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, (MGL Chap. 21, §§26-53),

Town of Charlton
Board of Sewer Commissioners
37 Main Street
Charlton, MA 01509

is authorized to discharge from a facility located at:

Charlton Wastewater Treatment Facility
Junction Routes 20 and 169
Charlton, MA 01509

to receiving water named: **Cady Brook (State Basin Code 41 – Quinebaug)**

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

This permit shall become effective upon 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 November 6, 2002. This permit consists of 14 pages in Part I including effluent limitations, monitoring requirements, Attachments A (Discharge Outfall) and B (Toxicity Testing Protocol), and Part II including General Conditions and Definitions.

Signed this 20th day of January, 2011

/S/SIGNATURE ON FILE

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

David Ferris, Director
Division of Watershed Management
Department of Environmental Protection
Commonwealth of Massachusetts
Boston, MA

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. Outfall 001

a. During the period beginning the effective date and lasting through expiration, the permittee is authorized to discharge treated effluent from outfall serial number 001 to Cady Brook. Such discharge shall be limited and monitored by the permittee as specified below.

Effluent Characteristic	**Units**	**Discharge Limitation**			**Monitoring Requirement** [*3]	
Parameter		**Average Monthly**	**Average Weekly**	**Maximum Daily**	**Measurement Frequency**	**Sample Type** [*3]
Flow (Annual Average) [*2] Flow [*2]	MGD MGD	0.45 [*2] Report	— —	Report Report	Continuous Continuous	Magnetic Flow Meter Magnetic Flow Meter
BOD_5 [*4] April 1 – October 31	mg/l lbs/day	14 53	18 67	Report Report	1/Week 1/Week	24-Hour Composite*[5] 24-Hour Composite*[5]
BOD_5 [*4] November 1 – March 31	mg/l lbs/day	21 80	32 120	Report Report	1/Week 1/Week	24-Hour Composite*[5] 24-Hour Composite*[5]
TSS [*4] April 1 – October 31	mg/l lbs/day	14 53	18 67	Report Report	1/Week 1/Week	24-Hour Composite*[5] 24-Hour Composite*[5]
TSS [*4] November 1 – March 31	mg/l lbs/day	21 80	32 120	Report Report	1/Week 1/Week	24-Hour Composite*[5] 24-Hour Composite*[5]
pH [*1]	Standard Units (S.U.)	6.5 – 8.3 (See Permit Part I.A.1.c.)			1/Day	Grab

Effluent Characteristic	Units	Discharge Limitation			Monitoring Requirement	
Parameter		**Average Monthly**	**Average Weekly**	**Maximum Daily**	**Measurement Frequency**	**Sample Type[*3]**
Fecal Coliform Bacteria[*1,*6] April 1 - Oct. 31, 2011	cfu /100 ml	200	—	400	1/Week	Grab
E. coli[*1,*6] (April 1 - Oct. 31)	cfu/100 ml	126	—	409	1/Week	Grab
Total Ammonia Nitrogen[*7] November 1 – April 31 May June 1 – October 31	mg/l mg/l mg/l	8 3.6 1.42	16 — —	— — —	1/Week 1/Week 1/Week	24-Hour Composite[*5] 24-Hour Composite[*5] 24-Hour Composite[*5]
Total Kjeldahl Nitrogen[*7] Total Nitrate Nitrogen[*7] Total Nitrite Nitrogen[*7]	mg/l mg/l mg/l	Report Report Report	— — —	— — —	1/Quarter 1/Quarter 1/Quarter	24-Hour Composite[*5] 24-Hour Composite[*5] 24-Hour Composite[*5]
Aluminum, Total	ug/l	93	—	803	1/Month	24-Hour Composite[*5]
Cadmium, Total Recoverable[*9]	ug/l	0.3	—	2.6	1/Month	24-Hour Composite[*5]
Copper, Total Recoverable	ug/l	20	—	28	1/Month	24-Hour Composite[*5]
Lead, Total Recoverable[*9]	ug/l	4	—	102	1/Month	24-Hour Composite[*5]
Zinc, Total [*9]	ug/l	142	—	142	1/Month	24-Hour Composite*[5]
Total Phosphorus (April 1 - Oct. 31) [*8] Total Phosphorus (Nov 1 – March 31) [*8]	mg/l mg/l	0.110 1.0	— —	Report Report	1/Week 1/Month	24-Hour Composite*[5] 24-Hour Composite*[5]
Ortho-phosphorus, dissolved (Nov 1-March 31) Ortho-phosphorus, dissolved (Nov 1-March 31)	lbs/day mg/l	Report Report	— —	— —	1/Month 1/Month	24-Hour Composite*[5] 24-Hour Composite*[5]
Whole Effluent Toxicity [*1, *10, *11, *12, *13]	% %	Acute LC_{50} $\geq$ 100% Chronic NOEC $\geq$ 93%			4/Year 4/Year	24-Hour Composite*[5] 24-Hour Composite*[5]

Footnotes:

*1. Required for State Certification.

*2. Report annual average, monthly average, and the maximum daily flow. The limit is an annual average, which shall be reported as a rolling average. The value will be calculated as the arithmetic mean of the monthly average flow for the reporting month and the monthly average flows of the eleven previous months.

*3. A routine sampling program will be developed in which samples are taken at the same location, same time, and on Wednesdays of every month – except that one sampling event will be conducted on one Monday of every month. Monday sampling events will be conducted immediately following a holiday weekend or on a holiday. Occasional deviations from the routine sampling program described above are allowed, but the reason for the deviation will be documented in correspondence appended to the applicable discharge monitoring report.

All samples will 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. All samples will be 24 hour composites unless specified as a grab sample in 40 CFR §136.

All required effluent samples shall be collected at the point specified herein. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP.	
PARAMETER:	SAMPLE LOCATION:
FLOW	Magnetic Flow Meter in the Effluent Line
FECAL COLIFORM and E-COLI	After discharge from the disinfection chamber, prior to discharge into Cady Brook
BOD_5, TSS, pH RANGE, TOTAL AMMONIA AS N, TOTAL KJELDAHL NITROGEN, TOTAL NITRITE, TOTAL NITRATE, and WHOLE EFFLUENT TOXICITY	After discharge from the disinfection chamber, prior to discharge into Cady Brook WET Dilution Water: Cady Brook upstream of treated wastewater discharge outfall
BOD and TSS (Influent)	Influent Line prior to primary tanks

*4. Sampling is required for influent and effluent.

*5. A 24-hour composite sample will consist of at least twenty four (24) grab samples taken during one consecutive 24 hour period, either collected at equal intervals and combined proportional to flow or continuously collected proportionally to flow.

*6. *Escherichia coli (E. coli)* and fecal coliform bacteria limitations and monitoring requirements are effective from April 1st through October 31st. The monthly average limits are expressed as geometric means. The fecal coliform limitations and monitoring requirements will expire on **October 31, 2011**. The *E. coli* limitations will become effective on **April 1, 2012,** but monitoring requirements become effective upon the effective date of the permit. *E. coli* and fecal coliform bacteria samples will be collected concurrently.

*7. Total ammonia nitrogen, total Kjeldahl nitrogen, nitrite nitrogen, and nitrate nitrogen samples shall be collected concurrently.

*8. See Part I.B. Effective Dates for Phosphorus Limitations.

*9. See Part I.C. Effective Date for Cadmium, Lead, and Zinc Limitations.

*10. The LC_{50} is the concentration of effluent which causes mortality to 50% of the test organisms. Therefore, a 100% limit means that a sample of 100% effluent (no dilution) shall cause no more than a 50% mortality rate.

*11. The permittee shall conduct modified acute and chronic toxicity tests four times per year. The permittee shall test the daphnid, Ceriodaphnia dubia, only. Toxicity test samples will be collected during the months of February, May, August, and November. The test results will be submitted by the last day of the month following the completion of the test. The results are due March 31st, June 30th, September 30th, and December 31st, respectively. The tests must be performed in accordance with test procedures and protocols specified in **Attachment B** of this permit.

Test Dates during the month of	**Submit Results By:**	**Test Species**	**Acute Limit** LC_{50}	**Chronic Limit** NOEC
February May August November	March 31st June 30th September 30th December 31st	Ceriodaphnia dubia (Daphnid) See **Attachment B**	$\geq$ 100%	$\geq$ 93%

After submitting a minimum of four consecutive sets of whole effluent toxicity (WET) test results, all of which demonstrate compliance with the WET permit limits, the permittee may request a reduction in the frequency of required WET testing. The permittee is required to continue testing at the frequency specified in the permit until notice is received by certified mail from the EPA that the WET testing requirement has been changed.

*12. If toxicity test(s) using receiving water as diluent show the receiving water to be toxic or unreliable, the permittee shall follow procedures outlined in **Attachment B Section IV., DILUTION WATER** in order to obtain permission to use an alternate dilution water. In lieu of individual approvals for alternate dilution water required in **Attachment B**, EPA-New England has developed a Self-Implementing Alternative Dilution Water Guidance document (called "Guidance Document") which may be used to obtain automatic approval of an alternate dilution

water, including the appropriate species for use with that water. This guidance is found in Attachment G of NPDES Program Instructions for the Discharge Monitoring Report Forms (DMRs) which is sent to all permittees with their annual set of DMRs and may also be found on the EPA, Region I web site at http://www.epa.gov/region01/enforcementandassistance/dmr.html. If this guidance is revoked, the permittee shall revert to obtaining individual approval as outlined in **Attachment B**. Any modification or revocation to this guidance will be transmitted to the permittees as part of the annual DMR instruction package. However, at any time, the permittee may choose to contact EPA-New England directly using the approach outlined in **Attachment B**. If the permittee uses an alternative dilution water, the ambient water will still need to be tested.

*13. The no observed effects concentration (NOEC) is the highest tested concentration of an effluent or a toxicant at which no adverse effects are observed on the aquatic test organisms at a specific time of observation.

Part I.A.1. (Continued)

b. The discharge will not cause a violation of the water quality standards of the receiving waters.

c. The pH of the effluent will not be less than 6.5 nor greater than 8.3 S.U. at any time.

d. The discharge will not cause objectionable discoloration of the receiving waters.

e. The effluent will contain neither a visible oil sheen, foam, nor floating solids at any time.

f. If the average annual flow in any calendar year exceeds 80 percent of the facility's design flow, the permittee will submit a report to MassDEP by **March 31st** of the following calendar year describing their plans for future flow increases and how they will maintain compliance with the flow limitation and all other effluent limitations and conditions in the permit.

g. The permittee's treatment facility will maintain a minimum of 85 percent removal of both total suspended solids and biochemical oxygen demand. The percent removal will be based on monthly average values.

h. The permittee is not authorized to use chlorine as a disinfection method.

2. All POTWs must provide adequate notice to the Director of the following:

a. Any new introduction of pollutants into that POTW from an indirect discharger in a primary industry category discharging process water; and

b. Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.

c. For purposes of this paragraph, adequate notice will include information on:

(1) the quantity and quality of effluent introduced into the POTW; and
(2) any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

3. Prohibitions Concerning Interference and Pass Through:

a. Pollutants introduced into POTW's by a non-domestic source (user) will not pass through the POTW or interfere with the operation or performance of the works.

4. Toxics Control

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

b. Any toxic components of the effluent will 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.

5. Numerical Effluent Limitations for Toxicants

a. EPA or MassDEP may use the results of the toxicity tests and 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.

B. EFFECTIVE DATES FOR PHOSPHORUS LIMITATIONS

The monthly average phosphorus limitation for the months of April through October will be 1.0 mg/l for the duration of the first April 1- October 31 period following the effective date of the permit. For example, if the permit becomes effective on May 1, 2011, the 1.0 mg/l April 1-October 31 monthly average limit would be in effect for the months of May 2011 through October 2011. Consistent with Section B.1. of Part II (General Conditions) of the permit, the permittee shall properly operate and maintain the existing phosphorus removal facilities at the treatment plant to obtain the lowest effluent phosphorus concentration that can be reasonably achieved.

The 0.110 mg/l monthly average total phosphorus limit for the months of April through October 31 shall become effective on the April 1st following the end of the period in which the 1.0 mg/l limit is in effective. Using the example in the previous paragraph, if the permit becomes effective on May 1, 2011, the 0.110 mg/l monthly average limit would become effective on April 1, 2012.

The winter phosphorus limitation is new for this permit. The 1.0 mg/l seasonal (**November 1st – March 31st**) total phosphorus limit in this permit shall become effective on **November 1, 2011**. The permittee will report the average monthly and maximum daily values of total phosphorus in the discharge for the months of the first winter period in which this permit is effective.

C. EFFECTIVE DATE FOR CADMIUM, LEAD, AND ZINC LIMITATIONS

The cadmium, lead, and zinc limitations are new for this permit, and will become effective **one year from the effective date of the permit**. The monitoring requirements become effective upon the effective date of the permit.

D. UNAUTHORIZED DISCHARGES

The permittee is authorized to discharge only in accordance with the terms and conditions of this permit and only from outfall 001 listed on **Attachment A** and in Part I.A.1.a. of this permit. Discharges of wastewater from any other point sources, including sanitary sewer overflows (SSOs) are not authorized by this permit and will be reported to EPA and MassDEP in accordance with Part II. Section D.1.e.(1) of the General Requirements of this permit (Twenty-four hour reporting).

Notification of SSOs to MassDEP will be made on its SSO reporting form (which includes MassDEP regional office telephone numbers). The reporting form and instructions for its completion can be found on-line at: http://www.mass.gov/dep/water/approvals/surffms.htm#sso.

E. OPERATION AND MAINTENANCE OF THE SEWER SYSTEM

Operation and maintenance of the sewer system will be in compliance with the General Requirements of Part II and the following terms and conditions:

1. Maintenance Staff

   The permittee will provide an adequate staff to carry out the operation, maintenance, repair, and testing functions required to ensure compliance with the terms and conditions of this permit.

