

LETTER OF TRANSMITTAL

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TO: SECRETARY MATTHEW A. BEATON
 EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
 100 CAMBRIDGE STREET, SUITE 900
 BOSTON, MA 02114

DATE: Nov. 25, 2015 TRANS NO: 001
 JOB NO: 200-1301.02 Task 2C
 ATTN: MEPA Office
 RE: Nagog Pond Water Treatment Plant
 Environmental Notification Form

WE ARE SENDING YOU VIA FEDEX the following items:

- Prints Invoices Shop Drawings Specifications
 Reports Disk(s) Copy of Letter/Memo Other

COPIES	DATE	REVIEW	DESCRIPTION
2	11/2015	n/a	Nagog Pond Water Treatment Plant – Acton, Massachusetts – Environmental Notification Form (3-ring binder)
2	11/18/15	n/a	Nagog Pond Water Treatment Plant - Full Size Plans
1	11/2015	n/a	First Three Pages of Environmental Notification Form and Project Description

THESE ARE TRANSMITTED:

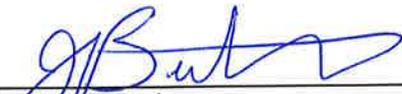
- For approval For your use As requested For Review & Comment

NOTES: Please find enclosed a complete Environmental Notification Form submittal for the Nagog Pond Water Treatment Plant project located on Skyline Drive in Acton, Massachusetts.

If you have any questions or require any additional information, please do not hesitate to contact Stephen Olson at 617-657-0200 or sco@envpartners.com.

ENVIRONMENTAL PARTNERS GROUP, INC.

Copy to: Refer to Appendix E of ENF for Distribution List
File



 Jeremy F. Butler
 Engineer

*Nagog Pond Water Treatment Plant
Acton, Massachusetts*

*Environmental Notification
Form*



*Prepared For:
Town of Concord
Public Works Department
November 2015*

Environmental  Partners
GROUP

A partnership for engineering solutions

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November 25, 2015

Secretary Matthew A. Beaton
Executive Office of Energy and Environmental Affairs
Attn: MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02114

RE: Environmental Notification Form
Nagog Pond Water Treatment Plant
Acton, Massachusetts

Dear Secretary Beaton:

On behalf of the Town of Concord's Water and Sewer Division, Environmental Partners Group, Inc. is submitting this Environmental Notification Form for the Nagog Pond Water Treatment Plant Design project in accordance with the Massachusetts Environmental Protection Agency (MEPA) Statute (M.G.L. Chapter 30 Section 61-62I) and MEPA Regulations (301 CMR 11.00). In addition to the Environmental Notification Form, this submittal includes the following attachments:

- Appendix A: Environmental Notification Form
- Appendix B: General Project Information Answers
- Appendix C: Environmental Notification Form Figures
- Appendix D: Permitting Design Plans
- Appendix E: Agencies Receiving ENF
- Appendix F: Stormwater Management Documents
- Appendix G: Wetlands Delineation Report
- Appendix H: Underwater Archaeological Resources Response Letter
- Appendix I: List of Municipal, State, and Federal Permit Requirements
- Appendix J: Public Notice of Environmental Review Form
-

Project Description

The Town of Concord is proposing to make comprehensive improvements and upgrades to its existing public water supply system infrastructure located in Acton. The proposed project includes replacement of the existing 16-inch cast iron intake pipe into Nagog Pond with a new 16-inch high density polyethylene (HDPE) intake pipe, replacement of the existing Ozone Disinfection Facility with a new Water Treatment Plant for the production of potable water, and the construction of an accessory solar photovoltaic (PV) array field to power the new facilities.

Water from Nagog Pond is obtained by means of an existing 16-inch diameter cast iron intake pipe (circa 1909). The intake pipe extends approximately 1,800 feet into Nagog Pond from the gate house at the dam and is partially supported by wooden cribbing. Physical inspections of the

intake pipe have indicated that it has significantly deteriorated, resulting in decreased hydraulic carrying capacity and risk of failure. Due to the condition of the existing intake pipe, the Town of Concord is proposing to replace it with a new 16-inch diameter HDPE pipe. The proposed replacement pipe will include the ability to draw water from two different levels and include an automated “air burst” cleaning system for the intake drum screens.

The proposed Nagog Pond Water Treatment Plant (WTP) will have the same hydraulic design capacity as the existing facility, 1.5 MGD. The proposed Nagog Pond WTP will utilize state of the art drinking water treatment technologies for the consistent production of high quality drinking water for Concord’s water system customers in both Concord and Acton. Several physical and chemical water treatment processes will be incorporated, including: pre-oxidation with potassium permanganate; coagulation with polyaluminum chloride; two-stage, tapered flocculation; clarification using dissolved air flotation (DAF); primary disinfection using ozone; filtration using granular activated carbon (GAC) media; pH adjustment using potassium hydroxide; corrosion control using zinc polyphosphate; secondary disinfection using sodium hypochlorite; and fluoridation using sodium fluoride.

The proposed treatment plant building is two stories having a site footprint of 7,165 square feet and a net floor space of 9,338 square feet. The exterior façade is proposed to be cement masonry unit (CMU) architectural block with sufficient windows to provide natural lighting. The building will house all of the treatment processes and equipment and ancillary support spaces such as a control room, water quality laboratory, and meeting room. The new building is much larger than the existing building due to the advanced treatment systems to be employed. The plan is to demolish the existing disinfection facility and build the new WTP within the same site footprint. This is essential as it will allow the new facilities to make use of the existing subsurface spaces which have been blasted out of the ledge. The project also includes the installation of additional underground utilities (natural gas, water, and cable TV), fencing, parking areas, stormwater drainage and handling systems, and widening of the existing access road to meet Fire Department access requirements.

To power the new facilities a solar PV system is also being proposed. The PV system is an essential accessory use and public benefit for the facility and general public, including residential and commercial establishments in Acton. There are several commercial businesses (48) and residences (22) along Great Road (Rt 2A) which receive their water service from the Town of Concord. Installation of the PV system will require clearing up to the 25 foot wetland buffer and installation of PV arrays up to the 50 foot wetland buffer. The areas to be altered are noted in the ENF Form (Appendix A).

Wetland Resources and Impacts to Wetlands Resource Areas

The wetland resources in the vicinity of the project area include Bordering Vegetated Wetland and an Outstanding Resource Water as determined by information provided through MassGIS and a wetland delineation performed by Pinebrook Consulting. The locations of the wetland resource areas adjacent to the project are presented on the project plans.

Replacement of the existing intake line will take place within the Outstanding Resource Water (Nagog Pond). The proposed intake line will be a 16” HDPE pipe that will traverse the bottom of Nagog Pond for approximately 2,530 feet. Due to the buoyancy of HDPE, concrete collars 30” wide by 30” tall by 12” thick will be used to restrain the pipe. The concrete collars will be

spaced approximately 10 feet apart along the entire length of the intake pipe, resulting in a total of approximately 253 concrete collars. These 253 concrete collars equates to an alteration of approximately 632.5 square feet of the pond bottom.

In addition to the concrete collars, there are areas along the proposed intake pipe route that may require dredging, approximately 1,080 feet. At a width of 4 feet, this represents an area of approximately 4,320 square feet and a potential volume of 425 cubic yards. These two proposed alterations of land under waterbodies represent a total alteration of less than 0.04% of the 12.27 million square feet of land under Nagog Pond. The installation of the intake pipe is an essential part of this project, as the existing intake line is significantly deteriorated and inhibiting the withdrawal capacity. If the intake pipe is not replaced, the Town of Concord would be at risk of not being able to meet their peak water demands, a situation that would be highly detrimental to public health.

The remainder of the project will take place in upland area, and a portion of the Vegetated Wetlands Buffer Zone. The total proposed alteration within the 100-ft buffer zone is approximately 46,602 square feet. This includes approximately 45,988 square feet for the proposed PV system. The Town of Concord is seeking a waiver from the Acton Conservation Commission associated with the 50-foot setback requirement for undisturbed vegetation and also a waiver from the 75-foot setback requirement for the edge of structures. The Town of Concord is proposing to clear the land within the PV area up to the 25-ft buffer, install a security fence no closer than 3 feet from the 25-ft buffer, and install the PV arrays no closer than the 50-ft buffer. The total area of PV arrays within the 75-ft buffer (and outside the 50-ft buffer) is approximately 5,347 square feet. A site plan showing the limits and extents of clearing, fencing, and the PV arrays are found in the design plans (Appendix D). The proposed fencing will include 6" of space underneath for wildlife passage.

The proposed PV system is considered to be a public benefit as it will provide a source of renewable energy both to power the proposed Nagog Pond WTP and the general public in Acton. As previously mentioned, the Concord water system serves numerous residences (22) and commercial businesses (48) in Acton, along the Great Road corridor. Although the buffer zone is proposed to be altered, the planned activities within the buffer zone are passive – solar photovoltaic arrays. The current area is wooded or forested, and after the PV system is installed the area will become meadow with PV arrays. The positive effects of clean, sustainable energy are of great importance and public benefit. The proposed project is being undertaken by the Town of Concord to conform with the principles of Envision™. Envision is a program and rating system for the measure of sustainability for public works projects. As energy demands rise and natural resources diminish, it is important now more than ever to seek out means for renewable energy. This is especially important for this proposed project since the enhanced treatment being employed at the Nagog Pond WTP is energy intensive, and will require a significant increase in electrical usage compared to the existing ozone disinfection facility.

The existing Nagog Pond Ozone Disinfection Facility does not conform with the Town of Acton setback requirements of the 75-ft wetland buffer for structures. At its closest point, the existing building is 70 feet from the wetland boundary. Due to significant site constraints, the new building is proposed to be 65 feet from the wetland boundary (closer than existing by 5 feet). A review of the enclosed design plans indicate that the proposed Nagog Pond WTP building is placed on the same footprint as the existing Ozone Disinfection Facility building. The northeast corners of the buildings are exactly the same, and the alignment on the site is exactly the same.

This design feature is to make full use of the underground excavations which were completed by blasting the site in 1995 for the construction of the existing facility. Soil borings completed in 1994 and 2015 confirm that the entire site is underlain with bedrock, the top of which is between 1 ft and 4 ft below the surface. For this reason, and based on the principles of Envision, it is essential to re-use the existing underground bedrock excavations to minimize the amount of blasting required and also benefit the project economics.

The 5-ft increase in the non-conforming setback of the structure is based on the required length of the proposed building. Alternative locations were assessed, but the options were limited due to presence of bedrock on the site. The size of the proposed Nagog Pond WTP has been reduced as much as possible without removing any key treatment processes, eliminating any ancillary functions, or violating building code requirements. In addition to the measures that were taken to reduce the building footprint, the new building will also be constructed on lands that are already developed, resulting in limited additional clearing required to erect the building.

All proposed disturbances and nonconformities have been reduced to the maximum extent possible. The benefits of clean drinking water and renewable energy are essential to quality of life and their importance is only going to increase with rising water and energy demands and fewer natural resources. All aspects of this project are essential to the greater good of society, the public benefit, and for setting the standard for the importance of sustainable infrastructure.

Proposed Environmental Protection Measures

In order to mitigate potential impacts to wetland resource areas during construction activities, the following environmental protection measures will be provided:

- Erosion and sedimentation control devices (i.e. filter sock) will be installed along the limits of work as shown on the design sheets and per the detail on Sheet CD-5. This measure will control sedimentation and erosion in the upland areas and also serve to define the upland limits of work. Erosion and sedimentation control devices will be inspected and maintained daily during the construction period.
- Silt sacks will be installed in all catch basins within and immediately adjacent to the work zone.
- Stockpiles of excavated material and aggregate materials (gravel, sand, and stone) are not anticipated to be maintained on-site. It is expected that these types of materials will be delivered on an as-needed basis. However, if stockpiling is required, then suitable erosion control measures will be employed including perimeter silt fencing.
- During construction, disturbed areas will be kept to a minimum, and all disturbed areas will be restored to pre-construction conditions with pavement or loamed and seeded after construction.
- Any trench dewatering required during construction shall pass through dewatering bags as shown on the design sheets.

If you should have any questions or require additional information, please do not hesitate to contact me at (617) 657-0255. I can also be reached via e-mail at sco@envpartners.com.

Very Truly Yours,
Environmental Partners Group, Inc.

Stephen C. Olson, P.E.
Sr. Project Manager

Appendix A: Environmental Notification Form
Appendix B: General Project Information Answers
Appendix C: Environmental Notification Form Figures
Appendix D: Permitting Design Plans
Appendix E: Agencies Receiving ENF
Appendix F: Stormwater Management Documents
Appendix G: Wetlands Delineation Report
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CC: Refer to Appendix E for Distribution List
File

APPENDIX A
ENVIRONMENTAL NOTIFICATION FORM

Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
Massachusetts Environmental Policy Act (MEPA) Office

Environmental Notification Form

For Office Use Only

EEA#: _____

MEPA Analyst: _____

The information requested on this form must be completed in order to submit a document electronically for review under the Massachusetts Environmental Policy Act, 301 CMR 11.00.

