AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

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

CSX Transportation, Inc.
500 Water Street – J275
Jacksonville, FL 32202

is authorized to discharge from a facility located at

CSX Transportation, Inc.
Beacon Park Yard
170 Cambridge Street
Allston, MA 02134

to receiving water named

Charles River Basin (MA72-36)

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

This permit shall become effective on the first day of the calendar month following 60 days after 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 July 1, 2005, was modified on February 2, 2006, and expired (as modified) on November 18, 2010.

This permit consists of ***13*** pages in Part I including effluent limitations and monitoring requirements, ***5 pages in Attachment 1, 4 pages in Attachment 2, 39 pages in Attachment 3,*** and 25 pages in Part II including Standard Conditions.

Signed this 24th day of September, 2014

_/S/SIGNATURE ON FILE_____	/S/SIGNATURE ON FILE_____
Ken Moraff, Director	David Ferris, Director
Office of Ecosystem Protection	Massachusetts Wastewater Management
Environmental Protection Agency Program	Department of Environmental Protection
Boston, MA	Commonwealth of Massachusetts
	Boston, MA

PART I
A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge treated stormwater and process water through **Outfall Serial Number 001A** to the Salt Creek Chamber which is part of a stormwater drainage system that flows to the Charles River. Such discharge shall: 1) be limited and monitored by the permittee as specified below; and 2) not cause a violation of the State Surface Water Quality Standards of the receiving water.

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements [1]	
		Average Monthly	Maximum Daily	Measurement Frequency [2,3]	Sample Type
Flow Rate Effluent	GPD	47,000	315,000	Continuous	Recorder
Oil and Grease (O&G)	mg/L	---	15	1/Month	Grab
pH [4]	SU	6.0 – 8.3		Continuous	Recorder
Benzene	µg/L	---	51.0	1/Month	Grab
Total Suspended Solids (TSS)	mg/L	---	100.0	1/Month	Grab
Surfactants	mg/L	---	Report	1/Month	Grab
Toluene	µg/L	---	Report	1/Quarter	Grab
Ethylbenzene	µg/L	---	Report	1/Quarter	Grab
Xylenes	µg/L	---	Report	1/Quarter	Grab
Zinc	µg/L	---	Report	1/Quarter	Grab
Chloroform	µg/L	---	Report	1/Quarter	Grab
Cyanide	mg/L	---	Report	1/Quarter	Grab
Bis(2-ethylhexyl)phthalate	µg/L	---	Report	1/Quarter	Grab
Escherichia coli (*E. coli*)[5]	colonies/100mL	---	Report	1/Quarter	Grab
Escherichia coli (*E. coli*)[5]	colonies/100mL	---	Report	1/Month	Grab

See page 3 for explanation of footnotes.

(Part I.A.1, Continued)

Footnotes:

1. All samples shall be representative of the effluent that is discharged through Outfall 001A, taken at a representative location between the point of discharge from the last oil/water (o/w) separator and the point of discharge to the Salt Creek Chamber. All samples shall be taken during normal operating conditions, which are defined as normal working hours when the o/w separator is operating. A routine sampling program shall be developed in which samples are taken at the same location, same time and same days of the month. Any deviations from the routine sampling program shall be documented in correspondence appended to the applicable discharge monitoring report submitted to EPA. In addition, all samples shall be analyzed using the analytical methods found in 40 CFR ï 136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR ï 136. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP.

2. Continuous monitoring shall be defined as monitoring at a minimum of fifteen (15) minute intervals during discharge. The results shall be recorded with the time and date on a chart, and shall be made readily available upon request by USEPA or MassDEP. The permittee shall use EPA Method 150.2 for continuous monitoring of pH, and use applicable instruments according to the manufacturing specifications that are commercially available to monitor and record flow rate. For operation and maintenance activities and for equipment failures and other malfunctions of the monitoring and recording equipment, the permittee shall estimate the flow rate if the equipment becomes inoperable using standard engineering principles at least once per day for up to seven days maximum. The chosen equipment for flow rate shall have an accuracy of +/- 100 GPD.

3. Sampling frequency of 1/month is defined as the sampling of one (1) discharge event during each calendar month, when discharge occurs. Sampling frequency of 1/quarter is defined as the sampling of four (4) discharge events in each calendar year, when discharge occurs. Quarters are defined as the interval of time between the months of: January through March, inclusive; April through June, inclusive; July through September, inclusive; and October through December, inclusive. If no discharge occurs during the monitoring period, the permittee shall indicate this on the Discharge Monitoring Report (DMR). The permittee shall submit the results to EPA of any additional testing done to that required herein, if it is conducted in accordance with EPA approved methods consistent with the provisions of 40 CFR ï 122.41(l)(4)(ii).

4. Required for State Certification. The permittee shall report the minimum daily pH value and the maximum daily pH value for each monitoring period. The pH shall be in the range of 6.0 to 8.3 standard units and no more than 0.5 units outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to this Class.

5. The permittee shall sample for *E. coli* on a monthly basis during dry weather and a quarterly basis during wet weather.

Part I.A. (Continued)

2. The discharge shall not cause objectionable discoloration of the receiving waters.

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

4. Any process that adds heat to the wastewater or stormwater effluent is prohibited.

5. The discharge of any flows through Outfall 002 other than stormwater not associated with industrial activity is prohibited.

6. The discharge of any flows other than those specified in this permit which discharge through Outfalls 001 and 002 are prohibited.

7. The discharge shall not contain materials in concentrations or combinations which are hazardous or toxic to human health, aquatic life of the receiving surface waters or which would impair the uses designated by its classification.

8. EPA may modify this permit in accordance with EPA regulations in 40 Code of Federal Regulations (CFR) ï 122.62 and ï 122.63 to incorporate more stringent effluent limitations, increase the frequency of analyses, or impose additional sampling and analytical requirements.

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

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

      (1) One hundred micrograms per liter (100 µg/l);

      (2) Two hundred micrograms per liter (200 µg/l) for acrolein and acrylonitrite; five hundred micrograms per liter (500 µg/l) for 2,4-dinitrophenol; and one milligram per liter (1 mg/l) for antimony;

      (3) Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 C.F.R.ï 122.21(g)(7); or

(4) Any other notification level established by the Director in accordance with 40 C.F.R.i 122.44(f).

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

(1) Five hundred micrograms per liter (500 µg/l);

(2) One milligram per liter (1 mg/l) for antimony;

(3) Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 C.F.R.i 122.21(g)(7);

(4) Any other notification level established by the Director in accordance with 40 C.F.R.i 122.44(f).

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

10. Toxics Control

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

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

B. REOPENER CLAUSES

a. This permit shall be modified, or alternately, revoked and reissued, to comply with any applicable standard or limitation promulgated or approved under sections 301(b)(2)(C) and (D), 304(b)(2), and 307(a)(2) of the Clean Water Act, if the effluent standard or limitation so issued or approved;
b. Contains different conditions or is otherwise more stringent than any effluent limitation in the permit; or

c. Controls any pollutants not limited in the permit.

C. STORM WATER POLLUTION PREVENTION PLAN

1. The permittee shall develop, implement, and maintain a Stormwater Pollution Prevention Plan (SWPPP) designed to reduce, or prevent, the discharge of pollutants in stormwater to the receiving waters identified in this permit. The SWPPP shall be a written document that is consistent with the terms of this permit. Additionally, the SWPPP shall serve as a tool to document the permittee's compliance with the terms of this permit. Development guidance and a recommended format for the SWPPP are available on the EPA website for the Multi-Sector General Permit (MSGP) for Stormwater Discharges Associated with Industrial Activities (http://cfpub.epa.gov/npdes/stormwater/msgp.cfm).

2. The SWPPP shall be completed or updated and certified by the permittee within 90 days after the effective date of this permit. The permittee shall certify that its SWPPP has been completed or updated and shall be signed in accordance with the requirements identified in 40 CFR §122.22. A copy of this initial certification shall be sent to EPA and MassDEP within one hundred and twenty (120) days of the effective date of this permit.

3. The SWPPP shall be prepared in accordance with good engineering practices and shall be consistent with the general provisions for SWPPPs included in the most current version of the MSGP. In the current MSGP (effective May 27, 2009), the general SWPPP provisions are included in Part 5 and Part 8.P. Specifically, the SWPPP shall document the selection, design, and installation of control measures and contain the elements listed below:

   a. A pollution prevention team with collective and individual responsibilities for developing, implementing, maintaining, revising and ensuring compliance with the SWPPP;
   b. A site description which includes the activities at the facility; a general location map showing the facility, receiving waters, and outfall locations; and a site map showing the extent of significant structures and impervious surfaces, directions of stormwater flows, and locations of all existing structural control measures, stormwater conveyances, pollutant sources (identified in Part 3.c. below), stormwater monitoring points, stormwater inlets and outlets, and industrial activities exposed to precipitation such as, storage, disposal, material handling;
   c. A summary of all pollutant sources which includes a list of activities exposed to stormwater, the pollutants associated with these activities, a description of where spills have occurred or could occur, a description of non-stormwater discharges, and a summary of any existing stormwater discharge sampling data;

d. A description of all stormwater controls, both structural and non-structural;
e. A schedule and procedure for implementation and maintenance of the control measures described above and for the quarterly inspections and best management practices (BMPs) described below;
f. Sector specific SWPPP provisions included in Sector P – Land Transportation and Warehousing, Subsector P1 - Railroad Transportation.

4. The SWPPP shall document the appropriate best management practices (BMPs) implemented or to be implemented at the facility to minimize the discharge of pollutants in stormwater to waters of the United States and to satisfy the non-numeric technology-based effluent limitations included in this permit. At a minimum, these BMPs shall be consistent with the control measures described in the most current version of the MSGP. In the current MSGP (effective May 27, 2009), these control measures are described in Part 2.1.2 and Part 8.P. Specifically, BMPs must be selected and implemented to satisfy the following non-numeric technology-based effluent limitations:

a. Minimizing exposure of manufacturing, processing, and material storage areas to stormwater discharges.
b. Good housekeeping measures designed to maintain areas that are potential sources of pollutants.
c. Preventative maintenance programs to avoid leaks, spills, and other releases of pollutants in stormwater discharged to receiving waters.
d. Spill prevention and response procedures to ensure effective response to spills and leaks if or when they occur.
e. Erosion and sediment controls designed to stabilize exposed areas and contain runoff using structural and/or non-structural control measures to minimize onsite erosion and sedimentation, and the resulting discharge of pollutants.
f. Runoff management practices to divert, infiltrate, reuse, contain, or otherwise reduce stormwater runoff.
g. Proper handling procedures for salt or materials containing chlorides that are used for snow and ice control.
h. Sector specific BMPs included in Sector P - Land Transportation and Warehousing, Subsector P1 - Railroad Transportation.

5. All areas with industrial materials or activities exposed to stormwater and all structural control used to comply with effluent limits in this permit shall be inspected, at least once per quarter, by qualified personnel with one or more members of the stormwater pollution prevention team. Inspections shall begin during the 1st full quarter after the effective date of this permit. EPA considers quarters as follows: January to March; April to June; July to September; and October to December. Each inspection must include a visual assessment of stormwater samples (from each outfall), which shall be collected within the first 30 minutes of discharge from a storm event, stored in a clean, clear glass or plastic

container, and examined in a well-lit area for the following water quality characteristics: color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and other obvious indicators of pollution. The permittee shall document the following information for each inspection and maintain the records along with the SWPPP:

a. The date and time of the inspection and at which any samples were collected;
b. The name(s) and signature(s) of the inspector(s)/sample collector(s);
c. If applicable, why it was not possible to take samples within the first 30 minutes;
d. Weather information and a description of any discharges occurring at the time of the inspection;
e. Results of observations of stormwater discharges, including any observed discharges of pollutants and the probable sources of those pollutants;
f. Any control measures needing maintenance, repairs or replacement; and,
g. Any additional control measures needed to comply with the permit requirements.

6. The permittee shall amend and update the SWPPP within 14 days of any changes at the facility that result in a significant effect on the potential for the discharge of pollutants to the waters of the United States. Such changes may include, but are not limited to: a change in design, construction, operation, or maintenance, materials storage, or activities at the facility; a release of a reportable quantity of pollutants as described in 40 CFR §302; or a determination by the permittee or EPA that the BMPs included in the SWPPP appear to be ineffective in achieving the general objectives of controlling pollutants in stormwater discharges associated with industrial activity.

7. Any amended, modified, or new versions of the SWPPP shall be re-certified and signed by the permittee in accordance with the requirements identified in 40 CFR §122.22. The permittee shall also certify, at least annually, that the previous year's inspections and maintenance activities were conducted, results recorded, records maintained, and that the facility is in compliance with this permit. If the facility is not in compliance with any aspect of this permit, the annual certification shall state the non-compliance and the remedies which are being undertaken. Such annual certifications also shall be signed in accordance with the requirements identified in 40 CFR §122.22. The permittee shall maintain at the facility a copy of its current SWPPP and all SWPPP certifications (the initial certification, re-certifications, and annual certifications) signed during the effective period of this permit, and shall make these available for inspection by EPA and MassDEP. In addition, the permittee shall document in the SWPPP any violation of numerical or non-numerical stormwater effluent limits with a date and description of the corrective actions taken.

8. Additionally, the permit requires development and implementation of the following site-specific BMPs, at a minimum:

a. Perform regular inspections and maintenance of the booms at Outfalls 001A and 002A, at a minimum frequency of 1/month, to ensure any accumulated oil, scum, debris, or trash collected around the booms is regularly removed and disposed of properly.
b. Perform regular inspections and maintenance of the absorbent track-matting, at a minimum frequency of 1/month.
c. Perform regular inspections and maintenance of the treatment systems (both the WWTF and the SWTF), at a minimum frequency of 1/month, to ensure that all treatment units are properly functioning.
d. Ensure no discharge of floating solids, visible foam, debris, or oil sheen occurs from Outfalls 001A and 002A.
e. To the extent practicable, the permittee shall protect all raw materials with weather-resistant covers to minimize exposure to stormwater. Raw materials stored outside that have the potential to contribute pollutants to the stormwater runoff include scrap metal piles and new railroad ties.
f. Develop and implement a Source Identification and Reduction Plan (SIRP) to identify and eliminate the use of surfactants onsite. If elimination of surfactants is not practicable, the permittee shall provide documentation citing the reasons elimination is infeasible and develop and implement a plan to minimize the use of surfactants onsite, to the maximum extent practicable.
g. Develop and implement a Source Identification and Reduction Plan (SIRP) to eliminate or reduce the discharge of bacteria through the facility's storm water system. In the event the source(s) of bacteria cannot be eliminated, Best Management Practices (BMPs) shall be developed to significantly reduce or eliminate the bacteria loading to the receiving water.
h. Provide annual certification to EPA and MassDEP that the site does not discharge stormwater associated with industrial activity to the drainage line which discharges through Outfall 002A.
i. Address any other potential sources of pollutants in the rail yard through site-specific BMPs. Specific activities occurring within the facility drainage area that have a potential to introduce pollutants to the storm water include the following:
    i. Fueling (ASTs and fueling fill ports are located within secondary containment. Vehicle fueling areas are located within secondary containment. Locomotive fueling, using #2 diesel fuel, is done on fuel spill containment pans that discharge to the WWTF for treatment;
    ii. Hazardous Waste Storage (waste oil and hazardous waste shall be stored in designated hazardous waste storage containers);
    iii. Sodium Hydroxide Storage (NaOH) shall be stored in an above ground storage tank with secondary containment);
    iv. New and/or used materials (materials shall be stored on pallets, concrete pads, under cover, or in staging areas to minimize exposure to storm water);

v. Petroleum product storage (shall be stored in above ground storage tanks with secondary containment);
vi. Storage and unloading of solid waste (dumpsters at the facility shall be closed top and/or covered to prevent contact with storm water);
vii. Transformers (both active and inactive transformers shall be inspected periodically as a preventative maintenance measure);
viii. Vehicle and equipment maintenance (storm water from the Car Shop, where vehicle and equipment maintenance is conducted, shall be directed to the WWTF. Various track maintenance materials stored at the facility shall be kept in secondary containment);
ix. Locomotive Maintenance shall be done on spill pans, to the extent practicable.

9. Additionally, the permit requires development and implementation of the following site-specific BMPs for phosphorus:
   a. The permittee shall estimate the average annual phosphorus load to the permitted outfall using the provided export rates as provided in Attachment 1, Method to Calculate Baseline Watershed Phosphorus Load.
   b. The permittee shall develop a Phosphorous Control Plan (PCP) and update the PCP in annual reports. The PCP shall describe measures the permittee will undertake to reduce the average annual baseline phosphorus load (calculated above in Part a, via Attachment 1) by 62%.
      i. Non-structural controls: The permittee shall describe the non-structural stormwater control measures to be implemented to support the achievement of the required phosphorus reductions. The description of non-structural controls shall include the planned measures, the areas where the measures will be implemented, and the annual phosphorus reductions that are expected to result from their implementation. Annual phosphorus reduction from non-structural BMPs shall be calculated consistent with Attachment 2, Phosphorus Reduction Credits for Selected Enhanced Non-Structural BMPs in the Watershed.
      ii. Planned structural controls: The permittee shall describe the structural stormwater control practices necessary to support achievement of the required phosphorus reduction. The description of structural controls shall include the planned controls, the drainage areas tributary to where the controls will be implemented, and the annual phosphorus reductions in units of mass per year that are expected to result from their implementation. Annual phosphorus reduction from structural BMPs shall be calculated consistent with Attachment 3, Methods to Calculate Phosphorus Load Reductions for Structural BMPs in the Watershed
   c. Within one year of the effective date of the permit, the permittee shall complete the estimation of the average annual phosphorus load to the permitted outfall using the provided export rates as provided in Attachment 1, Method to Calculate Baseline Watershed Phosphorus Load. Within 1.5 years of the effective date of the permit, the permittee shall complete the PCP. Within 2.5 years of the effective date of the

permit, the permittee shall complete implementation of the identified non-structural practices. Within 3.5 years of the effective date of the permit, the permittee shall complete construction, installation and inspection of the structural practices. Within 4.5 years of the effective date of the permit, the permittee shall begin certification of annual inspection and O&M.

D. 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 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 this 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 this 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
1 Winter St., 5th Floor
Boston, Massachusetts 02108

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. 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 address:

Massachusetts Department of Environmental Protection - NERO
Bureau of Waste Prevention
205B Lowell Street
Wilmington, MA 01887

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

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

NPDES PART II STANDARD CONDITIONS
(January, 2007)

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PART II. A. GENERAL REQUIREMENTS

1. Duty to Comply

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act (CWA) and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application.

a. The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the sludge use or disposal established under Section 405(d) of the CWA within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified to incorporate the requirements.

b. The CWA provides that any person who violates Section 301, 302, 306, 307, 308, 318, or 405 of the CWA or any permit condition or limitation implementing any of such sections in a permit issued under Section 402, or any requirement imposed in a pretreatment program approved under Section 402 (a)(3) or 402 (b)(8) of the CWA is subject to a civil penalty not to exceed $25,000 per day for each violation. Any person who negligently violates such requirements is subject to a fine of not less than $2,500 nor more than $25,000 per day of violation, or by imprisonment for not more than 1 year, or both. Any person who knowingly violates such requirements is subject to a fine of not less than $5,000 nor more than $50,000 per day of violation, or by imprisonment for not more than 3 years, or both.

c. Any person may be assessed an administrative penalty by the Administrator for violating Section 301, 302, 306, 307, 308, 318, or 405 of the CWA, or any permit condition or limitation implementing any of such sections in a permit issued under Section 402 of the CWA. Administrative penalties for Class I violations are not to exceed $10,000 per violation, with the maximum amount of any Class I penalty assessed not to exceed $25,000. Penalties for Class II violations are not to exceed $10,000 per day for each day during which the violation continues, with the maximum amount of any Class II penalty not to exceed $125,000.

Note: See 40 CFR §122.41(a)(2) for complete "Duty to Comply" regulations.

2. Permit Actions

This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or notifications of planned changes or anticipated noncompliance does not stay any permit condition.

3. Duty to Provide Information

The permittee shall furnish to the Regional Administrator, within a reasonable time, any information which the Regional Administrator may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Regional Administrator, upon request, copies of records required to be kept by this permit.

4. Reopener Clause

The Regional Administrator reserves the right to make appropriate revisions to this permit in order to establish any appropriate effluent limitations, schedules of compliance, or other provisions which may be authorized under the CWA in order to bring all discharges into compliance with the CWA.

For any permit issued to a treatment works treating domestic sewage (including "sludge-only facilities"), the Regional Administrator or Director shall include a reopener clause to incorporate any applicable standard for sewage sludge use or disposal promulgated under Section 405 (d) of the CWA. The Regional Administrator or Director may promptly modify or revoke and reissue any permit containing the reopener clause required by this paragraph if the standard for sewage sludge use or disposal is more stringent than any requirements for sludge use or disposal in the permit, or contains a pollutant or practice not limited in the permit.

Federal regulations pertaining to permit modification, revocation and reissuance, and termination are found at 40 CFR §122.62, 122.63, 122.64, and 124.5.

5. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from responsibilities, liabilities or penalties to which the permittee is or may be subject under Section 311 of the CWA, or Section 106 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA).

6. Property Rights

The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges.

7. Confidentiality of Information

a. In accordance with 40 CFR Part 2, any information submitted to EPA pursuant to these regulations may be claimed as confidential by the submitter. Any such claim must be asserted at the time of submission in the manner prescribed on the application form or instructions or, in the case of other submissions, by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, EPA may make the information available to the public without further notice. If a claim is asserted, the information will be treated in accordance with the procedures in 40 CFR Part 2 (Public Information).

b. Claims of confidentiality for the following information will be denied:

(1) The name and address of any permit applicant or permittee;
(2) Permit applications, permits, and effluent data as defined in 40 CFR §2.302(a)(2).

c. Information required by NPDES application forms provided by the Regional Administrator under 40 CFR §122.21 may not be claimed confidential. This includes information submitted on the forms themselves and any attachments used to supply information required by the forms.

8. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after its expiration date, the permittee must apply for and obtain a new permit. The permittee shall submit a new application at least 180 days before the expiration date of the existing permit, unless permission for a later date has been granted by the Regional Administrator. (The Regional Administrator shall not grant permission for applications to be submitted later than the expiration date of the existing permit.)

9. State Authorities

Nothing in Part 122, 123, or 124 precludes more stringent State regulation of any activity covered by these regulations, whether or not under an approved State program.

10. Other Laws

The issuance of a permit does not authorize any injury to persons or property or invasion of other private rights, nor does it relieve the permittee of its obligation to comply with any other applicable Federal, State, or local laws and regulations.

PART II. B. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit and with the requirements of storm water pollution prevention plans. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when the operation is necessary to achieve compliance with the conditions of the permit.

2. Need to Halt or Reduce Not a Defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

3. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

4. Bypass

a. Definitions

(1) *Bypass* means the intentional diversion of waste streams from any portion of a treatment facility.

(2) *Severe property damage* means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can be reasonably expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

b. Bypass not exceeding limitations

The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provision of Paragraphs B.4.c. and 4.d. of this section.

c. Notice

(1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten days before the date of the bypass.
(2) Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in paragraph D.1.e. of this part (Twenty-four hour reporting).

d. Prohibition of bypass

Bypass is prohibited, and the Regional Administrator may take enforcement action against a permittee for bypass, unless:

(1) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
(2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance; and
(3) i) The permittee submitted notices as required under Paragraph 4.c. of this section.
ii) The Regional Administrator may approve an anticipated bypass, after considering its adverse effects, if the Regional Administrator determines that it will meet the three conditions listed above in paragraph 4.d. of this section.

5. Upset

a. Definition. *Upset* means an exceptional incident in which there is an unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

b. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of paragraph B.5.c. of this section are met. No determination made during

administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

c. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

(1) An upset occurred and that the permittee can identify the cause(s) of the upset;
(2) The permitted facility was at the time being properly operated;
(3) The permittee submitted notice of the upset as required in paragraphs D.1.a. and 1.e. (Twenty-four hour notice); and
(4) The permittee complied with any remedial measures required under B.3. above.

d. Burden of proof. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

PART II. C. MONITORING REQUIREMENTS

1. Monitoring and Records

a. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

b. Except for records for monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities, which shall be retained for a period of at least five years (or longer as required by 40 CFR Part 503), the permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application except for the information concerning storm water discharges which must be retained for a total of 6 years. This retention period may be extended by request of the Regional Administrator at any time.

c. Records of monitoring information shall include:

(1) The date, exact place, and time of sampling or measurements;
(2) The individual(s) who performed the sampling or measurements;
(3) The date(s) analyses were performed;
(4) The individual(s) who performed the analyses;
(5) The analytical techniques or methods used; and
(6) The results of such analyses.

d. Monitoring results must be conducted according to test procedures approved under 40 CFR Part 136 or, in the case of sludge use or disposal, approved under 40 CFR Part 136 unless otherwise specified in 40 CFR Part 503, unless other test procedures have been specified in the permit.

e. The CWA provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000, or by

imprisonment for not more than 2 years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than $20,000 per day of violation, or by imprisonment of not more than 4 years, or both.

2. Inspection and Entry

The permittee shall allow the Regional Administrator or an authorized representative (including an authorized contractor acting as a representative of the Administrator), upon presentation of credentials and other documents as may be required by law, to:

a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

d. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the CWA, any substances or parameters at any location.

PART II. D. REPORTING REQUIREMENTS

1. Reporting Requirements

a. Planned Changes. The permittee shall give notice to the Regional Administrator as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is only required when:

(1) The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR§122.29(b); or
(2) The alteration or addition could significantly change the nature or increase the quantities of the pollutants discharged. This notification applies to pollutants which are subject neither to the effluent limitations in the permit, nor to the notification requirements at 40 CFR§122.42(a)(1).
(3) The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition or change may justify the application of permit conditions different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan.

b. Anticipated noncompliance. The permittee shall give advance notice to the Regional Administrator of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

c. Transfers. This permit is not transferable to any person except after notice to the Regional Administrator. The Regional Administrator may require modification or revocation and reissuance of the permit to change the name of the permittee and

incorporate such other requirements as may be necessary under the CWA. (See 40 CFR Part 122.61; in some cases, modification or revocation and reissuance is mandatory.)

d. Monitoring reports. Monitoring results shall be reported at the intervals specified elsewhere in this permit.

(1) Monitoring results must be reported on a Discharge Monitoring Report (DMR) or forms provided or specified by the Director for reporting results of monitoring of sludge use or disposal practices.

(2) If the permittee monitors any pollutant more frequently than required by the permit using test procedures approved under 40 CFR Part 136 or, in the case of sludge use or disposal, approved under 40 CFR Part 136 unless otherwise specified in 40 CFR Part 503, or as specified in the permit, the results of the monitoring shall be included in the calculation and reporting of the data submitted in the DMR or sludge reporting form specified by the Director.

(3) Calculations for all limitations which require averaging or measurements shall utilize an arithmetic mean unless otherwise specified by the Director in the permit.

e. Twenty-four hour reporting.

(1) The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances.

A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

(2) The following shall be included as information which must be reported within 24 hours under this paragraph.

(a) Any unanticipated bypass which exceeds any effluent limitation in the permit. (See 40 CFR §122.41(g).)
(b) Any upset which exceeds any effluent limitation in the permit.
(c) Violation of a maximum daily discharge limitation for any of the pollutants listed by the Regional Administrator in the permit to be reported within 24 hours. (See 40 CFR §122.44(g).)

(3) The Regional Administrator may waive the written report on a case-by-case basis for reports under Paragraph D.1.e. if the oral report has been received within 24 hours.

f. Compliance Schedules. Reports of compliance or noncompliance with, any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date.

g. Other noncompliance. The permittee shall report all instances of noncompliance not reported under Paragraphs D.1.d., D.1.e., and D.1.f. of this section, at the time monitoring reports are submitted. The reports shall contain the information listed in Paragraph D.1.e. of this section.

h. Other information. Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Regional Administrator, it shall promptly submit such facts or information.

2. Signatory Requirement

a. All applications, reports, or information submitted to the Regional Administrator shall be signed and certified. (See 40 CFR §122.22)

b. The CWA provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 2 years per violation, or by both.

3. Availability of Reports.

Except for data determined to be confidential under Paragraph A.8. above, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the State water pollution control agency and the Regional Administrator. As required by the CWA, effluent data shall not be considered confidential. Knowingly making any false statements on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the CWA.

PART II. E. DEFINITIONS AND ABBREVIATIONS

1. Definitions for Individual NPDES Permits including Storm Water Requirements

Administrator means the Administrator of the United States Environmental Protection Agency, or an authorized representative.

Applicable standards and limitations means all, State, interstate, and Federal standards and limitations to which a “discharge”, a “sewage sludge use or disposal practice”, or a related activity is subject to, including “effluent limitations”, water quality standards, standards of performance, toxic effluent standards or prohibitions, “best management practices”, pretreatment standards, and “standards for sewage sludge use and disposal” under Sections 301, 302, 303, 304, 306, 307, 308, 403, and 405 of the CWA.

Application means the EPA standard national forms for applying for a permit, including any additions, revisions, or modifications to the forms; or forms approved by EPA for use in "approved States", including any approved modifications or revisions.

Average means the arithmetic mean of values taken at the frequency required for each parameter over the specified period. For total and/or fecal coliforms and Escherichia coli, the average shall be the geometric mean.

Average monthly discharge limitation means the highest allowable average of "daily discharges" over a calendar month calculated as the sum of all "daily discharges" measured during a calendar month divided by the number of "daily discharges" measured during that month.

Average weekly discharge limitation means the highest allowable average of "daily discharges" measured during the calendar week divided by the number of "daily discharges" measured during the week.

Best Management Practices (BMPs) means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of "waters of the United States." BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Best Professional Judgment (BPJ) means a case-by-case determination of Best Practicable Treatment (BPT), Best Available Treatment (BAT), or other appropriate technology-based standard based on an evaluation of the available technology to achieve a particular pollutant reduction and other factors set forth in 40 CFR §125.3 (d).

Coal Pile Runoff means the rainfall runoff from or through any coal storage pile.

Composite Sample means a sample consisting of a minimum of eight grab samples of equal volume collected at equal intervals during a 24-hour period (or lesser period as specified in the section on Monitoring and Reporting) and combined proportional to flow, or a sample consisting of the same number of grab samples, or greater, collected proportionally to flow over that same time period.

Construction Activities - The following definitions apply to construction activities:

(a) Commencement of Construction is the initial disturbance of soils associated with clearing, grading, or excavating activities or other construction activities.

(b) Dedicated portable asphalt plant is a portable asphalt plant located on or contiguous to a construction site and that provides asphalt only to the construction site that the plant is located on or adjacent to. The term dedicated portable asphalt plant does not include facilities that are subject to the asphalt emulsion effluent limitation guideline at 40 CFR Part 443.

(c) Dedicated portable concrete plant is a portable concrete plant located on or contiguous to a construction site and that provides concrete only to the construction site that the plant is located on or adjacent to.

(d) Final Stabilization means that all soil disturbing activities at the site have been complete, and that a uniform perennial vegetative cover with a density of 70% of the cover for unpaved areas and areas not covered by permanent structures has been established or equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles) have been employed.

(e) Runoff coefficient means the fraction of total rainfall that will appear at the conveyance as runoff.

Contiguous zone means the entire zone established by the United States under Article 24 of the Convention on the Territorial Sea and the Contiguous Zone.

Continuous discharge means a "discharge" which occurs without interruption throughout the operating hours of the facility except for infrequent shutdowns for maintenance, process changes, or similar activities.

CWA means the Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Pub. L. 92-500, as amended by Pub. L. 95-217, Pub. L. 95-576, Pub. L. 96-483, and Pub. L. 97-117; 33 USC §§1251 et seq.

Daily Discharge means the discharge of a pollutant measured during the calendar day or any other 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurements, the "daily discharge" is calculated as the average measurement of the pollutant over the day.

Director normally means the person authorized to sign NPDES permits by EPA or the State or an authorized representative. Conversely, it also could mean the Regional Administrator or the State Director as the context requires.

Discharge Monitoring Report Form (DMR) means the EPA standard national form, including any subsequent additions, revisions, or modifications for the reporting of self-monitoring results by permittees. DMRs must be used by "approved States" as well as by EPA. EPA will supply DMRs to any approved State upon request. The EPA national forms may be modified to substitute the State Agency name, address, logo, and other similar information, as appropriate, in place of EPA's.

Discharge of a pollutant means:

(a) Any addition of any "pollutant" or combination of pollutants to "waters of the United States" from any "point source", or

(b) Any addition of any pollutant or combination of pollutants to the waters of the "contiguous zone" or the ocean from any point source other than a vessel or other floating craft which is being used as a means of transportation (See "Point Source" definition).

This definition includes additions of pollutants into waters of the United States from: surface runoff which is collected or channeled by man; discharges through pipes, sewers, or other conveyances owned by a State, municipality, or other person which do not lead

to a treatment works; and discharges through pipes, sewers, or other conveyances leading into privately owned treatment works.

This term does not include an addition of pollutants by any "indirect discharger."

Effluent limitation means any restriction imposed by the Regional Administrator on quantities, discharge rates, and concentrations of "pollutants" which are "discharged" from "point sources" into "waters of the United States", the waters of the "contiguous zone", or the ocean.

Effluent limitation guidelines means a regulation published by the Administrator under Section 304(b) of CWA to adopt or revise "effluent limitations".

EPA means the United States "Environmental Protection Agency".

Flow-weighted composite sample means a composite sample consisting of a mixture of aliquots where the volume of each aliquot is proportional to the flow rate of the discharge.

Grab Sample – An individual sample collected in a period of less than 15 minutes.

Hazardous Substance means any substance designated under 40 CFR Part 116 pursuant to Section 311 of the CWA.

Indirect Discharger means a non-domestic discharger introducing pollutants to a publicly owned treatment works.

Interference means a discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

(a) Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and

(b) Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act (CWA), the Solid Waste Disposal Act (SWDA) (including Title II, more commonly referred to as the Resources Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to Subtitle D of the SDWA), the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection Research and Sanctuaries Act.