2. Preventative Maintenance Program

   The permittee will maintain an ongoing preventative maintenance program to prevent overflows and bypasses caused by malfunctions or failures of the sewer system infrastructure. The program will include an inspection program designed to identify all potential and actual unauthorized discharges.

3. Infiltration/Inflow Control Plan:

   The permittee will continue to implement a plan to control infiltration and inflow (I/I) to the separate sewer system. The I/I Control Plan shall be updated and submitted to EPA and MassDEP **within six (6) months of the effective date** of this permit (see page 1 of this permit for the effective date) and shall describe the permittee's program for preventing infiltration/inflow related effluent limit violations, and all unauthorized discharges of wastewater, including overflows and by-passes due to excessive infiltration/inflow.

The plan shall include:

- An ongoing program to identify and remove sources of infiltration and inflow. The program shall include the necessary funding level and the source(s) of funding.
- An inflow identification and control program that focuses on the disconnection and redirection of illegal sump pumps and roof down spouts. Priority should be given to removal of public and private inflow sources that are upstream from, and potentially contribute to, known areas of sewer system backups and/or overflows.
- Identification and prioritization of areas that will provide increased aquifer recharge as the result of reduction/elimination of infiltration and inflow to the system.
- An educational public outreach program for all aspects of I/I control, particularly private inflow.

Reporting Requirements:

A summary report of all actions taken to minimize I/I during the previous calendar year shall be submitted to EPA and the MassDEP annually, by **February 28th** of each year. The summary report will, at a minimum, include:

- A map and a description of inspection and maintenance activities conducted and corrective actions taken during the previous year.
- Expenditures for any infiltration/inflow related maintenance activities and corrective actions taken during the previous year.
- A map with areas identified for I/I-related investigation/action in the coming year.
- A calculation of the annual average I/I, the maximum month I/I for the reporting year.
- A report of any infiltration/inflow related corrective actions taken as a result of unauthorized discharges reported pursuant to 314 CMR 3.19(20) and reported pursuant to the Unauthorized Discharges section of this permit.

4. Alternate Power Source

In order to maintain compliance with the terms and conditions of this permit, the permittee will continue to provide an alternative power source with which to sufficiently operate its treatment works (as defined at 40 CFR §122.2).

F. SLUDGE CONDITIONS

1. The permittee shall comply with all existing federal and state laws and regulations that apply to sewage sludge use and disposal practices, including EPA regulations promulgated at 40 CFR Part 503, which prescribe "Standards for the Use or Disposal of Sewage Sludge" pursuant to Section 405(d) of the CWA, 33 U.S.C. § 1345(d).

2. If both state and federal requirements apply to the permittee's sludge use and/or disposal practices, the permittee shall comply with the more stringent of the applicable requirements.

3. The requirements and technical standards of 40 CFR Part 503 apply to the following sludge use or disposal practices.

   a. Land application - the use of sewage sludge to condition or fertilize the soil
   b. Surface disposal - the placement of sewage sludge in a sludge only landfill
   c. Sewage sludge incineration in a sludge only incinerator

4. The requirements of 40 CFR Part 503 do not apply to facilities which dispose of sludge in a municipal solid waste landfill. 40 CFR § 503.4. These requirements also do not apply to facilities which do not use or dispose of sewage sludge during the life of the permit but rather treat the sludge (e.g. lagoons, reed beds), or are otherwise excluded under 40 CFR § 503.6.

5. The 40 CFR Part 503 requirements including the following elements:

   - General requirements
   - Pollutant limitations
   - Operational Standards (pathogen reduction requirements and vector attraction reduction requirements)
   - Management practices
   - Record keeping
   - Monitoring
   - Reporting

   Which of the 40 C.F.R. Part 503 requirements apply to the permittee will depend upon the use or disposal practice followed and upon the quality of material produced by a facility. The EPA Region 1 Guidance document, "EPA Region 1 - NPDES Permit Sludge Compliance Guidance" (November 4, 1999), may be used by the permittee to assist it in determining the applicable requirements.[1]

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1 This guidance document is available upon request from EPA Region 1 and may also be found at: http://www.epa.gov/region1/npdes/permits/generic/sludgeguidance.pdf

6. The sludge shall be monitored for pollutant concentrations (all Part 503 methods), pathogen reduction and vector attraction reduction (land application and surface disposal) at the following frequency. This frequency is based upon the volume of sewage sludge generated at the facility in dry metric tons per year

less than 290	1/ year
290 to less than1500	1 /quarter
1500 to less than 15000	6 /year
15000 +	1 /month

Sampling of the sewage sludge shall use the procedures detailed in 40 CFR 503.8.

7. Under 40 CFR § 503.9(r), the permittee is a "person who prepares sewage sludge" because it "is … the person who generates sewage sludge during the treatment of domestic sewage in a treatment works …." If the permittee contracts with *another* "person who prepares sewage sludge" under 40 CFR § 503.9(r) – i.e., with "a person who derives a material from sewage sludge" – for use or disposal of the sludge, then compliance with Part 503 requirements is the responsibility of the contractor engaged for that purpose. If the permittee does not engage a "person who prepares sewage sludge," as defined in 40 CFR § 503.9(r), for use or disposal, then the permittee remains responsible to ensure that the applicable requirements in Part 503 are met. 40 CFR §503.7. If the ultimate use or disposal method is land application, the permittee is responsible for providing the person receiving the sludge with notice and necessary information to comply with the requirements of 40 CFR Part 503 Subpart B.

8. The permittee shall submit an annual report containing the information specified in the 40 CFR Part 503 requirements (§ 503.18 (land application), § 503.28 (surface disposal), or § 503.48 (incineration) by **February 19th** (*see also* "EPA Region 1 - NPDES Permit Sludge Compliance Guidance"). Reports shall be submitted to the address contained in the reporting section of the permit. If the permittee engages a contractor or contractors for sludge preparation and ultimate use or disposal, the annual report need contain only the following information:

   - Name and address of contractor(s) responsible for sludge preparation, use or disposal
   - Quantity of sludge (in dry metric tons) from the POTW that is transferred to the sludge contractor(s), and the method(s) by which the contractor will prepare and use or dispose of the sewage sludge.

G. MONITORING AND REPORTING

1. **For a period of one year from the effective date of the permit**, the permittee may either submit monitoring data and other reports to EPA in hard copy form, or report electronically using NetDMR, a web-based tool that allows permittees to electronically submit discharge monitoring reports (DMRs) and other required reports via a secure internet connection. **Beginning no later than one year after the effective date of the permit**, the permittee shall begin reporting using NetDMR, unless the facility is able to demonstrate a reasonable basis that precludes the use of NetDMR for submitting all DMRs and reports. Specific requirements regarding submittal of data and reports in hard copy form and for submittal using NetDMR are described below:

a. Submittal of Reports Using NetDMR

NetDMR is accessed from: http://www.epa.gov/netdmr. Within one year of the effective date of the Permit, the permittee shall begin submitting DMRs and reports required under this permit electronically to EPA using NetDMR, unless the facility is able to demonstrate a reasonable basis, such as technical or administrative infeasibility, that precludes the use of NetDMR for submitting DMRs and reports ("opt out request").

DMRs shall be submitted electronically to EPA no later than the 15th day of the month following the completed reporting period. All reports required under the permit shall be submitted to EPA, including the MassDEP Monthly Operations and Maintenance Report, as an electronic attachment to the DMR. Once a permittee begins submitting reports using NetDMR, it will no longer be required to submit hard copies of DMRs or other reports to EPA and will no longer be required to submit hard copies of DMRs to MassDEP. However, permittees shall continue to send hard copies of reports other than DMRs (including Monthly Operation and Maintenance Reports) to MassDEP until further notice from MassDEP.

b. Submittal of NetDMR Opt Out Requests

Opt out requests must be submitted in writing to EPA for written approval at least sixty (60) days prior to the date a facility would be required under the Permit to begin using NetDMR. This demonstration shall be valid for twelve (12) months from the date of EPA approval and shall thereupon expire. At such time, DMRs and reports shall be submitted electronically to EPA unless the permittee submits a renewed opt out request and such request is approved by EPA.

All opt out requests should be sent to the following addresses:

Attn: NetDMR Coordinator
U.S. Environmental Protection Agency, Water Technical Unit
5 Post Office Square, Suite 100 (OES04-4)
Boston, MA 02109-3912

And

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

c. Submittal of Reports in Hard Copy Form

Monitoring results shall be summarized for each calendar month and reported on separate hard copy Discharge Monitoring Report Form(s) (DMRs) postmarked no later than the 15th day of the month following the completed reporting period. All reports required under this permit, including MassDEP Monthly Operation and Maintenance Reports, shall be submitted as an attachment to the DMRs. Signed and dated originals of the DMRs, and all other reports or notifications required herein or in Part II shall be submitted to the Director at the following address:

U.S. Environmental Protection Agency
Water Technical Unit (OES04-SMR)
5 Post Office Square, Suite 100
Boston, MA 02109-3912

Duplicate signed copies of all reports or notifications required above shall be submitted to the State at the following addresses:

MassDEP – Central Region
Bureau of Resource Protection
627 Main Street
Worcester, MA 01608

And

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

Any verbal reports, if required in Parts I and/or II of this permit, shall be made to both EPA-New England and to MassDEP.

H. STATE PERMIT CONDITIONS

1. This authorization to discharge includes two separate and independent permit authorizations. The two permit authorizations are: (i) a federal National Pollutant Discharge Elimination System permit issued by the U.S. Environmental Protection Agency (EPA) pursuant to the Federal Clean Water Act, 33 U.S.C. §§1251 et seq.; and (ii) an identical state surface water discharge permit issued by the Commissioner of the Massachusetts Department of Environmental Protection (MassDEP) pursuant to the Massachusetts Clean Waters Act, M.G.L. c. 21, §§26-53, and 314 C.M.R. 3.00. All of the requirements contained in this authorization, as well as the standard conditions contained in 314 CMR 3.19, are hereby incorporated by reference into this state surface water discharge permit.

2. This authorization also incorporates the state water quality certification issued by MassDEP under §401(a) of the Federal Clean Water Act, 40 C.F.R. 124.53, M.G.L.c.21, §27 and 314 CMR 3.07. All of the requirements (if any) contained in MassDEP's water quality certification for the permit are hereby incorporated by reference into this state surface water discharge permit as special conditions pursuant to 314 CMR 3.11.

3. Each Agency will have the independent right to enforce the terms and conditions of this permit. Any modification, suspension or revocation of this permit will be effective only with respect to the Agency taking such action, and will 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 will 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 will remain in full force and effect under State law as a permit issued by the Commonwealth of Massachusetts.

Attachment A
Advanced Wastewater Treatment Plant Discharge Outfall
NPDES Permit No. MA0101141
Charlton, MA

Outfall:	Description of Discharge:	Outfall Location/Receiving Water:
001	Advanced Wastewater Treatment Plant Effluent	Cady Brook

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND
5 POST OFFICE SQUARE, SUITE 100
BOSTON, MASSACHUSETTS 02109-3912

FACT SHEET

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

NPDES PERMIT NO.: **MA0101141**

NAME AND ADDRESS OF APPLICANT:

Town of Charlton
Board of Sewer Commissioners
37 Main Street
Charlton, MA 01509

NAME AND ADDRESS OF FACILITY WHERE THE DISCHARGE OCCURS:

Charlton Wastewater Treatment Facility
Junction Routes 20 and 169
Charlton, MA 01509

TO RECEIVING WATER: **Cady Brook (State Basin Code 41 – Quinebaug)**

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

CLASSIFICATION: **B (Warm Water Fishery)**

Table of Contents

Figures and Attachments:

I. PROPOSED ACTION

The above named applicant has applied to the U.S. Environmental Protection Agency for re-issuance of its National Pollutant Discharge Elimination System (NPDES) permit to discharge into the designated receiving waters. The existing permit expired on September 30, 2006 and is still in effect. The draft permit is written to have a term of five years from its effective date.

II. TYPE OF FACILITY AND DISCHARGE LOCATION

The facility is an advanced wastewater treatment plant and is engaged in the collection and treatment of municipal wastewater. The collection system consists of separate sanitary sewers, so there are no combined sewer outfalls. The facility does not serve any significant industrial users (SIUs). The treatment plant outfall pipe discharges into Cady Brook. The facility's location is shown in **Figure 1**.

Information regarding the facility's discharge outfall is listed below:

Outfall:	Description of Discharge:	Outfall Location:
001	Advanced Wastewater Treatment Plant Effluent	42^{O} 8' 27.6" / -71^{O} 59' 46.2"

III. DESCRIPTION OF THE DISCHARGE

The existing wastewater treatment facility (WWTF) includes physical, chemical, and biological treatment processes. The facility utilizes rotating biological contactors (RBCs) as its biological treatment process. Treated effluent is disinfected seasonally from April 1st through October 31st using ultraviolet light. Sludge removed from the treatment processes is trucked off-site for further treatment at the Upper Blackstone Water Pollution Abatement District (UBWPAD) treatment plant, located in Millbury, MA. The Charlton WWTF generates approximately 18.5 dry metric tons of sludge each year.

A quantitative description of the wastewater treatment plant discharge in terms of significant effluent parameters based on recent monitoring data is shown on **Attachment A** of this fact sheet. This facility's flow schematic is shown in **Figure 2**.

The Charlton WWTF is currently being upgraded to include a CoMag treatment system. This system will provide improved removal of pollutants, most notably phosphorus, and is expected to be on-line in the summer of 2010. This facility's CoMag treatment system flow schematic is shown in **Figure 3**.

IV. LIMITATIONS AND CONDITIONS

The effluent limitations of the draft permit and monitoring requirements may be found in the draft NPDES permit.