Project Name: Nagog Pond Water Treatment Plant		
Street Address: 180 & 182 Skyline Drive		
Municipality: Concord	Watershed: Nagog Pond	
Universal Transverse Mercator Coordinates:	Latitude: 42.505775 Longitude: 71.446768	
Estimated commencement date: February 2017	Estimated completion date: July 2018	
Project Type: WTP Construction	Status of project design: 50 %complete	
Proponent: Concord Public Works, Water & Sewer Division		
Street Address: 135 Keyes Road		
Municipality: Concord	State: MA	Zip Code: 01742
Name of Contact Person: Stephen C. Olson, P.E.		
Firm/Agency: Environmental Partners Group, Inc	Street Address: 1900 Crown Colony Drive, Suite 402	
Municipality: N/A	State: MA	Zip Code: 02169
Phone: 617-657-0200	Fax: 617-657-0201	E-mail: sco@envpartners.com

Does this project meet or exceed a mandatory EIR threshold (see 301 CMR 11.03)?
 Yes No

If this is an Expanded Environmental Notification Form (ENF) (see 301 CMR 11.05(7)) or a Notice of Project Change (NPC), are you requesting:

a Single EIR? (see 301 CMR 11.06(8)) Yes No
a Special Review Procedure? (see 301CMR 11.09) Yes No
a Waiver of mandatory EIR? (see 301 CMR 11.11) Yes No
a Phase I Waiver? (see 301 CMR 11.11) Yes No
(Note: Greenhouse Gas Emissions analysis must be included in the Expanded ENF.)

Which MEPA review threshold(s) does the project meet or exceed (see 301 CMR 11.03)?
11.03(4b4): Construction of a new WTP with >1 MGD capacity.
11.03(3b1c): Alteration of 1,000 or more sf of salt marsh or outstanding resource waters.

Which State Agency Permits will the project require?
All permits required: Chapter 91, U.S. Army Corps of Engineers Section 10/404 and 103, Notice of Intent, Order of Conditions, Bureau of Resource Protection – Water Supply, Hazardous Materials Licenses/Permits Resource Conservation and Recovery Act, State Environmental Code (Title 5), Historic Properties, Massachusetts State Building Code, Land Use Changes and of Water Supply Land, National Pollution Discharge Elimination System Construction Stormwater General Permit

Identify any financial assistance or land transfer from an Agency of the Commonwealth, including the Agency name and the amount of funding or land area in acres:

Summary of Project Size & Environmental Impacts	Existing	Change	Total
LAND			
Total site acreage	59.793		
New acres of land altered		1.697	
Acres of impervious area	.399	.281	.680
Square feet of new bordering vegetated wetlands alteration		0	
Square feet of new other wetland alteration		4,590	
Acres of new non-water dependent use of tidelands or waterways		0	
STRUCTURES			
Gross square footage	3,014	10,372	13,386
Number of housing units	0	0	0
Maximum height (feet)	17	13.5	30.5
TRANSPORTATION			
Vehicle trips per day	1.5	.1667	1.667
Parking spaces	3	2	5
WASTEWATER			
Water Use (Gallons per day)	0	20	20
Water withdrawal (GPD)	.75 MGD (3 months/year)	0 MGD	.75 MGD (continuously)
Wastewater generation/treatment (GPD)	0	20	20
Length of water mains (miles)	0	0	0
Length of sewer mains (miles)	0	0	0
<p>Has this project been filed with MEPA before? <input type="checkbox"/> Yes (EEA # _____) <input checked="" type="checkbox"/> No</p>			
<p>Has any project on this site been filed with MEPA before? <input checked="" type="checkbox"/> Yes (EEA # _____) <input type="checkbox"/> No</p>			

GENERAL PROJECT INFORMATION – all proponents must fill out this section

PROJECT DESCRIPTION:

Describe the existing conditions and land uses on the project site: Refer to Appendix B

Describe the proposed project and its programmatic and physical elements: Refer to Appendix B

NOTE: The project description should summarize both the project's direct and indirect impacts (including construction period impacts) in terms of their magnitude, geographic extent, duration and frequency, and reversibility, as applicable. It should also discuss the infrastructure requirements of the project and the capacity of the municipal and/or regional infrastructure to sustain these requirements into the future.

Describe the on-site project alternatives (and alternative off-site locations, if applicable), considered by the proponent, including at least one feasible alternative that is allowed under current zoning, and the reasons(s) that they were not selected as the preferred alternative:

Refer to Appendix B

NOTE: *The purpose of the alternatives analysis is to consider what effect changing the parameters and/or siting of a project, or components thereof, will have on the environment, keeping in mind that the objective of the MEPA review process is to avoid or minimize damage to the environment to the greatest extent feasible. Examples of alternative projects include alternative site locations, alternative site uses, and alternative site configurations.*

Summarize the mitigation measures proposed to offset the impacts of the preferred alternative:

Refer to Appendix B

If the project is proposed to be constructed in phases, please describe each phase:

Refer to Appendix B

AREAS OF CRITICAL ENVIRONMENTAL CONCERN:

Is the project within or adjacent to an Area of Critical Environmental Concern?

Yes (Specify _____)

No

if yes, does the ACEC have an approved Resource Management Plan? ___ Yes ___ No;

If yes, describe how the project complies with this plan.

Will there be stormwater runoff or discharge to the designated ACEC? ___ Yes ___ No;

If yes, describe and assess the potential impacts of such stormwater runoff/discharge to the designated ACEC.

RARE SPECIES:

Does the project site include Estimated and/or Priority Habitat of State-Listed Rare Species? (see http://www.mass.gov/dfwele/dfw/nhosp/regulatory_review/priority_habitat/priority_habitat_home.htm)

Yes (Specify _____) No

HISTORICAL /ARCHAEOLOGICAL RESOURCES:

Does the project site include any structure, site or district listed in the State Register of Historic Place or the inventory of Historic and Archaeological Assets of the Commonwealth?

Yes (Specify _____) No

If yes, does the project involve any demolition or destruction of any listed or inventoried historic or archaeological resources? Yes (Specify _____) No

WATER RESOURCES:

Is there an Outstanding Resource Water (ORW) on or within a half-mile radius of the project site? Yes No; if yes, identify the ORW and its location. Nagog Pond, Acton/Littleton

(NOTE: Outstanding Resource Waters include Class A public water supplies, their tributaries, and bordering wetlands; active and inactive reservoirs approved by MassDEP; certain waters within Areas of Critical Environmental Concern, and certified vernal pools. Outstanding resource waters are listed in the Surface Water Quality Standards, 314 CMR 4.00.)

Are there any impaired water bodies on or within a half-mile radius of the project site? Yes No; if yes, identify the water body and pollutant(s) causing the impairment: _____.

Is the project within a medium or high stress basin, as established by the Massachusetts Water Resources Commission? Yes No

STORMWATER MANAGEMENT:

Generally describe the project's stormwater impacts and measures that the project will take to comply with the standards found in MassDEP's Stormwater Management Regulations: Refer to Appendix F

MASSACHUSETTS CONTINGENCY PLAN:

Has the project site been, or is it currently being, regulated under M.G.L.c.21E or the Massachusetts Contingency Plan? site (including Release Tracking Number (RTN), cleanup phase, and Response Action Outcome classification): No

Is there an Activity and Use Limitation (AUL) on any portion of the project site? Yes No ; if yes, describe which portion of the site and how the project will be consistent with the AUL: _____.

Are you aware of any Reportable Conditions at the property that have not yet been assigned an RTN? Yes No ; if yes, please describe: _____

SOLID AND HAZARDOUS WASTE:

If the project will generate solid waste during demolition or construction, describe alternatives considered for re-use, recycling, and disposal of, e.g., asphalt, brick, concrete, gypsum, metal, wood: Please see Appendix B

(NOTE: Asphalt pavement, brick, concrete and metal are banned from disposal at Massachusetts landfills and waste combustion facilities and wood is banned from disposal at Massachusetts landfills. See 310 CMR 19.017 for the complete list of banned materials.)

Will your project disturb asbestos containing materials? Yes No ; if yes, please consult state asbestos requirements at <http://mass.gov/MassDEP/air/asbhom01.htm>

Describe anti-idling and other measures to limit emissions from construction equipment: Please see Appendix B

DESIGNATED WILD AND SCENIC RIVER:

Is this project site located wholly or partially within a defined river corridor of a federally designated Wild and Scenic River or a state designated Scenic River? Yes No ; if yes, specify name of river and designation:

If yes, does the project have the potential to impact any of the "outstandingly remarkable" resources of a federally Wild and Scenic River or the stated purpose of a state designated Scenic River? Yes No ; if yes, specify name of river and designation: _____;

if yes, will the project will result in any impacts to any of the designated "outstandingly remarkable" resources of the Wild and Scenic River or the stated purposes of a Scenic River. Yes No ;

if yes, describe the potential impacts to one or more of the "outstandingly remarkable" resources or stated purposes and mitigation measures proposed.

ATTACHMENTS:

1. List of all attachments to this document. **(Cover Letter, Attachment 1)**
2. U.S.G.S. map (good quality color copy, 8-½ x 11 inches or larger, at a scale of 1:24,000) indicating the project location and boundaries. **(Site Locus, Figure 1, Appendix C)**
3. Plan, at an appropriate scale, of existing conditions on the project site and its immediate environs, showing all known structures, roadways and parking lots, railroad rights-of-way, wetlands and water bodies, wooded areas, farmland, steep slopes, public open spaces, and major utilities. **(Nagog Pond Water Treatment Design Plans, Appendix D)**
4. Plan, at an appropriate scale, depicting environmental constraints on or adjacent to the project site such as Priority and/or Estimated Habitat of state-listed rare species, Areas of Critical Environmental Concern, Chapter 91 jurisdictional areas, Article 97 lands, wetland resource area delineations, water supply protection areas, and historic resources and/or districts. **(Environmental Constraints, Figure 2, Appendix C)**
5. Plan, at an appropriate scale, of proposed conditions upon completion of project (if construction of the project is proposed to be phased, there should be a site plan showing conditions upon the completion of each phase). **(Nagog Pond Water Treatment Plant Design Plans, Appendix D)**
6. List of all agencies and persons to whom the proponent circulated the ENF, in accordance with 301 CMR 11.16(2). **(ENF Distribution List, Appendix E)**
7. List of municipal and federal permits and reviews required by the project, as applicable. **(Appendix I)**

LAND SECTION – all proponents must fill out this section

I. Thresholds / Permits

A. Does the project meet or exceed any review thresholds related to **land** (see 301 CMR 11.03(1))
 Yes No; if yes, specify each threshold:

II. Impacts and Permits

A. Describe, in acres, the current and proposed character of the project site, as follows:

	<u>Existing</u>	<u>Change</u>	<u>Total</u>
Footprint of buildings	<u>0.03</u>	<u>0.146</u>	<u>0.176</u>
Internal roadways	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
Parking and other paved areas	<u>0.369</u>	<u>0.135</u>	<u>0.504</u>
Other altered areas	<u>0.714</u>	<u>1.697</u>	<u>2.411</u>
Undeveloped areas	<u>58.68</u>	<u>-1.978</u>	<u>56.702</u>
Total: Project Site Acreage	<u>59.793</u>	<u>0</u>	<u>59.793</u>

B. Has any part of the project site been in active agricultural use in the last five years?
 Yes No; if yes, how many acres of land in agricultural use (with prime state or locally important agricultural soils) will be converted to nonagricultural use?

C. Is any part of the project site currently or proposed to be in active forestry use?
 Yes No; if yes, please describe current and proposed forestry activities and indicate whether any part of the site is the subject of a forest management plan approved by the Department of Conservation and Recreation:

D. Does any part of the project involve conversion of land held for natural resources purposes in accordance with Article 97 of the Amendments to the Constitution of the Commonwealth to any purpose not in accordance with Article 97? Yes No; if yes, describe:

E. Is any part of the project site currently subject to a conservation restriction, preservation restriction, agricultural preservation restriction or watershed preservation restriction? Yes No; if yes, does the project involve the release or modification of such restriction?
 Yes No; if yes, describe:

F. Does the project require approval of a new urban redevelopment project or a fundamental change in an existing urban redevelopment project under M.G.L.c.121A? Yes No; if yes, describe:

G. Does the project require approval of a new urban renewal plan or a major modification of an existing urban renewal plan under M.G.L.c.121B? Yes No ; if yes, describe:

III. Consistency

A. Identify the current municipal comprehensive land use plan
Title: Watershed Resource Protection Plan - Nagog Pond Date 2011

B. Describe the project's consistency with that plan with regard to:
1) economic development see below
2) adequacy of infrastructure see below
3) open space impacts see below
4) compatibility with adjacent land uses see below

C. Identify the current Regional Policy Plan of the applicable Regional Planning Agency (RPA)
RPA: Metropolitan Area Planning Council

Title: MetroFuture Date 2008

D. Describe the project's consistency with that plan with regard to:

- 1) economic development see below
- 2) adequacy of infrastructure see below
- 3) open space impacts see below

B. 1) The Watershed Resource Protection Plan (Protection Plan) does not include any requirements for economic development.

2) The Protection Plan also does not directly include a statement on adequacy of infrastructure. However, the purpose of the Protection Plan is to reduce contaminants within Nagog Pond for treatment purposes. The proposed project will reduce the need for such stringent protective measures due to the improved water treatment process, but maintaining the existing Protection Plan is recommended.

3) The Protection Plan does not include a statement in regards to open space impacts, but does include the reduced development requirements for lands within 400' of a surface water source. The proposed project is in compliance with this requirement because none of the work proposed will result in an increase in untreated runoff flowing towards Nagog Pond. Additionally, this requirement is in place because Nagog Pond is used as a public water source, which is a system that this project aims to improve.

4) The project is compatible with adjacent land uses because the majority of the adjacent land strictly acts as protected watershed lands to Nagog Pond. Though the project site will not be forested as the adjacent land is, the project site is already primarily developed and no additional untreated runoff will enter the watershed. Also, watershed protection would not be as prevalent if Nagog Pond did not serve as a public water source, making conformance of other lands dependent on the functionality of the water treatment plant as opposed to the project site requiring conformance with surrounding lands.

