



# *Massachusetts Bay Transportation Authority*

*Deval L. Patrick*  
Governor

*Timothy P. Murray*  
Lt. Governor

*James A. Aloisi, Jr.*  
Secretary and MBTA Chairman

*Daniel A. Grabauskas*  
General Manager

June 1, 2009

US Environmental Protection Agency  
NCCW GP Processing  
Municipal Assistance Unit (CMU)  
1 Congress Street, Suite 1100  
Boston, MA 02114-2023

To Whom It May Concern:

The Massachusetts Bay Transportation Authority (MBTA) submits the attached Notice of Intent (NOI) to the USEPA and the MADEP, to be covered by the NPDES Noncontact Cooling Water General Permit (MAG 250000).

The attached NOI states that the discharge meets the applicable requirements of the General Permit, and the MBTA is requesting coverage under the NPDES Noncontact Cooling Water General Permit (MAG 250000).

Sincerely,

Janis O. Kearney  
Director of Environmental Compliance

**Attachment**

O:\Permits\EPA NOI Noncontact Cooling.doc

***Driven by Customer Service***

Massachusetts Bay Transportation Authority, Ten Park Plaza, Boston, MA 02116-3974



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General Manager

June 1, 2009

Massachusetts Department of Environmental Protection  
Division of Watershed Management  
627 Main Street, 2<sup>nd</sup> Floor  
Worcester, MA 01608

To Whom It May Concern:

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**APPENDIX 5**

**Suggested Form for Notice of Intent (NOI) for the Noncontact Cooling Water General Permit**

**1. General facility information. Please provide the following information about the facility.**

<b>a) Name of facility:</b> MBTA Everett Facility		<b>Type of Business:</b> Public Transportation Maintenance Facility
<b>Facility Location Address :</b> 80 Broadway Everett MA 02149 <b>longitude:</b> 71-03'45" <b>latitude:</b> 42-23'30"	<b>Facility SIC codes:</b> 411	<b>Facility Mailing Address (if not location address)</b> MBTA Environmental Department 10 Park Plaza Boston MA, 02116-3974
<b>b) Name of facility owner:</b> Massachusetts Bay Transportation <b>A</b>		<b>Email address of owner:</b> jkearney@mbta.com
<b>Owner's Tel #:</b> (617) 222-1592 <b>Owner's Fax #</b> (617) 222-1557		<b>Owner is (check one):</b> 1. Federal <input type="checkbox"/> 2. State <input checked="" type="checkbox"/> 3. Tribal <input type="checkbox"/> 4. Private <input type="checkbox"/> 5. Other <input type="checkbox"/> (Describe) _____
<b>Address of owner (if different from facility address)</b>   		
<b>Legal name of Operator, if not owner:</b> _____ <b>Operator Contact Name:</b> _____ <b>Fax Number:</b> _____ <b>Operator Tel Number:</b> _____ <b>Operator's email:</b> _____ <b>Operator Address (if different from owner)</b> _____		
<b>d) Attach topographic map indicating the locations of the facility and the receiving water; all NCCW discharge points; upstream and downstream monitoring points. Map attached? <input checked="" type="checkbox"/></b>		
<b>e) Check Yes or No for the following:</b> 1. Has a prior NPDES permit been granted for the discharge? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If Yes, Permit Number: MAG250005 2. Is the discharge a "new discharge" as defined by 40 CFR Section 122.22? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> 3. Is the facility covered by an individual NPDES permit? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If Yes, Permit Number _____ 4. Is there a pending application on file with EPA for this discharge? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If Yes, date of submittal: _____		

**2. Discharge information. Please provide information about the discharge, (attaching additional sheets as needed)**

a) Name of receiving water into which discharge will occur: Mystic River  
State Water Quality Classification: \_\_\_\_\_ Freshwater: \_\_\_\_\_ Marine Water: SB

b) Describe the discharge activities for which the owner/applicant is seeking coverage: The facility uses two (2) engine dynometers. Non contact cooling water is discharged from both dynometers.

