AUTHORIZATION TO DISCHARGE UNDER THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Clean Water Act as amended, (33 U.S.C. §§1251 et seq.; the "CWA"), and the Massachusetts Clean Waters Act, as amended, (M.G.L. Chap. 21, §§26-53),

Wheelabrator Saugus, Inc.

is authorized to discharge from a facility located at

Wheelabrator Saugus, Inc.
100 Salem Turnpike
Saugus, MA 01906

to the receiving water named the Saugus River, a class SB water, in accordance with effluent limitations, monitoring requirements, and other conditions set forth herein.

This permit shall become effective on the first day of the calendar month following sixty (60) days after the date of signature.

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

This permit supersedes the permit issued on September 30, 1991.

This permit consists of 11 pages in Part I including effluent limitations, monitoring requirements, and 25 pages in Part II including General Conditions and Definitions.

Signed this 12 day of February, 2010

/S/ SIGNATURE ON FILE

Stephen S. Perkins, Director
Office of Ecosystem Protection
Environmental Protection Agency
Boston, MA

Glenn Haas, Director
Division of Watershed Management
Department of Environmental Protection
Commonwealth of Massachusetts
Boston, MA

PART I.A. **EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS**

1. During the period beginning on the effective date and lasting through expiration, the permittee is authorized to discharge non-contact cooling water (NCCW) from outfall serial number **001.** Such discharges shall be limited and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTIC	EFFLUENT LIMITS		MONITORING REQUIREMENTS	
PARAMETER	**AVERAGE MONTHLY**	**MAXIMUM DAILY**	**MEASUREMENT FREQUENCY**	**SAMPLE[1] TYPE**
Flow, October 1 through May 31	43.2 MGD	43.2 MGD	Continuous	Recorder[2,3]
Flow, June 1 through September 30	See footnote 3	See footnote 3	Continuous	Recorder[2,3]
pH Range [4]	6.5 – 8.5 standard units (s.u.)		1/Week	Grab
Temperature, Effluent	Report ^{o}F [5,6]	90 ^{o}F [5,6]	Continuous	Recorder
Intake Temperature	Report ^{o}F [5,6]	Report ^{o}F [5,6]	Continuous	Recorder
Facility Temperature Rise (delta T):	Report ^{o}F [5,6]	22 ^{o}F [5,6]	Continuous	Recorder

Footnotes are listed on Page 3.

Footnotes:

1. Effluent sampling shall be conducted between the point after the NCCW exits the condenser and prior to discharge to Outfall 001, the outfall diffuser. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP. All samples shall be tested using the analytical methods found in 40 CFR §136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR §136.

2. For flow, report the maximum and minimum daily rates and total flow for each operating date. Attach this data to each Discharge Monitoring Report (DMR) form. Effluent flow may be measured or estimated through the use of pump capacity curves consistent with the pumps used at the site. For the period of June 1 to September 30, also attach a table showing the hourly average intake temperature for each clock hour (for example, 1:00 PM to 2:00 PM). For the period of October 1 through May 31, the permittee shall operate at lower flows to the extent practicable.

3. For the period of June 1 through September 30, the monthly average and daily maximum flow limits are based on the highest hourly average intake temperature for the day by clock hour as shown below. For the monthly average flow value, report the average of all the daily flow values on each DMR and for the daily maximum flow value report the highest daily flow of the month on each DMR. See Part C.3 below for further detail regarding this requirement. For each month, report the total number of calendar days that each particular flow limit was in effect. If a particular flow limit was not in effect for a particular month, enter the no data indicator code “9”. The flow limits are as follows:

Highest Daily Hourly Average Intake Temperature:	Under 65 ^{o}F	65-70 ^{o}F	Over 70 ^{o}F
Daily Flow Limit:	43.2 MGD	50 MGD	60 MGD

4. Required for State Certification. The pH of the effluent shall not be less than 6.5 nor greater than 8.5 standard units and not more than 0.2 units outside of the natural background range. The pH shall be monitored at least once per week.

5. Effluent temperature and temperature rise (delta T) shall be measured as hourly averages, for every clock hour as defined in footnote 2, with readings taken at least every fifteen (15) minutes. The delta T is the difference between the effluent temperature and intake temperature. The maximum hourly average effluent temperature and delta T values for a particular day shall be reported as the maximum daily values. The average monthly value for both parameters will be the average of all hourly averages for each month. For the period of June 1 to September 30, the hourly average values for effluent temperature and delta T shall be tabulated for each month and attached to the corresponding DMR.

6. The intake and effluent temperatures shall be recorded by instruments or computers. The intake temperature shall be measured after the water is withdrawn through the cooling water intake structure (CWIS) and prior to entering the condenser and the effluent temperature shall be taken after the condenser and prior to discharge to Outfall 001, the outfall diffuser.

PART I.A. **EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS**

2. During the period beginning on the effective date and lasting through expiration, the permittee is authorized to discharge traveling screen wash water from outfall serial number **002**. Such discharges shall be monitored by the permittee as specified below:

EFFLUENT CHARACTERISTIC	EFFLUENT LIMITS		MONITORING REQUIREMENTS	
PARAMETER	**AVERAGE MONTHLY**	**MAXIMUM DAILY**	**MEASUREMENT FREQUENCY**	**SAMPLE TYPE**
Flow	Report MGD	Report MGD	Continuous	Estimate
pH	Report s.u.	Report s.u.	1/Month	Grab

PART I.A. Conditions that apply to all outfalls

3. The discharges shall not cause a violation of the water quality standards of the receiving waters.

4. The discharges shall not cause objectionable discoloration of the receiving waters.

5. The effluents shall contain neither a visible oil sheen, foam, nor floating solids at any time.

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

7. Any material collected on the intake trash racks and the traveling screens, with the exception of aquatic life, shall not be returned to the receiving waters, to the extent practicable.

8. Toxics Control

   a. The permittee shall not discharge any pollutant or combination of pollutants in toxic amounts.

   b. Any toxic components of the effluent shall not result in any demonstrable harm to aquatic life or violate any state or federal water quality standard which has been or may be promulgated. Upon promulgation of any such standard, this permit may be revised or amended in accordance with such standards.

9. Numerical Effluent Limitations for Toxicants

   EPA or MassDEP may use the results of the chemical analyses conducted pursuant to this permit, as well as national water quality criteria developed pursuant to Section 304(a)(1) of the Clean Water Act (CWA), state water quality criteria, and any other appropriate information or data, to develop numerical effluent limitations for any pollutants, including but not limited, to those pollutants listed in Appendix D of 40 CFR Part 122.

10. All existing manufacturing, commercial, mining, and silvicultural dischargers must notify the Director as soon as they know or have reason to believe:

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

        (1) One hundred micrograms per liter (100 ug/l);
        (2) Two hundred micrograms per liter (200 ug/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/l) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/l) for antimony;
        (3) Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 C.F.R. §122.21(g)(7); or
        (4) Any other notification level established by the Director in accordance with 40 C.F.R. §122.44(f).

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

        (1) Five hundred micrograms per liter (500 ug/l);
        (2) One milligram per liter (1 mg/l) for antimony;
        (3) Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 C.F.R. §122.21(g)(7); or
        (4) Any other notification level established by the Director in accordance with 40 C.F.R. §122.44(f).

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

11. Unusual Impingement Events

    a. The permittee shall visually inspect the traveling screens of the CWIS every twelve (12) hours for dead and live fish when circulating pumps are in operation. Screen inspection shall start at the beginning of the 15 minute screen rotation period and continue for at least one full rotation of the screen. If the permittee observes on the traveling screens, or estimates based on time-line observations, 25 or more dead and live fish per hour within any twelve (12) hour period, the permittee shall:

    b. Report such occurrence to the Regional Administrator and the Commissioner within 24 hours by telephone as required by Part II of this permit. A written confirmation report is to be provided within five (5) business days. The oral and written reports shall include the following information:

i. An enumeration and recording of all dead fish by species. Report the species, size ranges (maximum and minimum length), and approximate number of organisms involved in the incident. In addition, a representative sample of 25% of fish specimens from each species, up to a maximum of 50 total fish specimens, shall be measured to the nearest centimeter total length. Upon the occurrence of a UIE, the permittee shall inspect the traveling screens and count the number of impinged fish at least once every six (6) hours and until the the impingement rate decreases to less than 5 fish per hour.

ii. The date and time of occurrence.

iii. The operational mode of the specific system that may have caused the occurrence.

iv. The determination or opinion of the permittee as to the reason the incident occurred.

v. The remedial action that the permittee recommends to reduce or eliminate this type of incident in the future.

12. This permit may be modified, or revoked and reissued, on the basis of new information in accordance with 40 CFR §122.62.

B. UNAUTHORIZED DISCHARGES

The permittee is authorized to discharge only in accordance with the terms and conditions of this permit and only from the outfalls listed in Parts I A.1 and I.A.2 of this permit. Discharges of wastewater from any other point sources are not authorized by this permit and shall be reported in accordance with Section D.1.e. (1) of the General Requirements (Part II) of this permit (twenty-four hour reporting).

C. COOLING WATER INTAKE STRUCTURE REQUIREMENTS TO MINIMIZE ADVERSE IMPACTS FROM IMPINGEMENT AND ENTRAINMENT

The design, location, construction, and capacity of the permittee’s CWIS shall reflect the best technology available (BTA) for minimizing the adverse environmental impacts from the entrainment and impingement of fish eggs and larvae, as well as impingement of adult and juvenile fish, due to the CWIS. In order to satisfy this BTA standard, the permittee shall comply with the following:

1. All live fish and other aquatic organisms collected or trapped on the traveling screens shall be returned to the subtidal waters of the Saugus River without injury. All other material, except natural debris (e.g. twigs and leaves), shall be removed from the traveling screens to the extent practicable and disposed of in accordance with all existing

federal, state, and local waste disposal laws and regulations. Removed material shall not be returned to the receiving waters. In addition:

a. The permittee shall modify the existing fish return system for this CWIS as necessary to ensure that fish and other organisms can safely be returned to the river at all stages of tide and flow. This system shall ensure that debris is not returned to the river to the extent practicable, and is prevented from traveling in the same return trough as aquatic organisms. The system shall be modified to replace any existing sharp turns or angles and to eliminate vertical drops at all tide stages. The end of the fish return pipe must be submerged at all times. The end of the fish return pipe shall be extended a sufficient distance into the river to ensure that the discharge flows directly into subtidal waters of the river at all stages of tide and flow and at a distance and location which minimizes exposure to thermal stress, re-entrainment and re-impingement.

2. The permittee shall curtail intake flows to a level commensurate with the permitted effluent flow of 43.2 MGD or less for the period of October 1 through May 31. The permittee shall utilize and maintain the variable speed drive to curtail intake flows to the extent practicable. During this time period, for the first year the permit is effective, the permittee shall assess the feasibility of operating down to a discharge rate of 38.9 MGD. The permittee shall report its findings no later than with its May DMR submittal for the year the feasibility assessment takes place. The permittee shall implement measures to curtail flows to the extent practicable for the remaining term of the permit.

3. During the period of June 1 through September 30, the permittee shall limit the effluent flow as shown in Footnote 3 on Page 3 of this Permit. These flow limits will be based on the highest hourly average intake temperature for each calendar day. The permittee shall utilize and maintain the variable speed drive to curtail intake flows to the extent practicable.

4. The permittee shall schedule the annual maintenance shutdown for its steam turbine during the period of April 1 to May 31, to the extent practicable. During the maintenance shutdown period, the permittee shall not intake any water from the Saugus River. If the permittee is not able to conduct this maintenance shutdown during the required period, it shall provide an explanation for this in the cover letter accompanying the May DMR submittal.

5. The permittee shall rotate the traveling screens for 15 minutes every 30 minutes when any one of the intake pumps is operating in order to minimize the amount of time that organisms are impinged on the screens. This requirement shall not apply to any period that either set of traveling screens is not in working order due to required maintenance. If either set of traveling screens is not operable due to a malfunction or other unplanned outage, the permittee shall comply with the upset provisions of the General Conditions (Part II), found at Part II.B.5.

6. Any change in the location, design, or capacity of the CWIS must be approved in advance and in writing by the EPA and MassDEP.

D. BIOLOGICAL MONITORING PROGRAM

1. During the operation of the Wheelabrator CWIS, the permittee shall conduct biological monitoring using the methods described below. The permittee shall begin monitoring within ninety (90) days after the effective date of the permit. If this date falls within a certain month when monitoring is required, the permittee shall begin such monitoring at the start of the following month.

2. Ichthyoplankton (fish eggs and larvae): Occurrence and Abundance of Species Entrained

   a. Entrainment monitoring shall be conducted weekly during the months of March through August, and twice per month during September through February. Three entrainment samples shall be collected each sampling week and shall target three separate periods of the diurnal cycle (for example, once on Monday morning at 8:00 am, once on Wednesday afternoon at 2:00 pm, and once on Friday night at 8:00 pm) for this CWIS. Samples shall not be taken during consecutive periods of the diurnal cycle or on consecutive days. One of the cooling water circulating pumps must be operated continuously during the sample period.

   b. Entrainment samples shall be collected from the intake pipe prior to the condensers if feasible, or from a representative location within the intake structure.

   c. Sampling shall be conducted using a 0.5-mm mesh, 60-cm diameter plankton net. Each sample shall represent approximately 100 cubic meters (m^3) of water. Filtration volume shall be recorded for each event and each sample shall represent approximately 100 m^3 of water. After each sample, the collection nets shall be washed down and the sample transferred from the net to a jar containing sufficient formalin to produce a 5 to 10% solution.

   d. In the laboratory, all fish eggs and larvae shall be identified to the lowest distinguishable taxonomic category and counted.

   e. Ichthyoplankton counts shall be converted to densities per 100 m^3 of water based on the flow through the sampling net and the data shall be presented in the annual Biological Monitoring Report (BMR) detailed in Part D.5 below. Estimates of total numbers of ichthyoplankton based on facility flow rates shall also be provided. Entrainment losses shall be converted from weekly estimates of density per unit volume, to monthly and annual loss estimates based on the permitted flow. In addition, loss estimates should be converted to adult equivalents for species for which regionally specific larval survival rates are available. (See “Case Study Analysis for the Proposed 316(b) Phase II Existing Facilities Rule” Chapter A7, EPA-821-R-02-002, February 2002.)

3. Finfish: Occurrence and Abundance of Species Impinged

   a. Impingement monitoring shall be conducted weekly during the months of March through October, and twice per month during November, December, January, and February. Each weekly sampling event shall consist of three four (4) hour collections that represent three separate periods of the diurnal cycle (for example, once on Monday morning at 8:00 am, once on Wednesday afternoon at 2:00 pm, and once on Friday night at 8:00 pm). Samples shall not be taken during consecutive periods of the diurnal cycle or on consecutive days.

   b. The permittee shall collect aquatic organisms passing through the fish return system. Each collection shall cover a period of at least two hours following an initial cleansing screenwash and the exact time period shall be recorded. The trash racks shall also be cleaned during each sampling period and their contents examined for any fish, mammals, reptiles or invertebrates and the specific quantity and type of such organisms shall be recorded.

   c. All fish will be immediately examined for initial condition (live, dead, injured). A representative sample of 25% of each fish species, up to a maximum of 50 specimens per species, alive or injured at the time of collection shall be placed in a 20-gallon holding tank supplied with continuously running ambient seawater. For the first year of the permit only, latent survival shall be determined after 48 hours, after which any live fish shall be safely returned to the subtidal waters of the Saugus River.

   d. All fish shall be identified to the lowest distinguishable taxonomic category, counted, and measured (to the nearest mm total length) and the data shall be presented in the annual BMR. In the event of a large impingement event of a school of equivalently sized forage (non-commercial) fish, a subsample of 50 fish can be taken for length measurements. Twenty-four hour and monthly totals shall be extrapolated and reported. For the purposes of this permit, a large impingement event shall be defined as one which includes at least 100 fish during any of the four (4) hour collection periods noted above.

   e. Annual impingement rates shall be extrapolated from the observed counts of the weekly sampling events.

4. This biological monitoring shall be conducted for the first three years of this permit. Following a request by the permittee, authorization to discontinue or modify portions of the biological monitoring program may be granted by the Regional Administrator and the Commissioner.

5. A **Biological Monitoring Report (BMR)** shall be submitted annually by February 28th. Each BMR shall provide a summary of the previous calendar year's information in a narrative format. The report shall also include graphical representations where appropriate and explain all quality control procedures that were employed.

a. The annual BMR conclusions shall indicate the trends of the various parameters analyzed and identify any anomalies that appear in the annual historical data comparison. These differences shall be explained, if possible. The permittee shall make recommendations for any remediation considered necessary or for any programs to better understand such anomalies.

b. The annual BMR shall provide the status of the present monitoring programs, the expected effort in the following calendar year, and an alert to EPA and the State of any anomalies or patterns that may be evident in the data collection.

c. Report the period of the annual maintenance shutdown for the steam turbine.

6. The permittee is required to submit a written explanation if any aspect of the biological monitoring program is not conducted. The report shall be submitted as part of the DMR for the month the sampling was not conducted. The explanation for not monitoring must include all specific sampling activities that did not take place, along with the justification for suspending the identified sampling. This information also must be included in the annual BMR.

E. MONITORING AND REPORTING

1. Reporting

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

Signed and dated originals of these, and all other reports required herein, shall be submitted to the Director and the State at the following addresses:

U.S. Environmental Protection Agency
Water Technical Unit (SMR-04)
5 Post Office Square - Suite 100
Boston, MA 02109-3912

The State Agency is:

Massachusetts Department of Environmental Protection
Bureau of Waste Prevention
Northeast Regional Office
205B Lowell Street
Wilmington, MA 01887

Signed and dated Discharge Monitoring Report Forms required by this permit shall also be submitted to the State at:

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

F. STATE PERMIT CONDITIONS

This discharge permit is issued jointly by the U. S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (MassDEP) under Federal and State law, respectively. As such, all the terms and conditions of this permit are hereby incorporated into and constitute a discharge permit issued by the Commissioner of the MassDEP pursuant to M.G.L. Chapter 21, §43.

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

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

FACT SHEET

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT TO DISCHARGE TO WATERS OF THE UNITED STATES PURSUANT TO THE CLEAN WATER ACT (CWA)

NPDES PERMIT NUMBER**: MA0028193**

NAME AND MAILING ADDRESS OF APPLICANT**:**

Wheelabrator Saugus, Inc.
100 Salem Turnpike
Saugus, MA 01906

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

Wheelabrator Saugus, Inc.
100 Salem Turnpike
Saugus, MA 01906

RECEIVING WATER(S): **Saugus River**
(USGS Hydrologic Code #01070002 – North Coastal River Basin)

RECEIVING WATER CLASSIFICATION(S): **Class SB** - warm water fishery

SIC CODES: **4953, 4931**

Table of Contents

1.0 Proposed Action, Type of Facility and Discharge Location

Wheelabrator Saugus, Inc. (WS), formerly Refuse Energy Systems Company (RESCO), the permittee, operates a waste to energy facility in Saugus, MA. Municipal Solid Waste (MSW) is combusted to produce 38 megawatts (MW) of electricity. The electricity is used to power the facility and is sold to the power grid, which is managed by the Independent System Operator for New England (ISO-NE). The facility's discharge of non-contact cooling water (NCCW) to, and withdrawals of water for cooling from, the Saugus River was last authorized by a National Pollution Discharge Elimination System (NPDES) permit issued to WS by the U.S. Environmental Protection Agency (EPA) on September 30, 1991. Although this permit's expiration date has passed, WS applied as required in May 1996 for permit reissuance and, as a result, the 1991 permit remains in effect until EPA reissues a new, final permit. WS's application seeks reissuance of the NPDES permit authorizing both discharges of NCCW from its condensers to the Saugus River via Outfall 001, a staged diffuser located on the bottom of the river channel, and withdrawals of river water for cooling through a cooling water intake structure. The only discharges to the Saugus River from WS are non-contact cooling water and traveling screen rinse water. The facility location is shown on **Figures 1 and 2**. EPA proposes to reissue the permit with the conditions described herein.

2.0 Description of Treatment System and Discharges

This facility began operation in 1975 and processes up to 1,500 tons per day of MSW, which is collected from municipalities including, but not limited to, those located in Essex, Middlesex and Suffolk counties. Initially, steam produced as a result of this combustion process was sold to the General Electric Company (GE) in Lynn, Massachusetts. In 1985, the facility was modified to include the installation and operation of a steam-driven turbine generator capable of generating 38 MW of electrical power. About 11% of this electricity is used for the facility's own power needs. The rest of the electricity is sent to a substation where it is stepped up from 13,800 volts (V) to 115,000 V and made available to the local electricity grid.

Process Description

MSW haulers deliver waste to an enclosed receiving area. A front end loader pushes the refuse into a holding pit, which has a maximum capacity of approximately 10,000 tons. The facility uses two overhead cranes (one typically in use) to move the refuse within the pit and to transfer refuse from the pit to the feed hoppers for the boilers. Refuse is fed into the boiler. Heat generated by the combustion of the MSW generates steam in two water wall boilers. A temperature of roughly 2000°F is achieved above the grates in the boilers. Secondary air is forced over the fire within the boiler to ensure complete burning of the waste and off-gases. The water used for heat recovery in the boiler is contained in a closed-loop system.

The steam powers a steam turbine and is then cooled to the liquid phase by a non-contact water condenser. The non-contact condenser uses a once-through cooling system, utilizing water from the Saugus River. The facility operates a pump house on the bank of the Saugus River. There are two pumps comprising a system capable of delivering non-contact cooling water at various flow rates depending upon plant operational needs and ambient river water temperature conditions. The pump house includes a trash rack to trap large debris and a traveling screen. The trash rack traps large debris and consists of steel bars placed in front of the intake structure. The trash rack is cleaned manually, as needed, and debris collected from it is transferred to the refuse pit and burned in the plant. The traveling screen's smaller mesh openings enable it to catch smaller items, including fish, but the mesh size is too large to catch fish eggs or larvae or any other tiny organisms living in the water. The traveling screen is rotated once every four hours or in response to a preset pressure drop. It may also be rotated as needed upon visual inspection, if debris caught on the screen is found to restrict flow through it. The traveling screen is washed by river water using both low pressure and high pressure water flows. Material collected from the traveling screen is transferred via a fish return pipe back to the Saugus River channel, about 300 feet from where the visible piping ends. Some of the debris is collected in a sump. Debris collected from the fish return system is taken to the refuse pit and burned in the plant. See **Figure 3** for a NCCW flow diagram.

Once the water has passed through the condenser, the heated water continues through the condenser piping and is discharged to the Saugus River through a staged diffuser located on the bottom of the river channel. This diffuser is 170 feet long and has 15 discharge ports which are about 10 feet apart. The once-through cooling system is monitored for several operational parameters required by the existing permit, including intake temperature, pH, flow rate and discharge temperature, before the heated effluent is routed to the discharge line leading to the outfall diffuser.

Certain turbine generator systems, such as lube oil coolers and hydrogen coolers, also use minor amounts of non-contact cooling water fed off of the same system in parallel with the surface condenser. The auxiliary cooling water is drawn by booster pumps from the cooling water system and is recombined with the discharge downstream of the condenser.

Within the pump house, water is drawn from the pump discharge line for the fish return trough and is used to wash the traveling screens. This water returns to the Saugus River via the fish return line or at the pump house. Water is also drawn by booster pumps and used as seal water for the bearings on the river water pumps. There is essentially no consumptive use of any intake water, so that whatever is withdrawn from the Saugus River gets discharged back out to the river.

Reused non-NPDES Plant Wastewaters --

The plant also generates several wastewater streams, which are reused within the facility. These wastewater streams include boiler blowdown, backflow from the plant's reverse osmosis demineralizer system, quench water (which contacts ash), and other facility wash waters. These waters are treated and used to fill various water-filled conveyers and the remaining water is pumped to the wastewater tanks and then used (evaporated) to control temperatures in the Spray Dryer Absorbers, which are components of the facility's air emission control systems.

3.0 Receiving Water Description

The Saugus River at the point of discharge is classified under the Massachusetts Department of Environmental Protection's (MassDEP) Surface Water Quality Standards (SWQS), see 314 CMR 4.06(1)(d)(1) and Table 27, as a Class SB water and an Outstanding Resource Water (ORW), as well as being included in the Rumney Marsh Area of Critical Environmental Concern (ACEC). The Saugus River is located in the North Coastal River basin and is a tributary to Lynn Harbor. Class SB waters are designated as a habitat for fish, other aquatic life and wildlife and for primary and secondary recreation. In approved areas, SB waters shall be suitable for shellfish harvesting with depuration (Restricted Shellfish Areas). These waters shall have consistently good aesthetic value. This segment of the Saugus River, #MA93-44, is on the MassDEP's 2006 303(d) list of impaired waters for thermal modifications, pathogens, oil & grease, and flow alterations. (Administrative Record (AR) item # 22)

An ACEC receives special recognition because of the quality, uniqueness, and significance of its natural and cultural resources. ACEC designation creates a framework for local, regional, and state stewardship of these critical resources. The purpose of the ACEC Program is to preserve, restore, and enhance critical environmental resources and resource areas of the Commonwealth of Massachusetts. The goals of the program are to identify and designate these ecological areas, to increase the level of protection for ACECs, and to facilitate and support the stewardship of ACECs. Rumney Marsh is a biologically significant salt marsh adjacent to the Saugus River which provides habitat for a wide range of aquatic species and native and migratory birds. Due to the historical alteration of this wetland, there are ongoing efforts to restore portions of this salt marsh and the related intertidal areas. The majority of land surrounding the facility, including the intake channel, is located within this ACEC-designated area. ORWs are afforded higher protection to maintain their existing uses and water quality.

4.0 Permit Requirements and Characterization of Pollutant Discharges

The effluent limitations and all other requirements described herein may be found in the draft permit. A quantitative description of the discharge in terms of significant effluent parameters from recent effluent monitoring data may be found in Attachment A.

5.0 Permit Basis: Statutory and Regulatory Authority

The Clean Water Act (CWA) prohibits the discharge of pollutants to waters of the United States unless such discharge is authorized by either an NPDES permit or some other provision of the statute. The NPDES permit is the mechanism used to impose technology-based and water quality-based effluent limits and other requirements, including monitoring and reporting, at specific facilities. While the CWA primarily focuses on pollutant discharges, Section 316(b) of the statute, 33 U.S.C. § 1326(b), addresses water withdrawals for cooling purposes by mandating that NPDES permit limits require the design, location, capacity and construction of cooling water intake structures to reflect the best technology available for minimizing adverse environmental impact.

5.1 General Requirements

This draft NPDES permit was developed in accordance with various statutory and regulatory requirements under the CWA and applicable State requirements. The regulations governing the EPA NPDES permit program are generally found at 40 CFR Parts 122, 124, 125, and 136.

When developing effluent discharge limits for an NPDES permit, EPA must consider applicable technology-based and water quality-based requirements. EPA compares the two sets of requirements and whichever is more stringent governs the permit requirements. In connection with this effort, EPA also considers all limits and requirements in the existing permit.

As discussed in more detail below, when it comes to thermal discharges, EPA may also consider granting a variance under Section 316(a) of the CWA, 33 U.S.C. § 1326(a), from either or both the technology-based and water quality-based effluent limits, if less stringent variance-based limits will be sufficient to assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the body of water into which the discharge is made (BIP). See Sections 5.4 and 6.1.1 below for further discussion of these matters.

5.2 Technology-Based Effluent Limits

Technology-based effluent discharge limits reflect the minimum level of control that must be imposed under Sections 301and 402 of the CWA to meet treatment requirements based on applicable technology standards, including best practicable control technology currently available (BPT), best conventional control technology (BCT) for conventional pollutants, and best available technology economically achievable (BAT) for toxic and non-conventional pollutants. *See* 33 U.S.C. § 1311(b)(1) and (2)(A) – (F). In the absence of EPA-promulgated technology-based national effluent guidelines, the permit writer is authorized under Section 402(a)(1)(B) of the CWA to establish effluent limitations on a case-by-case basis using best professional judgment (BPJ). *See also* 40 C.F.R. § 125.3. Subpart A of 40 CFR Part 125 establishes criteria and standards for the imposition of technology-based treatment requirements in permits under Section 301(b) of the CWA, including the application of EPA-promulgated national effluent limitation guidelines and case-by-case, BPJ determinations of effluent limitations. *See* 40 C.F.R. § 125.3.

In general, all of the above-mentioned technology-based effluent limitations are required to have been complied with by March 31, 1989 (see 40 CFR §125.3(a)(2)). Compliance schedules and deadlines not in accordance with the statutory provisions of the CWA cannot be authorized by a NPDES permit.

5.3 Water Quality-Based Effluent Limits

Water quality-based limits 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 (WQS). *See* 33 U.S.C. §§ 1311(b)(1)(C), 1341(a) and (d), 1370. State WQS classify the state's water bodies and for each classification identify "designated uses" and numeric and narrative criteria that the waters within that classification are supposed to achieve. Thus, water quality standards consist of three parts: (a) beneficial designated uses for a water body or a segment of a water body; (b) numeric and/or narrative water quality criteria sufficient to protect the assigned designated use(s); and (c) antidegradation requirements to ensure that once a use is attained it will not be degraded.

The Massachusetts Surface Water Quality Standards (SWQS), found at 314 CMR 4.00, include these elements. The state will limit or prohibit discharges of pollutants to surface waters to assure that SWQS of the receiving waters are attained. These SWQS also include requirements for the regulation and control of toxic constituents and require that EPA criteria, established pursuant to Section 304(a) of the CWA, shall be used unless a site-specific criterion is established.

The permit must address any pollutant or pollutant parameter (conventional, non-conventional, toxic and whole effluent toxicity) that is or may be discharged at a level that causes, has "reasonable potential" to cause, or contributes to an excursion above any water quality criterion. See 40 CFR Section 122.44(d)(1). An excursion occurs if the projected or actual in-stream concentration exceeds the applicable criterion. In determining reasonable potential, EPA considers (a) existing controls on point and non-point sources of pollution; (b) pollutant concentrations and variability in the effluent and receiving water as determined from the permit application, Monthly Discharge Monitoring Reports (DMRs), and State and Federal Water Quality Reports; (c) sensitivity of the species to toxicity testing (when evaluating whole effluent toxicity); (d) known water quality impacts of processes on wastewater; and, where appropriate, (e) dilution of the effluent in 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 concentration, are used. Acute aquatic-life criteria are considered applicable to daily time periods (maximum daily limit) and chronic aquatic-life criteria are considered applicable to monthly time periods (average monthly limit). Chemical-specific limits are allowed under 40 CFR § 122.44(d)(1) and are implemented under 40 CFR § 122.45(d).

A 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 where appropriate. Narrative criteria from the state's WQS often require limits on the toxicity in discharges where (a) a specific pollutant can be identified as causing or contributing to the toxicity but the state has no numeric standard; or (b) toxicity cannot be traced to a specific pollutant.

Consistent with the MA SWQS promulgated at 314 CMR 4.03(2) and MassDEP guidance documents, MassDEP may decide to exercise its discretion to set water quality-based discharge limits based on a "mixing zone". Generally, mixing zones are areas in which exceedances of numeric WQS may be allowed, provided that, among other things, these exceedances do not result in acute toxicity and that the mixing zone will still be protective of the narrative requirements of the WQS. In addition, mixing zones cannot be disproportionately large so as to interfere with the attainment of the designated uses assigned to the water body segment. All applicable numeric water quality criteria must be met at the edge of the mixing zone and requirements of the state mixing zone must also be satisfied.

Federal regulations found at 40 CFR Section 131.12 require states to develop and adopt as part of their water quality standards a statewide antidegradation policy which maintains and protects existing instream water uses and the level of water quality necessary to protect the existing uses, and maintains the quality of waters which exceed levels necessary to support the propagation of fish, shellfish, and wildlife and to support recreation in and on the water. EPA's regulations also provide that state antidegradation policies and implementing methods must be consistent with CWA § 316(a). The MA SWQS specify an antidegradation policy 314 CMR 4.04. The public has an opportunity to comment on the state's anti-degradation findings through the permit public notice process. See Section 6.1.15 below for the antidegradation discussion regarding temperature limits.

5.4 Section 316(a) of the Clean Water Act

Heat is defined as a pollutant under Section 502(6) of the CWA. 33 U.S.C. § 1362(6). As with other pollutants, discharges of heat (or "thermal discharges") must satisfy both technology-based standards (specifically, the BAT standard) and any more stringent water quality-based requirements that may apply. State WQS may include numeric temperature criteria, as well as narrative criteria and designated uses that apply to water body classifications and necessitate restrictions on thermal discharges. Section 316(a) of the CWA, 33 U.S.C. § 1326(a), provides, however, that thermal discharge limits less stringent than technology-based and/or water quality-based requirements may be authorized if the biological criteria of Section 316(a) are satisfied. The approval of such less stringent thermal discharge limits is referred to as a "Section 316(a) variance." In addition, the Massachusetts SWQS provide that "any determinations concerning thermal discharge limitations in accordance with 33 U.S.C. 1251 § 316(a) will be considered site-specific limitations in compliance with 314 CMR 4.00." *See* 314 CMR 4.05(4)(a)(2)(c) and 4.05(4)(b)(2)(c) (for Class SA and SB waters, respectively).

This variance, and the demonstration that an applicant must make to qualify for it, are addressed in CWA § 316(a) and EPA regulations promulgated at 40 CFR Part 125, Subpart H. This demonstration must show that the alternative, less stringent effluent limitations desired by the discharger, considering the cumulative impact of its thermal discharge together with all other significant impacts on the species affected, will assure the protection and propagation of the BIP. *See* 33 U.S.C. § 1326(a); 40 C.F.R. § 125.73(a) and (c)(1)(i). An applicant can perform either a predictive or retrospective analysis to make its case that the BIP is protected. If the applicant makes this demonstration to the satisfaction of EPA (or, if appropriate, the state), then the permitting authority may issue the permit with such alternative, variance-based limitations. Conversely, if the demonstration does not adequately support the requested variance-based thermal discharge limits, then the permitting authority shall deny the requested variance. In that case, the permitting authority may either impose alternative variance-based limits that *are* justified by the permit record or impose limits based on the otherwise applicable technology-based and water quality-based requirements. *See also* Section 6.1.1 below for further discussion of this matter.

5.5 Requirements for Cooling Water Intake Structures under CWA § 316(b)

With any NPDES permit issuance or reissuance, EPA is required to evaluate or re-evaluate compliance with applicable standards, including the technology standard specified in Section 316(b) of the CWA for cooling water intake structures (CWIS). Section 316(b) requires that:

> [a]ny standard established pursuant to section 301 or section 306 of this Act and applicable to a point source shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.

33 U.S.C. § 1326(b). 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, racks, or other structures. Section 316(b) applies if a point source discharger seeks to withdraw water for cooling from a water of the United States through a CWIS. Section 316(b) applies to this permit due to the operation of CWISs at WS.

The CWA requires that NPDES permits include limits and conditions necessary to meet applicable federal technology-based standards and any more stringent limits required by state water quality standards or other state law requirements. *See* 33 U.S.C. §§ 1311(b), 1341(a)(1) and (d), 1342(a), and 1370; 40 C.F.R. §§ 122.43(a) and 122.44. In other words, federal technology-based standards represent the minimum level of pollution control to be required by an NPDES permit. Therefore, an NPDES permit issued to a facility with CWISs should include limits reflecting the "best technology available for minimizing adverse environmental impacts" (BTA) under CWA § 316(b), *see* 40 C.F.R. §§ 122.44(b)(3) and 401.14, and any applicable, more stringent water quality standards. *See* 40 C.F.R. §§ 122.4(d) and 122.44(d). *See also* 40 C.F.R. §§ 125.80(d) and 125.84(e) (CWIS requirements for new facilities must comply with any more stringent, applicable state water quality standards). In the absence of national categorical standards under § 316(b), EPA has for many years applied the provision on a case-by-case, best professional judgment (BPJ) basis, for both new and existing facilities.

In December 2001, EPA promulgated final regulations under § 316(b) that provide specific categorical technology-based requirements for all types of *new* facilities with CWISs, except for new offshore oil and gas extraction facilities. 40 C.F.R. Part 125, Subpart I (Phase I rule or Phase I regulations). The Phase I rule does not apply to WS because it is not a new facility, as defined in 40 CFR Section 125.83.