Landfill means an area of land or an excavation in which wastes are placed for permanent disposal, and which is not a land application unit, surface impoundment, injection well, or waste pile.

Land application unit means an area where wastes are applied onto or incorporated into the soil surface (excluding manure spreading operations) for treatment or disposal.

Large and Medium municipal separate storm sewer system means all municipal separate storm sewers that are either: (i) located in an incorporated place (city) with a population of 100,000 or more as determined by the latest Decennial Census by the Bureau of Census (these cities are listed in Appendices F and 40 CFR Part 122); or (ii) located in the counties with unincorporated urbanized

populations of 100,000 or more, except municipal separate storm sewers that are located in the incorporated places, townships, or towns within such counties (these counties are listed in Appendices H and I of 40 CFR 122); or (iii) owned or operated by a municipality other than those described in Paragraph (i) or (ii) and that are designated by the Regional Administrator as part of the large or medium municipal separate storm sewer system.

Maximum daily discharge limitation means the highest allowable "daily discharge" concentration that occurs only during a normal day (24-hour duration).

Maximum daily discharge limitation (as defined for the Steam Electric Power Plants only) when applied to Total Residual Chlorine (TRC) or Total Residual Oxidant (TRO) is defined as "maximum concentration" or "Instantaneous Maximum Concentration" during the two hours of a chlorination cycle (or fraction thereof) prescribed in the Steam Electric Guidelines, 40 CFR Part 423. These three synonymous terms all mean "a value that shall not be exceeded" during the two-hour chlorination cycle. This interpretation differs from the specified NPDES Permit requirement, 40 CFR § 122.2, where the two terms of "Maximum Daily Discharge" and "Average Daily Discharge" concentrations are specifically limited to the daily (24-hour duration) values.

Municipality means a city, town, borough, county, parish, district, association, or other public body created by or under State law and having jurisdiction over disposal of sewage, industrial wastes, or other wastes, or an Indian tribe or an authorized Indian tribe organization, or a designated and approved management agency under Section 208 of the CWA.

National Pollutant Discharge Elimination System means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under Sections 307, 402, 318, and 405 of the CWA. The term includes an "approved program".

New Discharger means any building, structure, facility, or installation:

(a) From which there is or may be a "discharge of pollutants";

(b) That did not commence the "discharge of pollutants" at a particular "site" prior to August 13, 1979;

(c) Which is not a "new source"; and

(d) Which has never received a finally effective NPDES permit for discharges at that "site".

This definition includes an "indirect discharger" which commences discharging into "waters of the United States" after August 13, 1979. It also includes any existing mobile point source (other than an offshore or coastal oil and gas exploratory drilling rig or a coastal oil and gas exploratory drilling rig or a coastal oil and gas developmental drilling rig) such as a seafood processing rig, seafood processing vessel, or aggregate plant, that begins discharging at a "site" for which it does not have a permit; and any offshore rig or coastal mobile oil and gas exploratory drilling rig or coastal mobile oil and gas developmental drilling rig that commences the discharge of pollutants after August 13, 1979, at a "site" under EPA's permitting jurisdiction for which it is not covered by an individual or general permit and which is located in an area determined by the Regional Administrator in the issuance of a final permit to be in an area of biological concern. In determining whether an area is an area of biological concern, the Regional Administrator shall consider the factors specified in 40 CFR §§125.122 (a) (1) through (10).

An offshore or coastal mobile exploratory drilling rig or coastal mobile developmental drilling rig will be considered a "new discharger" only for the duration of its discharge in an area of biological concern.

New source means any building, structure, facility, or installation from which there is or may be a "discharge of pollutants", the construction of which commenced:

(a) After promulgation of standards of performance under Section 306 of CWA which are applicable to such source, or

(b) After proposal of standards of performance in accordance with Section 306 of CWA which are applicable to such source, but only if the standards are promulgated in accordance with Section 306 within 120 days of their proposal.

NPDES means "National Pollutant Discharge Elimination System".

Owner or operator means the owner or operator of any "facility or activity" subject to regulation under the NPDES programs.

Pass through means a Discharge which exits the POTW into waters of the United States in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation).

Permit means an authorization, license, or equivalent control document issued by EPA or an "approved" State.

Person means an individual, association, partnership, corporation, municipality, State or Federal agency, or an agent or employee thereof.

Point Source means any discernible, confined, and discrete conveyance, including but not limited to any pipe ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel, or other floating craft, from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff (see 40 CFR §122.2).

Pollutant means dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials (except those regulated under the Atomic Energy Act of 1954, as amended (42 U.S.C. §§2011 et seq.)), heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water. It does not mean:

(a) Sewage from vessels; or

(b) Water, gas, or other material which is injected into a well to facilitate production of oil or gas, or water derived in association with oil and gas production and disposed of in a well, if the well is used either to facilitate production or for disposal purposes is approved by the authority of the State in which the well is located, and if the State determines that the injection or disposal will not result in the degradation of ground or surface water resources.

Primary industry category means any industry category listed in the NRDC settlement agreement (Natural Resources Defense Council et al. v. Train, 8 E.R.C. 2120 (D.D.C. 1976), modified 12 E.R.C. 1833 (D. D.C. 1979)); also listed in Appendix A of 40 CFR Part 122.

Privately owned treatment works means any device or system which is (a) used to treat wastes from any facility whose operation is not the operator of the treatment works or (b) not a "POTW".

Process wastewater means any water which, during manufacturing or processing, comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, byproduct, or waste product.

Publicly Owned Treatment Works (POTW) means any facility or system used in the treatment (including recycling and reclamation) of municipal sewage or industrial wastes of a liquid nature which is owned by a "State" or "municipality".

This definition includes sewers, pipes, or other conveyances only if they convey wastewater to a POTW providing treatment.

Regional Administrator means the Regional Administrator, EPA, Region I, Boston, Massachusetts.

Secondary Industry Category means any industry which is not a "primary industry category".

Section 313 water priority chemical means a chemical or chemical category which:

(1) is listed at 40 CFR §372.65 pursuant to Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) (also known as Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986);

(2) is present at or above threshold levels at a facility subject to EPCRA Section 313 reporting requirements; and

(3) satisfies at least one of the following criteria:

(i) are listed in Appendix D of 40 CFR Part 122 on either Table II (organic priority pollutants), Table III (certain metals, cyanides, and phenols), or Table V (certain toxic pollutants and hazardous substances);
(ii) are listed as a hazardous substance pursuant to Section 311(b)(2)(A) of the CWA at 40 CFR §116.4; or
(iii) are pollutants for which EPA has published acute or chronic water quality criteria.

Septage means the liquid and solid material pumped from a septic tank, cesspool, or similar domestic sewage treatment system, or a holding tank when the system is cleaned or maintained.

Sewage Sludge means any solid, semisolid, or liquid residue removed during the treatment of municipal wastewater or domestic sewage. Sewage sludge includes, but is not limited to, solids removed during primary, secondary, or advanced wastewater treatment, scum, septage, portable toilet pumpings, Type III Marine Sanitation Device pumpings (33 CFR Part 159), and sewage sludge products. Sewage sludge does not include grit or screenings, or ash generated during the incineration of sewage sludge.

Sewage sludge use or disposal practice means the collection, storage, treatment, transportation, processing, monitoring, use, or disposal of sewage sludge.

Significant materials includes, but is not limited to: raw materials, fuels, materials such as solvents, detergents, and plastic pellets, raw materials used in food processing or production, hazardous substance designated under section 101(14) of CERCLA, any chemical the facility is required to report pursuant to EPCRA Section 313, fertilizers, pesticides, and waste products such as ashes, slag, and sludge that have the potential to be released with storm water discharges.

Significant spills includes, but is not limited to, releases of oil or hazardous substances in excess of reportable quantities under Section 311 of the CWA (see 40 CFR §110.10 and §117.21) or Section 102 of CERCLA (see 40 CFR § 302.4).

Sludge-only facility means any "treatment works treating domestic sewage" whose methods of sewage sludge use or disposal are subject to regulations promulgated pursuant to Section 405(d) of the CWA, and is required to obtain a permit under 40 CFR §122.1(b)(3).

State means any of the 50 States, the District of Columbia, Guam, the Commonwealth of Puerto Rico, the Virgin Islands, American Samoa, the Trust Territory of the Pacific Islands.

Storm Water means storm water runoff, snow melt runoff, and surface runoff and drainage.

Storm water discharge associated with industrial activity means the discharge from any conveyance which is used for collecting and conveying storm water and which is directly related to manufacturing, processing, or raw materials storage areas at an industrial plant. (See 40 CFR §122.26 (b)(14) for specifics of this definition.

Time-weighted composite means a composite sample consisting of a mixture of equal volume aliquots collected at a constant time interval.

Toxic pollutants means any pollutant listed as toxic under Section 307 (a)(1) or, in the case of "sludge use or disposal practices" any pollutant identified in regulations implementing Section 405(d) of the CWA.

Treatment works treating domestic sewage means a POTW or any other sewage sludge or wastewater treatment devices or systems, regardless of ownership (including federal facilities), used in the storage, treatment, recycling, and reclamation of municipal or domestic sewage, including land dedicated for the disposal of sewage sludge. This definition does not include septic tanks or similar devices.

For purposes of this definition, "domestic sewage" includes waste and wastewater from humans or household operations that are discharged to or otherwise enter a treatment works. In States where there is no approved State sludge management program under Section 405(f) of the CWA, the Regional Administrator may designate any person subject to the standards for sewage sludge use and disposal in 40 CFR Part 503 as a "treatment works treating domestic sewage", where he or she finds that there is a potential for adverse effects on public health and the environment from poor sludge quality or poor sludge handling, use or disposal practices, or where he or she finds that such designation is necessary to ensure that such person is in compliance with 40 CFR Part 503.

Waste Pile means any non-containerized accumulation of solid, non-flowing waste that is used for treatment or storage.

Waters of the United States means:

(a) All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of tide;

(b) All interstate waters, including interstate "wetlands";

(c) All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, "wetlands", sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters:

(1) Which are or could be used by interstate or foreign travelers for recreational or other purpose;

(2) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or

(3) Which are used or could be used for industrial purposes by industries in interstate commerce;

(d) All impoundments of waters otherwise defined as waters of the United States under this definition;

(e) Tributaries of waters identified in Paragraphs (a) through (d) of this definition;

(f) The territorial sea; and

(g) "Wetlands" adjacent to waters (other than waters that are themselves wetlands) identified in Paragraphs (a) through (f) of this definition.

Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of the CWA (other than cooling ponds as defined in 40 CFR §423.11(m) which also meet the criteria of this definition) are not waters of the United States.

Wetlands means those areas that are inundated or saturated by surface or ground water at a frequency and duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Whole Effluent Toxicity (WET) means the aggregate toxic effect of an effluent measured directly by a toxicity test. (See Abbreviations Section, following, for additional information.)

2. Definitions for NPDES Permit Sludge Use and Disposal Requirements.

Active sewage sludge unit is a sewage sludge unit that has not closed.

Aerobic Digestion is the biochemical decomposition of organic matter in sewage sludge into carbon dioxide and water by microorganisms in the presence of air.

Agricultural Land is land on which a food crop, a feed crop, or a fiber crop is grown. This includes range land and land used as pasture.

Agronomic rate is the whole sludge application rate (dry weight basis) designed:

(1) To provide the amount of nitrogen needed by the food crop, feed crop, fiber crop, cover crop, or vegetation grown on the land; and

(2) To minimize the amount of nitrogen in the sewage sludge that passes below the root zone of the crop or vegetation grown on the land to the ground water.

Air pollution control device is one or more processes used to treat the exit gas from a sewage sludge incinerator stack.

Anaerobic digestion is the biochemical decomposition of organic matter in sewage sludge into methane gas and carbon dioxide by microorganisms in the absence of air.

Annual pollutant loading rate is the maximum amount of a pollutant that can be applied to a unit area of land during a 365 day period.

Annual whole sludge application rate is the maximum amount of sewage sludge (dry weight basis) that can be applied to a unit area of land during a 365 day period.

Apply sewage sludge or sewage sludge applied to the land means land application of sewage sludge.

Aquifer is a geologic formation, group of geologic formations, or a portion of a geologic formation capable of yielding ground water to wells or springs.

Auxiliary fuel is fuel used to augment the fuel value of sewage sludge. This includes, but is not limited to, natural gas, fuel oil, coal, gas generated during anaerobic digestion of sewage sludge, and municipal solid waste (not to exceed 30 percent of the dry weight of the sewage sludge and auxiliary fuel together). Hazardous wastes are not auxiliary fuel.

Base flood is a flood that has a one percent chance of occurring in any given year (i.e. a flood with a magnitude equaled once in 100 years).

Bulk sewage sludge is sewage sludge that is not sold or given away in a bag or other container for application to the land.

Contaminate an aquifer means to introduce a substance that causes the maximum contaminant level for nitrate in 40 CFR §141.11 to be exceeded in ground water or that causes the existing concentration of nitrate in the ground water to increase when the existing concentration of nitrate in the ground water exceeds the maximum contaminant level for nitrate in 40 CFR §141.11.

Class I sludge management facility is any publicly owned treatment works (POTW), as defined in 40 CFR §501.2, required to have an approved pretreatment program under 40 CFR §403.8 (a) (including any POTW located in a state that has elected to assume local program responsibilities pursuant to 40 CFR §403.10 (e) and any treatment works treating domestic sewage, as defined in 40 CFR § 122.2,

classified as a Class I sludge management facility by the EPA Regional Administrator, or, in the case of approved state programs, the Regional Administrator in conjunction with the State Director, because of the potential for sewage sludge use or disposal practice to affect public health and the environment adversely.

Control efficiency is the mass of a pollutant in the sewage sludge fed to an incinerator minus the mass of that pollutant in the exit gas from the incinerator stack divided by the mass of the pollutant in the sewage sludge fed to the incinerator.

Cover is soil or other material used to cover sewage sludge placed on an active sewage sludge unit.

Cover crop is a small grain crop, such as oats, wheat, or barley, not grown for harvest.

Cumulative pollutant loading rate is the maximum amount of inorganic pollutant that can be applied to an area of land.

Density of microorganisms is the number of microorganisms per unit mass of total solids (dry weight) in the sewage sludge.

Dispersion factor is the ratio of the increase in the ground level ambient air concentration for a pollutant at or beyond the property line of the site where the sewage sludge incinerator is located to the mass emission rate for the pollutant from the incinerator stack.

Displacement is the relative movement of any two sides of a fault measured in any direction.

Domestic septage is either liquid or solid material removed from a septic tank, cesspool, portable toilet, Type III marine sanitation device, or similar treatment works that receives only domestic sewage. Domestic septage does not include liquid or solid material removed from a septic tank, cesspool, or similar treatment works that receives either commercial wastewater or industrial wastewater and does not include grease removed from a grease trap at a restaurant.

Domestic sewage is waste and wastewater from humans or household operations that is discharged to or otherwise enters a treatment works.

Dry weight basis means calculated on the basis of having been dried at 105 degrees Celsius (°C) until reaching a constant mass (i.e. essentially 100 percent solids content).

Fault is a fracture or zone of fractures in any materials along which strata on one side are displaced with respect to the strata on the other side.

Feed crops are crops produced primarily for consumption by animals.

Fiber crops are crops such as flax and cotton.

Final cover is the last layer of soil or other material placed on a sewage sludge unit at closure.

Fluidized bed incinerator is an enclosed device in which organic matter and inorganic matter in sewage sludge are combusted in a bed of particles suspended in the combustion chamber gas.

Food crops are crops consumed by humans. These include, but are not limited to, fruits, vegetables, and tobacco.

Forest is a tract of land thick with trees and underbrush.

Ground water is water below the land surface in the saturated zone.

Holocene time is the most recent epoch of the Quaternary period, extending from the end of the Pleistocene epoch to the present.

Hourly average is the arithmetic mean of all the measurements taken during an hour. At least two measurements must be taken during the hour.

Incineration is the combustion of organic matter and inorganic matter in sewage sludge by high temperatures in an enclosed device.

Industrial wastewater is wastewater generated in a commercial or industrial process.

Land application is the spraying or spreading of sewage sludge onto the land surface; the injection of sewage sludge below the land surface; or the incorporation of sewage sludge into the soil so that the sewage sludge can either condition the soil or fertilize crops or vegetation grown in the soil.

Land with a high potential for public exposure is land that the public uses frequently. This includes, but is not limited to, a public contact site and reclamation site located in a populated area (e.g., a construction site located in a city).

Land with low potential for public exposure is land that the public uses infrequently. This includes, but is not limited to, agricultural land, forest and a reclamation site located in an unpopulated area (e.g., a strip mine located in a rural area).

Leachate collection system is a system or device installed immediately above a liner that is designed, constructed, maintained, and operated to collect and remove leachate from a sewage sludge unit.

Liner is soil or synthetic material that has a hydraulic conductivity of 1×10^{-7} centimeters per second or less.

Lower explosive limit for methane gas is the lowest percentage of methane gas in air, by volume, that propagates a flame at 25 degrees Celsius and atmospheric pressure.

Monthly average (Incineration) is the arithmetic mean of the hourly averages for the hours a sewage sludge incinerator operates during the month.

Monthly average (Land Application) is the arithmetic mean of all measurements taken during the month.

Municipality means a city, town, borough, county, parish, district, association, or other public body (including an intermunicipal agency of two or more of the foregoing entities) created by or under State law; an Indian tribe or an authorized Indian tribal organization having jurisdiction over sewage sludge management; or a designated and approved management agency under section 208 of the CWA, as amended. The definition includes a special district created under state law, such as a water district, sewer district, sanitary district, utility district, drainage district, or similar entity, or an integrated waste management facility as defined in section 201 (e) of the CWA, as amended, that has as one of its principal responsibilities the treatment, transport, use or disposal of sewage sludge.

Other container is either an open or closed receptacle. This includes, but is not limited to, a bucket, a box, a carton, and a vehicle or trailer with a load capacity of one metric ton or less.

Pasture is land on which animals feed directly on feed crops such as legumes, grasses, grain stubble, or stover.

Pathogenic organisms are disease-causing organisms. These include, but are not limited to, certain bacteria, protozoa, viruses, and viable helminth ova.

Permitting authority is either EPA or a State with an EPA-approved sludge management program.

Person is an individual, association, partnership, corporation, municipality, State or Federal Agency, or an agent or employee thereof.

Person who prepares sewage sludge is either the person who generates sewage sludge during the treatment of domestic sewage in a treatment works or the person who derives a material from sewage sludge.

pH means the logarithm of the reciprocal of the hydrogen ion concentration; a measure of the acidity or alkalinity of a liquid or solid material.

Place sewage sludge or sewage sludge placed means disposal of sewage sludge on a surface disposal site.

Pollutant (as defined in sludge disposal requirements) is an organic substance, an inorganic substance, a combination or organic and inorganic substances, or pathogenic organism that, after discharge and upon exposure, ingestion, inhalation, or assimilation into an organism either directly from the environment or indirectly by ingestion through the food chain, could on the basis on information available to the Administrator of EPA, cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunction in reproduction) or physical deformations in either organisms or offspring of the organisms.

Pollutant limit (for sludge disposal requirements) is a numerical value that describes the amount of a pollutant allowed per unit amount of sewage sludge (e.g., milligrams per kilogram of total solids); the amount of pollutant that can be applied to a unit of land (e.g., kilograms per hectare); or the volume of the material that can be applied to the land (e.g., gallons per acre).

Public contact site is a land with a high potential for contact by the public. This includes, but is not limited to, public parks, ball fields, cemeteries, plant nurseries, turf farms, and golf courses.

Qualified ground water scientist is an individual with a baccalaureate or post-graduate degree in the natural sciences or engineering who has sufficient training and experience in ground water hydrology and related fields, as may be demonstrated by State registration, professional certification, or completion of accredited university programs, to make sound professional judgments regarding ground water monitoring, pollutant fate and transport, and corrective action.

Range land is open land with indigenous vegetation.

Reclamation site is drastically disturbed land that is reclaimed using sewage sludge. This includes, but is not limited to, strip mines and construction sites.

Risk specific concentration is the allowable increase in the average daily ground level ambient air concentration for a pollutant from the incineration of sewage sludge at or beyond the property line of a site where the sewage sludge incinerator is located.

Runoff is rainwater, leachate, or other liquid that drains overland on any part of a land surface and runs off the land surface.

Seismic impact zone is an area that has 10 percent or greater probability that the horizontal ground level acceleration to the rock in the area exceeds 0.10 gravity once in 250 years.

Sewage sludge is a solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in a treatment works. Sewage sludge includes, but is not limited to:, domestic septage; scum or solids removed in primary, secondary, or advanced wastewater treatment processes; and a material derived from sewage sludge. Sewage sludge does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator or grit and screening generated during preliminary treatment of domestic sewage in treatment works.

Sewage sludge feed rate is either the average daily amount of sewage sludge fired in all sewage sludge incinerators within the property line of the site where the sewage sludge incinerators are located for the number of days in a 365 day period that each sewage sludge incinerator operates, or the average daily design capacity for all sewage sludge incinerators within the property line of the site where the sewage sludge incinerators are located.

Sewage sludge incinerator is an enclosed device in which only sewage sludge and auxiliary fuel are fired.

Sewage sludge unit is land on which only sewage sludge is placed for final disposal. This does not include land on which sewage sludge is either stored or treated. Land does not include waters of the United States, as defined in 40 CFR §122.2.

Sewage sludge unit boundary is the outermost perimeter of an active sewage sludge unit.

Specific oxygen uptake rate (SOUR) is the mass of oxygen consumed per unit time per unit mass of total solids (dry weight basis) in sewage sludge.

Stack height is the difference between the elevation of the top of a sewage sludge incinerator stack and the elevation of the ground at the base of the stack when the difference is equal to or less than 65 meters. When the difference is greater than 65 meters, stack height is the creditable stack height determined in accordance with 40 CFR §51.100 (ii).

State is one of the United States of America, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, the Trust Territory of the Pacific Islands, the Commonwealth of the Northern Mariana Islands, and an Indian tribe eligible for treatment as a State pursuant to regulations promulgated under the authority of section 518(e) of the CWA.

Store or storage of sewage sludge is the placement of sewage sludge on land on which the sewage sludge remains for two years or less. This does not include the placement of sewage sludge on land for treatment.

Surface disposal site is an area of land that contains one or more active sewage sludge units.

Total hydrocarbons means the organic compounds in the exit gas from a sewage sludge incinerator stack measured using a flame ionization detection instrument referenced to propane.

Total solids are the materials in sewage sludge that remain as residue when the sewage sludge is dried at 103 to 105 degrees Celsius.

Treat or treatment of sewage sludge is the preparation of sewage sludge for final use or disposal. This includes, but is not limited to, thickening, stabilization, and dewatering of sewage sludge. This does not include storage of sewage sludge.

Treatment works is either a federally owned, publicly owned, or privately owned device or system used to treat (including recycle and reclaim) either domestic sewage or a combination of domestic sewage and industrial waste of a liquid nature.

Unstable area is land subject to natural or human-induced forces that may damage the structural components of an active sewage sludge unit. This includes, but is not limited to, land on which the soils are subject to mass movement.

Unstabilized solids are organic materials in sewage sludge that have not been treated in either an aerobic or anaerobic treatment process.

Vector attraction is the characteristic of sewage sludge that attracts rodents, flies, mosquitoes, or other organisms capable of transporting infectious agents.

Volatile solids is the amount of the total solids in sewage sludge lost when the sewage sludge is combusted at 550 degrees Celsius in the presence of excess air.

Wet electrostatic precipitator is an air pollution control device that uses both electrical forces and water to remove pollutants in the exit gas from a sewage sludge incinerator stack.

Wet scrubber is an air pollution control device that uses water to remove pollutants in the exit gas from a sewage sludge incinerator stack.

3. Commonly Used Abbreviations

BOD	Five-day biochemical oxygen demand unless otherwise specified
CBOD	Carbonaceous BOD
CFS	Cubic feet per second
COD	Chemical oxygen demand
Chlorine	
Cl_2	Total residual chlorine
TRC	Total residual chlorine which is a combination of free available chlorine (FAC, see below) and combined chlorine (chloramines, etc.)

TRO	Total residual chlorine in marine waters where halogen compounds are present
FAC	Free available chlorine (aqueous molecular chlorine, hypochlorous acid, and hypochlorite ion)
Coliform	
Coliform, Fecal	Total fecal coliform bacteria
Coliform, Total	Total coliform bacteria
Cont. (Continuous)	Continuous recording of the parameter being monitored, i.e. flow, temperature, pH, etc.
Cu. M/day or M^3/day	Cubic meters per day
DO	Dissolved oxygen
kg/day	Kilograms per day
lbs/day	Pounds per day
mg/l	Milligram(s) per liter
ml/l	Milliliters per liter
MGD	Million gallons per day
Nitrogen	
Total N	Total nitrogen
NH_3-N	Ammonia nitrogen as nitrogen
NO_3-N	Nitrate as nitrogen
NO_2-N	Nitrite as nitrogen
NO_3-NO_2	Combined nitrate and nitrite nitrogen as nitrogen
TKN	Total Kjeldahl nitrogen as nitrogen
Oil & Grease	Freon extractable material
PCB	Polychlorinated biphenyl
pH	A measure of the hydrogen ion concentration. A measure of the acidity or alkalinity of a liquid or material
Surfactant	Surface-active agent

Temp. °C	Temperature in degrees Centigrade
Temp. °F	Temperature in degrees Fahrenheit
TOC	Total organic carbon
Total P	Total phosphorus
TSS or NFR	Total suspended solids or total nonfilterable residue
Turb. or Turbidity	Turbidity measured by the Nephelometric Method (NTU)
ug/l	Microgram(s) per liter
WET	"Whole effluent toxicity" is the total effect of an effluent measured directly with a toxicity test.
C-NOEC	"Chronic (Long-term Exposure Test) – No Observed Effect Concentration". The highest tested concentration of an effluent or a toxicant at which no adverse effects are observed on the aquatic test organisms at a specified time of observation.
A-NOEC	"Acute (Short-term Exposure Test) – No Observed Effect Concentration" (see C-NOEC definition).
LC_{50}	LC_{50} is the concentration of a sample that causes mortality of 50% of the test population at a specific time of observation. The LC_{50} = 100% is defined as a sample of undiluted effluent.
ZID	Zone of Initial Dilution means the region of initial mixing surrounding or adjacent to the end of the outfall pipe or diffuser ports.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
5 POST OFFICE SQUARE, SUITE 100 (OEP06-4)
BOSTON, MASSACHUSETTS 02109-3912

FACT SHEET

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

NPDES PERMIT # MA0025704

PUBLIC NOTICE DATES: January 25, 2013 – February 23, 2013

NAME AND ADDRESS OF APPLICANT:

CSX Transportation, Inc.
500 Water Street – J275
Jacksonville, FL 32202

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

CSX Transportation, Inc.
Beacon Park Yard
170 Cambridge Street
Allston, MA 02134

RECEIVING WATERS: Charles River Basin (MA72-36)

CLASSIFICATION: Class B - CSO, warm water fishery

SIC CODE: 4011

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I. PROPOSED ACTION

The above named applicant has applied to the U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (MassDEP) for the re-issuance of a National Pollutant Discharge Elimination System (NPDES) permit to discharge process water and stormwater into the designated receiving water.

The current permit was issued to CSX Transportation, Inc. (CSXT) on July 1, 2005. The permit became effective on November 18, 2005, was modified on February 2, 2006, and expired November 18, 2010. EPA received a permit renewal application from CSXT on May 20, 2010. Since the permit renewal application was deemed timely and complete by EPA, the permit has been administratively continued.

II. TYPE OF FACILITY

CSXT Beacon Park Yard is a major rail road yard located in Allston, MA (See Attachment A, Topographic Map). Industrial activities at the facility include switching and through travel of railcars, locomotive fueling and repair, railcar repair, and material storage.

The facility is also comprised of several additional areas including the Classification Yard, West-End Tower, Intermodal Yard (operated by CSX Intermodal Terminals, Inc.), a transloading operation (operated by Savage Industries for Transflo – a CSX subsidiary), and a waste container transloading area (third party leased operations – Romar Technologies). The Intermodal operations also include a trailer chassis repair shop adjacent to the waste transloading operation. These areas do not discharge wastewater associated with industrial activity or contribute to the runoff through the outfalls identified in this permit. Therefore, discharges from these areas are not authorized under this NPDES Permit No. MA0025704. In the future, if CSXT or any other entity is found to be discharging from these areas without a permit, this may be considered a violation of the Clean Water Act and could result in an enforcement action.

The current NPDES permit covers drainage of stormwater from an area of approximately four acres that generally drains into the adjacent Charles River after treatment (see Attachment B, Locus Map). There are two outfalls covered under the current permit: Outfall 001A and Outfall 002A. The discharge through Outfall 002A of treated groundwater discharge associated with the Groundwater Treatment System was eliminated in May 2006. Therefore, the renewal application requests removal of Outfall 002A from the permit, as no facility industrial activities or areas contribute runoff or otherwise discharge waters to Outfall 002A. However, the permittee discharges stormwater from one catch basin located in a parking area at the north of the site to a drainage line owned by Massachusetts Department of Transportation, which flows to Outfall 002A. Additionally, runoff from the peripheral areas of the facility that do not conduct industrial activities enters a central storm drain, which discharges directly to the Charles River via Outfall 002A. See Attachment C, Site Drainage Map.

III. SUMMARY OF MONITORING DATA

A quantitative description of the discharges in terms of significant effluent parameters based on discharge monitoring reports (DMRs) submitted for Outfall 001A and 002A during the time period from April 2006 to December 2011 was reviewed and used in the development of the draft National Pollutant Discharge Elimination System (NPDES) permit (Draft Permit). A summary of the DMR data is provided in Attachment E to this Fact Sheet.

IV. PERMIT BASIS AND EXPLANATION OF EFFLUENT LIMITS

The effluent limitations, monitoring requirements, and any implementation schedule, if required, may be found in Part 1 (Effluent Limitations and Monitoring Requirements) of the draft permit. The permit re-application is part of the administrative file (Permit No. MA0025704).

A. General Requirements

The Clean Water Act (CWA) prohibits the discharge of pollutants to waters of the United States without a NPDES permit unless such a discharge is otherwise authorized by the CWA. The NPDES permit is the mechanism used to implement technology and water quality-based effluent limitations and other requirements including monitoring and reporting. The draft permit was developed in accordance with various statutory and regulatory requirements established pursuant to the CWA and applicable State regulations. During development, EPA considered the most recent technology-based treatment requirements, water quality-based requirements, and all limitations and requirements in the current/existing permit. The regulations governing the EPA NPDES permit program are generally found at 40 CFR Parts 122, 124, 125, and 136. The general conditions of the draft permit are based on 40 CFR §122.41 and consist primarily of management requirements common to all permits. 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(i), and §122.48.

1. Technology-Based Requirements

Subpart A of 40 CFR §125 establishes criteria and standards for the imposition of technology-based treatment requirements in permits under Section 301(b) of the CWA, including the application of EPA promulgated effluent limitations and case-by-case determinations of effluent limitations under Section 402(a)(1) of the CWA.

Technology-based treatment requirements represent the minimum level of control that must be imposed under Sections 301(b) and 402 of the CWA (see 40 CFR §125 Subpart A) to meet best practicable control technology currently available (BPT) for conventional pollutants and some metals, best conventional control technology (BCT) for conventional pollutants, and best available technology economically achievable (BAT) for toxic and non-conventional pollutants. In general, technology-based effluent guidelines for non-

POTW facilities must be complied with as expeditiously as practicable but in no case later than three years after the date such limitations are established and in no case later than March 31, 1989 [See 40 CFR §125.3(a)(2)]. Compliance schedules and deadlines not in accordance with the statutory provisions of the CWA cannot be authorized by a NPDES permit.

EPA has not promulgated technology-based National Effluent Guidelines for SIC code 4011 (railroads, line haul operations). However, the Multi-Sector General Permit for Stormwater Discharges Associated with Industrial Activity (MSGP) contains requirements for SIC code 4011, in Sector P – Land Transportation and Warehousing, Subsector P1 - Railroad Transportation. In the absence of technology-based effluent guidelines, the permit writer is authorized under Section 402(a)(1)(B) of the CWA to establish effluent limitations on a case-by-case basis using Best Professional Judgement (BPJ).

2. Water Quality-Based Requirements

Water quality-based criteria are required in NPDES permits when EPA and the State determine that effluent limits more stringent than technology-based limits are necessary to maintain or achieve state or federal water-quality standards (See Section 301(b) (1)(C) of the CWA). Water quality-based criteria consist of three (3) parts: 1) beneficial designated uses for a water body or a segment of a water body; 2) numeric and/or narrative water quality criteria sufficient to protect the assigned designated use(s) of the water body; and 3) anti-degradation requirements to ensure that once a use is attained it will not be degraded. The Massachusetts State Water Quality Standards, found at 314 CMR 4.00, include these elements. The State Water Quality Regulations limit or prohibit discharges of pollutants to surface waters and thereby assure that the surface water quality standards of the receiving water are protected, maintained, and/or attained. These standards also include requirements for the regulation and control of toxic constituents and require that EPA criteria, established pursuant to Section 304(a) of the CWA, be used unless site-specific criteria are established. EPA regulations pertaining to permit limits based upon water quality standards and state requirements are contained in 40 CFR §122.44(d).

Section 101(a)(3) of the CWA specifically prohibits the discharge of toxic pollutants in toxic amounts. The Commonwealth of Massachusetts (State) has a similar narrative criterion in their water quality regulations that prohibits such discharges [See Massachusetts Title 314 CMR 4.05(5)(e)]. The effluent limits established in the draft permit assure that the surface water quality standards of the receiving water are protected, maintained, and/or attained.

Section 303(d) of the Federal Clean Water Act (CWA) requires states to identify those water bodies that are not expected to meet surface water quality standards after the implementation of technology-based controls and, as such require the development of total maximum daily loads (TMDLs).