c) **FOR MASSACHUSETTS FACILITIES ONLY: Engineering Calculations:** Submit the completed engineering calculation of the surface water temperature rise as shown in Attachment A of the General Permit. Check if attached: ✓

d) Number of outfalls 1

For each outfall:

e) What is the maximum daily and average monthly flow of the discharge? Note that EPA will use the flow reported here as the facility's permitted effluent flow limit. Max Daily Flow 13,000 GPD Average Flow 6,500 GPD

f) What is the maximum daily and average monthly temperature of the discharge (in degrees F)? Max Temp. 140° Average Temp. 132°

g) What is the maximum and minimum monthly pH of the discharge (in s.u.)? Max pH 8 Min pH 6

h) **FOR MASSACHUSETTS FACILITIES ONLY:** Is the source water of the NCCW potable water? Yes ✓ No \_\_\_\_\_ If Yes, EPA will calculate the Total Residual Chlorine limit for facilities located in Massachusetts.

i) Is the discharge continuous? Yes \_\_\_\_\_ No ✓ If no, is the discharge periodic (P) (occurs regularly, i.e., monthly or seasonally, but is not continuous all year) or intermittent (I) (occurs sometimes but not regularly) or both (B) I  
If (P), number of days or months per year of the discharge \_\_\_\_\_ and the specific months of discharge \_\_\_\_\_;  
If (I), number of days/year there is a discharge 156

j) Latitude and longitude of each discharge within 100 feet: outfall 1: long. 71° 03'45" lat. 42° 23'30"; outfall 2: long. \_\_\_\_\_ lat. \_\_\_\_\_;  
outfall 3: long. \_\_\_\_\_ lat. \_\_\_\_\_ (See [http://www.epa.gov/tri/report/siting\\_tool](http://www.epa.gov/tri/report/siting_tool))

k) Provide the reported or calculated seven day-ten year low flow (7Q10) of the receiving water \_\_\_\_\_ cfs  
Please attach any calculation sheets used to support stream flow and dilution calculations. See General Permit Attachment B for equations and additional information.

**MASSACHUSETTS FACILITIES:** See Part 3.4 and Appendix 1 of the General Permit for more information on ACEC.  
Areas of Critical Environmental Concern (ACEC): Does the discharge occur in an ACEC? Yes \_\_\_\_\_ No ✓  
If yes, provide the name of the ACEC: \_\_\_\_\_

**3. NCCW Source Water Information.** Please provide information about the NCCW source water, using separate sheets as necessary:

<p>a) Indicate source of the NCCW (i.e., municipal water supply, private well, surface water withdrawal, groundwater):                  Source: <u>MVRA (Everett)</u>                  Name of Source Water: <u>Mass Water Resources Authority</u>                  _____                  Is the source registered/permitted under MA Water Management Act or NHDES Water User Registration Rule (Env Wq 2202)?                  Yes _____ No _____                  If yes, registration number: _____</p>	<p>b) If source water is surface water:                  i) Is it a freshwater river or stream Yes _____ No _____                  ii) Is it a lake? _____ reservoir? _____                  iii) Is it tidal river? _____ estuary? _____ ocean? _____                  c) Is the source water groundwater? Yes _____ No _____ If yes, see Appendix 8 and submit effluent and surface water test results, as required in Part 5.4 of the General Permit.                  d) Does the facility use both a primary and backup source of noncontact cooling water?                  Yes _____ No _____                  If yes, attach information that identifies and explains the primary and backup sources of noncontact cooling water for and how often the backup supply was used in last three years.</p>
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**4. Best Technology Available for CWIS**

Are you subject to BTA requirements at Part 4.2 of the General Permit? (Facility's discharge is covered by this General Permit and the facility withdraws noncontact cooling water from surface source water). Yes \_\_\_\_\_ No \_\_\_\_\_  
 If No, explain:

If YES, attach the facility-specific BTA description as required in Part 4.3 of the General Permit. For additional information and guidance, see Questions 13-23 of the NCCW Fact Sheet, posted at <http://www.epa.gov/region1/npdes/nccwgp.html>. Provide a map showing the location of each CWIS intake structure; NCCW outfall(s) and any CWIS feature referred to in the BTA description.