On July 9, 2004, EPA published final regulations that set national categorical standards under § 316(b) for *large, existing* power plants (Phase II rule or Phase II regulations). *See* 69 Fed. Reg. 41576 (July 9, 2004) (codified at 40 CFR Part 125, Subpart J). On July 9, 2007, EPA formally suspended the Phase II rule, except for § 125.90(b), which provides that "[e]xisting facilities that are not subject to [CWIS] requirements under [Part 125] must meet requirements under section 316(b) of the CWA determined by the Director on a case-by-case, BPJ basis." 72 Fed. Reg. at 37108. At this time, EPA is continuing to make § 316(b) determinations for large, existing power plants on a case-by-case, BPJ basis.

On June 16, 2006, EPA published the Phase III rule as the third and final phase of regulations under § 316(b) of the CWA. This rule determined how § 316(b) would be applied to facilities not governed by the Phase I or Phase II rules (*i.e.*, smaller existing power plants, all sizes of existing, non-power plant facilities with CWISs, and new offshore oil and gas extraction facilities). In promulgating the Phase III Rule, EPA decided to develop categorical standards only for new offshore oil and gas extraction facilities that have a design intake flow threshold of greater than 2 million gallons per day (MGD), and to continue to address the other facilities on a case-by-case, BPJ basis.

Given that WS is neither a Phase I facility nor a new, offshore oil and gas extraction facility, it is subject to permitting requirements under § 316(b) as applied on a case-by-case, BPJ basis. *See also* Section 7 below for further discussion of this matter.

5.6 Antibacksliding

The CWA's antibacksliding requirements preclude a permit from being renewed, reissued or modified with less stringent limitations or conditions than those contained in the previous permit, unless the criteria for one of the exceptions to the anti-backsliding requirements are met. *See* CWA §§ 402(o) and 303(d)(4) and 40 C.F.R. §122.44(l)(1) and (2). Accordingly, EPA's anti-backsliding provisions, which are found at 40 C.F.R. §122.44(l), prohibit the relaxation of permit limits, standards, and conditions, unless certain exceptions apply. See Sections 6.1.1 and 6.1.1.4 below for further discussion of this matter.

5.7 State Certification

Under Section 401 of the CWA, EPA is required to obtain certification from the state in which the discharge is located that the permit conditions will satisfy all water quality standards or other applicable requirements of state law. EPA permits are to include any conditions required in the state's certification as being necessary to ensure compliance with state water quality standards or other applicable requirements of state law. See 33 U.S.C. 1341(a) and (d); 40 CFR §124.53(e). Regulations governing state certification are set out at 40 CFR §124.53 and §124.55. EPA regulations pertaining to permit limits based upon water quality standards and state requirements are contained in 40 CFR §§122.4(d) and 122.44(d). *See also* 33 U.S.C. § 1311(b)(1)(C); 40 C.F.R. § 125.84(e) (Phase I regulation addressing state requirements and CWIS conditions).

6.0 Determination of Effluent Limits for the New WS Permit

6.1 Outfall 001

6.1.1 Thermal Discharge Limits

As discussed above, in developing thermal discharge limits for the WS permit, EPA and MassDEP must consider applicable technology-based requirements, water quality-based requirements, and any request for a CWA § 316(a) variance.

6.1.1.1 Technology-Based Requirements

Turning first to technology standards, the statute classifies heat as a "nonconventional" pollutant subject to BAT standards. *See* 33 U.S.C. §§ 1311(b)(2)(A) and (F). *See also* 33 U.S.C. §§ 1311(g)(4), 1314(a)(4) and 1362(6). There are, however, no effluent limitations guidelines (ELGs) which apply to this facility. ELGs for the Steam Electric Power Generating Point Source Category, which are found at 40 CFR Part 423, do not apply because WS does not meet the ELG's definition of a steam electric power plant. This definition covers facilities that, among other things, burn a fossil fuel (coal, oil, gas) as its fuel source, whereas WS burns municipal solid waste. In any event, the Steam Electric ELGs do not include categorical standards for thermal discharge. Given the absence of an applicable ELG, the permit writer is authorized under Section 402(a)(1)(B) of the CWA and 40 C.F.R § 125.3 to establish technology-based thermal discharge limits by applying the BAT standard on a case-by-case, BPJ basis.

With regard to technologies for reducing thermal discharges, EPA is aware that closed-cycle cooling towers could, if available for use at the site, substantially reduce thermal discharges from a facility like WS. Therefore, thermal discharge limits based on this technology would be substantially more stringent than the limits based on open-cycle cooling that the permittee is requesting here. As explained below, however, EPA has determined that closed-cycle cooling is not an available technology at WS. EPA has concluded, therefore, with closed-cycle cooling technology unavailable, that water quality-based limits would be more stringent than any technology-based requirements that would otherwise be evaluated.

6.1.1.2 Water Quality-Based Requirements

Such water quality-based requirements would be based on the SWQS's numeric and narrative temperature criteria, consideration of designated and existing uses and the State's antidegradation and mixing zone policies. The state's SWQS classify the Saugus River as a Class SB water and, accordingly, prohibit discharges from causing (a) ambient water temperatures to exceed either a daily maximum of 85°F (29.4°C), (b) a maximum daily mean of 80°F (26.7°C), or (c) a rise in temperature due to a discharge of more than 1.5°F (0.8° C) during the summer months (July through September) or 4° F (2.2° C) during the winter months (October through June).

At the current level of operation, however, WS's thermal discharge cannot always meet the numeric temperature criteria of the MA SWQS. In addition, at times, the thermal plume spans greater than 50 percent of the width of the river, which is inconsistent with the Massachusetts Mixing Zone Policy. As noted above, this segment of the Saugus River is on the MassDEP's 2006 303(d) list of impaired waters for thermal modifications.

6.1.1.3 CWA § 316(a) Variance-Based Limits

Given the inability to satisfy the SWQS, and based on EPA's conclusion that alternative, less stringent limits would be sufficient to assure the protection and propagation of the BIP in the Saugus River, the existing WS permit, which was issued in 1991, included thermal discharge limits based on a CWA § 316(a) variance. The permittee's application of May 1996 requested no changes from the permit's discharge limits of 90° F as a maximum effluent temperature and 20° F as the maximum rise in temperature (delta T). Although this permit application did not explicitly request a § 316(a) variance, the permittee had already requested renewal of its § 316(a) variance in a letter of December 15, 2005, to EPA (AR #5). Furthermore, in a September 1, 2006 response to an EPA information request, the permittee requested that its existing permit limits be relaxed to eliminate maximum effluent temperature limits year-round and to include an increased year-round delta T limit of 22°F. The permittee also submitted a thermal (modeling) verification program intended to show that state water quality criteria for temperature (delta T and absolute) would not be violated instream. In order to obtain a relaxation of existing § 316(a) variance-based limits, a discharger must show that there will be no appreciable harm to the BIP from the requested new permit limits. In addition, no harm to the BIP should have resulted from the discharge under the existing variance-based limits.[1]

---

[1] If harm to the BIP has resulted from the discharge under the current variance, it generally would not be renewed as is, much less relaxed. At the same time, it would theoretically be possible for an existing variance to be relaxed despite harm to the BIP if the permittee

Based on the existing information, EPA finds that the permittee has demonstrated that a change in the delta T limit to 22°F year-round will adequately protect the BIP, but that the permittee has not established that protection and propagation of the BIP of the Saugus River will be assured if year-round maximum effluent temperature limits are eliminated. Therefore, EPA is granting the permittee's request for a year-round delta T limit of 22°F, but denying the permittee's request for more lenient year-round effluent temperature limits. Accordingly, in addition to specifying a year-round delta T limit of 22°F in this draft permit, EPA has also established a year-round maximum effluent temperature limit of 90°F based on a CWA § 316(a) variance. In other words, EPA has determined that retaining the existing permit's year-round maximum effluent temperature limit of 90°F will assure the protection and propagation of the BIP. These variance-based themal discharge limits are less stringent than would otherwise be required under the applicable state SWQS.

As discussed below, this draft permit also contains technology-based cooling water intake structure requirements under CWA § 316(b) that mandate decreases in the amount of water withdrawn by the facility from the Saugus River for cooling. Due to operational considerations, a year-round increase in the ΔT limit (from 20 to 22 °F) is needed to accommodate these flow restrictions. Yet, the total amount of heat discharged to the Saugus River (as measured in British thermal units (Btu's)) will change very little if at all despite the increased delta T because the permit also decreases the volume of thermal effluent that is allowed and maintains the maximum temperature limit of 90°F.[2] The permittee has modeled the dynamics of the thermal plume under current conditions and under a scenario with the proposed greater ΔT limits. The modeling results suggest that the thermal plume with the requested increase in ΔT, and reduced volume of discharge, would be virtually identical to the current condition in size, shape and magnitude. Thus, EPA infers that no significant thermal impacts will result from changing the ΔT limit. At the same time, reductions in cooling water withdrawals would result in corresponding reductions in impingement and entrainment losses. EPA has determined that the benefit of reducing impingement and entrainment losses will be greater than any nominal effect associated with the increased ΔT and that the aquatic community in the Saugus River will experience an overall benefit as a result of these flow and temperature limit changes. This contributes to EPA's conclusion that the BIP will be adequately protected by the proposed thermal discharge limits.

---

demonstrated that some other critical factor that contributed to the harm had been eliminated. For example, if, hypothetically, there were two facilities with thermal discharges to a water body and the BIP suffered harm, but then one of the facilities terminated its discharge, it might be possible to show that the limits on the remaining discharge could be relaxed while still assuring the protection and propagation of the BIP. *See* 40 C.F.R. § 125.73(c).

[2] The amount of heat (in Btu's) discharged is a function of the delta T and the volume of thermal effluent discharged.

6.1.1.4 Saugus River Temperature Modeling

In November of 2000, the permittee contracted with Applied Science Associates (ASA) to develop a hydrothermal model to predict the duration and extent of the thermal plume in the Saugus River under varying thermal discharge scenarios. ASA developed a multi-layer three-dimensional model to predict time varying temperatures, but the calibration (skill assessment of the model compared to observations) was initially poor due to limited data on water movement in the Saugus River. To improve on the calibration of this model, ASA conducted a field program during the summer of 2001 to map the thermal plume temporally and spatially and to better define tidal circulation in the river. The sampling plan also sought to determine the probable source of warm water present at the WS intake during certain seasons of the year and tidal stages. Initial data from the intake indicated that warmer waters observed in the historical record primarily originate upstream of the intake and were most evident during the latter part of the falling tide and the early stages of the rising tide. Data on water temperature, salinity, position and depth was recorded by towed sensors at one-second intervals along multiple transect lines at various locations in the lower Saugus River. This data was used to predict water column thermal structure.

At EPA's request, the permittee used this hydrothermal model in 2005 to predict temperatures in the lower Saugus River for different seasons of the year (AR #4, #5). This modeling effort was fairly conservative as it utilized permitted heat loads from WS and the nearby General Electric (GE) facility, whereas actual thermal loads from these sources historically have been significantly lower than allowed by their permit limits. Six modeling scenarios were run, using a combination of effluent heat loads, which were consistent with those representing 70%, 85% and 100% of the permitted flows. Wheelabrator had indicated that it could not operate consistently at a level below 70% of its permitted flow due to operational constraints. Scenario 1 represents the full permitted flows for both facilities, while Scenario 6 represents a minimum flow scenario based on a 30% reduction in the WS flow and a 15% reduction in the GE flow at Outfall 018. Scenarios 2 through 5 represent various intermediate reduction scenarios. These scenarios were to be run during critical time periods of the year when fish runs and migrations were occurring, and the results were then compared to temperatures believed to be critical for the species listed below. Specifically, EPA asked the permittee to compare the modeling results to the following time periods and temperatures of concern:

March 15 -31; Rainbow smelt in-migration - 60 °F.
June 1 -15; Winter Flounder (benthic layer) - 75 °F;
Anadromous fish (upper water column) - 70 °F
August 1-31; State Water Quality Standard - 80 °F
October 1-15; Juvenile alewife out-migration; 80 °F (water column), 75 °F (benthic)

EPA requested that the model outputs consist of one-hour moving average temperatures and include graphs presenting the percentage of cross sectional area which would exceed these temperatures of concern at three different transects in the river. The outputs were also required to show tide elevation data and time periods when GE Outfall 014 was discharging (it typically discharges intermittently).

After initial model runs, the permittee determined that modeling only Scenarios 1 and 6 would be sufficient to provide an adequate analysis of temperature changes due to these discharges. Since initial modeling did not identify major distinctions between these two scenarios, and since they were the two outlying scenarios, the permittee argued that only these scenarios needed to be considered for further study. EPA agreed with this assessment.

ASA used the model to analyze the time periods noted above and to present the percentage of cross-sectional area in the lower Saugus River that exceeded the critical temperatures and the quantity of time that they were exceeded. For all time periods, a time series plot based upon model output was generated. Some graphs used a one-hour moving average as a time period while others used a block average for a full tidal cycle. Other graphs included 48-hour environmental background temperatures, which were selected to represent longer-term temperature averages and trends that occurred during the modeling period.

Modeling Results:

March - The critical temperatures were not exceeded under any of the discharge scenarios modeled.

June - Under the simulated background conditions, the June model run predicted that areas of the river would exceed the critical temperature of 70°F. At the beginning of the period (June 1), water throughout the estuary met the 70°F target. By the end of the modeling period (June 14), however, the natural background exceeded 70°F in much of the estuary. This reflects the natural seasonal warming of the system. The thermal impacts (as represented by areas above the critical temperatures) were virtually indistinguishable between Scenario1 and 6.

Model results showed that under both discharge scenarios, the SWQS criterion of 80°F (24-hour average) for SB waters was rarely exceeded.

Finally, the model predicted areas of water in the benthic zone that may have exceeded 75°F. The background condition exceeded this critical temperature, but only at the very end of the modeled time period (June 13 and 14). One-hour running average temperatures exceeded 75°F, but only after June 8 of the modeled time period. These exceedances were intermittent, lasted a short period of time, and coincided with low slack tide. Thermal impacts from Scenario 1 and 6 were almost identical.

August – The simulated background conditions exceeded the SWQS criterion of 80°F in a small area from August 9 to 12. Based on one-hour running average temperatures, this pattern of exceedance, coincided with the time period of slack water. It appears that heat accumulated at slack water and then was flushed with the changing tide. This pattern of intermittent exceedance of the critical temperature was also seen in the benthic layer. The area exceeding 75°F dropped to 0% as the tide ebbed and then built up to 100% coverage on slack high water. There was little discernable difference between the areas of exceedance under Scenarios 1 and 6.

October – The model did not predict any exceedances of the critical temperatures during the October period.

6.1.1.5 Determination under CWA § 316(a)

The draft permit grants a § 316(a) variance to allow WS to discharge heat to the Saugus River in a manner that will exceed the MA SWQS, but will nonetheless assure the protection and propagation of the BIP. EPA is granting the §316(a) variance based on available data indicating that no appreciable harm to the BIP has occurred from the existing thermal discharge and modeling results showing that the 30% reduction in cooling water flow, combined with a delta T limit increased to 22 °F and a maximum T limit maintained at 90°F, will only nominally affect the size, shape and magnitude of the current thermal plume, while benefiting the BIP by reducing entrainment and impingement. Consistent with this result, the amount of heat discharged by the facility to the Saugus River will change very little, if at all, under this combination of discharge limits.

Based on these modeling results, EPA has determined that the benefits of reducing impingement and entrainment of aquatic organisms at the CWIS outweigh any potential concerns about increased thermal impacts in the lower Saugus River because no significant change in the thermal plume is predicted to result from the change in intake flow.

Therefore, as discussed in more detail below in the sections addressing BTA requirements under CWA § 316(b), seasonal flow reductions have been established in this permit under CWA § 316(b). Specifically, this permit requires that WS reduce its intake flows (and corresponding effluent flows) by 28% for the period of October 1 to May 31. This is roughly consistent with Scenario 6 of the temperature modeling and reduces the flow limit from 60 MGD to 43.2 MGD. Although the modeling used a flow reduction of 30%, WS determined that the flow of 43.2 MGD, or a 28% reduction, was as close to 30% as the facility could reliably achieve, using a specific pumping rate. For the remainder of the year, June 1 through September 30, the permit will maintain the present flow limit of 60 MGD, but will require that the permittee limit intake flow consistent with specific intake temperature ranges, as shown in Section 7.6.3 below and in the permit.

With regard to thermal discharge limits, the 1991 permit states that the difference between the river intake and the NCCW discharge, the delta T, cannot exceed 20°F, and the maximum temperature of the discharge (effluent) can not exceed 90°F. In order to accommodate the permittee's operational needs while achieving the intake flow reductions discussed above, the permit's delta T limit has been increased from 20 °F to 22 °F. In addition, the maximum effluent temperature and the delta T limits will now be expressed as hourly averages, instead of as instantaneous values. The new draft permit retains the effluent temperature limit of 90°F in the permit as a year-round limit. The influent temperature is measured in the pipe leading from the pump house approximately 80 feet from the outlet of the pumps. The effluent temperature is measured at the outlet from the condenser.

For the period of October 1 through May 31, in light of colder river water temperatures that allow for lower intake flows than the currently permitted 60 MGD, the permittee is limited to an effluent flow of 43.2 MGD. For the period from June 1 through September 30, the effluent flow limits are based on the highest hourly average intake temperature recorded for each calendar day. When this temperature is below 65°F, the flow limit will be a daily maximum of 43.2 MGD. When the intake temperature is between 65 and 70°F, the flow limit will be 50 MGD and when the temperature is 70°F or higher, the flow limit will be 60 MGD.

In consideration of the reduced seasonal flow limits, the permittee's September 1, 2006, submission requested both a delta T of 22°F and elimination of the permit's maximum temperature limits. Consistent with this request, and as stated above, the draft permit changes the delta T limit to 22 °F year-round to reflect the fact that the permittee will be reducing permitted flows through most of the year. Moreover, the permittee has indicated that WS is not operated above a delta T of 22°F because it would lead to efficiency and operational problems.

In response to the permittee's request that maximum effluent temperature limits be eliminated during the period from June through September, EPA reviewed the scientific literature regarding temperature sensitivities for a number of species that utilize the Saugus River. EPA looked at winter flounder, alewives and striped bass, as these species are known to be thermally sensitive and represent a range of life histories. Collette and Klein-MacPhee (2002, AR #18) reported that winter flounder juveniles experience significant mortality at 86°F. Otto et al. (1976, AR #19) detailed some acute toxicity in juvenile alewives at 90°F. In addition, Pardue (1983, AR #20) classifies water temperatures above 90°F as completely unsuitable habitat for juvenile alewives. Finally, Collette and Klein-MacPhee (AR #18) report the temperature range for juvenile striped bass as extending up to 90°F. In light of this review, EPA does not believe that a discharge temperature in excess of 90°F would be protective of the balanced indigenous population and that a maximum temperature limit is needed because intake water temperatures are high enough that relying exclusively on a delta T of 22 °F would result in discharge temperatures in excess of 90°F and, at times, well in excess of that level.

In addition, without a maximum temperature limit, the increased delta T limit would result in an increased thermal load to the river during times of higher intake water temperatures. As explained earlier, EPA concludes that any small, temporary instream temperature increases associated with the increase in permitted delta T and the change in temperature limits to hourly averages would be more than offset by the benefits of reduced intake flows and corresponding decreases in entrainment. However, during periods of time when intake temperatures are highest – for example, from June through September, intake water temperatures approach and occasionally exceed 80°F, *see* **Figure 6** – allowing higher maximum effluent temperatures as well as higher delta T could lead to more significant increases in thermal loadings to the river as the permittee would need to take in and discharge water at a rate of 60 MGD or higher. Furthermore, at those times, there would be no benefit of entrainment reductions because there would be no decrease in permitted flows.

The draft permit also includes thermal effluent monitoring requirements, which have been established to yield data representative of the discharges under the authority of Sections 308(a) and 402(a) of the Clean Water Act, and in accordance with regulations set forth at 40 CFR §§ 122.41(j), 122.44(i) and 122.48. The approved analytical procedures are to be found in 40 CFR 136 unless other procedures are explicitly required in the permit.

6.1.1.6 Antibacksliding Provisions Regarding Temperature Limits

As discussed above, the CWA's anti-backsliding provisions, set forth in Section 402(o) of the CWA and 40 C.F.R. §122.44(l), bar the relaxation of prior permit limits under certain circumstances. These antibacksliding prohibitions do not, however, apply to this permit. The CWA's antibacksliding bar on relaxing permit limits explicitly applies only to the renewal, reissuance, or modification of technology-based or water quality-based effluent limitations in NPDES permits, as opposed to the revision of permit limits that were based on a § 316(a) variance. Since the thermal discharge limits in the current WS permit were based on a CWA 316(a) variance, the anti-backsliding prohibitions do not apply to these limits.

Even if the anti-backsliding provisions were applied to revisions of permit limits based on § 316(a) variances, two exceptions to the anti-backsliding bar on relaxing permit limits would apply to the thermal discharge limits set forth in this permit. First, the regulations at 40 C.F.R. §122.44(l)(2)(i)(D) offer an exception to the anti-backsliding provisions for permits that have limits or conditions developed pursuant to CWA § 316(a), as is the case in this permit. Specifically, not only were the thermal discharge limits in the currently effective permit based on a § 316(a) variance, but the limits proposed in the new draft permit are also based on a new § 316(a) variance analysis.

Second, the regulations at 40 C.F.R. §122.44(l)(2)(i)(B)(1) provide an exception to the anti-backsliding provisions where information is available that was not available at the time of the earlier permit issuance that would have justified the application of a less stringent effluent limitation. The results of the temperature modeling at WS, coupled with consideration of new intake flow restrictions, represent new information that was not available at the time of the previous permit issuance. As explained above in the discussion of permit requirements under § 316(a), and based on the new modeling information, the proposed changes in permit limits related to thermal discharges will result in only minor, inconsequential changes in the facility's overall thermal discharge and, at the same time, will allow for significantly reduced intake flow that will result in significantly reduced impingement and entrainment.

In this permit, the maximum effluent temperature limits and the delta T limit (difference between intake and effluent temperature) have been changed from instantaneous values to hourly averages, and the delta T limit has been increased from 20°F to 22°F. At the same time, these revised limits are associated with a corresponding *decrease* in the permitted discharge flow of at least 28% during the period from October to May, as well as flow *decreases* up to 28% for the period of June through September, depending upon intake temperatures. As explained above, these decreased flows are expected to have the benefit of reducing adverse impacts from impingement and entrainment of aquatic organisms, as they will occur during the predominant period for spawning and larval growth. Moreover, decreasing the discharge flow and maintaining the maximum temperature limit, even as the delta T limit is increased, will ensure that little if any increase in the amount of heat discharged to the Saugus River will be permitted. (Any increases in the amount of heat discharged to the Saugus River as a result of the permit changes will only involve small increases for short periods of time.) As a result, and as evidenced through the temperature modeling discussed above, EPA concludes that the revised effluent temperature limits will not adversely affect the lower Saugus River because little alteration to the size, shape and magnitude of the thermal plume will result. Furthermore, EPA also concludes if any adverse impacts related to these revised temperature limits do result, they will be slight and will be outweighed by the positive effects of the reductions in impingement and entrainment associated with operating of the CWIS at lower intake flows. Although the change in effluent temperature and delta T limits from instantaneous values to hourly averages, and the change in the delta T limit from 20 to 22 °F, make the permit less stringent in those specific respects, these changes go along with reductions in the permitted discharge and intake flows, and maintenance of a maximum temperature limits, which make the overall permit more stringent and more protective of the environment. EPA also notes that the use of hourly averages is consistent with the temperature limits in other power plant permits and these changes allow the permittee more operational flexibility when experiencing sudden fluctuations in temperature.

Based on the foregoing, the conditions of the new draft permit do not violate the CWA's anti-backsliding requirements.

6.1.1.7 Antidegradation related to thermal discharges

The MA SWQS regulations setting forth the state's antidegradation requirements are found at Title 314 CMR 4.04. These state requirements place certain restrictions on new or increased pollutant discharges to waters of the state.

The draft permit proposes certain changes to the existing permit limits governing thermal discharges. Specifically, (a) the permitted volume of thermal effluent is reduced, (b) the maximum temperature limit of 90 °F is maintained, (c) the delta T limit is increased from 20 °F to 22 °F, and (d) the maximum effluent temperature limits and the delta T limit have been changed from instantaneous values to hourly averages. Overall, the amount of heat (in BTUs) that is permitted to be discharged to the Saugus River will change little, if at all, and modeling predicts that the thermal plume under the new proposed permit limits would be virtually identical to the current condition in size, shape and magnitude. At the same time, the draft permit's reduction in the volume of water permitted to be withdrawn from the Saugus River for cooling should provide substantial environmental benefits in terms of reduced entrainment and impingement. Apart from these cooling system-related limits, all other limits in the draft permit are as stringent or more stringent than the limits in the current permit.

EPA has coordinated with MassDEP on the development of this permit and expects that the MassDEP will find, consistent with EPA's assessment, that the limits proposed in the draft permit will satisfy the state's antidegradation requirements. EPA concludes that the draft permit will not result in any degradation of the water quality in the Saugus River and will, instead, enhance the protection of the river and its aquatic life.

6.1.2 Thermal Effluent Flow

For the period of January 2004 through December 2006, WS discharged effluent within the range of 39.6 to 59.8 million gallons per day (MGD). The flow in the 1991 permit was limited year round to a monthly average and daily maximum of 60 MGD. In order to address the I&E impacts discussed earlier, this permit has established lower intake flow limits for certain portions of the year. This permittee has reduced the intake flow limit from 60 MGD to 43.2 MGD, reflecting about a 28% decrease, for the period of October 1 through May 31. For the period from June 1 through September 30, the effluent flow limits are based on the highest hourly average intake temperature recorded for each calendar day. When this temperature is below 65°F, the flow limit will be a daily maximum of 43.2 MGD. When the intake temperature is between 65 and 70°F, the flow limit will be 50 MGD and when the temperature is 70°F or higher, the flow limit will be 60 MGD. As discussed earlier, when inlet temperatures exceed 65°F, the permittee needs to increase the NCCW flow to maintain efficiency of power production. As part of the BTA requirement of this permit that is detailed in Section 7.6, the permittee will evaluate reducing the flow below the established permit limits on a year-round basis and shall implement such reductions to the maximum extent practicable. Flow will continue to be measured on a continuous basis with a flow meter located approximately 65 feet from the intake pumps.

The effluent flow has also been limited in the permit to levels consistent with the intake flow limits described above.

6.1.3 pH

For the period of January 2004 through December 2006, WS discharged effluent within the pH range of 6.5 to 8.2 standard units (s.u.). The permitted pH range is 6.5 - 8.5 s.u. and this is the instream range which is required for Class SB waters. The pH is measured from a sample port on the discharge side of the condenser.

6.2 Outfall 002

This is a newly designated outfall comprised of wash water from the traveling screen operation. While this is not a new discharge, the existing permit fails to address it, whereas the new draft permit identifies the outfall and proposes monitoring requirements for it. This water is discharged to the Saugus River through the fish return system piping and not to the outfall diffuser to which the non-contact cooling water is discharged. The addition of this outfall does not trigger the State's antidegradation provision, since it has been an ongoing separate discharge apart from the diffuser discharge, even though it was not identified as such in the 1991 permit.

Under current operation, the permittee rotates its traveling screens approximately once every four hours for 10 minutes or more often if the pressure drop across the screens exceeds six inches. The permittee estimates that this results in the discharge of this return water at about 3,080 gallons per screen for each cleaning cycle, which would be about 37,000 GPD assuming continuous operation throughout the day. This draft permit requires more frequent rotation of the traveling screens as described in Section 7.6.2 when any water is being withdrawn from the Saugus River and this would be expected to result in more water discharged through the fish return piping. The additional amount is not known and will vary based upon the amount of time during the day that water is being withdrawn and the frequency and duration of the spray operation. The draft permit has established flow and pH monitoring requirement for this outfall as well as a prohibition on returning any collected debris to the Saugus River.

6.3. Storm Water

This facility was previously authorized to discharge storm water associated with industrial activity on January 21, 2001 with EPA's Multi-Sector General Permit (MSGP). The MSGP requires an active and implemented Stormwater Pollution Prevention Plan (SWPPP). The MSGP was reissued on September 29, 2008. As required to have uninterrupted coverage under this permit, the permittee filed a Notice of Intent (NOI) for this reissued MSGP on January 5, 2009 and was authorized to discharge storm water under this MSGP as of February 5, 2009.

6.4 Other Requirements

The remaining conditions of the permit are based on the NPDES regulations, 40 CFR Parts 122 though 125, and consist primarily of management requirements common to all permits.[3]

---

[3] It should be noted that EPA is not proposing limits on chlorine or "low volume waste stream pollutants" (TSS, oil & grease) for the new draft permit because WS does not discharge these pollutants. WS does not use any form of chlorine at its facility. It controls biological growth in the cooling water system conveyances by manually cleaning them out on a regular basis. WS also collects its low volume waste streams separately and re-uses them within the facility (as described earlier) without discharging any component of them to the Saugus River.

7.0 Requirements for Cooling Water Intake Structures Under CWA § 316(b)

Consistent with the current state of the law and EPA policy, as described above, the Agency has developed this Draft Permit by applying CWA § 316(b) on a BPJ, site-specific basis, and considering applicable state SWQS.

7.1 Methodology for the BPJ Application of CWA § 316(b)

7.1.1 General principles

Neither the CWA nor EPA regulations dictate a specific methodology for developing BPJ-based limits under § 316(b). What is clear, however, is that the elements specified in the statute—namely, that the design, location, capacity and construction of CWISs must reflect the best technology available for minimizing the adverse impacts—must be satisfied.[4]

EPA has read CWA § 316(b) to intend that entrainment and/or impingement should be regarded as an "adverse impact" that must be minimized through the application of the BTA, but this might or might not require the complete elimination of all such impacts in a given case. EPA also looks by analogy to the factors considered in the BPJ development of BAT effluent limits under both the CWA and EPA regulations for guidance regarding additional factors to be considered in making a BTA determination under CWA § 316(b). In setting *BAT* effluent limitations on a BPJ basis, EPA considers various factors specified in the statute, *see* 33 U.S.C. §§ 1311(b)(2)(A) and 1314(b)(2), and in 40 C.F.R. § 125.3(d)(3).[5] These factors are: (1) the age

---

[4] Thus, a proper determination based on a BPJ analysis results in a valid, facility-specific BTA determination. In *NRDC v. EPA*, 859 F.2d 156, 199 (D.C. Cir. 1988) (industry and environmental group challenge to 1979 revisions to NPDES regulations, including the ban on backsliding from BPJ limits), the court explained:

> [i]n what EPA characterizes as a 'mini-guideline' process, the permit writer, after full consideration of the factors set forth in section 304(b), 33 U.S.C. § 1314(b) (which are the same factors used in establishing effluent guidelines), establishes the permit conditions 'necessary to carry out the provisions of [the CWA].' § 1342(a)(1). These conditions include the appropriate ... BAT effluent limitations for the particular point source. ... [T]he resultant BPJ limitations are as correct and as statutorily supported as permit limits based upon an effluent limitations guideline.

Id. See also Texas Oil & Gas Ass'n v. EPA, 161 F.3d 923, 929 (5th Cir. 1998) ("Individual judgments thus take the place of uniform national guidelines, but the technology-based standard remains the same.").

[5] *See also NRDC v. EPA*, 863 F.2d at 1425 ("in issuing permits on a case-by-case basis using its 'Best Professional Judgment,' EPA does not have unlimited discretion in establishing permit limitations. EPA's own regulations implementing [CWA § 402(a)(1)] enumerate the statutory factors that must be considered in writing permits.").

of the equipment and facilities involved, (2) the process employed, (3) the engineering aspects of applying various control techniques, (4) process changes, (5) cost, and (6) non-water quality environmental impacts (including energy issues). According to 40 C.F.R. § 125.3(c)(2), a BPJ-based BAT analysis also should consider the "appropriate technology for the category of point sources of which the applicant is a member, based on all available information," and "any unique factors relating to the applicant." As indicated above, the permit writer developing BAT limits on a site-specific, BPJ basis applies the same performance-based approach to an individual point source that EPA applies to whole categories and classes of point sources when it develops ELGs.[6]

7.1.2 Best performing technology

In applying the BAT standard for setting effluent limits, the CWA calls for EPA to look to the single "best" performing plant in the industry (in terms of effluent reduction) as the starting point for determining the "best available" technology for the industry.[7] EPA has also determined that it may look to any viable "transfer technologies"—that is, technology from another industry that can be "transferred" to the industry in question—as well as technologies shown to be viable in research even if not yet implemented at a full-scale facility.[8] Similarly, EPA's regulations for developing BAT-based effluent limits under BPJ require EPA to begin by identifying the "appropriate technology for the category of point sources of which the applicant is a member, based on all available information." 40 C.F.R. § 125.3(c)(2). These practices with regard to developing BAT effluent limitations are consistent with EPA's development of BTA standards under § 316(b) and it is logical to apply them to this BPJ development of BTA standards.

---

[6] *See, e.g., Texas Oil & Gas Ass'n*, 161 F.3d at 929 (under 40 C.F.R. § 125.3, "EPA must determine on a case-by-case basis what effluent limitations represent the BAT level, using its 'best professional judgment.' Individual judgments thus take the place of uniform national guidelines, but the technology-based standard remains the same.") (citation omitted); *NRDC v. EPA*, 859 F.2d at 201('in establishing BPJ limits, EPA considers the same statutory factors used to establish national effluent guidelines. BPJ limits thus represent the level of technology control mandated by the CWA for the particular point source."); *Trustees for Alaska v. EPA*, 749 F.2d 549, 553 (9th Cir. 1984) (EPA must consider statutorily enumerated factors in its BPJ determination of effluent limits); USEPA NPDES Permit Writer's Manual (1996) at 69-70. *See also NRDC v. EPA*, 863 F.2d at 1425 ("courts reviewing permits issued on a BPJ basis hold EPA to the same factors that must be considered in establishing the national effluent limitations" (citations omitted)).

[7] *E.g., Texas Oil & Gas Ass'n v. United States E.P.A.*, 161 F.3d 923, 928 (5th Cir. 1998); *Association of Pacific Fisheries v. Environmental Protection Agency*, 615 F.2d 794, 816-17 (9th Cir. 1980); *American Meat Inst. v. E.P.A.*, 526 F.2d 442, 462-63 (7th Cir. 1975).

[8] These approaches to determining BAT are supported by the CWA's legislative history and have been upheld by the courts. E.g., *Am. Petroleum Inst. v. EPA,* 858 F.2d 261, 264-65 (5th Cir. 1988); *Pacific Fisheries,* 615 F.2d at 816-17; *BASF Wyandotte Corp. v. Costle,* 614 F.2d 21, 22 (1st Cir. 1980); *Am. Iron & Steel Inst. v. EPA,* 526 F.2d 1027, 1061 (3d Cir. 1975); *Am. Meat Inst.,* 526 F.2d at 462-63.

Therefore, to ensure that the location, design, construction, and capacity of WS's CWIS reflect the best technology available for minimizing adverse environmental impacts, EPA's analysis begins with an inquiry into the capabilities of the best-performing CWISs in the same industrial category as WS.[9] Although WS is primarily a waste-to-energy facility, its secondary function is to generate electricity for sale to the local power grid by using the steam of a combustion process. This generating capability, along with the operation of the CWIS and the discharge of NCCW, make WS similar in important ways to steam electric power plants. Therefore, for the purposes of this discussion and analysis, WS will be compared directly to power plants whose primary function is the generation and transmission of electricity by means of the steam cycle.

Given that WS is an existing facility that would require retrofitting to achieve technologically-driven improvements, EPA can look to the *existing* steam electric facilities that have achieved the greatest reductions in adverse environmental impacts from their CWISs through technological retrofits. In addition, EPA could look to technologies shown to be feasible for use at WS even if not previously used to retrofit an existing facility. For example, in this regard, EPA could look to technologies being used at new power plants to determine if they would be feasible for application at Wheelabrator.[10]

As a general matter, the best performing facilities in terms of minimizing the adverse environmental impacts by CWISs at existing open-cycle power plants are facilities that have converted from open-cycle cooling to closed-cycle cooling using some type of "wet" cooling towers. EPA's research has identified a number of facilities that have made this type of technological improvement. *See Draft Permit Determinations Document for Brayton Point Station NPDES Permit,* at pp. 7-37 to 7-38; *Responses to Comments for Brayton Point Station NPDES Permit*, at p. IV-115.[11,12] Flow reduction improvements could also be made without

---

[9] It is important to emphasize that this is a site-specific determination and is not a finding regarding what would constitute appropriate national, industry category-wide BTA-based requirements under § 316(b).

