 of the Mirant Canal NPDES Permit Application No. MA0004928.

The complete results of this sampling conducted by the permittee are presented in the NPDES application for Mirant Canal Station. Based on this sampling, the permittee estimated that 2.6 to 3.6 billion eggs and 187-318 million larvae per year were entrained by the power plant. Data summarizing the loss of organisms by entrainment in the Mirant Canal Station cooling water intake structures is presented in Table 5.1. The permittee calculated annual entrainment estimates, shown in Table 5.1, for eighteen species representing sensitive species commonly found in entrainment samples from Mirant Canal Station in 1999-2000 and 2000-2001. The eggs and larvae of several Essential Fish Habitat species (e.g., hake, flounder and Atlantic mackerel) were found in significant numbers in entrainment samples. Seasonal differences in the species dominating in entrainment samples were observed, with Atlantic herring, sand lance, sculpins/grubby and Atlantic cod particularly abundant in the winter and early spring. Cunner, tautog, winter flounder, hake, menhaden and Atlantic mackerel were more often abundant during early summer.[8] Additionally, several species found in entrainment samples at Canal Station are forage species, those that provide an important food source for other species. Losses in forage species could have both immediate and long-term effects that could threaten the development and growth of species dependent upon these forage species as a food source.

Table 5.1: Annual Estimates of Finfish and Invertebrates Entrained at Canal Station

[7] Mirant Canal NPDES Permit Application No. MA0004928, October 2003, Attachment C.1, pp. A1-3 through A1-5.

[8] *Ibid.*

Common Name	Eggs (1999-2000)	Eggs (2000-2001)	Larvae (1999-2000)	Larvae (2000-2001)
River Herring - Alewife (*Alosa pseudoharengus*)	44,000	0	22,000	102,000
Atlantic Menhaden (*Brevoortia tyrannus*)	2,997,000	3,220,000	1,907,000	359,000
Atlantic Herring (*Clupea harengus*)	0	0	250,000	2,925,000
Atlantic Cod (*Gadus morhua*)	908,000	1,131,000	587,000	1,286,000
Pollock (*Pollachius virens*)	0	0	0	0
Hake - Red (*Urophycis chuss*) Spotted (*Urophycis regia*) White (*Urophycis tenuis*)	44,108,000	50,069,000	4,830,000	14,294,000
Silversides (*Menidia menidia*)	0	0	232,000	1,404,000
Sculpins Grubby (*Myoxocephalus aenaeus*))	0	0	6,473,000	7,639,000
Striped Bass (*Morone saxatilis*)	0	0	0	0
Scup (*Stenotomus chrysops*)	759,000	52,000	1,662,000	2,506,000
Cunner (*Tautogolabrus adspersus*)	2,227,814,000	2,883,771,000	33,116,000	99,865,000
Tautog (*Tautoga onitis*)	119,109,000	154,118,000	3,974,000	8,136,000
Sand Lance (*Ammodytes americanus*)	0	128,000	43,505,000	97,871,000

Atlantic Mackerel (*Scomber scombrus*)	208,344,000	269,581,000	892,000	18,017,000
Windowpane Flounder (*Scophthalamus aquosus*)	43,691,000	61,806,000	3,735,000	2,385,000
Winter Flounder (*Pleuronectes americanus*)	39,082,000	6,927,000	5,888,000	1,068,000
Yellowtail Flounder (*Pleuronectes ferruginea*)	38,419,000	44,730,000	702,000	2,054,000
American Lobster (*Homarus americanus*)	0	0	883,000	1,000

Additionally, the permittee also calculated estimates of entrainment losses using an equivalent adult analysis. In general, this analysis assumes that only a certain percentage of eggs and larvae would survive to adulthood. An adult equivalent analysis is one appropriate factor to consider in an overall assessment of the magnitude of the adverse impact of entrainment. It is not, however, the only factor to consider and such an analysis has certain limitations. For example, it does not consider or evaluate whether culling a large number of eggs and larvae from an area may potentially harm the area's population by weakening or destroying its compensatory reserve. In addition, this analysis does not factor in the resource value of eggs and larvae and individual life stages. As mentioned above, eggs and larvae are a food source for many species and losses within these life stages represent losses to the area's overall energy budget and food web at multiple trophic levels. Table 5.2 contains the number of equivalent adults lost due to entrainment as estimated by the permittee using egg and larval entrainment data from Table 5.1.

Table 5.2: Estimated Number of Equivalent Adult Species Entrained at Canal Station

Common Name	Scientific Name	Eggs (1999-2000)	Larvae (1999-2000)	Eggs and Larvae Totals (1999-2000)	Eggs (2000-2001)	Larvae (2000-2001)	Eggs and Larvae Totals (2000-2001)
River Herring - Alewife	*Alosa pseudoharengus*	1	1	1	0	4	4
Atlantic Menhaden	*Brevoortia tyrannus*	45	235	280	50	44	94
Atlantic Herring	*Clupea harengus*		83	83		968	968
Atlantic Cod	*Gadus morhua*	1	4	5	1	9	10
Pollock	*Pollachius virens*		0	0		0	0
Hake - Red/Spotted/White	*Urophycis chuss* *Urophycis regia* *Urophycis tenuis*	129	142	271	146	422	568
Silversides	*Menidia menidia*	0	929	929	0	5,616	5,616
Sculpins - Grubby	*Myoxocephalus aenaeus*	0	20,712	20,712		24,443	24,443
Striped Bass	*Morone saxatilis*	0	0	0	0	0	0
Scup	*Stenotomus chrysops*	14	67	81	1	102	103
Cunner	*Tautogolabrus adspersus*	205,883	100,343	306,226	266,504	302,592	569,096
Tautog	*Tautoga onitis*	323	35	358	417	71	488
Sand Lance	*Ammodytes americanus*	0	81,354	81,354	24	183,018	183,042
Atlantic Mackerel	*Scomber scombrus*	196	9	205	254	186	440
Windowpane Flounder	*Scophthalamus aquosus*	900	1,998	2,898	1,273	1,276	2,549
Winter Flounder	*Pleuronectes americanus*	217	363	580	38	66	104
Yellowtail Flounder	*Pleuronectes ferruginea*	38	4	42	45	10	55
American Lobster	*Homarus americanus*	0	1,849	1,849	0	24	24
Totals				415,874			787,604

Water that is circulated through Canal Station originates from the Cape Cod Canal, and also from Cape Cod Bay and Buzzards Bay. Though knowing where the water originates is useful, it does not specifically indicate where the eggs and larvae that are being entrained are coming from. The permittee attempted to estimate conditional mortality of eggs and larvae by estimating water flow past the plant and assuming an uniform density of larvae and eggs. The permittee estimates that conditional mortality rates for eggs and larvae are both less than 5%. This is a very rough estimate of conditional mortality. The volume of water passing the plant is a rough estimate and it is known that eggs and larvae are not uniformly distributed. Thus, actual conditional mortality could be much higher.

Based on the overall numbers described above, EPA concludes that Canal entrainment is taking a substantial number of fish eggs and larvae and that under CWA § 316(b), the design, location, construction and capacity of Canal Station's cooling water intake structures must reflect the Best Technology Available for minimizing these adverse impacts.