D. 1) MetroFuture intends to decrease economic development potential in areas slated for preservation. This project is consistent with that objective because all aspects of the project are meant to serve the public and are not meant to serve as a means of profit.

2) MetroFuture looks to have population growth centralized in areas with existing infrastructure and limiting work required to build new infrastructure. This project is consistent with that goal because the objective of this project is to improve existing facilities that are a key component of the Town of Concord's infrastructure. If the improvements of this project were to not be made, Concord would be at risk of having an infrastructure incapable of serving increases in population growth.

3) The only portion of this project with a significant alteration to open space is the installation of the photovoltaic arrays. Though MetroFuture seeks to reduce open space impacts, many of the key components of MetroFuture are related to renewable energy use/production. The installation of the photovoltaic arrays is in complete compliance with all energy goals outlined within the MetroFuture plan.

RARE SPECIES SECTION

I. Thresholds / Permits

- A. Will the project meet or exceed any review thresholds related to **rare species or habitat** (see 301 CMR 11.03(2))? ___ Yes X No; if yes, specify, in quantitative terms:

(NOTE: If you are uncertain, it is recommended that you consult with the Natural Heritage and Endangered Species Program (NHESP) prior to submitting the ENF.)

- B. Does the project require any state permits related to **rare species or habitat**? ___ Yes X No
- C. Does the project site fall within mapped rare species habitat (Priority or Estimated Habitat?) in the current Massachusetts Natural Heritage Atlas (attach relevant page)? ___ Yes X No.
- D. If you answered "No" to all questions A, B and C, proceed to the **Wetlands, Waterways, and Tidelands Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Rare Species section below.

II. Impacts and Permits

- A. Does the project site fall within Priority or Estimated Habitat in the current Massachusetts Natural Heritage Atlas (attach relevant page)? ___ Yes ___ No. If yes,
1. Have you consulted with the Division of Fisheries and Wildlife Natural Heritage and Endangered Species Program (NHESP)? ___ Yes ___ No; if yes, have you received a determination as to whether the project will result in the "take" of a rare species? ___ Yes ___ No; if yes, attach the letter of determination to this submission.
 2. Will the project "take" an endangered, threatened, and/or species of special concern in accordance with M.G.L. c.131A (see also 321 CMR 10.04)? ___ Yes ___ No; if yes, provide a summary of proposed measures to minimize and mitigate rare species impacts
 3. Which rare species are known to occur within the Priority or Estimated Habitat?
 4. Has the site been surveyed for rare species in accordance with the Massachusetts Endangered Species Act? ___ Yes ___ No
 4. If your project is within Estimated Habitat, have you filed a Notice of Intent or received an Order of Conditions for this project? ___ Yes ___ No; if yes, did you send a copy of the Notice of Intent to the Natural Heritage and Endangered Species Program, in accordance with the Wetlands Protection Act regulations? ___ Yes ___ No
- B. Will the project "take" an endangered, threatened, and/or species of special concern in accordance with M.G.L. c.131A (see also 321 CMR 10.04)? ___ Yes ___ No; if yes, provide a summary of proposed measures to minimize and mitigate impacts to significant habitat:

WETLANDS, WATERWAYS, AND TIDELANDS SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **wetlands, waterways, and tidelands** (see 301 CMR 11.03(3))? X Yes ___ No; if yes, specify, in quantitative terms:

Alteration of 1,000 or more sf of salt marsh or outstanding resource waters: The intake pipe installation will require approximately 4,683 SF of alteration to the land under Nagog Pond.

B. Does the project require any state permits (or a local Order of Conditions) related to **wetlands, waterways, or tidelands**? X Yes ___ No; if yes, specify which permit:

Work within the 100-foot buffer zone of land bordering vegetated wetland requires:
 Wetlands Protection Act Form 3 Notice of Intent
 Wetlands Protection Act Form 5 Order of Conditions

C. If you answered "No" to both questions A and B, proceed to the **Water Supply Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Wetlands, Waterways, and Tidelands Section below.

II. Wetlands Impacts and Permits

A. Does the project require a new or amended Order of Conditions under the Wetlands Protection Act (M.G.L. c.131A)? X Yes ___ No; if yes, has a Notice of Intent been filed? X Yes ___ No; if yes, list the date and MassDEP file number: November 18, 2015, CE-085-1188; if yes, has a local Order of Conditions been issued? ___ Yes X No; Was the Order of Conditions appealed? ___ Yes X No. Will the project require a Variance from the Wetlands regulations? X Yes ___ No.

B. Describe any proposed permanent or temporary impacts to wetland resource areas located on the project site:

Replacement of the existing intake pipe will require the installation of approximately 2,530 linear feet of the 16" HDPE pipe along the pond floor. Sections of the intake route will be dredged, resulting in a disturbed area of 4,320 square feet. Other sections of the pipe will not be dredged, however concrete collars will need to be placed every 10 feet on center. The total footprint of the area to be disturbed based on the concrete collars is 363 square feet.

C. Estimate the extent and type of impact that the project will have on wetland resources, and indicate whether the impacts are temporary or permanent:

<u>Coastal Wetlands</u>	<u>Area (square feet) or Length (linear feet)</u>	<u>Temporary or Permanent Impact?</u>
Land Under the Ocean	_____	_____
Designated Port Areas	_____	_____
Coastal Beaches	_____	_____
Coastal Dunes	_____	_____
Barrier Beaches	_____	_____
Coastal Banks	_____	_____
Rocky Intertidal Shores	_____	_____
Salt Marshes	_____	_____
Land Under Salt Ponds	_____	_____
Land Containing Shellfish	_____	_____
Fish Runs	_____	_____
Land Subject to Coastal Storm Flowage	_____	_____

Inland Wetlands

Bank (lf)	_____	_____
Bordering Vegetated Wetlands	_____	_____
Isolated Vegetated Wetlands	_____	_____
Land under Water	<u>4,683 SF</u>	<u>temporary & permanent</u>
Isolated Land Subject to Flooding	_____	_____
Bordering Land Subject to Flooding	_____	_____
Riverfront Area	_____	_____

D. Is any part of the project:

1. proposed as a **limited project**? ___ Yes X No; if yes, what is the area (in sf)? _____
2. the construction or alteration of a **dam**? ___ Yes X No; if yes, describe:
3. fill or structure in a **velocity zone** or **regulatory floodway**? ___ Yes X No
4. dredging or disposal of dredged material? X Yes ___ No; if yes, describe the volume of dredged material and the proposed disposal site:

Dredging will be required for installation of the intake pipe. The proposed volume to be dredged is 425 cubic yards and the majority of dredged material will be put back in place to cover the intake pipe. Any unused, clean material will be used as fill for this project.

5. a discharge to an **Outstanding Resource Water (ORW)** or an **Area of Critical Environmental Concern (ACEC)**? ___ Yes X No
6. subject to a wetlands restriction order? ___ Yes X No; if yes, identify the area (in sf):
7. located in buffer zones? X Yes ___ No; if yes, how much (in sf) 61,716

E. Will the project:

1. be subject to a local wetlands ordinance or bylaw? X Yes ___ No
2. alter any federally-protected wetlands not regulated under state law? ___ Yes X No; if yes, what is the area (sf)?

III. Waterways and Tidelands Impacts and Permits

A. Does the project site contain waterways or tidelands (including filled former tidelands) that are subject to the Waterways Act, M.G.L.c.91? X Yes ___ No; if yes, is there a current Chapter 91 License or Permit affecting the project site? ___ Yes X No; if yes, list the date and license or permit number and provide a copy of the historic map used to determine extent of filled tidelands:

B. Does the project require a new or modified license or permit under M.G.L.c.91? X Yes ___ No; if yes, how many acres of the project site subject to M.G.L.c.91 will be for non-water-dependent use? Current 0 Change 0 Total 0
If yes, how many square feet of solid fill or pile-supported structures (in sf)?

4,320 SF will be dredged for the placement of the intake pipe, plus an additional 363 SF of concrete collars resting on the pond floor.

C. For non-water-dependent use projects, indicate the following:

Area of filled tidelands on the site: _____

Area of filled tidelands covered by buildings: _____

For portions of site on filled tidelands, list ground floor uses and area of each use:

_____ Does the project include new non-water-dependent uses located over flowed tidelands?

Yes ___ No ___

Height of building on filled tidelands _____

Also show the following on a site plan: Mean High Water, Mean Low Water, Water-dependent Use Zone, location of uses within buildings on tidelands, and interior and exterior areas and facilities dedicated for public use, and historic high and historic low water marks.

D. Is the project located on landlocked tidelands? ___ Yes X No; if yes, describe the project's impact on the public's right to access, use and enjoy jurisdictional tidelands and describe measures the project will implement to avoid, minimize or mitigate any adverse impact:

E. Is the project located in an area where low groundwater levels have been identified by a municipality or by a state or federal agency as a threat to building foundations? ___ Yes X No; if yes, describe the project's impact on groundwater levels and describe measures the project will implement to avoid, minimize or mitigate any adverse impact:

F. Is the project non-water-dependent **and** located on landlocked tidelands **or** waterways or tidelands subject to the Waterways Act **and** subject to a mandatory EIR? ___ Yes X No;
(NOTE: If yes, then the project will be subject to Public Benefit Review and Determination.)

G. Does the project include dredging? X Yes ___ No; if yes, answer the following questions:

What type of dredging? Improvement X Maintenance Both

What is the proposed dredge volume, in cubic yards (cys) 425 CY

What is the proposed dredge footprint 1,080 length (ft) 4 width (ft) 1-6 depth (ft);

Will dredging impact the following resource areas?

Intertidal Yes___ No X; if yes, ___ sq ft

Outstanding Resource Waters Yes___ No X; if yes, ___ sq ft

Other resource area (i.e. shellfish beds, eel grass beds) Yes___ No X; if yes ___ sq ft

If yes to any of the above, have you evaluated appropriate and practicable steps to: 1) avoidance; 2) if avoidance is not possible, minimization; 3) if either avoidance or minimize is not possible, mitigation?

See Comprehensive Analysis of Practicable Alternatives.

If no to any of the above, what information or documentation was used to support this determination?

Provide a comprehensive analysis of practicable alternatives for improvement dredging in accordance with 314 CMR 9.07(1)(b). Physical and chemical data of the sediment shall be included in the comprehensive analysis.

See Appendix B for Comprehensive Analysis of Practicable Alternatives.

Sediment Characterization

Existing gradation analysis results? ___ Yes X No; if yes, provide results.

Existing chemical results for parameters listed in 314 CMR 9.07(2)(b)6? ___ Yes X No; if yes, provide results.

Do you have sufficient information to evaluate feasibility of the following management options for dredged sediment? If yes, check the appropriate option.

All dredged material will be reused within the pond excavation or used as fill for other portions of this project.

Beach Nourishment ___

Unconfined Ocean Disposal ___

Confined Disposal:

Confined Aquatic Disposal (CAD) ____
Confined Disposal Facility (CDF) ____
Landfill Reuse in accordance with COMM-97-001 ____
Shoreline Placement ____
Upland Material Reuse ____
In-State landfill disposal ____
Out-of-state landfill disposal ____

(NOTE: This information is required for a 401 Water Quality Certification.)

IV. Consistency:

A. Does the project have effects on the coastal resources or uses, and/or is the project located within the Coastal Zone? ____ Yes X No; if yes, describe these effects and the projects consistency with the policies of the Office of Coastal Zone Management:

B. Is the project located within an area subject to a Municipal Harbor Plan? ____ Yes X No; if yes, identify the Municipal Harbor Plan and describe the project's consistency with that plan:

WATER SUPPLY SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **water supply** (see 301 CMR 11.03(4))? X Yes ___ No; if yes, specify, in quantitative terms:

Construction of a new drinking water treatment plant with a capacity of 1,000,000 or more gpd: Nagog Pond Water Treatment Plant will have a design capacity of 1,500,000 gpd and replace the existing treatment facility.

B. Does the project require any state permits related to **water supply**? X Yes ___ No; if yes, specify which permit:

Bureau of Resource Protection Water Supply 24 (BRP WS 24): Approval to Construct a Facility \geq 1 MGD

C. If you answered "No" to both questions A and B, proceed to the **Wastewater Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Water Supply Section below.

II. Impacts and Permits

A. Describe, in gallons per day (gpd), the volume and source of water use for existing and proposed activities at the project site:

	<u>Existing</u>	<u>Change</u>	<u>Total</u>
Municipal or regional water supply	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
Withdrawal from groundwater	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
Withdrawal from surface water	<u>1.5 MGD</u>	<u>0 MGD</u>	<u>1.5 MGD</u>
Interbasin transfer	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>

(NOTE: Interbasin Transfer approval will be required if the basin and community where the proposed water supply source is located is different from the basin and community where the wastewater from the source will be discharged.)

B. If the source is a municipal or regional supply, has the municipality or region indicated that there is adequate capacity in the system to accommodate the project? X Yes ___ No

C. If the project involves a new or expanded withdrawal from a groundwater or surface water source, has a pumping test been conducted? ___ Yes N/A No; if yes, attach a map of the drilling sites and a summary of the alternatives considered and the results. _____

D. What is the currently permitted withdrawal at the proposed water supply source (in gallons per day)? N/A Will the project require an increase in that withdrawal? ___ Yes X No; if yes, then how much of an increase (gpd)? _____

E. Does the project site currently contain a water supply well, a drinking water treatment facility, water main, or other water supply facility, or will the project involve construction of a new facility? ___ Yes ___ If yes, describe existing and proposed water supply facilities at the project site:

Existing: Nagog Pond Water Treatment Plant, 1.5 MGD capacity, 0.75 MGD average withdrawal, active 3 months of the year to meet seasonal peak water demands.