The Charles River Watershed 2002-2006 Water Quality Assessment Report[1] indicates that the Aquatic Life, Fish Consumption, Primary Contact, Secondary Contact, and Aesthetics use category are characterized as impaired in the Charles River (Segment MA72-36). Aquatic Life is listed as impaired due to biological indicators of nutrient enrichment, elevated total phosphorus, elevated chlorophyll *a*, elevated saturation of dissolved oxygen, high pH, poor Secchi disk transparency, non-native aquatic species, fishes bioassessment, other flow regime alterations associated with dams/impoundments, other – relative absence of fluvial specialists/dependant fish species, barriers to fish passage, sediment toxicity. Sources include habitat alteration associated with dams/impoundments, municipal NPDES discharge(s) in upstream segments, contaminated sediments, and introduction of non-native aquatic organisms. Fish Consumption is listed as impaired due to elevated PCB in fish tissue, pesticides (total DDT), with a suspected source of contaminated sediments. Primary Contact is listed as impaired due to elevated *E.coli* and poor Secchi disk transparency due to upstream sources, discharges from municipal separate storm sewer systems, unspecified urban stormwater, and urban runoff/storm sewers, with suspected sources of illicit connections/hook-ups to storm sewers. Secondary Contact and Aesthetics are listed as impaired due to poor Secchi disk transparency due to upstream sources, discharges from municipal separate stormwater sewer systems, unspecified urban stormwater, urban runoff/storm sewers.

Additionally, this segment of the Charles River (segment MA72-36) (formerly part of the segment reported as MA72-08) is on the Final Massachusetts Year 2010 Integrated List of Waters,[2] as well as the Proposed Massachusetts Year 2012 Integrated List of Waters[3] in Category 5 – Waters Requiring a TMDL because of chlorophyll-*a*, DDT, Escherichia coli, fish-passage barrier, fishes bioassessments, non-native aquatic plants, oil and grease, other flow regime alterations, dissolved oxygen, Secchi disk transparency, nutrient/eutrophication biological indicators, total phosphorus, PCB in fish tissue, sediment bioassays – acute toxicity freshwater, and high pH.

There is a Final Phosphorus TMDL for the Lower Charles River Basin.[4] The drainage system discharges to the Lower Charles are grouped together into one allocation because there are presently very limited data available to characterize the sources that make up this group. Therefore, the Final Phosphorus TMDL recommends that owners of stormwater drainage system discharges to the Charles River undertake an iterative approach of managing their discharges. Briefly, this approach would involve adopting initial controls to reduce phosphorus while at the same time collecting information that will better characterize their sources so that subsequent control activities can be prioritized to achieve the greatest phosphorus load reductions in the most efficient and cost effective manner.

1 http://www.mass.gov/dep/water/resources/72wqar07.pdf
2 http://www.mass.gov/dep/water/resources/10list6.pdf
3 http://www.mass.gov/dep/water/resources/12list2.pdf
4 http://www.mass.gov/dep/water/resources/charlesp.pdf

Although the TMDL does not provide a numerical waste load allocation (WLA) for this facility, it does provide a % reduction phosphorous goal for the facility's drainage area (other drainage area) of 62% and a % reduction phosphorous goal for the facility's Land Cover/Source Category (Commercial) of 65% as a basis for the waste load allocation. The development and implementation of a Source Identification and Reduction Plan (SIRP), along with other requirements of the SWPPP, aimed at these phosphorous reductions represent a phosphorous control plan (PCP) required to achieve the WLA of the TMDL.

Additionally, a Final Pathogen TMDL exists for Segment 72-08, Charles Basin (Watertown Dam, Watertown to Science Museum, Boston).[5] Stormwater discharges continue to be a major source of bacterial pollution throughout the Charles River watershed. Quantification of water quality impacts from stormwater and anticipated reductions through remediation are difficult to project so implementation aimed at lessening impacts to water quality is geared towards the development and implementation of "Best Management Plans" [BMPs] which can be assessed qualitatively as to their effectiveness over time.

State Water Quality Standards require that for Class B surface waters, the geometric mean of all *E. coli* samples taken within the most recent six months shall not exceed 126 colonies per 100 mL typically based on a minimum of five samples and no single sample shall exceed 235 colonies per 100 mL (314 CMR 4.05(3)(b)4b).

3. Anti-Backsliding

EPA's anti-backsliding provision as identified in Section 402(o) of the Clean Water Act and at 40 CFR §122.44(l) prohibits the relaxation of permit limits, standards, and conditions unless the circumstances on which the previous permit was based have materially and substantially changed since the time the permit was issued. Anti-backsliding provisions apply to effluent limits based on technology, water quality, BPJ and State Certification requirements. Relief from anti-backsliding provisions can only be granted under one of the defined exceptions [See 40 CFR §122.44(l)(i)]. Since none of these exceptions apply to this facility, the effluent limits in the draft permit must be as stringent as those in the current permit.

4. Anti-Degradation

The Massachusetts Anti-Degradation Policy is found at Title 314 CMR 4.04. All existing uses of Charles River must be protected. The Charles River is classified as a Class B water, warm water fishery, by the Commonwealth of Massachusetts (314 CMR 4.06). These waters are designated at habitat for fish, other aquatic life, and wildlife, and for primary and secondary contact recreation. Where designated they shall be suitable as a source of public water supply with appropriate treatment. They shall be suitable for irrigation and other agricultural uses and for compatible industrial cooling and process uses. These waters shall have consistently good aesthetic value.

5 http://www.mass.gov/dep/water/resources/charles1.pdf

B. Description of the Facility

CSX Transportation (CSXT), Beacon Park Yard is a major railroad yard located in Allston, MA. The land is owned by Harvard University and leased to CSXT. Industrial activities at the facility include switching and through travel of railcars, locomotive fueling and repair, railcar repair, and material storage.

Drainage at the facility is generally split into two drainage basins. The southern portion of the facility drains via sheet flow to nearby catch basins that direct stormwater to drainage lines owned by Boston Water and Sewer Commission and Massachusetts Department of Transportation (that commingle with Outfall 001A in the Salt Creek Chamber for discharge to the Charles), described in Part IV.C.1.b, below. Wastewater associated with industrial activity areas located on the northern portion of the facility is directed to the wastewater treatment facility (WWTF). These activities include loading/unloading activities associated with petroleum storage, vehicle maintenance, and locomotive fueling. Railcar washing activities at the facility were terminated in 1996. The WWTF includes the following treatment processes: 100 gallon per minute (GPM) oil/water separator (OWS) with grit removal; two 300 GPM duplex pumps; 6,000 gallon wastewater surge tank; 300 GPM pump; and an open chamber. The treated discharge from the WWTF is then directed to the Storm Water Treatment Facility (SWTF) for further treatment prior to discharge to the Charles River via Outfall 001A (see Attachment D, Flow Diagram). The SWTF treatment process includes: two 500 GPM pumps; two 18,000 gallon retention basins; two 400 GPM pumps; and a 400 GPM oil/water separator.

To clarify, Outfall 001 shall refer to the physical discharge point from the Salt Creek Chamber to the Charles River. Outfall 001A shall refer to the internal outfall from the SWTF to the Salt Creek Chamber. Additionally, Outfall 002 shall refer to the physical discharge point from the Charles River Chamber to the Charles River, and Outfall 002A shall refer to the internal outfall of treated groundwater.

C. Description of Discharge

Two outfalls are permitted under the current permit: Outfall 002A (treated groundwater) and Outfall 001A (stormwater and process water). The permittee requested removal of Outfall 002A in their permit re-application, since the permittee no longer discharges treated groundwater or stormwater associated with industrial activities through Outfall 002A. Therefore, the only discharge included in the draft permit is Outfall 001A.

1. Outfall 001A

a. Waste Water Treatment Facility (WWTF)

Locomotives are fueled and supplied with sand (to help with traction on the rails) at the "Locomotive Fueling Pad." Water from the "Locomotive Fueling Pad" area (stormwater, any fuel spills from locomotive fueling using #2 diesel fuel, and water from maintenance of locomotives) is collected in "spill pans" and gravity fed to the oil/water (o/w) separator

at the WWTF. Water collected in floor drains at the "Diesel Shop" is pumped to the "Locomotive Fueling Pad," and also gravity fed to the o/w separator at the WWTF.

In the Car Shop light maintenance occurs on locomotives. This activity causes oil and diesel fuel to build up on the floors. The floors in the Car Shop are washed approximately twice a week with a steam pressure washer. No surfactants are used anywhere onsite. Each washing generates approximately 400 to 500 gallons of waste water which is discharged to the "track pit." The waste water is then pumped to the same culverts where the fuel pads drain. The wastewater from the Car Shop combines with the waste water from the fuel pads. The combined flow is treated at the WWTF and then piped to the Storm Water Treatment Facility (described below).

Grit is removed in the WWTF by gravity. Most of the product collected onsite is collected at this o/w separator by two (2) oil skimmers. The product is pumped to a 4,000 gallon waste oil tank for offsite recycling/disposal. From the o/w separator, the treated water is pumped to a wastewater surge tank and then to an open chamber (formerly an o/w separator). The treated flow from the WWTF combines with diesel shop area yard drainage.

Washing was previously conducted at the "Locomotive Pad", but all activities in this area have ceased. Catch basins in the area of the "Locomotive Pad" collect stormwater runoff which combines with the diesel shop area yard drainage.

b. Storm Water Treatment Facility (SWTF)

This combined flow [diesel shop area yard drainage (which flows through various catch basins onsite), WWTF flow, and Locomotive Pad flow] is then pumped to the SWTF for treatment. An oil skimmer at the SWTF pump station collects product for offsite recycling/disposal. The water is pumped through two retention basins to the o/w separator, which is housed in a building (along with a tank of sodium hydroxide (NaOH) with no secondary containment, a backup generator, and a diesel fuel tank for the backup generator).

The effluent from the o/w separator is sampled after the last baffle (the representative sampling point) and reported on DMRs as the discharge from Outfall 001A. The effluent from the o/w separator is adjusted with addition of caustic (NaOH) and continuously monitored.

The permittee stated that the cause of low pH levels at Outfall 001A is the rainwater (with documentation of rainwater pH as high as 6.36 SU and as low as 4.3 SU onsite). Several low level exceedences of pH have occurred at Outfall 001A, as documented in DMRs. As explained by the permittee, the operations of the NaOH injection system are set to inject NaOH when the pH drops below 6.5 SU.

After pH adjustment and collection of the representative sample for Outfall 001A, the treated water from the site flows to the Salt Creek Chamber (owned by Boston Water and

Sewer Commission), where it commingles with stormwater from drainage lines owned by Boston Water and Sewer Commission and Massachusetts Department of Transportation, discussed in detail immediately below. The commingled flows discharges from the Salt Creek Chamber directly to the Charles River. One (1) sausage boom and two (2) sets of river booms are maintained by the permittee at the point of this discharge of Outfall 001 to the Charles River. The booms are replaced 1/month, or as needed.

The drainage lines owned by Boston Water and Sewer Commission and Massachusetts Department of Transportation (that commingle with Outfall 001A in the Salt Creek Chamber for discharge to the Charles) are expected to collect stormwater flows from the southern portion of the site, the majority not operated by CSXT [including the Classification Yard, West-End Tower (owned by CSXT), CSX Intermodal, Inc. Boston Terminal (a CSX subsidiary), a transloading operation (operated by Savage Industries for Transflo – a CSX subsidiary), and a waste container transloading area (leased to a third party – Romar Technologies)].

The Intermodal Yard has a designated maintenance area for maintenance and repair of vehicles and equipment used on site. Any water that comes in contact with this industrial activity is collected for treatment offsite. The maintenance area is covered, and no stormwater comes in contact with the area, therefore no stormwater associated with industrial activity is generated for discharge at the Intermodal Yard. Additionally, no industrial activities occur at the Classification Yard, West-End Tower areas, the transloading operation area, or the waste container transloading area. The transloading operation (operated by Savage Industries for Transflo – a CSX subsidiary) and the waste container transloading area (leased to a third party – Romar Technologies) have ceased operations and the properties are vacant as of discussions with the permittee in December 2012.

Therefore, these areas do not discharge wastewater associated with industrial activity or contribute to the runoff through the outfalls identified in this permit. As previously stated, discharges from these areas are not authorized under this NPDES Permit and if CSXT or any other entity is found to be discharging from these areas without a permit, this may be considered a violation of the Clean Water Act and could result in an enforcement action.

2. Outfall 002A

According to the permit re-application, the discharge through Outfall 002A, included in the current permit, was discontinued in May 2006. The groundwater remediation system onsite is classified as a 21E, Class C Response Action Outcome (RAO) [Release Tracking Number (RTN) 3-4495], and is currently undergoing active recovery. The facility recovers only floating Light Non-Aqueous Phase Liquid (LNAPL) from the groundwater which is disposed of offsite, and no longer pumps and treats the groundwater for discharge (as was permitted by the current permit). The pumps which previously pumped groundwater from the six (6) recovery wells onsite to the groundwater remediation system have been removed. The recovery wells now only

contain pumps to remove the LNAPL. The LNAPL is pumped to a storage tank and is required to be removed every 90 days; however, the facility currently removes LNAPL from the tank via vacuum truck every 6 weeks. When the vacuum trunk is brought onsite to remove the LNAPL from the collection tank, any LNAPL in the recovery wells and monitoring wells is also removed through vacuum pumping.

The piping which previously discharged water from the groundwater remediation system to the Charles River Chamber (which discharges through Outfall 002) has been sealed. The current permit requires visual inspections of Outfall 002. No sheen has been observed on the river at the discharge of Outfall 002 since issuance of the current permit.

The permittee discharges stormwater from one catch basin located in a parking area at the north of the site to a drainage line owned by Massachusetts Department of Transportation. This stormwater is not associated with industrial activities. This drainage line, along with other Massachusetts Department of Transportation drainage lines from the north contribute stormwater flow to the Charles River Chamber, which subsequently discharge to the Charles River through Outfall 002. Outfall 002 is owned by Massachusetts Department of Transportation.

Therefore, since the permittee no longer discharges treated groundwater or stormwater associated with industrial activities through Outfall 002A, the monitoring requirements from the current permit have been removed for this outfall in the draft permit.

D. Discharge Location

The sampling point for Outfall 001A is located at the discharge from the last o/w separator of the Storm Water Treatment Facility. A 12-inch pipe leads from the o/w separator to Salt Creek Chamber where it mixes with drainage lines owned by Boston Water and Sewer Commission and Massachusetts Department of Transportation (as discussed above), stormwater from the MTA (MassDOT), and drainage from the Allston/Brighton sections of Boston.

The Salt Creek Chamber discharges to the Charles River through Outfall 001, which is located approximately 1800 feet from the Cambridge Street Bridge in a southerly direction.

E. Proposed Permit Effluent Limitations and Conditions

The effluent limitations and all other requirements described herein may be found in the draft permit. The effluent data submitted by the permittee in discharge monitoring reports (DMRs) is summarized in Attachment E.

1. Outfall 001A

a. Flow

The current permit requires the permittee to continuously monitor the flow rate for the discharge through Outfall 001A and report the average monthly and maximum daily flow rates. The current permit requires a flow rate limitation through Outfall 001A of 21,500 gpd monthly average and 225,000 gpd maximum daily.

Review of Discharge Monitoring Report (DMR) data from the time period of April 2006 – December 2011 for Outfall 001A reveals that the daily maximum flow rate has ranged from 7,531 – 314,920 gpd and the monthly average flow rate has ranged from 2,983 – 46,908 gpd. The discharge has exceeded the daily maximum flow rate effluent limitations on one (1) occasion and the monthly average flow rate limitation on twelve (12) occasions.

In the permit reapplication, the permittee requested an increase in the maximum daily flow rate limit from 225,000 gpd to 576,000 gpd, and removal of the monthly flow rate limit. CSXT explained that the exceedences of the current permit's flow rate limitation were caused by stormwater flows out of their control. These flow rates exceeded the current permit limit, but did not exceed the capacity of the treatment system of 576,000 gpd.

Therefore, based on this new information, the draft permit shall require an increased effluent flow rate limitation. Although the o/w separator has a theoretical capacity of 576,000 gpd (400 gpm), the permittee has never operated the o/w separator at that flow rate. Therefore, the draft permit has increased the maximum daily flow rate limitation of 225,000 gpd to 315,000 gpd, the maximum flow rate which has been experienced through Outfall 001A.

Additionally, the monthly average flow rate limitation in the draft permit has also been increased from 21,500 gpd to 47,000 gpd. Based on past performance, EPA expects that the permittee will be able to meet these effluent limitations.

b. Oil & Grease (O&G)

The current permit requires a daily maximum O&G effluent limitation of 15 mg/L, monitored 1/week. This limit was incorporated into the previous permit issued in 1987 under state certification requirements set forth in 40 CFR 124.53 and 124.55. The current permit retained the 15 mg/L limit as a technology BPJ based limit. Facilities that generate similar pollutants and process their wastewater through an o/w separator are limited to 15 mg/L for O&G.

This O&G limit of 15 mg/L is consistent with the narrative Massachusetts Surface Water Quality Standard at 314 CMR 4.05 (3)(b)7, which states,

> These waters shall be free from oil, grease and petrochemicals that produce a visible film on the surface of the water, impart an oily taste to the water or an oily or other undesirable taste to the edible portions of aquatic life, coat the banks or bottom of the water course, or are deleterious or become toxic to aquatic life.

Review of DMR data indicates that this limit has not been exceeded, with a maximum O&G concentration of 14 mg/L. The draft permit retains the 15 mg/L O&G limit, however, the monitoring frequency in the draft permit has been reduced to monthly.

c. pH

The current permit requires a pH effluent limitation range of 6.5 – 8.3 SU, monitored continuously via recorder. Review of DMR data indicates that this effluent limitation range has been exceeded on 44 occasions, with a range of 5.51 – 9.2 SU. The minimum limitation of 6.5 SU has been exceeded on thirty-nine (39) occasions and the maximum limitation of 8.3 SU has been exceeded on five (5) occasions. As explained by the permittee, the operations of the NaOH injection system are set to inject NaOH when the pH drops below 6.5 SU. The facility is currently experimenting with finding the lowest pH level to trigger NaOH injection that will result in the effluent pH not dropping below the permitted 6.5 SU.

The pH limits are based on the Massachusetts Surface Water Quality Standards, 314 Code of Massachusetts Regulations ("CMR"), Inland Water, Class B at 4.05 (3)(b)3. These standards require that the pH of the receiving water be in the range of 6.5 to 8.3 standard units and no more than 0.5 units outside the background range. There shall no change from background conditions that would impair any use assigned to this Class. The water quality criteria were adopted in the current permit as discharge limitations based on certification requirements under Section 401(a)(1) of the CWA, as described in 40 CFR 124.53 and 124.55.

The permittee has submitted information indicating that the numerous pH exceedences are likely due to the naturally occurring low pH of stormwater. Rainfall data collected at the facility on a roof top prior to contact with building materials or the ground indicate an average pH of rainfall in 2009 of 5.56 SU and in 2010 of 5.72 SU. The permittee indicates the difficulty in operating and maintaining a narrow pH range, since dosing cannot be consistent with variations in the rainfall pH as high as 6.36 SU and as low as 4.3 SU. Therefore, the permittee has requested the effluent limitation range for pH be revised to 6.0 – 9.0 SU.

Taking the low pH values of the rainfall into consideration, EPA has determined that an effluent limitation range of 6.0 – 8.3 SU will satisfy Water Quality Standards, since the State pH range is expected to be met instream. Therefore, the draft permit shall require a pH limitation range of 6.0 – 8.3 SU.

d. Benzene

CSXT uses diesel fuel to power its locomotives, which contains benzene, toluene, ethylbenzene, and xylenes, among other hydrocarbons (mixture of volatile organic compounds and polynuclear aromatic hydrocarbons).

Fuel refined petroleum products contain numerous types of hydrocarbons. Individual components partition to environmental media on the basis of their physical/chemical properties. Rather than attempt to establish effluent limits of every compound found in waste water or stormwater containing diesel fuel, limits are typically established for the compounds that would be the most difficult to remove or demonstrate the greatest degree of toxicity. Generally, the higher the solubility of a volatile organic compound (VOC) in water, the more difficult it is to remove.

VOCs such as benzene, toluene, ethylbenzene, and xylenes (BTEX) are normally found at relatively high concentrations in light distillate products, such as diesel fuel. Since many petroleum spills involve diesel fuels, a traditional approach for such spills has been to place limits on the individual BTEX components and/or the sum of total BTEX compounds.

Of these four compounds, benzene has one of the highest solubilities, is one of the most toxic constituents, and is found at relatively high concentrations in diesel fuel (290mg/L).[6] Because of the reasons mentioned above, benzene can be considered one of the most important limiting pollutant parameters found in diesel fuel. Building on this premise, benzene can be used as an indicator parameter for regulatory and characterization purposes for waste water and stormwater, which contains some diesel fuel. The primary advantage of using an indicator-parameter is that it can monitor the effectiveness of a treatment process and evaluate the potential impact on the environment.

The current permit requires a daily maximum benzene effluent limitation of 51.0 ug/L, monitored monthly. This limitation is based on the current recommended Federal Water Quality Criteria for benzene adopted by the Commonwealth of Massachusetts for Class B receiving waters, since benzene is not listed specifically in the Massachusetts Surface Water Quality Standards (314 CMR 4.00). According to the Massachusetts Surface Water Quality Standards [314 CMR 4.05(5)(e)]:

> For pollutants not otherwise listed in 314 CMR 4.00, the *National Recommended Water Quality Criteria: 2002, EPA 822R-02-047, November 2002* published by EPA pursuant to Section 304(a) of the Federal Water Pollution Control Act, are the allowable receiving water concentrations for the affected waters, unless the Department either establishes a site specific criterion or determines that naturally occurring background concentrations are higher.

EPA reviewed the National Recommended Water Quality Criteria, which contain human health criteria associated with the consumption of aquatic organisms for benzene of 51 ug/L. Review of DMR data reveals that this limit has not been exceeded on any occasion, with a maximum benzene concentration of 1 ug/L. Therefore, this limit shall remain unchanged in the draft permit, and continue to be monitored monthly.

e. Total Suspended Solids (TSS)

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6 "Composition of Petroleum Mixtures," Total Petroleum Hydrocarbon Criteria Working Group Series, T.L. Potter and K.E. Simmons, Vol. 2, p. 52 (May 1998).

The current permit requires a daily maximum effluent limitation of 100.0 mg/L TSS, monitored monthly. This limit is based on a BPJ determination that reviewed an effluent guideline for facilities that have a discharge with similar pollutants and use o/w separators to remove suspended solids, as well as other pollutants. Heavy metals and polycyclic aromatic hydrocarbons are readily absorbed onto particulate matter and the release of these compounds into the environment can be reduced by regulating the amount of suspended solids released. Additionally, an exceedence of the TSS limit is an indicator that maintenance of the o/w separator is necessary.

In making this determination in the current permit, EPA considered the ELGs promulgated at 40 CFR Part 423 for the Steam Electric Power Point Source Category for guidance. Steam electric generating facilities store fuel oil that can create a similar waste stream as CSXT, which involves diesel and fuel oils in stormwater. In developing ELGs for the Steam Electric Point Source Category, EPA identified TSS as a potential pollutant due to the drainage associated with equipment containing fuel oil and/or the leakage associated with the storage of oil (USEPA, 1982). EPA then considered the level of treatment that could be technologically achieved for TSS using an o/w separator and set corresponding limits in the guidelines (See 40 CFR Part 423, "low volume waste sources").

Review of DMR data reveals that the maximum daily TSS limitation of 100.0 mg/L has not been exceeded on any occasion, with a highest recorded TSS concentration of 45 mg/L. Therefore, the draft permit shall continue to require a TSS limit of 100.0 mg/L, with monitoring frequency remaining unchanged as monthly. The TSS grab sample shall be taken at the point of discharge from the last o/w separator of the SWTF, before the Salt Creek Chamber, during normal operating conditions.

f. Surfactants

The current permit requires reporting of daily maximum surfactant concentration on a monthly basis. Review of DMR data reveals that the concentration of surfactant has ranged from 0 – 0.59 mg/L and averaged 0.087 mg/L.

This requirement was established in the current permit based on the historical use of surfactants for cleaning purposes at CSXT. Use of surfactants could impair the ability of the o/w separators to function properly, as the o/w separator may not be able to properly separate the oil phase from the stormwater and waste water phase.

The draft permit shall continue monitoring for daily maximum surfactant concentration on monthly basis. Additionally, the SWPPP shall include a requirement to develop and implement a plan to identify and eliminate the use of surfactants onsite.

g. Priority Pollutants (PPs)

The current permit requires monitoring for priority pollutants at a frequency of twice per year. The waste oil debris that CSXT treats onsite with o/w separators contains certain polycyclic aromatic hydrocarbons (PAHs) and other volatile and semi-volatile compounds. Additionally, this monitoring replaced the semi-annual testing for toxic organic compounds required by the previous permit.

The current permit required a grab sample after discharge from the last o/w separator from the SWTF, before the Salt Creek Chamber, during normal operating conditions twice per year during the second week in the months of April and October. April and October were chosen to coordinate with the other semi-annual monitoring at the facility and the months of April and October are months that the EPA and MassDEP agreed to require toxic sampling events in the Charles River Watershed for administrative purposes, therefore obtaining data during similar time periods. The current permit required CSXT to submit the analytical results for PPs in a report, with the April and October DMRs, and allowed the permittee to request a reduction in sampling of the individual PP's to be sampled, after four consecutive semi-annual sampling rounds indicating non-detect (ND) for PPs.

Results submitted for April 2006 indicated concentrations of 1.4 ug/L ethylbenzene, 5.6 ug/L toluene, and 13 ug/L xylenes. Results submitted for October 2009 indicated chloroform was detected at a concentration of 1.9 ug/L. These results are all lower than the National Recommended Water Quality Criteria for Human Health Consumption. All other PP scan results submitted (April 2007 – Oct 2011) indicate ND for each PP.

Additionally, permit reapplication results, sampled 4/16/2010 – 4/17/2010, indicate concentrations of 152 ug/L and 169 ug/L zinc, 0.013 mg/L cyanide, and 176 ug/L bis(2-ethylhexyl)phthalate.

The National Recommended Water Quality Criteria for freshwater require limits for zinc of 120 ug/L (dissolved) for both acute and chronic (assuming a hardness of 100 mg/L $CaCO_3$). Assuming a hardness of 50 mg/L $CaCO_3$[7] and converting this to total recoverable, the limits are 66.6 ug/L for both acute and chronic.

The National Recommended Water Quality Criteria for cyanide are 22 ug free CN/L acute and 5.2 ug free CN/L chronic. No National Recommended Water Quality Criteria for Aquatic life exist for bis(2-ethylhexyl)phthalate, however the National Recommended Water Quality Criteria for Human Health Consumption is 1.2 ug/L (water + organism) and 2.2 ug/L (organism only).

EPA calculated the dilution factor for the discharge from Outfall 001A to the Charles River. The acute and chronic dilution factor calculations for the discharge through Outfall 001A based on the increased maximum daily flow (315,000 gpd) and the increased average flow (47,000 gpd) respectively, and a 7Q10 value of 18 cfs, are as follows:

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7 NPDES Permit No. MA0040291 for Genzyme Corporation, located directly upstream from CSX Transportation in Allston MA.

$$\text{Dilution Factor} = \frac{\text{River Flow (cfs)(Conv. Factor)} + \text{Plant Flow (MGD)}}{\text{Plant Flow (MGD)}}$$

$$\text{Acute Dilution Factor} = \frac{[(18\ \text{cfs})(0.6464) + 0.315\ \text{MGD}]}{0.315\ \text{MGD}} = 38 : 1$$

$$\text{Chronic Dilution Factor} = \frac{[(18\ \text{cfs})(0.6464) + 0.047\ \text{MGD}]}{0.047\ \text{MGD}} = 248 : 1$$

These dilution factors were used in assessing the need for effluent limitations. The National Recommended Water Quality Criteria for zinc and cyanide, as calculated above, were multiplied by the dilution factors as follows:

Zinc (total recoverable): 66.6 ug/L* 38 = 2530 ug/L (acute limit)
66.6 ug/L * 248 = 16,500 ug/L (chronic limit)

Cyanide: 22 ug free CN/L * 38 = 836 ug free CN/L (acute limit)
5.2 ug free CN/L * 248 = 1290 ug free CN/L (chronic limit)

Therefore, based on the available dilution and the results submitted by the permittee, the discharges from the facility are not expected to exceed water quality based effluent limitations. It should be noted that this method of determining whether the discharge exceeds water quality standards is conservative since more dilution than that provided by the 7Q10 low flow conditions would be expected during a storm event that results in the facility's maximum discharge of treated stormwater.

Therefore, the draft permit shall not require effluent limitations. However, due to detections of ethylbenzene, toluene, xylenes, chloroform , zinc, cyanide, and bis(2-ethylhexyl)phthalate in the discharge through Outfall 001A, the draft permit shall require monitoring, without effluent limitations, on a quarterly basis. These monitoring requirements replace the biannual priority pollutant monitoring required in the current permit.

h. Phosphorus

A Final Phosphorus TMDL exists for the Lower Charles River Basin. The drainage system discharges to the Lower Charles are grouped together into one allocation because there are presently very limited data available to characterize the sources that make up this group. There is no numerical WLA for this facility in the TMDL. However the TMDL provides a % reduction phosphorous goal for the facility's drainage area (other drainage area) of 62% and a % reduction phosphorous goal for the facility's Land Cover/Source Category (Commercial) of 65% as a basis for the waste load allocation. The development and implementation of a Source Identification and Reduction Plan (SIRP), along with other requirements of the SWPPP, aimed at these phosphorous

reductions represent a phosphorous control plan required to achieve the WLA of the TMDL.

Therefore, the draft permit shall require the permittee to monitor the concentration of phosphorus in the discharge through Outfall 001A. The permit shall also require development and implementation of a SIRP to eliminate or reduce the discharge of phosphorus through the facility's stormwater system. The permit requires that in the event the source(s) of phosphorus cannot be eliminated, Best Management Practices (BMPs) shall be developed to significantly reduce or eliminate the phosphorus loading to the receiving water.

i. Escherichia coli (*E. coli*)

State Water Quality Standards require for Class B surface waters that the geometric mean of all *E. coli* samples taken within the most recent six months shall not exceed 126 colonies per 100 ml typically based on a minimum of five samples and no single sample shall exceed 235 colonies per 100 ml. These criteria may be applied on a seasonal basis at the discretion of the Department.

Stormwater runoff is a significant contributor of pathogen pollution. During rain events fecal matter from domestic animals and wildlife are readily transported to surface waters via the stormwater drainage systems and/or overland flow. The natural filtering capacity provided by vegetative cover and soils is dramatically reduced as urbanization occurs because of the increase in impervious areas (i.e., streets, parking lots, etc.) and stream channelization in the watershed.[8]

Recommended TMDL implementation measures include identification and elimination of prohibited sources such as leaky or improperly connected sanitary sewer flows and best management practices to mitigate stormwater runoff volume. Therefore, the permit shall require development and implementation of a Source Identification and Reduction Plan (SIRP) to eliminate or reduce the discharge of bacteria through the facility's stormwater system. The permit requires that in the event the source(s) of bacteria cannot be eliminated, Best Management Practices (BMPs) shall be developed to significantly reduce or eliminate the bacteria loading to the receiving water. Additionally, the draft permit shall require monitoring for *E. coli*, consistent with State Water Quality Standards. The permittee shall sample for *E. coli* on a monthly basis during dry weather and quarterly during wet weather.

2. Stormwater Pollution Prevention Plan (SWPPP)

This facility engages in activities which could result in the discharge of pollutants to waters of the United States either directly or indirectly through stormwater runoff. These operations include at least one of the following in an area potentially exposed to precipitation or stormwater: material storage, in-facility material transfer, material processing, and material handling, or loading and unloading. To control the

8 Final Pathogen TMDL for the Charles River Watershed, January 2007.

activities/operations, which could contribute pollutants to waters of the United States, potentially violating the State's WQS, the draft permit requires the facility to develop, implement, and maintain a Stormwater Pollution Prevention Plan (SWPPP) containing best management practices (BMPs) appropriate for this specific facility. *See* Sections 304(e) and 402(a)(1) of the CWA and 40 CFR §122.44(k).

The goal of the SWPPP is to reduce, or prevent, the discharge of pollutants through the stormwater system. The SWPPP serves to document the selection, design and installation of control measures, including BMPs. Additionally, the SWPPP requirements in the draft permit are intended to provide a systematic approach by which the permittee shall at all times, properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of the permit. The SWPPP shall be prepared in accordance with good engineering practices and identify potential sources of pollutants, which may reasonably be expected to affect the quality of stormwater discharges associated with industrial activity from the facility. The SWPPP, upon implementation, will become a non-numerical effluent limitation or other condition that supports any numerical effluent limitations in the draft permit. Consequently, the SWPPP is equally as enforceable as the numerical limits.

The SWPPP development process involves the following four main steps:

(1) Form a team of qualified facility personnel who will be responsible for developing and updating the SWPPP and assisting the plant manager in its implementation;
(2) Assess the potential stormwater pollution sources;
(3) Select and implement appropriate management practices and controls for these potential pollution sources;
(4) Periodically reevaluate the effectiveness of the SWPPP in preventing stormwater contamination and in complying with the terms and conditions of the draft permit;

Structural best management practices in place at CSXT Beacon Park Yard include: oil absorbent track-matting used in track areas where locomotives are stationed, two o/w separators to treat stormwater prior to discharge, and use of regularly maintained absorbent booms at both outfalls. Non-structural best management practices include: regular inspections, good housekeeping practices, material handling practices designed to minimize the exposure of significant materials to stormwater, maintenance of outfall structures and drainage channels, and training of facility employees.

CSXT is required to review and amend its StormWater Pollution Prevention Plan within 90 days after the effective date of this permit. The SWPPP shall include the best management practices (BMPs) appropriate for this specific facility to control wastewater and stormwater discharges from activities that could contribute pollutants to waters of the United States.