5.2.2.b Impingement

Impingement of organisms occurs when water is drawn into a facility through its cooling water intake structures and organisms too large to pass through the protective screens and unable to swim away become trapped against the screens and other parts of the intake structure. The quantity of organisms impinged is a function of the intake structure's location, its depth, the velocity of water at the entrance of the intake structure and through the screens, the seasonal abundance of various species of fish, and the size of various fish relative to the size of the mesh in any intake barrier system (e.g., screens).

Intake structure location is an important factor that may have an impact on the organisms that become impinged. Generally, selecting locations to avoid important spawning areas, juvenile rearing areas, fish migration paths, shellfish beds or areas of particular importance for aquatic life is one means of reducing impingement mortality.

Depth of the intake structure relative to the depth of the water body may also have an effect on the type of organisms that become impinged. Benthic organisms are more susceptible to impingement than those that are pelagic or free-swimming, if the intake structure is situated on the bottom of a waterbody. Pelagic fish tend to be stronger swimmers and have some ability to avoid impingement, whereas benthic organisms such as lobsters and winter flounder, may even enter an intake structure to seek refuge and become impinged.

The velocity of water entering the intake structure and moving through the intake screens are other important factors that contribute to the impingement of organisms. Some species of fish are attracted by the high velocity water movement at the entrance to the intake structure and this can result in higher impingement rates. Approach velocity is generally lower than through-screen velocity, but may direct fish towards the CWIS. Through-screen velocity that is higher than the approach velocity may prevent escape and result in fish being held against the screens of the CWIS, leading to injury or death.

Seasonal abundance and size of various species of fish also contribute to higher impingement rates. While adults are susceptible to impingement, juvenile fish are generally weaker swimmers and tend to become impinged more often and in greater numbers than adults. Injury to fish, including descaling, exhaustion, asphyxiation and starvation may occur due to impact against the traveling screens.[9] Once injured, a fish that is released via the fish return system has the potential to become progressively weakened and unable to survive due to the injury. Impingement of juvenile fish or other smaller organisms is likely to result in mortality due to the inability of the organisms to withstand the force of being trapped on the traveling screens.

Mirant Canal Station uses separate cooling water intake structures for Unit 1 and Unit 2. The intake structure for Unit 1 is situated on the bottom of the Canal at an elevation of -25.0 feet (ft), while the intake structure for Unit 2, which was installed several years after Unit 1, has a 9 foot fish sill that elevates the entrance of the intake from -35.0 ft to -26.0 ft. This Unit 2 fish sill was installed to reduce impingement losses of winter flounder by reducing the number of fish entering the intake structure.[10] As previously mentioned, the location of the intake structure has an effect on the level of impingement. At Mirant Canal Station, the height of the Unit 2 intake structure above the bottom may reduce the level of impingement of benthic organisms in Unit 2 as compared to the level of impingement of benthic organisms in Unit 1.

The original Unit 1 discharge canal located between the two intake structures now serves to return impinged fish and seaweed back to the Cape Cod Canal. Fish are returned via sluiceways from both the Unit 1 and the Unit 2 CWIS's. The location of the original Unit 1 discharge canal between the two CWIS's increases the potential for fish to become re-impinged because once fish return to the high-velocity Cape Cod Canal, they may become re-impinged in either the Unit 1 or the Unit 2 intake structure. Whether they are re-impinged on the Unit 1 or Unit 2 CWIS depends on the direction of tidal flow when the fish emerge from the discharge channel to the Cape Cod Canal. Other aspects of the fish return system that may contribute to impingement mortality are discussed in Sections 4.2.2 and 4.3 (Outfall 002) of this Fact Sheet and include: location of the chlorination points, lack of fish buckets on the screens, use of high pressure spray wash, non-continuous rotation of screens, and the vertical drop of returned organisms to the water during low tide levels.

The permittee collected data on impingement rates and mortality from February 26, 1999 until March 31, 2000. Sampling occurred three times a week: once in the morning, once in the afternoon and once at night. Each Unit was sampled separately. Typically, both Units' screens were sampled simultaneously. Occasionally, if a pump was out of service, only one screen in front of the operating pump was sampled. Collections were made by placing a 3/8-inch (9.5 mm) stainless steel basket in the screenwash return sluiceway. Sampling was typically a

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[9] "Final Regulations To Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities; Final Rule. Federal Register, Vol. 69, No. 131, Friday July, 9, 2004, p 41586.

[10] Ph.D. Thesis, Boston Univ. Marine Program, Boston, MA. Collings, W.S., C.C. Sheenan et al., 1981. The effects of power generation of some living resources of the Cape Cod Canal and approaches. Massachusetts Dept. of Fisheries.

minimum of two hours as recorded from the end of the previous wash to the end of the current wash. Occasionally, such as during high fish impingement events or when seaweed was abundant, screens were operated continuously. On these occasions a one-hour sample was collected. Upon completion of each collection, the contents of the baskets were examined. Amounts of mixed wet algae were approximated in gallons. Fish retained by the basket were collected, identified, and enumerated. All fish were measured to the nearest mm total length. In large collections, 25 individuals per species were measured, the remainder counted. All fish were immediately examined for initial condition (e.g. live, dead, injured). Any fish that was alive or injured at the time of collection was placed in a 20-gallon holding tank supplied with continuously running ambient seawater. Latent survival was determined after 48 hours. The methodology used by Mirant Canal, LLC to collect impingement data is described in more detail in Appendix 1, Section C.1 of the October 30, 2003, Mirant Canal NPDES Permit Application No. MA0004928.

The complete results of this sampling conducted by the permittee are presented in the NPDES application for Mirant Canal Station. Data summarizing the loss of organisms by impingement mortality in Mirant Canal Station is presented in Table 5.3. The permittee calculated annual impingement mortality from daily estimates. Most impingement events occurred during November and December and were dominated by Atlantic menhaden, silverside and river herring (alewife and blueback herring). Alewife, Atlantic menhaden and silversides, all important forage species, were among those fish species most commonly identified in impingement samples and the most vulnerable to impingement mortality at Mirant Canal Station.

Table 5.3: Annual Estimates of Impingement Mortality by Species of Finfish and Invertebrates at Canal Station

Common Name	Scientific Name	Annual Estimates of Impingement Mortality (1999-2000)
River Herring - Alewife	*Alosa pseudoharengus*	25,779
Atlantic Menhaden	*Brevoortia tyrannus*	23,901
Atlantic Herring	*Clupea harengus*	1,230
Fourbeard Rockling	*Enchelyopus cimbrius*	22
Atlantic Cod	*Gadus morhua*	671
Pollock	*Pollachius virens*	234
Hake - Red/Spotted/White	*Urophycis chuss* *Urophycis regia* *Urophycis tenuis*	131
Silversides	*Menidia menidia*	12,742
Searobin	*Prionotus spp*	17
Sculpins - Grubby	*Myoxocephalus aenaeus*	997

Striped Bass	*Morone saxatilis*	30
Scup	*Stenotomus chrysops*	374
Tautog	*Tautoga onitis*	231
Cunner	*Tautogolabrus adspersus*	3,624
Sand Lance	*Ammodytes americanus*	25
Atlantic Mackerel	*Scomber scombrus*	0
Butterfish	*Peprilus triacanthus*	505
Windowpane Flounder	*Scophthalamus aquosus*	86
Winter Flounder	*Pleuronectes americanus*	542
Yellowtail Flounder	*Pleuronectes ferruginea*	44
American Lobster	*Homarus americanus*	438
Total Loss Due to Impingement		71,623

The permittee makes the assumption of complete mortality for all impinged organisms for the analysis of impingement data presented in Table 5.3. The impingement data collected by the permittee documents adverse impacts to large numbers of fish and invertebrates from the Cape Cod Canal due to Canal Station's two CWIS's. This Draft Permit addresses the impacts due to impingement with Best Technology Available (BTA) measures to minimize this adverse environmental impact as described in Section 5.2.4 of this Fact Sheet.