V. PERMIT BASIS AND EXPLANATION OF EFFLUENT LIMITATION DERIVATION

1. General Regulatory Background

Congress enacted the Clean Water Act (CWA), "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." CWA §101(a). To achieve this objective, the CWA makes it unlawful for any person to discharge any pollutant into the waters of the United States from any point source, except as authorized by specific permitting sections of the CWA,

one of which is Section 402. See CWA §§ 303(a), 402(a). Section 402(a) establishes one of the CWA's principal permitting program's, the National Pollutant Discharge Elimination System (NPDES). Under this section, EPA may "issue a permit for the discharge of any pollutant, or combination of pollutants" in accordance with certain conditions. See CWA § 402(a). NPDES permits generally contain discharge limitations and establish related monitoring and reporting requirements. See CWA § 402(a)(1)-(2).

Section 301 of the CWA provides for two types of effluent limitations to be included in NPDES permits: "technology-based" limitations and "water quality-based" limitations. See CWA §§ 301, 304(b); 40 C.F.R. 122, 125, 131. Technology-based limitations, generally developed on an industry-by-industry basis, reflect a specified level of pollutant reducing technology available and economically achievable for the type of facility being permitted. See CWA § 301(b). As a class, publicly owed treatment works ("POTWs") must meet performance-based requirements based on available wastewater treatment technology. See CWA § 301(b)(1)(B). The performance level for POTWs is referred to as "secondary treatment". Secondary treatment is comprised of technology-based requirements expressed in terms of BOD_5, TSS, and pH. See 40 C.F.R. Part 133. Under Section 301(b)(1) of the CWA, POTWs must have achieved effluent limitations based upon Secondary Treatment by July 1, 1977.

Water quality-based effluent limits are designed to ensure that State water quality standards are met regardless of the decision made with respect to technology and economics in establishing technology-based limitations. In particular, Section 301(b)(1)(C) requires achievement of, "any more stringent limitation, including those necessary to meet water quality standards…established pursuant to any State law or regulation…" See 40 C.F.R. §§ 122.4(d)(1) (providing that a permit must contain effluent limits as necessary to protect State water quality standards, "including State narrative criteria for water quality") (emphasis added) and 122.44(d)(5) (providing in part that a permit incorporate any more stringent limits required by Section 301(b)(1)(C) of the CWA).

The CWA requires that States develop water quality standards for all water bodies within the State. See CWA § 303. These standards have three parts: (1) one or more "designated uses" for each water body or water body segment in the state; (2) water quality "criteria", consisting of numeric concentration levels and/or narrative statements specifying the amounts of various pollutants that may be present in each water body without impairing the designated uses of that water body; and (3) an anti-degradation provision, focused on protecting existing uses. See CWA § 303(c)(2)(A) and 40 C.F.R. § 131.12. The limits and conditions of the permit reflect the goal of the CWA and EPA to achieve and then to maintain water quality standards.

Receiving stream requirements are established according to numeric and narrative standards adopted under State law for each stream classification. When using chemical-specific numeric criteria from the State's water quality standards to develop permit limits, both the acute and chronic aquatic life criteria are used and expressed in terms of maximum allowable in-stream pollutant concentrations. Acute aquatic life criteria are generally implemented through average monthly limits.

Where a State has not established a numeric water quality criterion for a specific chemical pollutant that is present in the effluent in a concentration that causes or has a reasonable potential to cause a violation of narrative water quality standards, the permitting authority must establish effluent limits in one of three ways: based on a "calculated numeric criterion for the pollutant which the permitting authority demonstrates will attain and maintain applicable narrative water quality criteria and fully protect the designated use," on a "case-by-case basis" using CWA Section 304(a) recommended water quality criteria, supplemented as necessary by other relevant information; or, in certain circumstances, based on an indicator parameter. See 40 C.F.R. §

122.44(d)(1)(vi)(A-C).

All statutory deadlines for meeting various treatment technology-based effluent limitations established pursuant to the CWA have expired. When technology-based effluent limits are included in a permit, compliance with those limitations is from the date the issued permit becomes effective. See 40 C.F.R. § 125.3(a)(1). Compliance schedules and deadlines not in accordance with the statutory provisions of the CWA cannot be authorized by an NPDES permit. The regulations governing EPA's NPDES permit program are generally found in 40 C.F.R. Parts 122, 124, 125, and 136.

The permit must limit any pollutant parameter (conventional, non-conventional, toxic, and whole effluent toxicity) that is or may be discharged at a level that causes or has "reasonable potential" to cause or contribute to an excursion above any water-quality criterion. See 40 C.F.R. §122.44(d)(1)(i). An excursion occurs if the projected or actual in-stream concentration exceeds the applicable criterion.

Reasonable Potential

In determining reasonable potential, EPA considers: 1) existing controls on point and non-point sources of pollution; 2) pollutant concentration and variability in the effluent and receiving water as determined from the permit's reissuance application, DMRs, and State and Federal Water Quality Reports; 3) sensitivity of the species to toxicity testing; 4) the statistical approach outlined in *Technical Support Document for Water Quality-Based Toxics Control*, March 1991, EPA/505/2-90-001 in Section 3; and, where appropriate, 5) dilution of the effluent in the receiving water.

Antibacksliding

Section 402(o) of the CWA generally provides that the effluent limitations of a renewed, reissued, or modified permit must be at least as stringent as the comparable effluent limitations in the previous permit. EPA has also promulgated anti-backsliding regulations which are found at 40 C.F.R. § 122.44(l). Unless applicable anti-backsliding requirements are met, the limits and conditions in the reissued permit must be at least as stringent as those in the previous permit.

Antidegradation

In accordance with the regulations found at 40 C.F.R. Section 131.12, MassDEP has developed and adopted a statewide antidegradation policy to maintain and protect existing in-stream water quality. The Massachusetts Antidegradation Policy is found at Title 314 CWR 4.04. No lowering of water quality is allowed, except in accordance with the anti-degradation policy. All existing uses of the Cady Brook must be protected. This draft permit is being reissued with allowable discharge limits as, or more, stringent than those in the current permit and with the same parameter coverage. There is no change in outfall location. The public is invited to participate in the anti-degradation finding through the permit public notice process.

State Certification

Section 401(a)(1) of the CWA requires all NPDES permit applicants to obtain a certification from the appropriate state agency stating that the permit will comply with all applicable federal effluent limitations and State water quality standards. See CWA § 401(a)(1). The regulatory provisions pertaining to State certification provide that EPA may not issue a permit until a certification is granted or waived by the state in which the discharge originates. See 40 C.F.R. § 124.53(a). The

regulations further provide that, "when certification is required…no final permit shall be issued…unless the final permit incorporates the requirements specified in the certification under § 124.53(e)." See 40 C.F.R. § 124.55(a)(2). Section 124.53(e) in turn provides that the State certification shall include "any conditions more stringent than those in the draft permit which the State finds necessary" to assure compliance with, among other things, State water quality standards. See 40 C.F.R. § 124.53(e)(2), and shall also include "[a] statement of the extent to which each conditions of the draft permit can be made less stringent without violating the requirements of State law, including water quality standards". See 40 C.F.R. §124.53(e)(3).

However, when EPA reasonably believes that a State water quality standard requires a more stringent permit limitation than that reflected in a state certification, it has an independent duty under CWA §301(b)(1)(C) to include more stringent permit limitations. See 40 C.F.R. §122.44(d)(1) and (5). It should be noted that under CWA § 401, EPA's duty to defer to consideration of state law is intended to prevent EPA from relaxing any requirements, limitations, or conditions imposed by State law. Therefore, "[a] State may not condition or deny a certification on the grounds that State law allows a less stringent permit condition." See 40 C.F.R. §12455(c). In such an instance, the regulation provides that, "The Regional Administrator shall disregard any such certification conditions or denials as waivers of certification." EPA regulations pertaining to permit limits based upon water quality standards and state requirements are contained in 40 C.F.R. §122.4(d) and 40 C.F.R. §122.44(d).

2. Water Quality Standards; Designated Use; Outfall 001

The Charlton WWTF discharges into Segment MA41-06 of Cady Brook, approximately 1.3 miles downstream of Glen Echo Lake. Cady Brook flows another 5.3 miles downstream of the Charlton treatment plant before joining the Quinebaug River, which flows southeast through the Town of Dudley and crosses the state line into Thompson, Connecticut. The Quinebaug River is joined by the French River in Thompson and continues south to Norwich where it is joined by the Shetucket River. This confluence forms the Thames River, which continues south to enter Long Island Sound in New London, CT.

Cady Brook is designated a Class B warm water fishery by the Massachusetts Surface Water Quality Standards, 314 Code of Massachusetts Regulations ("CMR") 4.05(4)(a). The Massachusetts Surface Water Quality Standards, 314 CMR 4.05(3)(b) states that Class B waters are designated as habitat for fish, other aquatic life, wildlife, and for primary and secondary contact recreation. They shall be a source of public water supply (i.e., where designated and with appropriate treatment). They shall be suitable for irrigation and other agricultural uses and for compatible industrial cooling and process uses. And they shall have consistently good aesthetic value.

The objective of the Federal Clean Water Act (CWA) is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. To meet this goal, the CWA requires states to develop information on the quality of their water resources and report this information to the U.S. Environmental Protection Agency (EPA), the U.S. Congress, and the public. To this end, the EPA released guidance on November 19, 2001, for the preparation of an integrated "List of Waters" that could combine reporting elements of both §305(b) and 303(d) of the CWA. The integrated list format allows the states to provide the status of all their assessed waters in one list. States choosing this option must list each water body or segment in one of the following five categories:

1) Unimpaired and not threatened for all designated uses; 2) Unimpaired waters for some uses and not assessed for others; 3) Insufficient information to make assessments for any uses; 4)

Impaired or threatened for one or more uses but not requiring the calculation of a Total Maximum Daily Load (TMDL); and 5) Impaired or threatened for one or more uses and requiring a TMDL. The Massachusetts Year 2008 Integrated List of Waters identifies segment MA41-06 as a Category 5 water, requiring a TMDL. The listed impairments are nutrients, organic enrichment/low DO , flow alteration, and taste, odor and color.

a. Available Dilution

7 Day, 10 Year Low Flow

Water quality-based effluent limitations are established with the use of a calculated dilution factor, based on the available dilution of the effluent. Massachusetts water quality regulations require that the available effluent dilution be based upon the 7 year, 10 day low flow (7Q10 flow) of the receiving water (314 CMR § 4.03(3)(a)). The 7Q10 low flow is the mean low flow over seven consecutive days, recurring every ten years. Additionally, the 30-day, ten year low flow (30Q10 flow) of the receiving water is used in the calculation of water quality-based limitations for parameters such as ammonia (EPA 1999 Update of Ambient Water Quality Criteria for Ammonia).

The facility design flow is 0.45 million gallons per day (mgd) or 0.6975 cubic feet per second (cfs). The 7Q10 flow data used in the calculation of water quality-based effluent limitations in the draft permit are based on stream flow collected by the United State Geological Survey (USGS). The nearest USGS stream flow gage stations to the discharge point are as follows:

USGS Gage Station #01123695[1]
McKinstry Brook @ Hill Road, near Charlton City, MA
Drainage Area = 3.60 square miles
7-day, 10 year low flow = 0.0 cfs
Low Flow per square mile = 0.0 cfsm

USGS Gage Station # 01123700[1]
McKinstry Brook @ Southbridge, MA
Drainage Area = 7.69 square miles
7-day, 10 year low flow = <0.1 cfs
Low flow per square mile = <0.013 cfsm

In-basin 7-day, 10-year low flow = 0.0 – 0.1 cfs (from 2 gage stations)

Charlton WWTF
Drainage Area (outlet of Glen Echo Lake to Charlton WWTF) = 3.0 square miles[2]
Flow Measurements @ Cady Brook, upstream of Charlton WWTF:
June 22, 1999, 0.03 cfs; July 8, 1999, 0.05 cfs; and, August 17, 1999, 0.06 cfs.
Average low flow = 0.05 cfs

[1] USGS – gage flow data derived from the National Water Information System, Web Interface, http://ma.water.usgs.gov/water/default.htm.

[2] USGS – *StreamStats is a web-based tool that allows users to obtain stream flow statistics, drainage-basin characteristics, and other information for user-selected sites on streams (i.e.,* http://water.usgs.gov/osw/streamstats/massachusetts.html). Streamstats was used to calculate the drainage area at the POTW

Based on the review of USGS partial flow gage stations and the stream flow measurements collected on Cady Brook during the summer of 1999, it is clear that the 7Q10 stream flow in Cady Brook upstream of the discharge is minimal, and not greater than 0.05 cfs,.

Using a 7Q10 stream flow of 0.05 cfs and the facility design flow of 0.6975 cfs, the resulting dilution factor can be calculated as follows:

$$\text{Dilution Factor (DF)} = \frac{(7Q10) + (\text{Plant Q})}{(\text{Plant Q})} = \frac{(0.05\ \text{cfs}) + (0.6975\ \text{cfs})}{(6.975\ \text{cfs})} = 1.07$$

This dilution factor is the same as in the previous permit.

30 Day, 10 Year Low Flow

Flow gaging data for the Seven Mile River, located in Spencer, MA, was used to help estimate the 30Q10 flow in Cady Brook. The Seven Mile River was chosen due to its similar drainage area, proximity to Cady Brook, and continuous flow gage record. McKinstry Brook was not used for this analysis, since it does not have a continuous gage record sufficient to develop a 7Q10 to 30Q10 ratio, which is critical to developing a 30Q10 flow.

Flow Gaging Information for the Seven Mile River

In the February 28, 2002 Fact Sheet	Updated in June of 2009
7Q10 = 0.24 cfs	7Q10 = 0.23 cfs
30Q10 = 0.40 cfs	30Q10 = 0.40 cfs

Therefore, the updated annual 30Q10 to 7Q10 ratio = (0.40 cfs / 0.23 cfs) = 1.739 = 1.7

Winter 30Q10 is estimated to be approximately three (3) times the annual 30Q10 by comparing the winter period monthly flow statistics to the summer monthly flow statistics using the gazetteer. (Gazeteer of Hydrological Characteristics of Streams in Massachusetts – U.S. Geological Survey – Connecticut River Basin.)