Proposed: Nagog Pond Water Treatment Plant, 1.5 MGD capacity, 0.75 MGD average withdrawal, operated continuously.

	<u>Permitted Flow</u>	<u>Existing Avg Daily Flow</u>	<u>Project Flow</u>	<u>Total</u>
Capacity of water supply well(s) (gpd)	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
Capacity of water treatment plant (gpd)	<u>N/A</u>	<u>.75 MGD</u>	<u>.75 MGD</u>	<u>.75 MGD</u>

F. If the project involves a new interbasin transfer of water, which basins are involved, what is the direction of the transfer, and is the interbasin transfer existing or proposed?

G. Does the project involve:

1. new water service by the Massachusetts Water Resources Authority or other agency of the Commonwealth to a municipality or water district? ___ Yes X No
2. a Watershed Protection Act variance? ___ Yes X No; if yes, how many acres of alteration?
3. a non-bridged stream crossing 1,000 or less feet upstream of a public surface drinking water supply for purpose of forest harvesting activities? ___ Yes X No

III. Consistency

Describe the project's consistency with water conservation plans or other plans to enhance water resources, quality, facilities and services:

Replacement of existing water treatment facility with new 1.5 MGD modern, treatment facility to produce water that meets current and future state and federal drinking water standards. An assessment of the existing treatment facilities indicates that compliance with future drinking water standards may be difficult to achieve, which may result in a situation of non-compliance with drinking water standards.

WASTEWATER SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **wastewater** (see 301 CMR 11.03(5))? ___ Yes X No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **wastewater**? ___ Yes X No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Transportation -- Traffic Generation Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Wastewater Section below.

II. Impacts and Permits

A. Describe the volume (in gallons per day) and type of disposal of wastewater generation for existing and proposed activities at the project site (calculate according to 310 CMR 15.00 for septic systems or 314 CMR 7.00 for sewer systems):

	<u>Existing</u>	<u>Change</u>	<u>Total</u>
Discharge of sanitary wastewater	_____	_____	_____
Discharge of industrial wastewater	_____	_____	_____
TOTAL	_____	_____	_____

	<u>Existing</u>	<u>Change</u>	<u>Total</u>
Discharge to groundwater	_____	_____	_____
Discharge to outstanding resource water	_____	_____	_____
Discharge to surface water	_____	_____	_____
Discharge to municipal or regional wastewater facility	_____	_____	_____
TOTAL	_____	_____	_____

B. Is the existing collection system at or near its capacity? ___ Yes ___ No; if yes, then describe the measures to be undertaken to accommodate the project's wastewater flows:

C. Is the existing wastewater disposal facility at or near its permitted capacity? ___ Yes ___ No; if yes, then describe the measures to be undertaken to accommodate the project's wastewater flows:

D. Does the project site currently contain a wastewater treatment facility, sewer main, or other wastewater disposal facility, or will the project involve construction of a new facility? ___ Yes ___ No; if yes, describe as follows:

	<u>Permitted</u>	<u>Existing Avg Daily Flow</u>	<u>Project Flow</u>	<u>Total</u>
Wastewater treatment plant capacity (in gallons per day)	_____	_____	_____	_____

E. If the project requires an interbasin transfer of wastewater, which basins are involved, what is the direction of the transfer, and is the interbasin transfer existing or new?

(NOTE: Interbasin Transfer approval may be needed if the basin and community where wastewater will be discharged is different from the basin and community where the source of water supply is located.)

F. Does the project involve new sewer service by the Massachusetts Water Resources Authority (MWRA) or other Agency of the Commonwealth to a municipality or sewer district? ___ Yes ___ No

G. Is there an existing facility, or is a new facility proposed at the project site for the storage, treatment, processing, combustion or disposal of sewage sludge, sludge ash, grit, screenings, wastewater reuse (gray water) or other sewage residual materials? ___ Yes ___ No; if yes, what is the capacity (tons per day):

	<u>Existing</u>	<u>Change</u>	<u>Total</u>
Storage	_____	_____	_____
Treatment	_____	_____	_____
Processing	_____	_____	_____
Combustion	_____	_____	_____
Disposal	_____	_____	_____

H. Describe the water conservation measures to be undertaken by the project, and other wastewater mitigation, such as infiltration and inflow removal.

III. Consistency

- A. Describe measures that the proponent will take to comply with applicable state, regional, and local plans and policies related to wastewater management:

- B. If the project requires a sewer extension permit, is that extension included in a comprehensive wastewater management plan? ___ Yes ___ No; if yes, indicate the EEA number for the plan and whether the project site is within a sewer service area recommended or approved in that plan:

TRANSPORTATION SECTION (TRAFFIC GENERATION)

I. Thresholds / Permit

A. Will the project meet or exceed any review thresholds related to **traffic generation** (see 301 CMR 11.03(6))? ___ Yes X No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **state-controlled roadways**? ___ Yes X No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Roadways and Other Transportation Facilities Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Traffic Generation Section below.

II. Traffic Impacts and Permits

A. Describe existing and proposed vehicular traffic generated by activities at the project site:

	<u>Existing</u>	<u>Change</u>	<u>Total</u>
Number of parking spaces	_____	_____	_____
Number of vehicle trips per day	_____	_____	_____
ITE Land Use Code(s):	_____	_____	_____

B. What is the estimated average daily traffic on roadways serving the site?

	<u>Roadway</u>	<u>Existing</u>	<u>Change</u>	<u>Total</u>
1.	_____	_____	_____	_____
2.	_____	_____	_____	_____
3.	_____	_____	_____	_____

C. If applicable, describe proposed mitigation measures on state-controlled roadways that the project proponent will implement:

D. How will the project implement and/or promote the use of transit, pedestrian and bicycle facilities and services to provide access to and from the project site?

C. Is there a Transportation Management Association (TMA) that provides transportation demand management (TDM) services in the area of the project site? ___ Yes ___ No; if yes, describe if and how will the project will participate in the TMA:

D. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation facilities? ___ Yes ___ No; if yes, generally describe:

E. If the project will penetrate approach airspace of a nearby airport, has the proponent filed a Massachusetts Aeronautics Commission Airspace Review Form (780 CMR 111.7) and a Notice of Proposed Construction or Alteration with the Federal Aviation Administration (FAA) (CFR Title 14 Part 77.13, forms 7460-1 and 7460-2)?

III. Consistency

Describe measures that the proponent will take to comply with municipal, regional, state, and federal plans and policies related to traffic, transit, pedestrian and bicycle transportation facilities and services:

TRANSPORTATION SECTION (ROADWAYS AND OTHER TRANSPORTATION FACILITIES)

I. Thresholds

A. Will the project meet or exceed any review thresholds related to **roadways or other transportation facilities** (see 301 CMR 11.03(6))? ___ Yes X No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **roadways or other transportation facilities**? ___ Yes X No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Energy Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Roadways Section below.

II. Transportation Facility Impacts

A. Describe existing and proposed transportation facilities in the immediate vicinity of the project site:

B. Will the project involve any

1. Alteration of bank or terrain (in linear feet)? _____
2. Cutting of living public shade trees (number)? _____
3. Elimination of stone wall (in linear feet)? _____

III. Consistency -- Describe the project's consistency with other federal, state, regional, and local plans and policies related to traffic, transit, pedestrian and bicycle transportation facilities and services, including consistency with the applicable regional transportation plan and the Transportation Improvements Plan (TIP), the State Bicycle Plan, and the State Pedestrian Plan:

ENERGY SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **energy** (see 301 CMR 11.03(7))?
___ Yes X No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **energy**? ___ Yes X No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Air Quality Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Energy Section below.

II. Impacts and Permits

A. Describe existing and proposed energy generation and transmission facilities at the project site:

	<u>Existing</u>	<u>Change</u>	<u>Total</u>
Capacity of electric generating facility (megawatts)	_____	_____	_____
Length of fuel line (in miles)	_____	_____	_____
Length of transmission lines (in miles)	_____	_____	_____
Capacity of transmission lines (in kilovolts)	_____	_____	_____

B. If the project involves construction or expansion of an electric generating facility, what are:

1. the facility's current and proposed fuel source(s)?
2. the facility's current and proposed cooling source(s)?

C. If the project involves construction of an electrical transmission line, will it be located on a new, unused, or abandoned right of way? ___Yes ___No; if yes, please describe:

D. Describe the project's other impacts on energy facilities and services:

III. Consistency

Describe the project's consistency with state, municipal, regional, and federal plans and policies for enhancing energy facilities and services:

AIR QUALITY SECTION

I. Thresholds

A. Will the project meet or exceed any review thresholds related to **air quality** (see 301 CMR 11.03(8))? ___ Yes X No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **air quality**? ___ Yes X No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Solid and Hazardous Waste Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Air Quality Section below.

II. Impacts and Permits

A. Does the project involve construction or modification of a major stationary source (see 310 CMR 7.00, Appendix A)? ___ Yes ___ No; if yes, describe existing and proposed emissions (in tons per day) of:

	<u>Existing</u>	<u>Change</u>	<u>Total</u>
Particulate matter	_____	_____	_____
Carbon monoxide	_____	_____	_____
Sulfur dioxide	_____	_____	_____
Volatile organic compounds	_____	_____	_____
Oxides of nitrogen	_____	_____	_____
Lead	_____	_____	_____
Any hazardous air pollutant	_____	_____	_____
Carbon dioxide	_____	_____	_____

B. Describe the project's other impacts on air resources and air quality, including noise impacts:

III. Consistency

A. Describe the project's consistency with the State Implementation Plan:

B. Describe measures that the proponent will take to comply with other federal, state, regional, and local plans and policies related to air resources and air quality:

SOLID AND HAZARDOUS WASTE SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **solid or hazardous waste** (see 301 CMR 11.03(9))? ___ Yes X No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **solid and hazardous waste**? ___ Yes X No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Historical and Archaeological Resources Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Solid and Hazardous Waste Section below.

II. Impacts and Permits

A. Is there any current or proposed facility at the project site for the storage, treatment, processing, combustion or disposal of solid waste? ___ Yes ___ No; if yes, what is the volume (in tons per day) of the capacity:

	<u>Existing</u>	<u>Change</u>	<u>Total</u>
Storage	_____	_____	_____
Treatment, processing	_____	_____	_____
Combustion	_____	_____	_____
Disposal	_____	_____	_____

B. Is there any current or proposed facility at the project site for the storage, recycling, treatment or disposal of hazardous waste? ___ Yes ___ No; if yes, what is the volume (in tons or gallons per day) of the capacity:

	<u>Existing</u>	<u>Change</u>	<u>Total</u>
Storage	_____	_____	_____
Recycling	_____	_____	_____
Treatment	_____	_____	_____
Disposal	_____	_____	_____

C. If the project will generate solid waste (for example, during demolition or construction), describe alternatives considered for re-use, recycling, and disposal:

D. If the project involves demolition, do any buildings to be demolished contain asbestos?
___ Yes ___ No

E. Describe the project's other solid and hazardous waste impacts (including indirect impacts):

III. Consistency

Describe measures that the proponent will take to comply with the State Solid Waste Master Plan:

HISTORICAL AND ARCHAEOLOGICAL RESOURCES SECTION

I. Thresholds / Impacts

A. Have you consulted with the Massachusetts Historical Commission? Yes ___ No; if yes, attach correspondence. For project sites involving lands under water, have you consulted with the Massachusetts Board of Underwater Archaeological Resources? Yes ___ No; if yes, attach correspondence

B. Is any part of the project site a historic structure, or a structure within a historic district, in either case listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth? ___ Yes No; if yes, does the project involve the demolition of all or any exterior part of such historic structure? ___ Yes ___ No; if yes, please describe:

C. Is any part of the project site an archaeological site listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth? ___ Yes No; if yes, does the project involve the destruction of all or any part of such archaeological site? ___ Yes ___ No; if yes, please describe:

D. If you answered "No" to all parts of both questions A, B and C, proceed to the **Attachments and Certifications** Sections. If you answered "Yes" to any part of either question A or question B, fill out the remainder of the Historical and Archaeological Resources Section below.

II. Impacts

Describe and assess the project's impacts, direct and indirect, on listed or inventoried historical and archaeological resources:

A project notification form has been submitted to the Massachusetts Historical Commission (MHC) and the Massachusetts Board of Underwater Archaeological Resources (BUAR). As of this submission, a response has not been received from MHC. Please see attached response letter from BUAR stating that this project is unlikely to impact submerged cultural resources.

III. Consistency

Describe measures that the proponent will take to comply with federal, state, regional, and local plans and policies related to preserving historical and archaeological resources:

Please refer to previous answer.