5.2.2.c Summary: Entrainment and Impingement Impacts

Mirant Canal Station withdraws approximately 518 million gallons of water per day from the Cape Cod Canal. Estimates of entrainment and impingement mortality calculated by the permittee show that approximately 2.6 to 3.6 billion eggs and 187-318 million larvae per year are entrained, while over 71,000 individuals per year are impinged in Mirant Canal Station. For the two years of sampling performed, the permittee estimated that 415,874 and 787,604 annual equivalent adults were lost due to entrainment. EPA considers these losses due to impingement and entrainment to be substantial. Reducing impingement mortality and entrainment from the existing conditions will reduce adverse impacts to organisms using the Cape Cod Canal near Mirant Canal Station.

5.2.3 Technological Options

This section discusses some of the potentially available, practicable technological alternatives for ensuring that the design, construction, location and capacity of the CWISs at Mirant Canal reflect the BTA for minimizing adverse environmental impacts, as required by CWA § 316(b). This discussion considers engineering, environmental and, at a general level, economic issues related to these alternatives and is based on EPA knowledge regarding CWIS technology and our review of the supplemental information the permittee submitted to EPA on October 30, 2003. In addition, this section explains why some alternatives were or were not considered components of BTA in the Draft Permit.

Canal Station retained Alden Research Laboratory, Inc. (Alden), to help develop its response to EPA's Request for Supplemental Information, dated April 30, 2003. As requested, Alden evaluated the effectiveness of different fish protection technologies for the cooling water intake structures at Mirant Canal. Alden's report, "Evaluation of Fish Protection Alternatives for the Canal Generating Station"(hereinafter referred to as "the Report"), summarizes the features and operations of Canal's CWIS's, presents several technology and flow reduction alternatives, and provides a detailed evaluation of selected designs and the estimated costs for the alternatives selected.

The Report discusses numerous possible technologies for Canal, including those within the following categories: physical barriers, collection systems, diversion systems, and behavioral deterrent technologies. From these options, the Report identifies six alternatives for further detailed evaluation because they were considered commercially available, practicable from an engineering stand-point, and potentially effective for reducing impingement mortality and/or entrainment at Canal Station. These six alternatives were:

1- Expand Intake and Install Fine Mesh Ristroph Screens

2- Retrofit Intake with Submerged, Cylindrical Wedge Wire Screens

3- Retrofit Intake with Barrier Net

4- Install Coarse Mesh Ristroph Screens in Existing Intake

5- Modified Plant Operations (Flow Limitation)

6- Retrofit Plant with Closed-Cycle Cooling System

Each option was assessed for the following:

> (1) technical considerations associated with design, installation, operation, and maintenance;
> (2) estimated construction costs and operating and maintenance costs, including for replacement power; and
> (3) estimated efficacy at reducing entrainment and impingement rates or impingement mortality.

The following discussion summarizes the Report's technological evaluations.

Alternative 1 - Expand Intake and Install Fine Mesh Ristroph Screens

Alternative 1 involves expanding each intake structure by addition of another intake bay at each CWIS. The existing traveling screens would be replaced with new flush-mounted, fine-mesh Ristroph screens. With these changes, the approach velocity would be reduced from approximately 0.7 or 0.8 ft/second currently, to approximately 0.5 ft/second (which is approximately 1 foot/second *through-screen* velocity). New fish return and debris troughs would also be installed with the screens. The intakes would be equipped with a low pressure spray wash and fish return system and a separate high pressure spray wash and debris return system. The new fish and debris return systems would discharge at either end of each Unit so that during ebb tide, debris/fish trough flow for both Units would discharge west of the intakes and during flood tide debris/fish trough flow would discharge east of the intakes. The new fish return system would reduce both impingement mortality and the probability of fish being re-impinged on the intake screens.

The construction cost for this option is estimated at $10.41 million. Also, it was determined that the operation and maintenance costs of the Ristroph screens and circulating water pumps would be similar to that for the existing system. Although, continuous screen washing would occur only during times of high debris loading or periods of high fish impingement/entrainment, the O&M costs were calculated based on twelve months of continuous operation. (*See* Alden, Table 5-5 Cost Comparison of Evaluated Alternatives, p. 5-7.)

The Report concludes that the fine mesh Ristroph screens would reduce, *to some extent*, the entrainment of eggs and larvae through the circulating water system. The diameters of eggs and head capsule size of the species most commonly entrained at Canal were evaluated and it was determined that "substantial retention would be expected for some of the species and life-stages commonly entrained," but that the eggs of other species' (such as tautog and cunner) would be too small for entrainment prevention.[11] In the preamble to the Phase II Regulations, EPA indicates that in some cases, "...fine mesh traveling screens with fish return systems have been shown to achieve 80 to 90 percent or greater reduction in entrainment compared to conventional once-through systems." (See 69 Fed. Reg. 41599 (July 9, 2004).) Alden's Report does not, however, find that fine mesh Ristroph screens would achieve this level of performance at Canal. Instead, as stated above, the Report concludes that they would provide some level of improvement for some species. The Report also points out that to the extent that these screens prevent entrainment of some organisms, they will necessarily impinge them and some of these eggs and larvae will not survive the effects of impingement. Such impingement mortality would offset the benefits of entrainment reduction. EPA agrees with the appraisal of this technology: namely, that it would likely result in some level of improvement but that there are limits to what it can achieve and additional study would be needed to characterize its overall effect. As a

[11] Alden Research Laboratory, Inc., "Evaluation of Fish Protection Alternatives for the Canal Generating Station", October 2003, p. 4-3.

result, EPA does not at this time designate this option as BTA for Canal Station's NPDES Permit, though further, future analysis of this technology may be warranted.

Alternative 2 - Retrofit Intake with Submerged, Cylindrical Wedge Wire Screens

Entrainment and impingement could also be reduced by the installation of submerged, cylindrical wedge wire screens. The screens would be mounted on a bulkhead that would be located in front of and surrounding the existing cooling water intake structures. Fifty-seven, T-shaped, wedge wire screens would be needed for maximum plant intake flow. The existing trash racks and traveling screens would not be needed and therefore would be removed. The high current velocities in the Cape Cod Canal should effectively clean the screens, although, an air-backwash system would be installed to periodically dislodge any debris. It is estimated that the through-screen velocity would not exceed 0.5 ft/second, significantly reducing impingement of adult, juvenile and some larval fish.

The Report indicates, based largely on recent laboratory tests, that wedge wire screens are highly effective at reducing both impingement and entrainment of all fish species tested when channel velocities are greater than 0.5 ft./second. As previously discussed, Cape Cod Canal has relatively high water current velocities (1 foot/second to 5 feet/second), similar to that of a riverine environment. However, mortality rates would increase during times of slack tides, which is assumed to be a 45-minute period during each 12 hour tidal cycle. To the extent that organisms that would have been entrained by the facility are blocked by the screens, those organisms may be impinged. Yet, if the system would prevent impingement mortality, then it would represent an overall improvement.