Cady Brook 30Q10 estimate

Annual 30Q10 = (Cady Brook 7Q10) x (30Q10 to 7Q10 ratio in Seven Mile River)
= (0.05 cfs x 1.7) = 0.085 cfs

Winter 30Q10 = (annual 30Q10) x (winter 30Q10 to annual 30Q10 ratio in Seven Mile River)
= (0.085 cfs x 3) = 0.26 cfs

Dilution Factor at Outfall:

WWTF design flow = 0.45 MGD = 0.6975 cfs

Winter 30Q10 of Cady Brook = 0.26 cfs

Winter 30Q10 dilution factor = (WWTF design flow + Cady Brook 30Q10)/(WWTF design flow)
= (0.6975 cfs + 0.26 cfs)/(0.6975 cfs)
= 1.37

3. Explanation of Effluent Limitations (Outfall 001)

In addition to the State and Federal regulations described above, data submitted by the permittee in the re-application as well as in monthly discharge monitoring reports (DMRs) and in whole effluent toxicity (WET) test reports from 2005 to 2008 was used to evaluate the discharge during the effluent limitations development process (see **Attachments A and C**).

a. Flow

The flow limitation of 0.45 MGD in the draft permit is the same as the limit in the current permit. The existing treatment plant, and upgrade currently under construction have design flows of 0.45 MGD

Flow will be measured continuously. The permittee will report the annual average monthly flow using the rolling average method (See Permit, Footnote 2). Additionally, the permittee will report the average monthly and maximum daily flow.

A maximum daily flow limitation is not proposed for the draft permit, since this limit is not required by federal regulation and has not been made a condition for State certification.

b. Conventional Pollutants

1. Biochemical Oxygen Demand (BOD)

The draft permit includes proposed average monthly, average weekly, and average monthly percent removal BOD limitations which are based on the requirements set forth at 40 CFR § 133.102(a)(1), (2), (3), and 40 CFR § 122.45(f). The draft permit includes maximum daily monitoring requirements, average monthly mass limitations, and average weekly mass limitations, based on current state water quality certification requirements and anti-backsliding regulations.

The average monthly and average weekly limitations for BOD during the summer period of April 1 to October 31 are based on the mass discharge authorized in the permit issued on September 30, 1996. Specifically, the mass discharge authorized by the 1996 permit was calculated using the concentration limits and the permitted design flow of 0.32 MGD. These mass discharges were included as limits in the draft permit. The concentrations were then calculated using the mass limits and the new flow limit 0.45 MGD.

The average monthly and average weekly BOD limitations from November 1 to March 31 are based on the mass discharge authorized (i.e., calculations are provided below).

2. Total Suspended Solids (nonfilterable) (TSS)

The draft permit includes proposed average monthly, average weekly, and average monthly percent removal TSS limitations which are based on the requirements set forth at 40 CFR § 133.102(a)(1), (2), (3), and 40 CFR § 122.45(f). The draft permit includes maximum daily monitoring requirements, average monthly mass limitations, and average weekly mass limitations, based on current state water quality certification requirements and anti-backsliding regulations.

The average monthly and average weekly limitations for TSS during the summer period of April 1 to October 31 are based on the mass discharge authorized in the permit issued on September 30,

1996. Specifically, the mass discharge authorized by the 1996 permit was calculated using the concentration limits and the permitted design flow of 0.32 MGD. These mass discharges were included as limits in the 2002 permit. The concentrations were then calculated using these mass limits and the new flow limit 0.45 MGD.

The average monthly and average weekly TSS limitations from November 1 to March 31 are based on the secondary treatment requirements of Section 301(b) of the Clean Water Act (CWA) as defined in 40 CFR § 133.102. The limits for this time period were not based on the mass loading in the 1996 permit, and an increase in mass was authorized since the receiving water flow is higher and temperature is colder during this period, thereby minimizing the impacts of the increased discharge. The permittee is however, required to optimize treatment efficiency for TSS in the winter period in order to minimize any lowering of water quality. This requirement coupled with the new toxicity based ammonia limit is expected to prevent any significant degradation of water quality.

Calculations for BOD and TSS Limitations

The average monthly and average weekly limitations for BOD and TSS were calculated as follows:

Mass Limitation (lbs/day) = C x DF x 8.34

Where:
C = Concentration limit
DF = Design flow of the facility, in million gallons per day (MGD)
8.34 = Factor to convert effluent concentration in mg/l and design flow in MGD to lbs/day. The units of this 8.34 conversion factor are (lbs)(l)/(mg)(gal).

April 1 – October 31 Limitations

Average Monthly Mass Limit = 20 mg/l x 0.32 MGD x 8.34 = 53.4 lbs/day = 53 lbs/day
Average Weekly Mass Limit = 25 mg/l x 0.32 MGD x 8.34 = 66.7 lbs/day = 67 lbs/day

Back-calculating to concentration limits:

Average Monthly Concentration Limit = 53 lbs/day / (0.45 MGD x 8.34) = 14.1 mg/l = 14 mg/l
Average Weekly Concentration Limit = 67 lbs/day / (0.45 MGD x 8.34) = 17.8 mg/l = 18 mg/l

The mass limitations in the draft permit are the same as those in the current permit and are consistent with anti-backsliding requirements.

November 1 – March 31 Limitations

Average Monthly Mass Limit = 30 mg/l x 0.32 MGD x 8.34 = 80 lbs/day
Average Weekly Mass Limit = 45 mg/l x 0.32 MGD x 8.34 = 120 lbs/day

Back-calculating to concentration limits:

Average Monthly Concentration Limit = 80 lbs/day / (0.45 MGD x 8.34) = 21.3 mg/l = 21 mg/l
Average Weekly Concentration Limit = 120 lbs/day / (0.45 MGD x 8.34) = 31.9 mg/l = 32 mg/l

The mass limitations in the draft permit are the same as those in the current permit and are consistent with anti-backsliding requirements.

3. pH

The draft permit includes pH limitations that are required by state water quality standards, and are protective of pH standards set forth at Title 314 CMR 4.05(b)(3), for Class B waters. The pH requirements are more stringent than those required under 40 CFR § 133.102(c). The pH limits are carried forward from the current permit, and so are consistent with antibacksliding requirements of 40 CFR § 122.44(1). The monitoring frequency for pH is set at once per day in the draft permit.

4. *Escherichia Coli Bacteria (E. coli)*

The *Escherichia Coli (E. coli)* limits for outfall 001 are based on state water quality standards for Class B waters (314 CMR 4.05(b)(4)). The State of Massachusetts recently (December 29, 2006) promulgated new bacteria criteria in the Surface Water Quality Standards (314 CMR § 4.00). The *E. coli* bacteria requirements will be monitoring only during the first summertime season, in order for the treatment facility to train staff on the required procedures for sampling and lab analysis. The fecal coliform bacteria limitations will be replaced by *E. coli* limits on **April 1, 2011**. The *E. coli* bacteria limits proposed in the draft permit for Outfall 001 are 126 cfu per 100 ml geometric mean and 409 cfu per 100 ml maximum daily value (this is the 90% distribution of the geometric mean of 126 cfu per 100 ml). The *E. coli* bacteria limits are seasonal, from April 1st – October 31st, to ensure the protection of the receiving water during the recreational period. The proposed *E. coli* bacteria monitoring frequency in the draft permit is once per week.

c. Non-Conventional Pollutants

1. Nitrogen

It has been determined that excessive nitrogen loadings are causing significant water quality problems in Long Island Sound, including low dissolved oxygen. In December 2000, the Connecticut Department of Environmental Protection (CT DEP) completed a Total Maximum Daily Load (TMDL) for addressing nitrogen-driven eutrophication impacts in Long Island Sound. The TMDL included a Waste Load Allocation (WLA) for point sources and a Load Allocation (LA) for non-point sources. The TMDL target of a 25 percent aggregate reduction from baseline loadings is currently being met, and the overall loading from MA, NH and VT wastewater treatment plants discharging to the Connecticut River watershed has been reduced by about 36 percent.

The agencies will annually update the estimate of all out-of-basin total nitrogen loads and may incorporate total nitrogen limits in future permit modifications or reissuances as may be necessary to address increases in discharge loads, a revised TMDL, or other new information that may warrant the incorporation of numeric permit limits. Since the annual average total nitrogen load from this facility (2004 – 2005) is estimated to be 21.1 lbs/day, the draft permit does not include an annual average total nitrogen limit at this time. Although not a permit requirement, it is strongly recommended that any facilities planning that might be conducted for this facility should consider alternatives for further enhancing nitrogen reduction.

The average monthly and maximum daily reporting requirements for total Kjeldahl nitrogen (TKN), total nitrite nitrogen (NO_2), and total nitrate nitrogen (NO_3) at a frequency of once per

quarter in the current permit have been maintained in the draft permit in order to continue assessing the annual average total nitrogen loading from this facility.

2. Ammonia-Nitrogen (NH_3-N)

Ammonia can be toxic to aquatic life and is also an oxygen demanding pollutant whose biological decomposition may cause reduced dissolved oxygen concentrations in the receiving water.

The ammonia limits in the draft permit for the months of May through October are necessary to meet water quality criteria for dissolved oxygen. These proposed limits were first included in the 2002 permit and were calculated to ensure that the mass discharge of ammonia during these months did not increase as a result of the increase of the permitted discharge flow from 0.32 MGD to 0.45 MGD and therefore have the potential to cause degradation of existing water quality. The monthly average and weekly average concentration limits for May, and April through October in the draft permit are the same as those in the 2002 permit, and so are consistent with antibacksliding requirements.

The proposed ammonia limits for the months of November through April are also the same as those in the 2002 permit. These limits are based on the potential for the discharge of ammonia to cause toxicity in the receiving water.

The calculations used in developing the limits for the 2002 permit are shown below:

Limitations for Summer Months (monthly average):

Limit for May

Load Limit = 5 mg/l at 0.32 MGD previous design flow (noted in the 2002 Permit)
= 5.0 mg/l x 0.32 MGD x 8.34
= 13.34 lbs/day

Proposed Limit = current load limit / ((current design flow) x 8.34)
= 13.34 lbs/day / (0.45 MGD x 8.34)
= 3.6 mg/l

Limit for June-October

Current Load Limit = 2 mg/l at 0.32 MGD design flow
= 2.0 mg/l x 0.32 MGD x 8.34
= 5.34 lbs/day

Proposed Limit = current load limit / ((current design flow) x 8.34)
= 5.34 lbs/day / (0.45 MGD x 8.34)
= 1.42

Limitations for Winter Months (monthly average and weekly average):

The effluent limits for the months of November through March are based on water quality criteria contained in the EPA's 1999 *Update of Ambient Water Quality Criteria for Ammonia* document. These criteria are based on the toxicity of ammonia. The limits for total ammonia-nitrogen (NH-N) have been placed in the draft permit based on the potential for ammonia toxicity in Cady

Brook. The limits are based on the available dilution factor and toxicity criteria. Control of ammonia in the discharge will also help to maintain dissolved oxygen (DO) levels in the stream.

The calculations are as follows:

Limits for November 1 – April 30

The ambient criteria used in establishing the monthly and weekly limits for Ammonia was obtained from the EPA document 1999 update of Water Quality Criteria for Ammonia. The monthly average criteria is 5.9 mg/l and the weekly average criteria is twice the monthly criteria, or 11.8 mg/l, using an assumed temperature of 10 degrees C and a pH of 7.0.

Monthly Average Limit = (monthly criteria) x (winter 30Q10 dilution factor)
= (5.9 mg/l x 1.37)
= 8.0 mg/l

Weekly Average Limit = (weekly criteria) x (winter 30Q10 dilution factor)
= (11.8 mg/l x 1.37)
= 16 mg/l

3. Phosphorus

While phosphorus is an essential nutrient for the growth of aquatic plants, it can stimulate rapid plant growth in freshwater ecosystems when it is present in high quantities. The excessive growth of aquatic plants and algae within freshwater systems negatively impacts water quality and can interfere with the attainment of designated uses by: (1) increasing the oxygen demand within the water body (to support an increase in both plant respiration and the biological breakdown of dead organic (plant) matter); (2) causing an unpleasant appearance and odor; (3) interfering with navigation and recreation; (4) reducing water clarity; and (5) reducing the quality and availability of suitable habitat for aquatic life. Cultural (or accelerated) eutrophication is the term used to describe dense and excessive plant growth in a water body that results from nutrients entering the system as a result of human activities. Discharges from municipal and industrial wastewater treatment plants, agriculture runoff, and stormwater are examples of human-derived (i.e., anthropogenic) sources of nutrients in surface waters.

Elevated concentrations of chlorophyll a, excessive algal and macrophyte growth, and either elevated (i.e., near saturation) or low levels of dissolved oxygen are all effects of nutrient enrichment. The relationship between these factors and high instream total phosphorus concentrations is well documented in scientific literature, including guidance developed by EPA to address nutrient overenrichment (Nutrient Criteria Technical Guidance Manual – Rivers and Streams. EPA July 2000 [EPA-822-B-00-002]).

The impacts associated with excessive phosphorus inputs are well documented in this segment of Cady Brook (MA41-06) in the French & Quinebaug River Watersheds 2001 Water Quality Assessment Report (MassDEP 2001). Observations of "organic enrichment and nutrient loadings from the Charlton WWTF, compounded by the low-base flow conditions in Cady Brook, impairs the *Aquatic Life Use* for the 0.3-mile segment below the facility's discharge". More recent observations within this segment are documented in the French & Quinebaug River Watersheds 2008 Water Quality Assessment Report (MassDEP 2008). This report documented "slightly elevated phosphorus concentrations" that ranged from 23 ug/l to 88 ug/l with five of the eleven samples collected greater than 50 ug/l, and placed this segment on the 2008 Integrated List of Waters in Category 5 – Waters Requiring a TMDL due to nutrients, organic enrichment and low dissolved oxygen, flow alteration, taste, odor, and color.