[10] Thus, one can consider whether a technology used at a *new* power plant could constitute a viable "transfer technology" for use at an *existing* plant.

[11] In the Phase I CWA § 316(b) Rule, EPA also determined that entrainment and impingement mortality reductions commensurate with the use of closed-cycle cooling reflect the BTA for *new* facilities with CWISs. *See* 40 C.F.R. Part 125, Subpart I (Phase I CWA § 316(b) Rule).

[12] Although the use of "dry" cooling might achieve an even greater marginal reduction in entrainment and impingement, EPA has not identified a single case of a facility retrofitting from open-cycle cooling to dry cooling. Although EPA is unaware of any technical reason that such a conversion would necessarily be impracticable at all facilities—though it seems likely that it would be infeasible at a larger proportion of existing facilities than would a conversion to wet cooling because of factors such as the greater space needed for dry cooling—it would likely achieve only a small marginal additional reduction over the high end of the reduction range for wet cooling towers and would be significantly more expensive. In the absence of examples of such a conversion ever having been implemented, EPA is not prepared to

actually changing technology by simply reducing the amount of cooling water used by the facility, but significant reductions would likely result in significantly reduced electrical generation, or more modest flow reductions might be accommodated, as discussed above, by increases in the permitted thermal discharge delta T. Requiring cutbacks in generation, sometimes on a seasonal basis, in order to reduce adverse CWIS impacts has been required in other permits. *See, e.g.*, Bulletin, Marine Resources Advisory Council, Vol. IX, No. 4, "Effects of Power Plants on Hudson River Fish," (requirements for plant included scheduled plant outages); *In the Matter of Fla. Power Corp., Crystal River Power Plant, Units 1, 2, and 3, Citrus County, Florida* (Findings and Determinations Pursuant to 33 U.S.C. § 1326; NPDES Permit No. FL0000159).

Although EPA concludes here that converting to a closed-cycle cooling system using wet cooling towers would *generally* be the best performing technology with regard to minimizing the adverse environmental impacts of existing power plants with CWISs, converting to closed-cycle cooling might not be practicable at particular facilities, and might not be determined to be the BTA for an entire category of facilities sources on a national basis for a variety of possible reasons (*e.g.*, another technology is more "cost-effective" or adverse secondary environmental effects). This BPJ permit determination for WS is not required to, and does not, evaluate all of these factors for the entire category of point sources nationally. Thus, any determination regarding the best-performing technology for use as a starting point in the BTA analysis for WS does not represent a determination of the BTA applicable to any other facility, much less the entire category of point sources.

7.1.3 Consideration of site-specific factors

Because a BPJ-based application of CWA § 316(b)'s BTA standard is conducted on a case-by-case, site-specific basis, EPA must also consider whether the technologies under consideration are truly practicable (or feasible) for use at the particular power plant in question. In other words, although a technology works at one power plant, it might not actually be feasible at another plant due to site-specific issues (*e.g.*, space limitations). Accordingly, a technology that works at another facility but is not actually feasible at WS would not be the BTA for this permit.

Again turning for guidance to the process for devising BPJ-based BAT limits, EPA regulations for BAT direct the Agency to consider "unique factors relating to the applicant." 40 C.F.R. § 125.3(c)(2). This parallels the above-described site-specific evaluation that EPA conducts in its BPJ application of CWA § 316(b).

---

conclude that a conversion to dry cooling is an appropriate transfer technology for consideration of BTA for an existing facility.

7.1.4 Consideration of BAT factors

As noted earlier, in developing BAT limits on a BPJ basis, EPA also considers the six statutory factors for developing BAT effluent limitations: (1) the age of the equipment and facilities involved, (2) the process employed, (3) the engineering aspects of applying various control techniques, (4) process changes, (5) cost, and (6) non-water quality environmental impacts (including energy issues). *See* USEPA NPDES Permit Writer's Manual (1996) at 70. The CWA sets up a loose framework for assessing these statutory factors in setting BAT limits.[13] It does not require their comparison, merely their consideration.[14] "[I]n enacting the CWA, 'Congress did not mandate any particular structure or weight for the many consideration factors. Rather, it left EPA with discretion to decide how to account for the consideration factors, and how much weight to give each factor.'"[15]

In sum, when EPA considers the statutory factors in setting BAT limits, it is governed by a standard of reasonableness.[16] It must consider each factor, but it has "considerable discretion in evaluating the relevant factors and determining the weight to be accorded to each in reaching its ultimate BAT determination."[17] One court has succinctly summarized the standard for judging EPA's consideration of the statutory factors in setting BAT effluent limits: "[s]o long as the required technology reduces the discharge of pollutants, our inquiry will be limited to whether the Agency considered the cost of technology, along with other statutory factors, and whether its conclusion is reasonable."[18]

---

[13] *BP Exploration & Oil, Inc.*, 66 F.3d at 796; *Weyerhauser v. Costle*, 590 F.2d 1011, 1045 (D.C. Cir. 1978) (citing Senator Muskie's remarks on CWA § 304(b)(1) factors during debate on CWA). *See also EPA v. Nat'l Crushed Stone Ass'n*, 449 U.S. 64, 74, 101 S.Ct. 295, 300, 66 L.Ed.2d 268 (1980) (noting with regard to BPT that "[s]imilar directions are given the Administrator for determining effluent reductions attainable from the BAT except that in assessing BAT total cost is no longer to be considered in comparison to effluent reduction benefits").

[14] *Weyerhauser*, 590 F.2d at 1045 (explaining that CWA § 304(b)(2) lists factors for EPA "consideration" in setting BAT limits, while CWA § 304(b)(1) lists both factors for EPA consideration and factors for EPA "comparison" -- *e.g.*, "total cost versus effluent reduction benefits" -- in setting BPT limits).

[15] *BP Exploration & Oil, Inc.*, 66 F.3d at 796; *Weyerhauser v. Costle*, 590 F.2d at 1045.

[16] *BP Exploration & Oil*, 66 F.3d at 796; *Am. Iron & Steel Inst. v. EPA*, 526 F.2d 1027, 1051 (1975), *modified in other part*, 560 F.2d 589 (3d Cir. 1977), *cert. denied*, 435 U.S. 914 (1978).

[17] *Texas Oil & Gas Ass'n*, 161 F.3d at 928; *NRDC v. EPA*, 863 F.2d at 1426. *See also Weyerhauser*, 590 F.2d at 1045 (discussing EPA's discretion in assessing BAT factors, court noted that "[s]o long as EPA pays some attention to the congressionally specified factors, the section [304(b)(2)] on its face lets EPA relate the various factors as it deems necessary").

[18] *Ass'n of Pacific Fisheries v. EPA*, 615 F.2d 794, 818 (9th Cir. 1980) (industry challenge to EPA regulations implementing BAT limits for seafood processing industry point sources). *See also Chemical*

Using the process for developing BAT limits as guidance, EPA has also considered the six statutory BAT factors in determining the BTA-based limits under CWA § 316(b) for this draft permit. EPA's site-specific evaluation of the relevant factors for WS is presented below.

7.2 State Water Quality Standards

In addition to satisfying technology-based requirements, NPDES permit limits for CWISs must also satisfy any more stringent provisions of state water quality standards (WQS) or other state legal requirements that may apply, as well as any applicable conditions of a state certification under CWA § 401. *See* CWA §§ 301(b)(1)(C), 401(a)(1), 401(d), 510; 40 C.F.R. §§ 122.4(d), 122.44(d). This means that permit conditions must satisfy any applicable water quality criteria and protect any relevant designated uses, including those for fish habitat, which may be set forth in the state's WQS. Indeed, the CWA authorizes states to impose more stringent water pollution control standards than dictated by the federal statute.[19] The Supreme Court has held that once the CWA § 401 state certification process has been triggered by the existence of a discharge, then the certification may impose conditions and limitations on the activity as a whole, and not merely on the discharge, to the extent that such conditions are needed to ensure compliance with state water quality standards or other applicable requirements of state law.[20]

Manufacturers Ass'n (CMA) v. EPA, 870 F.2d 177, 250 n.320 (5th Cir. 1989), *citing* Congressional Research Service, *A Legislative History of the Water Pollution Control Act Amendments of 1972* at 170 (1973) (hereinafter "*1972 Legislative History*") (in determining BAT, "'[t]he Administrator will be bound by a test of reasonableness.'") (industry challenge to EPA regulations implementing BAT limits for organic chemicals, plastics and synthetic fibers industry point sources); *NRDC v. EPA*, 863 F.2d at 1426 (same); *American Iron & Steel Inst.*, 526 F.2d at 1051 (same).

[19] The regulation governing the development of WQS notes 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." 40 C.F.R. § 131.4(a). The Supreme Court has cited this regulation in support of the view that states could adopt water quality requirements more stringent than federal requirements. *PUD No. 1 of Jefferson County v. Wash. Dep't of Ecology*, 511 U.S. 700, 705 (1994). *See also* 33 U.S.C. § 1370; 40 C.F.R. § 125.80(d).

[20] *PUD No. 1*, 511 U.S. at 711-12. holds that "in setting discharge conditions to achieve WQS, a state can and should take account of the effects of other aspects of the activity that may affect the discharge conditions that will be needed to attain WQS. 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." For example, a state could impose certification conditions related to CWISs 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 WQS. *See* at 713 (holding that Section 401 certification may impose conditions necessary to comply with designated uses).

With respect to cooling water withdrawals, both sections 301(b)(1)(C) and 401 authorize the Region to ensure that such withdrawals are consistent with state WQS, because the permit must assure that the overall "activity" associated with a discharge will not violate applicable WQS. *See PUD No. 1*, 511 U.S. at 711-12 (Section 401 certification); *Riverkeeper, Inc. v. United States EPA*, 358 F.3d 174, 200-202 (2d Cir. 2004) ("*Riverkeeper I*") (application of water quality standards under section 301(b)(1)(C)); *In re Dominion Energy Brayton Point, LLC*, 12 E.A.D. 490, 619-41 (EAB 2006) (addressing both Section 301(b)(1)(C) and Section 401). Moreover, the relevant WQS need not specifically or expressly address cooling water withdrawals, because both sections 301(b)(1)(C) and 401 may be applied to protect designated uses. *See PUD No. 1*, 511 U.S. at 714-18, 723 (Section 401 certification); *Riverkeeper I*, 358 F.3d at 200-02 (Section 301(b)(1)(C)); *Dominion*, 12 E.A.D. at 628, 633 (both authorities).

Therefore, the limits in EPA-issued NPDES permits that address CWISs must satisfy: (1) the BTA standard of CWA § 316(b); (2) state water quality requirements; and (3) any applicable conditions of a state certification under CWA § 401. Whichever standards are most stringent ultimately determine the final permit limits.

MassDEP has designated the Saugus River in the vicinity of this discharge a Class SB, Outstanding Resource Water. For Class SB waters, the applicable standard specifies that "[t]hese waters are designated as a habitat for fish [and] other aquatic life." 314 CMR 4.05(2)(b). SB waters are also supposed to provide a recreational fishing habitat. Though the standard for Class SB waters does not include any specific numeric criteria that apply directly to cooling water intakes, it is nevertheless clear that MassDEP must impose the conditions it concludes are necessary to protect the designated uses for the river and ensure that it remains a "habitat for fish [and] other aquatic life" and a recreational fishing resource. Massachusetts has indicated that SB waters are intended to provide, at a minimum, a good quality, healthful fish habitat, as opposed to a habitat of only minimal or low quality.[21] Section 4.05(1) of the Massachusetts standards provides that each water classification "is identified by the most sensitive, and therefore governing, water uses to be achieved and protected." This provision means that where a standard lists several uses, the most sensitive use will govern the permit in the sense that permit requirements must be sufficient to protect that use and achieve the water quality standard.

EPA agrees with Massachusetts's interpretation of its WQS as being applicable to cooling water withdrawals. First, the Massachusetts Clean Water Act provides that "no person shall engage in any other activity which may reasonably result, directly or indirectly, in the discharge of pollutants to waters of the [state] without a currently valid permit from the Department." M.G.L. ch. 21, § 43(2) and 314 CMR 3.04. MassDEP's position has been that the cooling water withdrawal associated with a once-through cooling water operation is an integral component of the "activity" that directly results in a thermal discharge. Therefore, WS's cooling water

21 By contrast, the state's SWQS require Class SA waters to provide "excellent" quality habitat for fish. 314 CMR 4.05(4)(a).

withdrawal is an activity subject to regulation under the permit that MassDEP must issue to authorize the discharge of thermal pollution under the Commonwealth's Clean Waters Act. Second, the state's CWA provides that MassDEP water permits may specify "technical controls and other components of treatment works to be constructed or installed . . . which [MassDEP] deems necessary to safeguard the quality of the receiving waters." M.G.L. ch. 21, § 43(7). "Treatment works" is broadly defined to include "any and all devices, processes and properties, real or personal, used in the collection, pumping, transmission . . . recycling . . . or reuse of waterborne pollutants." M.G.L. ch. 21, § 26A and 314 CMR 3.02. MassDEP has concluded that a CWIS constitutes an integral component of a facility's once-through cooling water "treatment works," and therefore, MassDEP has further authority to regulate such structures.

More recently, Massachusetts has amended its WQS to make explicit its interpretation of this matter and remove any possible uncertainty or ambiguity about it. On December 29, 2006, Massachusetts amended 314 CMR 4.05 to clarify that "in the case of a CWIS regulated by EPA under [CWA § 316(b)], the Department has the authority under [CWA § 401,] M.G.L. c. 21, §§ 26 through 53 and 314 CMR 3.00 to condition the CWIS to assure compliance of the withdrawal activity with 314 CMR 4.00, including, but not limited to, compliance with narrative and numerical criteria and protection of existing and designated uses." 314 CMR 4.05(3)(b)(2)(d). On January 11, 2007, Massachusetts submitted this revision (among others) to EPA for review pursuant to Section 303(c) of the Act. While EPA is still reviewing this submission, on July 29, 2007, EPA wrote a letter to MassDEP stating that "there is nothing in the CWA that prohibits MassDEP from adopting and enforcing WQS related to CWISs to ensure that water withdrawals are conducted in a manner that protect[s] designated and existing uses and compl[ies] with narrative and numeric criteria." Letter from Stephen S. Perkins, EPA, to Arleen O'Donnell, MassDEP (July 29, 2007), at 3.

In summary, Massachusetts SWQSs apply to CWISs and EPA's permit requirements must be sufficient to ensure that WS's CWIS do not cause or contribute to the violation of the SWQS and to satisfy the terms of the state's water quality certification under CWA § 401. EPA anticipates that the MassDEP will provide this certification before the issuance of the final permit.

7.3 Biological Impacts of CWISs

The principal adverse environmental impacts typically associated with CWISs evaluated by EPA are the entrainment of fish eggs, larvae, and other small forms of aquatic life through the plant's cooling system and the impingement of fish and other larger forms of aquatic life on the intake screens. See generally 66 Fed. Reg. at 65,292 ("[I]t is reasonable to interpret adverse environmental impact as including impingement and entrainment, diminishment of compensatory reserve, stresses to the population or ecosystem, harm to threatened and endangered species, and impairment of State or authorized Tribal water quality standards."). Entrainment and impingement can kill large numbers of the aforementioned aquatic organisms and contribute to diminished populations of local species of commercial and/or recreational importance, locally important forage species, and local threatened or endangered species. In addition to considering these adverse impacts directly, their effects as cumulative impacts or stressors in conjunction with other existing stressors on the species should also be considered. In addition, any losses of particular species could contribute to a decrease in the balance and diversity of the ecosystem. See 66 Fed. Reg. 65,256, 65,262-65 (Dec. 18, 2001) (preamble to Final Phase I rule under CWA § 316(b)).

Entrainment of organisms occurs when a facility withdraws water into the CWIS from an adjacent water body. Eggs and larvae are typically small enough to pass through 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. 66 Fed. Reg. at 65,263. These organisms can be killed or otherwise harmed as a result of entrainment. The number of organisms that become entrained is dependent upon the volume and velocity of cooling water flow 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. The extent of entrainment can be affected by the location of the intake structure, the biological community present in the water body, the nature of any intake screening system or other entrainment reduction equipment used by the facility, and by season. 66 Fed. Reg. at 65,263.

Impingement of organisms occurs when a facility draws water through its CWIS and organisms too large to pass through the 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 and depth, the velocity of water at the entrance of the intake structure (approach velocity) and through the screens (through screen velocity), 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). 66 Fed. Reg. at 65,263.

7.3.1 Waterbody Characteristics

As noted above, WS is located on the tidally influenced Saugus River. In developing national standards under CWA § 316(b), EPA recognized that tidal rivers and estuaries are biologically and ecologically sensitive and important water bodies that merit the highest levels of protection, and that impacts from both impingement and entrainment are concerns. In addition to providing foraging habitat and migratory pathways for adult organisms, thereby increasing the abundance of impingeable organisms in the waterbody, tidal rivers and estuaries also provide spawning and nursery habitat for many species, increasing the abundance of entrainable organisms and eggs. *See, e.g.,* 67 Fed.Reg. 17140 (April 9, 2002) (preamble to Proposed Phase II rule).

The depth of the river near WS varies and is subject to significant tidal action. The river is approximately 10 feet deep at mean low water (MLW) and there is a 9.5 foot differential between the mean water level at low tide and at high tide in the vicinity of the facility. WS maintains a dredged channel approximately 170 feet long and 25 feet wide to about 12 feet below MLW in front of its CWIS. According to maps of the area (see **Figures 1** and **2**), the river is generally deeper along its northern side (near GE) and a 100-foot navigational channel is maintained for commercial fishing vessel traffic. The southern portion of the river, where WS is situated, is shallower and largely consists of tidal flats and salt marshes with a rocky shoreline. According to depth soundings, the river is as shallow as 2-6 feet in some locations near the facility (TetraTech, 2006, AR #26).

7.3.2 Local Biology - Common and Notable Species Present

Four impingement and entrainment studies that were conducted in this reach of the Saugus River are available for characterization of potential impacts on local and anadromous fish and shellfish communities (MRI 1988, 1989, 1991, 1997; AR #71, 58, 72, 56). One study was conducted from 1984 to 1988 at the WS CWIS and provides data on impingement and entrainment rates as well as on the ambient biological conditions in the Saugus River. Two follow-up studies were conducted in the spring of 1989 and 1991 to obtain additional entrainment data during the most productive time of the year in the Saugus River. An additional study was conducted at GE's Power Plant CWIS from 1994 to 1996 (MRI, 1997, AR #56) and provides further information on the biological community in the vicinity of WS.

At the time of the 1987-1991 studies, WS employed a different intake technology than it does today. Before updating its intake in 2003, the facility employed standard 3/8" mesh traveling screens with a dual spray wash and separate return troughs for fish and debris. The analysis of the biological impacts below is based on data from the pre-2003 intake configuration, which did not indicate the intake flows at the facility during the sampling period. While changes to the intake technology may affect the impingement and entrainment rates at WS, the pre-2003 data is useful for describing the source water biological community and identifying the species most at risk to being impinged or entrained. No biological studies are known to have been conducted since 2003 to document impingement and entrainment with the modified CWIS.

Based on the two impingement and entrainment studies, the Saugus River fish assemblage in the vicinity of WS is composed not only of marine and estuarine species (e.g., winter flounder and Atlantic mackerel), but freshwater species that can withstand high levels of salinity, and anadromous (e.g., alewife and American shad) and catadromous fish (e.g., American eel) that pass through this section of the Saugus River during their seasonal spawning runs. **Table 1** contains a list of larval and adult fish captured during the entrainment and impingement studies conducted for the WS CWIS and also during source water sampling. A total of 57 fish species were entrained and/or impinged by the WS CWIS.

Many of these estuarine species are broadcast spawners, which release their eggs to the water column. The eggs and larvae of these species float throughout the water column with the currents until they reach their juvenile life stage. As larvae or eggs, they are vulnerable to entrainment. Juvenile fishes school in shallow, protected waters until they mature, at which point they move to deeper water. These estuarine conditions are highly productive and provide food for many species at different stages of life. Several of the fishes noted in the studies are sought by recreational and commercial fishermen (e.g., winter flounder, rainbow smelt, bay anchovy, Atlantic cod, and Atlantic mackerel).

Shellfish community richness, and impingement and entrainment impacts on shellfish, were not measured or discussed in the WS studies. However, species of potential concern found in the Saugus River were the blue mussel, horseshoe crab, and American lobster (**Table 2**). These shellfish species have economic value as commercial and recreational species of importance. Blue mussels spawn between April and August and produce larvae that are planktonic (exhibiting floating or drifting characteristics) between 15 and 35 days. It is likely that the critical period for blue mussel larvae is between April and September. Similarly, horseshoe crab spawn between May and July and produce a free-swimming larvae. The critical period for these invertebrates is likely between May and August. American lobster produce planktonic larvae that are present in the water column between May and October.

7.3.3 Entrainment and Impingement

The quantity of organisms entrained and impinged is generally a function of the intake structure's location, design, flow capacity (and resulting intake velocity), frequency of operation (i.e., capacity utilization), and the abundance of organisms within the influence of the cooling water intake current. The biological community of the Saugus River, coupled with the location of the WS CWIS in the shallow, rock lined, salt marsh habitat, provides for conditions that could potentially lead to high rates of entrainment as egg and larval densities are high in this area. This section discusses the potential for impacts to aquatic organisms as a result of the operation of WS's CWIS.

7.3.3.1 Entrainment Impacts

Fish eggs and larvae, and other aquatic organisms small enough to pass through the mesh of intake screens, are entrained in water drawn into a facility's cooling system. Organisms carried through the cooling system are exposed to high shear stress and a rapid increase in water temperature as heat is transferred to the cooling water from the facility's condensers. Finally, after being discharged, organisms that survive traveling through the facility's cooling water system may then be exposed to rapid decreases in water temperature as the heated cooling water mixes with the receiving waters. These physical, chemical, and thermal stressors, individually or in combination, can kill or injure the entrained organisms.

Impingement and entrainment effects were measured by the permittee from February 1984 through May 1988 (MRI 1988, AR #71). This study included 1-year of pre-operational source water sampling and 2-years of post-operational source water, impingement and entrainment sampling. The study (completed in May 1988) found that the most abundant entrained larvae over the two year post-operational sampling were: sculpin (*Myoxocephalus spp.*-primarily *M. aeneaus*), rainbow smelt (*Osmerus mordax)*, Atlantic silverside (*Menidia menidia*), Atlantic tomcod (*Microgadus tomcod*), winter flounder (*Psuedopleuronectes americanus*), and rock gunnel (*Pholis gunnellus*). In addition, fish eggs were commonly entrained with two groups accounting for most egg losses, i.e., Labrid eggs (primarily in the genus *Limanda* and likely yellowtail flounder) and windowpane eggs.

The follow-up entrainment study completed during the 1989 spawning season (which characterized entrainment for select species in more detail) further supported the high level of larval and egg losses due to WS's CWIS. The results from this study indicated that during the time larvae are present in the vicinity of the CWIS, the mean entrainment rates were 26.1 winter flounder larvae per 100 m^3 of water and 13.1 rainbow smelt larvae per 100 m^3. Smelt were collected from April 19 through June 5th, with the highest density (35.5 per 100 m^3) observed on May 3. Winter flounder were collected from April 10 to June 14, with the highest density (197.1 per 100 m^3) observed on May 23. This study also indicated that larval densities in the intake bay were consistently higher than in the river samples for several species, including rainbow smelt (mean difference 45:1), winter flounder (8:1), rock gunnel (5.5:1), northern pipefish (2:1), sculpin (35:1), and Atlantic silverside (27:1). Based on results of the post-operational and follow-up studies, EPA concludes that the WS CWIS adversely impacts the local Saugus River fish.

Seasonal patterns were noted in larval fish presence at WS for individual species (**Table 3**). However, when considering the entire Saugus River fish assemblage, eggs and larvae are vulnerable to entrainment throughout all seasons (**Tables 3 and 4**). The greatest number of species are present as larvae during the period of February through July.

To estimate the annual loss of larvae at WS, EPA looked to the 1988 MRI study, which provided the only facility-specific data available. Using the larval density data from the sampling station within the facility and assuming that the intake flow was 60 MGD over the prior 12 months, EPA estimated an annual loss of about 45 million fish larvae. Since fish eggs were not collected or identified in this study, this portion of entrainment loss could not be estimated. Yearly entrainment densities were also estimated from sampling at the GE discharge from 1994 to 1996 (MRI 1997, AR# 56). While, entrainment data for the two facilities are not directly comparable due to differences in intake volume, sampling methods, and microhabitat, both facilities have entrainment impacts. The intakes are located on opposite shores of the Saugus River in distinct habitats, with the WS CWIS located in tidal flats and the GE CWIS located in deeper waters closer to the navigational channel of the Saugus River. WS entrainment is dominated by sculpin, Atlantic silverside, and Atlantic tomcod larvae; GE entrainment is dominated by Atlantic herring, Atlantic mackerel, and sand lance larvae, as well as a higher proportion of eggs than larvae. However, both facilities entrain large numbers of winter flounder and rock gunnel larvae, as well as labrid and windowpane eggs, suggesting effects of entrainment at the GE and WS CWISs may have individual and cumulative adverse impacts on local fish communities.

EPA estimated the number of fish larvae that would be saved (i.e. not entrained) by the proposed flow reductions. EPA started with the monthly water intake for each month based on the current and proposed draft permit limits. This was combined with the entrainment data that the permittee provided in its 9/06 submittal (AR #55) from the original 1988 MRI study as well as supplemental sampling conducted MRI in 1989 and 1991 (AR #58, 72). Since there was considerable variation in larval densities between the river and in-plant sampling stations, EPA used the monthly mean value of the entrainment samples. This resulted in an estimated 10,800,500 fish larvae saved per year when comparing operations at current flow limit operation with operation at the proposed flow reduction of 28% to 43.2 MGD.

7.3.3.2 Impingement Impacts

The impingement of organisms occurs when water is drawn into a facility through a CWIS and organisms become trapped against the traveling screens. Impinged fish may suffer from improper gill movement, de-scaling, starvation, exhaustion and/or other physical injuries while trapped against intake screens. If an organism is returned to the waterbody through a debris return trough, it may suffer further injuries from contact with debris in the trough. Upon being returned to the waterbody, injured or disoriented organisms may be more susceptible to predation. *See* 66 FR 65263 (Preamble to Phase I Rule).

Impingement at the WS CWIS was measured from September 1986 to May 1988, with sampling methods varying between years (MRI 1988). A total of 23 fish species were impinged by the WS CWIS during the two years of post-operational sampling (**Table 1**). The five most abundant species in the impingement samples were winter flounder (*Pleuronectes americanus)*, northern pipefish (*Syngnathus fuscus*), mummichog (*Fundulus heteroclitus*), grubby (*Myoxocephalus aenaeus*), and windowpane (*Scophthalmus aquosus*), which collectively accounted for 86% of impinged fish. Winter flounder juveniles were most abundant in the impingement samples and contributed 36% of the impingement catch. Pipefish were second in abundance and accounted for 21.8% of the catch. Mummichogs, grubby, and windowpane accounted for 14.2%, 7.9% and 6.8% of the impingement catch respectively. Impingement rates for all species measured ranged between 1.8 and 20.4 fish per 24 hours, with a mean rate of 8.5 fish per 24 hours (approximately 3,100 fish per year or 129 fish per billion gallons).

As noted above, these biological studies were conducted when WS employed a different CWIS technology than currently used at the facility, but the data is useful in providing insight for characterizing the species present in the waterbody.

There is also some historical impingement data available from the GE's CWIS across the river. Although the river depths and CWIS at GE are different than Wheelabrator's, these data are also useful for species characterization. Impingement was measured at the GE CWIS from November 1994 through October 1996, and commonly impinged species were similar to those at WS. Grubby (*Myoxocephalus aenaeus*) were the most commonly impinged fish in both years (representing 48% of total) and were most numerous in samples from mid-October to February. Winter flounder (*Pleuronectes americanus*) were the second most commonly collected fish (26% of total), and were taken at the highest rates in November and January. Cunner (*Tautogolabrus adspersus*) were third in percent abundance and were taken most frequently in September through November. Other commonly impinged fish in order of percent composition were: windowpane (*Scophthalmus aquosus*), taken primarily as young-of-year and age 1 fish in October, November, December, and April; shorthead sculpin (*Myoxocephalus scorpius*) occurring in November through February; threespine stickleback (*Gasterosteus aculeatus*) collected primarily in January through April; and rainbow smelt (*Osmerus mordax*) impinged from October through February. The report provides an average fish impingement rate of 1,580 fish per billion gallons withdrawn from the Saugus River for GE's CWIS.

Impingement of shellfish was not measured or discussed for WS; therefore, a description of GE results were considered to provide perspective and information for this segment of the Saugus River. Although the Saugus River is deeper on the GE side and there may be differences in the presence or abundance of various species, there is no other known habitat assessment to draw from. Four species constituted the majority of shellfish impinged at GE's CWIS during the 1994 to 1996 study. The most abundant invertebrate was the green crab (*Carcinus maenas*), impinged primarily in October and November, which represented 45% of total in the first year and 7% in the second year. During the second year of sampling, a similar number of green crabs were impinged, however a large number of sevenspine bay shrimp (*Crangon septemspinosa*) were also impinged, reducing the green crab's proportion of the total number of organisms impinged. Sevenspine bay shrimp represented 28% of the total impingement catch in the first year and 91% in the second year. These were taken in greatest numbers in October and January. Also common were the Atlantic rock/jonah crab (*Cancer irroratus/borealis*) which represented 22% of total in the first year and 2% in the second. The American lobster (*Homarus americanus*) represented 4% and 0.4% of the impingement catch in the first and second years, respectively, with most being taken from late September through mid-October.

While it is important to understand an intake structure's potential to impinge organisms, it is also important to assess the capability of the intake system's design and operation to effectively return impinged organisms back to the receiving waters alive and uninjured. At the time of the 1988 study, WS's intake screens had a dual spray wash system that cleaned the traveling screens of impinged organisms and material. To study survival rates of impinged organisms, a 3/8-inch wire mesh basket was fitted to a high pressure wash trough and 3/8-inch nylon mesh net was fitted to a low pressure wash trough. Fish collected alive were placed in aerated containers and observed for 48 hours. Survival studies indicated a pooled latent survival rate from the low pressure wash system of 77.5% for winter flounder, 77.5% for northern pipefish, 79.6% for mummichogs, 78.5% for grubby, and 31.4% for windowpane (MRI 1988). Survival was significantly lower in the high pressure system (MRI 1988).

A similar study was done at the GE plant during the 1994 - 1996 survey. The impingement rates and initial survival of impinged organisms at the GE Power Plant CWIS were assessed by catching all materials washed off the collecting screens in a 1/4-inch mesh collecting pen attached to the end of the screenwash sluiceway. The initial reported survival of impinged fish following handling by the collecting screens was 99.7% for grubby and winter flounder, 100%

for cunner, windowpane, and shorthorn sculpin, and 82.6% for all remaining species. Data indicating the impingement survival rates for the current intake configuration were not provided.

In order to estimate the impingement reduction which would be experienced at the facility, EPA used the proposed flow limits and the impingement data that the permittee conducted from 1986 to 1988. EPA assumed that impingement reduction would be reduced in a linear fashion along with the intake flow. The proposed flow reductions in the draft permit would result in an estimated 574 fewer fish impinged per year, of which 224 would be winter flounder. This estimate is likely conservative as the permittee has shown that estimated through-screen velocities are reduced as intake flow is reduced, thereby allowing some fish to swim away from the intake's influence and not get impinged on its intake screens. In addition, EPA is not able to quantify the increased survival of impinged fish that would result from the increased screen rotation and improved fish return, but these requirements will also reduce the number of impingement mortalities at WS.

7.3.3.3 Summary of Entrainment and Impingement

The biological monitoring results from studies at WS indicate that operation of the facility's CWIS results in adverse environmental impacts through the entrainment of ichthyoplankton (larvae and eggs) and the impingement of fish and invertebrates from the Saugus River. Operations at WS impact not only forage fish, but also species experiencing population declines (*e.g.*, rainbow smelt) and recreationally and commercially important species occurring in the vicinity of the CWIS (*e.g.*, winter flounder).

The studies show that impingement and entrainment have historically occurred at WS at all times of the year, with the most important period being March through July, when juveniles of some species are likely to congregate near the CWIS. This pattern of high spring entrainment was further supported by the additional entrainment sampling conducted at WS (MRI 1989).
The lack of data provided or discussed on entrainment and impingement effects of WS on shellfish limited the thoroughness of the evaluation of biological impacts. Due to the shallow water, rocky shoreline, and littoral vegetation that comprises the habitat where the WS CWIS is located, it is likely that there are impacts to shellfish species within this part of the Saugus River. Green crab (*Carcinus maenas*), sevenspine bay shrimp (*Crangon septemspinosa*), Atlantic rock/jonah crab (*Cancer irroratus/borealis*) and American lobster (*Homarus americanus*) were all shown to be impacted by the CWIS across the river at the GE plant. Moreover, as discussed above, species of potential concern for larval entrainment included blue mussel, horseshoe crab, and American lobster. In summary, based on this historical data, the adverse environmental impacts (AEI) caused by operation of this CWIS are more than de minimis and must be minimized by implementation of the BTA described in this permit. Implementation of this BTA will have direct and indirect positive impacts on fish and other natural resources of the Saugus River. The required BTA will result in impingement of 500 fewer fish and prevent more than 10 million larvae from being entrained annually, which will directly benefit fish species of commercial and recreational importance, as well as help to preserve populations of forage fish

and invertebrates, and the overall biological diversity of the estuary. In turn, improvements to the River's aquatic life will benefit populations of migratory birds and other terrestrial animals dependent on the salt marsh; enhance recreational opportunities, including birdwatching, fishing and kayaking; and promote the preservation of Rumney Marsh, an outstanding resource water and ACEC with intrinsic biological value particularly worthy of protection, as indicated by the state's ACEC designation.

In order to assess the entrainment and impingement impacts associated with the modified WS CWIS, the draft permit has established an annual biological monitoring program. This program is outlined in Part D of the permit and prescribes biological monitoring that the permittee must conduct through the life of this permit. The goals and objectives of this biological monitoring are (1) to expand the baseline biological studies, conducted between 1984 and 1989 by the permittee and (2) to identify any changes in fish populations in the vicinity of the CWIS.

7.4 Permit Requirements Based on Determination of the BTA under CWA § 316(b)

7.4.1 Assessment of Cooling Water Intake Structure (CWIS) Technologies

Introduction

This section discusses potentially available technological alternatives for ensuring that the design, construction, location and capacity of the CWIS at WS reflects the BTA for minimizing adverse environmental impacts, as required by CWA § 316(b). This discussion considers engineering, environmental, economic, and other issues related to these alternatives, and concludes with EPA's determination of the CWIS BTA for this permit renewal.

As explained in more detail below, there is a range of alternatives for minimizing the adverse environmental impacts of CWISs. Each alternative has advantages and disadvantages, both inherent to the technology and as applied specifically at WS, and no one alternative commends itself as perfect, proven, and fully protective of the environment. Some of the alternatives have not yet amassed significant supporting case study data, while others have reportedly proven successful elsewhere but their application at WS might be complicated by site-specific factors. As a result, for this draft permit, EPA has proposed a series of measures that it has determined collectively represent the BTA for minimizing adverse environmental impacts at WS. For this analysis, EPA has considered the permit record, including the many recent submittals made by the permittee, such as WS's temperature modeling work and its March 17, 2008 response to EPA's Section 308(a) letter (AR #3).