**Include in your description:**

- \_\_\_\_\_ Measures to meet the General Permit Part 4.3.a general BTA requirements, including documentation that describes the facility's monitoring program for impinged fish and/or invertebrate; or the required alternative monitoring plan frequency and/or protocol
- \_\_\_\_\_ A characterization of the source water body's aquatic life habitat in the vicinity of each CWIS during the seasons when the CWIS may be in use
- \_\_\_\_\_ The attributes of the current CWIS
- \_\_\_\_\_ Design measures of the CWIS
- \_\_\_\_\_ Operation measures of the CWIS
- \_\_\_\_\_ Historical occurrence of impinged fish for the past five years
- \_\_\_\_\_ If applicable, a demonstration that the facility's intake rate is commensurate with a closed-cycle recirculation system
- \_\_\_\_\_ Other components to reduce impingement and/or entrainment of aquatic life

**4. BTA FOR CWIS CONTINUED:**

Provide the following information for each CWIS to support your attached facility-specific BTA description.

Design capacity of the of the CWIS \_\_\_\_\_MGD

Maximum monthly average intake of the CWIS during the previous five years \_\_\_\_\_MGD    Month in which this flow occurred \_\_\_\_\_  
Maximum through-screen design intake velocity \_\_\_\_\_feet/second (fps)

For facilities where the CWIS is located on a freshwater river or stream, provide the following information:

The source water's annual mean flow \_\_\_\_\_cubic feet/second (cfs) as available from USGS or other appropriate source

The design intake flow as a % of the source water's annual mean flow \_\_\_\_\_ Attach calculations if equal to or less than 5% of annual mean flow.

The source water's 7Q10 \_\_\_\_\_cfs. See Attachment B of the General Permit for more information on 7Q10 determinations.

The design intake flow as a percent of the source water's 7Q10 \_\_\_\_\_

**5. Contaminant Information**

If applicable, attach a listing of all non-toxic pH neutralization and/or dechlorination chemicals used, including chemical name and manufacturer; maximum and average daily quantity used as well as the maximum and average daily expected concentrations (mg/l) in the NCCW discharge, and the vendor's reported aquatic toxicity (NOAEL and/or LC<sub>50</sub> in percent for aquatic organism(s)).

**6. Determination of Endangered Species Act Eligibility:** Provide documentation of ESA eligibility as required at Part 3.4 and Appendix 2, Part C, Step 4, of the General Permit. In addition, respond to the following questions.

a) Are any listed threatened or endangered species, or designated critical habitat, in proximity to the discharge? Yes \_\_\_\_\_ No

b) Has any consultation with the federal services been completed? Yes \_\_\_\_\_ No \_\_\_\_\_

c) Is consultation underway? Yes \_\_\_\_\_ No

d) What were the results of the consultation with the U.S. Fish and Wildlife Service and/or NOAA Fisheries Service (check one):  
a "no jeopardy" opinion \_\_\_\_\_ or written concurrence \_\_\_\_\_ on a finding that the discharges are not likely to adversely affect any endangered species or

e) Which of the five eligibility criteria listed in Appendix 2, Section B (A,B,C,D or E) have you met? A

f) Attach a copy of the most current federal listing of endangered and threatened species from the USF&W web site listed in Appendices 2, 2.1 and 4

**7. Documentation of National Historic Preservation Act requirements:** Please respond to the following questions:

a) Are any historic properties listed or eligible for listing on the National Register of Historic Places located on the facility site or in proximity to the discharge? Yes \_\_\_\_\_ No

b) Have any State or Tribal historic preservation officers been consulted in this determination? Yes  or No \_\_\_\_\_ If yes, attach the results of the consultation(s).