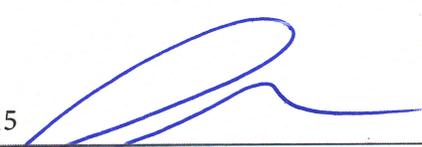
CERTIFICATIONS:

1. The Public Notice of Environmental Review has been/will be published in the following newspapers in accordance with 301 CMR 11.15(1):

(Name) Acton Beacon (Date) 12/3/15

2. This form has been circulated to Agencies and Persons in accordance with 301 CMR 11.16(2).

Signatures:

	<u>11/25/15</u>		
Date	Signature of Responsible Officer or Proponent	Date	Signature of person preparing ENF (if different from above)

<u>Alan H. Cathcart</u>	<u>Stephen C. Olson, P.E.</u>
Name (print or type)	Name (print or type)

<u>Concord Water and Sewer Division</u>	<u>Environmental Partners Group, Inc.</u>
Firm/Agency	Firm/Agency

<u>135 Keyes Road</u>	<u>1900 Crown Colony Drive, Suite 402</u>
Street	Street

<u>Concord, MA, 01742</u>	<u>Quincy, MA, 02169</u>
Municipality/State/Zip	Municipality/State/Zip

<u>978-318-3250</u>	<u>617-657-0200</u>
Phone	Phone

APPENDIX B
GENERAL PROJECT INFORMATION ANSWERS

Existing Conditions and Land Use

The existing site is located at 180/182 Skyline Drive in Acton and consists of two parcels of land owned by the Town of Concord (approximately 59.79 acres total). The parcels are partially developed for use by the existing dam/intake structure, ozone disinfection treatment plant, and associated appurtenant facilities (gate house, raw water wetwell, valve and meter vault, propane tank, electrical transformer, etc.). The remainder of land is undeveloped forestland for the purpose of protecting the watershed.

Nagog Pond is currently used as a supplemental source to augment the Town's groundwater production wells. The existing Nagog Pond Ozone Disinfection Water Treatment Facility has a hydraulic capacity of 1.5 million gallons per day (MGD). The facility includes a raw water wetwell, a pump control vault, two underground ozone contactors, and a brick and block building to house the ozone generation equipment. The water treatment facility was built in 1995 and the building has a foot print of approximately 1,291 square feet. The treatment facility is situated within 200 feet of Nagog Pond. The Nagog Pond dam was constructed over 100 years ago and rehabilitated/repared in 2012. The existing water intake pipe associated with Nagog Pond is also over 100 years old and is in poor condition. The intake pipe extends approximately 1,800 feet into Nagog Pond from the gate house at the dam, and consists of 16-inch diameter cast iron pipe, partially supported on wooden cribbing.

Raw water from Nagog Pond flows by gravity into the wetwell by means of a 16-inch intake pipe and gatehouse at the dam. Water is pumped from the wetwell through the contactors where ozone gas is added for oxidation and disinfection. Ozonated water then flows by gravity to the Route 2A Satellite Pumping Station via a 16-inch cement lined cast iron main (circa 1909). Final treatment is provided at the Rt 2A Satellite Pumping Station including additional disinfection with ultraviolet (UV) light, pH adjustment using potassium hydroxide, fluoridation using sodium fluoride, corrosion control using zinc polyphosphate, and secondary disinfection using sodium hypochlorite. Finished water is then pumped into Concord's water distribution system which provides service to the Town of Concord and several commercial businesses in Acton along Rt 2A.

Nagog Pond and the Ozone Disinfection Facility are currently operating with a Filtration Avoidance Waiver under the Surface Water Treatment Rule. Compliance and continued operation under the Filtration Avoidance Waiver requires strict conformance with federal and state water quality limits which have limited the use of this water supply. As a result, in the recent past Nagog Pond has been relegated to seasonal usage, typically in the summer to help meet peak demands.

Proposed Project

The principal use of the site will remain the same – the provision and treatment of public drinking water. The proposed Nagog Pond Water Treatment Plant (WTP) will have the same hydraulic design capacity as the existing facility, 1.5 MGD. The Nagog Pond WTP will incorporate several physical and chemical water treatment processes, including: pre-oxidation with potassium permanganate; coagulation with polyaluminum chloride; two-stage, tapered flocculation; clarification using dissolved air flotation (DAF); primary disinfection using ozone;

Nagog Pond Water Treatment Plant
ENF – General Project Information

filtration using granular activated carbon (GAC) media; pH adjustment using potassium hydroxide; corrosion control using zinc polyphosphate; secondary disinfection using sodium hypochlorite; and fluoridation using sodium fluoride. The proposed Nagog Pond WTP will be state of the art and allow for the consistent production of high quality water for Concord's water system customers in both Concord and Acton. Once constructed, the Town will be able to operate the facility with greater flexibility, on an as needed basis, instead of being limited to operating only when the Filtration Avoidance Waiver water quality parameters are satisfied.

The WTP building will consist of two stories having a site footprint of 7,165 square feet and a net floor space of 9,338 square feet. The exterior façade is proposed to be cement masonry unit (CMU) architectural block with sufficient windows to provide natural lighting. The building will house all of the treatment processes and equipment and ancillary support spaces such as a control room, water quality laboratory, and operations meeting room.

The plan is to demolish the existing disinfection facility and build the new WTP within the same site footprint. This is essential as it will allow the new facilities to make use of the existing subsurface spaces which have been blasted out of the ledge. The new building is larger than the existing building due to the proposed treatment systems to be employed, and it will extend further to the west and south.

The proposed Nagog Pond WTP is being designed as a zero discharge facility. All wastes generated at the facility, with the exception of sanitary wastes, will be recycled. The proposed WTP will include a small disposal system for sanitary wastes (20 gallons per day). Residuals generated from treating the water will be dewatered on site, and the solids trucked off-site for use as compost. The proposed Nagog Pond WTP will include suitable secondary containment and sufficient safety measures (including fire sprinklers) for the storage of water treatment chemicals in accordance with local and state requirements. In addition to the utilities serving the existing treatment facility, the proposed Nagog Pond WTP will require additional utility connections including: natural gas, high speed cable (internet), and water (from the Acton Water District).

As previously indicated, water from Nagog Pond is obtained by means of an old (circa 1909) 16-inch diameter cast iron pipe. Physical inspections of the intake pipe have indicated that it has significantly deteriorated, resulting in decreased hydraulic carrying capacity and risk of failure. Due to the condition of the existing intake pipe, a new raw water intake line is being included with this comprehensive project. The proposed intake pipe is 16-inch diameter high density polyethylene (HDPE). The intake line will include the ability to draw water from two different levels and include an automated "air burst" cleaning system for the intake drum screens. Placement of the new intake line will require dredging a narrow corridor along the pond bottom for suitable hydraulics and to prevent freezing during potential low water levels.

In addition to the principal use (the production of public drinking water), the project also includes an accessory use: solar photovoltaics (PV). In order to off-set the power requirements of the new Nagog Pond WTP, a photovoltaic array field is being proposed. The solar field will include an area of approximately 68,743 square feet for the installation of 17,768 square feet of photovoltaic arrays. The PV field will be located northeast of the proposed WTP building.

In summary, the proposed work area will include the entire developed portion of the existing ozone disinfection water treatment facility site, clearing and grading for the PV field, and

Nagog Pond Water Treatment Plant
ENF – General Project Information

dredging within Nagog Pond to construct the new intake pipe. The project includes demolition of the existing ozone disinfection facility, construction of the new water treatment plant and intake systems, construction of a solar photovoltaic array system, and installation of all supporting infrastructure and utilities.

The proposed project implementation plan will be conducted in phases. The PV system will be completed first to take full advantage of the market conditions and tax incentives. It is anticipated that construction activities associated with the PV system will begin in April 2016 and be operational by December 31, 2016. Construction of the WTP is anticipated to begin in February 2017, however the existing ozone disinfection facility will remain operational until August 2017. Once the existing ozone disinfection facility is taken off-line for demolition, the intake project can also commence. Both the new intake and WTP are scheduled to be on-line by the summer of 2018. The Concord water system consists of six (6) groundwater supply wells that will be used while Nagog Pond is not available during construction of the intake and WTP.

Alternatives Analysis

Several alternative building locations on the existing site were considered. However, because of the site constraints (wetland boundaries and ledge/bedrock), the most sustainable location was selected - on top of the existing footprint. There are several advantages to this alternative including:

- Minimizing the amount of site clearing.
- Minimizing the amount of excavation including bedrock/ledge removal.
- Maximizing the buffer area between abutters.

The location selected for the building maximizes the use of land area which has already been developed. In addition, it takes advantage of the 25-ft deep excavations that were blasted from the bedrock for the installation of the raw water wetwell, meter and valve vault, and ozone contactors. These three (3) subsurface bedrock excavations will be reused to accommodate the proposed raw water pumps, residuals storage tank, filter backwash waste tank, and filtered water wetwell. The proposed building location has the least environmental impact of any other location on the site and is the most economical.

In addition to the WTP building, several alternative intake designs and locations for PV systems were evaluated and considered. Intake alternatives considered rehabilitation of the existing 16-inch intake pipe and directionally drilling. Both alternatives have significant technical and economical disadvantages to the option selected. As for the PV system, the Town completed a comprehensive feasibility study of the entire Nagog Pond watershed and determined that it would be most advantageous to locate the system in close proximity to the proposed Nagog Pond WTP.

Mitigation Measures

The proposed project has poses potential impacts to the bordering vegetated wetland located north of the proposed WTP and north/east of the PV system and the outstanding water resource (Nagog Pond). No work is proposed within the bordering vegetated wetland; however, work is proposed within 100 feet of the bordering vegetated wetlands and also within the outstanding resource water.

Nagog Pond Water Treatment Plant
ENF – General Project Information

A Notice of Intent was filed with the Town of Acton Conservation Commission under the Wetlands Protection Act. Prior to the commencement of construction activities, erosion and sediment controls will be placed between the limits of work and the wetland boundaries. To reduce impacts to the outstanding resource water, all equipment and materials that come in contact with the water will be thoroughly inspected prior to construction to ensure that no foreign substances enter the source water.

To improve the current site stormwater runoff and handling, several groundwater recharge systems and stormwater best management practices are proposed. Infrastructure will include stormwater collection and infiltration systems to sufficiently sized to meet the requirements of the Massachusetts Stormwater Handbook. The infiltration structures will be equipped with an overflow directed towards the wetlands to discharge treated runoff that is not stored/infiltrated.

Phases of Construction

As indicated above, there are 3 phases or components of proposed construction activities: 1) the PV system, 2) the Nagog Pond WTP facilities, and 3) the Nagog Pond intake facilities.

Construction of the PV system will include the installation of erosion controls; clearing, grubbing, and grading the area; installation of the PV arrays; site restoration; and the installation of a perimeter fence. The work limits are shown on the enclosed plans. The PV arrays will be secured to the underlying bedrock on metal posts. Site restoration will include loaming and seeding with native meadow seed mix. The fence will be offset 3-feet from the cleared area and include a 4” to 6” gap underneath for the passage of small wildlife.

Construction activities that allow the existing ozone disinfection facility to remain on-line will begin in February/March 2017. Once the existing facility can be taken off-line in August/September 2017, the remaining construction will commence. Construction activities that can be completed while the existing facility is operational include various site work: clearing, grading, and the installation of subsurface utilities (stormwater, water, gas, sewer/septic). Once the facility is taken off-line, all other construction activities can commence. Construction of the intake system upgrades will take place when the existing ozone disinfection facility is off-line.

Stormwater Management

Please refer to Appendix F for the full stormwater report prepared for this project.

Solid and Hazardous Waste

The Contractor will be required to submit an alternatives assessment for the re-use and recycling of solid materials associated with the demolition of the existing ozone disinfection facility. Existing asphalt surfaces and other earth materials will be reclaimed for use on site. The Town has evaluated the process mechanical equipment and determined that it has reached its useful service life so that re-use is not practical.

Anti-Idling Measures

The Contractor will be required to submit a plan for anti-idling and emissions limiting measures taken for this project.

Comprehensive Analysis of Practicable Alternatives (Dredging)

The current approach includes 425 cubic yards of sediment to be dredged for the installation of the intake pipe. Dredging is required because a portion of the pond that the intake must run across could be exposed to the atmosphere if there were to be seasonally low water levels. This would create an issue with freezing during cold weather. Freezing conditions will prevent the use of the intake pipe and/or could damage the pipe. In addition to potential freezing concerns, the bathymetry of the intake pipe route is not uniform and would create multiple high spots for possible air entrapment which would create hydraulic restrictions. Multiple pipe alignments were assessed in an effort to reduce the quantity of dredging that will be required and it has been determined that this approach would require the least amount of dredging.

One alternative to the proposed approach would be to drain the lower half of the pond and excavate the sediment under dry conditions. This approach would result in the introduction of fewer suspended solids into the water during excavation. To drain the pond a temporary coffer dam would be constructed at the site of the existing coffer dam, and the dam bypass piping used.

Another alternative considered involved the cleaning and lining of the existing intake pipe. This approach was one of the first to be considered, as it would involve the least amount of disturbance to the lands underneath the pond. However, after inspection of the existing intake, it has been determined that the reuse of the existing intake is not feasible. Several cracks were located along the pipe and the wooden support cribbing has failed in several areas thereby making this alternative not feasible.

