

# NOTICE OF INTENT

*For Construction of a 2-family Dwelling, Drainage Improvements and Associated  
Utilities, Grading & Landscaping at*

**“SPRUCE CORNER”**  
232 Arlington Street  
Acton, Massachusetts

**Date:** August 19, 2010

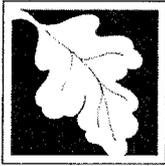
**Prepared for:**  
West Acton Trio, LLC  
P.O. Box 401012  
Cambridge, MA 02104

**Prepared by:**  
FORESITE Engineering Associates, Inc.  
16 Gleasondale Road, Suite 1-1  
Stow, Massachusetts 01775



# CONTENTS

1. WPA Form 3: Notice of Intent
2. WPA Appendix B: Wetland Fee Transmittal Form
3. Copies of Filling Fee Checks
4. Certified List of Abutters
5. Copy of Notice to Abutters
6. "Wetland Border Report, 232 Arlington Street, Acton, MA" prepared by Carr Research Lab, Inc. dated September 23, 2008
7. Locus Map (From USGS Maynard Quadrangle) Scale 1:25,000
8. "Spruce Corner - Site Plan Special Permit Application", Sheets 3, 4, 7 & 8, prepared by FORESITE Engineering Associates, Inc. dated July 6, 2010
9. "Stormwater Report and Calculations for Spruce Corner", prepared by FORESITE Engineering Associates, Inc., dated July 12, 2010



# WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

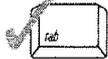
MassDEP File Number

Document Transaction Number

ACTON

City/Town

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



**Note:**  
Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

## A. General Information

1. Project Location (**Note:** electronic filers will click on button to locate project site):

232 Arlington Street	Acton	01720
a. Street Address	b. City/Town	c. Zip Code
Latitude and Longitude:	42D-28M-30S N	71D-28M-22S W
Map F2A	d. Latitude	e. Longitude
f. Assessors Map/Plat Number	70, 71 & 83	
	g. Parcel /Lot Number	

2. Applicant:

a. First Name	b. Last Name	
West Acton Trio, LLC		
c. Organization		
P.O. Box 401012		
d. Street Address		
Cambridge	MA	02104
e. City/Town	f. State	g. Zip Code
(617) 230-3674	markmyrealtor@yahoo.com	
h. Phone Number	i. Fax Number	j. Email Address

3. Property owner (required if different from applicant):  Check if more than one owner.

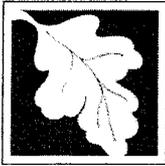
a. First Name	b. Last Name	
c. Organization		
d. Street Address		
e. City/Town	f. State	g. Zip Code
h. Phone Number	i. Fax Number	j. Email address

4. Representative (if any):

Scott	Hayes	
a. First Name	b. Last Name	
FORESITE Engineering Associates, Inc.		
c. Company		
16 Gleasondale Road, Suite 1-1		
d. Street Address		
Stow	MA	01775
e. City/Town	f. State	g. Zip Code
(978) 461-2350	(978) 841-4102	scott@foresite1.com
h. Phone Number	i. Fax Number	j. Email address

5. Total WPA Fee Paid (from NOI Wetland Fee Transmittal Form):

\$1,050	\$512.50	\$537.50
a. Total Fee Paid	b. State Fee Paid	c. City/Town Fee Paid



# WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

MassDEP File Number

Document Transaction Number

ACTON

City/Town

## A. General Information (continued)

6. General Project Description:

Construction of a two family dwelling, drainage improvements and associated utilities, site grading, and landscaping within 100-ft of a bordering vegetated wetland.

7a. Project Type Checklist:

- |   |   |
|---|---|
| 1. <input type="checkbox"/> Single Family Home                | 2. <input checked="" type="checkbox"/> Residential Subdivision        |
| 3. <input type="checkbox"/> Limited Project Driveway Crossing | 4. <input type="checkbox"/> Commercial/Industrial                     |
| 5. <input type="checkbox"/> Dock/Pier                         | 6. <input type="checkbox"/> Utilities                                 |
| 7. <input type="checkbox"/> Coastal Engineering Structure     | 8. <input type="checkbox"/> Agriculture (e.g., cranberries, forestry) |
| 9. <input type="checkbox"/> Transportation                    | 10. <input type="checkbox"/> Other                                    |

7b. Is any portion of the proposed activity eligible to be treated as a limited project subject to 310 CMR 10.24 (coastal) or 310 CMR 10.53 (inland)?