The construction cost of this alternative is estimated at $11.25 million.[12] In addition, there are several issues that would likely need to be addressed during any installation of the wedge wire screens and associated facilities, including disposal of dredged spoil, proximity to the navigation channel, and increased noise due to the air backwash system air compressors.

EPA consulted with the Army Corps of Engineers (Corps) to determine the likely feasibility of this technology for installation in the Cape Cod Canal from a navigational perspective. The Corps might need to issue a license under Section 10 of the Rivers and Harbors Act to authorize the installation of the wedge wire screen facilities to ensure that they do not unacceptably interfere with navigation. After review of the site-specific design for this technology prepared by Alden, the Corps determined that this technology would not likely be a good candidate for Canal Station. In a phone message to David Webster of EPA on February 15, 2005, Bill Hubbard of the Corps indicated that the wedge wire screens both would impede navigation in the channel and would not likely hold up during icing conditions. As a result, EPA does not at this

[12] Alden Research Laboratory, Inc., "Evaluation of Fish Protection Alternatives for the Canal Generating Station", October 2003, p. 5-7.

time designate this option as BTA for Canal Station's NPDES Permit. However, if the engineering issues were resolved, and depending on the results of further evaluation of the entrainment and impingement impact reduction benefits of the technology, EPA believes that permit limits based on the installation of Alternative 2 might be able to satisfy CWA § 316(b)'s BTA requirements and that this Alternative should continue to be considered in future analyses as a potential means of compliance.

Alternative 3 - Retrofit Intake with Barrier Net

The Report evaluated installing a 0.5 inch mesh barrier net in front of each intake structure at Canal Station. The construction cost of this alternative is estimated at $2.4 million.[13] While this approach would reduce impingement of fish on the existing intake screens, it would not reduce entrainment. In addition, the proximity to the navigation channel may also be an issue with this alternative. As a result, EPA does not give further consideration of this option for BTA at Canal Station.

Alternative 4 - Install Coarse Mesh Ristroph Screens in Existing CWIS

This alternative involves replacing the existing 3/8" mesh screens with new, state-of-the-art, coarse mesh (9.5 mm) Ristroph screens. The construction cost of this alternative is estimated at $2.4 million.[14] Similar to Alternative 3, this option may reduce impingement mortality somewhat but would not reduce entrainment. Therefore, EPA does not give further consideration of this option for BTA at Canal Station.

Alternative 5 - Reduced Circulating Water Pump Operation

With this option, Canal Station could achieve a 60% reduction in entrainment by reducing current circulating water pump capacity during periods of high entrainment. Reductions in impingement would also be realized, but not necessarily proportional to the flow reduction. There are several ways that this can be achieved without requiring the replacement or modification of the existing CWIS, including shutting down pumps, throttling discharge valves, and using variable speed drives. However, this option, for each scenario described in the Report, would decrease the capacity of the Station, resulting in lost generation. According to Alden's estimates (Table 5-5) the annual replacement cost for power is $161,885 million. This cost is significantly greater than the costs attributed to both Alternatives 1 and 2 (Expand Intake and Install Fine Mesh Ristroph Screens and Wedge Wire Screens, respectively), which both might, depending on the results of further study, be able to achieve similar results. This option would

[13] Alden Research Laboratory, Inc., "Evaluation of Fish Protection Alternatives for the Canal Generating Station", October 2003, p. 5-7.

[14] *Ibid.*

also reduce entrainment and impingement mortality less than Alternative 6 (Retrofit Plant with Closed-Cycle Cooling System), but would have a similar or greater cost than Alternative 6. As a result, EPA does not designate this option as BTA for Canal Station's NPDES Permit.

Alternative 6 - Retrofit Plant with Closed-Cycle Cooling System

A mechanical draft cooling tower could be retrofitted to the existing circulating system at Canal Station. Many of the components of the condenser system would remain intact and the flow through the condenser would remain approximately the same. Land is available at the site and construction could take place independent of the existing plant operations. However, the permittee predicts that mist eliminators and plume abatement equipment would be required to minimize impacts on nearby transportation. EPA notes that whether or not plume abatement equipment would be needed would require careful analysis of many factors, but that if they were required, it would add cost to the cooling tower system. Although cooling tower make-up water would be required, cooling water intake flows would be reduced by approximately 72%-98%. This reduction in intake flow would have a commensurate reduction in entrainment and impingement of organisms. The permittee estimates that approximately $108 million would be required for the construction cost of this alternative.[15] This option would achieve a greater degree of entrainment and impingement mortality reduction than the generating unit shutdowns and capacity reductions discussed for Alternative 5, but at lower cost. (EPA notes that Alden did not appear to quantify certain costs of Alternative 6, such as the cost of lost generation during any construction-related plant shutdowns. Therefore, this comparison of costs between the alternatives may warrant refinement in the future.) This option would also achieve greater entrainment and impingement mortality reductions than the technologies discussed in Alternatives 1 and 2 above - though the extent of that difference is unclear because further study is needed to characterize the entrainment and impingement mortality reduction capability of Alternatives 1 and 2 -- but at much greater cost. As a result, EPA does not at this time mandate this option as BTA for Canal Station’s NPDES Permit. EPA concludes, however, that permit limits based on the installation of Alternative 6, which would yield the largest entrainment and impingement mortality reduction of the six alternatives, would satisfy CWA § 316(b)'s BTA requirements, see 40 C.F.R. § 125.94(a)(1)(i), and that Alternative 6 remains open to Canal Station as a potential means of compliance. Another option that could be considered would be to provide closed-cycle cooling for some, but not all, of the plant's cooling needs. This would lessen the option's entrainment and impingement reductions, but would also lessen its cost.

5.2.4 Determination

This section presents EPA's determination with respect to the application of CWA § 316(b), 33 U.S.C. § 1326(b), to the NPDES permit for Canal Station. CWA § 316(b) requires that the

[15] Alden Research Laboratory, Inc., “Evaluation of Fish Protection Alternatives for the Canal Generating Station”, October 2003, p. 5-7.

design, capacity, location and construction of cooling water intake structures reflect the Best Technology Available (BTA) for minimizing adverse environmental impacts. EPA has considered the nature and magnitude of the adverse environmental impacts from Canal Station's CWIS and has evaluated the technological options available for minimizing these impacts and their performance capabilities. EPA has also considered the costs of implementing these technological options.

The adverse environmental impacts associated with the operation of the CWIS at Canal Station include the entrainment of eggs and larvae and the impingement of fish and shellfish. Entrainment and impingement seriously injure or kill a large percentage of the organisms involved. As currently operated, the plant can take in up to 518 million gallons per day of water from the Cape Cod Canal, entraining or impinging organisms present in that water. As previously discussed in Section 5.2.2.c of this Fact Sheet, Canal Station estimates that, on an annual basis, the Station entrains somewhere between 2.6 and 3.6 billion eggs, and 187-318 million larvae and that over 71,000 individuals are impinged.