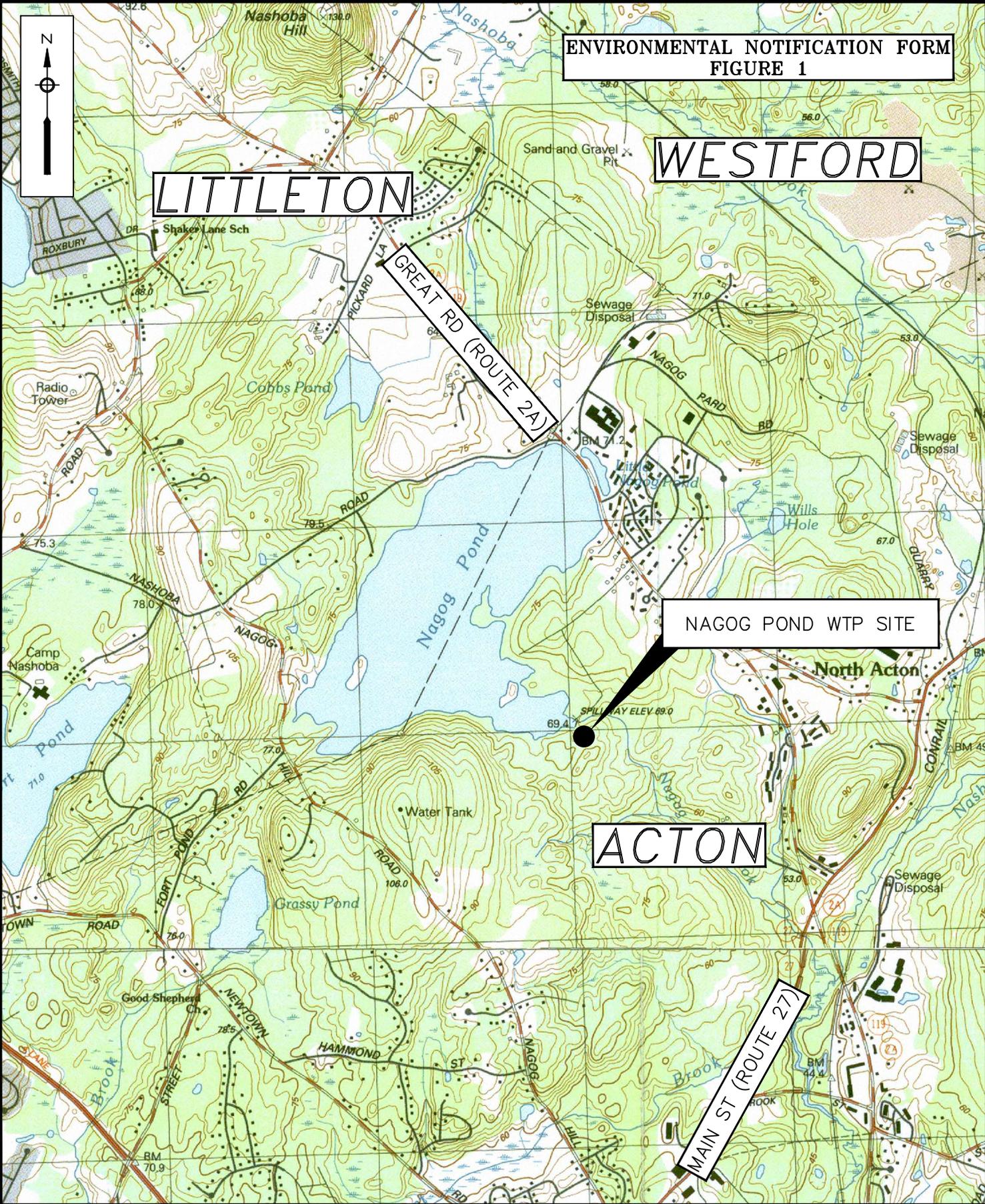
Of the three alternatives considered dredging appears to have the least impacts. However, draining the pond and excavating the pipe corridor may be required if bedrock is encountered. The results of field observations and probings to date have been inconclusive.

APPENDIX C
ENVIRONMENTAL NOTIFICATION FORM FIGURES

FIGURE 1: LOCUS PLAN

FIGURE 2: ENVIRONMENTAL CONSTRAINTS

ENVIRONMENTAL NOTIFICATION FORM
FIGURE 1



ENVIRONMENTAL NOTIFICATION FORM
FIGURE 2



16" ϕ RAW WATER INTAKE

ZONE A SURFACE
WATER SUPPLY
PROTECTION

CHAPTER 91
JURISDICTION

WETLAND LIMITS

ACTON

LIMITS OF LAND
DEVELOPMENT

100-FEET WETLAND
BUFFER

I:\CONCORD\200\200-1501 NAGOG POND WTP CONCEPTUAL DESIGN\PERMITTING\APPENDIX C-LOCUS MAPS\BOUNDARY LOCATIONS.DWG



NOVEMBER 2015
200-1501
1" = 300'

APPLICANT: TOWN OF CONCORD
NAGOG POND WATER TREATMENT PLANT
ENVIRONMENTAL CONSTRAINTS

APPENDIX D
PERMITTING DESIGN PLANS

NAGOG POND WATER TREATMENT PLANT

APPENDIX E
AGENCIES RECEIVING ENF

**Nagog Pond Water Treatment Plant
Town of Concord Department of Public Works
Environmental Notification Form – Distribution List**

Two Full Sized Copies:

1. Secretary Matthew A. Beaton
Executive Office of Environmental Affairs
Attn: MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02114

One copy to each of the following:

2. Alan Cathcart, Water/Sewer Superintendent
Concord Department of Public Works
135 Keyes Road
Concord, MA 01742
3. Department of Environmental Protection
Commissioner's Office
One Winter Street
Boston, MA 02108
4. Department of Environmental Protection
Central Regional Office
Attn: MEPA Coordinator
8 New Bond Street
Worcester, MA 01606
5. Department of Environmental Protection
Northeast Regional Office
Attn: MEPA Coordinator
205B Lowell Street
Wilmington, MA 01887
6. Massachusetts Department of Transportation
Public/Private Development Unit
10 Park Plaza
Boston, MA 02116
7. Massachusetts Department of Transportation
District #3
Attn: MEPA Coordinator
403 Belmont Street
Worcester, MA 01604
8. Massachusetts Historical Commission
The MA Archives Building
220 Morrissey Boulevard
Boston, MA 02125

**Nagog Pond Water Treatment Plant
Town of Concord Department of Public Works
Environmental Notification Form – Distribution List**

9. Board of Underwater Archaeological Resources
251 Causeway Street, Suite 800
Boston, MA 02114

10. Metropolitan Area Planning Council
60 Temple Place/6th floor
Boston, MA 02111

11. Acton Board of Selectmen
472 Main Street
Acton, MA 01720

12. Acton Planning Department
472 Main Street
Acton, MA 01720

13. Acton Conservation Commission
472 Main Street,
Acton, MA 01720

14. Acton Board of Health
472 Main Street,
Acton, MA 01720

15. Department of Public Health (DPH)
Director of Environmental Health
250 Washington Street
Boston, MA 02115

APPENDIX F
STORMWATER MANAGEMENT DOCUMENTS

**STORMWATER REPORT (FROM NOTICE OF INTENT
SUBMISSION TO TOWN OF ACTON CONSERVATION
COMMISSION)**

ATTACHMENT A: CHECKLIST FOR STORMWATER REPORT

ATTACHMENT B: STANDARD 2 HYDROCAD CALCULATIONS

ATTACHMENT C: SOIL INFORMATION

ATTACHMENT D: STANDARD 3 RECHARGE CALCULATIONS

ATTACHMENT E: STANDARD 4 WATER QUALITY CALCULATIONS

**ATTACHMENT F: LONG TERM POLLUTION PREVENTION PLAN
AND OPERATIONS & MAINTENANCE PLAN**

ATTACHMENT G: STORMWATER FIGURES

Stormwater Report



1900 Crown Colony Drive
Suite 402
Quincy, MA 02169
Tel: 617 657 0200
Fax: 617 657 0201
www.envpartners.com

To: Town of Acton Conservation Commission
From: Stephen C. Olson, P.E.
Cc: NOI CC list
Date: November 18, 2015
Subject: Nagog Pond Water Treatment Plant
WPA Form 3 - Notice of Intent
Stormwater Report

Environmental Partners Group, Inc. has prepared this stormwater report on behalf of the Town of Concord for the Wetlands Protection Act Notice of Intent for the Nagog Pond Water Treatment Plant project. This report has been prepared in accordance with the requirements of 310 CMR 10.00 and 310 CMR 21.00, and the guidelines of the Massachusetts Stormwater Handbook (MSH).

Project Applicant: Town of Concord Water Department
135 Keyes Road
Concord, MA 01742
Alan Cathcart, Water/Sewer Superintendent
(978) 318-3250

Preparer: Environmental Partners Group, Inc.
Stephen C. Olson, P.E.

Project Name: Nagog Pond Water Treatment Plant

Project Address: 180/182 Skyline Drive, Acton, MA 01720

The following materials are referenced as part of Stormwater Report:

- Stormwater Checklist
- Site Locus
- Demolition and Erosion Control Plan
- Site Plan and Yard Piping Plan
- Civil Details
- Stormwater Report
- Boring Logs and Sieve Analyses
- NCRS Soil Types and Soil Survey Map
- Source Control and Pollution Prevention Plan
- Stormwater Operation and Maintenance Plan

Project Type: Mix of New Development and Redevelopment

Project Narrative: The existing site is developed and includes a water treatment facility, chain link fencing, various yard piping, and an asphalt paved driveway. The site is bound to the north by Nagog Pond, to the east by wetlands and Nagog Brook, to the west by wetlands, and to the south by woods. Nagog Pond has an intake pipe, dam, and gatehouse associated with the existing water treatment plant.

The project includes the construction of a new water treatment plant, a new intake pipe, and a photovoltaic (PV) array. The new 1.5 million gallon per day drinking water treatment plant will replace the existing water treatment facility. The existing treatment facility is only operated seasonally in order to maintain an existing filtration waiver. The Town of Concord would like to construct a treatment plant capable of meeting all current drinking water regulations so that they may operate the facility on a continuous basis to meet current and future water demands. Construction activities will include architectural, structural, civil, process, HVAC, plumbing and electrical work, and the demolition of the existing treatment plant and appurtenant structures.

The new water treatment plant will be constructed over the existing water treatment facility on site, while also extending further to the west and south. Construction will begin with the installation of the PV array and all site work that will not require the treatment plant to be shut down. Since the existing facility is only operated seasonally, construction of the new water treatment plant will occur when the existing facility is not in use. The site grading will largely remain unchanged with only minor modifications to accommodate the new facilities. The paved area around the treatment plant will be sloped away from the building to direct stormwater away.

Existing Stormwater
Conditions:

The existing site has minimal stormwater management controls. Stormwater flows via sheet flow from the paved areas and roofs onto the surrounding grass, paved, rip-rap, and wooded areas. Ultimately, all stormwater is infiltrated into the ground or runs off towards Nagog Brook and through the culvert under Skyline Drive.

A rip-rap channel to the east of the existing driveway diverts driveway runoff towards a new catch basin near the intersection with Skyline Drive.

Proposed Stormwater
Conditions:

Cover type and grading will generally mimic existing conditions, with the exception of the PV array area being converted from a wooded area to an open space. The entire ground surface of the PV array area will receive a seed mix to encourage the development of a meadow.

In the vicinity of the new water treatment facility, stormwater runoff will be directed into a series of underground recharge chambers via deep sump catch basins with hoods, a drywell, and underground piping. The proposed stormwater facilities provide recharge, attenuate the peak discharge, and provide TSS removal. The overflow from this system will be equipped with a flared end section and rip-rap to provide additional velocity control and scour protection.

Runoff from the driveway will be directed towards the existing swale.

Existing and
Proposed Site Plans:

A set of full-size 22"x 34" design plans are provided as an attachment to the Notice of Intent. Existing conditions; the wetland boundary; 25-, 50-, 75- and 100-foot wetland buffer zones, and the existing water treatment facility are

shown on Sheet C-7. The proposed grading and drainage plan is shown on sheet C-11. Various civil details are shown on Sheets CD-1 through CD-7.

LID Measures: The project does not propose any disturbances to bordering vegetated wetlands.

Stormwater Standard 1: The project does not propose any new untreated discharges.

Stormwater Standard 2: The existing and proposed site conditions were analyzed for the 2, 10, and 100-year 24-hour storm events using HydroCAD Version 10. Based on these results, there is no increase in peak discharge rates for all storm events. Please refer to Table 1 below for a summary of peak rates. Please refer to the HydroCAD report in Attachment B for full details.

Table 1
Summary of Peak Discharge Rates

Storm Event	Existing Conditions	Developed Conditions
2-year	0.08 cfs	0.06 cfs
10-year	1.41 cfs	1.35 cfs
100-year	10.24 cfs	10.04 cfs

Soil type was determined using Natural Resource Conservation Service (NRCS) Soil Survey data. There are two Hydrologic Soil Groups (HSGs) on this site: HSG A and HSG D. Soil borings were conducted in the vicinity of the proposed recharge facilities to verify in situ soil conditions. Based on the sieve analyses from these soil borings, the HSG A soil in the vicinity of chamber C-2, chamber C-3, and the drywell has an infiltration rate of 5.1 inches/hour. This is consistent with the range of HSG A soil Rawls Rates listed in the MSH. The HSG D soil in the vicinity of C-1 was conservatively assumed to provide no infiltration in the HydroCAD model even though the current use of the area around C-1 for a leaching pit suggests that the soil in this location has a high infiltration rate. Soil borings and sieve analyses are provided in Attachment C.

Stormwater Standard 3: Stormwater will be recharged using underground chambers and a drywell. Recharge calculations are provided in Attachment D. Chambers C-2 and C-3 provide the *Required Recharge Volume* for this project, and the chambers will drain within the required 72 hours. Groundwater is not expected to affect recharge as there was no sign of any groundwater in any of the borings.