Additionally, the draft permit requires development and implementation of the following site-specific BMPs, at a minimum:

a. Perform regular inspections and maintenance of the booms at Outfalls 001 and 002, at a minimum frequency of 1/month, to ensure any accumulated oil, scum, debris, or trash collected around the booms is regularly removed and disposed of properly.
b. Perform regular inspections and maintenance of the absorbent track-matting, at a minimum frequency of 1/month.
c. Perform regular inspections and maintenance of the treatment systems (both the WWTF and the SWTF), at a minimum frequency of 1/month, to ensure that all treatment units are properly functioning.
d. Ensure no discharge of floating solids, visible foam, debris, or oil sheen occurs from Outfalls 001 and 002.
e. To the extent practicable, the permittee shall protect all raw materials with weather-resistant covers to minimize exposure to stormwater. Raw materials stored outside that have the potential to contribute pollutants to the stormwater runoff include scrap metal piles and new railroad ties.
f. Develop and implement a Source Identification and Reduction Plan (SIRP) to identify and eliminate the use of surfactants onsite. If elimination of surfactants is not practicable, the permittee shall provide documentation citing the reasons elimination is infeasible and develop and implement a plan to minimize the use of surfactants onsite, to the maximum extent practicable.
g. Develop and implement a Source Identification and Reduction Plan (SIRP) to eliminate or reduce the discharge of bacteria through the facility's stormwater system. In the event the source(s) of bacteria cannot be eliminated, Best Management Practices (BMPs) shall be developed to significantly reduce or eliminate the bacteria loading to the receiving water.
h. Develop and implement a Source Identification and Reduction Plan (SIRP) to eliminate or reduce the discharge of phosphorus through the facility's stormwater system. In the event the source(s) of phosphorus cannot be eliminated, Best Management Practices (BMPs) shall be developed to significantly reduce or eliminate the phosphorus loading to the receiving water.
i. Provide annual certification to EPA and MassDEP that the site does not discharge stormwater associated with industrial activity to the drainage line which discharges through Outfall 002.
j. Address any other potential sources of pollutants in the rail yard through site-specific BMPs. Specific activities occurring within the facility drainage area that have a potential to introduce pollutants to the stormwater include the following:
    i. Fueling [Above Ground Storage Tanks (ASTs) and fueling fill ports are located within secondary containment. Vehicle fueling areas are located within secondary containment. Locomotive fueling, using #2 diesel fuel, is done on fuel spill containment pans that discharge to the WWTF for treatment.]
    ii. Hazardous Waste Storage (waste oil and hazardous waste shall be stored in designated hazardous waste storage containers)
    iii. Sodium Hydroxide Storage (NaOH shall be stored in an above ground storage tank with secondary containment);

iv. New and/or used materials (materials shall be stored on pallets, concrete pads, under cover, or in staging areas to minimize exposure to stormwater)
v. Petroleum product storage (shall be stored in above ground storage tanks with secondary containment)
vi. Storage and unloading of solid waste (dumpsters at the facility shall be closed top and/or covered to prevent contact with stormwater)
vii. Transformers (both active and inactive transformers shall be inspected periodically as a preventative maintenance measure)
viii. Vehicle and equipment maintenance (stormwater from the Car Shop, where vehicle and equipment maintenance is conducted, shall be directed to the WWTF). Various track maintenance materials stored at the facility shall be kept in secondary containment.
ix. Locomotive Maintenance shall be done on spill pans, to the extent practicable.

The draft permit continues to ensure that the SWPPP is kept current and adhered to, by requiring CSXT to maintain and update the SWPPP as changes occur at the facility. In addition, the draft permit requires the CSXT to provide an annual report that certifies to EPA and the MassDEP that the previous year's inspections and maintenance activities were conducted, results recorded, records maintained, and that the facility is in compliance with its SWPPP. A signed copy of the report with the proper certification will be sent each year to EPA and MassDEP within thirty (30) days of the annual anniversary of the effective date of the draft permit. This report with the proper certification shall be signed in accordance with the requirements identified in 40 C.F.R. §122.22. A copy of the most recent SWPPP shall be kept at the facility and be available for inspection by EPA and MassDEP.

V. ENDANGERED SPECIES ACT

Section 7(a) of the Endangered Species Act of 1973, as amended (ESA) grants authority to and imposes requirements upon Federal agencies regarding endangered or threatened species of fish, wildlife, or plants ("listed species") and habitat of such species that has been designated as critical (a "critical habitat"). The ESA requires every Federal agency, in consultation with and with the assistance of the Secretary of Interior, to insure that any action it authorizes, funds, or carries out, in the United States or upon the high seas, is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. The United States Fish and Wildlife Service (USFWS) typically administer Section 7 consultations for bird, terrestrial, and freshwater aquatic species. The National Marine Fisheries Service (NMFS) administers Section 7 consultations for marine species and anadromous fish. The federal action being considered in this case is EPA's proposed draft NPDES permit for the CSX Transportation Facility. The draft permit is intended to replace the existing NPDES permit in governing the discharge from this facility.

As the federal agency charged with authorizing the discharge from this facility, EPA has conducted a review in support of our consultation responsibilities under section 7 (a)(2)

of the Endangered Species Act (ESA) for potential impacts to federally listed species. The facility discharges to the Charles River Basin in Allston, MA, which is located in Suffolk County. Based on the information available, it is EPA's understanding that federally listed species have not been identified as occurring in the Charles River or Boston Harbor. It is highly unlikely that any protected species would be present in the vicinity of this discharge or in any area influenced by the discharge. In addition, the effluent limitations and conditions which are in place in the draft permit should preclude any adverse effects should there be any incidental contact with listed species. No Section 7 consultation is required.

VI. ESSENTIAL FISH HABITAT

Under the 1996 Amendments (PL 104-267) to the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. §1801 et seq. (1998)), EPA is required to consult with the National Fisheries Services (NOAA Fisheries) if EPA's action or proposed action that it funds, permits, or undertakes, may adversely impact any essential fish habitat (EFH). The Amendments broadly define essential fish habitat as: waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (16 U.S.C. §1802 (10)). Adversely impact means any impact which reduces the quality and/or quantity of EFH (50 C.F.R. §600.910(a)). Adverse effects may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey, reduction in species fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

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.
The federal action being considered in this case is EPA's proposed draft NPDES permit for the CSX Transportation Facility. The draft permit is intended to replace the existing NPDES permit in governing the discharge from this facility.

A summary of EFH designations identified in a 10' x10' latitude and longitude square coordinate that is associated with the Charles River was consulted. This area, which is made up of Massachusetts Bay and Boston Harbor, contains a list of 23 EFH species and identifies the applicable lifestage(s). The list was taken from "Guide to Essential Fish Habitat Designations in the Northeastern United States, Volume II: Massachusetts and Rhode Island", published by NOAA Fisheries in March of 1999. The list is identified as Attachment F.

A review of the 23 species revealed that the life stages of concern are present in the seawater salinity zone (salinity > 25.0 parts per thousand) or the mixing water /brackish salinity zone (0.5 < salinity < 25.0 parts per thousand) only. No life stage is identified as inhabiting the tidal freshwater salinity zone. The freshwater of the Charles River does not experience appreciable mixing with the saline Boston Harbor water, due to the location of New Charles River Dam and Locks at the mouth of the river. This dam highly regulates

the river level and flow of the Charles River, resulting in the river possessing the characteristics of the freshwater salinity zone.

In addition, during four years of adult and juvenile fish sampling as well as extensive ichthyoplankton collection in the Charles River (1999, 2000, 2002 and 2003), conducted by Kendall Power Station, which also discharges into the Charles River, none of the 23 species listed in Attachment F have been collected.

Based on the freshwater characteristic of the river and the absence of any of the species listed in Attachment F, EPA has determined that the operation of the CSX Transportation Facility does not have a direct adverse effect on the EFH species of concern.

However, EPA recognizes that discharge from the CSX Facility has the potential to indirectly cause adverse effects to EFH species in Boston Harbor or Massachusetts Bay. Anadromous species that enter the Charles River and move upstream may come in contact with the discharge plume from the facility and could conceivably, under certain conditions, be affected by the discharge. These species, (blueback herring and alewife), while not identified as EFH species, may be selected as prey by EFH species. If these prey species are affected by discharges from the facility, this has the potential to indirectly affect EFH species through loss of prey.

Based on the available information, EPA has determined that the discharge from the facility, as restricted by the draft permit conditions, will not directly or indirectly cause adverse effects to EFH species. This is because the draft permit contains technology-based pollutant limits that either meet or are below the concentration for water quality standards of the Class B receiving waters of the Charles River.

EPA has concluded that the limits and conditions contained in this draft permit minimize indirect adverse effects to EFH species for the following reasons:

- This is a reissuance of an existing permit;
- The dilution factor (38:1) is relatively high;
- The Charles River is approximately 700 feet wide in the vicinity of the discharge, providing a large zone of passage for migrating EFH prey species that is unaffected by the discharge;
- The facility withdraws no water from the Charles River, so no life stages of EFH prey species are vulnerable to impingement or entrainment from this facility;
- The draft permit prohibits the discharge of pollutants or combination of pollutants in toxic amounts;

- The effluent limitations and conditions in the draft permit were developed to be protective of all aquatic life;

- The draft permit prohibits violations of the state water quality standards.

EPA believes that the draft permit limits adequately protect EFH species from indirect adverse effects to EFH species, and therefore additional mitigation is not warranted. If adverse impacts to EFH are detected as a result of this permit action, or if new information is received that changes the basis for our conclusion, NOAA Fisheries will be notified and an EFH consultation will be initiated.

VII. MONITORING AND REPORTING

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.

EPA currently conducts free training on the use of NetDMR, and anticipates that the availability of this training will continue to assist permittees with the transition to use of NetDMR. To participate in upcoming trainings, visit http://www.epa.gov/netdmr for contact information for Massachusetts.

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" request process. Permittees who believe they cannot 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 sixty (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. Hard copies of DMRs must be postmarked no later than the 15th day of the month following the completed reporting period.

VIII. STATE CERTIFICATION REQUIREMENTS

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

IX. ADMINISTRATIVE RECORD, PUBLIC COMMENT PERIOD, HEARING REQUESTS, AND PROCEDURES FOR FINAL DECISION

All persons, including applicants, who believe any condition of the draft permit is inappropriate must raise all issues and submit all available arguments and all supporting material for their arguments in full by the close of the public comment period, to Nicole Aquillano, U.S. EPA, Office of Ecosystem Protection**,** Industrial Permits Branch, 5 Post Office Square, Suite 100 (OEP06-4), Boston, Massachusetts 02109-3912. Any person, prior to such date, may submit a request in writing for a public hearing to consider the draft permit to EPA and the State Agency. Such requests shall state the nature of the issues proposed to be raised in the hearing. A public meeting may be held if the criteria stated in 40 C.F.R. §124.12 are satisfied. In reaching a decision on the final permit, the EPA will respond to all significant comments and make these responses available to the public on EPA's website and at EPA's Boston office.

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

X. EPA & MassDEP CONTACTS

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

Nicole Aquillano, EPA New England – Region 1
5 Post Office Square, Suite 100 (OEP06-4)
Boston, Massachusetts 02109-3912
Telephone: (617) 918-1746 FAX: (617) 918-0746
email: aquillano.nicole@epa.gov

Cathy Vakalopoulos, Massachusetts Department of Environmental Protection
Division of Watershed Management, Surface Water Discharge Permit Program
One Winter Street
Boston, MA 02108
Telephone: (617) 348-4026 FAX: (617) 292-5696
email: catherine.vakalopoulos@state.ma.us

January 2013

_____
Date

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

XI. ATTACHMENTS

A. Topographic Map

B. Locus Map

C. Site Drainage Map

D. Flow Diagram

E. DMR Data Summary

F. Summary of Essential Fish Habitat (EFH) Designation

Attachment A – Topographic Map

CSX Transportation – Beacon Park Yard (MA0025704)

CSX
PUBLIC SAFETY & ENVIRONMENT

Permit Application
Topographic Map (Form 1.XI)
BEACON PARK YARD
ALLSTON
MASSACHUSETTS
PERMIT NO MA0025704

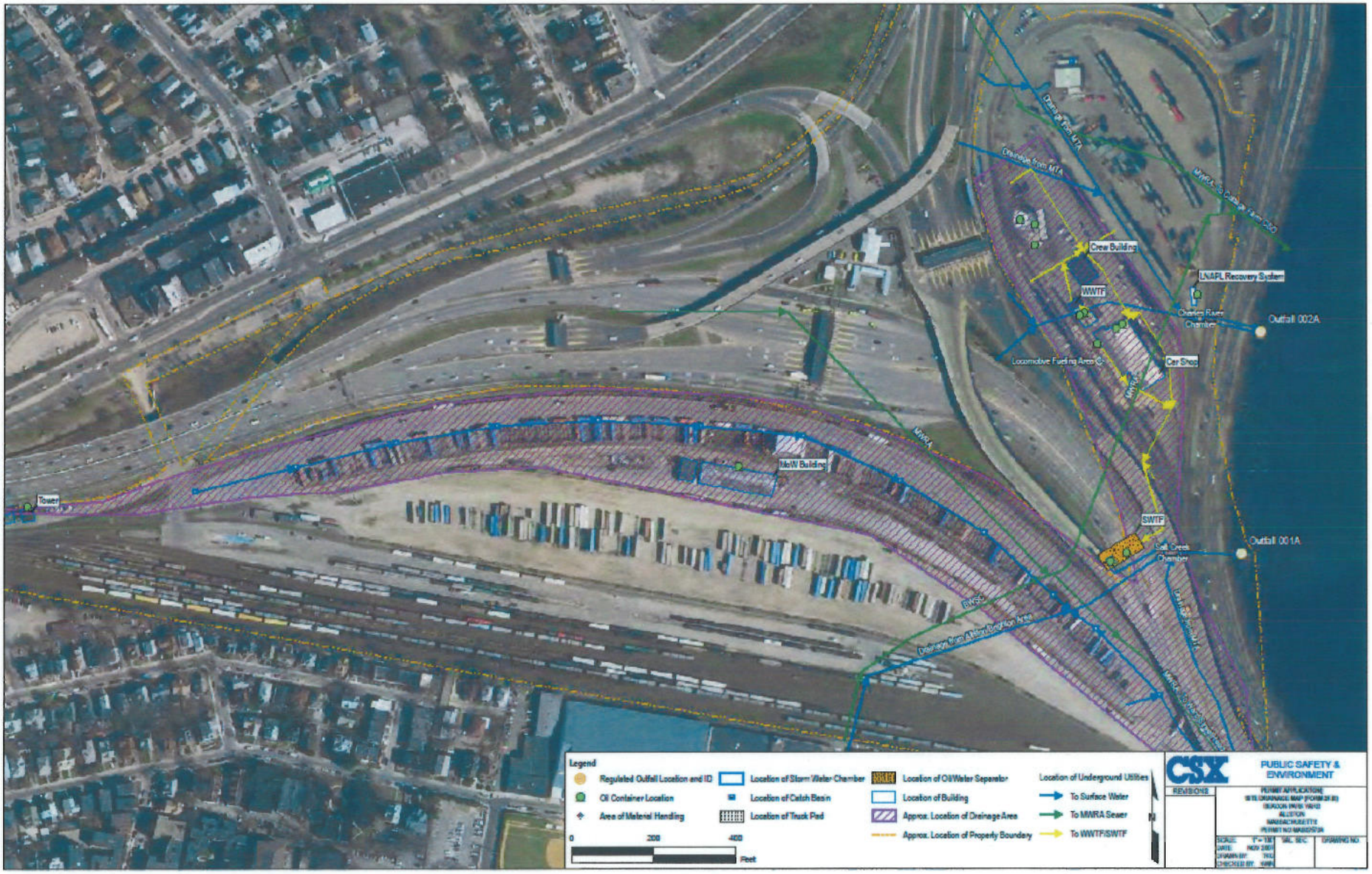
Map Source: ESRI ArcGIS Online and data partners including USGS and © 2007 National Geographic Society
Well Data: Massachusetts Office of Geographic and Environmental Information (MassGIS)

Attachment B – Locus Map

CSX Transportation – Beacon Park Yard (MA0025704)

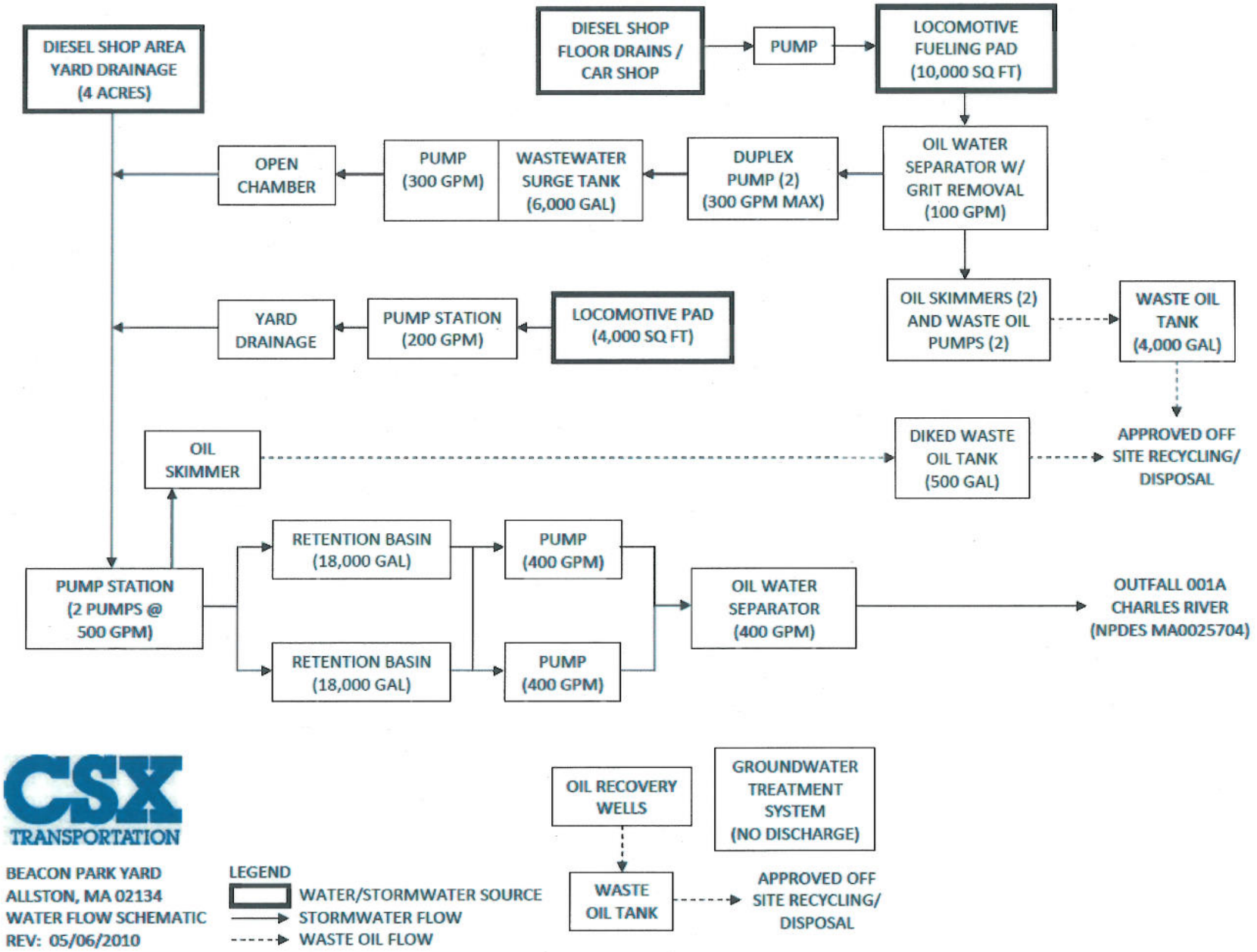
Attachment C – Site Drainage Map

CSX Transportation – Beacon Park Yard (MA0025704)



Attachment D – Flow Diagram

CSX Transportation – Beacon Park Yard (MA0025704)



Attachment E - DMR Data Summary

CSX Transportation - Beacon Park Yard (MA0025704)

Outfall 001	Benzene	Flow		Flowrate		O&G	pH		TSS	Surfactants
	51 ug/L	Req. Mon. Mgal/d	Req. Mon. Mgal/d	21500 gal/d	225000 gal/d	15 mg/L	6.5 SU	8.3 SU	100 mg/L	Req. Mon. mg/L
MP Date	DAILY MX	MO AVG	DAILY MX	MO AVG	DAILY MX	DAILY MX	MINIMUM	MAXIMUM	DAILY MX	DAILY MX
04/30/2006	0	.0105	.053	10500.	53000.	0	7.05	7.19	11.	.23
05/31/2006	0	.0251	.1667	25147.	166746.	0	6.56	6.78	5.	0
06/30/2006	0	.0252	.1574	25209.	157431.	7.6	6.81	7.33	11.	0
07/31/2006	0	.0108	.0522	10800.	52233.	0	6.72	7.3	7.	.24
08/31/2006	0	.007	.0165	6978.	16462.	0	6.36	6.86	5.	.24
09/30/2006	0	.0054	.0117	5358.	11679.	0	6.46	6.62	0	.3
10/31/2006	0	.0128	.0886	12819.	88595.	0	6.61	6.72	6.	0
11/30/2006	0	.0273	.123	27342.	122962.	0	6.72	7.05	5.	0
12/31/2006	0	.021	.0418	21009.	41781.	0	6.67	7.1	5.	.086
01/31/2007	0	.0111	.0229	11086.	22985.	0	6.42	6.64	18.	0
02/28/2007	0	.0058	.0137	5831.	13660.	0	6.62	7.2	16.	.26
03/31/2007	0	.0163	.0953	16284.	95277.	5.3	6.49	6.78	12.	0
04/30/2007	0	.0173	.1428	17289.	142765.	13.	6.45	7.27	22.	.2
05/31/2007	0	.0118	.047	11757.	47040.	0	6.35	7.82	0	0
06/30/2007	0	.0121	.063	12130.	63044.	0	6.35	7.85	7.	0
07/31/2007	0	.0103	.0621	10305.	62104.	0	6.5	7.1	0	.24
08/31/2007	0	.0036	.0075	3605.	7531.	0	6.4	7.1	7.5	0
09/30/2007	0	.0141	.0427	14123.	42681.	6.5	7.7	7.7	27.	.59
10/31/2007	0	.0107	.0357	10689.	35676.	0	6.47	7.5	7.5	0
11/30/2007	0	.009	.0247	8986.	24697.	0	6.53	6.7	5.5	0
12/31/2007	0	0.0143	0.049	14265	48961	0	6.4	7.7	12.	0
01/31/2008	0	.0095	.0379	9507.	37927.	2.1	6.4	6.8	0	0
02/29/2008	0	.0218	.0842	21776.	84174.	10.	6.6	7.4	23.	0
03/31/2008	0	0.0187	0.0939	18675	93902	0	6.6	6.6	13.	0
04/30/2008	0	0.0193	0.0577	19254	57658	0	6.6	7.2	7.5	0
05/31/2008	0	0.0226	0.0696	22645	69551	0	6.78	7.1	6.5	0
06/30/2008	0	0.0154	0.0578	15445	57789	0	6.2	7.2	8.5	0
07/31/2008	0	0.0289	0.1688	28944	168787	14	6.1	7.4	11.	0.22
08/31/2008	0	0.0212	0.1003	21248	100315	0	6.	6.	6.5	0
09/30/2008	0	0.0315	0.132	31472	132045	5.1	6.1	6.8	5.	0.22
10/31/2008	0	.024	.0455	21112.	45469.	0	6.2	6.2	13.	0
11/30/2008	0	0.0199	0.0976	19850	97628	0	6.5	7.7	.	0
12/31/2008	0	.0143	.049	14265.	48961.	0	6.4	7.7	12.	0
01/31/2009	0	.0104	.0353	10412.	35312.	0	6.3	6.5	7.5	0
02/28/2009	0	.0196	.1139	19602.	113910.	0	6.35	6.5	5.	0
03/31/2009	0	.0108	.0188	10808.	18811.	0	6.3	6.5	5.5	0
04/30/2009	0	.0245	.058	24471.	57995.	0	6.4	6.7	9.	.24
05/31/2009	0	.0174	.0258	17376.	25787.	0	7.4	7.4	44.	0
06/30/2009	0	.0191	.0297	19107.	29732.	1.4	6.2	7.8	10.	.1
07/31/2009	0	.0363	.1146	36270.	114605.	0	6.	7.8	5.	.2
08/31/2009	0	.0202	.0596	20245.	59641.	0	6.	6.5	36.	0
09/30/2009	0	.0271	.0812	5511.	81247.	0	6.3	7.5	12.	0
10/31/2009	0	.0177	.0509	17706.	50938.	0	5.8	6.37	0	0
11/30/2009	0	.0187	.1502	18652.	150165.	0	5.51	5.6	5.5	0
12/31/2009	0	.0185	.072	18541.	72000.	0	5.53	6.8	10.	0
01/31/2010	0	.0014	.02	7412.	20000.	0	6.5	6.8	8.	0
02/28/2010	0	.0169	.0726	16864.	72606.	0	6.6	7.	7.	0
03/31/2010	0	.0469	.3149	46908.	314920.	0	6.5	6.7	13.	0
04/30/2010	0	.0082	.0271	8212.	27139.	0	6.6	6.8	10.	0
05/31/2010	0	.0095	.0469	9468.	46909.	0	6.6	6.7	0	0
06/30/2010	0	.0082	.0442	8162.	44174.	0	6.6	6.6	13.	.21
07/31/2010	B	.0111	.0891	11081.	89080.	B	6.5	6.4	45.	B
08/31/2010	1.	.030169	.127583	30169.	127583.	5.	6.5	7.8	20.	.23
09/30/2010	B	.0232	.0352	23236.	35181.	B	6.5	7.	14.	.21
10/31/2010	B	9375.	9375.	9375.	9375.	B	6.3	9.	7.5	B
11/30/2010	B	.015873	.037004	15873.	37004.	B	6.4	6.71	17.	B
12/31/2010	B	.014277	.038051	14277.	38051.	9.3	6.56	7.1	8.	B
01/31/2011	B	.01396	.02517	13960.	25170.	B	6.4	6.7	16.	5 (NODI)
02/28/2011	B	.009082	.071784	9082.	71784.	B	6.2	7.	18.	B
03/31/2011	B	.006136	.029879	6136.	29879.	B	6.2	8.	14.	B
04/30/2011	B	.011499	.039635	11499.	39635.	B	6.3	7.4	14.	B
05/31/2011	B	.009295	.063498	9295.	63498.	B	6.4	8.6	13.	B
06/30/2011	B	.010501	.038914	10501.	38914.	B	6.5	8.3	17.	.23
07/31/2011	B	.002983	.026753	2983.	26753.	B	6.4	7.6	14.	B
08/31/2011	B	.018504	.078659	18504.	78659.	B	6.2	9.2	12.	B
09/30/2011	1	.010181	.072199	10181.	72199.	4.7	6.3	8.8	8.	.2
10/31/2011	B	.013626	.059223	13626.	59223.	B	6.4	9.	5.5	B
11/30/2011	1	.008186	.058745	8186.	58745.	5.4	6.6	8.1	10.	.4
12/31/2011	B	.011876	.114318	11876.	114318.	B	6.6	7.2	B	B
min	.	.0014	.0075	2983.	7531.	.	5.51	5.6	.	.
max	1.	9375.	9375.	46908.	314920.	14.	7.7	9.2	45.	.59
average	0.056	135.885	135.937	15525.681	67571.855	1.625	6.433	7.201	11.015	0.087
exceedences				12	1	0	39	5	0	0

B = invalid NODI (No Data Indicator Code)

5(NODI) = No Data Indicator Code 5 "Frozen Conditions"

Attachment F – Summary of Essential Fish Habitat (EFH) Designation

CSX Transportation – Beacon Park Yard (MA0025704)

10□ x 10□ Square Coordinates:

Boundary	North	East	South	West
Coordinate	42° 30.0□ N	71° 00.0□ W	42° 20.0□ N	71° 10.0□ W

Square Description (i.e. habitat, landmarks, coastline markers): Waters within the Atlantic Ocean within the square within Massachusetts Bay and within Boston Harbor affecting the following: South Boston, MA., Boston, MA., Chelsea River, Mystic River, Charles River, East Boston, MA., Chelsea, MA., Orient Heights, and most of Logan Airport.

Species	Eggs	Larvae	Juveniles	Adults
Atlantic cod *(Gadus morhua)*	X	X	X	X
haddock *(Melanogrammus aeglefinus)*	X	X		
pollock *(Pollachius virens)*	X	X	X	X
whiting *(Merluccius bilinearis)*	X	X	X	X
offshore hake *(Merluccius albidus)*				
red hake *(Urophycis chuss)*	X	X	X	X
white hake *(Urophycis tenuis)*	X	X	X	X
redfish *(Sebastes fasciatus)*	n/a			
witch flounder *(Glyptocephalus cynoglossus)*				
winter flounder *(Pseudopleuronectes americanus)*	X	X	X	X
yellowtail flounder *(Limanda ferruginea)*	X	X	X	X
windowpane flounder *(Scophthalmus aquosus)*	X	X	X	X
American plaice *(Hippoglossoides platessoides)*	X	X	X	X
ocean pout *(Macrozoarces americanus)*	X	X	X	X
Atlantic halibut *(Hippoglossus hippoglossus)*	X	X	X	X
Atlantic sea scallop *(Placopecten magellanicus)*	X	X	X	X
Atlantic sea herring *(Clupea harengus)*		X	X	X
monkfish *(Lophius americanus)*				
bluefish *(Pomatomus saltatrix)*				
long finned squid *(Loligo pealeii)*	n/a	n/a	X	X

short finned squid *(Illex illecebrosus)*	n/a	n/a	X	X
Atlantic butterfish *(Peprilus triacanthus)*	X	X	X	X
Atlantic mackerel *(Scomber scombrus)*	X	X	X	X
summer flounder *(Paralichthys dentatus)*				X
scup *(Stenotomus chrysops)*	n/a	n/a	X	X
black sea bass *(Centropristis striata)*	n/a		X	X
surf clam *(Spisula solidissima)*	n/a	n/a	X	X
ocean quahog *(Artica islandica)*	n/a	n/a		
spiny dogfish *(Squalus acanthias)*	n/a	n/a		
tilefish *(Lopholatilus chamaeleonticeps)*				
bluefin tuna *(Thunnus thynnus)*			X	X

Response to Comments on Draft National Pollutant Discharge Elimination System (NPDES) Permit No. MA0025704 – CSX Transportation, Inc., Beacon Park Yard

Introduction:

In accordance with the provisions of 40 C.F.R. §124.17, this document presents EPA's responses to comments received on the Draft NPDES Permit (MA0025704). The responses to comments explain and support the EPA determinations that form the basis of the Final Permit. The CSX Transportation, Beacon Park Yard, Draft Permit public comment period began May 29, 2013 and ended on June 27, 2013. Comments on the draft permit were received from CSX Transportation.

The Final Permit is almost identical to the Draft Permit that was available for public comment. Although EPA's knowledge of the facility has benefited from the comments, the information and arguments presented do not raise any substantial new questions concerning the permit. EPA did, however, make certain changes and clarifications in response to updated information relating to the CSX Transportation Beacon Yard site and identification of an error in a mailing address. These changes are listed below.

Changes to Permit:

1. The requirement at Part I.C.9.c of the draft permit has been revised by extending some of the deliverable dates by six months. The new schedules takes into account the ongoing process of transferring the transportation easement from CSX Transportation to the owner of the property, which is expected to be the new operator of the site. Part I.C.9.c now reads "Within one year of the effective date of the permit, the permittee shall complete the estimation of the average annual phosphorus load to the permitted outfall using the provided export rates as provided in Attachment 1, Method to Calculate Baseline Watershed Phosphorus Load. Within 1.5 years of the effective date of the permit, the permittee shall complete the PCP. Within 2.5 years of the effective date of the permit, the permittee shall complete implementation of the identified non-structural practices. Within 3.5 years of the effective date of the permit, the permittee shall complete construction, installation and inspection of the structural practices. Within 4.5 years of the effective date of the permit, the permittee shall begin certification of annual inspection and O&M."

2. On page 12, MassDEP's address for sending opt out requests has been changed to:

Massachusetts Department of Environmental Protection
Surface Water Discharge Permit Program
1 Winter St., 5th Floor
Boston, Massachusetts 02108

Comments from CSX Transportation:

Comment 1:
The permit now requires CSX Transportation to develop a Phosphorus Control Plan implementing controls to achieve a 62% reduction in phosphorus discharge. CSX Transportation disagrees with this requirement for two (2) reasons. First, in the original application, CSX Transportation made no reference to the use of phosphorus or phosphate containing chemicals and none were identified during the site visit in 2012. Second, CSX Transportation has recently reviewed and investigated the chemicals used at the shop in the yard and there are no chemicals used containing phosphorus or phosphates.

Response to Comment 1:
EPA appreciates the knowledge that phosphorus containing chemicals have not been or are not currently used at the site. However, phosphorus is prevalent in the developed environment and is included in sources such as dust and dirt, organic debris such as pollen and leaf litter, vehicle emissions especially from diesel engines and from both dry and wet weather atmospheric deposition. These sources may be deposited directly on the site or may be carried on from adjacent land areas by wind and traffic. Such sources result in the accumulation of phosphorus on land surfaces where it then becomes available for wash-off during precipitation events as part of stormwater runoff. This is especially true for impervious surfaces that offer little capacity to capture phosphorus through storage or filtering. Consequently, phosphorus from these common sources that are ubiquitous in the built-up environment result in phosphorus loads being discharged from the impervious surfaces at the CSX Transportation site. Therefore, the Phosphorus Control Plan requirements remain unchanged in the Final Permit.