The adverse effects of entrainment and impingement by the plant's intake structures could be avoided or reduced by the installation of existing, practicable cooling water intake technologies and the implementation of practicable operational measures at Canal Station. Some combination of steps will be needed to meet the CWA § 316(b) requirement that the design, location, construction and capacity of cooling water intake structures reflect the BTA for minimizing adverse environmental effects.

As previously explained, this determination of limits under CWA § 316(b)'s BTA requirement for the Canal Station permit is based on EPA's site-specific, Best Professional Judgment (BPJ), consistent with 40 C.F.R. §125.95(a)(2)(ii) of the new Phase II CWA § 316(b) Regulations. In addition to the BTA requirements, EPA is requiring biological monitoring (before and after technological changes have been made at the Station) in the Draft Permit. Monitoring is needed to better determine the magnitude of environmental impacts associated with the CWIS, the effectiveness of BTA measures, and whether additional changes to the facility's CWA §316(b)-related permit requirements would be warranted in the future, either in a reissued or modified permit. To the extent possible, monitoring shall be performed with procedures consistent with the Station's previous data collection activities so that the new information will be comparable to current information.

Entrainment and impingement are the two major classes of adverse environmental impacts from Canal Station's CWIS. Therefore, EPA has developed CWA § 316(b) permit limits on a BPJ basis to address each.

Turning first to entrainment, EPA has assessed the entrainment impacts of Canal Station and has determined that control measures to reduce entrainment are necessary to provide the BTA for minimizing adverse environmental impacts, as required by CWA § 316(b). While Canal could comply with CWA § 316(b)'s BTA requirement by deciding to retrofit its cooling system with closed-cycle cooling (Alternative 6, discussed above), EPA is not presently prepared to mandate closed-cycle technology in this permit because of the need to further evaluate its cost as well as the performance capabilities of other significantly less expensive alternatives. Regarding the other technologies that can reduce entrainment, further evaluation is needed of their entrainment reduction capabilities, any offsetting impingement mortality increases they might cause, their costs, and any problems with engineering/logistical practicability that they might pose (e.g., possible interference with navigation in the Cape Cod Canal).

EPA notes that the new Phase II Regulations require the development of the information necessary to compare compliance alternatives and identify BTA requirements, and that deadlines for submitting this information are phasing in over the next few years. Thus, for example, facilities must submit a Proposal for Information Collection (PIC) by October 2006 and a Comprehensive Demonstration Study (CDS) by January 2008. See 40 C.F.R. § 125.95(a)(2)(ii) and (b). Therefore, EPA's site-specific BPJ determination of BTA limits under CWA § 316(b) with respect to entrainment reduction for Canal's permit is to require Canal to follow the procedures for developing, selecting, and implementing one of the five compliance alternatives, mandated by the Phase II Regulations. These requirements are spelled out in Section 8 of the Draft Permit and will include submission to EPA and DEP as soon as practicable, but no later than October 7, 2006, of the permittee's preliminary selection of one of the five compliance alternatives discussed in 40 C.F.R. § 125.94 for providing the Best Technology Available for minimizing adverse environmental impact and submission to EPA and DEP of the permittee's final compliance alternative selection no later than January 7, 2008.[16]

Turning to impingement mortality reductions, EPA's site-specific BPJ evaluation of adverse environmental impact and technological alternatives (including their practicability, cost, performance, etc.) has led to the conclusion that BTA to minimize impingement mortality at Canal Station currently consists of the following components:

1. Within six weeks of permit issuance, the permittee shall remove sediment buildup on the face of the Unit 2 intake sill (Part I.A.9.d of Draft Permit), and thereafter, periodically remove sediment build-up to maintain the Unit 2 intake sill as designed to minimize impingement[17];

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[16] EPA notes that issuing the permit now, rather than delaying issuance until after further study of the entrainment reduction issues discussed above, has the benefit of moving ahead with the impingement mortality reduction and pollutant discharge control measures required by the permit.

[17] After this has been completed and for the duration of the permit, the permittee shall evaluate and report the number of impinged organisms for each individual intake structure

2. Immediately eliminate fish exposure to heated and chlorinated once-through cooling water in the fish return discharge flume (Outfall 002)(Part I.A.3.b of Draft Permit);
3. Within 12 months of the effective date of the permit, equip the existing screens with fish holding buckets to hold collected organisms in approximately 2 inches of water while they are lifted to the fish return system;
4. Within 12 months of the effective date of the permit, ensure that a low pressure (<30 psi) screen spray wash is in operation as part of each screenwash system in a manner such that organisms are not exposed to high pressure screen spray and are removed from the fish holding buckets into the fish return sluiceway;
5. Within 12 months of the effective date of the permit, relocate all cooling water chlorination injection points in a manner such that organisms are not exposed to chlorine prior to and during impingement on the intake screens;
6. Within 18 months from permit issuance, reconfigure the fish return system such that, once returned to the Cape Cod Canal, the fish are transported away from both intake structures based on the tidal flow in the Cape Cod Canal[18]. The fish return trough shall be engineered to provide the return of aquatic organisms to the Cape Cod Canal always at sufficient depth for fish locomotion, with minimal stress, including during all periods of low tide level. In addition, there shall be no vertical drop of fish from the end of the fish return trough to the surface of the Cape Cod Canal.; and
7. After completion of the reconfigured fish return system and for the duration of the permit, the permittee shall operate all screens continuously when the corresponding circulating water pumps are in operation[19].

Unless otherwise noted, these requirements are found in Part I.A.13 of the Draft Permit.

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separately. The purpose of this report shall be to determine the effectiveness of the fish sill in reducing impingement mortality compared to the intake structure without a sill.

[18] As described in Section 5.2.3, Alternative 1 of this Fact Sheet, the probability of fish being re-impinged would be reduced with the installation of new fish and debris return systems that would discharge at either end of each Unit so that during ebb tide, fish trough flow for both Units would discharge west of the intakes and during flood tide fish trough flow would discharge east of the intakes. The estimated cost of this new fish and debris return system is $192,000 according to Alden’s Report, page 5-3.

[19] EPA is aware that the facility currently uses pressure differential switches to periodically operate the rotating intake screens. In order to reduce the time organisms are trapped against the screens, the Draft Permit requires that the rotating screens be operated when the corresponding circulating pumps are operating (after the fish return system has been reconfigured). EPA invites comment regarding the feasibility of this change to the facility operation.

6.0 Essential Fish Habitat (EFH)

Under the 1996 Amendments (PL 104-297) to the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801 et seq. (1998)), EPA is required to consult with the National Marine Fisheries Service (NMFS) if EPA's actions, or proposed actions that EPA funds, permits, or undertakes, "may adversely impact any essential fish habitat." 16 U.S.C. § 1855(b). The Amendments broadly define essential fish habitat as, "... those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." 16 U.S.C. § 1802(10). Adverse impact means any effect which reduces the quality and/or quantity of EFH. 50 C.F.R. § 600.910(a). Adverse effects may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey, reduction in species' fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions. EFH is only designated for species for which Federal Fishery Management Plans exist (16 U.S.C. § 1855(b)(1)(A)). EFH designations were approved for New England by the U.S. Department of Commerce on March 3, 1999.