c) Which of the three National Historic Preservation Act requirements listed in Appendix 3, Section C (1,2 or 3) have you met? 2

8. **Supplemental Information:** Please provide any supplemental information. Attach any analytical data used to support the application. Attach any certification(s) required by the general permit

9. **Signature Requirements:** The Notice of Intent must be signed by the operator in accordance with the signatory requirements of 40 CFR Section 122.22 (see below) including the following certification:

I certify under penalty of law that (1) no biocides or other chemical additives except for those used for pH adjustment and/or chlorination are used in the noncontact cooling water (NCCW) system; (2) the discharge consists solely of NCCW (to reduce temperature) and authorized pH adjustment and/or dechlorination chemicals; (3) the discharge does not come in contact with any raw materials, intermediate product, water product (other than heat) or finished product; (4) if the discharge of noncontact cooling water subsequently mixes with other wastewater (i.e. stormwater) prior to discharging to the receiving water, any monitoring provided under this permit will be only for noncontact cooling water; (5) where applicable, the facility has complied with the requirements of this permit specific to the Endangered Species Act and National Historic Preservation Act; and (6) this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted.

Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, I certify that the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I certify that I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Facility Name: MBTA Everett Maintenance Facility

Operator signature: *James O. Kennedy*

Title: Director of Environmental Compliance

Date: 6/1/09

Federal regulations require this application to be signed as follows:

1. For a corporation, by a principal executive officer of at least the level of vice president;
2. For a partnership or sole proprietorship, by a general partner or the proprietor, respectively, or,
3. For a municipality, State, Federal or other public facility, by either a principal executive officer or ranking elected official.

# **Everett Heavy Bus Repair Shop**

## ***CNG Retrofit and Fire Protection System***

### ***Everett, Massachusetts***



**PROJECT LOCATION**

**FIGURE 1**



Facility	Permit No.	Receiving Water (Watershed)	7Q10 (MGD)
Isomedix Operations, Steris Corp Northboro	MAG250029	Wheeler Pond (SuAsCo)	Lake
Jen-Coat , Inc. Westfield	MAG250856	Westfield River	25
Kiddie-Fenwal, Inc. Ashland	MAG250946	Cold Spring Brook (SuAsCo)	0.23
Lawrence Hydropower Associates Lawrence Hydroelectric Project Lawrence	MAG250948	Merrimack River	604
Lewcott Corporation Millbury	MAG250969	Blackstone River	~63
Mantrose-Haeuser Company, Inc. Attleboro	MAG250958	Ten Mile River	0.9
MBTA Everett Shops Everett		Mystic River	2.8
MGH Institute of Health Professions Charlestown	MAG250019	Boston Harbor	Marine
MWRA Oakdale Power Station West Boylston	MAG250025	Quinapoxet River (Nashua)	3.4
Norfolk & Dedham Mutual Fire Insurance Co., Dedham	MAG250034	Charles River	8.3
Parkview Condominiums Winchester	MAG250009	Aberjona River (Mystic)	0.24
Photofabrication Engineering, Inc. Milford	MAG250033	Quarry (Charles)	Quarry
Polymer Corp. Monson	MAG250376	Chicopee Brook (Chicopee)	0.8
Raytor Compounds (formerly Perstorp Compounds, Inc.) Florence	MAG250960	Mill River (Connecticut)	4.1
Riverdale Mills Northbridge	MAG250279	Blackstone River	29
Saint-Gobain Containers Milford	MAG250911	Charles River	0.05




U.S. Department  
of Transportation  
**Federal Transit  
Administration**

REGION I  
Connecticut, Maine,  
Massachusetts,  
New Hampshire,  
Rhode Island, Vermont

Volpe Center  
55 Broadway Suite 920  
Cambridge, MA 02142-1093  
617-494-2055  
617-494-2865 (fax)

Mr. Daniel A. Grabauskas  
General Manager  
Massachusetts Bay Transportation Authority  
Ten Park Plaza  
Boston, MA 02116