1.  Yes  No     If yes, describe which limited project applies to this project:

2. Limited Project

8. Property recorded at the Registry of Deeds for:

Middlesex South District Registry of Deeds

a. County

51261

b. Certificate # (if registered land)

583

c. Book

d. Page Number

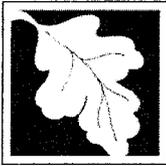
## B. Buffer Zone & Resource Area Impacts (temporary & permanent)

- Buffer Zone Only – Check if the project is located only in the Buffer Zone of a Bordering Vegetated Wetland, Inland Bank, or Coastal Resource Area.
- Inland Resource Areas (see 310 CMR 10.54-10.58; if not applicable, go to Section B.3, Coastal Resource Areas).

Check all that apply below. Attach narrative and any supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

For all projects affecting other Resource Areas, please attach a narrative explaining how the resource area was delineated.

<u>Resource Area</u>	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
a. <input type="checkbox"/> Bank	1. linear feet	2. linear feet
b. <input type="checkbox"/> Bordering Vegetated Wetland	1. square feet	2. square feet
c. <input type="checkbox"/> Land Under Waterbodies and Waterways	1. square feet 3. cubic yards dredged	2. square feet



WPA Form 3 - Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

ACTON

City/Town

B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

Resource Area, Size of Proposed Alteration, Proposed Replacement (if any)
d. Bordering Land Subject to Flooding
e. Isolated Land Subject to Flooding
f. Riverfront Area

2. Width of Riverfront Area (check one):

- 25 ft. - Designated Densely Developed Areas only
100 ft. - New agricultural projects only
200 ft. - All other projects

3. Total area of Riverfront Area on the site of the proposed project: square feet

4. Proposed alteration of the Riverfront Area:

a. total square feet b. square feet within 100 ft. c. square feet between 100 ft. and 200 ft.

5. Has an alternatives analysis been done and is it attached to this NOI? Yes No

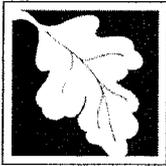
6. Was the lot where the activity is proposed created prior to August 1, 1996? Yes No

3. Coastal Resource Areas: (See 310 CMR 10.25-10.35)

Check all that apply below. Attach narrative and supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

Resource Area, Size of Proposed Alteration, Proposed Replacement (if any)
a. Designated Port Areas
b. Land Under the Ocean
c. Barrier Beach
d. Coastal Beaches
e. Coastal Dunes



# WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

MassDEP File Number \_\_\_\_\_

Document Transaction Number \_\_\_\_\_

ACTON

City/Town \_\_\_\_\_

## B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
f. <input type="checkbox"/> Coastal Banks	_____	_____
	1. linear feet	
g. <input type="checkbox"/> Rocky Intertidal Shores	_____	_____
	1. square feet	
h. <input type="checkbox"/> Salt Marshes	_____	_____
	1. square feet	2. sq ft restoration, rehab., creation
i. <input type="checkbox"/> Land Under Salt Ponds	_____	_____
	1. square feet	
	_____	
	2. cubic yards dredged	
j. <input type="checkbox"/> Land Containing Shellfish	_____	_____
	1. square feet	
k. <input type="checkbox"/> Fish Runs	Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above	
	_____	
	1. cubic yards dredged	
l. <input type="checkbox"/> Land Subject to Coastal Storm Flowage	_____	_____
	1. square feet	
4. <input type="checkbox"/> Restoration/Enhancement	If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.2.b or B.3.h above, please enter the additional amount here.	
	_____	_____
	a. square feet of BVW	b. square feet of Salt Marsh
5. <input type="checkbox"/> Project Involves Stream Crossings		
	_____	_____
	a. number of new stream crossings	b. number of replacement stream crossings

## C. Other Applicable Standards and Requirements

### Streamlined Massachusetts Endangered Species Act/Wetlands Protection Act Review

1. Is any portion of the proposed project located in **Estimated Habitat of Rare Wildlife** as indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage and Endangered Species Program (NHESP)? To view habitat maps, see the *Massachusetts Natural Heritage Atlas* or go to [http://www.mass.gov/dfwele/dfw/nhESP/regulatory\\_review/priority\\_habitat/online\\_viewer.htm](http://www.mass.gov/dfwele/dfw/nhESP/regulatory_review/priority_habitat/online_viewer.htm).

a.  Yes  No **If yes, include proof of mailing or hand delivery of NOI to:**

**Natural Heritage and Endangered Species Program  
Division of Fisheries and Wildlife  
Route 135, North Drive  
Westborough, MA 01581**