Attachment 1: ***Method to Calculate Baseline Watershed Phosphorus Load***

(NPDES Permit No. MA0025704 – CSX Transportation, Inc., Beacon Park Yard)

The methods and annual phosphorus export load rates presented in Attachments 1, 2 and 3 to the Final Permit are for the purpose of calculating load reductions for various stormwater BMPs treating runoff from different site conditions (i.e. impervious or pervious) and land uses (e.g. commercial, industrial). The estimates of annual phosphorus load and load reductions resulting from BMP implementation are intended for use by the permittee to measure compliance with its Phosphorus Reduction Requirement under the permit.

This attachment provides the method to calculate a baseline phosphorus load discharging in stormwater for the drainage area of the permitted outfall. This method shall be used to calculate the following annual phosphorus loads:

1) Watershed Phosphorus Load;
2) Watershed Phosphorus Pounds Reduction (Phosphorus Reduction Requirement); and
3) BMP Load.

The **Watershed Phosphorus Load** is a measure of the annual phosphorus load discharging in stormwater from the impervious and pervious areas of the contributing drainage area to the permitted outfall.

The **Watershed Phosphorus Pounds Reduction** referred to as the permittee's **Phosphorus Reduction Requirement** represents the required reduction in annual phosphorus load in stormwater to meet the WLA for the impaired watershed. The percent phosphorus reduction for the contributing drainage area to the permitted outfall is 62 % and is applied to the Watershed Phosphorus Load to calculate the Phosphorus Pounds Reduction.

The **BMP Load** is the annual phosphorus load from the drainage area to each proposed or existing BMP used by permittee to claim credit against its Phosphorus Reduction Requirement. The BMP Load is the starting point from which the permittee calculates the reduction in phosphorus load achieved by each existing and proposed BMP. Attachments 2 and 3 to the Permit provide the methods for calculating annual phosphorus load reductions for enhanced non-structural BMPs and structural BMPs, respectively.

Examples are provided to illustrate use of the methods. Table 1-1, below, provides annual phosphorus load export rates for commercial and industrial land use categories, for both impervious and pervious areas. For pervious areas, if the hydrologic soil group (HSG) is known, use the appropriate value. If the HSG is not known, assume HSG D conditions for the phosphorus load export rate.

Table 1-1. Annual phosphorus load export rates

Phosphorus Source Category by Land Use	Land Surface Cover	Phosphorus Load Export Rate, lbs/ac/yr	Phosphorus Load Export Rate, kg/ha/yr
Commercial (Com) and Industrial (Ind)	Impervious	1.8	2.0
	Pervious	See *DevPERV	See *DevPERV
*Developed Land Pervious (DevPERV)- HSG A/B	Pervious	0.2	0.2
*Developed Land Pervious (DevPERV) – HSG C	Pervious	0.4	0.5
*Developed Land Pervious (DevPERV) - HSG D	Pervious	0.7	0.8

Notes:

- For pervious areas, if the hydrologic soil group (HSG) is known, use the appropriate value from this table. If the HSG is not known, assume HSG D conditions for the phosphorus load export rate.

(1) Watershed Phosphorus Load: The permittee shall calculate the **Watershed Phosphorus Load** by the following procedure:

1) Determine the total area (acre) associated with the permitted discharge;

2) Sort the total area associated with the watershed into two categories: total impervious area (IA) and total pervious area (PA);

3) Calculate the annual phosphorus load associated with impervious area (Watershed P Load $_{IA}$) and the pervious area (Watershed P Load $_{PA}$) by multiplying the IA and PA by the appropriate land use-based phosphorus load export rate provided in Table 1-1; and

4) Determine the Watershed Phosphorus Load by adding the Watershed Site P Load $_{IA}$ to the Watershed Site P Load $_{PA}$.

Example 1-1 to determine Watershed Phosphorus Load:
Watershed A is 15.11 acres, with 11.0 acres of industrial impervious area (e.g. access drives, buildings, and parking lots), 3.0 acres of industrial pervious area (HSG unknown), and 4.0 acres of industrial pervious area (HSG C).

The **Watershed Phosphorus Load** = (Watershed Load $_{IA}$) + (Watershed Load $_{PA}$)

Where:
Watershed P Load $_{IA}$ = ($IA_{INDUSTRIAL}$) x (impervious cover phosphorus export loading rate for industrial use (Table 1-1))
= 11.0 acre x 1.8 lbs/acre/year
= 19.8 lbs P/year

Watershed P Load $_{PA}$ = ($PA_{INDUSTRIAL}$) x (pervious cover phosphorus export loading rate for HSG D (Table 1-1))
+ ($PA_{INDUSTRIAL}$) x (pervious cover phosphorus export loading rate for HSG C (Table 1-1))
= 3.0 acre x 0.7 lbs/acre/year + 4.0 acre x 0.4 lbs/acre/year
= 3.7 lbs P/year

The Baseline Watershed Phosphorus Load = 19.8 lbs P/year + 3.7 lbs P/year
= **23.5 lbs P/year**

(2) Watershed Phosphorus Pounds Reduction (Phosphorus Reduction Requirement): The Watershed Phosphorus Reduction requirement is the amount of reduction in annual phosphorus load (in pounds) that the permittee is required to achieve in the contributing drainage area. The permittee shall calculate the **Phosphorus Pounds Reduction** by multiplying the **Watershed Phosphorus Load** by 62 percent.

Example 1-2 to determine Watershed Phosphorus Pounds Reduction:
As identified above, Watershed A's percent phosphorus reduction is 62%; therefore the Watershed Phosphorus Pounds Reduction is:

Phosphorus Pounds Reduction = (Watershed Phosphorus Load) x (0.62)
= (23.5 lbs P/year) x (0.62)
= **14.6 lbs P/year**

(3) BMP Load: To estimate the annual phosphorus load reduction that a storm water BMP can achieve, it is first necessary to estimate the amount of annual phosphorus load that the BMP will receive or treat (BMP Load).
For a given BMP:

1) Determine the total drainage area to the BMP;

2) Distribute the total drainage area into impervious and pervious subareas by land use category;

3) Calculate the phosphorus load for each land use-based impervious and pervious subarea by multiplying the subarea by the appropriate phosphorus load export rate provided in Table 1-1; and

4) Determine the total annual phosphorus load to the BMP by summing the calculated impervious and pervious subarea phosphorus loads.

Example 1-3 to determine phosphorus load to a proposed BMP: For the same 15.11 acre Watershed A as specified in Example 1-1, a permittee is proposing a storm water infiltration system that will treat runoff from 8.23 impervious acres, 1.51 acres of pervious area of an unknown hydrologic soil group (HSG) and 0.57 acres of the pervious area of HSG C. The drainage area information for the proposed BMP is:

BMP Subarea ID	Land Use Category	Cover Type	Area (acre)	P export rate (lbs P/acre/year)*
1	industrial	impervious	8.23	1.8
2	industrial	Pervious (HSG D)	1.51	0.7
3	industrial	Pervious (HSG C)	0.57	0.4

*From Table 1-1

The phosphorus load to the proposed BMP (BMP Load) is calculated as:

BMP Load = ($IA_{INDUSTRIAL}$ (acre) x P export rate) + (PA_{MDR} x P export rate) + (PA_{FOREST} x P export rate)
= (8.23 x 1.8) + (1.51 x 0.7) + (0.57 x 0.4)
= 16.1 lbs P/year

Attachment 2: ***Phosphorus Reduction Credits for Selected Enhanced Non-Structural BMPs in the Watershed***

(NPDES Permit No. MA0025704 – CSX Transportation, Inc., Beacon Park Yard)

The permittee shall use the following methods to calculate phosphorus load reduction credits for the following enhanced non-structural control practices implemented in the Watershed:

1) Enhanced Sweeping Program;
2) Catch Basin Cleaning.

The methods include the use of default phosphorus reduction factors that EPA has determined are acceptable for calculating phosphorus load reduction credits for these practices.

The methods and annual phosphorus export load rates presented in this attachment are for the purpose of counting load reductions for various BMPs treating storm water runoff from varying site conditions (i.e., impervious or pervious surfaces) and different land uses (e.g. industrial and commercial) within the impaired watershed. Table 2-1 below provides annual phosphorus load export rates by land use category for impervious and pervious areas. The estimates of annual phosphorus load and load reductions resulting from BMP implementation are intended for use by the permittee to measure compliance with its Phosphorus Reduction Requirement under the permit.

Alternative Methods and/or Phosphorus Reduction Factors: A permittee may propose alternative methods and/or phosphorus reduction factors for calculating phosphorus load reduction credits for these non-structural practices. EPA will consider alternative methods and/or phosphorus reduction factors, provided that the permittee submits adequate supporting documentation to EPA. At a minimum, supporting documentation shall consist of a description of the proposed method, the technical basis of the method, identification of alternative phosphorus reduction factors, supporting calculations, and identification of references and sources of information that support the use of the alternative method and/or factors in the Watershed. If EPA determines that the alternative methods and/or factors are not adequately supported, EPA will notify the permittee and the permittee may receive no phosphorus reduction credit other than a reduction credit calculated by the permittee using the default phosphorus reduction factors provided in this attachment for the identified practices.

Table 2-1. Phosphorus load export rates by land cover

Phosphorus Source Category by Land Use	Land Surface Cover	Phosphorus Load Export Rate, lbs/ac/yr	Phosphorus Load Export Rate, kg/ha/yr
Commercial (Com) and Industrial (Ind)	Impervious	1.8	2.0
	Pervious	See *DevPERV	See *DevPERV
*Developed Land Pervious (DevPERV)- HSG A/B	Pervious	0.2	0.2
*Developed Land Pervious (DevPERV) – HSG C	Pervious	0.4	0.5
*Developed Land Pervious (DevPERV) - HSG D	Pervious	0.7	0.8

Notes:
- For pervious areas, if the hydrologic soil group (HSG) is known, use the appropriate value from this table. If the HSG is not known, assume HSG D conditions for the phosphorus load export rate.

(1) Enhanced Sweeping Program: The permittee may earn a phosphorus reduction credit for conducting an enhanced sweeping program of impervious surfaces. Table 2-2 below outlines the default phosphorus removal factors for enhanced sweeping programs. The credit shall be calculated by using the following equation:

$$Credit_{sweeping} = IA_{swept} \times PLE_{IC\text{-}land\ use} \times PRF_{sweeping} \quad \textbf{(Equation 2-1)}$$

Where:

$Credit_{sweeping}$ = Amount of phosphorus load removed by enhanced sweeping program (lbs/year)

IA_{swept} = Area of impervious surface that is swept under the enhanced sweeping program (acres)

$PLE_{IC\text{-}land\ use}$ = Phosphorus Load Export Rate for impervious cover and specified land use (lbs/acre/yr) (see Table 2-1)

$PRF_{sweeping}$ = Phosphorus Reduction Factor for sweeping based on sweeper type and frequency (see Table 2-2).

As an alternative, the permittee may apply a credible sweeping model of the Watershed and perform continuous simulations reflecting build-up and wash-off of phosphorus using long-term local rainfall data.

Table 2-2. Phosphorus reduction efficiency factors ($PRF_{sweeping}$) for sweeping impervious areas

Frequency[1]	Sweeper Technology	$PRF_{sweeping}$
2/year (spring and fall)[2]	Mechanical Broom	0.01
2/year (spring and fall)[2]	Vacuum Assisted	0.02
2/year (spring and fall)[2]	High-Efficiency Regenerative Air-Vacuum	0.02
Monthly	Mechanical Broom	0.03
Monthly	Vacuum Assisted	0.04
Monthly	High Efficiency Regenerative Air-Vacuum	0.08
Weekly	Mechanical Broom	0.05
Weekly	Vacuum Assisted	0.08
Weekly	High Efficiency Regenerative Air-Vacuum	0.10

[1] For full credit for monthly and weekly frequency, sweeping must be conducted year round. Otherwise, the credit should be adjusted proportionally based on the duration of the sweeping season.
[2] In order to earn credit for semi-annual sweeping the sweeping must occur in the spring following snow-melt and road sand applications to impervious surfaces and in the fall after leaf-fall and prior to the onset to the snow season.

Example 2-1: Calculation of enhanced sweeping program credit ($Credit_{sweeping}$): A permittee proposes to implement an enhanced sweeping program and perform weekly sweeping from April 1 – December 1 (9 months) on site, using a vacuum assisted sweeper on 20.3 acres of parking lots and roadways in an industrial area (impervious). For this site the needed information is:

IA_{swept} = 20.3 acres
$PLE_{IC\text{-}INDUSTRIAL}$ = 1.8 lbs/acre/yr (from Table 2-1)
$PRF_{sweeping}$ = 0.08 (from Table 2-2) x (9 months / 12 months)
= 0.06

Substitution into equation 2-1 yields a $Credit_{sweeping}$ of 2.2 pounds of phosphorus removed per year.

$Credit_{sweeping}$ = IA_{swept} x $PLE_{land\ use}$ x $PRF_{sweeping}$
= 20.3 acres x 1.8 lbs/acre/yr x 0.06
= 2.2 lbs/yr

(2) Catch Basin Cleaning: The permittee may earn a phosphorus reduction credit, Credit $_{CB}$, by removing accumulated materials from catch basins (i.e., catch basin cleaning) in the Watershed such that a minimum sump storage capacity of 50% is maintained throughout the year. The credit shall be calculated by using the following equation:

$$\text{Credit}_{CB} = IA_{CB} \times PLE_{\text{IC-land use}} \times PRF_{CB} \qquad \textbf{(Equation 2-2)}$$

Where:

Credit_{CB}	=	Amount of phosphorus load removed by catch basin cleaning (lbs/year)
IA_{CB}	=	Impervious drainage area to catch basins (acres)
$PLE_{\text{IC-land use}}$	=	Phosphorus Load Export Rate for impervious cover and specified land use (lbs/acre/yr) (see Table 2-1)
PRF_{CB}	=	Phosphorus Reduction Factor for catch basin cleaning (see Table 2-3)

Table 2-3. Phosphorus reduction efficiency factor (PRF_{CB}) for semi-annual catch basin cleaning.

Frequency	Practice	PRF_{CB}
Semi-annual	Catch Basin Cleaning	0.02

Example 2-2: Calculation for catch basin cleaning credit (Credit_{CB}):
A permittee proposes to clean catch basins on their site (i.e., remove accumulated sediments and contaminants captured in the catch basins) that drain runoff from 15.3 acres of industrial impervious area. For this site the needed information is:

IA_{CB} = 15.3 acres
$PLE_{\text{IC-INDUSTRIAL}}$ = 1.8 lbs/acre/yr (from Table 2-1)
PRF_{CB} = 0.02 (from Table 2-3)

Substitution into equation 2-2 yields a Credit_{CB} of 0.55 pounds of phosphorus removed per year:

$\text{Credit}_{CB} = IA_{CB} \times PLE_{\text{IC-MDR}} \times PRF_{CB}$
$= 15.3 \text{ acres} \times 1.8 \text{ lbs/acre/yr} \times 0.02$
= 0.55 lbs/yr

Attachment 3: ***Methods to Calculate Phosphorus Load Reductions for Structural Storm Water Best Management Practices in the Watershed***

(NPDES Permit No. MA0025704 – CSX Transportation, Inc., Beacon Park Yard)

This attachment provides methods to determine design storage volume capacities and to calculate phosphorus load reductions for the following structural Best Management Practices (structural BMPs) for a Watershed:

1) Infiltration Trench;
2) Infiltration Basin or other surface infiltration practice;
3) Bioretention Practice;
4) Gravel Wetland System;
5) Porous Pavement;
6) Wet Pond or wet detention basin;
7) Dry Pond or detention basin; and
8) Water Quality Swale.

Methods and examples are provided in this Attachment to calculate phosphorus load reductions for structural BMPs for the four following purposes:

1) To determine the design volume of a structural BMP to achieve a known phosphorus load reduction target when the contributing drainage area is 100% impervious;
2) To determine the phosphorus load reduction for a structural BMP with a known design volume when the contributing drainage area is 100% impervious;
3) To determine the design volume of a structural BMP to achieve a known phosphorus load reduction target when the contributing drainage area has impervious and pervious surfaces; and
4) To determine the phosphorus load reduction for a structural BMP with a known design volume when the contributing drainage area has impervious and pervious surfaces.

The methods and annual phosphorus export load rates presented in this attachment are for the purpose of counting load reductions for various BMPs treating storm water runoff from varying site conditions (i.e., impervious or pervious surfaces) and different land uses (e.g. commercial and institutional). The estimates of annual phosphorus load and load reductions by BMPs are to demonstrate compliance with the permittee's Phosphorus Reduction Requirement under the permit.

For each structural BMP type identified above, long-term cumulative performance information is provided to calculate phosphorus load reductions or to determine needed design storage volumes to achieve a specified reduction target (e.g., 62% phosphorus load reduction). The performance information is expressed as cumulative phosphorus load removed (% removed) depending on the physical storage capacity of the structural BMP (expressed as inches of runoff from impervious area) and is provided at the end of this Attachment (see Tables 3-1 through 3-18 and performance curves Figures 3-1 through 3-17). Multiple tables and performance curves are provided for the infiltration practices to represent cumulative phosphorus load reduction performance for six

infiltration rates (IR), 0.17, 0.27, 0.53, 1.02, 2.41, and 8.27 inches/hour. The permittee may use the performance curves provided in this attachment to interpolate phosphorus load removal reductions for field measured infiltration rates that are different than the infiltration rates used to develop the performance curves. Otherwise, the permittee shall use the performance curve for the IR that is nearest, but less than, the field measured rate.

EPA will consider phosphorus load reductions calculated using the methods provided below to be valid for the purpose of complying with the terms of this permit for BMPs that have not been explicitly modeled if the desired BMP has functionality that is similar to one of the simulated BMP types. Please note that only the surface infiltration and the infiltration trench BMP types were simulated to direct storm water runoff into the ground (i.e., infiltration). All of the other simulated BMPs represent practices that have either under-drains or impermeable liners and therefore, are not hydraulically connected to the sub-surface soils (i.e., no infiltration). Following are some simple guidelines for selecting the BMP type and/or determining whether the results of any of the BMP types provided are appropriate for another BMP of interest.

Infiltration Trench is a practice that provides temporary storage of runoff using the void spaces within the soil/sand/gravel mixture that is used to backfill the trench for subsequent infiltration into the surrounding sub-soils. Performance results for the infiltration trench can be used for all subsurface infiltration practices including systems that include pipes and/or chambers that provide temporary storage. Also, the results for this BMP type can be used for bio-retention systems that rely on infiltration when the majority of the temporary storage capacity is provided in the void spaces of the soil filter media and porous pavements that allow infiltration to occur.

Surface Infiltration represents a practice that provides temporary surface storage of runoff (e.g., ponding) for subsequent infiltration into the ground. Appropriate practices for use of the surface infiltration performance estimates include infiltration basins, infiltration swales, rain gardens and bio-retention systems that rely on infiltration and provide the majority of storage capacity through surface-ponding.

Bio-filtration is a practice that provides temporary storage of runoff for filtering through an engineered soil media. The storage capacity is typically made of void spaces in the filter media and temporary ponding at the surface of the practice. Once the runoff has passed through the filter media it is collected by an under-drain pipe for discharge. Depending on the design of the filter media manufactured or packaged bio-filter systems such as tree box filters may be suitable for using the bio-filtration performance results.

Gravel Wetland performance results should be used for practices that have been designed in accordance or share similar features with the design specifications for gravel wetland systems provided in the most recent version of *the New Hampshire Stormwater Manual* (http://des.nh.gov/organization/divisions/water/stormwater/manual.htm. Retrieved 12/14/12)

Porous Pavement performance results represent systems with an impermeable under-liner and an under-drain. *If porous pavement systems do not have an impermeable under-liner so that filtered runoff can infiltrate into sub-soils then the performance results for an infiltration trench may be used for these systems.*

Extended Dry Detention Pond performance results should only be used for practices that have been designed in accordance with the design specifications for extended dry detention ponds provided in the most recent version of *the New Hampshire Stormwater Manual* (http://des.nh.gov/organization/divisions/water/stormwater/manual.htm. Retrieved 12/14/12)

Water Quality Wet Swale performance results should only be used for practices that have been designed in accordance with the design specifications for a water quality wet swale provided in the most recent version of *the New Hampshire Stormwater Manual* (http://des.nh.gov/organization/divisions/water/stormwater/manual.htm. Retrieved 12/14/12)

Alternative Methods:

A permittee may propose alternative long-term cumulative performance information or alternative methods to calculate phosphorus load reductions for the structural BMPs identified above or for other structural BMPs not identified in this Attachment.

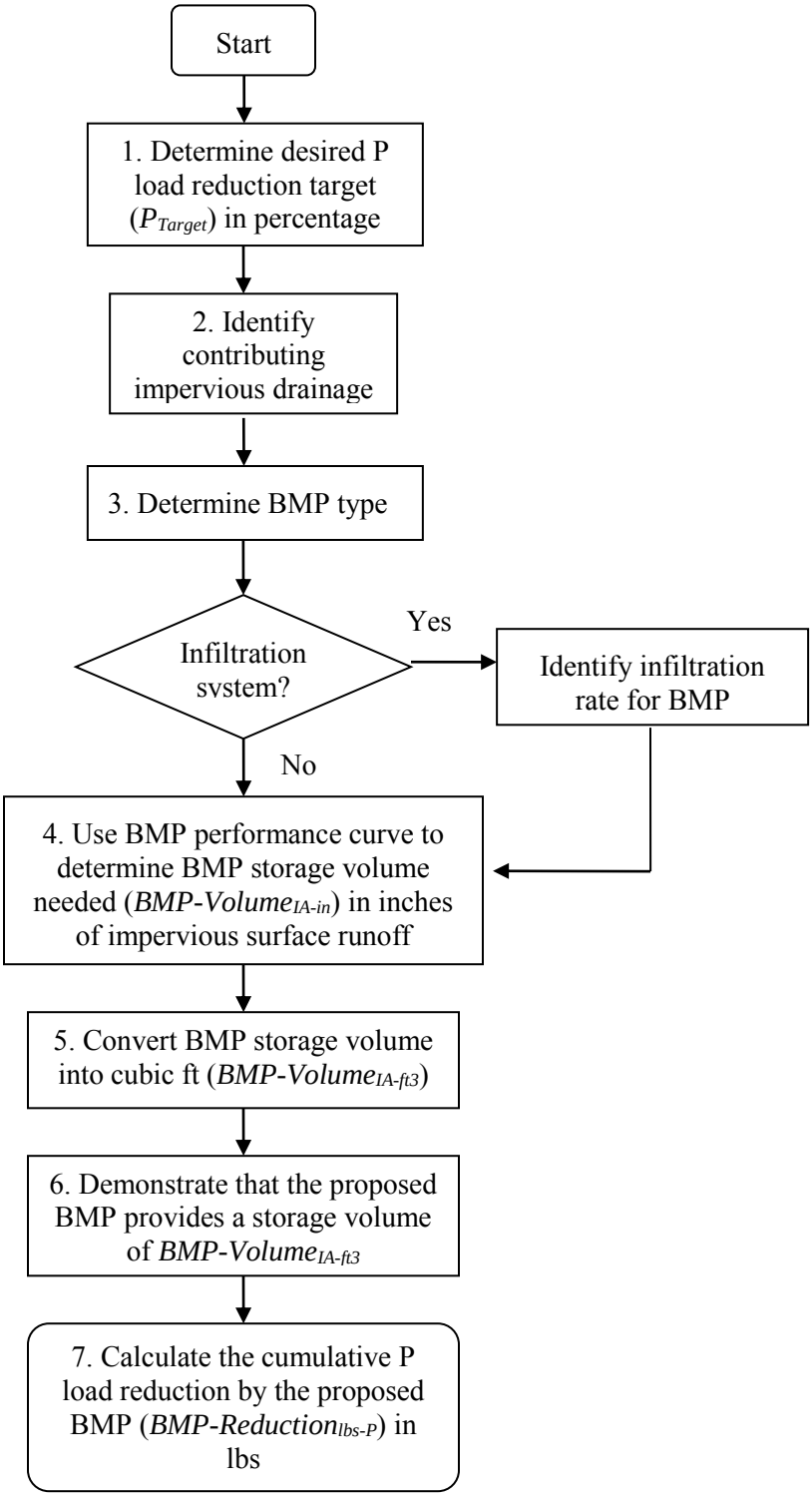
EPA will consider alternative long-term cumulative performance information and alternative methods to calculate phosphorus load reductions for structural BMPs provided that the permittee provides EPA with adequate supporting documentation. At a minimum, the supporting documentation shall include:

1) Results of continuous BMP model simulations representing the structural BMP, using a verified BMP model and representative long-term (i.e., 10 years) climatic data including hourly rainfall data;
2) Supporting calculations and model documentation that justify use of the model, model input parameters, and the resulting cumulative phosphorus load reduction estimate; and
3) Identification of references and sources of information that support the use of the alternative information and method.

If EPA determines that the long-term cumulative phosphorus load reductions developed based on alternative information are not adequately supported, EPA will notify the permittee in writing, and the permittee may receive no phosphorus reduction credit other than a reduction credit calculated by the permittee using the default phosphorus reduction factors provided in this attachment for the identified practices. The permittee is required to submit to EPA valid phosphorus load reductions for structural BMPs in the Watershed in accordance with the submission schedule requirements specified in the permit and Appendix F.

(1) Method to determine the design volume of a structural BMP to achieve a known phosphorus load reduction target when the contributing drainage area is 100% impervious:

Flow Chart 1 illustrates the steps to determine the design volume of a structural BMP to achieve a known phosphorus load reduction target when the contributing drainage area is 100% impervious.



Flow Chart 1. Method to determine BMP design volume to achieve a known phosphorous load reduction when contributing drainage area is 100% impervious.

1) Determine the desired cumulative phosphorus load reduction target (P_{target}) in percentage for the structural BMP;

2) Determine the contributing impervious drainage area (IA) in acres to the structural BMP;

3) Determine the structural BMP type (e.g., infiltration trench, gravel wetland). For infiltration systems, determine the appropriate infiltration rate for the location of the BMP in the Watershed;

4) Using the cumulative phosphorus removal performance curve for the selected structural BMP (Figures 3-1 through 3-18), determine the storage volume for the BMP (BMP-Volume $_{IA\text{-}in}$), in inches of runoff, needed to treat runoff from the contributing IA to achieve the reduction target;

5) Calculate the corresponding BMP storage volume in cubic feet (BMP-Volume $_{IA\text{-}ft^3}$) using BMP-Volume $_{IA\text{-}in}$ determined from step 4 and equation 3-1:

BMP-Volume $_{IA\text{-}ft^3}$ = IA (ac) x BMP-Volume $_{IA\text{-}in}$ x 3630 ft^3/ac-in **(Equation 3-1)**

6) Provide supporting calculations using the dimensions and specifications of the proposed structural BMP showing that the necessary storage volume, BMP-Volume $_{IA\text{-}ft^3}$, determined from step 5 will be provided to achieve the P_{Target}; and

7) Calculate the cumulative phosphorus load reduction in pounds of phosphorus (BMP-Reduction $_{lbs\text{-}P}$) for the structural BMP using the BMP Load (as calculated from the procedure in Attachment 1 to Appendix F) and P_{target} by using equation 3-2:

BMP-Reduction $_{lbs\text{-}P}$ = BMP Load x (P_{target} /100) **(Equation 3-2)**

Example 3-1: Determine design volume of a structural BMP with a 100% impervious drainage area to achieve a known phosphorus load reduction target:

A permittee is considering a surface infiltration practice to capture and treat runoff from 2.57 acres of impervious area that will achieve a 70% reduction in annual phosphorus load. The infiltration practice would be located adjacent to the impervious area. The permittee has measured an infiltration rate (IR) of 0.39 inches per hour (in/hr) in the vicinity of the proposed infiltration practice. Determine the:

A) Design storage volume needed for an surface infiltration practice to achieve a 70% reduction in annual phosphorus load from the contributing drainage area (BMP-Volume $_{IA\text{-}ft^3}$); and

B) Cumulative phosphorus reduction in pounds that would be accomplished by the BMP (BMP-Reduction $_{lbs\text{-}P}$)

Solution:

1) Contributing impervious drainages area (IA) = 2.57 acres

2) BMP type is a surface infiltration practice (i.e., basin) with an infiltration rate (IR) of 0.39 in/hr

3) Phosphorus load reduction target (P_{target}) = 70%

4) The performance curve for the infiltration basin (i.e., surface infiltration practice), Figure 3-8, IR = 0.27 in/hr is used to determine the design storage volume of the BMP (BMP-Volume $_{IA\text{-}in}$) needed to treat runoff from the contributing IA and achieve a P_{target} = 70%. The curve for an infiltration rate of 0.27 in/hr is chosen because 0.27 in/hr is the nearest simulated IR that is less than the field measured IR of 0.39 in/hr. From Figure 3-8, the BMP-Volume $_{IA\text{-}in}$ for a P_{target} = 70% is 0.36 in.

5) The BMP-Volume $_{IA\text{-}in}$ is converted to cubic feet (BMP-Volume $_{IA\text{-}ft^3}$) using Equation 3-1:

BMP-Volume $_{IA\text{-}ft^3}$ = IA (acre) x BMP-Volume $_{IA\text{-}in}$ x 3,630 ft^3/acre-in
BMP-Volume $_{IA\text{-}ft^3}$ = 2.57 acre x 0.36 in x 3,630 ft^3/acre-in
= **3,359 ft^3**

6) A narrow trapezoidal infiltration basin with the following characteristics is proposed to achieve the P_{Target} of 70%:

Length (ft)	Design Depth (ft)	Side Slopes	Bottom area (ft^2)	Pond surface area (ft^2)	Design Storage Volume (ft^3)
355	1.25	3:1	1,387	4,059	3,404

The volume of the proposed infiltration practice, 3,404 ft^3, exceeds the BMP-Volume $_{IA\text{-}ft^3}$ needed, 3,359 ft^3 and is sufficient to achieve the P Target of 70%.

7) The cumulative phosphorus load reduction in pounds of phosphorus for the infiltration practice (BMP-Reduction $_{lbs\text{-}P}$) is calculated using Equation 3-2. The BMP Load is first determined using the method in Attachment 1 to Appendix F.

BMP Load = IA x impervious cover phosphorus export loading rate for commercial use (see Table 1-1 from Attachment 1 to Appendix F)
= 2.57 acres x 1.8 lbs/acre/yr
= 4.63 lbs/yr

BMP-Reduction $_{lbs\text{-}P}$ = BMP Load x (P_{target} /100)
BMP-Reduction $_{lbs\text{-}P}$ = 4.63 lbs/yr x (70/100)
= **3.24 lbs/yr**

Alternate Solution: Alternatively, the permittee could determine the design storage volume needed for an IR = 0.39 in/hr by performing interpolation of the results from the surface infiltration performance curves for IR = 0.27 in/hr and IR = 0.52 in/hr as follows (replacing steps 3 and 4 on the previous page):

4 alternative) Using the performance curves for the infiltration basin (i.e., surface infiltration practice), Figures 3-8, IR = 0.27 in/hr and 3-9, IR = 0.52 in/hr, interpolate between the curves to determine the design storage volume of the BMP (BMP-Volume $_{IA\text{-}in}$) needed to treat runoff from the contributing IA and achieve a P_{target} = 70%.

First calculate the interpolation adjustment factor (IAF) to interpolate between the infiltration basin performance curves for infiltration rates of 0.27 and 0.52 in/hr:

$$IAF = (0.39 - 0.27)/ (0.52 – 0.27) = 0.48$$

From the two performance curves, develop the following table to estimate the general magnitude of the needed storage volume for an infiltration swale with an IR = 0.39 in/hr and a P_{target} of 70%.

Table Example 3-1. Interpolation Table for determining design storage volume of infiltration basin with IR = 0.39 in/hr and a phosphorus load reduction target of 70%.

BMP Storage Volume	% Phosphorus Load Reduction IR = 0.27 in/hr ($PR_{IR=0.27}$)	% Phosphorus Load Reduction IR = 0.52 in/hr ($PR_{IR=0.52}$)	Interpolated % Phosphorus Load Reduction IR = 0.39 in/hr ($PR_{IR=0.39}$) **$PR_{IR=0.39}$= IAF($PR_{IR=0.52}$ – $PR_{IR=0.27}$) + $PR_{IR=0.27}$**
0.3	64%	67%	65%
0.4	74%	77%	75%
0.5	79%	82%	80%

As indicated from Table Example 3-1, the BMP-Volume $_{IA\text{-}in}$ for $PR_{IR=0.39}$ of 70% is between 0.3 and 0.4 inches and can be determined by interpolation:

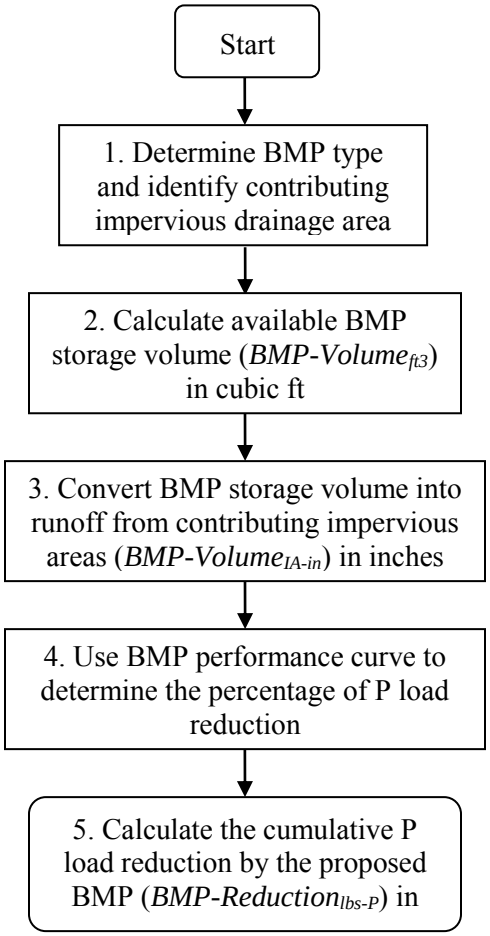
$$\text{BMP-Volume}_{IA\text{-}in} = (70\% - 65\%)/ (75\% - 65\%) \times (0.4 \text{ in} – 0.3 \text{ in}) + 0.3 \text{ in}$$
$$= 0.35 \text{ inches}$$

5 alternative) Convert the resulting BMP-Volume $_{IA\text{-}in}$ to cubic feet (BMP-Volume $_{IA\text{-}ft^3}$) using equation 3-1:

$$\text{BMP-Volume}_{IA\text{-}ft^3} = 2.57 \text{ acre} \times 0.35 \text{ in} \times 3{,}630 \text{ ft}^3/\text{acre-in}$$
$$= 3{,}265 \text{ ft}^3$$

(2) Method to determine the phosphorus load reduction for a structural BMP with a known design volume when the contributing drainage area is 100% impervious:

Flow Chart 2 illustrates the steps to determine the phosphorus load reduction for a structural BMP with a known design volume when the contributing drainage area is 100% impervious.