As described in Section 1.0 of this Fact Sheet, Mirant Canal Station is an 1120 megawatt fossil fuel electrical generation facility. EPA intends to reissue the facility's NPDES permit. This draft permit continues to authorize the withdrawal and discharge of "once-through" cooling water but is based on the assumption that the facility will employ specific measures to reduce adverse environmental impact to fish and invertebrate species found in the vicinity of Mirant Canal Station consistent with applicable requirements under the Clean Water Act.

The Cape Cod Canal connects two bays, Buzzards Bay to Cape Cod Bay and is influenced by two tidal flows between these two bays. The Canal provides habitat as well as a migratory route for a variety of species of finfish and invertebrates. Some species may use the Canal for spawning and others are present seasonally.

Table 6.1 provides a list of EFH species and applicable life stages designated by NMFS as present in Cape Cod Canal and waters within Cape Cod Bay and Buzzards Bay.

Table 6.1: EFH Species and Applicable Life Stages Present in Cape Cod Canal and Adjacent Bays

EFH Species	Eggs	Larvae	Juveniles	Adults
Atlantic cod (*Gadus morhua*)	x	x	x	x
haddock (*Melanogrammus aeglefinus*)	x	x		

pollock (*Pollachius virens*)		x	x	x
whiting (*Merluccius bilinearis*)	x	x	x	x
red hake (*Urophycis chuss*)	x	x	x	x
white hake (*Urophycis tenuis*)	x	x	x	x
winter flounder (*Pseudopleuronectes americanus*)	x	x	x	x
yellowtail flounder (*Pleuronectes ferruginea*)	x	x	x	x
windowpane flounder (*Scopthalmus aquosus*)	x	x	x	x
American plaice (*Hippoglossoides platessoides*)	x	x	x	x
ocean pout (*Macrozoarces americanus*)	x	x	x	x
Atlantic halibut (*Hippoglossus hippoglossus*)	x	x	x	x
Atlantic sea scallop (*Placopecten magellanicus*)	x	x	x	x
Atlantic sea herring (*Clupea harengus*)		x	x	x
monkfish (*Lophius americanus*)	x	x		
bluefish (*Pomatomus saltatrix*)			x	x
long finned squid (*Loligo pealie)*	n/a	n/a	x	x
short finned squid (*Illex illecebrosus*)	n/a	n/a	x	x
Atlantic butterfish (*Peprilus tricanthus*)	x	x	x	x
Atlantic mackerel (*Scomber scombrus*)	x	x	x	x
summer flounder (*Paralichthys dentatus*)				x
scup (*Stenotomus chrysops*)	x	x	x	x
black sea bass (*Centropristus striata*)	n/a		x	x
spiny dogfish (*Squalus acanthias*)	n/a	n/a		x
bluefin tuna (*Thunnus thynnus*)			x	x

The Mirant Canal Facility utilizes a once-through cooling system and impacts aquatic resources in three major ways: (A) by entrainment of small organisms into and through the cooling water intake structure; (B) by impingement of juvenile and adult organisms on the intake screens; and

(C) by discharging heated effluent to the receiving waters.

A. Entrainment: The potential to impact aquatic organisms by entrainment largely depends on the presence and abundance of organisms that are vulnerable to entrainment, and the flow required for cooling. Other important considerations include the location and design of the intake structure. According to section 316(b) of the Clean Water Act, any point source that uses a cooling water intake structure must ensure that its location, design, construction and capacity reflect the Best Technology Available (BTA) for minimizing adverse environmental impact.

The EFH resources (including forage species) most vulnerable to entrainment in the vicinity of this facility are species that have positively buoyant eggs, and/or pelagic larvae, and have been found in entrainment samples. These species include:

EFH Species	Egg	Larvae
1. Atlantic Cod	buoyant	pelagic
2. haddock	buoyant	pelagic
3. whiting	buoyant	pelagic
4. red hake	buoyant	pelagic
5. white hake	buoyant	pelagic
6. winter flounder	demersal, adhesive	pelagic
7. yellowtail flounder	buoyant	pelagic
8. windowpane flounder	buoyant	pelagic
9. American plaice	buoyant	pelagic
10. ocean pout	demersal	pelagic
11. Atlantic halibut	buoyant	pelagic
12. monkfish	buoyant	pelagic
13. Atlantic mackerel	buoyant	pelagic
14. Atlantic sea herring	demersal, adhesive	pelagic
15. scup	buoyant	pelagic
16. Atlantic butterfish	buoyant	pelagic

Major Forage Species	Egg	Larvae
1. American sand lance	demersal, adhesive	pelagic
2. Atlantic silversides	demersal, adhesive	remain local to spawning site
3. Atlantic menhaden	buoyant	pelagic

The species most commonly entrained at Mirant Canal Station included Atlantic mackerel, cunner, Atlantic herring, hake (spp.), winter flounder, yellowtail flounder, windowpane flounder and tautog. Forage species that were most commonly entrained at Mirant Canal Station included Atlantic silversides and American sand lance. Numeric estimates of entrainment losses can be found in Table 5.1 of this Fact Sheet. Table 5.2 of this Fact Sheet provides estimates of adult equivalents lost by entrainment at Canal Station. Cunner, sand lance and grubby have the greatest loss of equivalent adults.

B. Impingement: Organisms that are of a size too large to pass through the intake screens are still vulnerable to being impinged on the screens. Additionally, the intake location and design, and cooling water flow requirements are major factors in assessing impingement potential.

EFH species considered to be most vulnerable to harm from impingement have one or more of the following characteristics: (A) pass intake structures in large, dense schools as juveniles or adults; (B) are actively pursued as major forage species; (C) are attracted to the intake structure as a source of forage or refuge; (D) are slow moving or are otherwise unable to escape the intake current; and/or (E) are structurally delicate, and likely to die if impinged. Of the EFH species and their forage previously listed, the following species have been impinged at Canal Station, or are potentially vulnerable to impingement based on their characteristics as outlined above:

EFH Species	Vulnerable Lifestage
1. Atlantic cod	juvenile, adult
2. pollock	juvenile, adult
3. red hake	juvenile, adult
4. white hake	juvenile, adult
5. winter flounder	juvenile, adult
6. yellowtail flounder	juvenile, adult
7. windowpane flounder	juvenile, adult
8. Atlantic sea herring	juvenile, adult
9. Atlantic butterfish	juvenile, adult
10. Atlantic mackerel	juvenile, adult
11. scup	juvenile, adult

Major Forage Species	Vulnerable Lifestage
1. American sand lance	juvenile, adult
2. Atlantic silversides	juvenile, adult
3. alewife	juvenile, adult
4. Atlantic menhaden	juvenile, adult

Species that were found to be most commonly impinged included Atlantic menhaden and Atlantic silversides, alewife and cunner. Estimates of impingement losses can be found in Table 5.3 of this Fact Sheet.

C. Discharge of Heated Effluent: The discharge of heated effluent may kill or impair organisms directly, elicit changes in normal behavior (alter normal migration patterns, cause avoidance of areas) or change normal trophic dynamics. The size and location of the thermal plume as well as the magnitude of the change over ambient temperatures (delta T) determine the level of thermal impact.