EPA considered the elements for identifying the BTA based on the terms of CWA § 316(b) – i.e., that it be the "best technology available for minimizing adverse environmental impacts." EPA first evaluated the BTA by focusing on the degree to which technologies or operational measures could minimize the adverse impacts of CWISs: namely, entrainment and impingement. EPA then looked to additional relevant considerations, focusing on the factors that are considered by EPA in the analogous exercise of determining BAT effluent standards. For each potential impingement and entrainment technology, EPA considered the following six factors: (1) the age of the equipment and facilities involved; (2) the process employed; (3) process changes; (4) cost; (5) the engineering aspects of applying various control techniques; and (6) non-water quality environmental impacts (including energy issues). *See* CWA § 304(b)(2)(B); 40 C.F.R. § 125.3(d)(3).

7.4.2 BTA Evaluation

The discussion below provides an evaluation of the location, design, construction, and capacity of WS's CWIS. In addition to reviewing relevant documentation provided by Wheelabrator and participating in discussions with Wheelabrator personnel familiar with the CWIS and its operation, a site visit was conducted on July 21, 2005, to assess the facility's CWIS design and operation. A contractor to EPA, Tetra Tech, was also present at this site visit and has provided EPA with information which has been specifically cited in this Fact Sheet. EPA also considered requested information from the permittee received on September 1, 2006 and March 17, 2008 in preparation of this draft permit.

7.4.2.1 Location of CWIS

The location of a CWIS in the waterbody is an important factor influencing its impacts. EPA evaluated the location of the CWIS in the waterbody (e.g., proximity to a shoreline), the type of waterbody, and the depth of the intake structure to determine if it meets the requirements of BTA under CWA § 316(b).

WS is located on a relatively straight reach of the Saugus River, especially in comparison to the meandering reaches upstream of the facility. WS's CWIS and pump house are located along the southern shore where the river is generally shallow (e.g., 2 to 6 feet in some locations) and contains substantial salt marsh and tidal flat habitat (see Figure 2). The pump house is situated on land owned by Wheelabrator, and is connected to the plant via a right of way across land owned by GE. The GE land includes the GE landfill, which was capped in 1999, pursuant to MassDEP solid waste regulations. Other land in this vicinity includes that of an auto junkyard and an active ash residue landfill operated by the permittee.

The CWIS is located in highly productive tidal waters, which raises concerns for the organisms that use this habitat. Tidal rivers and estuaries are among the most productive water bodies and provide spawning and nursery habitat for many aquatic species, as well as permanent habitat for adult organisms. In 1988, Massachusetts designated the tidal area encompassing the CWIS, know as Rumney Marshes, an Area of Critical Environmental Concern (ACEC). The boundary of this ACEC is the limit of the 100-year flood on the Lynn side of the Saugus River and includes WS's pump house and surrounding land. Rumney Marsh is one of the most extensive and biologically significant salt marsh systems in the Greater Boston area. The ACEC provides habitat for a diverse assemblage of birds and marine life, including migratory birds and at least five state listed threatened and endangered species or species of concern. The area is a target for salt marsh restoration, including an 0.5 acre parcel adjacent to the GE landfill which was restored in 1998 as mitigation for the landfill closure. In fact, the permittee was required to restore about 5000 square feet of salt marsh on both sides of the pump house during construction in 1984. In addition to providing biological habitat, the salt marsh offers a large area of undeveloped public land for recreation (MWRP 2002, AR #61).

The CWIS consists of a submerged shoreline intake structure with two intake bays located at the end of an approximately 170-foot long intake channel. Unlike the adjacent shallow areas of the Saugus River, the 25-foot wide channel is maintained by periodic dredging. The channel depth in front of the CWIS is approximately 12 feet and gradually decreases to a depth of 6-8 feet towards the main channel of the Saugus River. The CWIS pulls cooler water from the bottom of the channel. Entrainment monitoring in 1987 through 1989 found a higher density of rainbow smelt and winter flounder in the CWIS intake bay compared to river sampling locations, with mean differences as high as 45:1 for rainbow smelt and 8:1 for winter flounder (MRI 1989). Additional post-operational monitoring in 1991 demonstrated that winter flounder were predominant in the mid to bottom layers of the river, suggesting that the high density of winter flounder in the intake bay was occurring because the circulating pumps draw from bottom waters (MRI 1991). However, densities of northern pipefish and Atlantic silversides, two species that are not typically demersal, were also higher in the intake bay than the river in 1989. Based on existing entrainment data for WS, orienting the CWIS to draw water from either the bottom or surface is unlikely to minimize adverse impacts.

An alternative CWIS location on the site is not available to WS at this time. The parcel on which the existing pump house is located is not large enough for a substantial expansion of the CWIS. Numerous regulatory approvals would be required for construction of a new intake. More importantly, a new intake on the salt marsh would result in adverse environmental impacts to sensitive, protected, and previously restored habitat. Disturbance from construction activities would adversely impact birds and marine life, and a new intake would permanently displace biologically productive salt marsh and tidal flats. Moving the intake to the main channel of the Saugus River would be unlikely to reduce impacts associated with the CWIS, as GE's CWIS, which is located closer to the main channel, also results in impingement and entrainment impacts. Finally, relocating the intake to the main channel of the Saugus River is unavailable because it would interfere with the existing navigational channel managed by the ACOE (Guidelines for the placement of fixed and floating structures in navigable waters of the U.S regulated by the New England District, U.S. Army Corps of Engineers, July 1996, AR #64). At this time, EPA has no reason to believe that an alternative location would minimize adverse environmental impacts due to impingement and entrainment.

7.4.2.2 Design, Construction, and Operation of the CWIS

The design, construction and operation of a CWIS are additional important factors in assessing biological impacts. Fish protection technologies at a CWIS can reduce impingement and entrainment impacts if properly designed, installed, and maintained.

The facility is permitted to withdraw and discharge up to a daily maximum of 60 MGD of NCCW through its once-through cooling system. The CWIS has two intake bays, separated by a cement wall, each with identical screening and pumping technologies. The facility updated its CWIS in 2003 by installing new Ristroph coarse-mesh traveling screens, two new intake pumps rated at 40,000 gallons per minute (gpm) each, and a single variable frequency drive[22]. The shared variable frequency drive can be switched between the two intake pumps. During normal operation, one of the two intake pumps is always on and the other is operated during periods when the intake water is warm, to run the plant efficiently and to meet the thermal discharge limits of the permit. Each intake bay is preceded by a trash rack, with bars approximately 2-3" apart and situated at about a 70 degree angle toward the water, which screens large debris and is cleaned manually every day.

The single entry-single exit Ristroph traveling screens (see **Figure 4**) have openings that are classified as coarse mesh (1/4 inch by 1/2 inch) and they are rotated for ten minutes every four hours or more frequently if a certain pressure drop is experienced across the screens. There are separate fish and debris spray wash systems and pipes. The screens are first cleaned by a low-pressure (approximately 7 pounds per square inch (psi)) spray wash which removes impinged organisms and deposits them into a dedicated return trough. Any remaining debris is removed by a second spray wash (approximately 15 psi) which deposits the debris into a separate return trough. There is also a high pressure spray operating at about 80 psi which is used mainly for dislodging debris from the screens. Debris not directed to a sump or otherwise collected by the permittee and burned in the refuse pit is returned with organisms to the waterbody via separate outfalls. The submerged fish return discharges organisms into the river and maintains a constant flow in the return pipe, even when the screens are not rotating.

A low through screen velocity (TSV) ensures that a substantial number of adult and juvenile fish are able to escape impingement. EPA derived a 0.5 fps protective through-medium velocity from the studies cited, and analysis provided, in the preamble to the Phase I Rule. See 65 Fed. Reg. at 49,087-88. Many species and life stages evaluated are able to swim against a velocity as high as 1.0 fps, however, a more conservative through-screen velocity limit of 0.5 fps velocity protected 96 percent of tested fish. Moreover, a more conservative limit is particularly appropriate because it provides a margin of safety for circumstances in which screens become

[22] A variable frequency drive (VFD) is an electrical motor that adjusts the power supplied to the pump, thereby changing the speed at which the pump operates. This allows the pump to operate at less than its maximum capacity and more efficiently meet the water needs of the facility. If the VFD is used to reduce the volume of water being pumped from the river, it should result in a proportional reduction in I&E.

occluded by debris during the operation of a facility and velocity increases through the portions of a screen that remain open.

At WS, a low TSV will provide the best impingement protection because stronger fish will be able to avoid impingement, and those that do become impinged on the traveling screens will be returned to the river via the fish return system. The TSV at WS's traveling screens varies depending on the tide and intake flow. (**See Figure 5**) According to the permittee, the current TSV at the existing screens consistently exceeds a protective velocity of 0.5 fps at the permitted flow of 60 MGD, except at peak high tide. By decreasing flows below 30,000 gpm (43.2 MGD), the TSV would be mostly less than 0.5 fps, except for brief periods on either side of low tide, reaching a maximum of approximately 0.65 fps. The TSV would drop as low as 0.35 fps during high tide if the intake volume is reduced to 38.9 MGD and the excursions above 0.5 fps would be even more limited. Although the permittee operates at intake flow rates above 60 MGD for certain periods when intake water temperatures are high, it did not provide estimated TSVs for flow rates above 60 MGD. Even though TSVs at such higher flow rates will exceed 0.5 fps for longer periods, many fish species are able to overcome the influence associated with TSVs of up to 1.0 fps as mentioned above. In addition, the permittee will be improving the fish return system and, as discussed below, is required to rotate the traveling screens for 15 minutes every 30 minutes when water is being withdrawn from the Saugus River. This combination of measures will improve the survival of fish that become impinged and are washed off the traveling screens.

Existing Traveling Screens

The updated Ristroph screens are designed with a relatively low approach velocity and improved buckets to protect fish after they become impinged. In laboratory and field studies, adults and juveniles of tested species showed high rates of survival (92 to 100 percent) and low rates of injury, even at approach velocities higher than 1.0 fps, although mortality, injury, and scale loss tended to increase with longer impingement durations (EPRI 2006, AR #62).

At WS, the screen material is made from panels of wedgewire, which are less abrasive to aquatic organisms and more corrosion-resistant than traditional screen materials. In addition, the updated fish buckets and generally low TSV are protective of impinged fish. However, the fish return pipe includes several sharp turns and an 8-foot vertical drop, which may adversely affect fish survival. Sudden changes in direction may subject organisms to physical shock during the return, resulting in direct injuries, death, or indirect deaths due to being stunned upon return to the water body and more susceptible to predation. In addition, the facility typically only rotates the screens every four hours, resulting in potentially long impingement durations that may not minimize adverse impacts on fish. Ristroph screens are used at a number of facilities nationwide and are typically rotated continuously, which is considered a "best" operating practice. Research indicating that mortality increases with the duration of impingement (EPRI 2007, AR #63) suggests that continuous rotation is the most protective for impinged organisms. According to the permittee, the existing rotating screens at the facility cannot accommodate continuous rotation due to operational and maintenance problems. The facility can, however, rotate the screen at a maximum frequency cycle of 15 minutes on/15 minutes off according to the manufacturer's recommendation. This impingement duration would be a marked improvement from the current rotation procedure and would minimize impingement mortality. Thus, the draft permit requires the permittee to restructure its fish return to eliminate sharp turns and vertical drops, and to rotate its traveling screens for 15 minutes every 30 minutes when water is being withdrawn from the Saugus River. *See* Part C of the draft permit. EPA has determined that with these improvements, the design of the existing traveling screens and fish return system will be considered components of BTA for minimizing impingement harm.

However, due to the relatively coarse size of the screen mesh, these design technologies are not sufficient for minimizing entrainment. Organisms subject to entrainment are generally too small to be collected on WS's screens. Therefore, the permittee and EPA have considered other technologies for minimizing entrainment at the facility, including fine mesh traveling screen overlays, wedgewire screens, aquatic barrier or filter barrier nets, and flow reduction through the use of cooling towers or a variable frequency drive.

Fine Mesh Screen Overlays

EPA evaluated the feasibility of installing fine mesh screen overlays seasonally to the existing traveling screens. Fine-mesh traveling screens, which typically include screens with mesh sizes less than 5 mm, can be mounted onto existing conventional traveling screens to exclude certain eggs, larvae, and juvenile fish from CWISs. The efficacy of the screens for excluding organisms from being entrained at a specific site will depend on the relative sizes of the mesh and the aquatic organisms of concern, but the survival of any organisms that are excluded will further depend on the design and implementation of an aquatic organism handling and return system that safely returns the impinged organisms to the aquatic environment. The organisms impinged on a fine-mesh screen will include tiny, delicate eggs and larvae too large to pass through the fine-mesh screen, and which would otherwise be entrained through the existing coarse-mesh screen, and these fragile organisms are at high risk of being killed as a result of being impinged.

Fine-mesh screens attempt to reduce entrainment of ichthyoplankton by using a small mesh size and low through-screen velocity to exclude organisms from being entrained. The existing ½ by ¼-inch screens are not effective in excluding most fish eggs and larvae from being entrained through the facility, where they likely perish or suffer injury as a result. For example, the smallest organisms entrained at WS are winter flounder eggs [(approximately 0.74 to 0.8 mm in diameter (0.03 inches)], and cunner and tautog eggs [(approximately 0.7 to 1.14 mm in diameter (0.027 – 0.044 inches)] (Callaghan 2005, AR #65).

The proportion of a given type of organism that is successfully excluded by a screening system is known as the "retention" and can be measured by the number of larvae recovered in front of the screen following a trial. ESEERCO (1981, AR #66) examined the retention of 0.5 mm mesh at 0.5 fps, and found that: (1) retention of winter flounder yolk sac larvae (YSL) with 0.5 mm mesh was substantial (nearly 70 percent) and that a 1.0 mm mesh did not effectively retain YSL (mean retention less than 1 percent). Similarly, EPRI (2008, AR #67) observed that more than 80 percent of 6 mm rainbow smelt larvae were recovered in tests with 0.5 mm mesh, but recovery declined to less than 40 percent when mesh size increased to 2 mm mesh. Based on these results, EPA concludes that a 0.5 mm screen would be required to substantially exclude eggs and larvae from being entrained at WS.

Similar screens have been implemented at the Big Bend Power Plant in Tampa Bay, Florida. After resolving a series of maintenance and biofouling problems, the fine-mesh (0.5 mm) screens at Big Bend reportedly substantially reduced entrainment of eggs and invertebrates (retention up to 100%). The study reported that the screens were not as effective in reducing larval entrainment, with retention less than 50% for some species (Mote Labs, AR #68). The screens were likely more effective at retaining eggs than larvae, even though eggs are typically smaller, because larvae (reported as total length) encounter the screens at different orientations. If oriented head-first into the screen, the relatively small head capsule allows the larvae to be entrained even if mesh size is smaller than larval total length (e.g, rainbow smelt larvae with an average length of 6.2 mm had an average head capsule depth of 0.8 mm in a 2008 EPRI study).

If eggs and larvae suffer mortality during impingement, even though they were prevented from becoming entrained, an adverse environmental impact associated with the CWIS is still apparent, with entrainment being traded for impingement mortality. Thus, mortality of eggs and larvae following impingement on fine-mesh screens is integral to overall performance of the technology and, to date, has not been well studied. In the few studies that have been conducted, survival is species- and stage-specific, is influenced by intake velocity, and can be poor for some species. For instance, ESEERCO (1981) winter flounder early post-yolk sac larvae (PYSL) tended to have high mortality (greater than 65%), regardless of velocity or impingement duration, and alewife PYSL had high mortality (greater than 76%) in all tests.

EPA evaluated the availability of fine-mesh traveling screens at WS based on BAT factors. Regarding the age of the equipment, fine-mesh screen overlays would benefit from using the newly upgraded traveling screen apparatus and re-configured fish return system. Fine-mesh screens would be unlikely to introduce major non-water quality impacts. The technology also would not result in changes to the existing processes employed at the plant, but it would require additional maintenance of the screens (e.g., cleaning the screens to address any biofouling and/or to remove any aquatic debris caught on the screens) and scheduled outages to install and remove the screens seasonally (i.e., removing during coldest months to avoid damage by accumulating ice). There are also substantial challenges related to the engineering feasibility of this technology, specifically related to space limitations. Because the small size of eggs and larvae at WS requires a 0.5 mm mesh size, the surface area of the screens would need to be larger than the current configuration in order to maintain a low through-screen velocity of approximately 0.5 fps to promote survival of impinged eggs and larvae. Therefore, in order to accommodate a larger fine-mesh configuration, the facility would have to expand the pump house, which is not likely to be feasible due to limited available upland. Going beyond the upland would likely require salt marsh destruction that would cause adverse environmental impacts and be likely to preclude permitting. Fine-mesh screens cannot be overlaid on the existing traveling screens without intake expansion because the TSVs would substantially increase due to the decrease in percent open area, which would likely result in high mortality of impinged eggs and larvae. A larger mesh size (e.g., 1-3 mm) may decrease the surface area required to maintain a low TSV, but would be unlikely to exclude a substantial number of eggs and larvae at WS.

Thus, although the installation and operation of fine-mesh traveling screens is a mature technology, its performance potential is uncertain, and it is not available at WS, in any event, because of space limitations. As a result, EPA has determined that fine-mesh traveling screens do not constitute a component of the BTA at WS at this time.

Wegdewire Screens

A wedgewire screen uses a "v" or wedge-shaped, cross-section wire welded to a framing system to form a slotted screening element.[23] Wedgewire screens have demonstrated an ability to reduce both entrainment and impingement, and could potentially do so at this location. Wedgewire screens reduce entrainment and impingement both through physical exclusion and hydrodynamics by using the flushing action of currents present in the source waterbody. The screen's cylindrical shape maintains a low through-slot velocity by quickly dissipating velocity. A sufficient ambient current must be present in the source waterbody to aid organisms in bypassing the structure and to remove debris from the screen face (*See* EPA Technical Development Document for the Final Section 316(b) Phase II Rule, Feb. 12, 2004 p. A-13).

Small slot-size (0.5 to 3 mm) wedgewire screens have been used or tested at a number of facilities, including Chalk Point Station, Charles Point Recovery Facility, Oyster Creek Nuclear Generating Station, and Arbuckle Hydroelectric Station, as well as in controlled laboratory studies (EPRI 2008, AR #67)). Studies of wedgewire screens suggest that they can effectively exclude small eggs and larvae with high survival and low impingement if a sweeping flow is present to encourage organisms past the face of the screens. For instance, Alden Research Laboratory (EPRI 2003, AR #69) observed that 0.5 mm slot wedgewire screens generally prevented entrainment of most winter flounder larvae at a slot velocity of 0.5 fps. However, entrainment of winter flounder larvae (slot velocity of 0.5 fps) increased to greater than 60% when slot size increased to 1.0 mm. With a larger slot size (1 mm), nearly 85 percent of winter flounder larvae were entrained when the channel velocity was low (0.25 fps), suggesting that a sufficient sweeping flow may be integral to the performance of the screens. Similarly, in a Chesapeake Bay field study of wedgewire screens EPRI (2006, AR #73) demonstrated that, in general, entrainment increased as channel velocity decreased, indicating that a sufficient sweeping flow is required to effectively reduce entrainment with wedgewire screens.

---

[23] Taft, E.P. 2000. Fish protection technologies: a status report. Environmental Science & Policy Volume 3: S349-S359.

EPA evaluated the availability of wedgewire screens at WS based on BAT factors. Regarding age, wedgewire screens would replace the existing, relatively new traveling screens, but would still allow operation of the VFD for the intake pumps. This technology would not change the process of generating electricity, but would change how cooling water is withdrawn from the river. The existing, recently upgraded traveling screens and fish return system would likely be removed and the pumps re-piped to withdraw water through several wedgewire screens situated, for example, in the intake channel. In addition, a compressed air system would be required to clear debris from the screens, and additional maintenance would likely be needed to maintain effective performance.

There are substantial challenges related to the engineering feasibility of this technology at WS. Wedgewire screens at WS would need to be designed with a slot size of 0.5 mm, to effectively screen eggs and larvae commonly entrained, and a TSV of 0.5 fps to minimize impingement and entrainment. A low TSV to allow fish to escape impingement is particularly important with wedgewire screens because unlike traveling screens, wedgewire screens have no method of safely removing impinged fish. The permittee estimated that permitted flow at WS would require four cylindrical units, each with a diameter of 54 inches and a depth of 9 feet (twice the screen diameter) to ensure that screens remain submerged at all times during operation. The mean low water level in the intake channel at low tide is about 10 feet, which is barely adequate. Also, the channel is about 25 feet at its widest point. Four units would not fit in a 25-foot wide area with adequate clearance on all sides, and the intake channel is not deep or wide enough towards the main channel to accommodate the required clearance. A cone-shaped wedgewire screen, available from one vendor (ISI), may accommodate the shallower depths in the intake channel better than a T-screen. Because these cone-shaped screens are generally smaller, more units would be required to accommodate pumping volume. In addition to dimensional limitations, the intake channel may not provide the consistent, sweeping flow required for the technology to effectively minimize impingement and entrainment. As described above, wedgewire screens rely on an ambient current to sweep eggs, larvae, and other organisms and debris past the face of the technology to minimize impingement and entrainment. The dimensions and topography (e.g. narrow channel with variable depth) are not suitable for a bounded system to induce sweeping flow. The dimensional limitations and lack of a sweeping flow eliminates wedgewire screens as BTA in the intake channel.

The main channel of the Saugus River outside of the intake channel is approximately the same depth as the intake channel (8 to 10 feet), which is the minimum depth required for a 4 to 5 foot diameter screen. A precise measure of sweeping flow is unavailable, although sufficient sweeping flow to maintain performance is likely present, except for a minimal period around slack tide. However, because the Saugus River is a navigational channel maintained by the ACOE, installing a technology in the river would introduce non-water quality impacts. Wedgewire screens, given their dimensions, would likely interfere with the use of the navigational channel. The policies of the ACOE do not permit structures in navigational channels or setback areas (U.S. ACOE, July 1996, AR #64), and under 310 C.M.R. 9.35(2)(a), the state further restricts impeding navigational channels. This is not to say that such a structure would never be allowed, but that wedgewire screens in the river include regulatory considerations not apparent with other effective technologies. Based on the infeasibility of installing wedgewire screens due to dimensional requirements and sweeping flow, and the non-water quality impacts on the navigation channel if screens are installed in the Saugus River, EPA has determined that wedgewire screens would not be considered a component of BTA at WS at this time.

Aquatic Barrier Nets/ Filter Barriers

Barrier net systems involve nets anchored in front of an intake to passively filter water and exclude organisms larger than the mesh size of the net. These systems include simple static nets as well as more specialized filter fabric nets known as aquatic filter barriers. Both technologies minimize entrainment by having a mesh size small enough to effectively exclude most eggs and larvae (e.g. 0.5 mm), and minimize impingement by having TSVs low enough (i.e., less than 0.5 fps) to protect most life stages and species of aquatic organisms. However, aquatic filter barriers also incorporate a compressed air system to clear debris to help maintain the screen's performance. These systems would be expected to work best in low flow environments with minimal debris loading. Installations of these technologies for entrainment reduction are limited [e.g., NYC Waterfalls exhibit, Lovett Generating Station (NY), and Taunton Water Development Project(MA)], but results of monitoring studies suggest that the technology can effectively minimize entrainment. For example, extensive biological studies of the aquatic filter barrier at Lovett Station indicate that entrainment, primarily post-yolk sac larvae, was reduced between 73 percent (in 2004) to 92 percent (in 2005) for all species combined with low rates of impingement (ASA 2004, AR #70). None of these studies, to EPA's knowledge, observed survival of eggs and larvae at these installations. Excluding organisms may not be enough to minimize adverse environmental impacts of the CWIS. As with wedgewire screens, a sufficient ambient flow should be present so that eggs and larvae may be swept away from the media and entrainable organisms do not accumulate at the face of the technology where they suffer mortality due to impingement, predation, and competition for food.

EPA evaluated the availability of a fine mesh barrier net or aquatic filter barrier at WS based on BAT factors. The existing, recently upgraded traveling screens would likely be used to minimize impingement instead of a barrier system during colder months when accumulating ice could damage the nets. The technology would not impact how electricity is generated at the plant, but would require additional maintenance and, in the case of an aquatic filter barrier, would include a compressed air system to clear debris. There are, however, substantial challenges related to the engineering feasibility of this technology. In order to achieve a low TSV with a mesh size no greater than 0.5 mm, the permittee has estimated a fine mesh barrier net or aquatic filter barrier at WS would require 400-600 linear feet of permeable material. This amount of space is not available in front of the intake at the end of the channel (channel width is only about 25 feet at its widest point), nor is it available if the intake were re-piped to allow withdrawal along the length of the channel (approximately 160 feet). In addition, the intake channel does not provide steady sweeping flow, without which, the net may become occluded and TSV could increase to levels well above 0.5 fps. The channel is not suitable for installation of a bounded system to induce sweeping flow. Thus, space limitations and lack of a steady sweeping flow eliminates a barrier net or aquatic filter barrier as BTA in the intake channel.

The Saugus River, at the mouth of the intake channel, would provide the area and sweeping flow necessary to install and operate a barrier net or aquatic filter barrier to minimize entrainment. However, the barrier would have to tie back into the bank near the intake in order to effectively filter all the water pulled into the facility. This deployment would require an estimated 400 linear feet parallel to shore with an additional 350 feet of permeable material across the mudflats on either side of the barrier to connect to shore and create a "sealed" containment at multiple depths, resulting in a footprint larger even than wedgewire screens. Effectively enclosing this area would also eliminate access for organisms to the tidal flats. High debris associated with estuarine environments, such as eelgrass, can cause problems with fouling of barrier nets, but this issue has been effectively minimized in other locations (e.g., Lovett Generating Station). In addition, the channel does not currently have any infrastructure to support a barrier net. Constructing a barrier net or aquatic filter barrier system may substantially impact tidal flat habitat during construction, and may be impacted by availability of land owned or maintained by other entities. Also, because the Saugus River is a navigational channel maintained by the ACOE, installing a technology in the river introduces non-water quality impacts for vessel traffic in the channel and is unlikely to be permitted by the ACOE and the State (see 310 CMR 9.35(2)(a)). Based on the infeasibility of installing a barrier net or aquatic filter barrier in the intake channel, the adverse effects on the tidal flat/marsh environment, and the adverse non-water quality impacts associated with installing either technology in the Saugus River, EPA has determined that neither a barrier net nor an aquatic filter barrier is BTA at WS at this time.

7.4.2.3 Capacity of CWIS

"Capacity" refers to the volume and velocity of water being withdrawn by a given CWIS. Capacity is another important factor in assessing the biological impacts of CWIS. As noted in the 316(b) Phase I regulations, the volume of water withdrawn has a direct influence on the numbers of organisms entrained, especially with regard to pelagic (free-floating) eggs and larvae (see 66 FR 65273). A reduction in water withdrawals, possible either through the implementation of closed-cycle cooling or reduced pumping is one of the most effective methods for reducing entrainment (66 FR 65273). Reducing flow proportionally decreases entrainment by reducing the number of organisms exposed to entrainment, whereas other technologies designed to exclude organisms or deposit them away from the intake, still expose eggs and larvae to the CWIS and potential injury or mortality.

The WS CWIS has two large capacity, single speed pumps, but usually operates only one at a time to meet the cooling water needs of the facility. In 2003, the permittee installed a variable frequency drive (VFD), which can be used on either of the two intake pumps. The facility operates continuously with a permitted flow of 60 MGD, but with considerable variation during the year and even within a 24-hour period as intake water temperatures change. In warmer months, the permittee requires up to 60 MGD in order to maintain turbine efficiency. The permittee currently uses the recently installed VFD to reduce pump speed when the temperature or plant loads warrant and also allows for parallel pump operation with higher flows when water temperatures are higher.

Closed-Cycle Cooling

Closed-cycle cooling recirculates cooling water and according to EPA estimates can reduce cooling water intake volumes by up to 96 to 98 percent and as a result can achieve a corresponding reduction in the number of organisms entrained by the CWIS (66 FR 65273). This technology is the most effective means of reducing entrainment and impingement (66 FR 65273).

In its March 17, 2008 submittal, the permittee outlined two types of mechanical draft cooling towers (CT), wet and wet/dry or hybrid CTs, and assessed their feasibility at this location.[24] According to the permittee, converting the facility to closed-cycle cooling could potentially reduce the required intake volume from up to 60 MGD to approximately 5 MGD (a 92 percent reduction).

EPA evaluated the closed-cycle cooling with "wet" mechanical draft cooling towers at WS based on the previously mentioned BAT factors. The installation of cooling towers would significantly change the cooling water process at WS. Unlike once-through cooling, in which water is continually withdrawn and discharged, closed-cycle cooling with wet mechanical draft cooling towers recirculates water and dissipates heat in evaporative cooling towers. Currently NCCW is discharged to a diffuser at WS and the current permit limits flow, temperature, and pH. Following a conversion to closed-cycle cooling, the permittee would need to discharge blowdown from the cooling towers (CT) to eliminate solids that have accumulated in the cooling tower. The blowdown discharge would contain these solids and could also potentially contain treatment chemicals that have been added for corrosion control and to inhibit biological growth in the tower (e.g., chlorine). This is not to say that discharge of CT blowdown would be prohibited. Several New England generating stations routinely discharge CT blowdown to receiving waters while maintaining the existing and designated uses of the water body. If WS needed to discharge CT blowdown to the Saugus River, the permit would likely establish additional effluent limits and the facility might require additional treatment for the discharge. In addition, the permittee states that converting to closed-cycle cooling would also require

[24] EPA notes that the permittee did not evaluate "wet" natural draft cooling towers, or dry cooling towers, but finds that wet mechanical draft towers were a reasonable option to focus on for this evaluation given that they currently represent the most commonly used type of cooling towers in the United States, and that dry cooling is more expensive and EPA is unaware of any examples of an existing facility converting from open-cycle cooling to dry cooling. Moreover, the space problems associated with mechanical draft cooling towers, as discussed herein, would also exist for natural draft and dry cooling towers.

modification of the pump house and additional pumps to pump water to the top of the cooling towers. Closed-cycle cooling is the most costly of the technologies evaluated, and also introduces the potential for several non-water quality impacts, including lost turbine performance (estimated by the permittee at up to 9 MWh/day), additional power use (estimated by the permittee at 1100 to 1500 kW), an occasionally visible plume of water vapor from the tops of the CTs, and sound emissions from the operation of the towers. However, most of these impacts and changes would be minor and could be accommodated by the permittee.

On the other hand, space constraints in and around the WS site appear to preclude the use of cooling towers. The facility is constructed on fill and is located entirely within the Rumney Marsh ACEC. This designation results in certain extended regulatory protections for the area and a special review is required for any project proposed in this area. According to the permittee, the installation of a cooling tower array comprised of 3 wet mechanical draft cooling tower cells requires a footprint of 165 feet by 55 feet. If wet/dry mechanical draft towers were installed (to address vapor plume issues), the permittee estimates an even larger footprint – 200 feet by 48 feet. Given the environmental resources in the area (salt marsh wetlands, waterways, riverfront, and the associated "do not disturb/do not build" buffer zones), as well as site soil conditions, slope, areas already in use for site equipment and operations, and the potential for the need to disturb closed and/or capped landfill areas, adequate space on-site to build the necessary cooling tower array and its associated piping is not available.

In light of the above analysis, EPA has determined that closed cycle cooling is not available at WS at this time, primarily due to space constraints at the site and adverse environmental effects, primarily involving disturbance to sensitive salt marsh and tidal flat habitat.

Seasonal Flow Reductions

As discussed above, WS installed a VFD in 2003. The VFD enables the facility to reduce the volume of its water withdrawals from the Saugus River under certain circumstances. The permittee has proposed to optimize use of the existing VFD to reduce its intake flows (and corresponding effluent flows) by at least 28% for the period of October 1 to May 31 each year. This is consistent with Scenario 6 of the temperature modeling discussed earlier. (In addition, the permittee has agreed to study the feasibility of decreasing intake flows to 38.9 MGD (a 35% decrease from the maximum permitted flow) when water temperatures are less than 50 °F, which typically occur between November and April (WS; 3/17/08).)

EPA agrees with the permittee that the proposed intake flow regime should offer significant reductions in adverse environmental effects. The permittee points out that previous entrainment studies indicate that about 88% of the larvae of all species combined were collected during the period of February through May. As the permittee also notes, the flow reduction to 43.2 MGD would, therefore, take place during the peak entrainment period and would reduce entrainment of fish eggs and larvae by a corresponding amount. Another benefit of this flow reduction noted by the permittee is that it would effectively bring the range of TSV to a maximum of 0.5 fps except at and around peak low tide (See **Figure 5**), further minimizing the potential for impingement. By optimizing the use of the VFD according to intake temperatures, the permittee estimates that larval entrainment would be reduced by 29% for all species and up to 35% for rainbow smelt (compared to a permitted daily maximum flow of 60 MGD), or 17% for all species and up to 19% for rainbow smelt (compared to actual, recent high-end flows; 308 Request Submittal, page 4, Section 6.4, AR #3).

EPA also evaluated the use of VFDs at WS based on BAT factors. With regard to the age of equipment, the VFD was installed relatively recently. Therefore, it is reasonable to continue using this equipment but to do so in manner that further reduces entrainment and impingement, while also operating the upgraded traveling screens and fish return system to minimize impingement. This approach would not change the process of power generation at WS. Operating at lower flows, the facility's discharge temperature would be slightly higher than current conditions (discussed in Section 6.1.1 Thermal Discharge Limits), but based on thermal modeling of the discharge, EPA has determined that, in this case, the slight increase in temperature will not adversely impact the BIP and is necessary in order to minimize adverse environmental impacts associated with impingement and entrainment. The VFD is incorporated into the existing CWIS at WS, and would not require additional construction or engineering or non-water quality impacts, and would likely yield cost savings because pumps would use less power than when consistently operated at rated speed. Based on these BAT factors and the estimated reductions in entrainment resulting from optimizing use of the existing VFD, EPA has determined that this technology is one component of BTA at WS.

EPA has further determined that the following specific CWIS intake capacity or flow limits reflect the BTA at WS: (a) from October 1 to May 31 the intake (and corresponding discharge) flow will be limited to 43.2 MGD (a 28% reduction), with an additional requirement that the permittee must decrease flows to the extent practicable below that amount; and (b) for the remainder of the year, the period of June 1 through September 30, the permittee is limited to a daily maximum effluent flow to 43.2 MGD when the highest hourly average intake temperature of any calendar day is below 65°F, to 50 MGD when such intake temperature is between 65 and 70°F, and to 60 MGD when such intake temperature is 70°F or greater. In addition, the permittee will be required to evaluate whether a further reduction in the permitted intake flow to 38.9 MGD (a 35% reduction) is feasible or would result in substantial maintenance issues or pump instability as a result of reducing the pumping rate below 70% of rated capacity, which is the minimum rate recommended by the manufacturer.

Plant outages

Maintenance outages are periodically conducted on the facility's two boilers and the turbine generator. Each boiler undergoes several maintenance events per year lasting from several hours to several days each. One boiler is worked on at a time so that the other may be operating. The turbine undergoes one major maintenance shutdown per year lasting for 4-5 consecutive days and this is the only scheduled period when there is no intake and discharge of water.

Since the permittee has flexibility in scheduling this maintenance work, it has indicated that it could do so during periods of time when entrainable aquatic life is believed to be present at relatively high levels in the Saugus River. (personal communication with Matt Killeen of Wheeleabrator– 8/7/08, AR #23). The species of the greatest concern in the Saugus River are rainbow smelt and winter flounder. Rainbow smelt are currently being studied by the United States Fish and Wildlife Service (USFWS) for inclusion on its endangered species list and is also considered a species of concern for the National Marine Fisheries Service (NMFS) due to declining landings through the 1990's. Winter flounder is a commercially important species. The 1988 MRI study measured larval densities of many fish species in the Saugus River and the WS intake and found that the vast majority of rainbow smelt and winter flounder larvae were found in the months of April and May. Many other species were found throughout the year, but the majority was found in the February to July time frame.

Scheduling maintenance outages during peak entrainment periods would help to reduce entrainment further, and would not result in impacts under any of the BAT factors. Therefore, a scheduled plant outage for the period of April 1 to May 31 is one component of BTA at WS.

7.5. Summary

In addition to focusing on the degree to which technologies or operational measures could minimize entrainment and impingement, EPA also evaluated additional factors that are considered by EPA in the analogous exercise of determining BAT effluent standards. *See* CWA § 304(b)(2)(B); 40 C.F.R. § 125.3(d)(3). EPA's consideration of these factors was presented above and is summarized below.