 FEB 28 2008

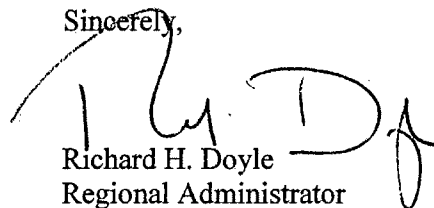
**Re: Everett Bus Shop  
Categorical Exclusion**

Dear Mr. Grabauskas:

After reviewing the Categorical Exclusion checklist submitted by the Massachusetts Bay Transportation Authority (MBTA) for renovations to the Everett Bus Shop, the Federal Transit Administration (FTA) has determined that the specific conditions for a Categorical Exclusion under 23 CFR 771.117 (d) (9) are satisfied and that significant environmental impacts will not result (attached).

If you have any questions, please contact Donna Laidley at 617-494-2484. The FTA looks forward to continuing to work with you on this transit improvement.

Sincerely,



Richard H. Doyle  
Regional Administrator

Attachment

## CATEGORICAL EXCLUSION

**Project:** Everett Bus Shop Renovations

**Project Location:** Everett, MA

**Project Applicant:** Massachusetts Bay Transportation Authority

### Project Scope

The Massachusetts Bay Transportation Authority (MBTA) proposes to utilize Federal Transit Administration (FTA) financial assistance to retrofit the Everett Bus Shop for compressed natural gas (CNG) and to upgrade the fire protection system. Additional facility renovations include improvements to paint booths, steam cleaning room, degreasing area, automotive shop, body shop, transmission shop and employee support facilities. The majority of work will be within existing buildings with the exception of a small building extension into a currently paved area.

### Section 106


There are no historic resources in the immediate vicinity of the project. The MBTA conducted an evaluation of the facility and determined that the facility meets the criteria for eligibility for listing in the National Register, under Criteria A and C despite major interior alterations that occurred over the years. Based upon materials submitted by the MBTA and in accordance with Section 106 of the National Historic Preservation Act, the FTA finds that the project will not result in adversely affecting the historic character of the building façade. The Massachusetts Historical Commission on February 21, 2008, concurred in FTA's determination.

### Section 4(f)

In accordance with 23 CFR 771.135, FTA has determined that Section 4(f) requirements do not apply since this project does not use 4(f) resources.

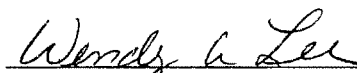
### National Environmental Policy Act

Based on the attached Categorical Exclusion checklist submitted by the MBTA, the FTA finds that the specific conditions or criteria for a Categorical Exclusion under 23 CFR 771.117(d) (9) are satisfied and that significant environmental impacts will not result.

  
\_\_\_\_\_  
Richard H. Doyle  
Regional Administrator, FTA Region I

Date: 2/28/08

Concurrence:

  
\_\_\_\_\_  
Wendy A. Lee  
Regional Counsel

Date: 2/28/08

# **Massachusetts**

Common Name	Scientific Name	Status	Distribution
<b>FISHES:</b>			
Sturgeon, shortnose*	Northeastern bulrush	E	Atlantic coastal waters and rivers (Conn. R.)
<b>REPTILES:</b>			
Turtle, bog	Clemmys	T	Berkshire County
Turtle, green*	muhlenbergii	T	Oceanic straggler in southern New England
Turtle, hawksbill*	Chelonia mydas	E	Oceanic straggler in southern New England
Turtle, leatherback*	Eretmochelys imbricata	E	Oceanic summer resident
Turtle, loggerhead*		T	Oceanic summer resident
Turtle, Atlantic ridley*	Dermochelys coriacea	E	Oceanic summer resident
Turtle, Northern red-bellied couter (Plymouth redbelly)	Caretta caretta	E	Oceanic summer resident
	Lepidochelys kempii		Plymouth & Dukes Counties
	Chrysemys rubriventris bangsi		
<b>BIRDS:</b>			
Plover, piping		T	
Tern, roseate		E	Atlantic coast, nesting
	Charadrius melodus		Atlantic coast/islands, nesting
<b>MAMMALS:</b>			
Bat, Indiana	Sterna dougallii	E	
Whale, blue*	dougallii	E	
Whale, finback*		E	Berkshire County/hist
Whale, humpback*	Myotis sodalis	E	Oceanic
Whale, right*	Balaenoptera	E	Oceanic
Whale, sei*	musculus	E	Oceanic
Whale, sperm*	Balaenoptera physalus		Oceanic
	Megaptera novaeangliae	E	Oceanic
<b>MOLLUSKS:</b>			
Wedgemussel, dwarf	Eubalaena spp. (all species)		
	Balaenoptera borealis	T	Hampshire, Franklin County
	Physeter catodon	T	
		E	