Flow Chart 2. Method to determine the phosphorus load reduction for a BMP with a known design volume when contributing drainage area is 100% impervious.

1) Identify the structural BMP type and contributing impervious drainage area (IA);

2) Document the available storage volume (ft^3) of the structural BMP (BMP-Volume $_{ft^3}$) using the BMP dimensions and design specifications (e.g., maximum storage depth, filter media porosity);

3) Convert BMP-Volume $_{ft^3}$ into inches of runoff from the contributing impervious area (BMP-Volume $_{IA\text{-}in}$) using equation 3-3:

BMP-Volume $_{IA\text{-}in}$ = BMP-Volume $_{ft^3}$/ IA (acre) x 12 in/ft x 1 acre/43560 ft^2
(Equation 3-3)

4) Determine the % phosphorus load reduction for the structural BMP (BMP Reduction $_{\%\text{-}P}$) using the appropriate BMP performance curve (Figures 3-1 through 3-18) and the BMP-Volume $_{IA\text{-}in}$ calculated in step 3; and

5) Calculate the cumulative phosphorus load reduction in pounds of phosphorus for the structural BMP (BMP Reduction $_{lbs\text{-}P}$) using the BMP Load as calculated from the procedure in Attachment 1 to Appendix F and the percent phosphorus load reduction (BMP Reduction $_{\%\text{-}P}$) determined in step 4 by using equation 3-4:

$$\text{BMP Reduction}_{lbs\text{-}P} = \text{BMP Load} \times (\text{BMP Reduction}_{\%\text{-}P}/100) \qquad \textbf{(Equation 3-4)}$$

Example 3-2: Determine the phosphorus load reduction for a structural BMP with a known storage volume capacity when the contributing drainage area is 100% impervious:

A permittee is considering a bioretention system to treat runoff from 1.49 acres of impervious area. Site constraints would limit the bioretention system to have a surface area of 1200 ft^2 and the system would have to be located next to the impervious drainage area to be treated. The design parameters for the bioretention system are presented in Table Example 3-2.

Table Example 3-2. Design parameters for bioretention system for Example 3-2

Components of representation	Parameters	Value
Ponding	Maximum depth	6 in
	Surface area	1200 ft^2
	Vegetative parameter[a]	85-95%
Soil mix	Depth	30 in
	Porosity	40%
	Hydraulic conductivity	4 inches/hour
Gravel layer	Depth	8 in
	Porosity	40%
	Hydraulic conductivity	14 inches/hour
Orifice #1	Diameter	6 in

[a] Refers to the percentage of surface covered with vegetation

Determine the:

A) Percent phosphorus load reduction (BMP Reduction $_{\%\text{-}P}$) for the specified bioretenion system and contributing impervious drainage area; and

B) Cumulative phosphorus reduction in pounds that would be accomplished by the bioretention system (BMP-Reduction $_{lbs\text{-}P}$)

Solution:

1) The BMP is a bioretention system that will treat runoff from 1.49 acres of impervious area (IA = 1.49 acre);

2) The available storage volume capacity (ft^3) of the bioretention system (BMP-Volume $_{BMP\text{-}ft^3}$) is determined using the surface area of the system, depth of ponding, and the porosity of the filter media:

Solution continued:

BMP-Volume $_{BMP\text{-}ft^3}$ = (surface area x pond maximum depth) + ((soil mix depth + gravel layer depth)/12 in/ft) x surface area x gravel layer porosity)
= (1,200 ft^2 x 0.5 ft) + ((38/12) x 1,200 ft^2 x 0.4)
= 2,120 ft^3

3) The available storage volume capacity of the bioretention system in inches of runoff from the contributing impervious area (BMP-Volume $_{IA\text{-}in}$) is calculated using equation 3-3:

BMP-Volume $_{IA\text{-}in}$ = (BMP-Volume $_{ft^3}$/ IA (acre) x 12 in/ft x 1 acre/43560 ft^2
BMP-Volume $_{IA\text{-}in}$ = (2120 ft^3/1.49 acre) x 12 in/ft x 1 acre/43560 ft^2
= 0.39 in

4) Using the bioretention performance curve shown in Figure 3-13, a **51%** phosphorus load reduction (BMP Reduction %-P) is determined for a bioretention system sized for 0.39 in of runoff from 1.49 acres of impervious area; and

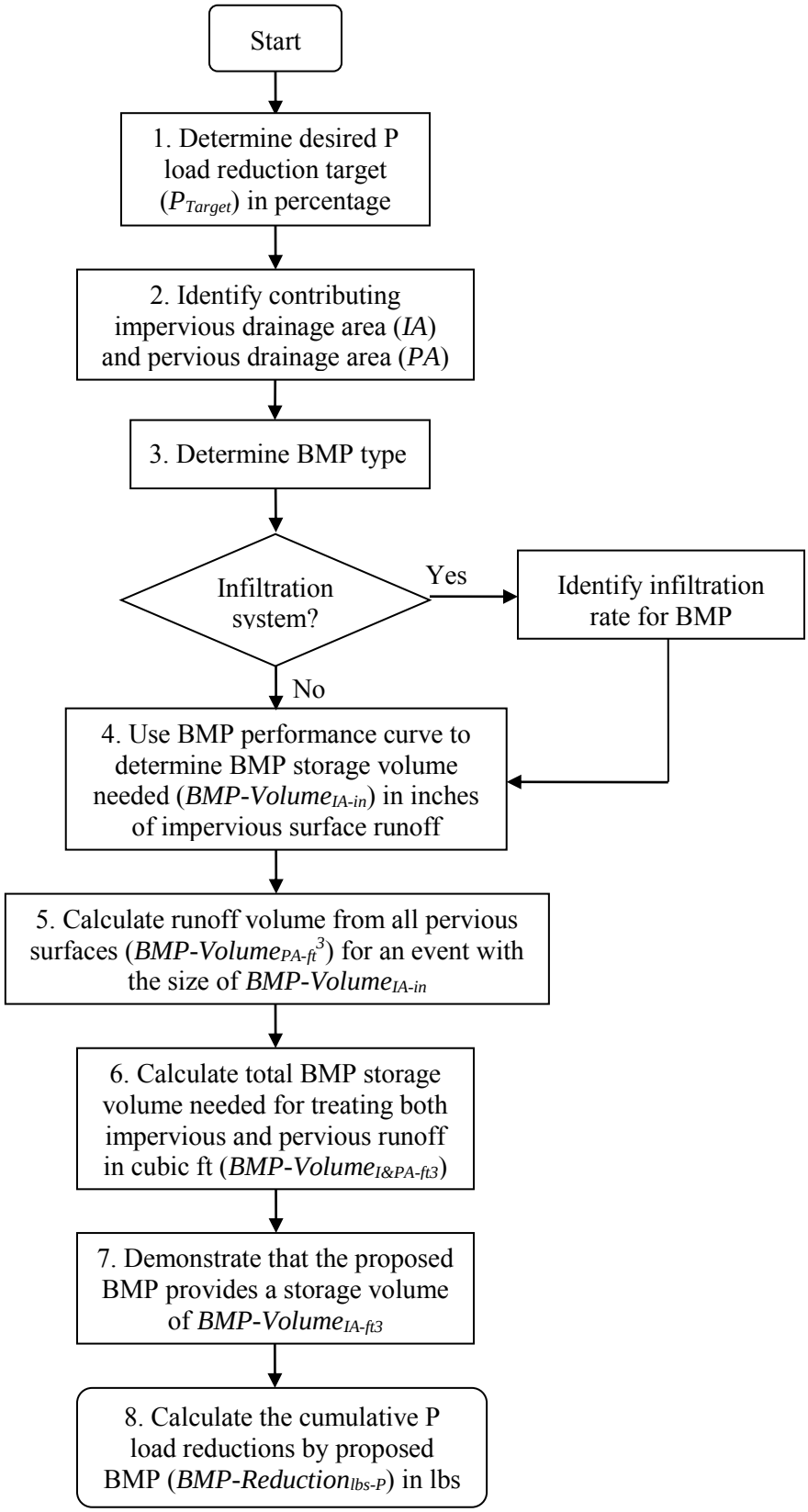
5) Calculate the cumulative phosphorus load reduction in pounds of phosphorus for the bioretention system (BMP Reduction $_{lbs\text{-}P}$) using the BMP Load as calculated from the procedure in Attachment 1 to Appendix F and the BMP Reduction $_{\%\text{-}P}$ determined in step 4 by using equation 3-4. First, the BMP Load is determined as specified in Attachment 1:

BMP Load = IA (acre) x impervious cover phosphorus export loading rate for industrial use (see Table 1-1 from Attachment 1 to Appendix F)
= 1.49 acres x 1.8 lbs/acre/yr
= 2.68 lbs/yr

BMP Reduction $_{lbs\text{-}P}$ = BMP Load x (BMP Reduction $_{\%\text{-}P}$/100)
BMP Reduction $_{lbs\text{-}P}$ = 2.68 lbs/yr x (51/100)
= **1.37 lbs/yr**

(3) Method to determine the design storage volume of a structural BMP to achieve a known phosphorus load reduction target when the contributing drainage area has impervious and pervious surfaces:

Flow Chart 3 illustrates the steps to determine the design storage volume of a structural BMP to achieve a known phosphorus load reduction target when the contributing drainage area has impervious and pervious surfaces.



Flow Chart 3. Method to determine the design storage volume of a BMP to reach a known P load reduction when both impervious and pervious drainage areas are present.

1) Determine the desired cumulative phosphorus load reduction target (P_{target}) in percentage for the structural BMP;

2) Characterize the contributing drainage area to the structural BMP by identifying the following information for the impervious and pervious surfaces:

Impervious area (IA) - Area (acre) and land use (e.g., commercial)

Pervious area (PA) – Area (acre) and runoff depths based on hydrologic soil group (HSG) and rainfall depth. Table 3-3-1 provides values of runoff depth from pervious areas for various rainfall depths and HSGs. Soils are assigned to an HSG on the basis of their permeability. HSG A is the most permeable, and HSG D is the least permeable. HSG categories for pervious areas in the Watershed shall be estimated by consulting local soil surveys prepared by the National Resource Conservation Service (NRCS) or by a storm water professional evaluating soil testing results from the Watershed. If the HSG condition is not known, a HSG D soil condition should be assumed.

Table 3-3-1. Developed Land Pervious Area Runoff Depths based on Precipitation depth and Hydrological Soil Groups (HSGs)

Rainfall Depth, Inches	Runoff Depth, inches		
	Pervious HSG A/B	Pervious HSG C	Pervious HSG D
0.10	0.00	0.00	0.00
0.20	0.00	0.01	0.02
0.40	0.00	0.03	0.06
0.50	0.00	0.05	0.09
0.60	0.01	0.06	0.11
0.80	0.02	0.09	0.16
1.00	0.03	0.12	0.21
1.20	0.04	0.14	0.39
1.50	0.11	0.39	0.72
2.00	0.24	0.69	1.08

Notes: Runoff depths derived from combination of volumetric runoff coefficients from Table 5 of *Small Storm Hydrology and Why it is Important for the Design of Stormwater Control Practices*, Pitt, 1999 and using the Stormwater Management Model (SWMM) in continuous model mode for hourly precipitation data for Boston, MA, 1998-2002.

C) Determine the structural BMP type (e.g., infiltration trench, gravel wetland). For infiltration systems, determine the appropriate infiltration rate for the location of the BMP in the Watershed.

D) Using the cumulative phosphorus removal performance curve for the selected structural BMP, determine the storage volume capacity of the BMP in inches

needed to treat runoff from the contributing impervious area (BMP-Volume $_{IA-in}$);

E) Using Equation 3-5 below and the pervious area runoff depth information from Table 3-3-1, determine the total volume of runoff from the contributing pervious drainage area in cubic feet (BMP Volume $_{PA-ft^3}$) for a rainfall size equal to the sum of BMP Volume $_{IA-in}$, determined in step 4. The runoff volume for each distinct pervious area must be determined.

BMP-Volume $_{PA\ ft^3}$ = $\sum$ (PA x (runoff depth) x 3,630 ft^3/acre-in) $_{(PA1,\ldots\ PAn)}$ **(Equation 3-5)**

F) Using equation 3-6 below, calculate the BMP storage volume in cubic feet (BMP-Volume $_{IA\&PA-ft^3}$) needed to treat the runoff depth from the contributing impervious (IA) and pervious areas (PA).

BMP-Volume $_{IA\&PA-ft^3}$ = BMP Volume $_{PA-ft^3}$ + (BMP Volume $_{IA-in}$ x IA (acre) x 3,630 ft^3/acre-in) **(Equation 3-6)**

G) Provide supporting calculations using the dimensions and specifications of the proposed structural BMP showing that the necessary storage volume determined in step 6, BMP- Volume $_{I\&PA-ft^3}$, will be provided to achieve the P $_{Target}$; and

H) Calculate the cumulative phosphorus load reduction in pounds of phosphorus (BMP-Reduction $_{lbs-P}$) for the structural BMP using the BMP Load (as calculated from the procedure in Attachment 1 to Appendix F) and the P $_{target}$ by using equation 3-2:

BMP-Reduction $_{lbs-P}$ = BMP Load x (P $_{target}$ /100) **(Equation 3-2)**

Example 3-3: Determine the design storage volume of a structural BMP to achieve a known phosphorus load reduction target when the contributing drainage area has impervious and pervious surfaces

A permittee is considering a gravel wetland system to treat runoff from a high-density residential site. The site is 7.50 acres of which 4.00 acres are impervious surfaces and 3.50 acres are pervious surfaces. The pervious area is made up of 2.5 acres of lawns in good condition surrounding cluster housing units and 1.00 acre of stable unmanaged woodland. Soils information indicates that all of the woodland and 0.50 acres of the lawn is hydrologic soil group (HSG) B and the other 2.00 acres of lawn are HSG C. The permittee wants to size the gravel wetland system to achieve a cumulative phosphorus load reduction (P $_{Target}$) of 55% from the entire 7.50 acres. Determine the:

A) Design storage volume needed for a gravel wetland system to achieve a 55% reduction in annual phosphorus load from the contributing drainage area (BMP-Volume $_{IA\&PA-ft^3}$); and

B) Cumulative phosphorus reduction in pounds that would be accomplished by the BMP (BMP-Reduction $_{lbs-P}$)

.

Solution:

1) The BMP type is gravel wetland system.

2) The phosphorus load reduction target (P_{Target}) = 55%.

Solution continued:

3) Using the cumulative phosphorus removal performance curve for the gravel wetland system shown in Figure 3-14, the storage volume capacity in inches needed to treat runoff from the contributing impervious area (BMP Volume $_{IA\text{-}in}$) is 0.71 in;

4) Using equation 3-5 and the pervious runoff depth information from Table 3-3-1, the volume of runoff from the contributing pervious drainage area in cubic feet (BMP Volume $_{PA-ft^3}$) for a rainfall size equal to 0.71 in is summarized in Table Example 3-3-B.

As indicated from Table 3-3-1, the runoff depth for a rainfall size equal to 0.71 inches is between 0.6 and 0.8 inches and can be determined by interpolation (example shown for runoff depth of HSG C):

Runoff depth (HSG C) = (0.71 – 0.6)/(0.8 – 0.6) x (0.09 in – 0.06 in) + 0.06 in
= 0.07 inches

Table Example 3-3-B. Runoff contributions from pervious areas for high density residential site

ID	Type	Pervious Area (acre)	HSG	Runoff (in)	Runoff = (runoff) x PA (acre-in)	Runoff = Runoff (acre-in) x 3630 ft^3/acre-in (ft^3)
PA1	Grass	2.00	C	0.07	0.14	508
PA2	Grass	0.50	B	0.01	0.0	0.0
PA3	Woods	1.00	B	0.01	0.0	0.0
Total	-----	**3.50**	-----	-----	**0.14**	**508**

5) Using equation 3-6, determine the BMP storage volume in cubic feet (BMP-Volume $_{IA\&PA\text{-}ft^3}$) needed to treat 0.71 inches of runoff from the contributing impervious area (IA) and the runoff of 0.14 acre-in from the contributing pervious areas, determined in step 5 is:

BMP Volume$_{IA\&PA\text{-}ft^3}$ = BMP Volume $_{PA\ ac\text{-}in}$ + (BMP Volume $_{IA\text{-}in}$ x IA (acre)) x 3,630 ft^3/acre-in)
BMP Volume$_{IA\&PA\text{-}ft^3}$ = (508 ft^3+ (0.71 in x 4.00 acre)) x 3,630 ft^3/acre-in
= 10,817 ft^3

6) Table Example 3-3-C provides design details for of a potential gravel wetland system (based on Volume 2, Chapter 4 of the New Hampshire Stormwater Manual).

Solution continued:

Table Example 3-3-C. Design details for gravel wetland system

Gravel Wetland System Components	Design Detail	Depth (ft)	Surface Area (ft^2)	Volume (ft^3)
Sediment Forebay	**10% of Treatment Volume**			
Pond area	----	1.33	896	1,192
Wetland Cell #1	**45% of Treatment Volume**	----------	----------	----------
Pond area	----	2.00	1,914	3,828
Gravel layer	porosity = 0.4	2.00	1,914	1,531
Wetland Cell #2	**45% of Treatment Volume**	----------	----------	----------
Pond area	----	2.00	1,914	3,828
Gravel layer	porosity = 0.4	2.00	1,914	1,531

The total design storage volume for the proposed gravel wetland system identified in Table Example 3-3-C is 11,910 ft^3. This volume is greater than 11,834 ft^3 ((BMP-Volume $_{IA\&PA-ft^3}$), calculated in step 6) and is therefore sufficient to achieve a P_{Target} of 55%.

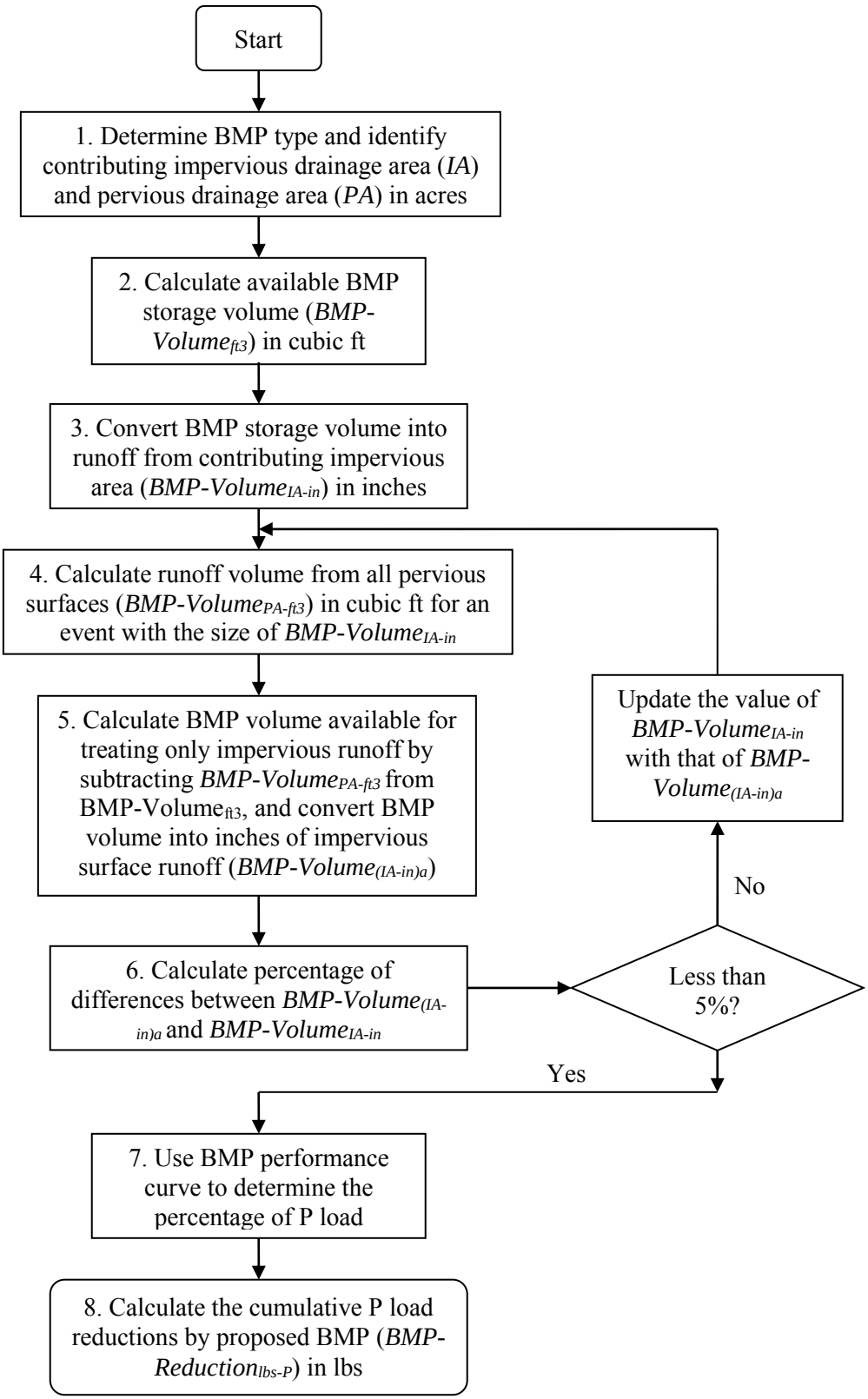
7) The cumulative phosphorus load reduction in pounds of phosphorus (BMP-Reduction $_{lbs-P}$) for the proposed gravel wetland system is calculated by using equation 3-2 with the BMP Load (as determined by the procedure in Attachment 1 to Appendix F) and the P_{target} = 55%.

BMP-Reduction $_{lbs-P}$ = BMP Load x (P_{target} /100) (**Equation 3-2**)

Using Table 1-1 from Attachment 1 to Appendix F, the BMP Load is calculated:
BMP Load = (IA x impervious cover phosphorus export loading rate for HDR)
+ ($PA_{HSG\ B}$ x pervious cover phosphorus export loading rate for HSG B)
+ ($PA_{HSG\ C}$ x pervious cover phosphorus export loading rate for HSG C)
= (4.00 acre x 2.3 lbs/acre/yr) + (1.50 acre x 0.2 lbs/acre/yr) + (2.00 acre x 0.5 lbs/acre/yr)
= 9.69 lbs/yr
BMP-Reduction $_{lbs-P}$ = BMP Load x (P_{target} /100)
BMP-Reduction $_{lbs-P}$ = 10.5 lbs/yr x 55/100
= **5.78 lbs**

(4) Method to determine the phosphorus load reduction for a structural BMP with a known storage volume when the contributing drainage area has impervious and pervious surfaces:

Flow Chart 4 illustrates the steps to determine the phosphorus load reduction for a structural BMP with a known storage volume when the contributing drainage area has impervious and pervious surfaces.



Flow Chart 4. Method to determine the phosphorus load reduction for a BMP with known storage volume when both pervious and impervious drainage areas are present.

1) Identify the type of structural BMP and characterize the contributing drainage area to the structural BMP by identifying the following information for the impervious and pervious surfaces:

Impervious area (IA) – Area (acre) and land use (e.g., commercial)

Pervious area (PA) – Area (acre) and runoff depth based on hydrologic soil group (HSG) and size of rainfall event. Table 3-3-1 provides values of runoff depth for various rainfall depths and HSGs. Soils are assigned to an HSG based on their permeability. HSG categories for pervious areas in the Watershed shall be estimated by consulting local soil surveys prepared by the National Resource Conservation Service (NRCS) or by a storm water professional evaluating soil testing results from the Watershed. If the HSG condition is not known, a HSG D soil condition should be assumed.

2) Determine the available storage volume (ft^3) of the structural BMP (BMP-Volume $_{ft^3}$) using the BMP dimensions and design specifications (e.g., maximum storage depth, filter media porosity);

3) To estimate the phosphorus load reduction of a BMP with a known storage volume capacity, it is first necessary to determine the portion of available BMP storage capacity (BMP-Volume $_{ft^3}$) that would treat the runoff volume generated from the contributing impervious area (IA) for a rainfall event with a depth of *i* inches (in). This will require knowing the corresponding amount of runoff volume that would be generated from the contributing pervious area (PA) for the same rainfall event (depth of *i* inches). Using equation 3-6a below, solve for the BMP capacity that would be available to treat runoff from the contributing imperious area for the unknown rainfall depth of *i* inches (see equation 3-6b):

$$\text{BMP-Volume}_{ft^3} = \text{BMP-Volume}_{(IA\text{-}ft^3)i} + \text{BMP-Volume}_{(PA\text{-}ft^3)i} \quad \textbf{(Equation 3-6a)}$$

Where:

BMP-Volume $_{ft^3}$	=	the available storage volume of the BMP
BMP-Volume $_{(IA\text{-}ft^3)i}$	=	the available storage volume of the BMP that would fully treat runoff generated from the contributing impervious area for a rainfall event of size *i* inches
BMP-Volume $_{(PA\text{-}ft^3)i}$	=	the available storage volume of the BMP that would fully treat runoff generated from the contributing pervious area for a rainfall event of size *i* inches

Solving for BMP-Volume $_{(IA\text{-}ft^3)i}$:

$$\text{BMP-Volume}_{(IA\text{-}ft^3)i} = \text{BMP-Volume}_{ft^3} - \text{BMP-Volume}_{(PA\text{-}ft^3)i} \quad \textbf{(Equation 3-6b)}$$

To determine BMP-Volume $_{(IA\text{-}ft^3)i}$, requires performing an iterative process of refining estimates of the rainfall depth used to calculate runoff volumes until the rainfall depth used results in the sum of runoff volumes from the contributing IA and PA equaling the available BMP storage capacity (BMP-Volume $_{ft^3}$). For the purpose of estimating BMP

performance, it will be considered adequate when the IA runoff depth (in) is within 5% IA runoff depth used in the previous iteration.

For the first iteration (1), convert the BMP-Volume $_{ft^3}$ determined in step 2 into inches of runoff from the contributing impervious area (BMP Volume $_{(IA\text{-}in)1}$) using equation 3-7a.

BMP-Volume $_{(IA\text{-}in)1}$ = (BMP-Volume$_{ft^3}$/ IA (acre)) x (12 in/ft /43,560 ft^2/acre) **(Equation 3-7a)**;

For iterations 2 through n (2…n), convert the BMP Volume $_{(IA\text{-}ft^3)2\ldots n}$, determined in step 5a below, into inches of runoff from the contributing impervious area (BMP Volume $_{(IA\text{-}in)2\ldots n}$) using equation 3-7b.

BMP-Volume $_{(IA\text{-}in)2\ldots n}$ = (BMP-Volume $_{(IA\text{-}ft^3)2\ldots n}$ / IA (acre)) x (12 in/ft /43,560 ft^2/acre) **(Equation 3-7b)**;

4) For 1 to n iterations, use the pervious runoff depth information from Table 3-3-1 and equation 3-8 to determine the total volume of runoff (ft^3) from the contributing PA (BMP Volume $_{PA\text{-}ft^3}$) for a rainfall size equal to the sum of BMP-Volume $_{(IA\text{-}in)1}$, determined in step 3. The runoff volume for each distinct pervious area must be determined.

BMP Volume $_{(PA\text{-}ft^3)1\ldots n}$ = $\sum$ ((PA x (runoff depth)$_{(PA1,\ PA2..PAn)}$ x (3,630 ft^3/acre-in) **(Equation 3-8)**

5) For iteration 1, estimate the portion of BMP Volume that is available to treat runoff from only the IA by subtracting BMP-Volume $_{PA\text{-}ft^3}$, determined in step 4, from BMP-Volume $_{ft^3}$, determined in step 2, and convert to inches of runoff from IA (see equations 3-9a and 3-9b):

BMP-Volume $_{(IA\text{-}ft^3)2}$ = ((BMP-Volume$_{ft^3}$- BMP Volume $_{(PA\text{-}ft^3)1}$) **(Equation 3-9a)**

BMP-Volume $_{(IA\text{-}in)2}$ = (BMP-Volume $_{(IA\text{-}ft^3)2}$/IA (acre)) x (12 in/ft x 1 acre/43,560 ft^2) **(Equation 3-9b)**

If additional iterations (i.e., 2 through n) are needed, estimate the portion of BMP volume that is available to treat runoff from only the IA (BMP-Volume $_{(IA\text{-}in)3..n+1}$) by subtracting BMP Volume $_{(PA\text{-}ft^3)2..n}$, determined in step 4, from BMP Volume $_{(IA\text{-}ft^3)3..n+1}$, determined in step 5, and by converting to inches of runoff from IA using equation 3-9b):

6) For iteration a (an iteration between 1 and n+1), compare BMP Volume $_{(IA\text{-}in)a}$ to BMP Volume $_{(IA\text{-}in)a\text{-}1}$ determined from the previous iteration (a-1). If the difference in these values is greater than 5% of BMP Volume $_{(IA\text{-}in)a}$ then repeat steps 4 and 5, using BMP Volume $_{(IA\text{-}in)a}$ as the new starting value for the next iteration (a+1). If the difference is less than or equal to 5 % of BMP Volume $_{(IA\text{-}in)a}$ then the permittee may proceed to step 7.

7) Determine the % phosphorus load reduction for the structural BMP (BMP Reduction $_{\%\text{-}P}$) using the appropriate BMP performance curve and the BMP-Volume $_{(IA\text{-}in)n}$ calculated in the final iteration of step 5; and

8) Calculate the cumulative phosphorus load reduction in pounds of phosphorus for the structural BMP (BMP Reduction $_{lbs-P}$) using the BMP Load as calculated from the procedure in Attachment 1 to Appendix F and the percent phosphorus load reduction (BMP Reduction $_{\%-P}$) determined in step 7 by using equation 3-4:

BMP Reduction $_{lbs-P}$ = BMP Load x (BMP Reduction $_{\%-P}$/100) **(Equation 3-4)**

Example 3-4: Determine the phosphorus load reduction for a structural BMP with a known design volume when the contributing drainage area has impervious and pervious surfaces

A permittee is considering an infiltration basin to capture and treat runoff from a portion of the Watershed draining to the impaired waterbody. The contributing drainage area is 16.55 acres and is 71% impervious. The pervious drainage area (PA) is 80% HSG D and 20% HSG C. An infiltration basin with the following specifications can be placed at the down-gradient end of the contributing drainage area where soil testing results indicates an infiltration rate (IR) of 0.28 in/hr:

Structure	Bottom area (acre)	Top surface area (acre)	Maximum pond depth (ft)	Design storage volume (ft^3)	Infiltration Rate (in/hr)
Infiltration basin	0.65	0.69	1.65	48,155	0.28

Determine the:

A) Percent phosphorus load reduction (BMP Reduction $_{\%-P}$) for the specified infiltration basin and the contributing impervious and pervious drainage area; and

B) Cumulative phosphorus reduction in pounds that would be accomplished by the BMP (BMP-Reduction $_{lbs-P}$)

Solution:

1) A surface infiltration basin is being considered. Information for the contributing impervious (IA) and pervious (PA) areas are summarized in Tables Example 3-4-A and Example 3-4-B, respectively.

Table Example 3-4-A Impervious area characteristics

ID	Land use	Area (acre)
IA1	Industrial	11.75

Table Example 3-4-B Pervious area characteristics

ID	Area (acre)	Hydrologic Soil Group (HSG)
PA1	3.84	D
PA2	0.96	C

Solution continued:

2) The available storage volume (ft^3) of the infiltration basin (BMP-Volume $_{ft^3}$) is determined from the design details and basin dimensions; BMP-Volume $_{ft^3} = 48{,}155\ ft^3$.

3) To determine what the BMP design storage volume is in terms of runoff depth (in) from IA, an iterative process is undertaken:

Solution Iteration 1

For the first iteration (1), the BMP-Volume$_{ft^3}$ is converted into inches of runoff from the contributing impervious area (BMP Volume $_{(IA\text{-}in)1}$) using equation 3-5a.

$$\text{BMP Volume}_{(IA\text{-}in)1} = (48{,}155\ ft^2/\ 11.75\ acre) \times (12\ in/ft\ /43{,}560\ ft^2/acre)$$
$$= 1.13\ in$$

4-1) The total volume of runoff (ft^3) from the contributing PA (BMP Volume $_{PA\text{-}ft^3}$) for a rainfall size equal to the sum of BMP Volume $_{(IA\text{-}in)1}$ determined in step 3 is determined for each distinct pervious area identified in Table Example 3-4-B using the information from Table 3-3-1 and equation 3-5. Interpolation was used to determine runoff depths.

$$\text{BMP Volume}_{(PA\text{-}ft^3)1} = ((3.84\ acre \times (0.33\ in) + (0.96\ acre \times (0.13\ in)) \times 3{,}630\ ft^3/acre\text{-}in$$
$$= 5052\ ft^3$$

5-1) For iteration 1, the portion of BMP Volume that is available to treat runoff from only the IA is estimated by subtracting the BMP Volume $_{(PA\text{-}ft^3)1}$, determined in step 4-1, from BMP Volume$_{ft^3}$, determined in step 2, and converted to inches of runoff from IA:

$$\text{BMP Volume}_{(IA\text{-}ft^3)2} = 48{,}155\ ft^3 - 5052\ ft^3$$
$$= 43{,}103\ ft^3$$
$$\text{BMP Volume}_{(IA\text{-}in)2} = (43{,}103\ ft^3/11.75\ acre) \times (12\ in/ft \times 1\ acre/43{,}560\ ft^2)$$
$$= 1.01\ in$$

6-1) The % difference between BMP Volume $_{(IA\text{-}in)2}$, 1.01 in, and BMP Volume $_{(IA\text{-}in)1}$, 1.13 in is determined and found to be significantly greater than 5%:

$$\%\ \text{Difference} = ((1.13\ in - 1.01\ in)/1.01\ in) \times 100$$
$$= 12\%$$

Therefore, steps 4 through 6 are repeated starting with BMP Volume $_{(IA\text{-}in)2} = 1.01$ in.