Cape Cod represents a biological breakpoint with different assemblages of species north and south of this peninsula. The species from the northern side of the Cape (Gulf of Maine) are primarily cold water species, while those from the southern side (Buzzards Bay) are primarily warm water species. The Cape Cod Canal gets a mix of species from both sides, some appearing only seasonally, primarily in response to water temperature. Species that are found primarily in the Gulf of Maine and are at their southern range of distribution would likely be at the greatest risk for impacts due to the thermal discharge. Table 6.2 provides a brief compilation of temperature preferences of the EFH species likely to be present in the Canal. This is not a comprehensive list, information is taken primarily from Collette and Klein-Macphee.[20]

Table 6.2: Temperature Preferences of EFH Species Likely to be Present in the Cape Cod Canal

EFH Species	Temperature range (°C)	Spawning temperature (°C)
Atlantic cod (*Gadus morhua*)	0 to13	5 to 7
haddock (*Melanogrammus aeglefinus*)	2 to16 2 to10 preferred	2.5 to 6.6
pollock (*Pollachius virens*)	0 to15	4.4 to 6.1
whiting (*Merluccius bilinearis*)	7 to17	no data available
red hake (*Urophycis chuss*)	5 to12	5 to10
white hake (*Urophycis tenuis*)	0 to13 4 to10 preferred	no data available
winter flounder (*Pseudopleuronectes americanus*)	0 to 20	3.3 to 5.5
yellowtail flounder (*Pleuronectes ferruginea*)	-1 to 18	4.5 to 8.1
windowpane flounder (*Scopthalmus aquosus*)	0 to 26.8	6 to 17 8.5 to 13.5 majority of spawning occurs
American plaice (*Hippoglossoides platessoides*)	1.7 to 13 1.7 to 7.7 preferred	2.7 to 4.4

[20] Collette, B and G. Klein-MacPhee (eds.), 2002, Bigelow and Schroeder's fishes of the Gulf of Maine, Smithsonian Institution Press, Washington DC, p. 748.

ocean pout (*Macrozoarces americanus*)	0 to 16 6 to 9 preferred	no data available
Atlantic halibut (*Hippoglossus hippoglossus*)	0.6 to 15 3 to 9 preferred	no data available
monkfish (*Lophius americanus*)	0 to 24	no data available
Atlantic sea herring (*Clupea harengus*)	4 to 16 5 to 9 preferred	10 to 15
bluefish (*Pomatomus saltatrix*)	11.8 to 30.4	18 to 25
Atlantic butterfish (*Peprilus tricanthus*)	4.4 to 21.6	15 to 20
Atlantic mackerel (*Scomber scombrus*)	6 to 20	9 to 14
black sea bass (*Centropristus striata*)	6 to 29.8	no data available

Based on the thermal monitoring and hydrodynamic modeling as discussed in Section 5.1 of this Fact Sheet and the temperature tolerance data for the relevant EFH species, EPA does not believe that significant impacts will occur to essential fish habitat.

EPA does not believe that essential fish habitat is being significantly impacted by the thermal discharge. EPA is concerned about the entrainment and impingement losses, as a result a thorough review of technological changes at the station was conducted. EPA determined that the steps outlined in Section 5.2.4 of this Fact Sheet should be taken to minimize entrainment and impingement mortality under CWA § 316(b). These steps have been incorporated into the Draft Permit at Section I.A.13.

As the federal agency charged with authorizing the discharge from this facility, EPA is consulting with the NMFS under section 305 (b)(2) of the Magnuson-Stevens Act for EFH. As mentioned above a number of EFH species have been entrained and/or impinged by Canal Station. This consultation will be completed before the permit is finalized.

7.0 Endangered Species Act (ESA)

The U.S. Environmental Protection Agency - Region I, New England (EPA) is preparing to reissue the National Pollutant Discharge Elimination System (NPDES) permit to the Mirant Canal, LLC Station in Sandwich, Massachusetts, located on the southern shore of the Cape Cod Canal, about 1,500 yards from the eastern exit to Cape Cod Bay. The NPDES permit authorizes the withdrawal of water from and the discharge of heated effluent into the Cape Cod Canal that connects Cape Cod Bay and Buzzards Bay. A detailed description of the Facility and the local environment may be found in the October 30, 2003, Mirant Canal, LLC NPDES Permit Application (MA0004928) and in Section 4.2 of this Fact Sheet.

As the federal agency charged with authorizing the discharge from this facility, EPA, as part of its consultation responsibilities under section 7 (a)(2) of the Endangered Species Act (ESA) for potential impacts to federally listed species, is seeking written concurrence from the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) on this determination. In this particular case, several endangered species under the jurisdiction of NOAA Fisheries may potentially be affected by the reissuance. It is EPA's opinion, however, that the location and operation of this facility, as governed by the Draft Permit, are not likely to adversely affect the species of concern.

The marine species shown in Table 7.1 are listed as threatened or endangered and may be found in the vicinity of this facility. In making its assessment, EPA has consulted general profiles and descriptions of these species found in the following sources:

1. NOAA Fisheries, 2005. http://www.nmfs.noaa.gov/pr/species/turtles/#species. National Marine Fisheries Service.

2. CCCSTSL, 2005. http://www.cccturtle.org/contents.htm. Caribbean Conservation Corporation & Sea Turtle Survival League.

Table 7.1: Endangered/Threatened Marine Mammal Species Found in the Vicinity of Mirant Canal Station

Marine Mammal	Species	Threatened or Endangered
Loggerhead Turtle	*Caretta caretta*	Threatened
Kemp's Ridley Turtle	*Leipdochelys kempii*	Endangered
Hawksbill Turtle	*Eretmochelys imbricata*	Endangered

Leatherback Turtle	*Dermochelys coriacea*	Endangered
Green Turtle	*Chelonia mydas*	Endangered/Threatened
Northern Right Whale	*Eubalaena glacialis*	Endangered
Humpback Whale	*megaptera novaeangliae*	Endangered

Marine Turtles

Loggerhead *(Caretta caretta)*

(Threatened): Listed as threatened since 1978, this species is more abundant in United States coastal waters than any other marine turtle, preferring bays, continental shelves and estuarine habitats. Sexual maturity occurs between 16-40 years and individuals may take up to thirty years to mature. Mating occurs from late March through early June, and eggs may be laid throughout the summer. Nesting occurs during the summer in lower latitudes (NOAA Fisheries). The diet of this turtle consists mainly of mollusks, jellyfish, shrimp and crabs (CCCSTSL). The mortality rate of these turtles is approximately 2% from being caught in power plant intake systems (NOAA Fisheries).

Kemp's Ridley *(Lepidochelys kempii)*

(Endangered): Listed as endangered since 1970, this species occurs in the northwestern Atlantic along shallow coastal areas with sandy or muddy bottoms. Sexual maturity is thought to occur between 7-15 years in this species, the smallest of all marine turtles (NOAA Fisheries). Annual nesting occurs usually twice per season as a mass synchronized event along the Northeast coast of Mexico. The diet of this turtle consists of clams, shrimp, fish, squid, jellyfish, crabs, mussels and sea urchins. Potential threats to this species include habitat degradation and entanglement from floating debris (CCCSTSL).

Hawksbill *(Eretmochelys imbricata)*

(Endangered): Listed as endangered since 1970, this species occurs in tropical and subtropical areas of the Atlantic Ocean, but may be found in coastal areas north to Massachusetts, in rocky areas, reefs and in both low and high energy areas. Nesting occurs in a variety of habitats usually under some vegetation and may occur in intervals of 2-4 years. The age at which this species is considered sexually mature is unknown (NOAA Fisheries). These turtles usually feed on squid, shrimp, sponges and anemones (CCCSTSL). Potential threats to this species include coastal pollution and these turtles are known to be caught in cooling water intake structures of coastal facilities (NOAA Fisheries).