7.5.1 Age

In June 2003, WS made capital upgrades to its CWIS, including improvements to the existing traveling screens to better secure the survival of impinged fish and the addition of a VFD capable of being used with either pump. Wedgewire screens, which require that the intake be reconfigured to withdraw water through the new technology, would supplant the existing, newly upgraded traveling screens. Fine mesh traveling screens could benefit from recent upgrades to the fish return system, but would likely require new infrastructure to support the increased surface area required by the technology. A fine mesh barrier net or aquatic filter barrier could be used in conjunction with existing equipment on a seasonal basis or during maintenance periods. However, the best use of the newly upgraded traveling screens and VFD would be to increase the frequency of rotation consistent with the manufacturer's recommendations, reconfigure the fish return system to eliminate sharp turns and drops, and optimize use of the VFD to reduce flows seasonally.

7.5.2 Process employed

None of the technologies considered would substantially impact the facility's ability to convert waste to energy. However, closed-cycle cooling would require additional energy to operate and result in a less efficient generating process, thereby reducing the electricity available for the grid.

7.5.3 Process changes

Neither wedgewire screens, fine-mesh traveling screens, nor barrier nets/aquatic filter barriers would introduce changes to the cooling process, but each technology could require additional maintenance compared to the current traveling screens. Closed-cycle cooling would alter the cooling process by dissipating heat through evaporative cooling, which allows the facility to recirculate cooling water. The additional cooling tower blowdown discharge could require chemical treatment and additional effluent limitations. Improving the existing traveling screens and fish return system and optimizing seasonal use of the VFD to reduce flows would result in the fewest process changes because each technology is already in use to some degree.

7.5.4 Engineering

Space limitations associated with the facility site and intake channel present engineering challenges for many of the technologies. The location of the CWIS lacks sufficient space to expand the pump house to accommodate the necessary surface area for fine-mesh traveling screens operating at a protective TSV. The intake channel lacks sufficient sweeping flow to clear away debris, eggs, and larvae from wedgewire screens, barrier nets, or aquatic filter barriers to ensure optimal performance. The intake channel also may not have sufficient space to accommodate a cylindrical wedgewire screen or a barrier net/aquatic filter barrier system. The narrow channel with variable depth may also interfere with deployment and performance of a barrier net system. The facility also lacks sufficient space to construct cooling towers for closed-cycle cooling. Upgrading the existing traveling screens to reduce impingement mortality will require changes to the existing fish return and more frequent screen rotation, both of which can be accommodated by the facility. Optimizing the VFD for seasonal flow reductions presents no engineering challenges, as the technology is already in limited use.

7.5.5 Non-water quality impacts

Traveling screens (both fine and coarse mesh) and seasonal flow reductions via VFD will not introduce non-water quality impacts at the facility. Wedgewire screens or a barrier net/aquatic filter barrier installed in the main channel (to access sufficient ambient flow) appear likely to interfere with navigation in the Saugus River. Closed -cycle cooling would result in lost turbine performance, increased power use, and could require additional mitigation or technology to reduce impacts from noise and a vapor plume. In addition, due to the space limitations discussed above, wedgewire screens, barrier nets, and closed-cycle cooling are all likely to require construction either in the river or in salt marsh, or both. This would cause adverse environmental impacts to the aquatic habitat within the designated ACEC. These impacts include disturbance of sensitive habitat and organisms during construction activities and, in some cases, will eliminate biologically productive salt marsh and tidal flat habitat in an ACEC targeted for restoration projects.

7.5.6 Cost

Closed cycle cooling is the most expensive technology with an estimated cost provided by the permittee of $10 to $21 million with additional annual maintenance costs of $86,000 to $114,000. The permittee did not provide a site specific cost estimate for installation of wedgewire screens, but the cost of the equipment was quoted at $180,800 and TetraTech (2006, AR #25) estimated a cost of $1.1 million for equipment and installation. The permittee did not provide a cost of barrier net technologies, but barrier nets of similar size at other facilities have been estimated between $1 and $4 million (Mirant Kendall Station, Cambridge, MA, NPDES #MA0004898). The cost of upgrading the fish return system was estimated by the permittee at $75,000 for materials and installation. In addition, increasing the frequency of screen rotation may incur greater annual maintenance costs than the current rotation procedure. However, the required frequency does not exceed the manufacturer's specifications and additional costs, if any, are likely to be substantially less than the costs associated with continuous rotation.[25] Optimizing the VFD to reduce flows seasonally will likely provide cost savings directly related to savings in power required to operate the pumps, although this savings could be offset to some degree by lost power generation due to lower vacuum in the condenser, depending on river temperatures.

7.6 316(b) BTA Determination

As discussed in Part I.C. of the draft permit, EPA has determined, that the following are components of the BTA for this facility: (i) improving the fish return, (ii) rotating existing traveling screens for 15 minutes every 30 minutes, (iii) maximizing the use of the existing VFD to minimize intake volume to the extent practicable (and by specific amounts at certain times of the year), and (iv) scheduling the steam turbine maintenance outage during the peak entrainment period. EPA has determined that the anticipated environmental improvements to the Saugus River from these steps, described in Section 7.3.3, warrant the relatively minimal expenditures that would be required of the permittee, as discussed below. These BTA elements are described in more detail below.

7.6.1 Reconfiguration of fish return trough

A well designed fish return system is one component of BTA at WS. The current design includes steep drops and sharp turns, which can increase fish mortality. As specified in the draft

[25] In their March 17, 2008 NPDES Permit Letter Response (AR #3), the permittee estimated that continuous screen rotation would require additional maintenance at an annual cost of $100,000 to $175,000 based on experience with maintenance costs from current operation.

permit, EPA requires the permittee to reconfigure the fish return system to eliminate sharp turns and drops to minimize the potential for injury. A redesign of this fish return is an available technology that will minimize impingement mortality. The cost of such a reconfiguration is believed to be affordable to the permittee and the effectiveness of the technology in reducing impingement mortality cannot be achieved by another available technology at a lower cost. The specific design requirements of this fish return may be found in Part I.C. of the draft permit.

7.6.2 Increased Frequency of Rotation of Traveling Screens

An organism impinged on the traveling screen stands a good chance of survival if quickly returned to the receiving water with minimal stress. In general, survival of organisms decreases as their exposure to air and duration of impingement increases. Current available technology widely used in the industry operates with continuous screen rotation and best minimizes adverse environmental impacts associated with impingement. However, in this case, operational and maintenance problems prevent the existing screens from being rotated continuously. Still, the current procedure of rotating the screens for ten minutes every four hours is not sufficient to minimize the duration of impingement and may increase impingement mortality. Therefore, the draft permit requires the permittee to rotate the existing traveling screens for fifteen minutes every thirty minutes while any intake water is being withdrawn, in order to minimize the amount of time that organisms are impinged and increase the likelihood of their survival. This operation frequency is consistent with the screen manufacturer's maximum frequency recommendation. This operation would require more water to be used depending on the frequency of the spraying operation onto the screens. However, this would not require additional water to be withdrawn from the Saugus River, but would simply result in less water being discharged to the outfall diffuser and more being discharged to the fish return system to Outfall 002.

7.6.3 Flow Reductions

In order to reduce the impacts of entrainment associated with this CWIS, it was determined that a minimum flow reduction of 28% from the permitted flow limit of 60 MGD to 43.2 MGD, or as low as 38.9 MGD, depending on the results of a flow reduction study, represents BTA for the period of October 1 through May 31. Flow reductions may, at times, result in slightly higher effluent temperatures and delta Ts. However, this tradeoff represents an overall benefit to the aquatic organisms in the Saugus River ecosystem because the proportional entrainment reductions associated with a 28% flow reduction during peak entrainment periods are believed to be necessary to protect the aquatic community. Further, the thermal modeling indicates that the BIP will be protected at the temperatures projected under the flow reductions. EPA calculated the number of fish larvae that would be saved through this flow reduction by estimating the total number of larvae entrained at the current permitted flow limit (60 MGD) compared to the proposed flow limit (43.2 MGD) using monthly mean total larval fish densities provided by the permittee in its September 1, 2006 submittal. The proposed flow reduction could save as many as 10,801,500 fish larvae annually, including over 1 million winter flounder larvae. Further reducing flows to 38.9 MGD for this period, an option that the permittee will explore, will further minimize entrainment and save more fish larvae. It should also be noted that the estimate of annual entrainment reductions do not include fish eggs at this time, but fish eggs will also benefit from a flow reduction.

Higher intake temperatures that occur during the time period of June 1 through September 30 require higher intake flows in order to maintain operating efficiency. Thus, as the intake temperatures rise the permittee will need to operate at increasingly higher flows, up to the current maximum daily flow limit of 60 MGD. The permittee has noted that there are no consumptive uses of water at the facility and that essentially all of the water that is withdrawn for cooling purposes is eventually discharged. For the remainder of the year, the period of June 1 through September 30, the permittee is limited to a daily maximum effluent flow to 43.2 MGD when the highest hourly average intake temperature of any calendar day is below 65°F, to 50 MGD when such intake temperature is between 65 and 70°F, and to 60 MGD when such intake temperature is 70°F or greater.

7.6.4 Scheduled Plant Outages

Conducting shutdowns of the steam turbine for maintenance activities between April 1 and May 31 also represents the BTA at WS. As discussed earlier, the highest larval concentration of rainbow smelt and winter flounder, as well as many other species, occur during this period. This measure would eliminate impingement, entrainment, and thermal impacts for approximately 5 days, since there would be no water withdrawn from or discharged to the Saugus River.

8.0. Essential Fish Habitat Determination (EFH):

Under the 1996 Amendments (PL 104-267) 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 Services (NMFS) if EPA's action or proposed actions that it funds, permits, or undertakes, may adversely impact any essential fish habitat such as: waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (16 U.S.C. § 1802 (10)). Adversely impact means any impact which reduces the quality and/or quantity of EFH (50 C.F.R. § 600.910 (a)). Adverse effects may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey, reduction in species' fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

EFH is only designated for species for which federal fisheries management plans exist (16 U.S.C. § 1855(b) (1) (A)). EFH designations for New England were approved by the U.S. Department of Commerce on March 3, 1999. The following is a list of the EFH species and applicable life stage(s) for Massachusetts Bay, to which the Saugus River discharges:

Species	Eggs	Larvae	Juveniles	Adults
Atlantic cod (*Gadus morhua*)	X	X	X	X
haddock (*Melanogrammus aeglefinus*)	X	X		
Pollock (*Pollachius virens*)	X	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
Long finned squid (*Loligo pealei*)	n/a	n/a	X	X
Short finned squid (*Illex illecebrosus*)	n/a	n/a	X	X
Atlantic butterfish (*Peprilus triacanthus*)	X	X	X	X
Atlantic mackerel (*Scomber scombrus*)	X	X	X	X
summer flounder (*Paralicthys dentatus*)				X
Scup (*Stenotomus chrysops*)	n/a	n/a	X	X
black sea bass (*Centropristus striata*)	n/a		X	X
Surf clam (*Spisula solidissima*)	n/a	n/a	X	X
bluefin tuna (*Thunnus thynnus*)			X	X

A review of past studies indicates that multiple life stages of several of these species are present in the Saugus River in the vicinity of the discharge. Refer to **Tables 1 through 4**. Therefore, EPA recognizes that this facility's operation has the potential to cause adverse effects to EFH species in the Saugus River. Anadromous fish species that enter the Saugus River from Massachusetts Bay and move past the facility to spawn upstream may be affected by the thermal plume or the cooling water intake operation at the facility, or both. These species, which include alewife and American shad, while not identified as EFH species, may be selected as prey by EFH species. If these prey species are affected by facility operation, this has the potential to indirectly affect EFH species through loss of prey.

Based on the available information, EPA has concluded that the limits and conditions contained in this Draft Permit minimize adverse effects to EFH species for the following reasons:

- The low through-screen velocity, continuous screen rotation, and improvements to the fish return system minimize potential adverse impacts from impingement associated with the CWIS;
- The 28% flow reduction from currently permitted levels minimizes potential adverse impacts from entrainment associated with the CWIS, particularly as it occurs during periods of peak larval density;
- Modeling results showing that the 30% reduction in cooling water flow will only nominally affect the size, shape and magnitude of the current thermal plume, while the hourly average temperature limit of 90°F will ensure protection of the BIP.

EPA believes the Draft Permit adequately protects EFH species, and therefore additional mitigation is not warranted. NMFS will be notified and an EFH consultation will be initiated if adverse impacts to EFH are detected as a result of this permit action, or if new information is received that changes the basis for our conclusions.

9.0 Endangered Species Act (ESA)

Section 7(a) of the Endangered Species Act of 1973, as amended (ESA) grants authority to and imposes requirements upon Federal agencies regarding endangered or threatened species of fish, wildlife, or plants ("listed species") and habitat of such species that has been designated as critical (a "critical habitat"). The ESA requires every Federal agency, in consultation with and with the assistance of the Secretary of Interior, to insure that any action it authorizes, funds, or carries out, in the United States or upon the high seas, is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. The United States Fish and Wildlife Service (USFWS) typically administer Section 7 consultations for bird, terrestrial, and freshwater aquatic species. The NMFS typically administers Section 7 consultations for marine species and anadromous fish.

EPA has reviewed the listing of federal endangered or threatened species of fish, wildlife, and plants to see if any such listed species might potentially be impacted by the reissuance of this NPDES permit and has not found any such listed species. Upon review of the current endangered and threatened species in the area, EPA has determined that there are no species of concern present in the vicinity of the outfalls from this Facility. Therefore, EPA does not need to consult with NMFS or USFWS in regard to the provisions of the ESA.

During the public comment period, EPA has provided a copy of the Draft Permit and Fact Sheet to both NMFS and USFWS.

10.0 State Certification Requirements

EPA may not issue a permit unless the State Water Pollution Control Agency with jurisdiction over the receiving waters certifies that the effluent limitations contained in the permit are stringent enough to assure that the discharge will not cause the receiving water to violate State Water Quality Standards. The staff of the Massachusetts Department of Environmental Protection has reviewed the draft permit and advised EPA that the limitations are adequate to protect water quality. EPA has requested permit certification by the State pursuant to 40 CFR 124.53 and expects that the draft permit will be certified.

11.0 Public Comment Period, Public Hearing, and Procedures for Final Decision

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 George Papadopoulos, U.S. EPA, Office of Ecosystem Protection, Industrial Permits Branch, 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.

Pursuant to 40 CFR §124.57(a) and 314 CMR 2.06(4)(d), the EPA and MassDEP are soliciting comment on the 316(a) variance determination that has been made in this draft permit. See Section 6.1.1.3 of this fact sheet for more detail on the 316(a) variance determination.

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 & MassDEP Contacts

Additional information concerning the draft permit may be obtained between the hours of 9:00 a.m. and 5:00 p.m., Monday through Friday, excluding holidays, from the EPA and MassDEP contacts below:

George Papadopoulos, Industrial Permits Branch
One Congress Street Suite 1100 - Mailcode CIP
Boston, MA 02114-2023
Telephone: (617) 918-1579 FAX: (617) 918-1505

Paul Hogan, Massachusetts Department of Environmental Protection
Division of Watershed Management, Surface Water Discharge Permit Program
627 Main Street, 2nd Floor, Worcester, Massachusetts 01608
Telephone: (508) 767-2796 FAX: (508) 791-413

May 5, 2009
Date

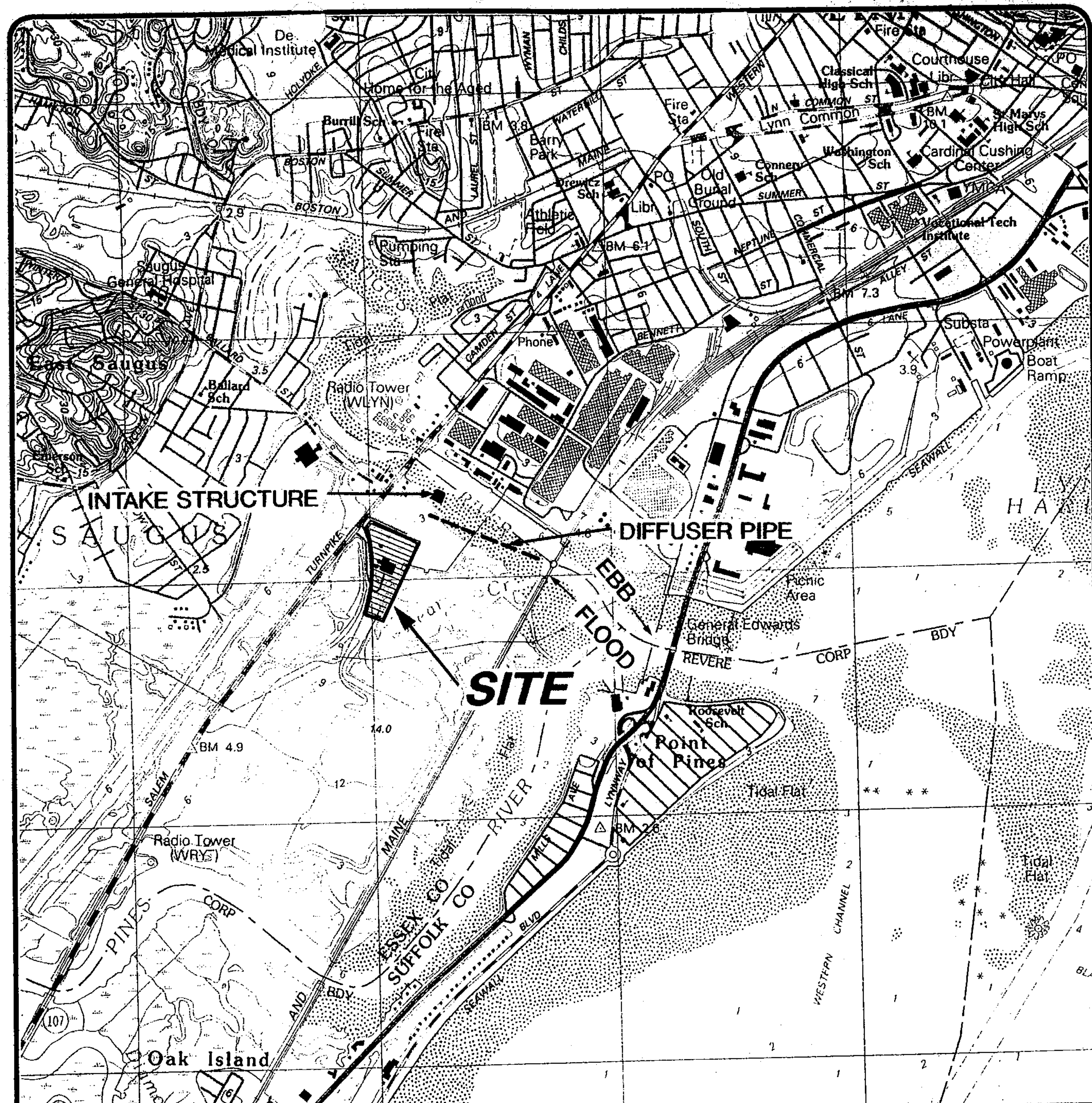
Stephen S. Perkins, Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency

ATTACHMENT A - OUTFALL 001 MONITORING RESULTS[1]

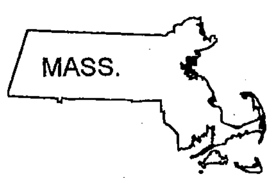
Parameter	Range	Permit Limit	Permit Violations
Flow, MGD	39.6 - 59.8	60	0
pH, standard units	6.53 – 8.2	6.5 - 8.5	0
Delta T[2]	16 - 22 °F	20 °F	3
Effluent Temperature, °F	58 - 91 °F	90 °F	3

1. Data is from Discharge Monitoring Reports for the period of January 2004 to December 2006.
2. This is the difference between the intake temperature and the effluent temperature.

Figure 1 - Facility Location



SCALE: 1"=2000'



Base map from USGS 7.5' Quadrangle Map:
Lynn (1985), Massachusetts

LONGITUDE: 52 DEG., 81 MIN., 50 SEC.
LATITUDE: 74 DEG., 17 MIN., 50 SEC.

SCALE: 0 0.5 1.0 MILE

N

Figure 2

Intake and Outfall Location

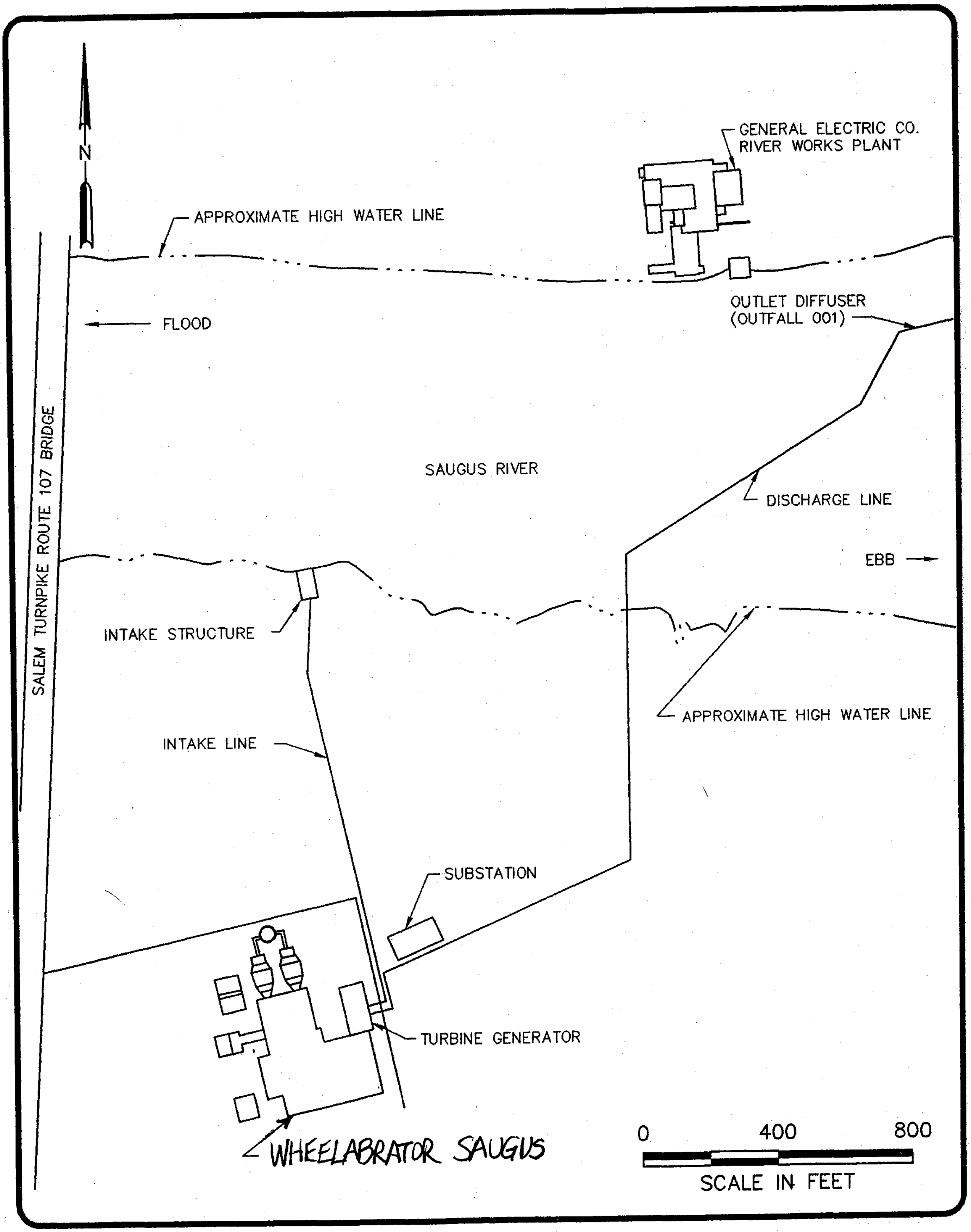


Figure 3

Non-Contact Cooling Water Flow Diagram

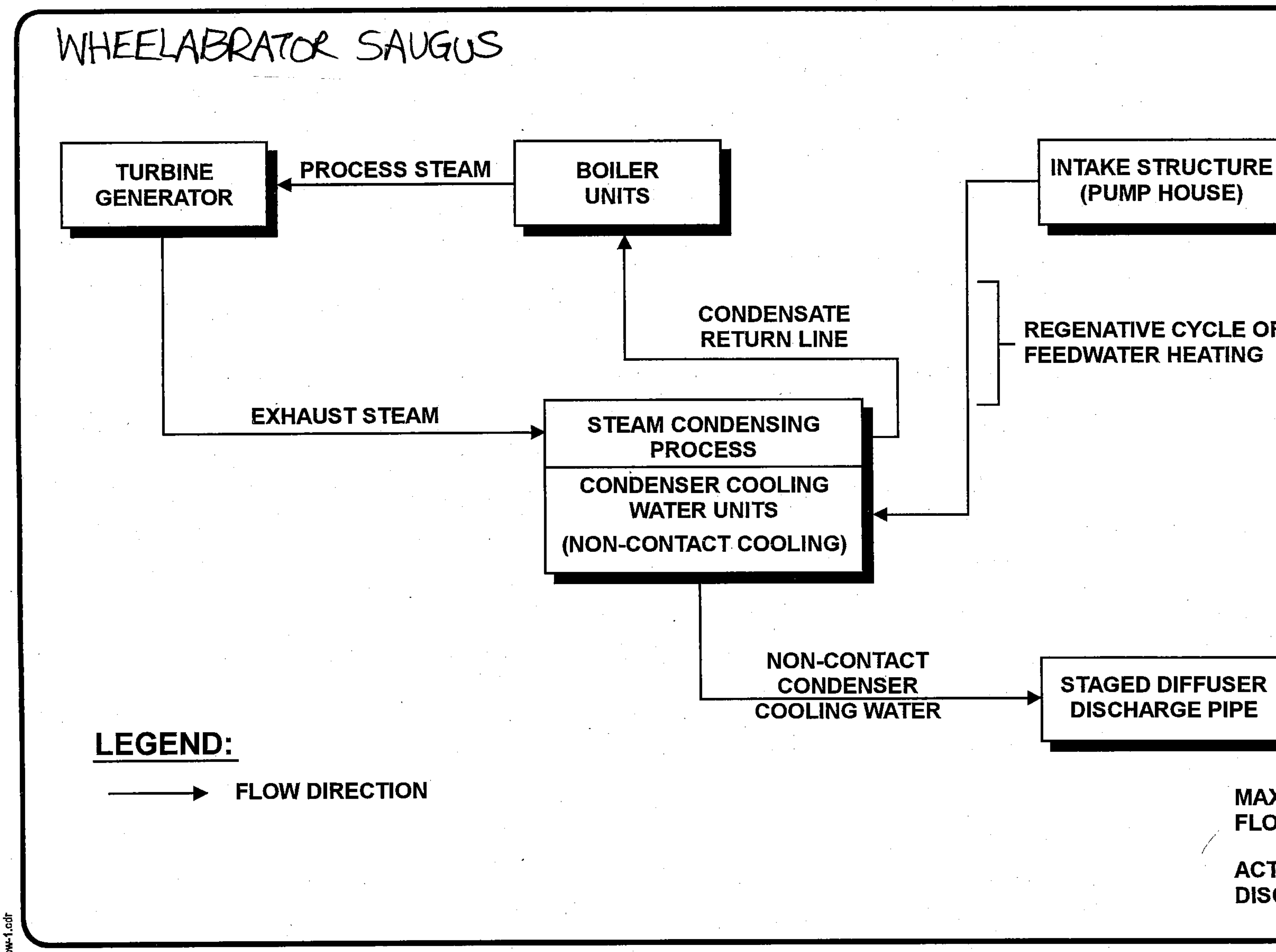


Figure 4. Single entry modified traveling screen (Ristroph screen)

The Ristroph screen is similar to a conventional traveling screen, except that it is fitted with a "fish bucket" on each screen panel. The buckets collect impinged organisms and retain water while traveling upward out of the water. By maintaining water in the bucket, impinged organisms are more likely to survive until they are returned to the waterbody. Ristroph screens generally have a dual spray wash system. The first spray (a low-pressure spray) washes the organism into a dedicated fish return trough. A second, high-pressure spray then washes off any remaining debris into a separate debris trough.

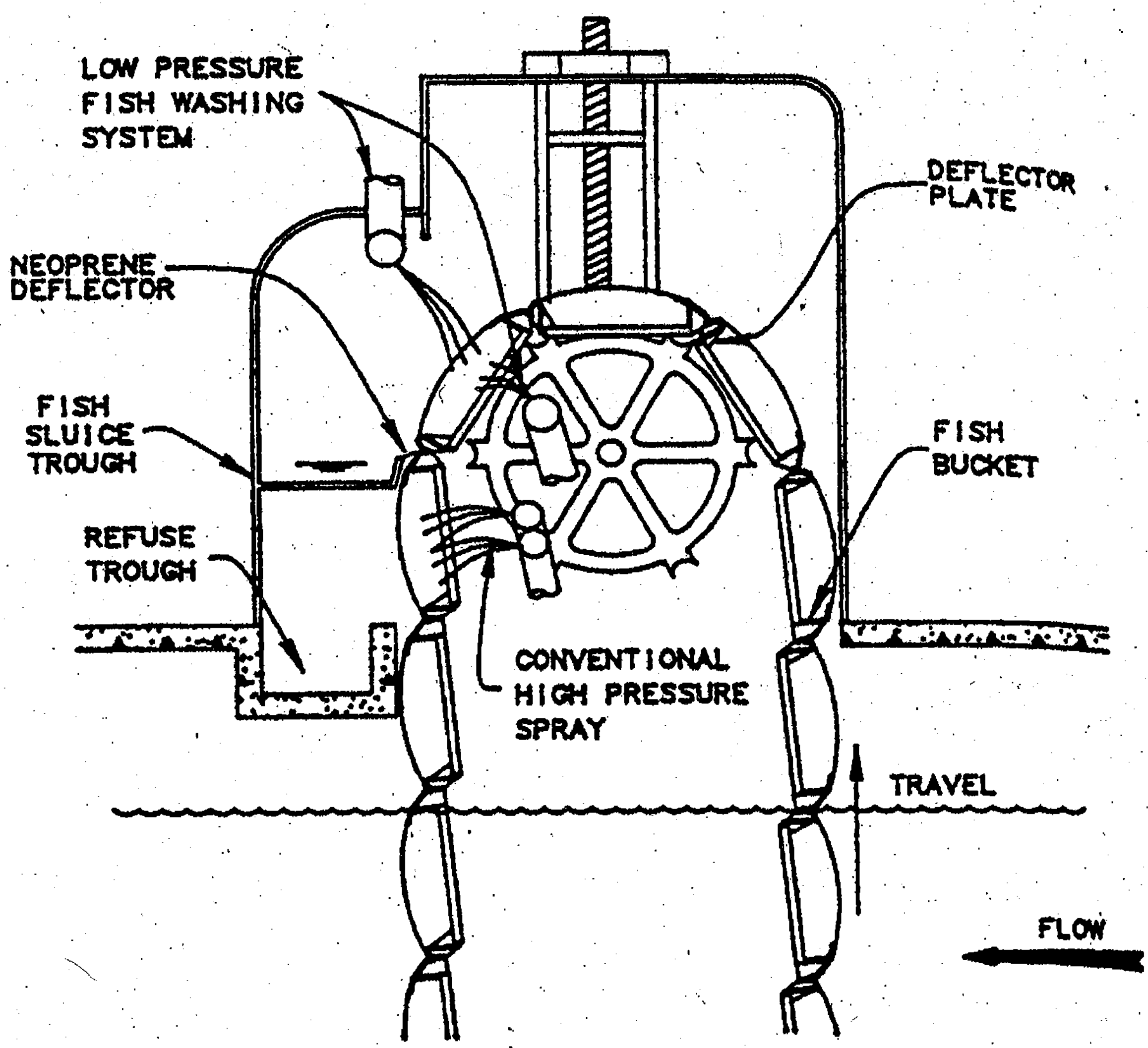


Figure 5

Thru Screen Velocities vs. Tide at Traveling Screen

(27,000 GPM = 38.9 MGD ; 30,000 GPM = 43.2 MGD ; 41,670 GPM = 60MGD)

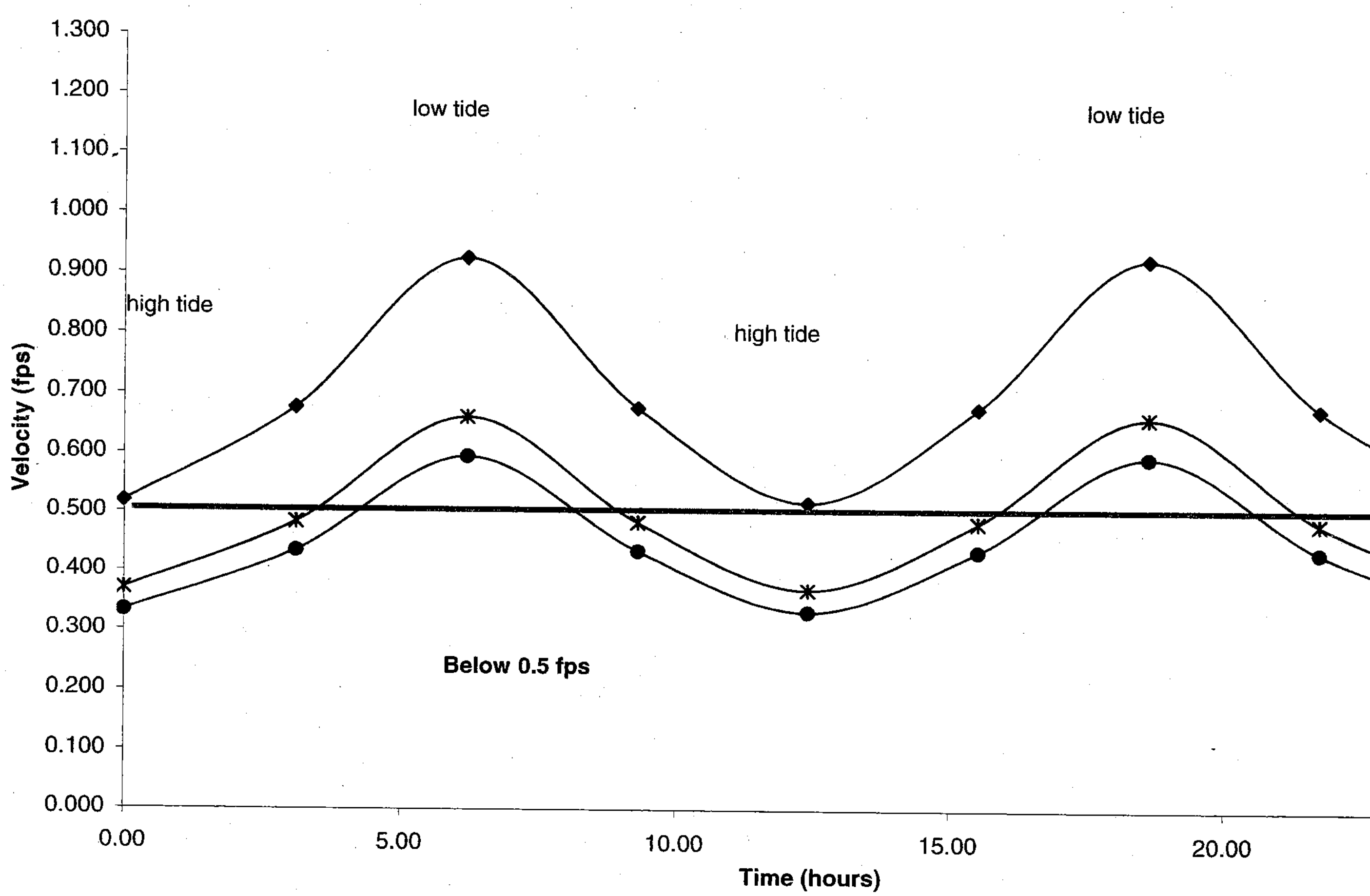


Figure 6

Saugus River Water Inlet Average Daily Temperatures 1997-2003

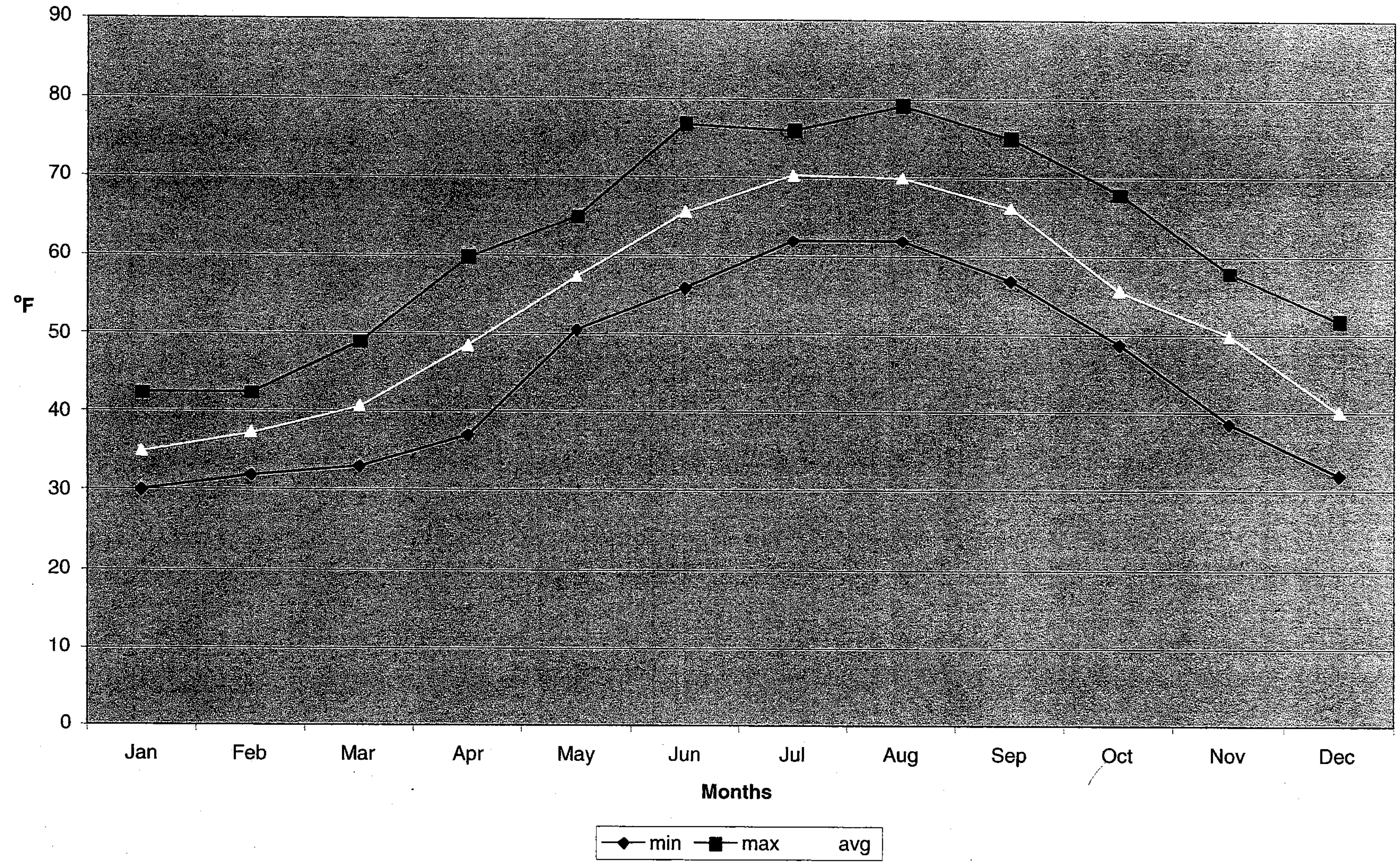


Table 1. List of larval fishes entrained and adult fishes impinged during 1984 - 1989 studies at Wheelabrator Saugus by Marine Research Inc.