Solution Iteration 2

4-2) $$\text{BMP-Volume}_{(PA\text{-}ft^3)2} = ((3.84\ acre \times 0.21\ in) + (0.96\ acre \times 0.12\ in)) \times 3{,}630\ ft^3/acre\text{-}in$$
$$= 3{,}358\ ft^3$$

5-2) $$\text{BMP-Volume}_{(IA\text{-}ft^3)3} = 48{,}155\ ft^3 - 3{,}358\ ft^3$$
$$= 44{,}797\ ft^3$$
$$\text{BMP-Volume}_{(IA\text{-}in)3} = (44{,}797\ ft^3/11.75\ acre) \times (12\ in/ft \times 1\ acre/43{,}560\ ft^2)$$
$$= 1.05\ in$$

Solution continued:

6-2) % Difference = ((1.05 in – 1.01 in)/1.05 in) x 100
= 4%

The difference of 4% is acceptable.

7) The % phosphorus load reduction for the infiltration basin (BMP Reduction $_{\%-P}$) is determined by using the infiltration basin performance curve for an infiltration rate of 0.27 in/hr and the treatment volume (BMP-Volume $_{\text{Net IA-in}}$ = 1.05 in) calculated in step 5-2 and is **BMP Reduction $_{\%-P}$ = 93%**.

The performance curve for IR = 0.27 is used rather than interpolating between the performance curves for IR = 0.27 in/hr and 0.52 in/hr to estimate performance for IR = 0.28 in/hr. An evaluation of the performance curves for IR = 0.27 in/hr and IR = 0.52 in/hr for a design storage volume of 1.05 in indicate a small difference in estimated performance (BMP Reduction $_{\%-P}$ = 93% for IR = 0.27 in/hr and BMP Reduction $_{\%-P}$ = 95% for IR = 0.52 in/hr).

8) The cumulative phosphorus load reduction in pounds of phosphorus (BMP-Reduction $_{\text{lbs-P}}$) for the proposed infiltration basin is calculated by using equation 3-2 with the BMP Load (as determined by the procedure in Attachment 1 to Appendix F) and the P $_{\text{target}}$ of 93%.

BMP-Reduction $_{\text{lbs-P}}$ = BMP Load x (P $_{\text{target}}$ /100) **(Equation 3-2)**

Using Table 1-1 from Attachment 1, the BMP load is calculated:

BMP Load = (IA x impervious cover phosphorus export loading rate for industrial)
+ (PA $_{\text{HSG D}}$ x pervious cover phosphorus export loading rate for HSG D)
+ (PA $_{\text{HSG C}}$ x pervious cover phosphorus export loading rate for HSG C)
= (11.75 acre x 1.8 lbs/acre/yr) + (3.84 acre x 0.7 lbs/acre/yr)
+ (0.96 acre x 0.4 lbs/acre/yr)
= 24.22 lbs/yr

BMP-Reduction $_{\text{lbs-P}}$ = 24.22 lbs/yr x 93/100 = **22.52 lbs**

Table 3-1

Infiltration Trench (IR = 0.17 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	14.7%	27.6%	48.6%	64.1%	74.9%	82.0%	91.6%	95.4%
Cumulative Phosphorus Load Reduction	18%	33%	57%	73%	83%	90%	97%	99%

Figure 3-1

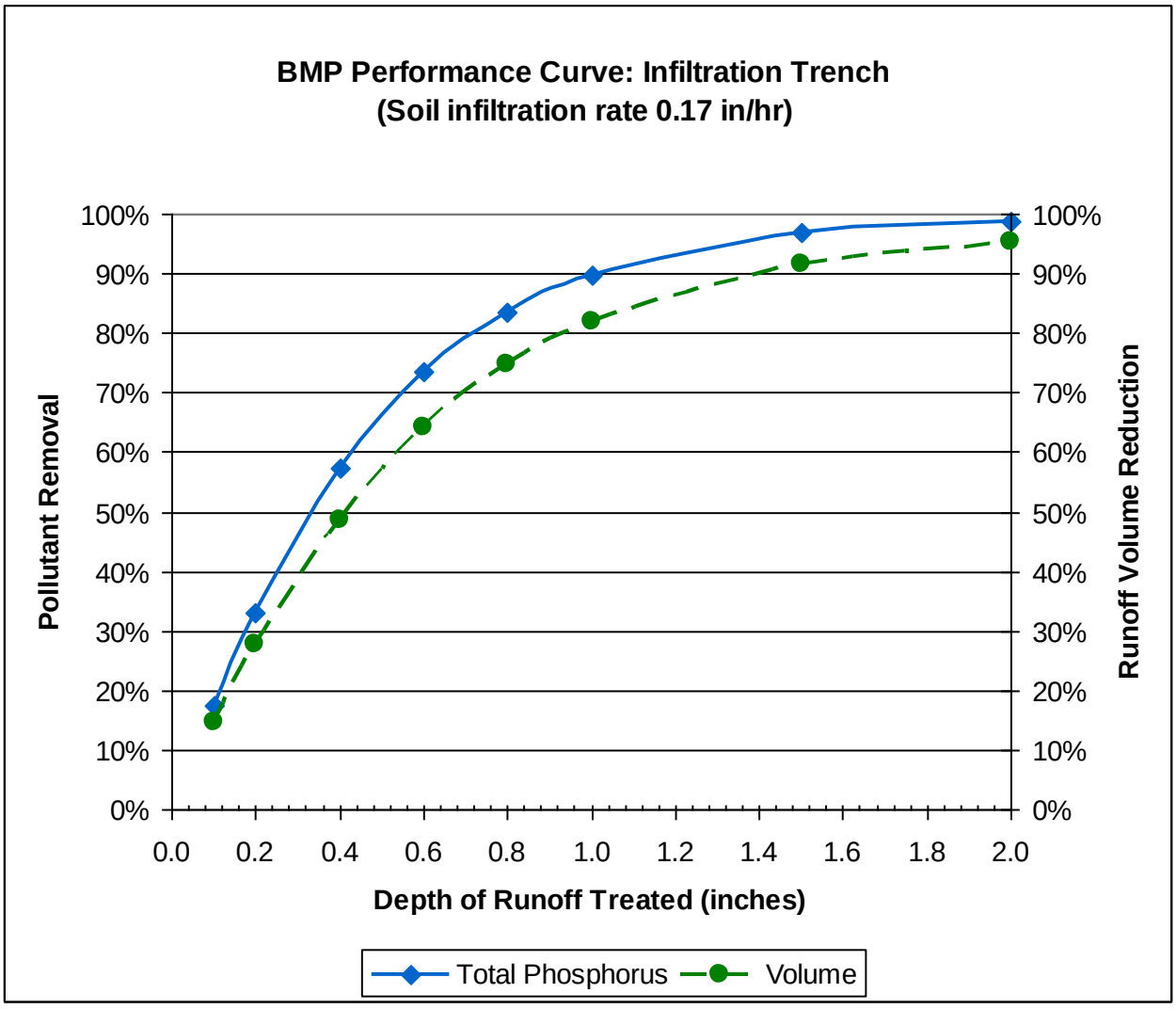


Table 3-2

Infiltration Trench (IR = 0.27 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	17.8%	32.5%	55.0%	70.0%	79.3%	85.2%	93.3%	96.3%
Cumulative Phosphorus Load Reduction	20%	37%	63%	78%	86%	92%	97%	99%

Figure 3-2

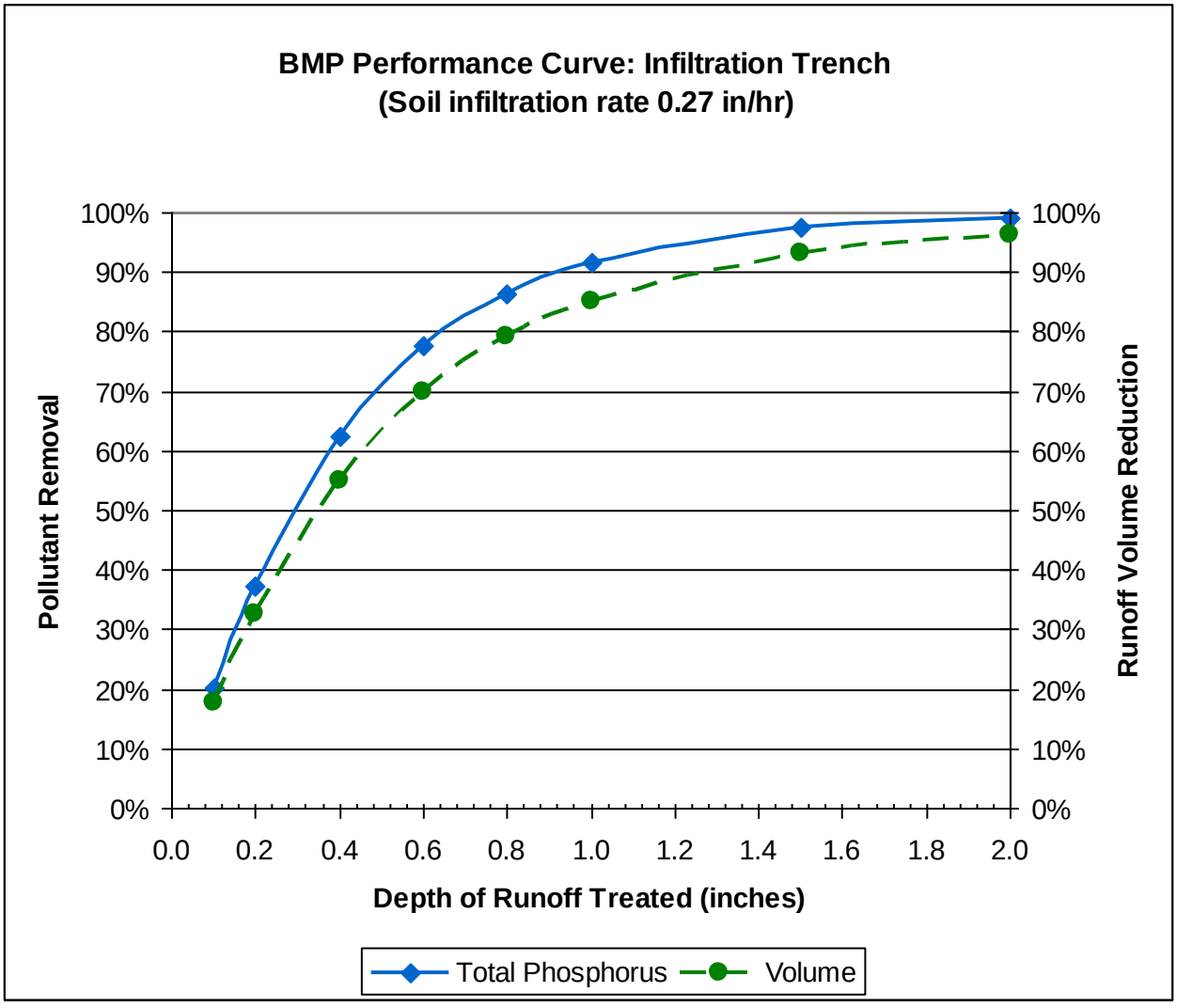


Table 3-3

Infiltration Trench (IR = 0.52 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	22.0%	38.5%	61.8%	75.7%	83.7%	88.8%	95.0%	97.2%
Cumulative Phosphorus Load Reduction	23%	42%	68%	82%	89%	94%	98%	99%

Figure 3-3

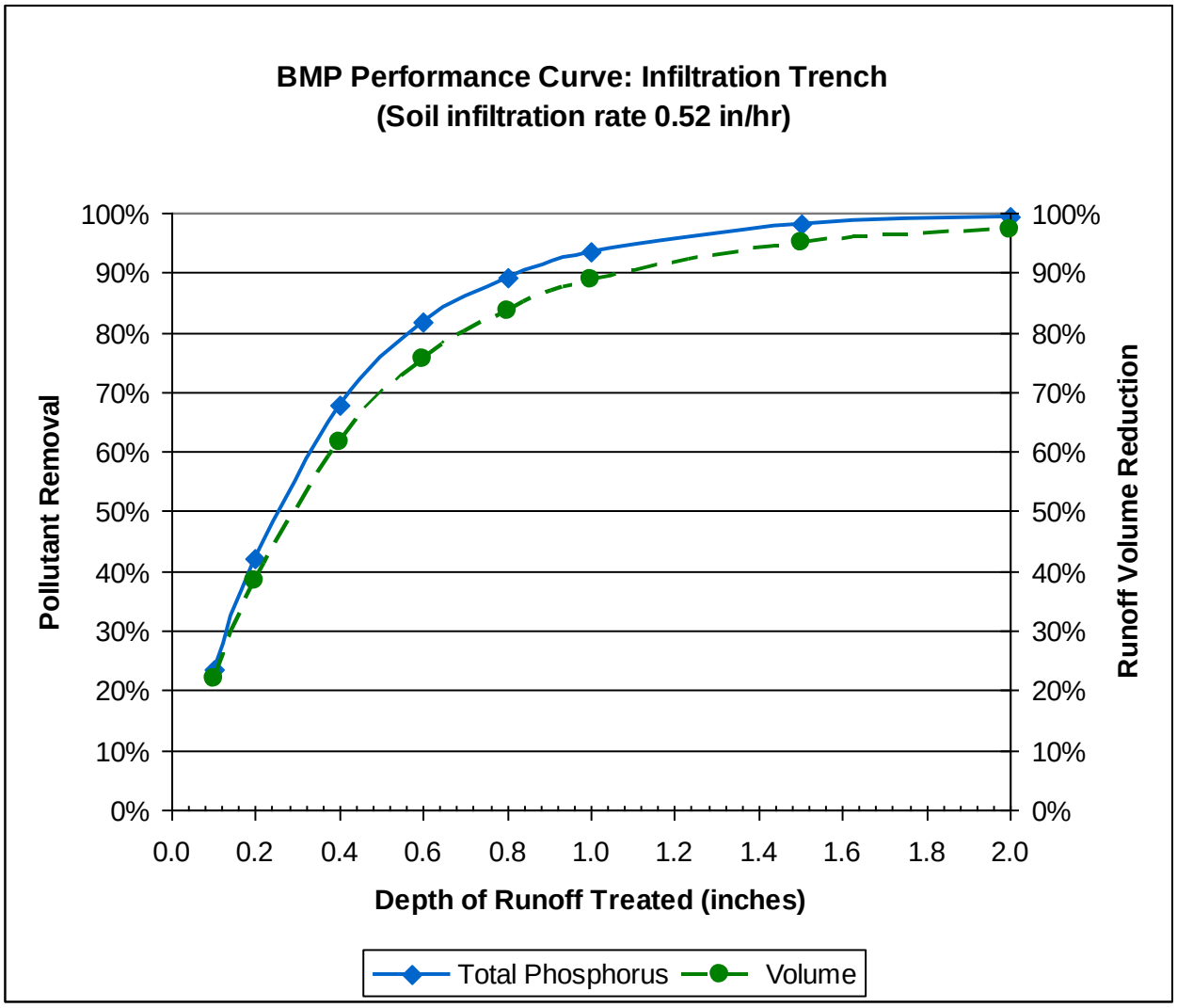


Table 3-4

Infiltration Trench (IR = 1.02 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	26.3%	44.6%	68.2%	81.0%	88.0%	92.1%	96.5%	98.3%
Cumulative Phosphorus Load Reduction	27%	47%	73%	86%	92%	96%	99%	100%

Figure 3-4

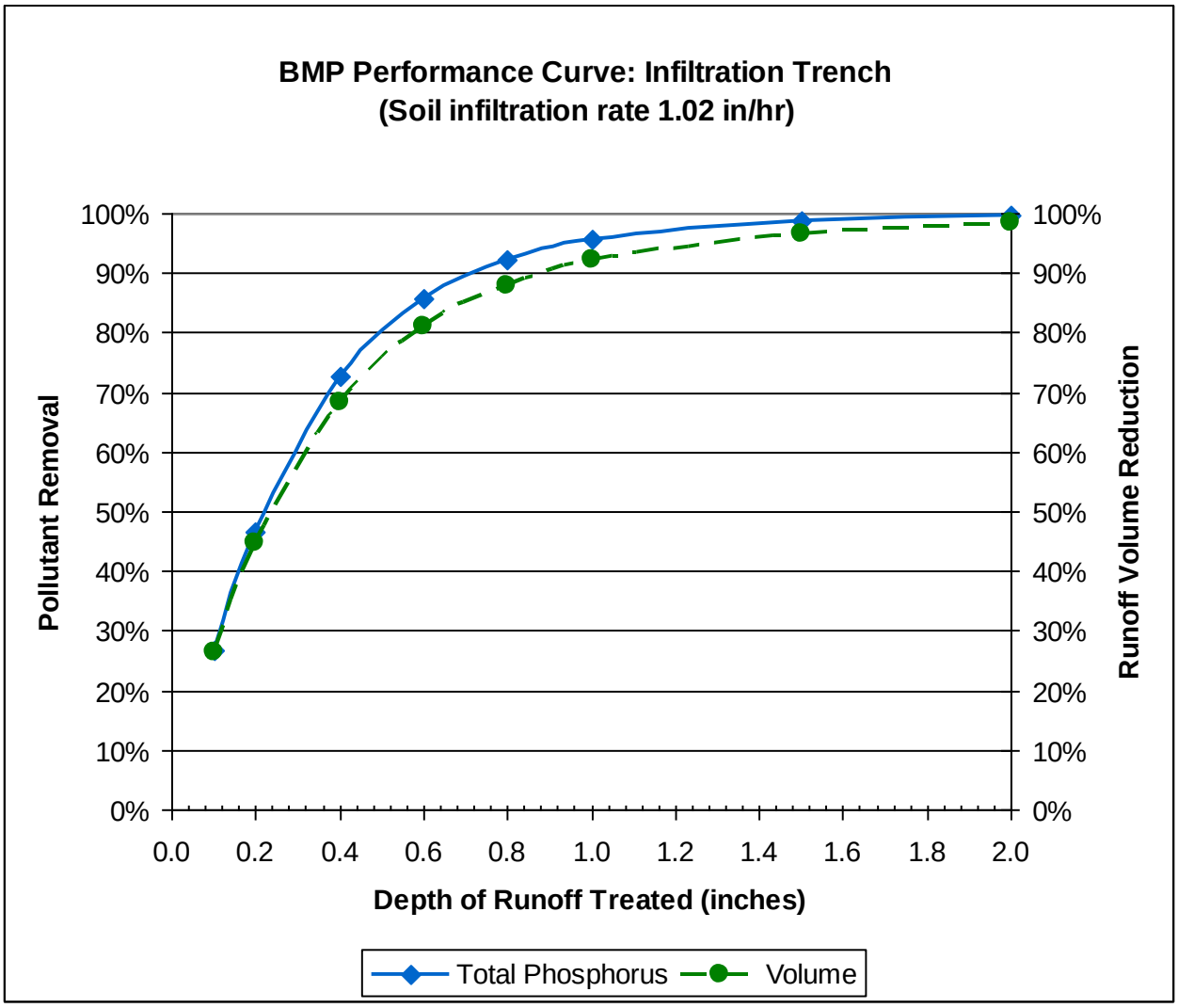


Table 3-5

Infiltration Trench (IR = 2.41 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	34.0%	54.7%	78.3%	88.4%	93.4%	96.0%	98.8%	99.8%
Cumulative Phosphorus Load Reduction	33%	55%	81%	91%	96%	98%	100%	100%

Figure 3-5

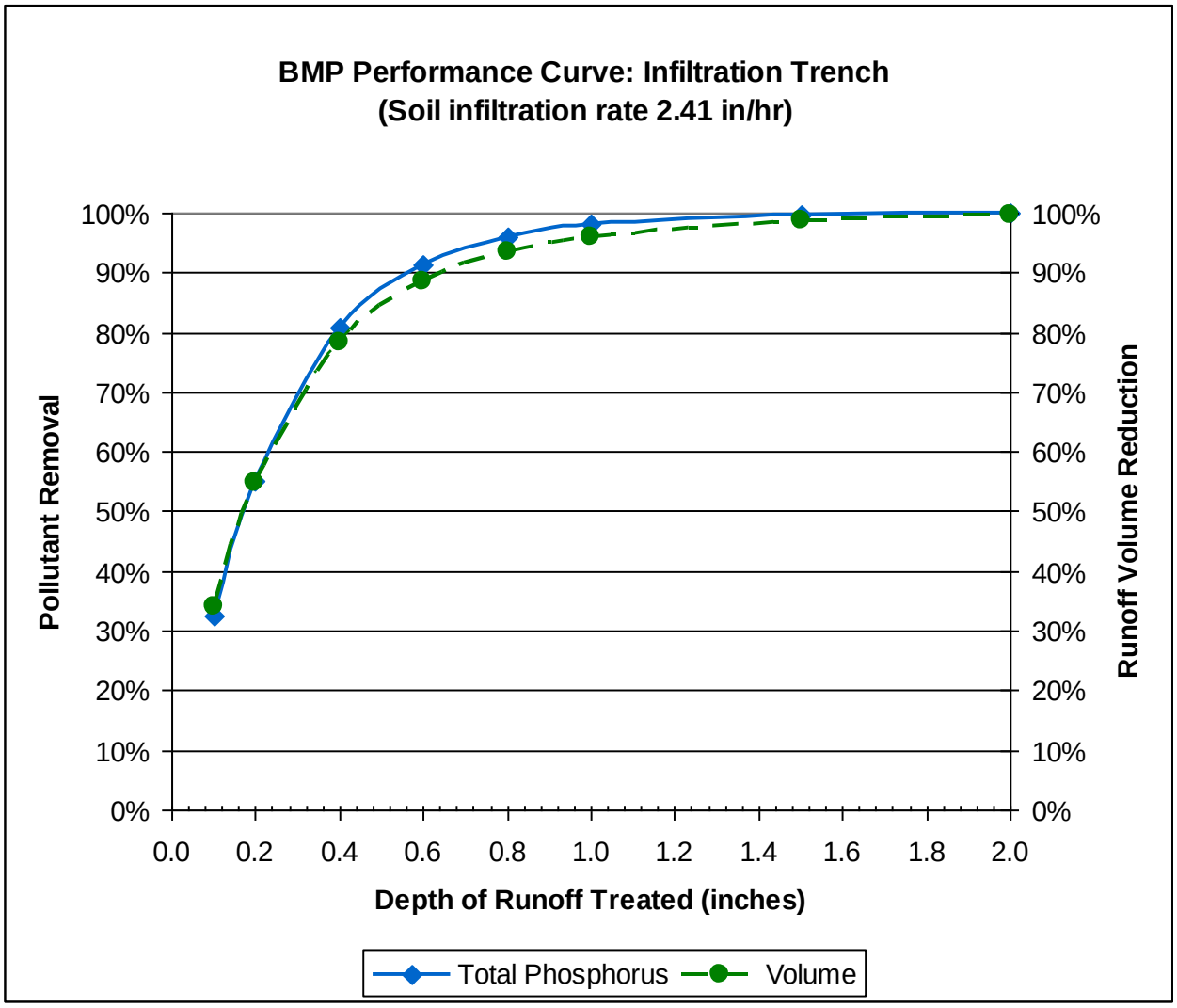


Table 3-6

Infiltration Trench (8.27 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	53.6%	76.1%	92.6%	97.2%	98.9%	99.5%	100.0%	100.0%
Cumulative Phosphorus Load Reduction	50%	75%	94%	98%	99%	100%	100%	100%

Figure 3-6

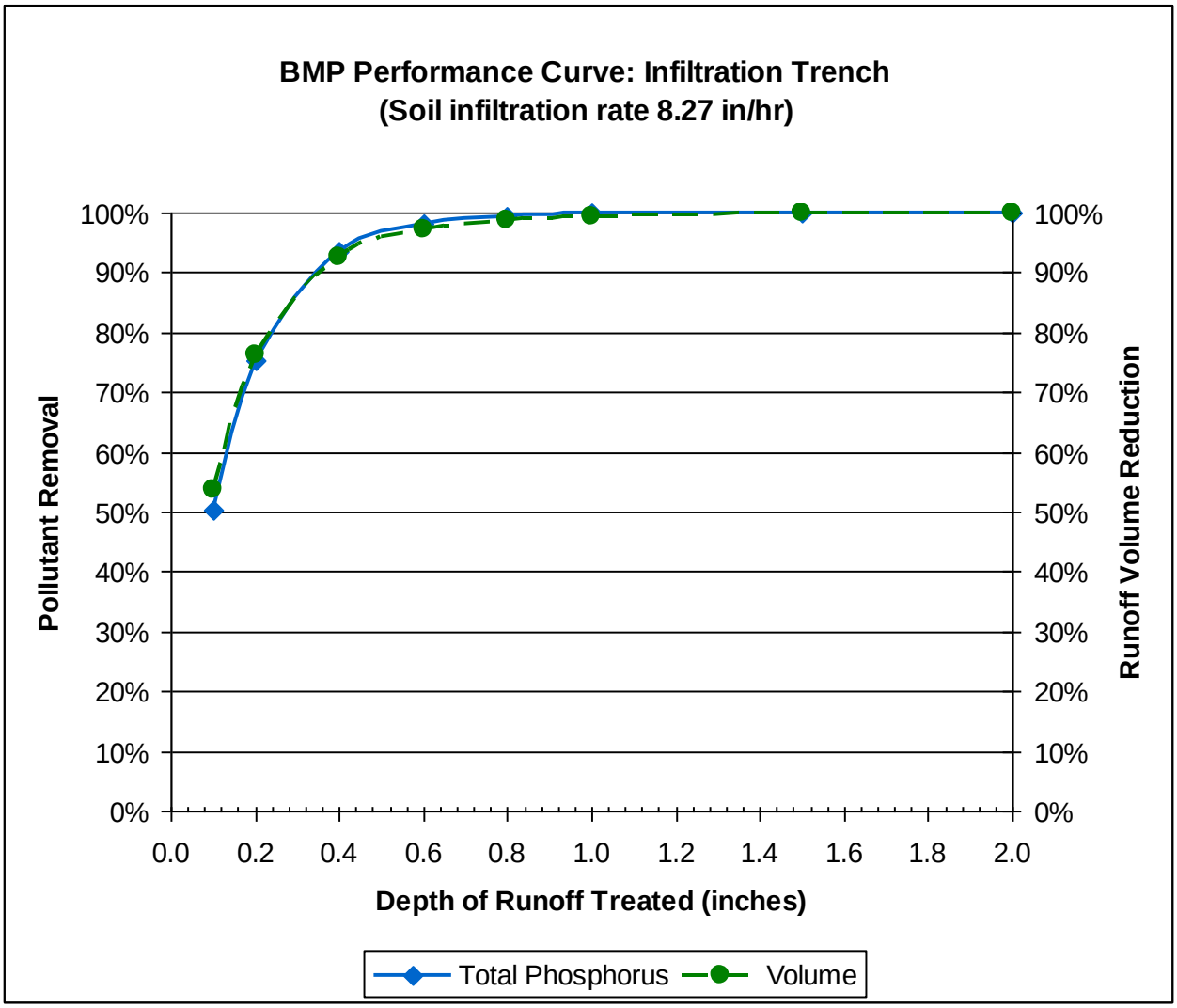


Table 3-7

Infiltration Basin (0.17 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	13.0%	24.6%	44.2%	59.5%	70.6%	78.1%	89.2%	93.9%
Cumulative Phosphorus Load Reduction	35%	52%	72%	82%	88%	92%	97%	99%

Figure 3-7

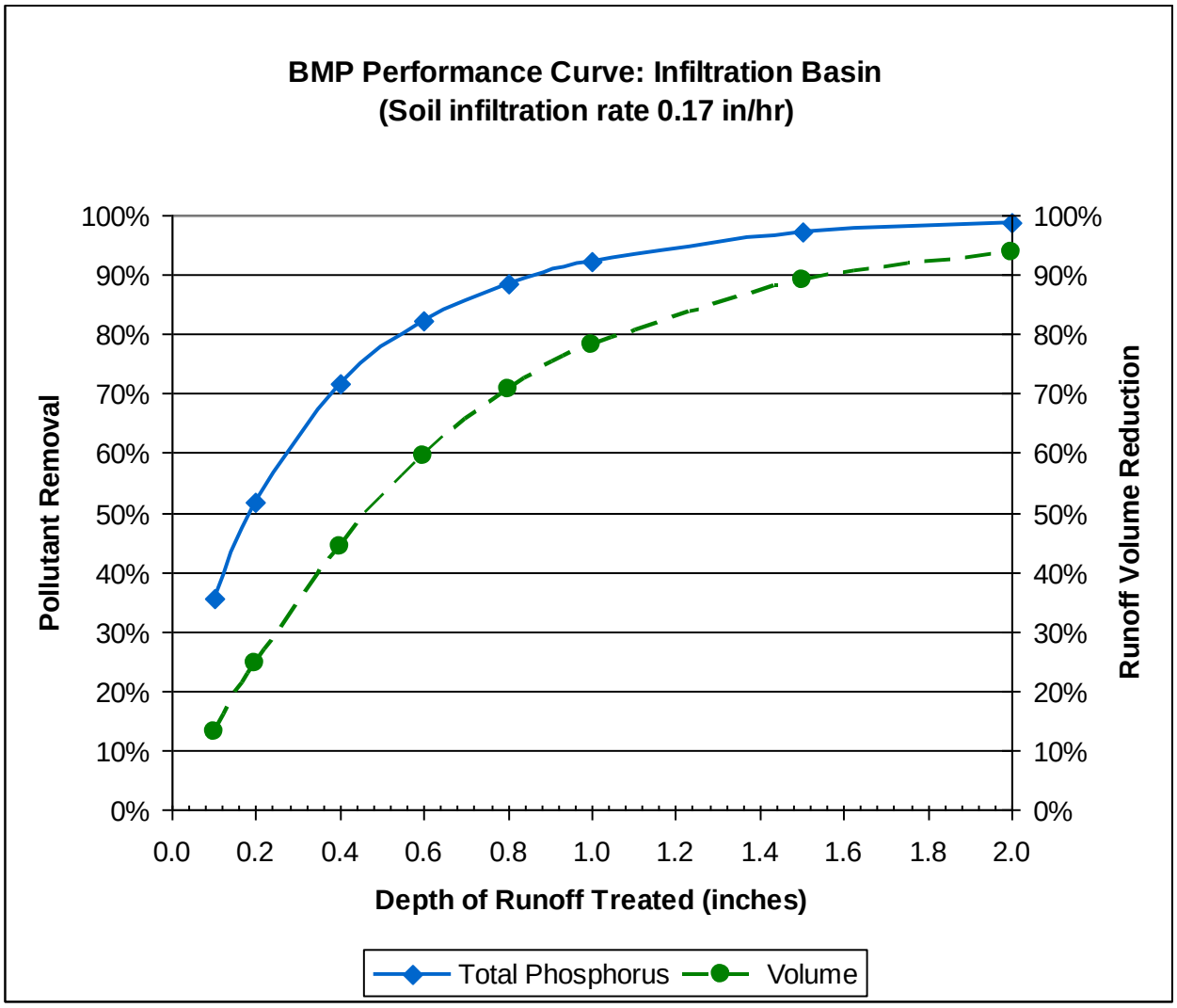


Table 3-8

Infiltration Basin (0.27 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	16.3%	29.8%	51.0%	66.0%	76.0%	82.4%	91.5%	95.2%
Cumulative Phosphorus Load Reduction	37%	54%	74 %	85%	90%	93%	98%	99%