beach			Hampshire County
Beetle, American	Alasmidonta		Dukes & Bristol Coun
burying	heterodon	T	Penikese & Nantucket
			Franklin County
* Except for sea turtle nesting habitat, principal responsibility for these species is			
<b>PLANTS:</b>			
Small whorled pogonia	Cicindela puritana	E	Hampshire, Essex,
Rev. 1/8/02	Cicindela dorsalis		Hampden, Worcester,
Sandplain gerardia	dorsalis		Middlesex Counties
Northeastern bulrush	Nicrophorus		Barnstable & Dukes
	americanus		Counties
			Franklin County
	Isotria medeoloides		
	Agalinus acuta		
	Scirpus		
	ancistrochaetus		

Project Number: 612023.5400001  
Project Name/Client Name Everett CNG/ MBTA  
Calculation Title NCCW Permit Temperature Information  
Calculation Identification Number 612023.5-FAC-004 Rev. 0

<u>Preparer Frank Collins</u>	<u><i>Frank Collins</i></u>	<u>06/02/2009</u>
Name	Signature	Date
<u>Reviewer</u>	<u></u>	<u></u>
Name	Signature	Date
<u>Approver</u>	<u></u>	<u></u>
Name	Signature	Date
<u>Approver</u>	<u></u>	<u></u>
Name	Signature	Date

By: Frank Collins Date 07/18/2007 Subject Plumbing Pipe Sizing  
Chkd By: \_\_\_\_\_ Date \_\_\_\_\_ Calculation No. 612023.2-FAC-001 Rev. 0

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By: Frank Collins Date 07/18/2007 Subject Plumbing Pipe Sizing  
Chkd By: \_\_\_\_\_ Date \_\_\_\_\_ Calculation No. 612023.2-FAC-001 Rev. 0

**Purpose/Objective**

The purpose of this calculation is to determine the temperature rise and dilution factors to support the Non contact Cooling Water permit for the discharge of the cooling water from the Engine Dyno and Transmission Dyno in the Everett Bus Overall Facilities. The dynos use potable water for cooling and discharge through the Roof /Storm drainage system to the Mystic River

**Inputs**

1. From Power Test the supplier of the equipment temperatures  
The Transmission Dyno, AIDCO Model 450, uses 50 gpm when operating with a discharge temperature of 125°F. This is intermittent. I'd estimate they are actually testing (discharging water for about 20 minutes a test and could at best test 4 transmission a day.)

The Engine Dyno is a Power Test Model 50x4 uses about 150 when operating with a discharge temperature of 140°F. This is also intermittent. I'd estimate they are actually testing (discharge water for about 30 minutes a test and could test 2 engines a day)

Based on 60°F potable water

2. From Mass. Form NPDES Estimated 7Q10

Mystic River Flow rate = 2.8 MGD

**Assumptions**

1. No cooling takes place in the roof and storm water discharge piping. This is conservative since

**Computer Software**

None

**References**

- 1.