EPA has produced several guidance documents which contain recommended total phosphorus criteria for receiving waters. EPA has published national guidance documents which contain recommended total phosphorus criteria and other indicators of eutrophication. EPA's 1986 *Quality Criteria for Water* (the "Gold Book") recommends that instream phosphorus concentrations not exceed 0.05 mg/l in any stream entering a lake or reservoir, 0.1 mg/l for any stream not discharging directly into lakes or impoundments, and 0.025 mg/l within a lake or reservoir.

More recently, EPA has released recommended Ecoregional Nutrient Criteria, established as part of an effort to reduce problems associated with excess nutrients in water bodies in specific areas of the country. The published criteria represent conditions in waters within ecoregions that are minimally impacted by human activities, and thus free from the effects of cultural eutrophication. Charlton is located within Ecoregion XIV, Eastern Coastal Plains. The recommended total phosphorus criterion for this ecoregion, found in Ambient Water Quality Criteria Recommendations: Information Supporting the Development of State and Tribal Nutrient Criteria, Rivers and Streams in Ecoregion XIV (EPA December 2000) is 24 ug/l (0.024 mg/l).

Currently, the Massachusetts Water Quality Standards do not contain numerical criteria for phosphorus. The narrative criterion for nutrients, found at 314 CMR § 4.05(5)(c), states that nutrients "shall not exceed the site-specific limits necessary to control accelerated or cultural eutrophication". The Massachusetts Water Quality Standards also require that "any existing point source discharges containing nutrients in concentrations which encourage eutrophication, including the excessive growth of aquatic plants or algae, in any surface water shall be provided with the highest and best practical treatment to remove such nutrients" (314 CMR § 4.05(5)(c)). The MassDEP has established that a monthly average total phosphorus limit of 0.2 mg/l represents the highest and best practical treatment for POTWs.

The current permit includes a monthly average total phosphorus limit of 0.2 mg/l for the months of April through October, based on MassDEP's highest and best practical treatment standard. The permit also included an interim effluent limitation of 1.0 mg/l, which was in effect until either 1) the operation of the existing treatment plant was optimized to achieve the final limit, or 2) if optimization was shown to be insufficient, the treatment plant was upgraded to achieve the final limit.

The treatment plant upgrade currently being completed was undertaken, in part, to achieve the final total phosphorus limit.

In this reissuance, EPA evaluated whether the current limit of 0.2 mg/l was sufficient to achieve the Massachusetts Water Quality Standards. Consistent with other POTW permits it has issued in Massachusetts, EPA used total phosphorus criteria from EPA Gold Book to determine whether the discharge had the reasonable potential to cause or contribute to exceedances of water quality criteria. EPA decided to apply the Gold Book criterion because it was developed from an effects-based approach versus the reference conditions-based approach used in the derivation of the ecoregion criteria. The effects-based approach is preferred in this case because it is more directly associated with an impairment of designated use (e.g., fishing). The effects-based approach provides a threshold value above which water quality impairments are likely to occur. It applies empirical observations of a causal variable (i.e., phosphorus) and a response variable (i.e., algal growth) associated with impairment of designated uses. Reference-based values are statistically derived from a comparison within a population of rivers in the same ecoregional class. They are a quantitative set of river characteristics (physical, chemical, and biological) that represent minimally impacted conditions.

In order to check whether the existing limit is sufficiently stringent to attain water quality standards, EPA first reviewed available upstream total phosphorus data in order to characterize background phosphorus concentrations. As shown in Attachment B, samples collected in Cady Brook in 1999, approximately 50 feet upstream of the treatment facility discharge measured total phosphorus concentrations of 21 and 23 ug/l. The 21 ug/l sample was collected on August 17, 1999, when stream flow was at approximately 7Q10 (i.e., 0.06 cfs). This phosphorus sample result represents a worse-case upstream phosphorus concentration value. Accounting for this in-stream concentration, and in order to ensure water quality protection for the receiving water, a permit limit for phosphorus can be calculated as follows:

$\{(Q_R + Q_W) * C_{WQ} – (Q_R * C_R)\} / Q_W = C_W$

Where:
Q_R = 7Q10 flow of Cady Brook at the point of discharge = 0.05 cfs
Q_W = Design flow of the Charlton WWTF = 0.6975 cfs
C_W = In-stream water quality criteria = 100 ug/l
C_R = In-stream phosphorus concentration located upstream of the discharge = 21 ug/l
C_W = Phosphorus concentration limit for the Charlton WWTF

$\{(0.05 + 0.6975) * 100 – (0.05 * 21)\} / 0.6975 = 105.66$ ug/l = 0.11 mg/l

Since this calculated limit is more stringent than the current effluent limit of 0.2 mg/l, the discharge of phosphorus at the current effluent limit has the reasonable potential to cause or contribute to an exceedance of water quality standards. Accordingly, the draft permit includes a proposed monthly average total phosphorus limit of 0.11 mg/l. This limit will be in effect during the months of April through October, the growing season for aquatic plants.

Also, in order to ensure that the higher levels of phosphorus discharged during remainder of the year do not result in the accumulation of phosphorus in the sediments, and subsequent release during the growing season, a monthly average limit of 1.0 mg/l is include in the draft permit for the months of November through March.. The limitation assumes that the vast majority of the phosphorus discharged will be in the dissolved fraction and that dissolved phosphorus will pass through the system and not accumulate in the sediments. A dissolved orthophosphorus monitoring requirement has been included to verify the dissolved fraction.

4. Metals (Aluminum, Copper, Cadmium, Lead, Nickel, and Zinc)

The Massachusetts Surface Water Quality Standards include requirements for the regulation and control of toxic constituents and also require that EPA criteria in “National recommended Water Quality Criteria: 2002”, published pursuant to Section 304(a) of the CWA be used unless site-specific criteria are established. See 314CMR 4.05(5)(e).

In evaluating the reasonable potential for the Charlton WWTF discharge to cause or contribute to an excursion above any State water quality standard for a particular metal, a permissible effluent concentration was calculated based on an allowable receiving water concentration (criteria) and the available dilution at the point of discharge. The following equation was used in the calculation of an allowable concentration of a particular metal in the effluent:

$C_d = C_r \times DF$

Where:

C_d = Allowable concentration of a particular pollutant in the effluent.
C_r = Allowable in-stream concentration of a pollutant.
DF = Dilution factor (available dilution at the point of discharge).

Metals data submitted by the permittee on its DMRs, along with the results of chemical analyses performed in conjunction with the whole effluent toxicity (WET) tests were then compared to the calculated allowable effluent concentration. If the effluent monitoring data revealed discharges of a particular metal in concentrations exceeding the calculated allowable effluent concentration, then reasonable potential exists for this discharge to cause or contribute to an excursion above a State water quality standard. In this case, a limit equal to the allowable effluent concentration would be incorporated into the permit. The process used to determine whether an effluent limitation for aluminum, copper, cadmium, lead, nickel, and zinc will be necessary in the draft permit, is shown in the following sections.

Aluminum

The following criteria from the EPA 2002 National Recommended Water Quality Criteria were used in the calculation of permissible effluent concentrations of aluminum:

Criterion Maximum Concentration (CMC) = 750 ug/l
Criterion Chronic Concentration (CCC) = 87 ug/l

Using the above criteria and the calculated dilution factor of 1.07, the allowable concentrations of aluminum that can be discharged from the Charlton WWTF into the receiving water was determined as follows:

Allowable Acute Effluent Concentration

C_d = CMC x DF = 750 ug/l x 1.07 = 802.5 ug/l = 0.803 mg/l
Allowable Chronic Effluent Concentration

C_d = CCC x DF = 87 ug/l x 1.07 = 93.1 ug/l = 0.093 mg/l

Since the permittee ceased using all aluminum products at their facility on April 1, 2005, DMR data and WET test reports after this date were reviewed. Specifically, a review of monthly discharge monitoring reports (DMRs) submitted by the permittee from April 2005 to August 2008 showed monthly average effluent concentrations of aluminum ranging from a minimum of 10 ug/l to a maximum of 173 ug/l. A review of WET test reports submitted by the permittee from March 2006 to February 2009 showed concentrations of aluminum in the effluent ranging from not being detected to a maximum of 170 ug/l (see **Attachment A**). Since the facility's discharge data indicates that the facility has a reasonable potential to cause or contribute to a violation of the calculated allowable chronic concentration value, a monthly average limit of 93 ug/ is proposed in the draft permit.

Hardness-dependent Metals (Copper, Lead, Nickel, and Zinc)

Certain metals, including cadmium, lead, nickel and zinc, are more toxic at lower hardness, and this is factored into calculations of the water quality criteria. EPA's Office of Water – Office of Science and Technology stated in a letter dated July 7, 2000 that: *The hardness of the water containing the discharged toxic metals should be used for determining the applicable criterion.*

Thus, the downstream hardness should be used.

The hardness of Cady Brook downstream of the treatment plant during critical low flow periods was calculated based on average ambient and effluent hardness data collected for the whole effluent toxicity tests conducted in the summer months of August 2006 – 2008 and October 2006.

$$Cr = \frac{QdCd + QsCs}{Q_r} = \frac{(0.6975\ cfs)(118\ mg/l) + (0.05\ cfs)(45)}{(0.05\ cfs + 0.6975\ cfs)} = 112.7\ mg/l = 113\ mg/l$$

Where:

Qs = 7Q10 river stream flow upstream of plant = 0.05 cfs
Qd = Design discharge flow from plant = 0.45 MGD = 0.6975 cfs
Qr = Combined stream flow (7Q10 + plant flow) = 0.75 cfs
Cs = Upstream hardness concentration = 45 mg/l
Cd = Plant discharge hardness concentration = 118 mg/l
Cr = Receiving water hardness concentration

Therefore, a hardness of 113 mg/l was used to calculate the water quality criteria for certain metals. The water quality criteria formulas are found in Appendix B of EPA's National Recommended Water Quality Criteria – 2006:

1. Acute Criteria $_{(Dissolved)} = \exp\{m_a[\ln(h)]+b_a\}(CF)$[3]

Where:
m_a = Pollutant-specific coefficient
b_a = Pollutant-specific coefficient
ln = Natural logarithm
h = Hardness of the receiving water, expressed in terms of mg/l $CaCo_3$
CF = Pollutant-specific conversion factor used to convert total recoverable metals to dissolved metal

2. Chronic Criteria $_{(Dissolved)} = \exp\{m_c[\ln(h)]+b_c\}(CF)$

Where:
m_c = Pollutant-specific coefficient
b_c = Pollutant-specific coefficient
ln = Natural logarithm
h = Hardness of the receiving water, expressed in terms of mg/l $CaCo_3$
CF = Pollutant-specific conversion factor used to convert total recoverable metals to dissolved metal

[3] EPA Metal Translator Guidance for Calculating a Total Recoverable Permit Limit from a Dissolved Criteria (EPA-823-B96-007) was used as the basis for the use of the criteria conversion factor (CF). National Guidance requires that permit limits for metals are to be expressed in terms of total recoverable metal and not dissolved metal. As such, conversion factors are used to develop total recoverable limits from dissolved criteria. The conversion factor reflects how the discharge of a particular metal partitions between the particulate and dissolved form after mixing with the receiving water. In the absence of site-specific data describing how a particular discharge partitions in the receiving water, a default assumption equivalent to the criteria conversion factor is used in accordance with the Metal Translator Guidance.

Parameters for Calculating Freshwater Dissolved Metals Criteria That Are Hardness Dependent

					Freshwater Conversion Factors (CF)	
Chemical	m_A	b_A	m_c	b_c	CMC	CCC
Cadmium	1.0166	-3.924	0.7409	-4.719	1.136672-[(ln hardness)(0.041838)]	1.101672-[(ln hardness)(0.041838)]
Lead	1.273	-1.460	1.273	-4.705	1.46203-[(ln hardness)(0.145712)]	1.46203-[(ln hardness)(0.145712)]
Nickel	0.8460	2.255	0.8460	0.0584	0.998	0.997
Zinc	0.8473	0.884	0.8473	0.884	0.978	0.986

The dissolved acute and chronic criteria and total recoverable maximum daily and average limits are listed on the summary table below.

Metals Criteria and Limits

In order to determine the reasonable potential to cause or contribe to exceedances of the metals criteria in Cady Brook, metals data submitted with the toxicity test reports and DMRs were evaluated against potential water quality based effluent limits based on the respective water quality criteria for each metal. The table below summarizes the criteria, potential water quality based limits, and discharge quality for six trace metals (aluminum, copper, cadmium, lead, nickel, and zinc) that are commonly present in the effluent of POTWs.

Summary of Reasonable Potential Analysis for Selected Trace Metals

Metal	Acute Criterion, Dissolved (ug/l)	Chronic Criterion, Dissolved (ug/l)	Maximum Monthly Limit, Total (ug/l)	Average Monthly Limit, Total (ug/l)	Effluent	
					Range (ug/l)	Number of Exceedances
Aluminum	750	87	802.5	93.1	< 0 – 173	15
Copper	25.7	18.1	28	20	1 – 450	10[1]
Cadmium	2.44	0.27	2.6	0.3	< 0 – 1.2	1
Lead	78.86	3.09	102.1	4.0	< 0 – 14	1
Nickel	555.5	57.67	556.7	61.9	< 0 - 14	0
Zinc	139	139.3	142.2	142.2	29 - 990	5

[1] Based on revised Massachusetts Water Quality Criteria.

Based on the criteria and concentrations of metal in the effluent, there is a reasonable potential to cause or contribute to a violation of the water quality standards for several metals. The aluminum limits have been maintained, the copper limits have been revised, and limits have been added for cadmium, lead and nickel.