Stormwater Standard 4: The proposed best management practices (BMPs) treat the *Required Water Quality Volume* and provide 80% TSS removal. Based on one inch of runoff times the impervious area, the *Required Water Quality Volume* is 2,471 cf. The 2-year storm generates 2,573 cfs of runoff directed towards the BMPs around the proposed building. This is greater than the *Required Water Quality Volume*. The 2-year storm HydroCAD calculations provided in Attachment E show that proposed BMPs are sized appropriately to treat this volume. Therefore, this project meets the *Required Water Quality Volume* requirements.

Volume 2, Chapter 2 of the MSH states that subsurface structures, including underground plastic chambers, provide 80% TSS removal. Consequently, this project meets the TSS removal requirements as well.

A Long-Term Pollution Prevention Plan is combined with the Operation and Maintenance Plan (Standard 9) and is included in Attachment F.

Stormwater
Standard 5:

The water treatment process uses and will accept deliveries of various chemicals. There will be secondary containment within the delivery area to keep any spillage from migrating offsite.

Stormwater
Standard 6:

Standard 6 is applicable due to this project's proximity to Nagog Brook (a Division of Fisheries and Wildlife cold-water fishery) and Nagog Pond (Outstanding Resource Water).

As discussed above, the proposed BMPs treat the *Required Water Quality Volume* calculated using the "one-inch rule" (one-inch times the impervious area).

The project includes the use of subsurface structures, which are recommended BMPs for compliance with Standard 6. Deep sump catch basins with hoods are proposed to help provide additional TSS removal.

Stormwater
Standard 7:

"Maintenance and improvement of existing roadways" qualifies as a redevelopment project according to the MSH. In that sense, the improvement of the driveway to the facility counts as a redevelopment project. However, the entire project leads to an increase in impervious area. The increase in impervious area is generally a result of the enlarged building and the new pavement around the building. Consequently, the project proposes to meet all the Standards, and there is a particular focus on improving the stormwater management system near the proposed facility.

Stormwater
Standard 8:

A Construction Period Stormwater Pollution Prevention and Erosion and Sedimentation Control Plan (SWPPP) has not been included in this Stormwater Report. The project Contractor(s) will be required to submit a SWPPP for review and approval prior to any land disturbance.

Stormwater
Standard 9:

The Post Construction Operation and Maintenance (O&M) Plan is attached to this Stormwater Report. The O&M Plan includes the name of the stormwater management system owners, the party responsible for operation and maintenance, a schedule for implementation of routine and non-routine maintenance tasks, and a maintenance log form.

Stormwater

Standard 10: The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges. An Illicit Discharge Compliance Statement is not attached to this Stormwater Report but will be submitted prior to the discharge of any stormwater to post-construction BMPs.

Attachments:

Attachment A – Checklist for Stormwater Report

Attachment B – Standard 2 HydroCAD Calculations

Attachment C – Soil Information

Attachment D – Standard 3 Recharge Calculations

Attachment E – Standard 4 Water Quality Calculations

Attachment F – Long Term Pollution Prevention Plan and Operations & Maintenance Plan

Attachment G – Stormwater Figures

ATTACHMENT A
CHECKLIST FOR STORMWATER REPORT



Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the [Massachusetts Stormwater Handbook](#). The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.¹ This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

¹ The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

² For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



Adam S. Kran 11/18/15
Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

- New development
- Redevelopment
- Mix of New Development and Redevelopment



Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- No disturbance to any Wetland Resource Areas
- Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- Reduced Impervious Area (Redevelopment Only)
- Minimizing disturbance to existing trees and shrubs
- LID Site Design Credit Requested:
 - Credit 1
 - Credit 2
 - Credit 3
- Use of "country drainage" versus curb and gutter conveyance and pipe
- Bioretention Cells (includes Rain Gardens)
- Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- Treebox Filter
- Water Quality Swale
- Grass Channel
- Green Roof
- Other (describe): _____

Standard 1: No New Untreated Discharges

- No new untreated discharges
- Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- Soil Analysis provided.
- Required Recharge Volume calculation provided.
- Required Recharge volume reduced through use of the LID site Design Credits.
- Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - Static
 - Simple Dynamic
 - Dynamic Field¹
- Runoff from all impervious areas at the site discharging to the infiltration BMP.
- Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - Site is comprised solely of C and D soils and/or bedrock at the land surface
 - M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - Solid Waste Landfill pursuant to 310 CMR 19.000
 - Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

¹ 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

- The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
 - Provisions for storing materials and waste products inside or under cover;
 - Vehicle washing controls;
 - Requirements for routine inspections and maintenance of stormwater BMPs;
 - Spill prevention and response plans;
 - Provisions for maintenance of lawns, gardens, and other landscaped areas;
 - Requirements for storage and use of fertilizers, herbicides, and pesticides;
 - Pet waste management provisions;
 - Provisions for operation and management of septic systems;
 - Provisions for solid waste management;
 - Snow disposal and plowing plans relative to Wetland Resource Areas;
 - Winter Road Salt and/or Sand Use and Storage restrictions;
 - Street sweeping schedules;
 - Provisions for prevention of illicit discharges to the stormwater management system;
 - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
 - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
 - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
 - Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
 - is within the Zone II or Interim Wellhead Protection Area
 - is near or to other critical areas
 - is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
 - involves runoff from land uses with higher potential pollutant loads.
 - The Required Water Quality Volume is reduced through use of the LID site Design Credits.
 - Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- The BMP is sized (and calculations provided) based on:
 - The ½" or 1" Water Quality Volume or
 - The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

- The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior to** the discharge of stormwater to the post-construction stormwater BMPs.
- The NPDES Multi-Sector General Permit does **not** cover the land use.
- LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- All exposure has been eliminated.
- All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

- The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- Critical areas and BMPs are identified in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
 - Limited Project
 - Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
 - Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
 - Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
 - Bike Path and/or Foot Path
 - Redevelopment Project
 - Redevelopment portion of mix of new and redevelopment.
- Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
 - Construction Period Operation and Maintenance Plan;
 - Names of Persons or Entity Responsible for Plan Compliance;
 - Construction Period Pollution Prevention Measures;
 - Erosion and Sedimentation Control Plan Drawings;
 - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
 - Vegetation Planning;
 - Site Development Plan;
 - Construction Sequencing Plan;
 - Sequencing of Erosion and Sedimentation Controls;
 - Operation and Maintenance of Erosion and Sedimentation Controls;
 - Inspection Schedule;
 - Maintenance Schedule;
 - Inspection and Maintenance Log Form.
- A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

- The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- The project is **not** covered by a NPDES Construction General Permit.
- The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

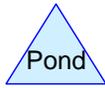
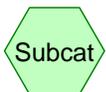
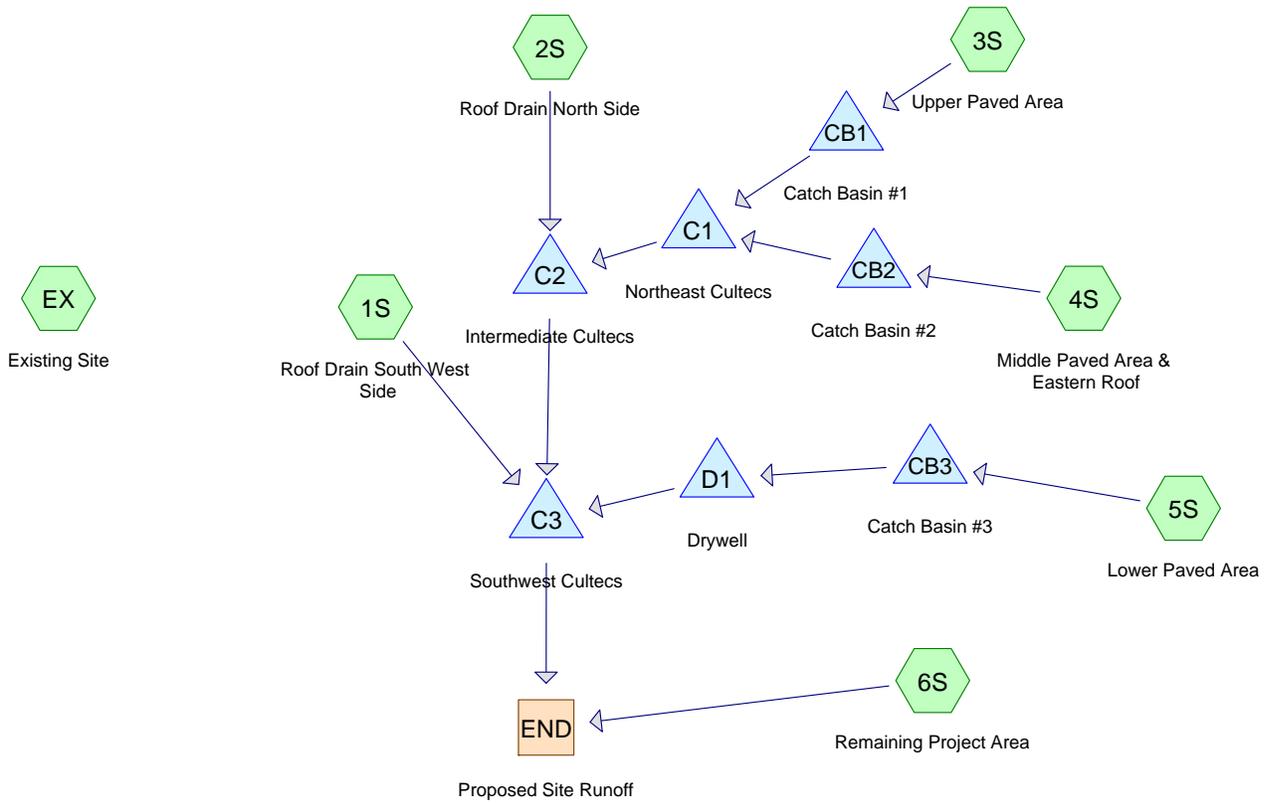
Standard 9: Operation and Maintenance Plan

- The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - Name of the stormwater management system owners;
 - Party responsible for operation and maintenance;
 - Schedule for implementation of routine and non-routine maintenance tasks;
 - Plan showing the location of all stormwater BMPs maintenance access areas;
 - Description and delineation of public safety features;
 - Estimated operation and maintenance budget; and
 - Operation and Maintenance Log Form.
- The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
 - A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
 - A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

- The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- An Illicit Discharge Compliance Statement is attached;
- NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

ATTACHMENT B
STANDARD 2 HYDROCAD CALCULATIONS



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Page 2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
37,532	49	50-75% Grass cover, Fair, HSG A (3S, 6S, EX)
12,778	76	Gravel roads, HSG A (6S, EX)
6,262	76	Gravel roads, HSG A (RIP RAP) (6S, EX)
698	76	Gravel roads, HSG A (rip rap) (3S)
39,143	30	Meadow, non-grazed, HSG A (6S)
27,757	78	Meadow, non-grazed, HSG D (6S)
39,344	98	Paved parking, HSG A (3S, 4S, 5S, 6S, EX)
7,639	98	Roofs, HSG A (1S, 2S, 4S)
224,763	30	Woods, Good, HSG A (6S, EX)
88,351	77	Woods, Good, HSG D (6S, EX)
484,267	51	TOTAL AREA

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Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
368,159	HSG A	1S, 2S, 3S, 4S, 5S, 6S, EX
0	HSG B	
0	HSG C	
116,108	HSG D	6S, EX
0	Other	
484,267		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Nun
37,532	0	0	0	0	37,532	50-75% Grass cover, Fair	
19,738	0	0	0	0	19,738	Gravel roads	
39,143	0	0	27,757	0	66,900	Meadow, non-grazed	
39,344	0	0	0	0	39,344	Paved parking	
7,639	0	0	0	0	7,639	Roofs	
224,763	0	0	88,351	0	313,114	Woods, Good	
368,159	0	0	116,108	0	484,267	TOTAL AREA	

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Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	C1	231.67	230.95	145.0	0.0050	0.012	4.0	0.0	0.0
2	C1	232.33	231.44	145.0	0.0061	0.012	8.0	0.0	0.0
3	C2	230.00	230.00	10.0	0.0000	0.012	8.0	0.0	0.0
4	C3	230.68	230.48	20.0	0.0100	0.012	8.0	0.0	0.0
5	CB1	232.95	231.75	20.0	0.0600	0.012	6.0	0.0	0.0
6	CB2	232.95	231.75	75.0	0.0160	0.012	6.0	0.0	0.0
7	CB3	232.95	232.38	115.0	0.0050	0.012	6.0	0.0	0.0
8	D1	231.25	231.00	5.0	0.0500	0.012	6.0	0.0	0.0

Time span=0.10-24.00 hrs, dt=0.02 hrs, 1196 points x 3
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Roof Drain South West Runoff Area=2,749 sf 100.00% Impervious Runoff Depth>2.83"
 Flow Length=50' Slope=0.1300 '/' Tc=6.0 min CN=98 Runoff=0.19 cfs 647 cf

Subcatchment 2S: Roof Drain North Side Runoff Area=3,230 sf 100.00% Impervious Runoff Depth>2.83"
 Flow Length=50' Slope=0.1300 '/' Tc=6.0 min CN=98 Runoff=0.22 cfs 761 cf

Subcatchment 3S: Upper Paved Area Runoff Area=10,259 sf 69.83% Impervious Runoff Depth>1.64"
 Tc=6.0 min CN=85 Runoff=0.45 cfs 1,399 cf

Subcatchment 4S: Middle Paved Area & Runoff Area=4,232 sf 100.00% Impervious Runoff Depth>2.83"
 Tc=6.0 min CN=98 Runoff=0.29 cfs 997 cf