Family	Scientific Name	Common Name	Entrained	Impinged
Rajidae	*Raja erinacea*	little skate		X
Anguillidae	*Anguilla rostrata*	American eel	X	X
Engraulidae	*Anchoa mitchilli*	bay anchovy	X	
Clupeidae	*Alosa aestivalis*	blueback herring		
	Alsoa pseudoharengus	alewife		X
	Alsoa sapidissima	American shad		
	Brevoortia tyrannus	Atlantic menhaden	X	X
	Clupea harengus harengus	Atlantic herring	X	X
Cyprinidae	*Notemigonus crysoleucas*	golden shiner		X
Osmeridae	*Osmerus mordax*	rainbow smelt	X	X
Phycidae	*Enchelyopus cimbrius*	fourbeard rockling	X	
	Urophycis chuss	red hake	X	
	Urophycis tenuis	white hake		
Merlucciidae	*Merluccius bilinearis*	silver hake	X	
Gadidae	*Brosme brosme*	cusk	X	
	Gadus morhua	Atlantic cod	X	
	Melanogrammus aeglefinus	haddock	X	
	Microgadus tomcod	Atlantic tomcod	X	
	Pollachius virens	pollock	X	X
Lophiidae	*Lophius americanus*	goosefish	X	
Atherinopsidae	*Menidia beryllina*	inland silverside		
	Menidia menidia	Atlantic silverside	X	X
Fundulidae	*Fundulus heteroclitus*	mummichog	X	X
	Fundulus majalis	striped killifish	X	
Gasterosteidae	*Apeltes quadracus*	fourspine stickleback		X
	Gasterosteus aculeatus	threespine stickleback	X	X
	Gasterosteus wheatlandi	blackspotted stickleback		X
	Pungitius pungitius	ninespine stickleback		
Syngnathidae	*Syngnathus fuscus*	northern pipefish	X	X
Triglidae	*Prionotus* spp.	searobin	X	
Cottidae	*Myoxocephalus aenaeus*	grubby	X	X
	Myoxocephalus octodecemspinosus	longhorn sculpin	X	
	Myoxocephalus scorpius	shorthorn sculpin	X	
Agonidae	*Aspidophoroides monopterygius*	alligatorfish	X	
Cyclopteridae	*Cyclopterus lumpus*	lumpfish	X	X
Liparidae	*Liparis atlanticus*	seasnail	X	
	Liparis coheni	Gulf snailfish	X	
Serranidae	*Centropristis striata*	black sea bass	X	
Centrarchidae	*Lepomis macrochirus*	bluegill		X
	Micropterus salmoides	largemouth bass		X
Pomatomidae	*Pomatomus saltatrix*	bluefish		
Labridae	*Tautoga onitis*	tautog	X	X
	Tautogolabrus adspersus	cunner	X	X
Stichaeidae	*Ulvaria subbifurcata*	radiated shanny	X	
Pholidae	*Pholis gunnellus*	rock gunnel	X	
Ammodytidae	*Ammodytes* sp.	sand lance	X	
Scombridae	*Scomber scombrus*	Atlantic mackerel	X	

Table 2. List of invertebrates captured during 1989 and 1997 Saugus River studies

Common Name	Scientific Name
common periwinkle	*Littorina littorea*
blue mussel	*Mytilus edulis*
horseshoe crab	*Limulus polyphemus*
seven-spine bay shrimp	*Crangon septemspinosa*
American lobster	*Homarus americanus*
flatclaw hermit crab	*Pagurus pollicaris*
rock crab/johah crab	*Cancer borealis/irroratus*
gree crab	*Carcinus maenas*
lady crab	*Ovalipes ocellatus*
starfish	*Asteria forbesi*

Table 3
Seasonal occurrence of larvae taken at 3 stations in the Saugus and Pines River and at the Wheelabrator
from February to December 1984 and from June 1986 to May 1988

Table 3. Seasonal occurance of larvae taken at three stations in the Saugus and Pines Rivers and at the Wheelabrator Saugus intake from February - December 1984 and from June 1986

Family	Scientific Name	Common Name	January	February	March	April	May	June	July	August	September	O
Clupeidae	*Clupea harengus harengus*	Atlantic herring										
Pholidae	*Pholis gunnellus*	rock gunnel										
Gadidae	*Gadus morhua*	Atlantic cod										
Cottidae	*Myoxocephalus aenaeus*	grubby										
Cottidae	*Myoxocephalus octodecemspinosus*	longhorn sculpin										
Cottidae	*Myoxocephalus scorpius*	shorthorn sculpin										
Liparidae	*Liparis coheni*	Gulf snailfish										
Ammodytidae	*Ammodytes sp.*	sand lance										
Pleuronectidae	*Pseudopleuronectes americanus*	winter flounder										
Gadidae	*Microgadus tomcod*	Atlantic tomcod										
Pleuronectidae	*Hippoglossoides platessoides*	American plaice										
Pleuronectidae	*Limanda ferruginea*	yellowtail flounder										
Anguillidae	*Anguilla rostrata*	American eel										
Osmeridae	*Osmerus mordax*	rainbow smelt										
Syngnathidae	*Syngnathus fuscus*	northern pipefish										
Cyclopteridae	*Cyclopterus lumpus*	lumpfish										
Liparidae	*Liparis atlanticus*	seasnail										
Labridae	*Tautogolabrus adspersus*	cunner										
Stichaeidae	*Ulvaria subbifurcata*	radiated shanny										
Pleuronectidae	*Liopsetta putnami*	smooth flounder										
Phycidae	*Enchelyopus cimbrius*	fourbeard rockling										
Atherinopsidae	*Menidia spp.*	silversides										
Gasterosteidae	*Gasterosteus aculeatus*	threespine stickleback										
Scombridae	*Scomber scombrus*	Atlantic mackerel										
Scophthalmidae	*Scophthalmus aquosus*	windowpane										
Clupeidae	*Brevoortia tyrannus*	Atlantic menhaden										
Phycidae	*Urophycis spp.*	hake										
Merlucciidae	*Merluccius bilinearis*	silver hake										
Gadidae	*Brosme brosme*	cusk										
Fundulidae	*Fundulus heteroclitus*	mummichog										
Gasterosteidae	*Gasterosteus wheatlandi*	blackspotted stickleback										
Labridae	*Tautoga onitis*	tautog										
Pleuronectidae	*Glyptocephalus cynoglossus*	witch flounder										
Lophiidae	*Lophius americanus*	goosefish										
Paralichthyidae	*Paralichthys oblongus*	fourspot flounder										
Engraulidae	*Anchoa spp.*	anchovy										
Serranidae	*Centropristis striata*	black sea bass										
Fundulidae	*Fundulus majalis*	striped killifish										
Stromateidae	*Peprilus triacanthus*	butterfish										
Gadidae	*Pollachius virens*	pollock										

= peak densities

= present

TABLE 4

Seasonal occurance of eggs taken at three stations in the Saugus and Pines Rivers and at the Wheelabrator Saugus intake from February - December 1984 and from June 1986 - May 1988.

Family	Species	Common Name	January	February	March	April	May	June	July	August	September	October	November	December
Gadidae	*Gadus morhua*	Atlantic cod												
Pleuronectidae	*Hippoglossoides platessoides*	American plaice												
Gadidae	*Pollachius virens*	pollock												
Cottidae	*Myoxocephalus spp.*	sculpin												
Labridae - Pleuronectidae	*Labridae - Limanda ferruginea*	wrasses - yellowtail flounder												
Pleuronectidae	*Pseudopleuronectes americanus*	winter flounder												
Phycidae - Stromateidae	*Enchelyopus cimbrius. - Urophycis spp. - Peprilus spp.*	rockling - hake - butterfish												
Gadidae - Pleuronectidae	Gadidae - *Glyptocephalus cynoglossus*	witch flounder												
Scopthalmidae -Paralichthyidae	*Scophthalmus aquosus - Paralichthys oblongus*	windowpane - fourspot flounder												
Gadidae	*Melanogrammus aeglefinus*	haddock												
Atherinopsidae	*Menidia menidia*	Atlantic silverside												
Scombridae	*Scomber scombrus*	Atlantic mackerel												
Engraulidae	*Anchoa mitchilli*	bay anchovy												
Triglidae	*Prionotus spp.*	searobins												
Clupeidae	*Brevoortia tyrannus*	Atlantic menhaden												
Merlucciidae - Sparidae - Sciaenidae	*Merluccius bilinenaris - Stenotomus chrysops - Cynoscion regalis*	silver hake - scup - weakfish												

= peak densities

= present

Response to Public Comments

Introduction

From May 12, 2009 to June 10, 2009, the United States Environmental Protection Agency ("EPA") and the Massachusetts Department of Environmental Protection ("MassDEP") (together, the "Agencies") solicited public comments on a draft National Pollutant Discharge Elimination System ("NPDES") Permit developed pursuant to a permit renewal application from the Wheelabrator Saugus Facility (also referred to in this document as "Wheelabrator" and "the permittee"). This is for the reissuance of a NPDES permit authorizing the intake of Saugus River water and the discharge of non-contact cooling water and traveling screen wash water from Outfalls 001 and 002, respectively, to the Saugus River in Saugus, Massachusetts. In accordance with the provisions of 40 C.F.R. §124.17, this document presents the Agencies' responses to comments received on this Draft Permit. The responses to comments explain and support the Agencies' determinations that form the basis of the Fact Sheet.

Comments on the Draft Permit and Fact Sheet were received from the permittee and from the parties listed below:

National Marine Fisheries Service

Massachusetts Division of Marine Fisheries (MA DMF)

Massachusetts Coastal Zone Management (MA CZM)

Massachusetts Department of Conservation and Recreation (MA DCR)

Saugus River Watershed Council

After a review of the comments received, EPA and MassDEP have made a final decision to issue this permit authorizing this intake and discharge. The Final Permit is substantially identical to the Draft Permit that was available for public comment. Although EPA's decision-making process has benefited from the various comments and additional information submitted, the information and arguments presented did not raise any substantial new questions concerning the Permit. EPA did, however, improve certain analyses and make certain clarifications and changes to the Final Permit which are detailed in this document and reflected in the Final Permit. A summary of the changes made in the Final Permit is listed below. The analyses underlying these changes are explained in the responses to individual comments that follow. Since the Fact Sheet is a final document, no changes were made to this document. Instead, Fact Sheet comments were noted, and responses to them are included in this document.

The Final Permit and this response to public comments are available on EPA's web site at epa.gov/region01/npdes. Copies of the Final Permit also may be obtained by writing or calling EPA's Industrial Permits Branch, Mailcode OEP 06-1, Office of Ecosystem

Protection, 5 Post Office Square, Suite 100, Boston, Massachusetts 02109-3912; Telephone: (617) 918-1579.

This permit is being jointly issued by EPA and MassDEP. EPA will generally present responses to comments as EPA's, unless there are particular issues in which MassDEP plays a unique role beyond being a co-issuer of this permit. For most responses where EPA is the agency presenting the response, MassDEP's certification and joint issuance of the permit will establish that the Department agrees with EPA's response.

The following changes have been made from the Draft Permit to the Final Permit. Where applicable, relevant sections of the response document where the following changes have been discussed have been included in parentheses at the end of each item:

1. The Final Permit at Part I.A.11.a. has been changed to require that the traveling screens be visually inspected at a minimum of once every 12 hours instead of every 8 hours. However, when an unusual impingement event (UIE) occurs, as defined in Part I.A.11. of the permit, the permittee will be required to inspect the traveling screens and count the number of impinged fish at least once every six (6) hours in order to better quantify the duration and scope of such an event. (A2, C3)

2. Part I.C.1.a. of the Final Permit has been revised to require that the end of the fish return pipe is submerged at all times. (A3)

3. Language has been added to Part I.C.5. of the permit to take into consideration periods of time when traveling screens are not in working order due to required maintenance in order to comply with the screen rotation requirement of 15 minutes every 30 minutes. This part also refers the permittee to the bypass language of the General Conditions regarding unplanned outages or other malfunctions that would render the traveling screens inoperable. (A4)

4. EPA has reduced the monitoring requirements in Part I.D.4. of the Final Permit from five years to three years. The permittee will conduct monitoring in years 1, 2, and 3 of the permit and submit annual biological monitoring reports. (A7)

5. Part I.D.3.c. has been revised to require latent survival analysis during the first year of the permit only. (A9)

6. Part I.A.11.a. requires that the permittee inspect the traveling screens for live as well as dead fish to determine whether the 25 fish per hour threshold that signifies an unusual impingement event has occurred. Part I.A.11.a. also requires that the permittee initiate the inspection of the traveling screens at the beginning of the 15 minute rotation and continue for at least one full rotation of the screens. (C1)

7. Part I.A.11.b.i of the Final Permit requires that, upon the occurrence of a UIE, the permittee shall continue inspecting the traveling screens every six (6) hours thereafter, until the impingement rate decreases to less than 5 fish per hour. (C2, F9)

8. Part I.D.3.b. of the Final Permit has eliminated the requirement that the permittee sample impingement using ¾-inch stainless steel baskets placed in the screenwash return sluiceway. Instead, the language in the Final Permit has been changed to require the permittee to collect aquatic organisms passing through the fish return system without specifying a particular method.

9. Part I.D.3.e. of the Final Permit has been revised to require that the total number of impinged fish shall be derived from an extrapolation of observed counts. (C4)

10. Parts I.D.2.a. and I.D.3.a. have added the following language regarding the biological monitoring program "Samples shall not be taken during consecutive periods of the diurnal cycle or on consecutive days." This language was added to these Parts in order to prevent the permittee from completing sampling on a single day. EPA and MassDEP believe that spreading this sampling out over several days or a week would yield more representative results.

A) Comments submitted by Wheelabrator Saugus:

General Comment: The Draft permit includes an absolute discharge temperature of 90 °F for outfall 001. Allowing higher absolute discharge temperatures while maintaining a 22 °F Facility temperature rise (delta T) was the approach that we had proposed to maintain de-minimis thermal impacts which continue to protect the Balanced Indigenous Populations (BIP) and reduce impingement and entrainment impacts by reducing flow as much as possible without significantly impacting plant operations.

Our facility is obligated by contracts with municipalities and others to receive and process MSW (our fuel) regardless of weather conditions. As we have indicated in previous correspondence, in warm weather conditions, historically in July and August, when intake temperatures reach the high 70s(°F) and low 80s(°F) we have had to drop load and vent steam to avoid exceeding the 90 °F absolute discharge limit. This has resulted in significant wasted energy over the years. Wheelabrator has requested the increase to prevent the need to waste energy in the future, especially in the summer when power demand is typically higher.

During the permit renewal process, we recommended and conducted thermal modeling of an approach that addresses this issue as well as addressing concerns about entrainment and impingement, particularly in the late winter and spring when fish eggs and larvae are most abundant. The approach included:

> Use of a variable frequency drive (VFD) on one of the pumps to allow turndown during cold water months (essentially October through May) and thereby achieving significant impingement and entrainment reduction especially in the months when eggs and larvae have been determined to be most abundant (March through May).

Use of the VFD on warm days to increase flow as required for operations during warmer periods (typically ebb tide to low tide) and operate at lower flow during relatively cooler periods (typically flood tide through high tide) while always staying within our Daily Maximum 60 MGD flow limit.

Request to eliminate, or increase the absolute discharge temperature limit above 90°F to 95 °F to allow lower flow for longer periods in the warm weather months while allowing the plant to operate at full load, and produce electricity from a renewable source during periods of high demand. Operating with lower cooling water flows for longer periods of time will further decrease potential impingement and entrainment impacts. Modeling analysis provided to EPA in presentations and in our December 15, 2005 report on modeling results (Scenario 6) has shown no meaningful or significant difference between scenarios with and without the 90°F discharge temperature limit.

The Draft Permit includes some, but not other, pieces of our proposal. We are concerned that by not taking the pieces together, as proposed, that the targeted benefits will not be achieved and our operations will be significantly impacted without providing additional environmental benefit.

Response to General Comment: Wheelabrator comments that the Draft Permit's maximum temperature limit (Max-T) of 90°F should either be replaced with a limit of 95°F (or higher) or be eliminated. In support of this comment, the company states that Wheelabrator Station is obligated by contract to receive and process municipal solid waste (MSW) "regardless of weather conditions." Further, the company expresses concern that the facility has at times in the past had to "drop load and vent steam" in July and August, when intake temperatures peak, in order to avoid violating the permit's maximum temperature (Max-T) limit of 90°F. Wheelabrator explains that it had proposed that the permit require reduced intake flow (to achieve entrainment and impingement reductions) but allow an attendant increase in the permit's temperature change (Delta-T) and Max-T limits (in order to avoid restricting electrical generation and in light of the company's view that increased discharge temperatures would not harm aquatic organisms).

While EPA and MassDEP have agreed to certain of the permit changes requested by Wheelabrator – notably, an increase in the Delta-T limit from 20°F to 22°F and a shift from assessing compliance based on instantaneous temperature values to using hourly averages – the agencies do not agree that the permit's current Max-T limit of 90°F should be eliminated or replaced with a limit of 95°F or higher. The reasons for the agencies' determination in this regard are set forth below.

With regard to Wheelabrator's reference to its contractual obligations, the agencies point out only that the company is, of course, obligated to comply with its NPDES permit limits. It is apparent that the company understands this given its statement that it has on occasion in the past dropped load in July and August to avoid violating its Max-T limit. The facility's original owners chose to locate the power plant on the Saugus River, a water of both the United States and the Commonwealth of Massachusetts, and a part of the Rumney Marshes Area of Critical Environmental Concern (ACEC), as later designated by the Commonwealth. Wheelabrator Station uses the river both as a source of water for cooling and as a receptacle for the facility's waste heat (and certain other pollutants). The Saugus River is an important public natural resource and Wheelabrator Station's uses of the river are subject to the requirements of the Clean Water Act (and other laws) designed to protect the Nation's waters and the organisms that inhabit them. Whether or not Wheelabrator ultimately chooses to comply with its permit limits by occasionally dropping load and venting steam, or some other method, has no bearing on the derivation of the thermal discharge limits needed to protect the river consistent with legal requirements.[1]

Wheelabrator Station's cooling system can adversely affect the Saugus River ecosystem in two primary ways. First, the facility's withdrawal of river water for cooling causes the entrainment and impingement of aquatic organisms. Second, its discharge of waste heat can raise ambient water temperatures in the river. EPA and MassDEP appreciate that Wheelabrator has explored and proposed certain changes in operation that will benefit the ecology of the Saugus River. Specifically, Wheelabrator proposes operating at lower cooling water intake flows, which will reduce current levels of entrainment and impingement. Accordingly, the new permit's limits reflect sizable reductions in flow for a large percentage of the year, and these more stringent flow limits can be achieved by operational changes using the recently installed VFDs. At the same time, however, handling the same amount of waste heat with a lower volume of cooling water produces a corresponding increase in the maximum temperature of the thermal discharge.

EPA and MassDEP must consider both sides of the equation. Weighing the environmental benefits of reducing intake flow against the drawbacks of increasing discharge temperature is a delicate balancing act. As detailed below, the agencies conclude that, for the most part, the ecological benefit of the entrainment and impingement reductions associated with reduced cooling water intake flows will more than offset the risk of harm from the resulting increase in discharge temperatures. This conclusion does not, however, extend so far as to support eliminating the permit's Max-T limit of 90°F and replacing it with a limit of 95°F (or higher) or no limit at all. Without the 90°F Max-T limit, the increased risk of adverse thermal discharge effects would threaten the protection and propagation of the Saugus River's balanced, indigenous population of fish. Moreover, this increased risk would not be offset by the marginal additional entrainment and impingement reductions that would be associated with the marginal additional intake flow reductions that would be facilitated by a higher thermal discharge limit.

Wheelabrator's comment expresses concern that load shedding could potentially be required in July and August to meet the Max-T limit of 90°F. EPA's review of ambient water temperature collected at the intake by Wheelabrator from 1997-2003 (Figure 6 in the Fact Sheet) confirms that July and August is the time of year, on average, when the

---

[1] While energy is lost when load is dropped and steam vented, energy is also lost when waste heat is discharged to the Saugus River. Maximizing plant efficiency and finding productive uses for the facility's waste heat would help to limit these energy losses.

discharge limit of 90°F could occasionally require Wheelabrator to curtail generation of electricity. (Obviously, in a cool summer, the quantity of time that generation might need to be curtailed would be less, and in a warm year it would be more.)

Nevertheless, EPA's biological analysis indicates that discharge temperatures above 90°F in July and August would be ecologically damaging. Permit limits for Wheelabrator Station's thermal discharge are being set under a CWA § 316(a) variance from otherwise applicable technology-based and water quality-based standards. As such, these limits must assure the protection and propagation of the balanced, indigenous population of fish, shellfish and wildlife (BIP) in and on the Saugus River. EPA's initial review of the species expected to be present in the Saugus River and their temperature sensitivities, *see* Fact Sheet at 17, suggested that, taking into account the limited temporal exposure to the thermal plume that organisms would likely experience due to the dynamic flushing of the Saugus River, water temperatures in the mid-80s to 90° F would serve as a maximum temperature threshold for multiple species (*e.g.,* winter flounder, alewives and striped bass). The scientific literature suggests that water temperatures as low as the mid-80s (F) could cause these species to suffer effects ranging from mortality, to reduced habitat suitability, to forced habitat avoidance and possibly other sublethal effects. Alewife population numbers are dramatically reduced throughout Massachusetts, resulting in the state closing both the commercial and recreational fishery for the species. Moreover, winter flounder populations have significantly deteriorated regionally, which has resulted in the National Oceanic and Atmospheric Administration (NOAA) severely restricting fishing for the species. Striped bass are a popular recreational species that generates millions of dollars of revenue per year in Massachusetts. As a result, the agencies have heightened concerns over the potential for Wheelabrator Station's cooling system to harm these species within the Saugus River.

Based on data from neighboring river systems (Charles River), and in the opinion of the state of Massachusetts anadromous fish biologist (Phillips Brady, MADMF), July through October/November would most likely be the period of juvenile alewife outmigration in the Saugus River. Juvenile winter flounder and striped bass would also certainly be present in the Saugus River during that time frame.

Additional literature review on alewives in particular, suggests that temperatures in the mid-80s to 90° F can trigger sublethal impacts and mortality within relatively short exposure times. Otto et al. (1976), Administrative Record Item (AR) #88, observed that (i) 50% of juvenile alewives acclimated to 18-20°C (64.4-68°F) and later exposed to 31°C (87.8°F) died in about an hour or less (actually, 70 minutes or less); and that (ii) 50% of juvenile alewives acclimated to 24-26°C (75.2-78.8°F) and later exposed to 33°C (91.4°F) died within 76 minutes or less. Coutant (1972), AR #89 has shown that one can arrive at an approximate NOAEL (no observed acute effect level) in thermal tests for some fish by subtracting 2° (3.6°F) from the TL50 (the temperature lethal to 50% of the test organisms). NOAELs in the two tests cited above from Otto et al. (1976) appear to be 2.5-3°C below the approximate TL50 and generally support the Coutant figure. Based on the Coutant estimate, we would expect the NOAEL from this particular exposure scenario to be about 84.2°F (29°C) to 87.8°F (31°C). The agency selected these particular values from the Otto et al. (1976) to help (roughly) estimate juvenile survival rates after about an hour of exposure time and these were a reasonably close fit.

The agency realizes that it is not possible to accurately predict acclimation temperature or exposure time for juvenile alewives in the lower Saugus River, and that we cannot be certain how closely the critical temperatures identified in either laboratory studies or *in situ* studies from other locations would be mirrored in the Saugus River. Nevertheless, the data from Otto et al. (1976) suggest that significant mortality (and/or sublethal effects) to juvenile alewives could occur at temperatures in the mid-80s to low 90s°F within exposure times (around 60 minutes) that could be experienced around the low slack tide in that system given the range of water temperatures that exist upstream of the Rt. 107 Bridge in the summertime. The Fact Sheet, at 17, also discusses scientific literature indicating that water with temperatures above 90°F (and in some cases as low as 86°F) could result in acute toxicity for juvenile winter flounder, juvenile striped bass and juvenile alewives.

Thermal modeling of the discharge plume predicts that the period of slack low tide is the period of time with the least amount of mixing and dilution. Dispersion of the facility's thermal discharge due to tidal currents is also at its minimum at slack tide. This combination of factors is expected to occur twice a day for a period of roughly one hour each time. During these periods, Wheelabrator Station's thermal plume drives water temperatures across and throughout virtually the entire water column. This is of greatest concern during the summer months from July through September, when ambient water temperatures are at their maximum and thermal discharges could cause river temperatures to approach or exceed the range determined to be protective of the BIP.

In General Comment (A) the permittee maintains that "operating at lower flows for longer periods of time will further decrease potential impingement and entrainment impacts." EPA agrees that lower flows result in reduced impingement and entrainment impacts. In general, reduced impingement and entrainment losses would be beneficial to the Saugus River. However, during the summer, EPA believes that the potential negative impacts from a higher absolute discharge temperature outweigh the potential incremental benefits of the reduced flow. In the Draft Permit, EPA increased the Delta-T limit and introduced an hourly average (as opposed to instantaneous) maximum daily temperature limit to allow the facility to reduce flows between October 1 and May 31, resulting in at least a 28% reduction in impingement and entrainment. Low intake water temperatures during these months allow the permittee to reduce intake flows and increase the Delta-T of its discharge while remaining below the Max-T limit of 90°F and ensuring protection of the BIP. Under these conditions, the amount of heat (as measured in British thermal units (BTUs)) discharged remains essentially the same; although the water is somewhat warmer, a smaller volume is discharged. When intake temperatures exceed 65°F, however, the facility must increase its intake flows to compensate for the loss of cooling capacity in the water [See Figure 5 in the 2008 308 Response, AR #3]. Indeed, when intake temperatures reach the high 70s to 80°F, which can occur periodically in August (See ASA 2004, AR #4, Figure 2.8a and b), intake flows may need to reach as high as 50,000 to 55,000 gallons per minute (gpm), which would require the facility to discharge at or approaching the maximum permitted volume of 60 MGD. Thus, under such conditions, cooling water intake volumes would not be significantly reduced even if the Max-T limit was increased above 90˚F. As a result, during these periods, raising the Max-T limit would result in increased thermal loading (i.e., more BTUs) to the river without significantly reduced entrainment and impingement.

In other words, while the permittee will likely be able to reduce cooling water withdrawal volumes during the cooler months (i.e., October through May, and most likely all or part of June and September), operational limitations associated with higher intake temperatures will likely preclude such reductions during the hottest summer months (i.e., July and August) (*see* March 2008 308 Response, AR #3, Section 6.4, page 2). Thus, increasing the maximum daily discharge temperature to 95˚F at times when ambient river temperature is high, and intake flows are approaching or equal to 60 MGD, would result in increased heat load to the river at a time when river conditions are approaching the limits of thermal tolerance for several fish species. Retaining the maximum daily discharge limit of 90˚F will protect the BIP during the hottest summer months by preventing the facility from adding even more heat to the system than is currently permitted. While EPA and MassDEP recognize that retaining the Max-T limit of 90° F may keep Wheelabrator Station from reducing its water withdrawal volumes at certain times – most likely to occur on some number of days in June and September -- and that this will result in marginally greater entrainment and impingement, the agencies have concluded, in light of our review of the scientific literature on thermal effects, that it is more important in this case to prevent the effects that could result from discharges above 90°F.

The permittee maintains that the modeling results show "no meaningful or significant difference with or without the 90˚F discharge temperature limit." For the most part, EPA agrees with this assessment. The model appears to predict average water temperatures over entire tidal cycles with reasonable accuracy and is useful in predicting the impacts of a small Delta-T increase with reduced flows. At the same time, however, a comparison of modeled and observed temperatures indicates that at stations in the vicinity of the GE discharge and upstream of the Wheelabrator discharge, the model is not accurately predicting peak temperatures around low slack tide. In some cases, observed temperatures near the low slack period were 5-7°C (9-12.6°F) higher than the model's predicted value (See ASA 2004, AR #4, Figures 5.2-5.10). The differences between observed and modeled temperatures suggest that the model may not accurately predict the impact of a 95˚F discharge at 60 MGD during low slack tide in August, which is a serious concern for EPA and MassDEP given that this time period reflects the highest natural river temperatures and the least mixing and dilution, and is the time when thermal impacts to alewife, winter flounder, and striped bass juveniles are most likely to occur. Indeed, the occurrence of very high temperatures in localized areas (i.e., near the thermal discharges) during low slack tide is one of EPA's chief concerns with regard to assuring the protection and propagation of the BIP.

In light of the above considerations, EPA and MassDEP also considered imposing a maximum discharge temperature limit even lower than 90°F. The agencies currently conclude, however, that the more conservative approach of a lower discharge temperature is not necessary at this time. This conclusion is based on the limited temporal and spatial extent of the thermal plume at temperatures above levels of concern for resident and anadromous species in light of the dynamic flushing provided by the Saugus River. After issuance of the new permit, the agencies anticipate additional evaluation of the actual behavior of the thermal plume in the Saugus River at periods of low slack tide in the summer (and during other periods) to further characterize the water temperatures that will result during that segment of the tidal cycle.

As stated above, this discharge is being regulated under 316(a) of the Clean Water Act. As such, the discharge limits must assure the protection and propagation of the BIP. In light of the above analysis, EPA and MassDEP find that a permit with a Max-T limit of 95°F (or higher), or without any Max-T limit at all, would under certain conditions raise river temperatures to levels that would pose a risk of significant adverse thermal impacts to at least 3 important resident species in the Saugus River – namely, alewives, winter flounder and striped bass – and would as a result not reasonably assure the protection and propagation of the BIP as required by § 316(a). Moreover, EPA and MassDEP must also consider the possible cumulative effect of the Wheelabrator Station thermal discharge when coupled with the thermal discharge from the nearby General Electric facility. *See* 40 C.F.R. §§ 125.73(a) and (c)(1)(i).

Conversely, for the reasons stated above, with a maximum discharge temperature of 90°F, EPA and MassDEP find that the risk of adverse thermal impacts would be sufficiently reduced to provide reasonable assurance of the protection and propagation of the BIP. Although EPA and MassDEP have decided to grant the company's request to increase the Delta-T limit from 20°F to 22°F, and to base compliance on hourly average temperatures rather than instantaneous temperatures, the agencies have also decided to reject Wheelabrator's request to raise or eliminate the maximum temperature limit. As a result, the overall thermal load (as measured in BTUs) to the Saugus River from Wheelabrator Station's discharge will not appreciably increase because despite the increased Delta-T, the cooling water flow volume will be reduced for much of the year and the 90°F maximum temperature limit will be retained.

While the permit's thermal discharge limits are based on a CWA § 316(a) variance, rather than state water quality standards, the regulatory agencies also note that under the Massachusetts Surface Water Quality Standards (SWQS), 314 CMR Part 4.00, the Saugus River is designated as a Outstanding Resource Water (ORW) due to its designation by the state as an Area of Critical Environmental Concern (ACEC). ORWs receive a high level of protection under the state's SWQS. For example, new or increased discharges of pollutants to an ORW are prohibited unless they are determined to be for the express purpose of enhancing the resource for its designated uses. *See* 314 CMR 4.04(3).

In connection with the Rumney Marshes ACEC designation, the US Fish and Wildlife Service (USF&WS) characterized the area as "one of the most biologically significant estuaries in Massachusetts north of Boston." USF&WS commented on the proposed ACEC designation as follows:

> "Nearly 70 percent of all commercial fish and shellfish resources are dependent on estuaries for spawning and nursery grounds. Winter flounder, alewife, smelt, blueback herring, and American eel are a few of the more common finfish that occur within the nominated estuarine ecosystems.... Intertidal habitats ... support a wide variety of invertebrate resources. These include soft shelled and razor clams, mussels, snails, marine worms, and other invertebrates that are integral components of the marine food chain. Although many of the shellfish beds are too contaminated for human consumption, they represent an important food source for wildlife, attracting large numbers of wintering waterfowl to the area annually."

In the ACEC designation document for this area, the Massachusetts Secretary of Environmental Affairs found that the:

> . . . list of bird species, migratory or indigenous, is extraordinary. The Massachusetts Natural Heritage and Endangered Species Program has commented that the area contains at least 5 species listed by the Division of Fisheries and Wildlife as Endangered, Threatened, or a Species of Special Concern. Despite its proximity to the intense development of the area, there is little doubt of the productivity of the designated area. ... Given its close proximity to a major metropolitan center with a population in excess of one million, this relatively undisturbed estuary and marsh complex is indeed unique...this relatively large tract of marshland habitat, situated in an area subject to intense development pressure, provides the resource base necessary to maintain the diversity and productivity of an ecosystem which must, despite stringent regulation, accommodate the cumulative impacts arising from this development. While there may be smaller parcels of marshland which dot the urban landscape, the inventory of larger marshes capable of supporting these vital resources is dwindling and must be preserved.