<u>Leatherback *(Dermochelys coriacea)*</u>

(Endangered): Listed as endangered since 1970, this primarily pelagic species is larger and more widely distributed than any other species of marine turtle. Although nesting does not occur often in U.S. coastal waters, this species is known to feed in offshore areas primarily on jellyfish (CCCSTSL). During the summer, this species may be found in coastal areas from Florida to the Gulf of Maine. Floating debris is one of the primary threats to these turtles (NOAA Fisheries).

<u>Green *(Chelonia mydas)*</u>

(Endangered/Threatened): Listed as endangered for breeding populations off of the Pacific coast of Mexico and Florida in 1978, these turtles range from temperate to tropical waters, and may be found in coastal areas with sea grass beds, protected shores, bays and around islands. Age at sexual maturity is thought to be between 20-50 years with intervals of 2-4 years between nesting periods (NOAA Fisheries). As juveniles, the diet of these turtles consists of aquatic insects, algae, crustaceans and worms. As adults, these turtles are herbivorous, eating only algae and sea grasses (CCCSTSL). Potential threats to this turtle include coastal pollution and becoming caught in cooling water intake structures of coastal power plants, with the mortality estimate of 7% (NOAA Fisheries).

<u>Cetaceans</u>

<u>Northern Right Whale *(Eubalaena glacialis)*</u>

(Endangered): Listed as endangered in 1970, this species is among the rarest of the large whales, with only a few hundred left in the North Atlantic populations. In general, these whales may be found in coastal or continental shelf waters. However, their distribution is based upon the distribution of their prey. Age at sexual maturity is usually between 9-10 years, and reproduction may occur at intervals of every 3-6 years. Calving takes place during the winter season in the coastal areas of Southeastern U.S. Nursery and feeding grounds include coastal areas of New England up to the Bay of Fundy during the summer season. In 1991, the U.S. National Marine Fisheries Service (NMFS) identified key habitats, or areas of “High Use,” one of which is Cape Cod Bay/ Massachusetts Bay. In 1994, these areas were designated by NMFS as Critical

Habitat for the Western North Atlantic population. Potential threats to this species included habitat degradation and pollution (NOAA Fisheries).

Humpback Whale *(Megaptera novaeangliae)*

(Endangered): Listed as endangered in 1970, this species is widely distributed in the world's oceans among four different stocks, one of which is the Gulf of Maine stock. These whales inhabit coastal embayments during the summer but are generally found in waters over continental shelves. Similar to Northern Right Whales, the humpback whales migrate to lower latitudes during the winter for breeding season, and return to higher latitudes for the summer feeding season. Age at sexual maturity is between 4-6 years old with reproduction occurring at intervals of every 2-3 years. Humpback whales feed on small schooling fishes including mackerel, haddock, sand lance and herring, as well as zooplankton. Potential impacts from coastal development and pollution include degraded habitat, resulting in the limitation of habitat necessary for survival and reproduction (NOAA Fisheries).

As previously discussed, the Cape Cod Canal is a channel that connects Cape Cod Bay to Buzzards Bay and may be used for transport by various species of marine organisms, including sea turtles, seals and other marine mammals. Coastal power plants and other industrial facilities are known to have an adverse impact on marine organisms by impingement or entrainment in cooling water intake structures.

In the case of Mirant Canal Station, the potential impact of facility operation on marine turtles and marine mammals has been minimal historically, with the last sighting of a marine turtle in the vicinity of the intake structure having occurred in 1977.

Although the intake structures are wide enough to accommodate sea turtles and many marine mammals, the ability of these organisms to swim away and escape impingement prevents injury. In addition, although heated water is discharged from this facility, the flow of the Cape Cod Canal in conjunction with a submerged diffuser provides for rapid mixing of heated effluent and, therefore, reduces the adverse impact of heat stress to these organisms, as well as reducing the likelihood of the thermal discharge providing a dangerous attractant.

EPA has included in the Draft Permit a requirement for the facility to develop a plan to monitor and report any marine turtles or marine mammals sighted in close proximity to the facility and its intake structures. In addition, it also requires that a response protocol be designed as a precaution for any impingement of these organisms that may occur in the future.

Based upon the factors outlined above, EPA believes that there will be no significant adverse environmental impact to the endangered species that migrate through or inhabit areas in the vicinity of Mirant Canal Station. Furthermore, the Draft Permit provides a means to monitor for the presence of marine turtles and marine mammals that may be susceptible to adverse impact from this facility. Therefore, EPA believes that this permit action does not warrant a formal consultation under section 7 of the ESA. EPA will engage in informal consultation with NOAA Fisheries to determine whether formal consultation will be needed.

8.0 Monitoring Frequency

The effluent monitoring requirements have been established to yield data representative of the discharge under authority of Section 308(a) of the CWA as required by 40 C.F.R. 122.41 (j), 122.41 (j)(4), (5), 122.44 and 122.48.

9.0 State Certification Requirements

EPA may not issue a permit in the Commonwealth of Massachusetts unless the Massachusetts Department of Environmental Protection (MA DEP) either certifies that limits contained in the permit are stringent enough to assure that pollutant discharges and cooling water withdrawals will not result in violations of the State's Water Quality Standards or waives this certification. The staff of the MA DEP has reviewed the Draft Permit. EPA has requested permit certification by the state pursuant to 40 C.F.R. 124.53 and expects that the Draft Permit will be certified.

10.0 General Conditions and Definitions

The remaining general and special conditions of the permit are based on the NPDES regulations, 40 C.F.R. Parts 122 through 125, and consist primarily of management requirements common to all permits.

11.0 Comment Period, Hearing Requests, and Procedures for Final Decisions

All persons, including applicants, who believe any condition of the Draft Permit is inappropriate must raise all issues and submit all available arguments and all supporting material for their arguments in full by the close of the public comment period, to the U.S. EPA, Office of Ecosystem Protection, Massachusetts State Program Unit, 1 Congress Street, Suite 1100, Boston, Massachusetts 02114-2023. Any person, prior to such date, may submit a request in writing for a public hearing to consider the Draft Permit to EPA and the State Agency. Such requests shall state the nature of the issues proposed to be raised in the hearing. A public meeting may be held if the criteria stated in 40 C.F.R. § 124.12 are satisfied. In reaching a final decision on the Draft Permit, the EPA will respond to all significant comments and make these responses available to the public at EPA's Boston office.

Following the close of the comment period, and after any public hearings, if such hearings are held, the EPA will issue a Final Permit decision and forward a copy of the final decision to the applicant and each person who has submitted written comments or requested notice. Within 30 days following the notice of the Final Permit decision, any interested person may submit a petition for review of the permit to EPA's Environmental Appeals Board consistent with 40 C.F.R. § 124.19.

12.0 EPA Contact

Additional information concerning the Draft Permit may be obtained between the hours of 9:00 A.M. and 5:00 P.M. (8:45 A.M. and 5:00 P.M. for the state), Monday through Friday, excluding holidays from:

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____________________________ **Linda M. Murphy, Director**
Date: **Office of Ecosystem Protection**
U.S. Environmental Protection Agency