Copper

The draft permit contains revised limits for copper. The limits for copper in the existing permit were calculated based on the chronic and acute criteria set forth in the 1998 *National Recommended Water Quality Criteria*, pursuant to the Massachusetts Water Quality Standards in effect when the existing permit was issued in 2002. Since that time the Commonwealth of Massachusetts has issued, and EPA has approved, site-specific water quality criteria for copper for Cady Brook that are less stringent than the prior criteria. The new site specific criteria for copper establish a chronic criterion of 18.1 ug/$l_{(dissolved, "d")}$, [4] and an acute criterion of 25.7 ug/$l_{(d)}$. The draft permit contains effluent limits of 20 ug/$l_{(total\ recoverable\ "tr")(monthly\ average)}$ and 28 ug/$l_{(tr)(maximum\ daily)}$, which are the limits necessary to attain the site-specific criteria. The derivation of these limits is set forth below.

1. Standard for determining effluent limitations under revised water quality standard

In determining the appropriate effluent limitation in response to this revised standard, EPA must apply the requirements of the revised state standard, as set forth in the Mass DEP *Protocol for and Determination of Site-Specific Copper Criteria for Ambient Waters in Massachusetts,* January 2007 (the "site-specific protocol"), and the requirements of the anti-backsliding provisions of the Clean Water Act §§ 402(o) and 303(d)(4).

Site-Specific Protocol: In determining effluent limitations under the revised standard, the site-specific protocol allows for relaxation of permit limits to reflect the higher criteria only to the extent required to reflect the actual performance that the facility has been able to achieve. It states:

> [A]s part of the site-specific criteria, all reasonable efforts to minimize the loads of metals, and copper in this case, are part of the criteria revision protocol. So, the Department on a case-by-case basis will develop permit copper limits. Each determination will be based not only on the adjusted concentration resulting from the appropriate multiplier but will reflect the demonstrated level of copper reduction routinely achievable at the facility in order to minimize copper loads and thereby reduce its accumulation in the sediment.

Thus, determination of the appropriate effluent limits under the site-specific protocol requires calculating both (i) the required effluent limits that would meet the numeric criteria (criteria-based limits) and (ii) the actual effluent concentrations achieved by the facility (performance-based limits), and selecting the more stringent of the two.

Anti-backsliding: The reissuance of a permit with less stringent effluent limits must meet the requirements of the Clean Water Act's anti-backsliding provision, § 402(o), which allows relaxation of water quality based standards only if they comply with CWA § 303(d)(4), and only

[4] Water quality criteria for copper are expressed in terms of dissolved metals. However, permit limitations for copper are expressed in terms of total recoverable metals in accordance with the requirements of 40 CFR § 122.45(c). As such, conversion factors are used to develop total recoverable limits from dissolved criteria. The conversion factor reflects how the discharge of a particular metal partitions between the particulate and dissolved form after mixing with the receiving water. In the absence of site-specific data describing how a particular discharge partitions in the receiving water, a default assumption equivalent to the criteria conversion factor is used in accordance with the *Metal Translator Guidance for Calculating a TotalRecoverable Permit Limit from a Dissolved Criterion* (USEPA 1996 [EPA-823-B96-007]). Therefore, a conversion factor of 0.960 was used to convert between total recoverable and dissolved copper concentrations. Dissolved concentrations are denoted ug/$l_{(d),}$ while total recoverable concentrations are denoted ug/$l_{(tr)}$

if the revised limit meets current effluent guidelines and will not cause a violation of water quality standards.[5] The Massachusetts antidegradation policy is set forth in 314 CMR § 4.04, providing, *inter alia*, "[i]n all cases existing uses and the level of water quality necessary to protect the existing uses shall be maintained and protected."

The analysis under the site-specific protocol addresses the antibacksliding and antidegradation requirements by relaxing the copper limits to the more stringent of the limits necessary to achieve the revised criteria, or to the limits that have historically been achieved by the facility (unless the facility has historically discharged an effluent concentration lower than the current permit limits, in which those limits are retained). Because any relaxed limits will result in attainment of the site-specific criteria and not be less stringent than the facility's current performance, the facility will not be able to scale back its efforts to reduce copper concentrations in the effluent. Therefore, the less stringent limits will not have the result of exceeding the revised criteria or worsening water quality in the receiving water, and the antidegradation requirement will be met.

2. Determination of Effluent Limitations

As set forth above, the effluent limitations are determined by calculating both (i) the required effluent limits that would meet the numeric criteria (criteria-based limits) and (ii) the actual effluent concentrations achieved by the facility (performance-based limits), and selecting the more stringent of the two. The only exception to this procedure is if the actual effluent concentration is lower than the current (non site-specific) limits, then the current limits are retained in the permit

Criteria-based calculation. The criteria-based limits are calculated based on a mass-balance equation that incorporates the relevant flows (7Q10 for the receiving water and design flow for the facility) and the background concentration in Cady Brook (based on receiving water data from the facility WET reports). The equation is

$QrCr = QdCd + QsCs$

Which was rearranged as:

$Cd = (QrCr – QsCs)/Qd$

Where:
Qs = receiving water flow upstream of the discharge (7Q10 flow) = 0..05 cfs
Cs = copper concentration upstream of the discharge = 7 µg/l(tr)
Qr = receiving water flow downstream from the discharge = Qr = Qd + Qs = 0.75 cfs
Cr = copper concentration downstream from the discharge = set equal to criteria
Qd = design flow of the facility = 0.6975 cfs
Cd = copper concentration in the discharge = effluent limit (being solved for)

C_r = Chronic criterion = 18 ug/l (dissolved); 18.9 ug/l (total recoverable)
C_r = Acute criterion = 25.7 ug/l (dissolved); 26.8 ug/l (total recoverable)

[5] The anti-backsliding rule also contains a number of exceptions that are not applicable here. *See* CWA § 402(o)(2); 40 CFR § 122.44(l).

The resulting criteria-based limits are:

Monthly average (chronic):

Cd = [(0.75 cfs)(18.9 µg/l)- (0.05 cfs)(7 µg/l)] /0.6975 cfs
Cd = 19.8 = 20 µg/l(tr)

Maximum daily (acute):

Cd = [(0.75 cfs)(26.8 µg/l) - (0.05 cfs)(7 µg/l)] /0.6975 cfs
Cd = 28.3 = 28 µg/l(tr)

Performance-based calculation. The level of copper removal routinely achieved by the facility (i.e., the past demonstrated performance of the facility) is determined by a statistical analysis of discharge data submitted by the facility over the two year period from April 2008 through March 2010, using the methodology set forth in the Technical Support Document for Water Quality-based Toxics Control, EPA/505/2-90-001 (March 1991) (Appendix E). The average monthly and maximum daily limits are based on the 95th and 99th percentile of a lognormal distribution, based on the facility's monthly average effluent data as shown in Attachment B. These calculations indicate that limits based solely on past performance would result in a monthly average limit of 25.1 µg/l and a maximum daily limit of 33.4 µg/l..

Resulting Effluent Limitation. As noted above, pursuant to the site-specific protocol, effluent limits will be relaxed only to the more stringent of the criteria-based or performance-based limits. In this case the criteria-based limits are more stringent, so these effluent limits have been included in the draft permit, which are as follows:

Monthly average: 20 µg/l(tr)
Maximum daily: 28 µg/l(tr)

5. Whole Effluent Toxicity

Under Section 301(b)(1)(C) of the CWA, discharges are subject to effluent limitations based on water quality standards. The Massachusetts State Surface Water Quality Standards, found at 314 CMR § 4.05(5)(e),include the following narrative statements and require that EPA criteria established pursuant to Section 304(a)(1) of the CWA be used as guidance for interpretation of the following narrative criteria:

> *All surface waters shall be free from pollutants in concentrations or combinations that are toxic to humans, aquatic life or wildlife. Where the State determines that a specific pollutant not otherwise listed in 314 CMR 4.00 could reasonably be expected to adversely affect existing or designated uses, the State shall use the recommended limit published by EPA pursuant to 33 U.S.C. 1251 § 304(a) as the allowable receiving water concentrations for the affected waters unless a site-specific limit is established. Site-specific limits, human health risk levels and permit limits will be established in accordance with 314 CMR 4.05(5)(e)(1)(2)(3)(4).*

National studies conducted by the EPA have demonstrated that domestic sources, as well as industrial sources, contribute toxic constituents to POTWs. These constituents include metals, chlorinated solvents, aromatic hydrocarbons and others. Based on the potential for toxicity from domestic and industrial contributions, the state narrative water quality criterion, the level of dilution at the discharge location, and in accordance with EPA national and regional policy and 40 CFR § 122.44(d), the draft permit includes a whole effluent acute toxicity (lethal concentration

to 50% of the test organisms, or LC_{50}) limitation and a chronic toxicity (no observed effluent concentration, or C-NOEC) monitoring requirement. (See also: *Policy for the Development of Water Quality-Based Permit Limitations for Toxic Pollutants*, 49 Fed. Reg. 9016, March 9, 1984, and EPA's *Technical Support Document for Water Quality-Based Toxics Control,* September, 1991.)

The Massachusetts Department of Environmental Protection's (MassDEP) Division of Watershed Management has a current toxics policy which requires toxicity testing for all major dischargers such as the Charlton WWTF (*Implementation Policy for the Control of Toxic Pollutants in Surface Waters*, MassDEP 1990). In addition, EPA feels that toxicity testing is required to assure that the synergistic effect of the pollutants in the discharge does not cause toxicity, even though the pollutants may be at low concentrations in the effluent. The inclusion of whole effluent toxicity limitations in the draft permit will assure that the Charlton WWTF does not discharge combinations of toxic compounds into Cady Brook in amounts which would affect aquatic or human life.

Pursuant to EPA Region I Policy, and MassDEP's *Implementation Policy for the Control of Toxic Pollutants in Surface Waters* (February 1990), dischargers having a dilution factor less than 10 are required to conduct acute and chronic toxicity testing four times per year unless there are passing results over an extended period of time. In accordance with the above guidance, the draft permit includes an acute toxicity limit (LC_{50} of $\geq$ 100%) and a chronic toxicity limit (C-NOEC of $\geq$ 93%). The permittee shall conduct the modified acute and chronic toxicity tests using the daphnid, *Ceriodaphnia dubia* (*C. dubia*), as the test species. Toxicity testing must be performed in accordance with the EPA Region I test procedures and protocols specified in **Attachment B** of the draft permit (Freshwater Chronic Toxicity Procedure and Protocol), and the tests will be conducted four times a year. EPA and the MADEP may use the results of the toxicity tests and chemical analyses conducted by the permittee, required by the permit, as well as national water quality criteria, state water quality criteria, and any other appropriate information or data, to develop numerical effluent limitations for any pollutants.

VI. SLUDGE CONDITIONS

Section 405(d) of the Clean Water Act requires that EPA develop technical standards regarding the use and disposal of sewage sludge. On February 19, 1993, EPA promulgated technical standards. These standards are required to be implemented through permits. The conditions in the permit satisfy this requirement.

VII. INFILTRATION/INFLOW (I/I)

Infiltration is groundwater that enters the collection system through physical defects such as cracked pipes or deteriorated joints. Inflow is extraneous flow that enters the collection system through point sources such as roof leaders, yard and area drains, sump pumps, manhole covers, tide gates, and cross connections from storm water systems. Significant I/I in a collection system may displace sanitary flow, reducing the capacity and the efficiency of the treatment works and may cause bypasses of secondary treatment. It greatly increases the potential for sanitary sewer overflows (SSO) in separate systems, and combined sewer overflows (CSO) in combined systems.

The draft permit includes a requirement for the permittee to control infiltration and inflow (I/I) within the sewer collection system it owns and operates. The permittee shall develop an I/I removal program commensurate with the severity of I/I in the collection system. This program may be scaled down in sections of the collection system that have minimal I/I.

VIII. OPERATION AND MAINTENANCE OF THE SEWER SYSTEM

The standard permit conditions for "Proper Operation and Maintenance", set forth at 40 CFR § 122.41(e), require the proper operation and maintenance of permitted wastewater systems and associated facilities to achieve permit conditions. The requirements at 40 CFR § 122.41(d) impose a "duty to mitigate" upon the permittee, which requires that "all reasonable steps be taken to minimize or prevent any discharge violation of the permit which has a reasonable likelihood of adversely affecting human health or the environment". EPA and the MassDEP maintain that an I/I removal program is an integral component to ensuring compliance with the requirements of the permit under the provisions at 40 CFR § 122.41(d) and (e).

General requirements for proper operation and maintenance, and mitigation have been included in Part II of the permit. Specific permit conditions have also been included in Part I.D. and I.E. of the draft permit. These requirements include reporting of unauthorized discharges including SSOs, maintaining an adequate maintenance staff, performing preventative maintenance, controlling inflow and infiltration to separate sewer collection systems (combined sewers are not subject to I/I requirements) to the extent necessary to prevent SSOs and I/I related effluent violations at the wastewater treatment plant, and maintaining alternate power where necessary.

IX. ESSENTIAL FISH HABITAT DETERMINATION (EFH)

Under the 1996 Amendments (PL 104-267) to the Magnusun-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," (16 U.S.C. § 1855(b)).

The Amendments broadly define "essential fish habitat" (EFH) as: "waters and substrate necessary to fish for spawning, breeding, or growth to maturity," (16 U.S.C. § 1802(10)). "Adverse impact" means any impact which reduces the quality and/or quantity of EFH (50 CFR § 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 of habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

Essential fish habitat 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. Cady Brook is not covered by the EFH designation for riverine systems and thus EPA and the MassDEP have determined that a formal consultation with NMFS is not required.

X. ENDANGERED SPECIES ACT (ESA)

Section 7(a) of the Endangered Species Act (ESA) of 1973, as amended (the "Act"), grants authority to and imposes requirements upon Federal agencies regarding threatened or endangered species of fish, wildlife, or plants ("listed species") and habitat of such species that have been designated as critical ("critical habitat").