Relative to the importance of this area, the Secretary further stated:

> I also hereby find that the coastal wetland resource areas included in the Rumney Marshes ACEC, the title taken from the name used during the colonial era to identify the marshes and lowlands of this region, are significant to flood control, the prevention of storm damage, the protection of land containing shellfish, and fisheries; the prevention of pollution, the protection of wildlife habitat, the protection of public and private water supplies; public interests defined in the Wetlands Protection Act (MGL c. 131, s. 40; 310 CMR 10.00).[2]

---

[2] See "Designation of Portions of the Cities of Boston, Lynn, and Revere, and the Towns of Saugus and Winthrop as the Rumney Marshes Area of Critical Environmental Concern with Supporting Findings", dated 22 August 1988.

It is noteworthy that the Secretary identified "the protection of land containing shellfish, and fisheries; the prevention of pollution, [and] the protection of wildlife habitat" as issues of importance in the ACEC designation. These issues, as they pertain to the Lower Saugus River, particularly in view of its status as an ORW resource, would likewise necessitate protection under the SWQS.

The agencies have concluded that an increase in Wheelabrator's maximum allowable discharge temperature would allow an increase in the discharge of heat, a pollutant, to the lower Saugus River. In addition, this additional discharge of heat is neither proposed for the express purpose and intent of maintaining or enhancing the resource for its designated uses (i.e., "habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation habitat for aquatic life", among other uses, *see* 314 CMR 4.05 (4)(b)), nor would it constitute such an enhancement. *See* 314 CMR 4.04(3)(b)(1). As a result, an increase in Wheelabrator Station's discharge of heat to the lower Saugus River would be inconsistent with the intent of the anti-degradation requirements of the Massachusetts SWQS, which require the maintenance and protection of the quality of ORWs. While other Wheelabrator comments (*see* Comments A15, A16 and A19 below) ask whether a mixing zone could be provided under the state water quality standards to authorize exceedances of state water quality criteria for temperature within the zone, MassDEP has determined that, independent of a 316(a) analysis, the proposed discharge will not meet the state's Mixing Zone Policy guidance under the circumstances of this case. (*See* Response A16 below; *see also* Response A15 and A19 below.)

Comment A1: Revise Effluent Temperature from 90 °F to 95 °F

The effluent absolute temperature limit of 90 °F does not represent a threshold of significance of impact from the thermal discharge in the river and does not allow the full entrainment/impingement withdrawal reduction benefit of the VFD. A higher absolute temperature would delay the need to increase flow (and would reduce entrainment and impingement during those periods). We have demonstrated with the modeling of Scenario 6 in the December, 2005 submittal that the thermal impacts to the river are not significant using scenarios with no absolute discharge temperature and therefore we feel very strongly that this condition:

- does not provide the available benefit to the environment of the Saugus River either with regard to impingement or entrainment, nor does it materially reduce thermal impacts;
- does not provide benefit to the environment as a whole, since when the absolute discharge temperature limit is approached, steam is vented and fuel is wasted in our plant and additional fuel must be combusted elsewhere to generate electricity (high temperature days correspond with increased electrical demand). Overall air emissions regionally therefore increase.

The absolute discharge temperature limit is presumed to be a consideration in the Mass DEP Water Quality Standards aspects of the Permit, which has not yet been available for our review. We had requested confirmation that the Mass DEP Mixing Zone Policy of January 8, 1993 is available to be applied to this Permit. We also requested the opportunity to provide specific information demonstrating compliance with this Policy before a Draft Permit was issued since, based on the information available to date, such compliance had been demonstrated.

Response to Comment A1:

Contrary to the comment, EPA and MassDEP maintain that 90°F does represent a critical temperature threshold in this case. As explained in the Fact Sheet in Part 6.1.1.5, (a) water temperatures above 90°F have been shown to be unsuitable for striped bass habitat, (b) at this temperature and above, juvenile winter flounder experience significant mortality; and (c) juvenile alewives have been found to experience some acute toxicity and at least one expert has characterized water temperatures above 90°F as "entirely unsuitable" for juvenile alewives. Therefore, EPA and MassDEP concluded that allowing an effluent temperature above 90°F would not assure the protection and propagation of the BIP in the Saugus River, as required by CWA § 316(a). This conclusion was only strengthened by further research into the alewife literature (see the Agency's response to the General Comment above) since the development of the Fact Sheet. The literature points to even lower temperatures, in some cases in the mid-80s°F, as having the potential to cause adverse impacts under certain conditions. While the permit's thermal discharge limits are based on CWA § 316(a), the agencies also point out that under the Massachusetts SWQS, a discharger may not increase its pollutant discharges to an ORW – such as the segment of the Saugus River at issue here. Raising the effluent temperature limit to 95°F would, in effect, raise the amount of heat discharged to the ORW, especially in the summer, and would be barred by the SWQS independent of a 316(a) analysis.

The permittee comments that its modeling showed that thermal impacts to the river from the current discharge are insignificant and would remain so with its requested thermal discharge limits. The agencies disagree and have explained their view in the response to the General Comment immediately above. In fact, not only did the model predict that discharges with the requested temperature increases *would* exceed certain water quality criteria for brief periods of time, but the model did not estimate *how high* the temperatures would go above the applicable water quality criteria. This undermines the permittee's argument that the model demonstrates that the requested thermal discharge limits would produce no significant adverse effects. Wheelabrator Station's comment fails to address the relationship between the facility's thermal discharges, the resulting in-river temperatures and the thermal tolerances for relevant species of fish. This relationship is critical for determining the environmental effects of the requested permit limits. In addition, the comment does not address the state's designation of this waterbody as an ORW, which is relevant for assessing whether the requested increases could be permitted as a matter of antidegradation under the SWQS.

With regard to the Massachusetts Mixing Zone Policy, the permittee has always been free to make the case to the agencies that a mixing zone should be applied to authorize its thermal discharges under the state's SWQS. In the Fact Sheet, EPA and MassDEP explained both that the permittee's discharge would result in exceedances of certain state water quality criteria and that the proposed discharge could not satisfy a mixing zone set under the state's mixing zone requirements. *See* Fact Sheet at §§ 5.3 and 6.1.1.2. The permittee was free to comment on that aspect of the Draft Permit and has done so, arguing that its modeling work shows that its proposed thermal discharge would satisfy Massachusetts SWQS with the application of an appropriate mixing zone. EPA and MassDEP disagree, however. Responses to the permittee's comments regarding state mixing zone issues are further detailed in Responses A15, A16 and A19 and the MassDEP mixing zone analysis referenced therein.

With regard to the permittee's venting of waste heat (steam) in order to meet the permit limits, that is a consequence of its chosen approach for complying with its permit. The permit sets thermal discharge limits to satisfy applicable requirements of federal and state law; the permit does not provide an exemption from necessary thermal discharge limits in order to enable Wheelabrator Station to maximize its electrical generation without the possibility of needing to vent steam. To the extent that it has not already done so, or has not found it infeasible, the permittee could investigate whether there are ways to ratchet down production when approaching temperature limits, or whether it can spread out electricity generation throughout the day, in order to avoid needing to vent steam. Alternatively, if the permittee cannot fine tune its operations to avoid having to vent steam under certain circumstances, perhaps it could explore productive uses for the steam that it would otherwise vent.

Finally, Wheelabrator Station also comments that the permit's thermal discharge limits should be further relaxed because they do not benefit "the environment as a whole." This comment, however, does not provide a basis for changing the permit's limits and is unconvincing on the merits. The agencies have explained above their conclusion that limiting Wheelabrator Station's thermal discharge as provided in the Permit is ecologically preferable to relaxing the thermal discharge limit in order to obtain the marginal amount of additional entrainment and impingement reduction that could accompany higher thermal discharge limits. Furthermore, the air pollution considerations raised by the permittee are not relevant to setting thermal discharge limits under CWA § 316(a). Permit limits under § 316(a) turn on biological considerations: namely, on what thermal discharge limits are needed to assure the protection and propagation of the BIP. Similarly, any determination of effluent limits based upon the application of state water quality standards are driven by water quality concerns and air pollution considerations would not factor into the determination. In addition, the permittee's intimation that the permit's thermal discharge limits will lead to significant additional air pollution is unconvincing. First, the above discussion reveals that the permit's thermal discharge limits will only *potentially* lead to a small reduction in generation at Wheelabrator Station. The air pollution ramifications of any such reduction would depend on how the lost generation was replaced by the "grid" – e.g., by an oil-burning facility, a natural gas-burning facility, a hydropower facility, etc. -- but, in any case, the amount of air pollution involved would be quite small, whereas increased thermal discharges could prove toxic to resident species and could cause serious environmental harm locally to the Saugus River ecosystem.

Comment A2: The Draft Permit contains a requirement at Part I.A.11.a for conducting a visual inspection of the fish screen every eight (8) hours for dead and live fish. Facility staff make regular rounds (2-3 per shift) based on facility needs. The pump house is not immediately adjacent to the facility and Wheelabrator believes that it would be more practical, and just as protective of the environment to include a permit condition that requires visual inspection of the screens to coincide with the regular inspections of the pump house which occurs once during each twelve hour shift. The permit condition as proposed creates additional trips to the pump house that are out of synch with other operational inspections. Wheelabrator requests that the language of this Part be changed to inspect the CWIS a minimum of once per twelve hour shift.

Response to Comment A2: EPA believes that this is a reasonable request due to staff constraints and the location of the pump house relative to the main building. Therefore, the Final Permit has been changed to require that the fish screens be visually inspected at a minimum of once every 12 hours. However, when an unusual impingement event (UIE) occurs, as defined in Part I.A.11 of the permit, the permittee will be required to inspect the fish screens and count the number of impinged fish at least once every six (6) hours and until the UIE has ended, in order to better quantify the duration and scope of such an event. Also see response to comment C3 below.

Comment A3: Part I.C.1.a. of the Draft Permit states that "The end of the fish return pipe shall be extended a sufficient distance into the river to ensure that the discharge flows directly into the subtidal waters of the river at all stages of tide and flow". The system already extends to such a point, therefore, we are confirming that no extension is required.

Response to Comment A3: This provision was included in the Draft Permit because photograph numbers 8-11 in Attachment 2 of the March 17, 2008 308 Response submittal (AR #3) indicated that the end of the discharge pipe may not be submerged at all tidal heights. Following issuance of the Draft Permit, EPA was informed that these photographs do not depict the pipe outlet, and that the pipe extends to the main channel and is submerged at all tide stages. Upon reviewing the permit language regarding this provision, EPA realized that its intent was to have the fish return pipe "submerged" at all times, not just "extending into the subtidal waters." Therefore, the Final Permit requires that the end of the fish return pipe is submerged at all times. However, EPA is satisfied that the end of the pipe is submerged under the current configuration. Provided that the fish return outfall location is not changed during modifications to the fish return system, no action is required by the permittee regarding this provision.

Comment A4: The permit condition at Part I.C.5 governing operation of the traveling screens should take into account time the screens are not available due to required maintenance or mechanical problems, and provide an exception for times of maintenance or mechanical malfunction. In order to be able to operate reliably, the screens do require regular maintenance and the screens cannot rotate during maintenance activities. Also, should one screen experience a mechanical issue it would be impractical to shut off the pumps and vent steam from the plant.

Response to Comment A4: EPA agrees with the comment. In complying with the requirement to rotate its traveling screens at least 15 minutes for every 30 minute period while any intake pump is operating, the permittee shall not include in its calculation the time period during which any one screen was not operating due to regular maintenance being conducted for these screens. However, if any screen will not be operating due to a malfunction or other unexpected condition, the permittee would need to comply with the upset provision found in Part II.B.5 of Part II, General Conditions. The following language has been added to Part I.C.5 of the permit to reflect this change as shown in the italicized text below:

This requirement shall not apply to any period that either set of traveling screens is not in working order due to required maintenance. If either set of traveling screens is not operable due to a malfunction or other unplanned outage, the permittee shall comply with the upset provisions of the General Conditions (Part II), found at Part II.B.5.

Comment A5: Wheelabrator Saugus recommends no permit condition regarding screen rotation at this time pending a study we would implement to attempt to determine if there are any differences in impingement related impacts with rotation for fifteen of every thirty minutes in conjunction with the required Biological Monitoring program. By varying the screen rotation frequency and duration, the number and condition of impinged fish can be evaluated and the need for Permit conditions regarding frequency and duration of rotation can be based on the results of the study.

Response to Comment A5: EPA believes that the rotating screen manufacturer's recommendation of allowing 15 minutes of screen rotation every 30 minutes is necessary to minimize the time aquatic organisms are impinged on the screens. EPA acknowledges that more frequent screen rotation may require additional maintenance and repair of these screens. The permittee may request a permit modification after operating under this regime if such operation is documented by the permittee to not be feasible or results in excessive maintenance or repair occurrences. Also see response to Comment A4.

Comment A6: Wheelabrator seeks the opportunity to work with EPA on the details of the biological monitoring program and the required duration of the elements of the monitoring before the Draft Permit is issued. Overall, Wheelabrator feels that the Draft Biological Monitoring Program proposed by EPA has certain elements that are impractical or infeasible and that the proposed duration of the program is excessive in relation to the value of the data that will be obtained. We feel that with appropriate refinements, we can agree with the agency on a program that can accomplish the agency's apparent objectives of documenting impingement and entrainment impacts of the cooling water intake system. Consistent with the approach taken in other permits, we suggest developing an appropriately refined program within 60 days of the effective date of the Final Permit.

Specific comments on the biological monitoring program are provided below, as well as our suggested language for the biological monitoring program. Our comments are based on a review of the historic biological monitoring at this site and biological program requirements in permits for similar facilities.

Wheelabrator offers the following as replacement language for the Biological Monitoring section. This language would allow Wheelabrator and our biologist, who has specific experience with collecting samples from the Wheelabrator system as well as the Saugus River, to have input into the details of the biological monitoring program.

Suggested Language for Biological Monitoring Section.

Item D.1.

The permittee shall, within 60 days of the effective date of the permit, submit an entrainment and impingement related sampling, monitoring and reporting program plan for review and approval. The plan shall be designed and implemented to provide information to evaluate the entrainment and impingement impact of the CWIS. Upon receipt of a notice to proceed from EPA, the permittee shall implement the program.

The plan, upon implementation, shall include sampling, monitoring and assessment methodology to evaluate the entrainment of ichthyoplankton and impingement of aquatic organisms as a result of the operation of the CWIS. The methodology in the plan will include:

- A description of the locations where sampling/monitoring will take place,
- The dates and frequency of sampling/monitoring,
- The means and timing by which samples will be taken,
- Sample preservation methods,
- Provision for identification to the lowest distinguishable taxonomic category,
- A sampling, monitoring and assessment methodology to evaluate the survival of fish that are impinged on the intake screens and returned to the River,
- Adult equivalent analysis for species of interest, including but not necessarily limited to winter flounder, smelt and river herring,
- Methods for estimating the total number of eggs and larvae lost to entrainment,
- Proposed durations and checkpoints for each element of the monitoring program over the duration of the permit, based on results.

Response to Comment A6: Allowing a plan to be developed, approved, and implemented would likely take longer than the ninety (90) days for implementation of a biological monitoring program (BMP) as required by the Draft Permit. The regulatory agencies believe that it is appropriate for the permit to include the specified biological monitoring requirements and mandate their implementation on a reasonably expeditious basis. *See* 33 U.S.C. §§ 1318(a) and 1342(a)(2); 40 C.F.R. §§ 122.44(i) and 122.48. Negotiations between the Agencies and the permittee regarding the specifics of the plan could result in a significant delay to permit issuance and the initiation of monitoring. As written, the Draft Permit leaves many of the monitoring details to the permittee's discretion, including the exact monitoring locations, sample preservation methods, adult equivalent analysis for species of interest, and methods for estimating the total number of eggs and larvae lost to entrainment. The BMP outlined in the Draft Permit sets conditions only for the approximate monitoring locations (e.g., at the intake prior to the condensers), the frequency of monitoring, and the quantitative endpoints (e.g., total number of eggs and larvae entrained). Moreover, Part I.D.4 of the permit allows the permittee to submit a request to reduce monitoring frequency during the permit term. Thus, the BMP is consistent with many of the elements requested by the permittee. EPA has responded to specific aspects of monitoring below.

The following three comments on the Draft Permit's biological monitoring program were offered for consideration if EPA did not accept the proposal detailed in Comment A6.

Comment A7: Wheelabrator feels that the requirement in Part D.4. to conduct monitoring throughout the duration of the permit is excessive. Wheelabrator proposes to perform monitoring in years 1, 2 & 4. We feel that three full years of monitoring will provide adequate data. At the conclusion of the third year we would review the data with the agency and determine if any additional collection was required to address specific issues.

Response to Comment A7: EPA does not feel that requiring monitoring throughout the duration of the permit is excessive, and further notes that this level of monitoring is commonly required of similarly sized power plants. However, EPA has reduced the monitoring requirements in Part D.4 of the Final Permit from five years to three years. The permittee will perform monitoring and submit annual biological monitoring reports in years 1, 2, and 3. At the conclusion of the third year, EPA anticipates reviewing the data and determining if additional collection is necessary.

Comment A8: Regarding Part I.D.3.b. of the Draft Permit, it is Wheelabrator's experience that it is very rare for any living organisms to be trapped at the trash racks (bar screen). Debris including grass, litter, etc. is generally limited to the few inches near the water surface. Following a year's worth of monitoring, the value of continuing to examine the removed grass and litter for the occurrence of organisms may be viewed as not yielding any useful data.

Response to Comment A8: The permit did not specify that the trash racks be inspected only for the presence of "live organisms" and requires that the presence of any organisms, whether dead or alive, be recorded. Part I.D.3.c of the permit notes that "all fish will be immediately examined for initial condition (live, dead, injured)." If one year of monitoring indicates that very few organisms are found during the sorting of trash rack debris, this monitoring could be discontinued, pursuant to the permittee's request consistent with Part I.D.4 of the permit. However, following the granting of such request by the permittee to discontinue this monitoring, if the permittee finds any live or dead organisms during the disposal of trash rack debris, the occurrence should be recorded, reported in the annual report, and live organisms be returned to the river as described in Part I.D.3.c of the permit. In any event, EPA does not believe that it is overly burdensome to require the recording of the presence of organisms during these cleaning events, as such recording is not believed to add a significant amount of time to the trash rack cleaning procedure. If the employee conducting this cleaning procedure is not able to or qualified to accurately characterize the organisms present, pictures of such organisms may be taken along with written documentation if necessary. This information could be analyzed more thoroughly at a later date by someone who is qualified, such as a fisheries biologist.

Comment A9: Continuing the latent survival analysis (holding impinged fish for 48 hours) for the duration of the permit required in Part D.3.c. will cause additional unnecessary mortality of organisms and yield little, if any, additional data beyond what will be known from an initial analysis period of one year. Extension of this component will incur significant additional cost without benefit and with additional mortality to the species targeted for protection. Therefore, we request limiting the latent survival analysis to one year with a frequency to be resolved during the development of the full study methodology described below. If necessary, supplemental analysis could be performed in any seasons where potentially significant uncertainties remain.

Response to Comment A9: EPA acknowledges this comment and will amend the permit to limit the latent survival analysis to the first year of the BMP only. EPA would not expect the latent survival figures to change drastically from year to year if no subsequent changes are made to the intake structure. At the conclusion of this first year of latent survival analyses under the BMP, EPA anticipates reviewing the data and determining if additional analyses are necessary.

Comments on Fact Sheet

Process Description

Comment A10: On page 3, the pit capacity is 6,800 tons, not 10,000 tons as described in the first paragraph of the process description.

Comment A11: On page 3, the combustion temperature is closer to 2,400 degrees F rather than the 2,000 degrees F described in the process description.

Comment A12: On process descriptions on page 3, the facility uses two overhead ***furnace feeders*** to move refuse. Use of the term "cranes" has a regulatory connotation under Massachusetts Department of Public Safety requirements which do not apply to the furnace feeders.

Comment A13: On Page 4, in the second paragraph the term "*heated water*" is used. For clarity, please refer to this as condenser discharge water.

Comment A14: On Page 4, in the last paragraph, the boiler water treatment system is improperly described. The plant does not have a reverse osmosis demineralization system. The words reverse osmosis should be removed from the sentence.

Response to Comments A10 through A14: Although these clarifications are noted in this response document for the record, EPA is not modifying the Fact Sheet after the public comment period None of these clarifications would result in any changes to the Final Permit or the basis for making or not making changes.

Comment A15: On page 11, paragraph 3, the Fact Sheet states, "At the current level of operation, WS's thermal discharge cannot always meet the numeric criteria of the MA SWQS". This statement is unsupported by any evidence in the Fact Sheet, and WS does not believe this to be correct with an appropriate mixing zone.

Response to Comment A15: This comment and response pertain to Wheelabrator Station's current thermal discharge only and they do not address the increased discharge proposed by the company. The permitting agencies find that the record clearly demonstrates that, as stated in the Fact Sheet, WS's current thermal discharge cannot always meet the numeric thermal criteria of the MA SWQS. Some of the record evidence on this point is discussed below.

Contrary to the permittee's comment, EPA did support this statement with evidence in the Fact Sheet. In the discussion of the modeling results, Section 6.1.1.4 of the Fact Sheet (p.15) states "the simulated background conditions exceeded the SWQS criterion of 80° F in a small area from August 9 to 12. Based on one-hour running average temperatures, this pattern of exceedance coincided with the time period of slack water." This conclusion is based on Figures 2.9.3 and 2.10.3 presented in the 2005 Modeling Results (AR #5), which depicts an exceedance of the 80°F SWQS under current operations at the downstream transect (closest to the facility's discharge) on a running one-hour average and block (tidal) average. The 80°F SWQS at 314 CMR 4.05(4)(b)2.a is based on a 24-hour average. Because the permittee did not perform modeling based on a 24-hour average, an analysis of the tidal average at the downstream transect (closest to the facility's discharge, Figure 2.10.3) may be more appropriate in this case. At the downstream transect, the 80°F SWQS was exceeded on a 24-hour average (based on 2 tidal averages) between August 9 and August 12 under current operations over a portion of the cross-sectional area of the river. The block average model results based only on Wheelabrator's discharge (Figures 3.6.1 to 3.6.3 in the 2005 Report, AR #5) also demonstrate an exceedance of the 80˚F SWQS over a portion of the river at all transects from August 9 to August 12. Thus, the Fact Sheet correctly stated and the record supports that the current operations cannot always meet the numeric criteria of the MA SWQS.

In addition, graphics presented in the 2004 ASA Report (AR #4) demonstrate that the MA SWQS's instantaneous maximum temperature criterion of 85°F (314 CMR 4.05(4)(b)2.a) was exceeded in the lower Saugus River in 2001. This 2001 data is the only in-stream temperature monitoring data in the record and was collected by the permittee in support of model development. No temperature monitoring was conducted directly at the facility's discharge, which limits the ability to evaluate thermal impacts solely from Wheelabrator's discharge. However, the agencies consider the 2001 thermistor data evidence of the cumulative effects of Wheelabrator and General Electric Aviation's discharges under certain conditions. These data are also representative of the actual thermal conditions of the river under current operations. Graphic 2.13a (South of the channel opening at the steam bridge) shows one exceedance of the 85˚F criterion between 8/10/2001 and 8/11/2001. In addition, exceedances occurred on several occasions based on the temperatures presented in Graphic 2.14b (North of the channel opening at the steam bridge). Figure 5.4 also shows a number of exceedances southeast of the Wheelabrator intake from 8/08/2001 through 8/11/2001 at the surface. Both the model and the actual observations hit 30°C (86°F), and perhaps would have shown even higher temperatures if the scale of the y-axis in Figure 5.4 extended beyond 30°C. Indeed, the graphic presentation of the data in Figure 5.4 may have cut off or cropped some higher, peak results, given that temperatures higher than 30°C were identified on several occasions at this particular station in Figures 2.12a and 2.12b. Thus, record evidence shows temperatures in excess of the instantaneous maximum temperature criterion of 85°F in August of 2001 in the Lower Saugus near the facility's discharge.

Thus, based on the analysis above, the agencies believe that the statement in the Fact Sheet – "At the current level of operation, WS's thermal discharge cannot always meet the numeric criteria of the MA SWQS" – is reasonable and adequately supported. While Wheelabrator's comment suggests that its current discharge could meet MA SWQS with a mixing zone, the statement from the Fact Sheet was not addressing mixing zones. EPA and MassDEP have, however, considered the issue of mixing zones and respond to Wheelabrator's comments about mixings zones in Responses A16 and A19 below.

.

Comment A16: On page 11, paragraph 3, the Fact Sheet states, "In addition, at times, the thermal plume spans more than 50% of the width of the river, which is inconsistent with the Massachusetts Mixing Zone Policy". This is not a correct characterization of the Policy, which states: "When zone of passage is an issue, at least half of a waterbody's area or volume should remain free from mixing zones." The Policy allows for either surface area or volume to provide passage when passage is at issue. As shown by the project modeling, passage is not at issue here because higher than-the-plume ambient temperatures in the river extend from upstream down to the discharge site, where they are decreasing even in the presence of the discharge. Further, the area and volumetric coverage of the plume in any river cross-section is less than 50% of the cross section at least 97% of the time on each tide cycle (i.e. for a duration of a half hour or less). This makes timely passage a non-issue, notwithstanding that it is passage to the warmer, upstream area.

Response to Comment A16: Wheelabrator Station comments that the regulatory agencies have incorrectly characterized the Massachusetts Mixing Zone Policy's approach to ensuring adequate zone of passage for aquatic organisms. The company also urges, that properly understood, zone of passage should not be a problem here in light of relevant facts. EPA and MassDEP disagree.

Federal law allows states, subject to EPA review and approval, to use mixing zones in the application of their water quality standards. *See* 40 C.F.R. § 131.13. The Massachusetts SWQS provide for mixing zones and the criteria governing such mixing zones are set forth in state regulations and the Massachusetts Mixing Zone Policy, subject to the terms of EPA mixing zone policy. *See* 314 CMR 4.03(2). The state regulations dictate that "the Department *may* recognize a limited area or volume of a waterbody as a mixing zone for the initial dilution of a discharge." *Id.* (emphasis added). Thus, whether or not to allow a mixing zone is within the discretion of the MassDEP.

The MassDEP has assessed the mixing zone issue and concluded that neither the current thermal discharge, which was previously authorized under CWA § 316(a), *see* Fact Sheet at § 6.1.1.3, nor the increased thermal discharge proposed by Wheelabrator, would meet the state's Mixing Zone Policy guidance independent of a 316(a) analysis. *See* Attachment A, MassDEP Mixing Zone Analysis. EPA has independently reviewed the state's analysis and agrees with its conclusions.

Comment A17: On page 13, paragraph 1 the Fact Sheet states that " EPA finds that the permittee has demonstrated that a change in the delta T limit to 22°F year-round will adequately protect the BIP, but that the permittee has not established that the protection and propagation of the BIP of the Saugus River will be assured if year-round maximum effluent temperature limits are eliminated." In its letter of April 8, 2009, WS refined its request regarding maximum discharge temperature from a general request to eliminate the maximum limit to a specific request for a Maximum Daily limit of 95°F. This value is the same value for which the December 15, 2005 modeling results were provided and thereafter upon which EPA based the Fact Sheet finding that a delta T of 22°F will adequately protect the BIP. EPA sent a letter on May 18, 2006 (attached) stating "we have determined that EPA is likely to consider permit conditions for both the Wheelabrator Saugus and GE - Lynn NPDES permits which reflect the heat load conditions in Scenario 6". Scenario 6 did not have an absolute discharge limit. Therefore, WS believes the same analysis by definition demonstrates protection of the BIP at both the evaluated delta T of 22°F and correspondingly evaluated absolute temperature of 95°F.

Response to Comment A17: EPA and MassDEP considered permit conditions based on the permittee's modeling, but as explained in the agency's responses to the company's General Comment and Comment A1, the effluent temperature in the Draft Permit was retained at 90°F and will remain at 90°F for the Final Permit. The purpose of the modeling was to use different scenarios of intake flow combinations for Wheelabrator and General Electric and compare these to the temperatures of concerns for several periods during the year. Although the effluent temperature limit has not been increased, the Delta-T was increased from 20 to 22°F and the effluent temperature and Delta-T have been changed from instantaneous limits to hourly averages. As stated in the Fact Sheet:

EPA concludes that the revised effluent temperature limits will not adversely affect the lower Saugus River because little alteration to the size, shape and magnitude of the thermal plume will result. Furthermore, EPA also concludes if any adverse impacts related to these revised temperature limits do result, they will be slight and will be outweighed by the positive effects of the reductions in impingement and entrainment associated with operating of the CWIS at lower intake flows. Although the change in effluent temperature and delta T limits from instantaneous values to hourly averages, and the change in the delta T limit from 20 to 22 °F, make the permit less stringent in those specific respects, these changes go along with reductions in the permitted discharge and intake flows, and maintenance of maximum temperature limits, which make the overall permit more stringent and more protective of the environment.

Thus, although EPA considered the permittee's request for a higher effluent temperature limit, such an increase was found not to be adequately protective of the BIP (not to mention, inconsistent with the waterbody's ORW designation). However, the other changes regarding the Delta T and the expression of the temperature limits in terms of hourly averages were made, as the regulatory agencies concluded that these changes would still result in adequate protection of the BIP, would not violate the CWA's antibacksliding provisions, would give the permittee to more flexibility through the day in meeting its generating needs, and would be consistent with the approach to permit limits for certain other power plants.

Comment A18: In the final paragraph on Page 14 , the Fact Sheet references a request to WS to model "time periods and temperatures of concern" associated with biological phenomena, as follows:

- March 15-31, Rainbow Smelt in-migration 60°F
- June 1-15, winter flounder, Benthic layer -75°F
  Anadromous fish-upper water column-70°F
- August 1-31, State Water Quality standard-80°F

- October 1-15, juvenile alewife out-migration, 80°F (water column), 75°F (benthic)

Later, at page 15, paragraph 3, these temperatures are referred to as "critical".

With the exception of the 80 °F Daily Mean Water Quality Standard, the Fact Sheet neither provides nor references any evidence that these temperatures are either "critical" or merit "concern". WS believes that thorough scientific analysis of available evidence would demonstrate that these temperatures are not "critical" nor do they provide a basis for "concern". Examples of evidence to that end include, but are not limited to the following:

> Anadromous fish in the upper water columns of many streams supporting them in Massachusetts, including the Saugus River, successfully carry out all life cycle functions in early June at temperatures exceeding 70°F. These temperatures occur in ambient background between June 1-15 in the majority of years, as was presented in the background case of the modeling analysis.
>
> Based on year-class returns of adults from the corresponding birth years, juvenile alewife out-migration successfully occurs throughout Massachusetts during periods when water temperatures exceed 80°F in the upper water column and 75°F in the benthic zone.

Contrary to the representation at page 15, paragraph 6, the 80°F 24-hour average Water Quality standard was never exceeded in the thermal model runs for June.

The results for the WS discharge by itself plus ambient background never exceeded the 80°F 24-hour average Water Quality Standard in 50% or more of the cross-sectional area of the river in August.

Response to Comment A18: While EPA and MassDEP stand by these temperatures as representing critical temperatures in various respects, as discussed in the Fact Sheet, these temperatures did not, in any event, drive the agencies' decision about thermal discharge limits. The permit's thermal discharge limits were set under CWA § 316(a) and, as explained in the Response to General Comment A, were driven by concerns over potential lethal and sublethal effects to alewives, winter flounder and striped bass from exposure to temperatures in the mid-80's °F or higher which might occur throughout the water column at slack low tide during hot summer days, depending on discharge temperatures.

With regard to the modeling and critical temperatures discussed in the comment, EPA requested that the permittee model temperatures and time periods that were agreed upon by EPA, MassDEP, Massachusetts Division of Marine Fisheries (DMF), and Massachusetts Office of Coastal Zone Management (CZM). March represents the onset of in-migration of anadromous species, including rainbow smelt and alewife [Mullen et al. 1986 (AR #86), Buckley, 1989 (AR #87)] A literature review in the Determination

Document for Mirant Kendall Station (Section 5.7.3) concluded that a temperature of 60˚F was predicted to ensure the adequate entry of migrating alewife adults. This temperature was also accepted as adequate for in-migration of rainbow smelt by DMF (email from Brad Chase, September 20, 2005, AR# 37). Another literature review in the Determination Document for Kendall Station (Section 5.7.3) specifies a maximum temperature of 70˚F in early June at the mouth of the Charles River to protect alewife in-migration and a preferred range of temperatures up to a maximum of 80˚F in late summer and early fall during out-migration of juvenile alewife. Casterlin and Reynolds (1982), AR#85, indicate that juvenile winter flounder exhibit avoidance behavior at temperatures above 75˚F, and the Determination Document associated with the NPDES Permit for Brayton Point Station [Section 6.3.3e(i)(B)] specifies a critical threshold summer benthic temperature of 75˚F to protect winter flounder.

EPA recognizes that individuals within a population will have varying thermal tolerances. To determine critical temperatures that trigger important behavioral or physiological responses, a controlled study that tests a representative sample of individuals of one species would need to be conducted. Observations of single or a few fish in ambient waters at various temperatures may tell you something about those individuals, but does not reveal anything definitive about the larger population. The temperatures EPA requested from the model were not necessarily representative of a lethal threshold, but were chosen to represent temperatures necessary for the protection and propagation of the BIP in light of the life histories of the relevant species, consistent with CWA §316(a).

Comment A19: 6.1.1.5 Determination Under CWA §316(a)

Paragraph 4 on Page 17 of the Fact Sheet fails to reflect the WS request to limit the maximum discharge temperature to 95°F that was made in April 2009. The modeling results showed that none of the temperature thresholds referenced in this paragraph (the lowest of which is 86°F) would be reached in the river, neither beyond the Zone of Initial Dilution nor in 50% of the cross-sectional area of the river. These results demonstrate compliance of the requested 95°F maximum discharge temperature with the Mass WQS under the applicable Mixing Zone Policy.

Response to Comment A19: Paragraph 4 on page 17 of the Fact Sheet summarizes temperature sensitivities for key fish species found in the Saugus River. The Fact Sheet stated that significant mortality for some species could occur at temperatures as low as 86˚F. Further review, in particular data from Otto et al. 1976 (AR#88), heightens the agencies' concern that even very short-term thermal plumes in the mid-to high 80s (°F) will be toxic to out-migrating juvenile alewives (see Response to General Comment). As a result, EPA and MassDEP have concluded that temperatures in the mid-80's to 90˚F would serve as reasonable maximum temperature thresholds in this system.

EPA acknowledges that the analysis on page 17 of the Fact Sheet specifically refers to the permittee's request for no maximum temperature limit. However, at the end of the paragraph referenced by the permittee, EPA also states that it "does not believe that a discharge temperature in excess of 90°F would be protective of the balanced indigenous population," which applies equally to a 95°F maximum temperature limit as it does to a permit with no maximum temperature limit. Comment A19 claims that "modeling results showed that none of the temperature thresholds referenced in this paragraph…would be reached in the river." The agencies disagree with this assertion. The 2005 modeling results (AR #5) present only the percent of the river's cross-sectional area that would exceed a specific temperature (e.g., 80°F). They do not demonstrate whether the increased discharge could result in an absolute temperature greater than 86°F. Furthermore, the 2004 calibration results (ASA 2004, AR # 4) suggest that the model does not accurately depict peak high temperatures surrounding low tide during summer, which is the period of most concern regarding potential acute toxicity (see Response to General Comment and MassDEP Mixing Zone Analysis). Therefore, the agencies are not convinced that the model could demonstrate compliance with the requested 95°F maximum discharge temperature.

With regard to mixing zones, MassDEP has concluded that, exclusive of a 316(a) analysis, the discharge will not meet the state's Mixing Zone Policy guidance in this case. *See* Attachment A, MassDEP Mixing Zone Analysis.