Figure 3-8

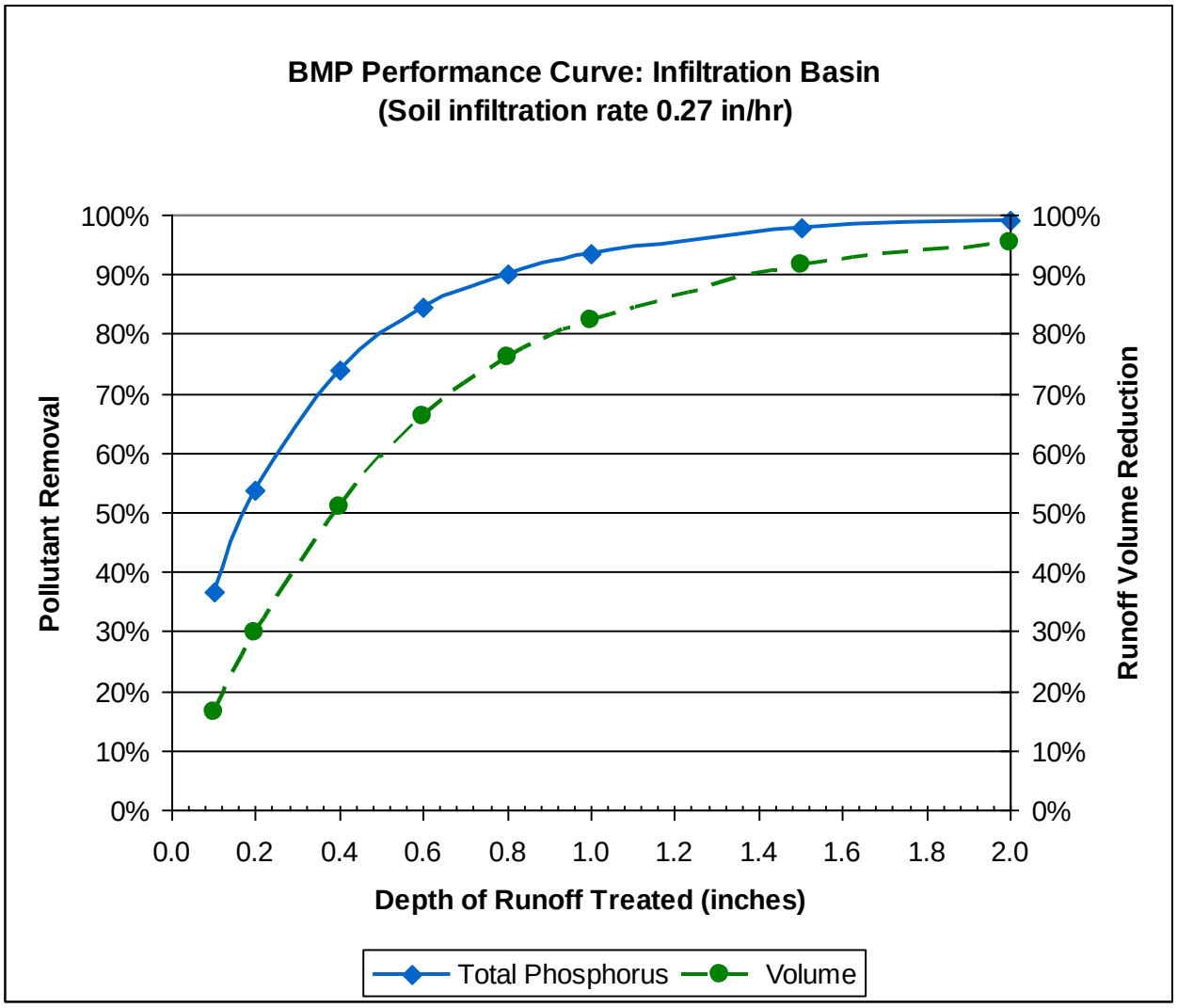


Table 3-9

Infiltration Basin (0.52 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	20.2%	35.6%	58.0%	72.6%	81.3%	86.9%	94.2%	96.7%
Cumulative Phosphorus Load Reduction	38%	56%	77%	87%	92%	95%	98%	99%

Figure 3-9

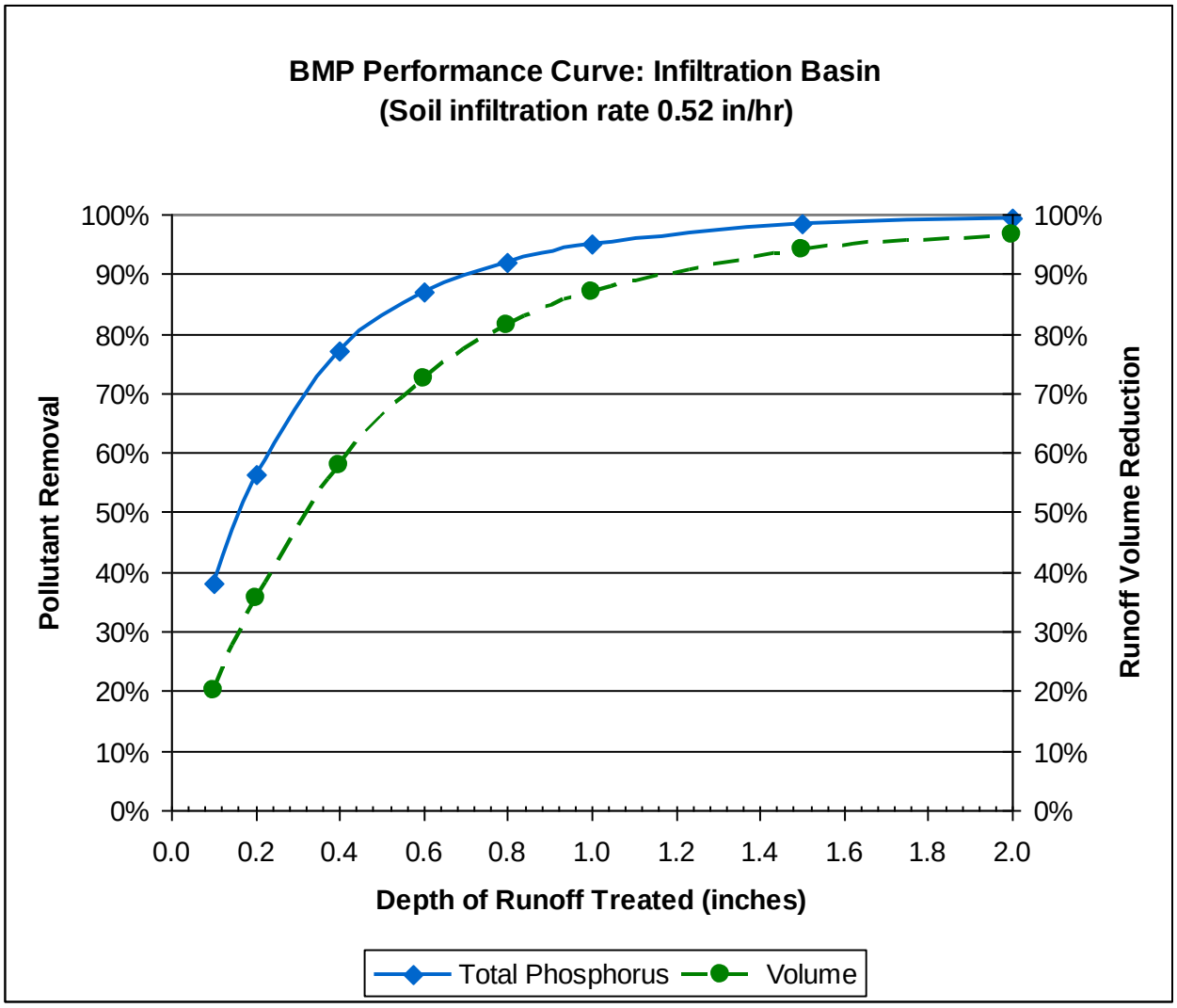


Table 3-10

Infiltration Basin (1.02 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	24.5%	42.0%	65.6%	79.4%	86.8%	91.3%	96.2%	98.1%
Cumulative Phosphorus Load Reduction	41%	60%	81%	90%	94%	97%	99%	100%

Figure 3-10

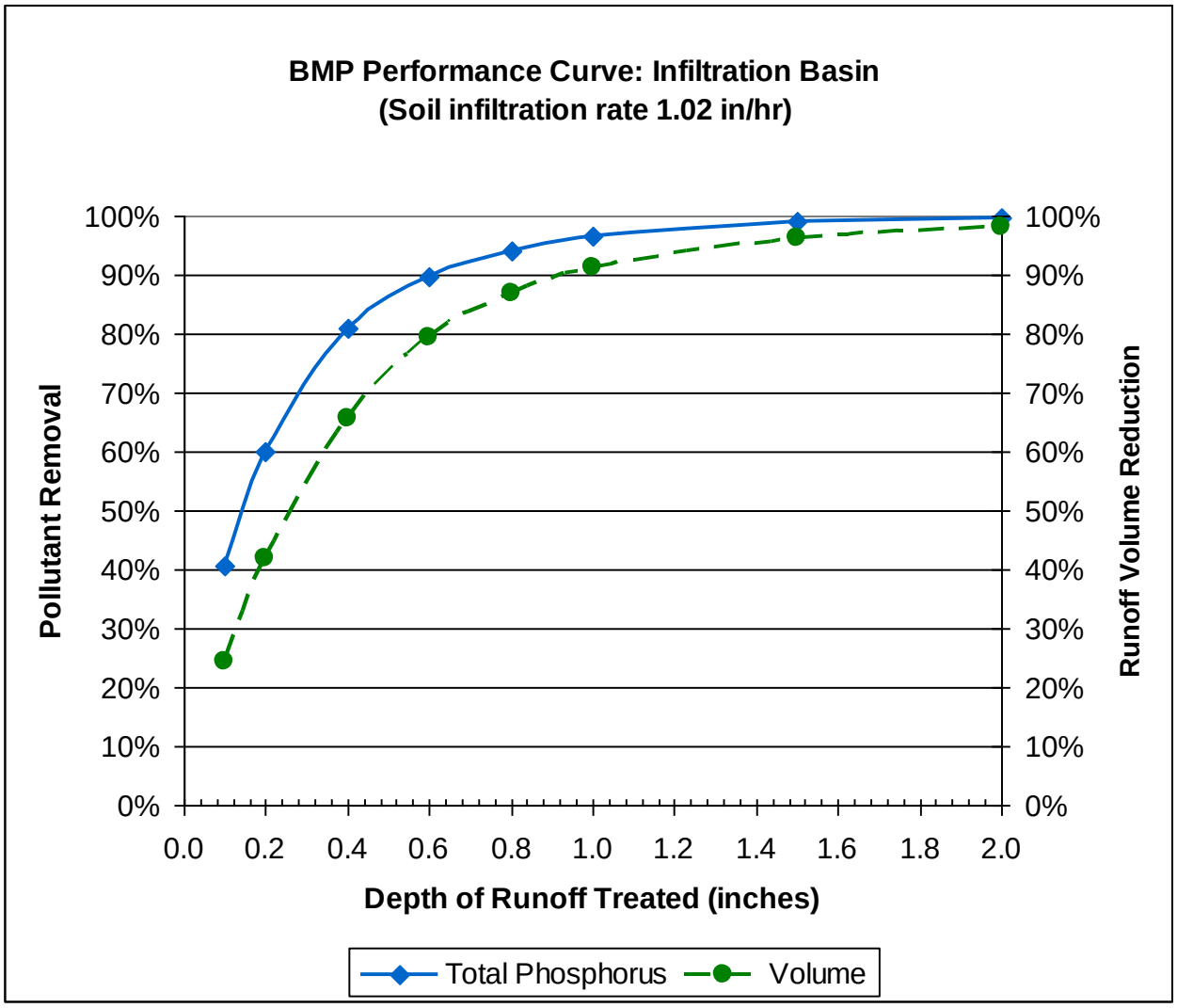


Table 3-11

Infiltration Basin (2.41 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	32.8%	53.8%	77.8%	88.4%	93.4%	96.0%	98.8%	99.8%
Cumulative Phosphorus Load Reduction	46%	67%	87%	94%	97%	98%	100%	100%

Figure 3-11

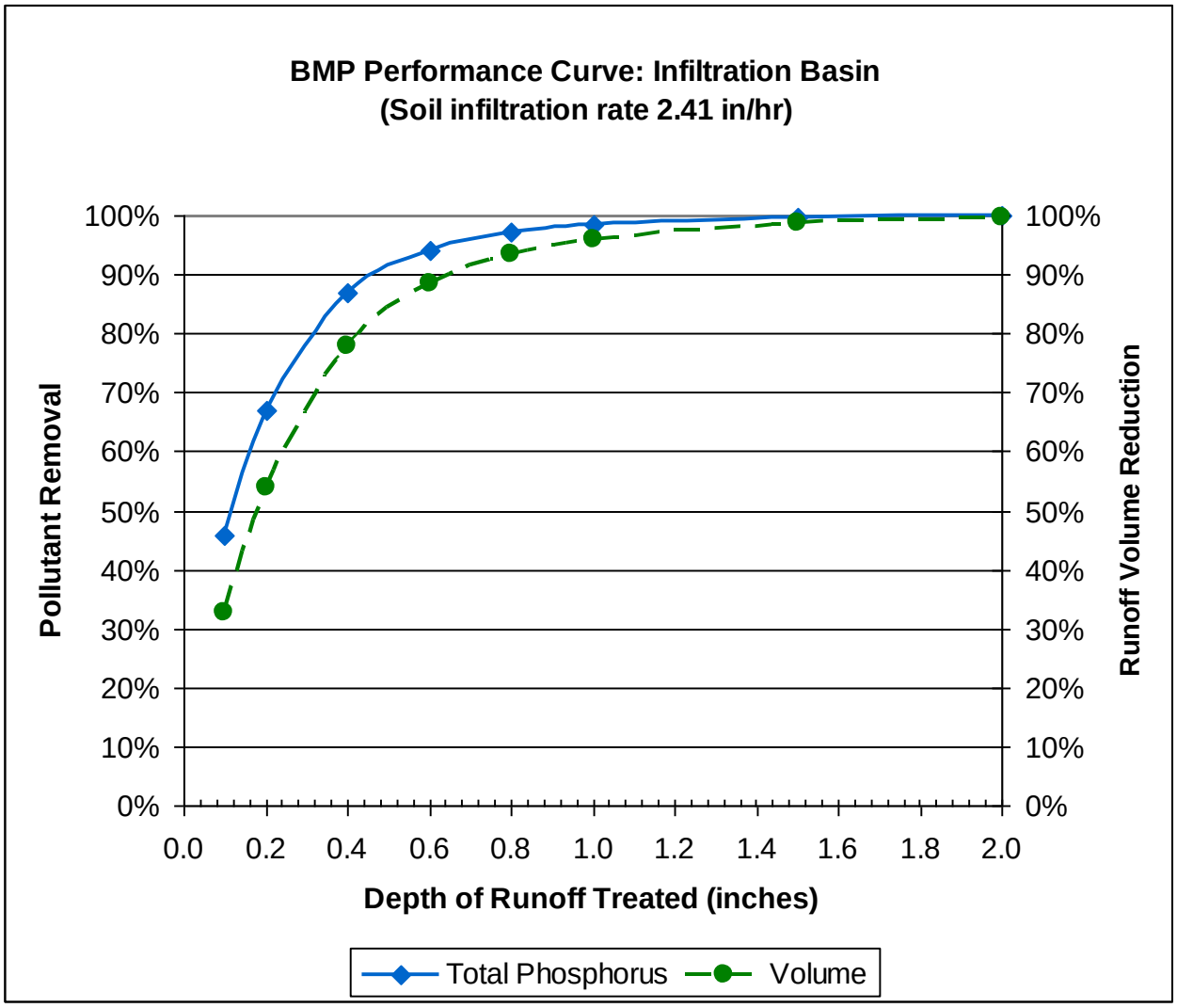


Table 3-12

Infiltration Basin (8.27 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	54.6%	77.2%	93.4%	97.5%	99.0%	99.6%	100.0%	100.0%
Cumulative Phosphorus Load Reduction	59%	81%	96%	99%	100%	100%	100%	100%

Figure 3-12

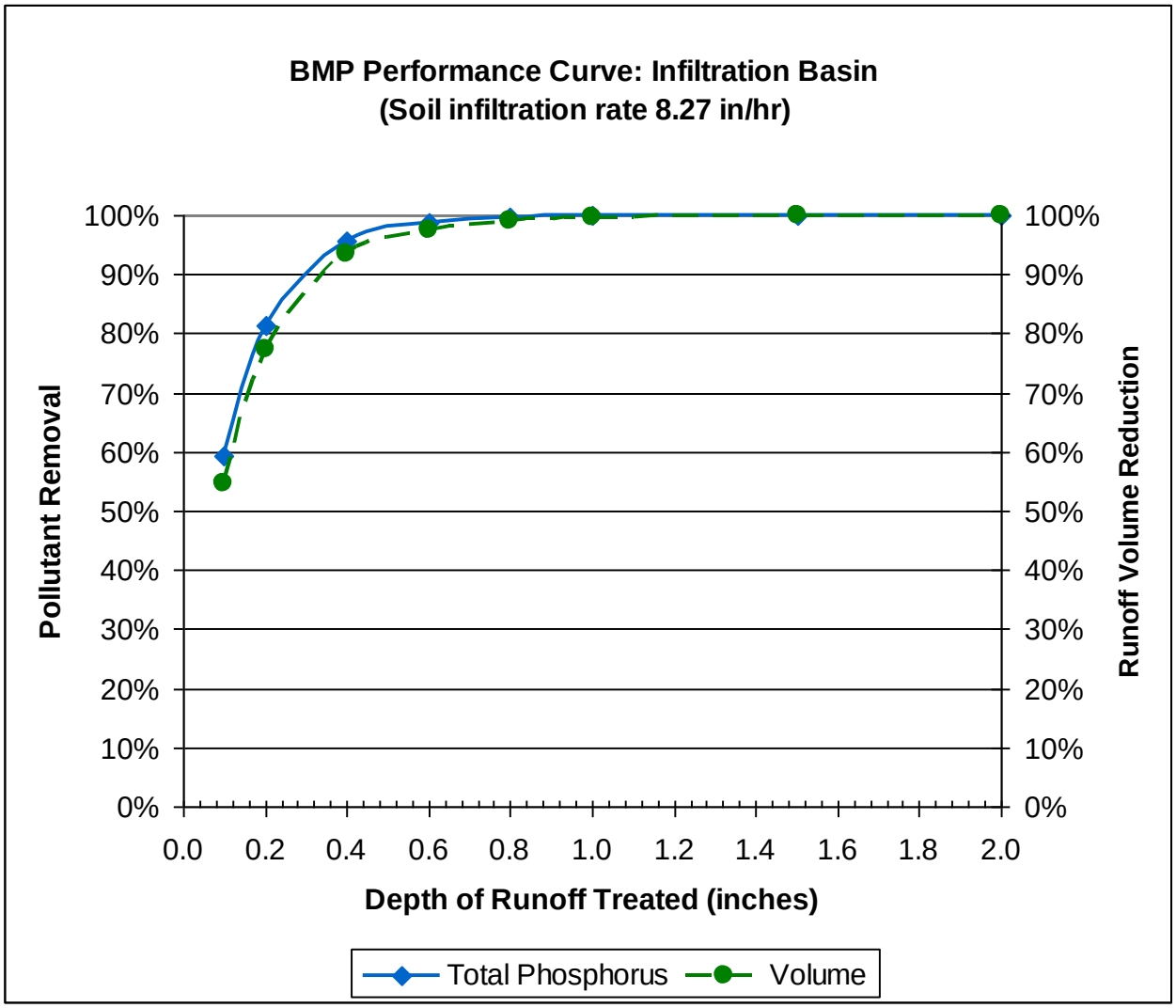


Table 3-13

Bioretention BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Cumulative Phosphorus Load Reduction	19%	34%	53%	64%	71%	76%	84%	89%

Figure 3-13

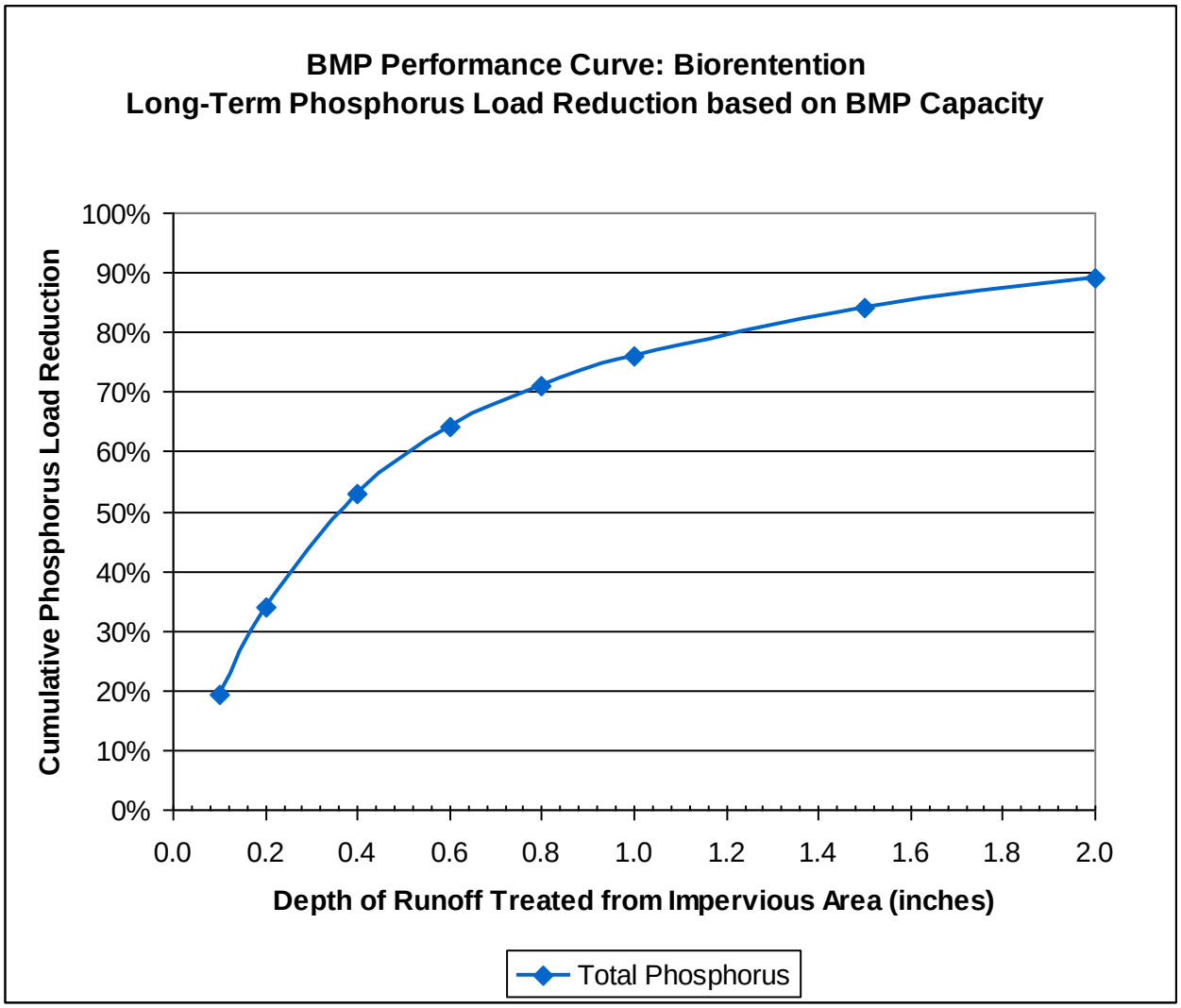


Table 3-14

Gravel Wetland BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Cumulative Phosphorus Load Reduction	19%	26%	41%	51%	57%	61%	65%	66%

Figure 3-14

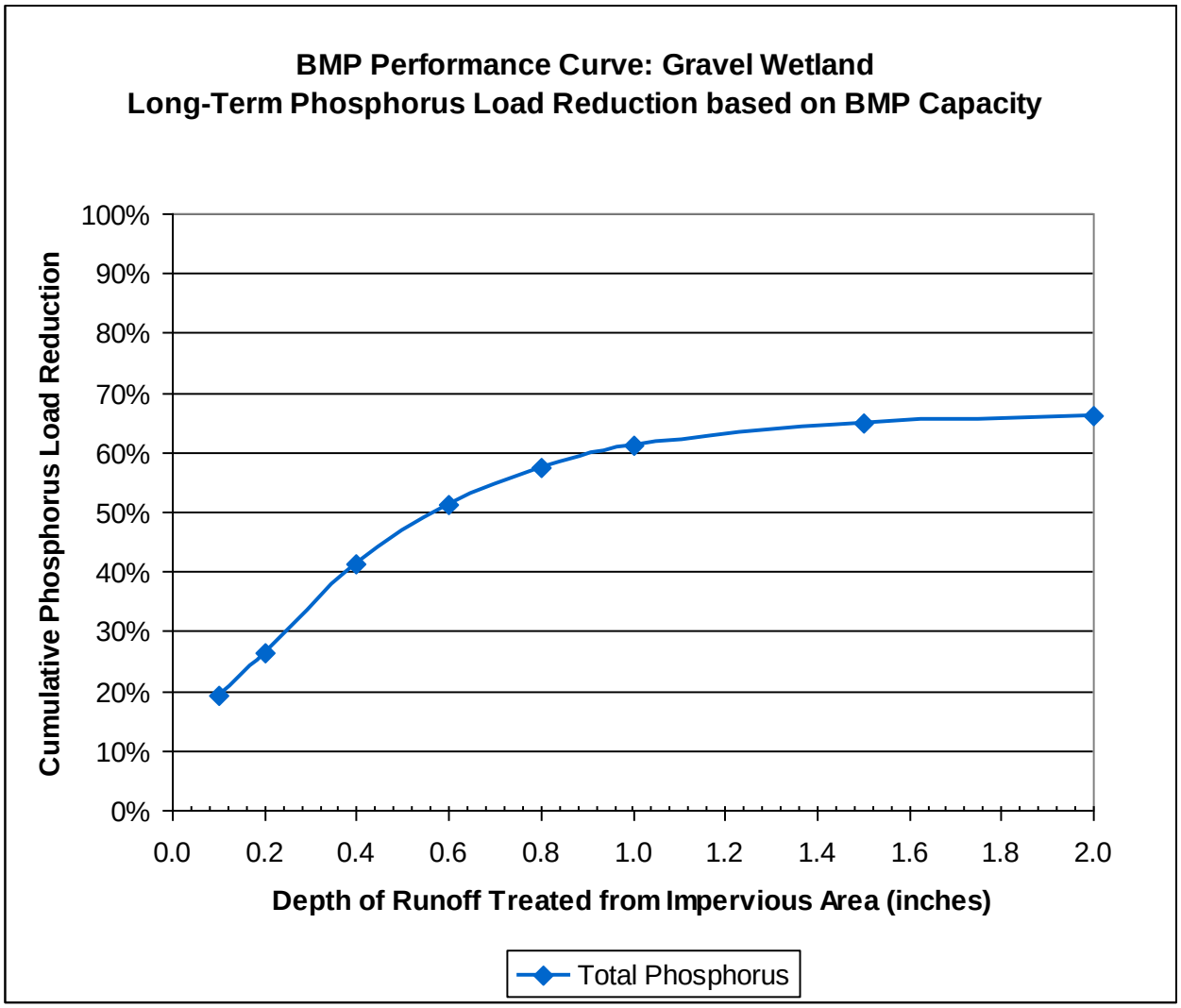


Table 3-15

Porous Pavement BMP Performance Table: Long-Term Phosphorus Load Reduction				
BMP Capacity: Depth of Filter Course Area (inches)	12.0	18.0	24.0	32.0
Cumulative Phosphorus Load Reduction	62%	70%	75%	78%

Figure 3-15

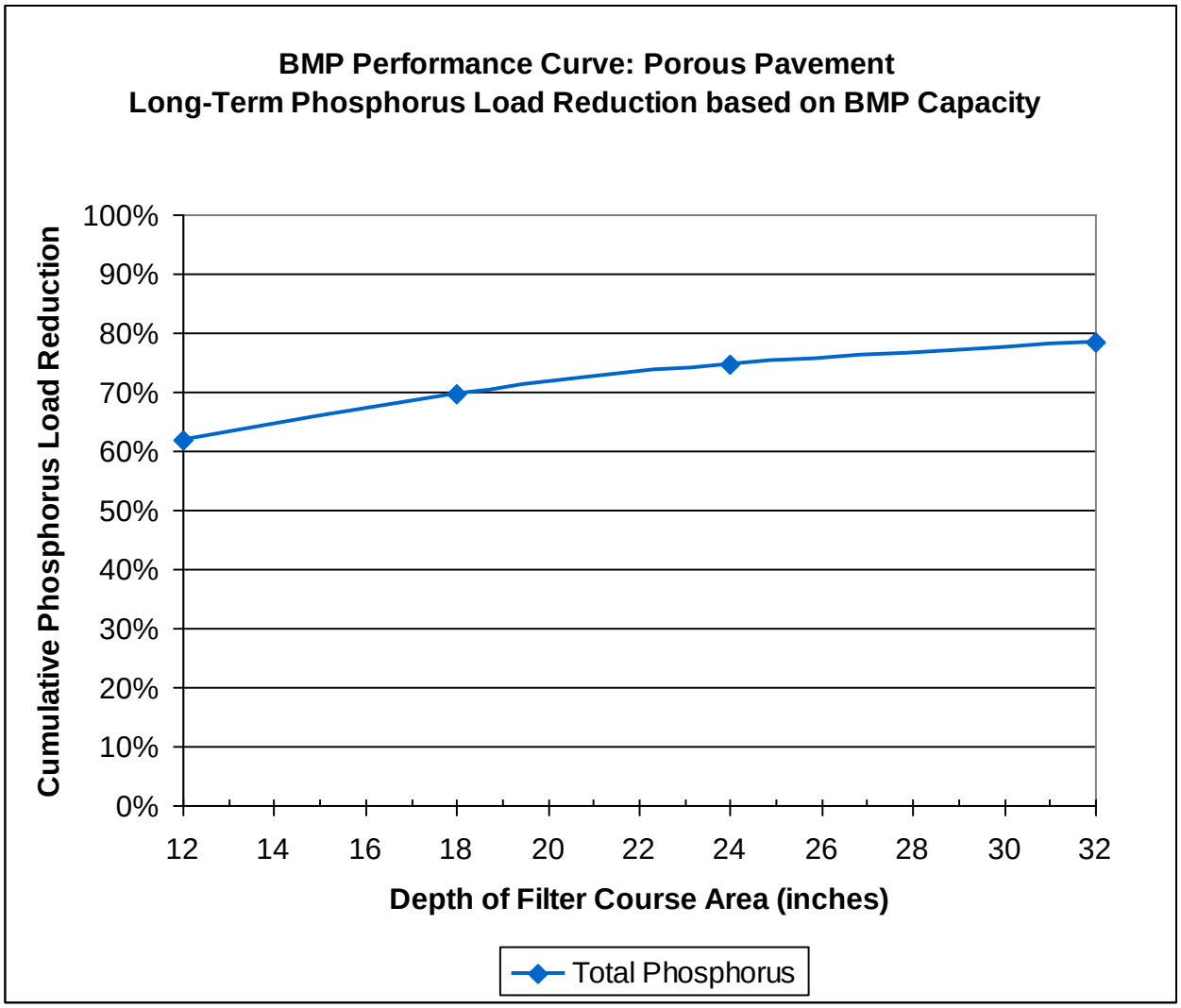


Table 3-16

Wet Pond BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Cumulative Phosphorus Load Reduction	14%	25%	37%	44%	48%	53%	58%	63%

Table 3-17

Dry Pond BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Cumulative Phosphorus Load Reduction	3%	6%	8%	9%	11%	12%	13%	14%

Figure 3-16

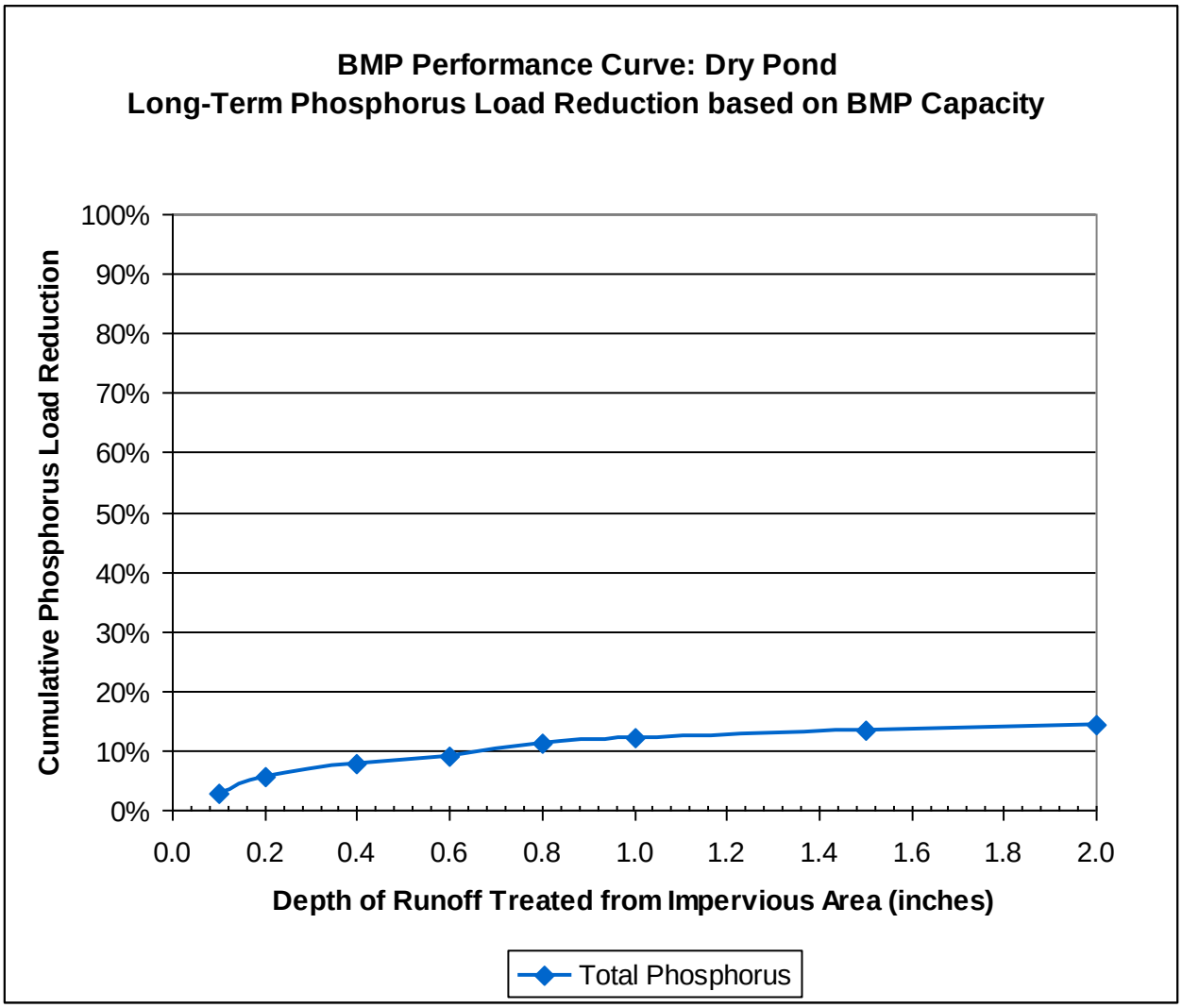


Table 3-18

Grass Swale BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Cumulative Phosphorus Load Reduction	2%	5%	9%	13%	17%	21%	29%	36%

Figure 3-17