Section 7(a)(2) of the Clean Water Act requires every Federal agency in consultation with and with the assistance of the Secretary of the 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 National Marine Fisheries Service (NMFS) administers Section 7 consultations for freshwater species. EPA informally consulted with NMFS recently to determine whether or not

there are any threatened or endangered species within an area that could be affected by the Charlton WWTF's discharge. EPA and NMFS determined that a formal ESA consultation will not be required for this discharge, since there are no known threatened or endangered species or their critical habitat within the vicinity of the Charlton discharge.

The permittee should contact the State regarding a Massachusetts Natural Heritage and Endangered Species Program (NHESP) review.

XI. MONITORING AND REPORTING

The permittee is obligated to monitor and report sampling results to EPA and the MassDEP within the time specified within the permit. Timely reporting is essential for the regulatory agencies to expeditiously assess compliance with permit conditions.

The effluent monitoring requirements have been established to yield data representative of the discharge under authority of Section 308 (a) of the CWA in accordance with 40 CFR §§122.41 (j), 122.44 (l), and 122.48.

The Draft Permit includes new provisions related to Discharge Monitoring Report (DMR) submittals to EPA and the State. The Draft Permit requires that, no later than one year after the effective date of the permit, the permittee submit all monitoring data and other reports required by the permit to EPA using NetDMR, unless the permittee is able to demonstrate a reasonable basis, such as technical or administrative infeasibility, that precludes the use of NetDMR for submitting DMRs and reports ("opt out request").

In the interim (until one year from the effective date of the permit), the permittee may either submit monitoring data and other reports to EPA in hard copy form, or report electronically using NetDMR.

NetDMR is a national web-based tool for regulated Clean Water Act permittees to submit discharge monitoring reports (DMRs) electronically via a secure Internet application to U.S. EPA through the Environmental Information Exchange Network. NetDMR allows participants to discontinue mailing in hard copy forms under 40 CFR 122.41 and 403.12. NetDMR is accessed from the following url: http://www.epa.gov/netdmr Further information about NetDMR, including contacts for EPA Region 1, is provided on this website.

The Draft Permit requires the permittee to report monitoring results obtained during each calendar month using NetDMR no later than the 15th day of the month following the completed reporting period. All reports required under the permit shall be submitted to EPA as an electronic attachment to the DMR. Once a permittee begins submitting reports using NetDMR, it will no longer be required to submit hard copies of DMRs or other reports to EPA and will no longer be required to submit hard copies of DMRs to MassDEP. However, permittees must continue to send hard copies of reports other than DMRs to MassDEP until further notice from MassDEP.

The Draft Permit also includes an "opt out" requests process. Permittees who believe they can not use NetDMR due to technical or administrative infeasibilities, or other logical reasons, must demonstrate the reasonable basis that precludes the use of NetDMR. These permittees must submit the justification, in writing, to EPA at least sixty (60) days prior to the date the facility would otherwise be required to begin using NetDMR. Opt outs become effective upon the date of written approval by EPA and are valid for twelve (12) months from the date of EPA approval. The opt outs expire at the end of this twelve (12) month period. Upon expiration, the permittee

must submit DMRs and reports to EPA using NetDMR, unless the permittee submits a renewed opt out request 60 days prior to expiration of its opt out, and such a request is approved by EPA.

Until electronic reporting using NetDMR begins, or for those permittees that receive written approval from EPA to continue to submit hard copies of DMRs, the Draft Permit requires that submittal of DMRs and other reports required by the permit continue in hard copy format.

XII. STATE PERMIT CONDITIONS

The NPDES Permit is issued jointly by the U. S. Environmental Protection Agency and the Massachusetts Department of Environmental Protection under federal and state law, respectively. As such, all the terms and conditions of the permit are, therefore, incorporated into and constitute a discharge permit issued by the Director of the Division of Watershed Management pursuant to M.G.L. Chap. 21, §43.

XIII. GENERAL CONDITIONS

The general conditions of the permit are based on 40 CFR Parts 122, Subparts A and D and 40 CFR § 124, Subparts A, D, E, and F and are consistent with management requirements common to other permits.

XIV. STATE CERTIFICATION REQUIREMENTS

The staff of the Massachusetts Department of Environmental Protection has reviewed the draft permit. EPA has requested permit certification by the State pursuant to CWA § 401(a)(1) and 40 CFR § 124.53 and expects that the draft permit will be certified.

XV. PUBLIC COMMENT PERMIT, 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 before the close of the public comment period, to the U.S.EPA, Office of Ecosystem Protection, Municipal Permits Unit (OEP06-1), 5 Post Office Square, Suite 100, Boston, MA 02109-3912. Any person, prior to such date, may submit a request in writing to EPA and the state agency for a public hearing to consider the draft permit. Such requests shall state the nature of the issues proposed to be raised in the hearing. In reaching a final decision on the draft permit, the Regional Administrator will respond to all significant comments and make these responses available to the public at EPA's Boston office.

Following the close of the comment period, and after a public hearing, if such a hearing is held, the Regional Administrator will issue a final permit decision and forward a copy of the final decision to the applicant and each person who has submitted written comments or requested notice. Permits may be appealed to the Environmental Appeals Board in the manner described at 40 CFR § 124.19.

XVI. EPA AND 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:

Janet Deshais
Chemical/Environmental Engineer
U.S. Environmental Protection Agency
Office of Ecosystem Protection (OEP06-1)
5 Post Office Square, Suite 100
Boston, MA 02109 - 3912
Telephone: (617) 918-1667
E-mail: deshais.janet@epa.gov

Kathleen Keohane, Environmental Engineer
Surface Water Permit Program
Division of Watershed Management
Department of Environmental Protection
627 Main Street, Second Floor
Worcester, MA 01608
Telephone: (508) 767-2856
E-mail: Kathleen.Keohane@state.ma.us

Date: _____
Stephem Perkins, Director*
Office of Ecosystem Protection
U.S. Environmental Protection Agency

*Please address all comments to Janet Deshais and Kathleen Keohane at the addresses above.

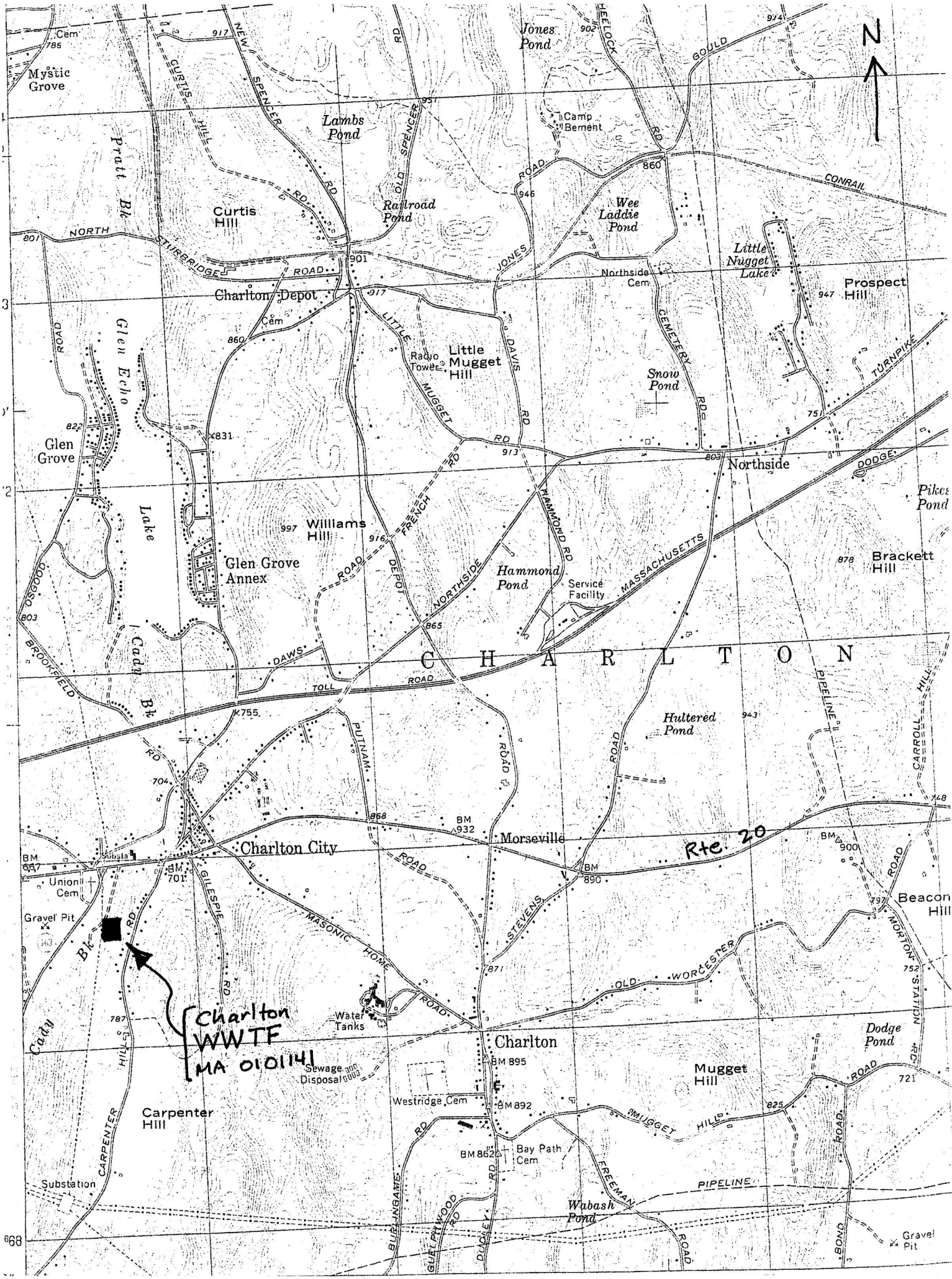
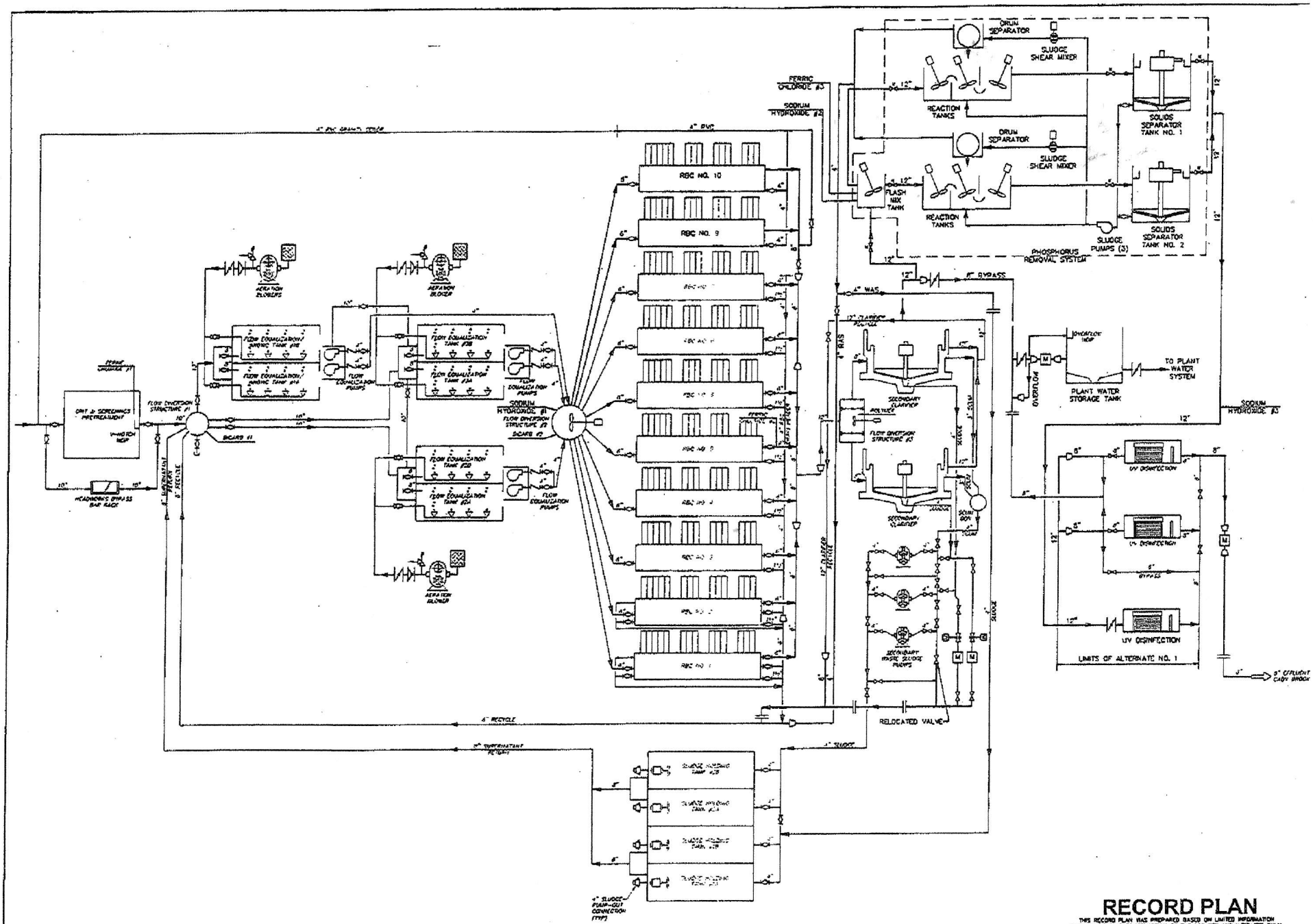

N
CHARLTON
Charlton City
Morseville
Charlton Depot
Northside
Northside Cem
Glen Grove
Glen Grove Annex
Glen Echo Lake
Curtis Hill
Williams Hill
Little Mugget Hill
Mugget Hill
Prospect Hill
Brackett Hill
Beacon Hill
Dodge Pond
Carpenter Hill
Lambs Pond
Railroad Pond
Wee Laddie Pond
Little Nugget Lake
Snow Pond
Hammond Pond
Hultered Pond
Wabash Pond
Pikes Pond
Jones Pond
Camp Bement
Union Cem
Gravel Pit
Water Tanks
Sewage Disposal
Westridge Cem
Bay Path Cem
Substation
Radio Tower
Service Facility
Pratt Bk
Cady Bk
Cady Lake
Rte. 20
CONRAIL
PIPELINE
Charlton WWTF MA 0101141

Figure 1



RECORD PLAN

THIS RECORD PLAN WAS PREPARED BASED ON LIMITED INFORMATION GATHERED DURING CONSTRUCTION OF THE PROJECT AND INDICATES ONLY SIGNIFICANT CHANGES MADE FROM THE DESIGN PLANS DURING CONSTRUCTION.