Comment A20: In the last paragraph on Page 17 and continuing to page 18, EPA fails to reflect the WS request to limit the maximum discharge temperature to 95°F. Scenario 6 presented in the December 15, 2005 modeling results had no limit on the discharge temperature and showed little discernable difference in thermal impacts. This is the same scenario used by EPA to support the Fact Sheet finding that a delta T of 22°F will adequately protect the BIP. Therefore, WS believes the same analysis demonstrates protection of the BIP at both the evaluated delta T of 22°F and correspondingly evaluated absolute temperature of 95°F.

Response to Comment A20: EPA and MassDEP maintain that, in reference to the last paragraph on Page 17 and continuing to Page 18 of the Fact Sheet, allowing a maximum discharge temperature of 95°F "could lead to more significant increases in thermal loadings to the river as the permittee would need to take in and discharge water at a rate of 60 MGD or higher." A comparison of scenarios 1 and 6 in the 2005 modeling results (AR #5) shows little difference between the two operating conditions regarding the percentage of the cross-sectional area of the river exceeding the modeled temperature for most of the year. However, EPA and MassDEP are primarily concerned with a maximum discharge temperature of 95°F in summer – when river temperatures are already high and increasing the discharge temperature could push river temperatures to dangerous levels around slack low tide – and the model does not accurately depict maximum temperatures during that period.

Contrary to the permittee's statement, scenario 6 does not support the increase because it is not representative of the discharge flow or heat load in summer. Scenario 6 is based on a discharge of 42 MGD and a heat load of approximately 320 mBTU/hr. Because the ambient temperature of the river is high and the cooling capacity of the water is lower, the facility will have to take in and discharge *more than* 42 MGD in summer. As stated in the Fact Sheet, the permittee will operate with discharge flows closer to 60 MGD in summer, which, at a temperature of 95˚F, represents a higher heat load than both the current discharge and the discharge presented as scenario 6 in the 2005 model. Therefore, EPA does not believe that the modeling analysis presented in 2005 supports increasing the maximum discharge temperature to 95˚F. Please also see our response to the Wheelabrator Saugus' General Comment.

B) Comments submitted by Mary A. Colligan, Assistant Regional Administrator for Protected Resources of the United States Department of Commerce's National Marine Fisheries Service (NMFS):

Comment B1: While several species of listed whales and sea turtles occur seasonally in waters off Massachusetts coast and populations of the federally endangered shortnose sturgeon occur in the Connecticut and Merrimack Rivers, no listed species are known to occur in the Saugus River. As such, no further coordination with NMFS PRD is necessary.

Response to Comment B1: This comment is noted for the record. EPA agrees with the assessment that no further coordination is necessary at this time.

C) Comments submitted by Paul Diodati, Director of the Division of Marine Fisheries of the Commonwealth of Massachusetts:

Comment C1: We agree with EPA that 25 fish within an eight hour period is appropriate to constitute an adverse impingement event at the intake screens, as required by Part I.A.11 of the permit. We recommend that both dead and/or alive impinged fish, instead of only dead fish, be counted to reach the 25 fish threshold that triggers an unusual impingement event (UIE).

Response to Comment C1: Upon review of the permit in response to this comment, EPA has changed the threshold for an UIE in the Final Permit from 25 fish per eight hour period to 25 fish per hour. Similar requirements in other permits, such as the Mirant Canal Draft Permit, include a threshold of 40 fish per eight hour period, or 5 fish per hour. However, Mirant Canal is required to rotate and inspect the traveling screens at least once per eight hour period. Because the screens are only rotated once during each inspection period, the permittee will observe 25 or more fish as an UIE, rather than using time-line observations. In the case of WS, the traveling screens must be rotated twice per hour (15 minutes every 30 minutes). An UIE based on an impingement rate of 25 fish per eight hour period and 2 traveling screens would be triggered by observation of a single impinged fish (1 observed fish x 2 screens x 2 rotations per hour x 8 hours = 32).

The intent of the UIE is to document impingement of a school of fish or large number of fish that exceeds the normal historical impingement rate. Impingement at WS generally ranges from 1 to 21 fish per 24 hours. Thus, EPA believes that impingement of 25 fish per hour is indicative of a UIE.

EPA agrees with the commenter that both dead and alive fish should be counted, and has changed the Final Permit to reflect this. Although the Draft Permit required the inspection of traveling screens for "live and dead fish", EPA inadvertently only included "dead fish" in the eight hour period requirement, but intended to include both dead and live fish as was stated earlier in the paragraph regarding the screen inspection.

Comment C2: We request that whenever a UIE occurs that the permittee continuously rotate the (traveling) screens until the number of fish, dead and alive, drops below 25 impinged fish. While we recognize that the permittee expressed concern with continuously rotating the screens, we believe that during a UIE the effort to reduce fish mortality warrants continuous screen rotation. Once the UIE passes, the permittee would then resume operational screen rotation as specified in the Draft Permit.

Response to Comment C2: According to the manufacturer's recommendations, the rotating screens employed at Wheelabrator can be rotated continuously for a maximum of 15 minutes on, 15 minutes off (i.e., rotated 15 minutes for every 30 minute period). The Final Permit requires the permittee to rotate the screens at this rate (15 minutes every 30 minutes) in Part I.C.5. To accommodate this consideration, the Final Permit will require that, upon the occurrence of a UIE, the permittee rotate the screens and inspect more frequently (every six hours) until the impingement rate decreases to less than 5 fish per hour.

Comment C3: We request that during a UIE that fish counts be taken every 4 hours instead of every 8 hours until the number of impinged fish drops below 25. This will improve the accuracy of extrapolating the total number of fish that were impinged and shorten the time needed by the permittee to resume normal operations once the UIE concludes.

Response to Comment C3: The permittee has noted that staffing at the plant and the distance of the intake from the main facility make it difficult to inspect the rotating screens more often than once per 12 hour shift. However, since it is critical that a UIE be identified as soon as possible and its effect and duration be adequately documented, the permit will require that the permittee conduct fish counts at least every 6 hours after a UIE occurs, and more frequently if feasible, until the impingement rate decreases to less than five fish per hour. Also see the response to Comment A2.

Comment C4: We recommend the enumeration and counting of all impinged fish during a UIE based on discrete counts should include a total estimated number of impinged fish for the entire event based on extrapolating the observed counts over the duration of the event to arrive at an estimated total number of impinged fish.

Response to Comment C4: EPA agrees that an estimate of the total number of impinged fish should be derived and believes that an extrapolation from observed counts is an appropriate way to derive this estimate.

Comment C5: Marine Fisheries finds that the Draft Permit provides little guidance to the permittee for the design of the fish return system to safely return fish to the subtidal waters of the Saugus River. EPA has already incorporated instructions for a fish return system in NPDES Permit MA0002241 for another power plant and we recommend EPA adopt the same return system design for the Wheelabrator permit. Specifically, modifications to the existing fish return system would include replacing any sharp angles in the pipe with multiple low-angle turns (< 22.5 degrees) or one continuous arc. Provisions would also be made for the installation of an in-line fish tank, or other means to allow for better counts of impinged fish and to reduce the physical stress when fish transit from the screens through the return sluiceway to the river.

Response to Comment C5: The existing fish return pipe has a long vertical drop and several sharp angles (i.e., 90°). Organisms suffering a vertical drop or hitting a hard turn as they are carried swiftly through the pipe could be stunned, injured, or killed prior to being returned to the river. Thus, the current design does not ensure that organisms impinged on the screens are safely returned to the river alive. The Draft Permit required that the fish return system be "modified to replace any existing sharp turns or angles and eliminate vertical drops at all tide stages" (Part I.C.1(a)), but did not require a specific design configuration. Wheelabrator submitted a proposed fish return design that is detailed in Attachment B to this document. This design eliminates vertical drops, by employing a 45 degree downward slope, and has eliminated any sharp angles by employing a series of sweeping curves. EPA believes this proposed design meets the performance standards outlined in the Draft Permit.

In addition, it should be understood that the specific fish return system requirements in NPDES Permit MA 0002241 were not based on a determination by EPA that the precise parameters specified in the permit were biologically necessary to maximize survival of organisms being returned to the water body and necessarily needed to be replicated at other permits. Rather, it was more generally determined that it was biologically necessary to remove sharp angle turns -- which are more likely to result in injury to the organisms sent through the return system – and specification of a maximum curve of 22.5° was based on a determination that pipe meeting that design criterion were available "off-the-shelf" for procurement. EPA concludes that the narrative design criteria in the Draft Permit are biologically and technologically sound and are, in fact, consistent with the intent of the condition in Permit MA0002241. Therefore, these criteria are retained for the Final Permit and, as stated above, Wheelabrator has submitted a proposed design that should satisfy them.

In response to the installation of an in-line fish tank, EPA does not generally include requirements specific to a single piece of monitoring equipment (e.g., an in-line fish tank) in a permit. In the past, WS has obtained counts of impinged fish by installing a net in the fish return pipe which prevents fish from returning to the river during sampling, which is a method commonly employed at a number of facilities (e.g., GE Lynn, West Springfield Station, and Public Service of New Hampshire Newington Station). EPA considers counts obtained using this method to be an accurate representation of the number of fish impinged at a facility and sees no reason why WS should be required to install an in-line fish tank for monitoring purposes. In addition, the fish return system at WS is configured along the wall of the pump house, and it is not known if there is available space for an in-line fish tank. Finally, in-line fish tanks used for monitoring at other facilities (e.g., Brayton Point Station) have been installed in such a manner that, when not in use, may present an impediment that can cause injury and stress to the fish when being transported through the sluiceway. For this reason, EPA does not believe that an in-line fish tank would reduce physical stress during transit compared to a single, contiguous sluiceway. Still, the Final Permit does not prohibit the permittee from using an in-line fish tank to count impinged fish if they choose, as long as it does not hinder the safe return of fish to the river.

Comment C6: We further recommend that EPA review and approve the permittee's plans for the replacement of the fish return prior to its construction and installation in order to ensure the desired outcome of reduced impingement mortality is achieved.

Response to Comment C6: Wheelabrator submitted a design for a new fish return system to EPA on October 30, 2009. EPA reviewed this design and asked for some modifications. Wheelabrator agreed to make the requested changes and resubmitted their proposed design plan on November 2, 2009. EPA believes that the proposed system which has eliminated vertical drops and sharp angles will be a design that minimizes harm to fish as they are returned to the environment. A copy of the proposed fish return system is shown in Attachment B to this document.

Comment C7: At Part I.D.2.e of the permit, since fish species in the Saugus River are the food of other organisms, including other fish, we recommend that the permittee estimate production foregone along with converting ichthyoplankton counts to adult equivalents.

Response to Comment C7: For winter flounder, rainbow smelt, alewives and blueback herring, EPA will require the calculation of adult equivalents. This facility, historically, has never impinged large numbers of schooling or forage fish. Thus, EPA does not believe that calculation of production foregone is warranted. As long as impingement data is collected, production foregone can always be calculated at a later time, if it is deemed necessary.

Comment C8: By using ichthyoplankton data from over a decade ago, EPA's estimate of entrainment reductions may likely be inaccurately high if ichthyoplankton densities today are lower than over a decade ago but the intake rate is proportionately higher compared to current densities. We seek clarification as to how EPA intends to calculate changes in entrainment based solely on flow reductions without knowing the current distribution and abundance of ichthyoplankton in the Saugus River. Given the low numbers of returning river herring, we believe EPA should consider greater levels of entrainment reduction in order to protect fish stocks that are at all time low abundance from becoming more scarce. We recommend EPA evaluate requirements necessary for this power plant to achieve a 60% reduction in entrainment as contained in the Phase II 316(b) rule for existing power plants.

Response to Comment C8: DMF comments that EPA should evaluate requirements necessary to achieve a 60% reduction in entrainment, as contained in the Phase II 316(b) Rule for large, existing power plants. While EPA considered a variety of alternatives in determining requirements for this permit under § 316(b), it is nevertheless important to understand that the Phase II Rule and its performance standards did not, and do not, apply to Wheelabrator Station (WS). As explained on pages 9-10 of the Fact Sheet, WS is not a "Phase II facility" and, therefore, was not subject to the Phase II Rule.

Furthermore, the Phase II Rule is no longer in effect. EPA suspended the Rule on July 9, 2007, *see* 72 Fed. Reg. 37107-37109 (July 9, 2007) (suspension notice) (only 40 C.F.R. § 125.90(b) from the Phase II Rule remains in effect), in response to the decision in *Riverkeeper, Inc. v. EPA,* 475 F.3d 83 (2d Cir. 2007). This court decision remanded numerous provisions of the Rule – including its 60 to 90% entrainment reduction performance standard – back to EPA for further evaluation.

As a result, neither statute nor regulation currently mandates a specific numeric percentage of entrainment reduction for WS. Instead, permit limits for cooling water intakes are determined on a case-by-case basis, the Best Professional Judgment (BPJ) application of CWA § 316(b)'s requirement that the location, construction, capacity and design of cooling water intake structures reflect the Best Technology Available (BTA) for minimizing adverse environmental impact. *See* 33 U.S.C. § 1342(a)(1)(B); 40 C.F.R. §§ 125.90(b) and 401.14. Accordingly, the BTA requirements for this permit have been developed based on a case-by-case, BPJ determination of the BTA specifically for WS, as described in Section 5.5 of the Fact Sheet.

While DMF asks EPA to consider greater levels of entrainment reduction for certain fish stocks, it does not offer any viable options for reducing entrainment beyond the levels expected to be obtained by the proposed flow reductions. Put simply, few technologies are capable of achieving the levels of entrainment reduction cited by DMF. For its part, EPA evaluated a number of technologies for possible implementation at WS, including two technologies – closed-cycle cooling and wedgewire screens – that *are* potentially capable of reducing entrainment by 60% or greater, as urged by the commenter. Yet, EPA determined that neither of these technologies is available at WS and EPA is aware of no other available technology that can achieve this level of entrainment reduction. Nevertheless, the conditions in the new permit do represent a significant environmental improvement as the flow reductions required by the permit will result in corresponding reductions in entrainment and impingement. EPA has determined that the Final Permit conditions reflect the BTA for WS to minimize entrainment, particularly for rainbow smelt, river herring, and winter flounder.

With regard to the comment concerning the use of older entrainment data, EPA acknowledges that the historic data that has been used may not be representative of current conditions, but it is the best available site-specific data for this facility. Obtaining new data at this point would delay the issuance of a Final Permit with more stringent requirements under Section 316(b) of the Clean Water Act and would prevent the river from receiving the benefit of these requirements, possibly for several more years. The permittee will be generating additional information through monitoring as we move forward.

In addition, the permit does not require calculation of changes in entrainment based on flow reductions. EPA intends to use annual loss estimates gathered from entrainment monitoring, coupled with adult equivalent analyses, to assess entrainment at this facility. EPA believes that the proposed flow reductions represent BTA and will benefit fish stocks by reducing entrainment over currently permitted flows. In fact, the Final Permit requires that flow reductions be timed specifically to maximize benefits for those species whose eggs and larvae are prevalent in the spring, including species of particular concern for DMF and EPA, such as river herring and rainbow smelt.

D) Comments submitted by Todd Callaghan of the Office of Coastal Zone Management of the Commonwealth of Massachusetts:

Comment D1: I am also pleased to see that the revised NPDES permit includes modifications to Wheelabrator's cooling water intake structure, in an effort to reduce entrainment and impingement. In particular, the flow reductions from October to May, the fish return system re-design, and the maximized use of variable speed pumps and rotating screens should result in reductions in entrainment and impingement. In addition to the requirements in Part I.C.1.a., I suggest that:

1. EPA require the applicant to modify the fish return system so that all angles in the system are less than 22.5°, as was requested by Massachusetts Division of Marine Fisheries and as EPA required in the Taunton River Municipal Lighting Plant NPDES permit (MA 0002241, Section C. 3.b.); and

2. EPA require that the fish return system include an in-line holding tank so that physical stress to the fish being returned to the Saugus River can be reduced, and so that the evaluation of survival of impinged fish and fish impingement counts can be improved.

Response to Comment D1: See response to Comment C5.

E) Comments submitted by Elizabeth Sorenson, Director of the Area of Critical Environment Concern (ACEC) Program with the Department of Conservation and Recreation of the Commonwealth of Massachusetts:

General Comment: The DCR administers the ACEC Program on behalf of the Massachusetts Executive Office of Energy and Environmental Affairs. These comments are written from the perspective of the ACEC Program. We submit these comments primarily to clarify language in the draft NPDES permit regarding the regulatory impacts of ACEC designation on future WS facility upgrades or modifications.

The Rumney Marshes ACEC, designated in 1988, comprises approximately 2,800 acres in the municipalities of Boston, Lynn, Revere, Saugus, and Winthrop. The area provides an expansive recreational and ecological sanctuary in an urban setting. The salt marshes within the ACEC are critical to the surrounding human population in their capacity to prevent flood damage by providing flood water storage. The water bodies and wetlands of the Rumney Marshes ACEC are classified as Outstanding Resource Waters (ORW) in the Massachusetts Surface Water Quality Standards and provide significant habitat for shell and finfish. However, the Saugus River, including the portion within Rumney Marshes, is listed on the Massachusetts 2008 List of Integrated Waters as Category 5 ("impaired or threatened for one or more uses and requiring a TMDL") and impaired for fecal coliform, oil and grease, and temperature. Much of Rumney Marshes is publicly owned by DCR and the surrounding municipalities. The marsh itself and the flood protection functions it provides to the surrounding communities are threatened by development along the entire length of its perimeter.

Comment E1: The Draft Permit also evaluated other facility modifications including the installation of technologies that might require the expansion of the overall facility footprint. The Draft Permit indicated that due to the sensitivity of the area, the ACEC designation and cost, these technologies that would expand the facility's footprint were not feasible.

Effects of ACEC designation

ACEC designation recognizes significant ecosystems across the Commonwealth and is intended to foster appreciation and stewardship of unique natural and cultural resources. ACEC designation does not prohibit land development but in some cases requires a higher level of review to ensure adverse environmental impacts are adequately avoided, minimized and mitigated. In the case of solid waste management facilities such as WS, the higher standards for ACECs within the Massachusetts Department of Environmental Protection (MassDEP)'s Solid Waste Facilities Site Assignment Regulations may apply. These regulations may prohibit the siting of new or expansions/upgrades to existing solid waste management facilities within ACECs or adjacent to ACECs (310 CMR 16.00). Other state regulations relating to wetland resource areas, waterways and tidelands, and endangered species habitat may also apply.

We recognize the positive benefits the technologies proposed in the Draft Permit will have on impingement and entrainment and the surrounding estuarine habitat of the

Rumney Marshes ACEC. However, future NPDES permit reviews may be able to broaden review of technologies that could further reduce the WS facility's impacts on the ecosystem even with the higher regulatory standards within ACECs. In 1989, the WS solid waste management facility, already operating within the ACEC, was required by federal regulation to provide upgrades to comply with the Clean Air Act. Rumney Marshes ACEC was amended by the Secretary of Environmental Affairs in 1989 (as a temporary "boundary modification") to allow this upgrade with accompanying state site assignment. The ACEC boundary was reinstated after the upgrade was completed and permitted. Should future facility modifications be required that would provide overriding public and environmental benefits, the potential exists for formal public review of an ACEC amendment request to the Secretary of Energy and Environmental Affairs.

Response to Comment E1: The Agencies appreciate the clarifications provided by the ACEC Program and understand that under certain circumstances improvements to a facility may be able to be made within areas designated as ACECs, if the improvements are approved after a thorough review in accordance with ACEC program requirements. The Agencies also appreciate the example of facility modifications that were approved in the past under the ACEC program. We also acknowledge the comment's suggestion that, if warranted by the fact, "future NPDES permit reviews may be able to broaden review of technologies that could further reduce the WS facility's impacts on the ecosystem." For the current permit, as EPA explained in the Fact Sheet, the ACEC designation was one of several factors considered in determining whether certain technologies, such as closed cycle cooling, could be considered BTA for this permit. Also see the response to Comment F3 below.

Comment E2: Projects located within ACECs that require state agency action (a state permit, use of state funds, or actions proposed by a state agency) require review by the Massachusetts Environmental Policy Act (MEPA) Office (excluding single family homes and routine maintenance). We recommend the proponent consult with the MEPA Office to determine whether the proposed changes to the WS facility would require any state agency actions that would require a formal MEPA review.

Response to Comment E2: EPA and MassDEP note the ACEC Program Office's comment "recommend[ing that] the proponent consult with the MEPA Office to determine whether the proposed changes to the WS facility would require any state agency actions that would require a formal MEPA review." The permitting agencies further state that the permittee must comply with any applicable legal requirements as it moves forward in order to achieve compliance with the new permit.

F) Comments submitted by Joan Leblanc, Executive Director of the Saugus River Watershed Council:

General Comment: The Saugus River Watershed Council (SRWC) is a non-profit organization founded in 1991 to protect and restore the natural resources of the Saugus River watershed. The SRWC has been actively involved in protecting and restoring the natural resources of the region by working with federal, state and local agencies to implement the Rumney Marshes Salt Marsh Restoration Plan, monitor and promote restoration of historic fisheries, monitor and improve water quality, remove illegally dumped debris, and educate the public about the natural resources of Rumney Marsh. Thanks to increased environmental enforcement and local cleanup efforts, the Massachusetts Division of Marine Fisheries in conjunction with local communities reopened shellfish beds (conditionally with depuration) in the Saugus / Pines River estuary during 2007. For the past five years, the Saugus River Watershed Council has been working in partnership with the Division of Marine Fisheries to monitor, protect and restore habitat for historic fisheries such as rainbow smelt and American eel in the Saugus River watershed.

Our primary concerns related to the draft NPDES permit for Wheelabrator are the need to: 1) minimize thermal impacts associated with discharged cooling water; and 2) reduce the amount of fish that are directly harmed during the intake and discharge process.

Comment F1 As noted in the Fact Sheet, reductions in the amount of cooling water withdrawals should result in corresponding reductions in fish injured or killed by impingement and fish eggs and larvae killed by entrainment. Page 13 of the Fact Sheet states, "Due to operational considerations, a year-round increase in the Delta T limit from 20 °F to 22 °F is needed to accommodate these flow restrictions." Unfortunately the permit does not define 'operational considerations'. Since these operational conditions provide the basis for weakening temperature provisions from the limits included in the 1991 permit, the Fact Sheet should include a detailed analysis of what the operational considerations are and why they are necessary.

Response to Comment F1: See the permittee's general comment above that discusses operational considerations. In order to be able to comply with the lower flow limits for certain periods of the year, the permittee would need to operate at slightly higher delta Ts. This would allow the permittee to generate an equivalent amount of electricity and reduce the amount of steam it would need to vent as it approaches the delta T and effluent temperature limits. As the comment acknowledges, this would result in lower rates of entrainment and impingement. As explained in the Fact Sheet, any short term effects from this increase in delta T is believed to be outweighed by the benefits of lower impingement and entrainment as was discussed and quantified in the Fact Sheet. See Response A1 for additional discussion on potential thermal impacts.

Comment F2: **The Saugus River Watershed Council is opposed to the provisions of the Wheelabrator Saugus NPDES permit that would provide less stringent controls of thermal discharges to the Saugus River**. Specifically, we support the EPA's decision not to remove the year round maximum effluent temperature limit of 90 °F, but we are opposed to the EPA's decisions to grant Wheelabrator an increase in the year-round delta T limit of 22 °F, and to change the method for calculating both the maximum effluent temperature limit and delta T limit from instantaneous values to hourly averages.

Response to Comment F2: The thermal discharge limits for this permit are based upon the application of CWA § 316(a), which requires that the limits assure the protection and propagation of the balanced, indigenous population of fish, shellfish and wildlife (BIP) in the Saugus River. EPA had concluded that the Max-T discharge limit of 90°F with a Delta-T limit of 22°F, represents a limited risk of heat-induced lethality or other adverse effects and is protective of the BIP.

Thermal modeling suggests that the Saugus River system in the area affected by Wheelabrator Station's discharge is well mixed and the thermal discharge is rapidly diluted for most phases of the tidal cycle. During periods of low slack tide, however, there is a period of approximately one hour when mixing is reduced and elevated water temperatures may collect in a small area within the river. This pocket of warm water is quickly dispersed after the tide turns. Due to the ephemeral nature of this phenomenon, the regulatory agencies are less concerned about avoidance responses -- i.e., fish avoiding the area due to elevated temperatures -- but must still be wary of heat-induced lethality.

It is important to understand that the increase in the Delta-T limit does not allow a significant increase change in the mass flux of heat into the river, because the increased Delta-T will, at most times, be accompanied by a reduction in intake and discharge volumes, and because the permit retains the Max-T limit of 90°F. In addition, modeling had shown that under most conditions the relative amount of heat added to the system by Wheelabrator Station is small compared to other sources, such as the river flow from upstream, the mudflats after low tide. Finally, modeling suggests that the footprint of the thermal plume is not significantly different between the new permit limits and the old limits, thus we do not anticipate any significant changes in the level of thermal impacts.

In sum, EPA concludes that the new permit limits will benefit the ecology of the Saugus River by reducing entrainment and impingement losses, while having a negligible effect on thermal discharges.

Comment F3: Unfortunately, the initial decision not to require cooling towers at the facility has resulted in significant thermal discharges to the Saugus River and the Rumney Marshes Area of Critical Environmental Concern since the facility's inception. Given the general agreement among Wheelabrator, EPA and DEP that cooling towers are not practicable at this site, every effort should be made to reduce thermal discharges utilizing all other available technologies. Because the Saugus River is already on the Massachusetts Department of Environmental Protection's 2006 303(d) list of impaired waters for thermal modifications, it is extremely important that any new environmental permit not include provisions that could worsen the situation. Consideration of alternatives such as a 'scaled down' version of cooling towers to reduce some percentage of the thermal discharges could also be considered.

Response to Comment F3: As stated in the Response to General Comment A, EPA considered maximum discharge temperature limits lower than 90° F, but currently feels that, due to the limited temporal and spatial scale of the plume predicted by the thermal model, the more conservative approach of a lower discharge temperature is not required at this time. EPA believes that the total amount of heat discharged to the Saugus River (as measured in British Thermal Units) will change very little, if at all, despite the increased Delta-T because the permit also decreases the volume of the thermal effluent that is allowed and maintains the maximum discharge temperature limit of 90°F (See p. 13 of the Fact Sheet). Thermal modeling presented in the Fact Sheet suggests that, with the operational changes proposed under the Final Permit, the thermal plume will be virtually identical to the current condition in size, shape and magnitude.

Thus, the operational changes proposed in the Final Permit will not worsen the thermal discharge from WS and will benefit fish and invertebrate populations in the Saugus River through the reduction in impingement mortality and entrainment. Furthermore, as presented in the Fact Sheet and reiterated in this Response to Comments, EPA determined that a year-round maximum effluent temperature limit of 90°F assures the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife on and in the Saugus River. For these reasons, a "scaled down" version of cooling towers to reduce the facility's thermal discharge was not considered. The regulatory agencies continue to think that it is not necessary to further consider this option. (The agencies note that it is not entirely clear what the commenter is suggesting with regard to a "scaled-down" version of cooling towers, but the agencies believe that this refers to a cooling tower system with the capacity to handle only some of the facility's cooling water.)

EPA did evaluate the feasibility of installing cooling towers at WS in order to minimize the adverse environmental impacts (e.g., entrainment and impingement) associated with the cooling water intake structure (CWIS). Cooling towers minimize the volume of cooling water withdrawn from the waterbody, resulting in an entrainment reduction proportional to the reduction in volume (in some cases as high as 98%). EPA determined that cooling towers were not available at WS due to the limited space available for cooling towers of any size, as well as the adverse environmental impacts associated with the disturbance to sensitive salt marsh and tidal flat habitat (See Fact Sheet p.48-49). Other factors considered in this determination included potential non-water quality impacts from salt drift, vapor plumes, noise, and the suitability of soils to support the structures. See Part 7.4.2.3 of the Fact Sheet for a full discussion of closed cycle cooling for this site. It is likely that a scaled-down version of cooling towers would also raise some or all of these same issues, albeit to a lesser extent.

Comment F4: The Saugus River Watershed Council is also concerned about the potential extent of the 'mixing zone' for thermal discharges to the Saugus River. The Fact Sheet included with this proposed permit indicates that the mixing zone extends beyond 50% of the river's width, which is not consistent with the state's Mixing Zone Policy. The extensive size of the mixing zone could be acting as a thermal barrier discouraging fish passage.

Response to Comment F4: This permit is based on a 316(a) variance, not on water quality standards, thus the state mixing zone policy does not apply here. That being said, the thermal plume only exceeds 50% of the width of the river for short periods of time during slack low tide. Due to the limited temporal nature of this phenomenon, the thermal plume is unlikely to act as a thermal barrier to fish passage (*See* Attachment A, MassDEP Mixing Zone Analysis.)

Comment F5: The Saugus River Watershed Council strongly disagrees with the statement on page 18 of the Fact Sheet that 'anti-backsliding' provisions of the Clean Water Act do not apply to this permit. This statement and the justification provided in the Fact Sheet are in complete opposition to the intent of the Clean Water Act. The fact that the 1991 permit was based upon a variance because it doesn't meet certain provisions of the Clean Water Act, should provide an even stronger argument for ensuring that the anti-backsliding provisions of the Clean Water Act are met in this case. When you combine the previous variance with the facts that the site is already degraded, has multiple sources of thermal pollution, and is located within an ACEC, it should be a foregone conclusion that in the 19 years since the last permit was issued, any new permit would include only more stringent and not weaker provisions to protect water quality and fisheries in the river.

Response to Comment F5: While we understand the Saugus River Watershed Council's position that the CWA should not allow the relaxation of permit provisions that were previously based on a Section 316(a) variance, Congress did not structure the CWA in this manner. The anti-backsliding provisions of the CWA, set forth in Section 402(o) of the CWA and 40 C.F.R. §122.44(l), state that a permit may not be renewed, reissued, or modified to contain less stringent effluent limitations than the comparable effluent limitations in the previous permit only in cases where the previous permit limits were established on the basis of Section 402(a)(1)(B) (i.e., technology-based effluent limitations) or Sections 301(b)(1)(C) or 303(d) or (e) (i.e., water quality-based effluent limitations). The anti-backsliding provisions do not refer to the renewal, reissuance, or modification of permits that previously contained effluent limitations established on the basis of a Section 316(a) variance under the CWA. Therefore, since EPA is reissuing a permit that previously contained thermal discharge limitations based on a 316(a) variance, rather than based on technology or water quality standards, the anti-backsliding provisions of the CWA do not apply to the 316(a) variance aspects of this permit reissuance. As long as the thermal limits ensure the protection and propagation of the BIP, the limits comply with the requirements of the CWA and EPA's regulations.

Even if the anti-backsliding provisions of the CWA were applied to this permit, however, two exceptions to the anti-backsliding bar on relaxing permit limits would apply to the thermal discharge limits set forth in this permit. The statute and regulations offer an exception to the anti-backsliding provisions for permits that have limits or conditions developed pursuant to CWA § 316(a), as is the case in this permit. *See* 33 U.S.C. § 1342(o)((2)(D); 40 C.F.R. §122.44(l)(2)(i)(D). Additionally, the regulations at 40 C.F.R. §122.44(l)(2)(i)(B)(1) provide an exception to the anti-backsliding provisions where information is available that was not available at the time of the earlier permit issuance that would have justified the application of a less stringent effluent limitation. New information became available to EPA that was not available at the time of the previous permit issuance, including the results of temperature modeling at the facility, coupled with consideration of new intake flow restrictions, which supported the changes in the thermal discharge limits in this permit.

Comment F6: Detail regarding the thermal modeling described in the Fact Sheet for this permit is very limited. It is difficult to determine how the proposed permit changes will affect the size of the thermal plume, or exactly how the less stringent temperature limits would affect overall temperature in the Saugus River if included in the Final Permit. Even if the negative impact associated with increasing delta T temps to 22 ^{o}F and changing monitoring methods from instantaneous to hourly average temperatures were offset by reducing withdrawals and improving the intake process, that argument should not be used to justify weakening provisions of the permit. To be consistent with the goals of protecting an ACEC and striving to meet CWA provisions, the permit should include provisions that will provide the greatest possible environmental protection -- in this case, the proposed improvements in addition to at least maintaining the existing 1991 permit requirements associated with temperature.

Response to Comment F6: EPA and the state resource agencies (Mass DMF, Mass CZM, Mass DEP) have reviewed the model results and believe that the extent of the thermal plume with the new permit limits will be virtually identical to that associated with the old permit limits. Thus, all reviewers involved believed that there will be little to no change expected in the level of thermal impacts. All modeling information provided by the permittee to EPA is part of the permit's administrative record. Over the course of this new permit, EPA anticipates continuing to evaluate the extent of the thermal plume, especially at periods of slack low tide.

Comment F7: While the research highlighted in the Fact Sheet associated with this permit provides useful information about the relationship between elevated temperatures and fish mortality, it does not provide adequate information about chronic toxicity or negative impacts related to fish passage, development, or feeding. The MA Division of Marine Fisheries has been documenting an overall decline in herring runs throughout New England. The impact of elevated temperatures needs to be evaluated within the context of these elevated levels of concern for herring and other anadromous fish that utilize various habitats within the Saugus River watershed to feed, spawn and mature.

Response to Comment F7: Due to the natural salinity gradient in the Saugus River, the lower part of the river near the Wheelabrator discharge is not considered spawning habitat for anadromous fish. It is important that the discharge does not result in a thermal blockage to fish movement. Thermal modeling shows that the Massachusetts Mixing Zone policy is met for most of the time. Briefly, during periods of slack low tide, the thermal plume may span greater than 50% of the width of the river. The state resource agencies have reviewed this and do not believe that this constitutes an impediment to normal fish migration.

Comment F8: The proposed permit includes broad assumptions about the impact of the proposed permit changes on water quality and fisheries in the Saugus River based upon very limited modeling and fish data that are two decades old. It is impossible to adequately evaluate the impact on fish from existing conditions vs. those proposed in the permit, since the detail provided in the Fact Sheet does not provide information regarding impact on fisheries for the past two decades. Considering that this proposed 2009 permit will be replacing the previous permit in place since 1991, information regarding fish impingement and entrainment of larvae and eggs should be provided for the period subsequent to the 1991 permit. We recommend that the EPA require Wheelabrator to submit more recent data regarding fish impingement and fish egg and larvae entrainment which can be used as a baseline to determine the impact of conditions proposed in this permit as well as evaluate impact going forward once a Final Permit is approved.

Response to Comment F8: This permit will require Wheelabrator to collect and submit additional information on entrainment and impingement. This information will be collected within the term of the new permit and should prove useful for making future permitting decisions. In this instance, EPA does not feel it is appropriate to wait for this additional data collection prior to permit reissuance. Thus, EPA is issuing a permit that should improve the ecology of the Saugus River immediately, while collecting additional data for future permitting actions as well.

Comment F9: We agree with DMF's recommendations regarding counting both dead and alive fish to determine when the 25 fish threshold for an 'unusual impingement event' has been reached. We also strongly agree with DMF's recommendations that whenever an unusual impingement event occurs, fish counts are taken every four hours and the screens continuously rotated until the number of fish, dead or alive, drops below 25 impinged fish.

Response to Comment F9: EPA acknowledges this comment and refers the commenter to response to Comments C1 and C2. In addition, the Final Permit has added language defining the end of a UIE as characterized by a fish impingement rate of less than 5 fish per hour.

Comment F10: SRWC supports the proposed permit requirements associated with separating debris from fish before returning fish to the river. We urge EPA to review (with input from the MA Division of Marine Fisheries) the planned structures for returning fish to the Saugus River to ensure that the system protects fish by minimizing obstructions and trauma while providing suitable temperatures to promote survival.

Response to Comment F10: EPA acknowledges the comment regarding the separation of debris and fish and refers the commenter to the response to Comment C6 regarding the requirements to install an improved fish return system.

Comment F11: Regular monitoring of temperatures in the receiving waters should also be required to determine the permit's actual effect on thermal pollution in the ACEC.

Response to Comment F11: In the Final Permit, the permittee is required to routinely monitor temperature in the effluent. The permittee's thermal model has produced reasonable predictions of water temperature, because it was calibrated using historic water temperature data collected in numerous locations within the river. As a result, EPA believes that as long as the permittee complies with its thermal discharge limits, the resulting water temperatures in the river should have minimal impact on the resident organisms of the Saugus River. At this time, EPA is not requiring the permittee to measure water temperatures in the receiving waters in the Final Permit.

February 9, 2010