**Methodology**

1. Temperature Rise

From **ATTACHMENT A - NCCW General Permit**

**Example Receiving Water Temperature  
Engineering Calculation for Massachusetts Facilities**

Example calculation for a facility that uses a river as the receiving water:

The basic equations used for the calculation of river temperature rise are as follows:

$$Q_{\text{plant}} = C_p m_p \Delta T_p$$

$$Q_{\text{river}} = C_p m_r \Delta T_r$$

$$C_p m_p \Delta T_p = C_p m_r \Delta T_r$$

$$\Delta T_r = m_p / m_r \times \Delta T_p$$

Where

$Q_{\text{plant}}$  = heat load discharged from plant (btu)



$C_p$  = heat capacity of water = 1.0 °F x btu/lb  
 $m_p$  = mass of effluent, lbs (gal. or cubic feet per second if volume is used)  
 $\Delta T_p$  = change in temperature, effluent – influent, °F  
 $m_r$  = mass of river, lbs (gal. or cubic feet per second if volume is used)  
 $\Delta T_r$  = change in river temperature, °F

Notes:

- (1) Since both the effluent mass ( $m_p$ ) and river mass ( $m_r$ ) convert to volume by using the same factor of 1 gal/8.34 lbs, a volumetric unit may be substituted for mass in the above equation, as long as same units are consistently used for both the river and plant terms.
- (2) The 7Q10 should be used as the mass of the river. Typically, 7Q10 information is given in units of cubic feet per second (cfs).

## 2. Dilution Factor

### **From ATTACHMENT B of the Noncontact Cooling Water General Permit Dilution Factor Calculations for Massachusetts and New Hampshire**

#### **Massachusetts:**

Equation used to calculate the dilution factor at the treatment plant's outfall.

$$\text{Dilution Factor} = \frac{QR + (QP \times 1.55)}{QP \times 1.55}$$

where:

QR =

Estimated 7Q10 low flow for the receiving water at the plant's outfall, in cubic feet per second (cfs).

QP = Plant's maximum design flow, in million gallons per day (mgd).

1.55 = Factor to convert mgd to cfs.

#### **EXAMPLE**

QR = 325 cfs

QP = 3.2 mgd

$$\text{Dilution Factor} = \frac{QR + (QP \times 1.55)}{QP \times 1.55} = \frac{325 + (3.2 \times 1.55)}{3.2 \times 1.55} = 66.5$$

QR x 1.55 3.2 x 1.55

## Calculation

### 1. Calculate flows and energy of water discharged

#### a. Engine Dyno

$$150 \text{ gpm} \times 30 \text{ minutes} \times \text{twice a day} = 9,000 \text{ gals/day}$$

$$\text{Energy} = 9,000 \text{ gals/day} \times 1.0 \times 8.34 \times (140^\circ\text{F} - 60^\circ\text{F}) = 6,004,800 \text{ Btu/day}$$

#### b. Transmission Dyno

$$50 \text{ gpm} \times 20 \text{ minute} \times 4 \text{ times a day} = 4,000 \text{ gals/day}$$

$$\text{Energy} = 4,000 \text{ gals/day} * 1.0 * 8.34 * (125^{\circ}\text{F} - 60^{\circ}\text{F}) = 2,168,400 \text{ Btu/day}$$

c. Total Flow & Energy

$$\text{Total flow} = 9,000 \text{ gals/day} + 4,000 \text{ Gals/day} = 13,000 \text{ Gals/day}$$

$$\text{Total Energy} = 6,004,800 \text{ Btu/day} + 2,168,400 \text{ Btu/day} = 8,173,200 \text{ Btu/day}$$

2. Calculate rise in Mystic River temperatures

$$\Delta T = 8,173,200 / ((2,800,000 \text{ gals/day} + 13,000 \text{ gals/day}) * 8.34) = \underline{0.35} \text{ }^{\circ}\text{F}$$

3. Dilution Factor

$$\text{Dilution Factor} = (2,800,000 \text{ gals/day} + 13,000 \text{ gals/day}) / 13,000 \text{ gals/day} = \underline{216}$$

Results

Mystic River temperature rise = 0.35 °F

Dilution Factor = 216