Figure 2

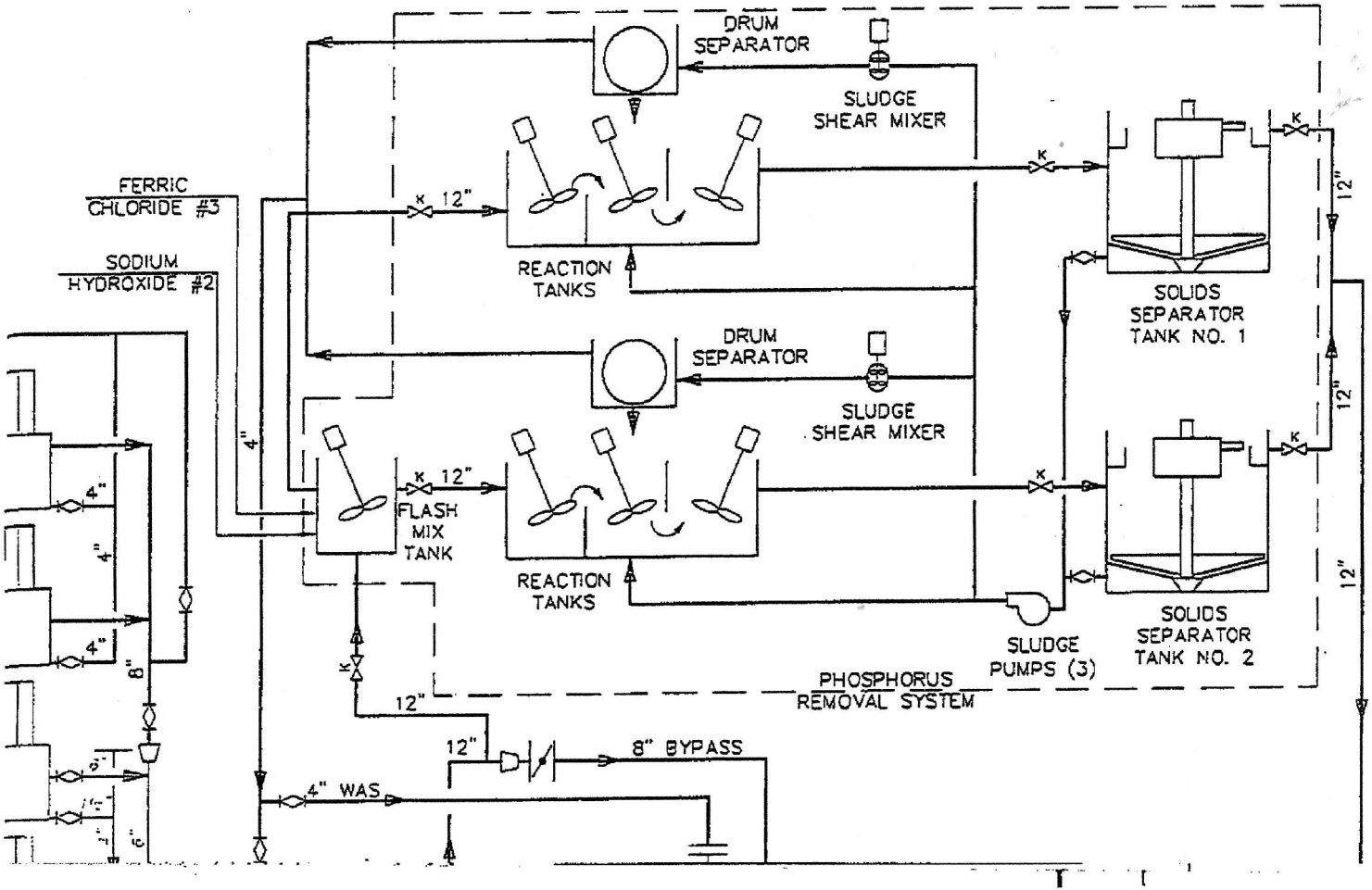

DRUM SEPARATOR
SLUDGE SHEAR MIXER
FERRIC CHLORIDE #3
SODIUM HYDROXIDE #2
K
12"
REACTION TANKS
SOLIDS SEPARATOR TANK NO. 1
DRUM SEPARATOR
SLUDGE SHEAR MIXER
4"
FLASH MIX TANK
REACTION TANKS
SOLIDS SEPARATOR TANK NO. 2
SLUDGE PUMPS (3)
PHOSPHORUS REMOVAL SYSTEM
8"
12"
8" BYPASS
4" WAS

Figure 3

ATTACHMENT A
EFFLUENT MONITORING DATA
NPDES Permit No. MA0101141
CHARLTON, MA

DESCRIPTION OF DISCHARGE: Advanced Wastewater Treatment Plant Effluent

DISCHARGE: Outfall 001 (The receiving water is the Cady Brook)

The discharge monthly reports for monthly average and daily maximum values listed below, were reported from January 2005 to August 2008 unless otherwise indicated.

EFFLUENT CHARACTERISTICS AT THE POINT OF DISCHARGE:

Parameter	Monthly Average (range)	Weekly Average (range)	Daily Maximum
Flow, MGD (annual average)	0.14 – 0.24	-----	-----
BOD, mg/l	2.0 - 18	3.0 - 24	3.0 - 17
BOD, lb/day	3.0 - 21	-----	4.0 - 40
TSS, mg/l	2.0 - 25	2.0 - 56	-----
TSS, lb/day	3.0 – 30	-----	-----
pH, standard units	5.8 – 6.8 (minimum range)	7.0 – 9.3 (maximum range)	
Total Fecal Coliform, cfu/100 ml	2.0 – 102	-----	3.0 - 272
Total Phosphorus, mg/l			
May 1 – October 31	0.1 – 1.2	-----	0.1 – 1.7
Total Nitrogen, Ammonia (as N), mg/l			
November 1 – March 31	0.2 – 1.2	0.2 – 12	-----
April	0.5 – 5.0	0.6 – 7.0	-----
May	0.4 – 1.0	-----	-----
June 1 – October 31	0.3 – 4.3	-----	-----
Total Nitrogen, Kjeldahl (as N), mg/l	1.3 – 8.0	-----	-----
Total Nitrate plus Nitrite, mg/l	13 - 41	-----	-----
Aluminum, ug/l (April '05 – Aug. '08)	10 – 173	-----	10 - 173
Copper, ug/l	1.0 - 237	-----	1.0 – 450
Zinc, ug/l	29 – 166	-----	-----

Whole Effluent Toxicity (WET) Tests submitted by the permittee:

LC_{50} (Ceriodaphnia dubia) $\geq$ 100% (14 tests)
$\geq$ 35.2% (1 test on 2/29/08)

NOEL (Ceriodaphnia dubia) $\geq$ 93- 100% (8 tests)
$\geq$ 50% (3 tests)
$\geq$ 25% (2 tests)
$\geq$ 6.25% (4 tests)

Metals Chemistry Data: (March 2006 – February 2009, monthly average range)

Aluminum, ug/l	0 – 170
Copper, ug/l	6 – 28
Lead, ug/l	0 – 14
Zinc, ug/l	42 – 990
Cadmium, ug/l	0 – 1.2

ATTACHMENT B
TOTAL PHOSPHORUS MONITORING DATA
NPDES Permit No. MA0101141
CHARLTON, MA

Total Phosphorus Monitoring Data:
The MassDEP has an on-going sampling program for Cady Brook (See: Table 1). The following information includes the total phosphorus data that is currently available.

Table 1 – Total Phosphorus Monitoring Data collected at various locations along Cady Brook.

Date of Sampling	Station ID	Mile Point	Total Phosphorus (ug/l)
5-19-99	CA03	5.328	30
6-15-94	QR12	5.321	50
6-22-99	CA04	5.071	20
8-17-99	CA04	5.071	21
6-22-99	WWTP	5.059	2100
6-22-99	WWTP	5.059	2200
8-17-99	WWTP	5.059	1400
6-15-99	CA06	4.989	100
5-19-99	CA06	4.989	60
6-22-99	CA06	4.989	850
6-22-99	CA06	4.989	850
8-17-99	CA06	4.989	610
8-17-99	CA06	4.989	620
6-22-99	CA10	3.806	170
8-17-99	CA10	3.806	170
6-22-99	CA14	2.494	80
8-17-99	CA14	2.494	76
8-17-99	CA16	1.723	53
5-19-99	CA18	0.338	60
6-22-99	CA18	0.338	20
8-17-99	CA18	0.338	36
6-15-99	QR04	0.048	100
2-26-03	CA12	3.259	42
4-23-03	CA12	3.259	33
6-25-03	CA12	3.259	44
8-27-03	CA12	3.259	88
2-11-04	CA12	3.259	54
3-31-04	CA12	3.259	69
5-27-04	CA12	3.259	48
7-28-04	CA12	3.259	63
9-29-04	CA12	3.259	77

ATTACHMENT B, Continued;

A list of the sampling stations and their respective locations:

CA03 – approximately 20 feet upstream / north of the Route 20 bridge in Charlton.

QR12 – at the Route 20 bridge in Charlton / upstream of the Charlton WWTF discharge.

CA04 – upstream / north of the Charlton WWTF discharge.

WWTP - at the Charlton WWTF discharge.

CA06 – East of Route 169 approximately 250 feet downstream from the discharge.

CA10 – Upstream / north at Snake Hill Road in Charlton.

CA12 – at the Route 169 bridge in Charlton (near the pipeline crossing, approximately 3.5 river miles downstream of the Charlton WWTF discharge).

CA14 – at the first bridge crossing of Route 169 approximately 1000 meters north of the Charlton / Southbridge border.

CA16 – approximately 5 feet upstream / north of Brookside Road Bridge in Southbridge.

CA18 – upstream / northern side of Randolph Street Bridge in Southbridge.

QR04 – near the confluence with Quinebaug River, at the footbridge on American Optical property parking lot, access via Violet Street off Route 169 in Southbridge.

The permittee collected phosphorus data from Cady Brook that was approximately 50 feet upstream of the Charlton WWTF (See: Table 2).

Table 2 – Total Phosphorus Monitoring Data collected from Cady Brook.

Date of Sampling	Station ID	Mile Point	Total Phosphorus (ug/l)
4-22-09	CA04	5.071	23

ATTACHMENT C
SAMPLE CALCULATIONS
NPDES Permit No. MA0101141
CHARLTON, MA

Plant Design Flow = 0.45 MGD
= (0.45 MGD) x (1.55 converts to cfs)
= 0.6975 cfs

Instream 7Q10 = 0.05 cfs

Dilution Factor = (Instream 7Q10 + Design Flow) / Design Flow
= (0.05 cfs + 0.6975 cfs) / 0.6975 cfs
= 1.07 (High Risk Toxicity - Acute and Chronic Limits)
(LC_{50} Limit $\geq$ 100% and C-NOEC Limit $\geq$ 93%)

Hardness of Cady Brook = 113 mg/l
(This value represents the hardness of the receiving water that is downstream from the discharge.)

Biochemical Oxygen Demand (BOD) Limits:
Average Monthly Concentration Limit = 30 mg/l
Average Weekly Concentration Limit = 45 mg/l

Total Suspended Solids (TSS) Limits:
Average Monthly Concentration Limit = 30 mg/l
Average Weekly Concentration Limit = 45 mg/l

Total Phosphorus Seasonal Limits:
Average Monthly (April 1 – October 31) = 0.11 mg/l
Average Monthly (November 1 – March 31) = 1.0 mg/l

Aluminum Limits:
Acute Aluminum Limit = (acute criteria x dilution factor) = (750 ug/l x 1.07) = 802.5 ug/l = 803 ug/l
Chronic Aluminum Limit = (chronic criteria x dilution f.) = (87 ug/l x 1.07) = 93.1 ug/l = 93 ug/l

Copper Limits:
Copper limits are based on site-specific criterion.
See page 23 of the Fact Sheet for the copper samples calculations.

Lead Limits:
Lead is dependent on the hardness of the receiving water.
Acute Lead Limit = $e^{(1.273 * \ln 113) + (-1.46)}$ x dilution factor = (95.38 ug/l x 1.07) = 102.1 ug/l
Chronic Lead Limit = $e^{(1.273 * \ln 113) + (-4.705)}$ x dilution factor = (3.72 ug/l x 1.07) = 4 ug/l

Nickel Limits:
Nickel is dependent on the hardness of the receiving water.
Acute Lead Limit = $e^{(0.846 * \ln 113) + (2.255)}$ x dilution factor = (520.28 ug/l x 1.07) = 556.7 ug/l
Chronic Lead Limit = $e^{(0.846 * \ln 113) + (0.0584)}$ x dilution factor = (57.84 ug/l x 1.07) = 61.9 ug/l

Zinc Limits:
Zinc is dependent on the hardness of the receiving water.
Acute Zinc Limit = $e^{(0.8473 * \ln 113) + (0.884)}$ x dilution factor = (132.8 ug/l x 1.07) = 142 ug/l
Chronic Zinc Limit = $e^{(0.8473 * \ln 113) + (0.884)}$ x dilution factor = (132.8 ug/l x 1.07) = 142 ug/l