Subcatchment 5S: Lower Paved Area Runoff Area=3,960 sf 100.00% Impervious Runoff Depth>2.83"
 Tc=6.0 min CN=98 Runoff=0.27 cfs 933 cf

Subcatchment 6S: Remaining Project Area Runoff Area=217,642 sf 3.80% Impervious Runoff Depth>0.08"
 Flow Length=562' Tc=15.9 min CN=49 Runoff=0.06 cfs 1,506 cf

Subcatchment EX: Existing Site Runoff Area=242,195 sf 7.17% Impervious Runoff Depth>0.10"
 Flow Length=562' Tc=15.9 min CN=50 Runoff=0.08 cfs 2,027 cf

Reach END: Proposed Site Runoff Inflow=0.06 cfs 1,506 cf
 Outflow=0.06 cfs 1,506 cf

Pond C1: Northeast Cultecs Peak Elev=232.17' Storage=0.025 af Inflow=0.74 cfs 2,357 cf
 Discarded=0.00 cfs 0 cf Primary=0.16 cfs 1,884 cf Outflow=0.16 cfs 1,884 cf

Pond C2: Intermediate Cultecs Peak Elev=230.35' Storage=313 cf Inflow=0.33 cfs 2,645 cf
 Discarded=0.06 cfs 1,899 cf Primary=0.14 cfs 746 cf Outflow=0.20 cfs 2,644 cf

Pond C3: Southwest Cultecs Peak Elev=230.33' Storage=0.012 af Inflow=0.45 cfs 1,934 cf
 Discarded=0.12 cfs 1,934 cf Primary=0.00 cfs 0 cf Outflow=0.12 cfs 1,934 cf

Pond CB1: Catch Basin #1 Peak Elev=233.56' Storage=27 cf Inflow=0.45 cfs 1,399 cf
 6.0" Round Culvert n=0.012 L=20.0' S=0.0600 '/' Outflow=0.45 cfs 1,380 cf

Pond CB2: Catch Basin #2 Peak Elev=233.35' Storage=24 cf Inflow=0.29 cfs 997 cf
 6.0" Round Culvert n=0.012 L=75.0' S=0.0160 '/' Outflow=0.29 cfs 977 cf

Pond CB3: Catch Basin #3 Peak Elev=233.34' Storage=24 cf Inflow=0.27 cfs 933 cf
 6.0" Round Culvert n=0.012 L=115.0' S=0.0050 '/' Outflow=0.27 cfs 913 cf

Pond D1: Drywell Peak Elev=231.63' Storage=35 cf Inflow=0.27 cfs 913 cf
 Discarded=0.01 cfs 372 cf Primary=0.26 cfs 541 cf Outflow=0.27 cfs 913 cf

Total Runoff Area = 484,267 sf Runoff Volume = 8,270 cf Average Runoff Depth = 0.20"
90.30% Pervious = 437,284 sf 9.70% Impervious = 46,983 sf

Summary for Subcatchment 1S: Roof Drain South West Side

Runoff = 0.19 cfs @ 12.08 hrs, Volume= 647 cf, Depth> 2.83"

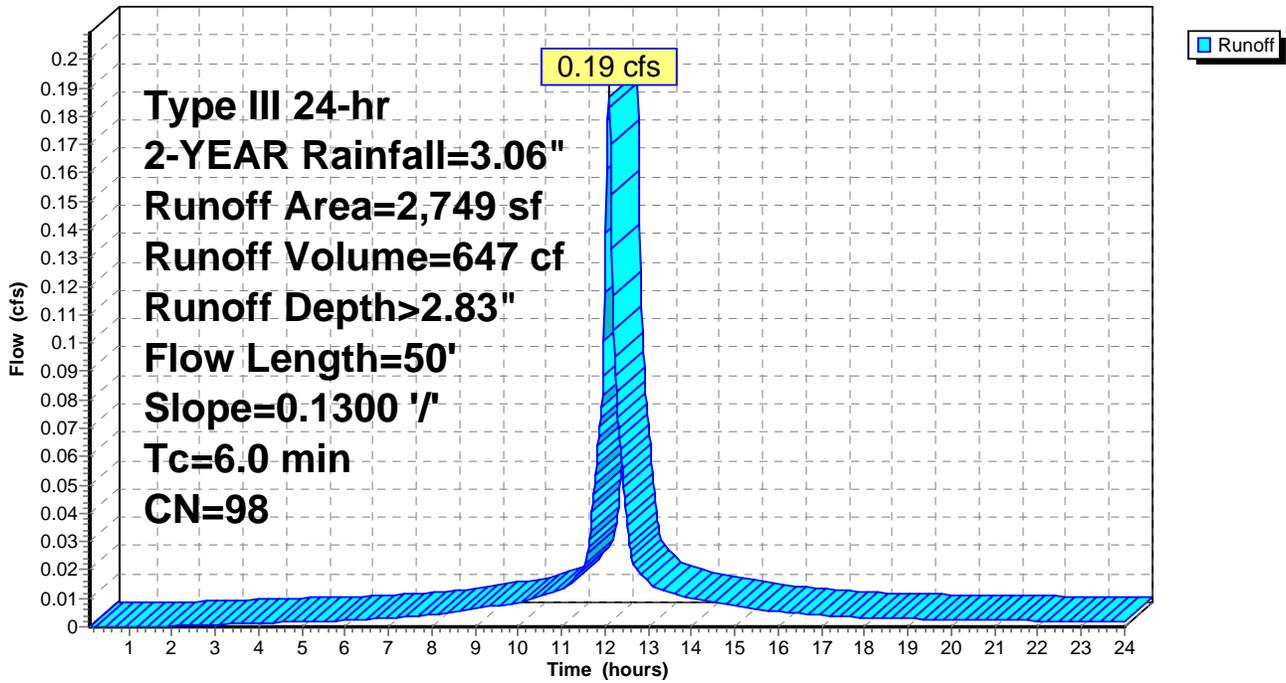
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-YEAR Rainfall=3.06"

Area (sf)	CN	Description
2,749	98	Roofs, HSG A
2,749		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.1300	0.14		Sheet Flow, sheet flow Woods: Light underbrush n= 0.400 P2= 3.06"

Subcatchment 1S: Roof Drain South West Side

Hydrograph



Summary for Subcatchment 2S: Roof Drain North Side

Runoff = 0.22 cfs @ 12.08 hrs, Volume= 761 cf, Depth> 2.83"

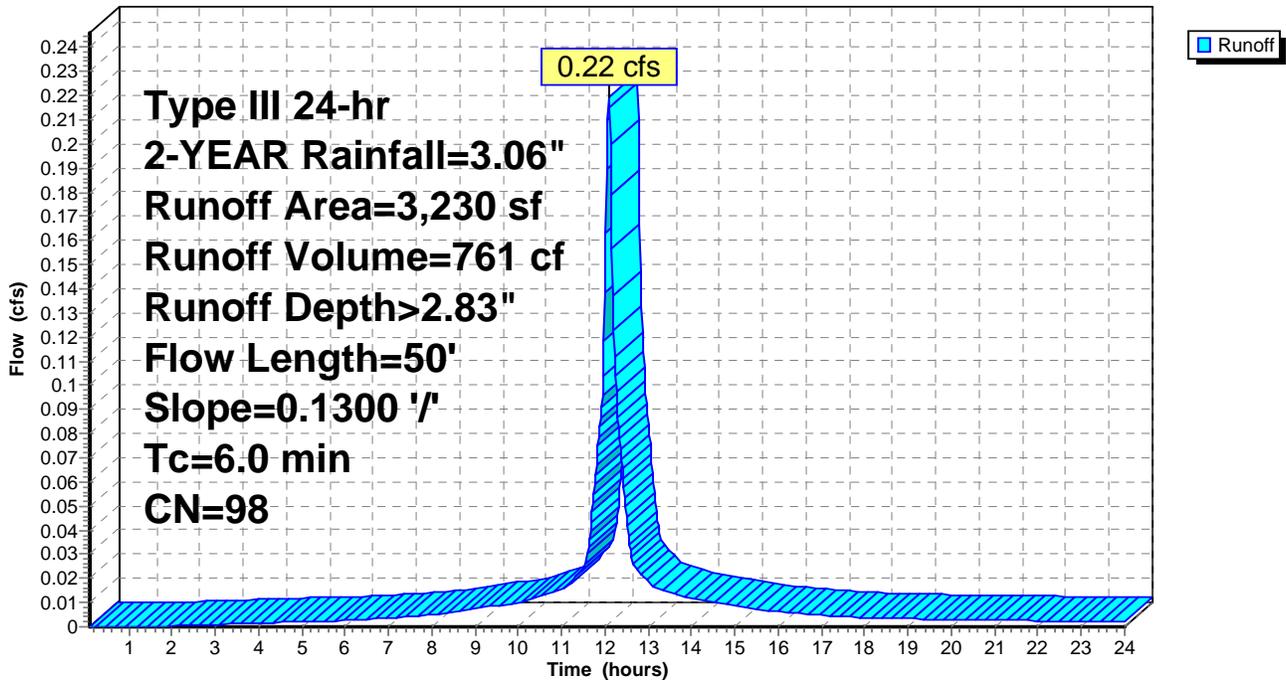
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-YEAR Rainfall=3.06"

Area (sf)	CN	Description
3,230	98	Roofs, HSG A
3,230		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.1300	0.14		Sheet Flow, sheet flow Woods: Light underbrush n= 0.400 P2= 3.06"

Subcatchment 2S: Roof Drain North Side

Hydrograph



Summary for Subcatchment 3S: Upper Paved Area

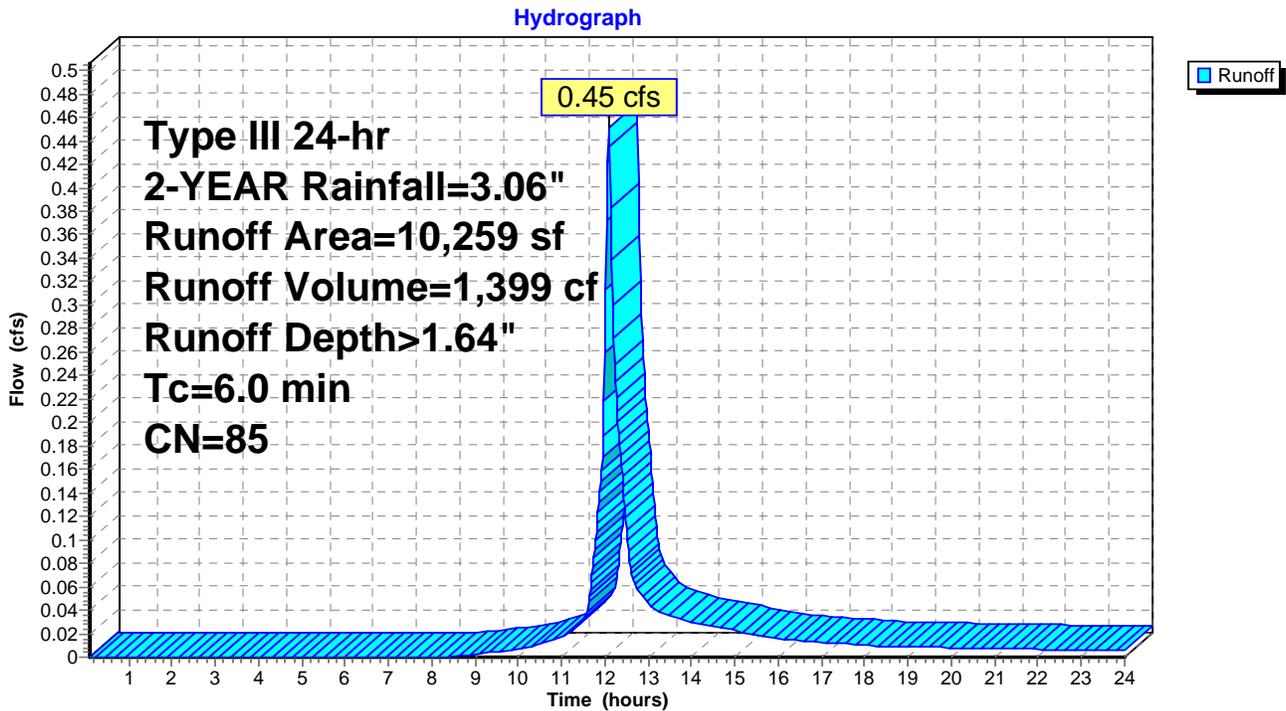
Runoff = 0.45 cfs @ 12.09 hrs, Volume= 1,399 cf, Depth> 1.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-YEAR Rainfall=3.06"

Area (sf)	CN	Description
7,164	98	Paved parking, HSG A
1,956	49	50-75% Grass cover, Fair, HSG A
441	49	50-75% Grass cover, Fair, HSG A
* 698	76	Gravel roads, HSG A (rip rap)
10,259	85	Weighted Average
3,095		30.17% Pervious Area
7,164		69.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, pavement

Subcatchment 3S: Upper Paved Area



Summary for Subcatchment 4S: Middle Paved Area & Eastern Roof

Runoff = 0.29 cfs @ 12.08 hrs, Volume= 997 cf, Depth> 2.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-24.00 hrs, dt= 0.02 hrs
 Type III 24-hr 2-YEAR Rainfall=3.06"

Area (sf)	CN	Description
2,572	98	Paved parking, HSG A
1,660	98	Roofs, HSG A
4,232	98	Weighted Average
4,232		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, pavement

Subcatchment 4S: Middle Paved Area & Eastern Roof

Hydrograph