2010

b. Date of map \_\_\_\_\_



# WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

MassDEP File Number \_\_\_\_\_

Document Transaction Number \_\_\_\_\_

ACTON

City/Town \_\_\_\_\_

## C. Other Applicable Standards and Requirements (cont'd)

If yes, the project is also subject to Massachusetts Endangered Species Act (MESA) review (321 CMR 10.18). To qualify for a streamlined, 30-day, MESA/Wetlands Protection Act review, please complete Section C.1.C, and include requested materials with this Notice of Intent (NOI); OR complete Section C.1.d, if applicable. *If MESA supplemental information is not included with the NOI, by completing Section 1 of this form, the NHESP will require a separate MESA filing which may take up to 90 days to review (unless noted exceptions in Section 2 apply, see below).*

1. c. Submit Supplemental Information for Endangered Species Review\*

1.  Percentage/acreage of property to be altered:

(a) within wetland Resource Area

\_\_\_\_\_ percentage/acreage

(b) outside Resource Area

\_\_\_\_\_ percentage/acreage

2.  Assessor's Map or right-of-way plan of site

3.  Project plans for entire project site, including wetland resource areas and areas outside of wetlands jurisdiction, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work \*\*\*\*

(a)  Project description (including description of impacts outside of wetland resource area & buffer zone)

(b)  Photographs representative of the site

(c)  MESA filing fee (fee information available at:

[http://www.mass.gov/dfwele/dfw/nhesp/regulatory\\_review/mesa/mesa\\_fee\\_schedule.htm](http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/mesa/mesa_fee_schedule.htm)).

Make check payable to "Commonwealth of Massachusetts - NHESP" and **mail to NHESP** at above address

*Projects altering 10 or more acres of land, also submit:*

(d)  Vegetation cover type map of site

(e)  Project plans showing Priority & Estimated Habitat boundaries

d. OR Check One of the Following

1.  Project is exempt from MESA review.

Attach applicant letter indicating which MESA exemption applies. (See 321 CMR 10.14, [http://www.mass.gov/dfwele/dfw/nhesp/regulatory\\_review/mesa/mesa\\_exemptions.htm](http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/mesa/mesa_exemptions.htm); the NOI must still be sent to NHESP if the project is within estimated habitat pursuant to 310 CMR 10.37 and 10.59.)

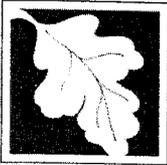
2.  Separate MESA review ongoing.

\_\_\_\_\_ a. NHESP Tracking #

\_\_\_\_\_ b. Date submitted to NHESP

\* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see <http://www.mass.gov/dfwele/dfw/nhesp/nhesp.htm>, regulatory review tab). Priority Habitat includes habitat for state-listed plants and strictly upland species not protected by the Wetlands Protection Act.

\*\* MESA projects may not be segmented (321 CMR 10.16). The applicant must disclose full development plans even if such plans are not required as part of the Notice of Intent process.



# WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

MassDEP File Number

Document Transaction Number

ACTON

City/Town

## C. Other Applicable Standards and Requirements (cont'd)

- 3.  Separate MESA review completed.  
Include copy of NHESP "no Take" determination or valid Conservation & Management Permit with approved plan.

- 2. For coastal projects only, is any portion of the proposed project located below the mean high water line or in a fish run?

- a.  Not applicable – project is in inland resource area only

- b.  Yes  No If yes, include proof of mailing or hand delivery of NOI to either:

South Shore - Cohasset to Rhode Island, and the Cape & Islands:

North Shore - Hull to New Hampshire:

Division of Marine Fisheries -  
Southeast Marine Fisheries Station  
Attn: Environmental Reviewer  
1213 Purchase Street – 3rd Floor  
New Bedford, MA 02740-6694

Division of Marine Fisheries -  
North Shore Office  
Attn: Environmental Reviewer  
30 Emerson Avenue  
Gloucester, MA 01930

Also if yes, the project may require a Chapter 91 license. For coastal towns in the Northeast Region, please contact MassDEP's Boston Office. For coastal towns in the Southeast Region, please contact MassDEP's Southeast Regional Office.

- 3. Is any portion of the proposed project within an Area of Critical Environmental Concern (ACEC)?

- a.  Yes  No If yes, provide name of ACEC (see instructions to WPA Form 3 or MassDEP Website for ACEC locations). **Note:** electronic filers click on Website.

b. ACEC

- 4. Is any portion of the proposed project within an area designated as an Outstanding Resource Water (ORW) as designated in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00?

- a.  Yes  No

- 5. Is any portion of the site subject to a Wetlands Restriction Order under the Inland Wetlands Restriction Act (M.G.L. c. 131, § 40A) or the Coastal Wetlands Restriction Act (M.G.L. c. 130, § 105)?

- a.  Yes  No

- 6. Is this project subject to provisions of the MassDEP Stormwater Management Standards?

- a.  Yes. Attach a copy of the Stormwater Report as required by the Stormwater Management Standards per 310 CMR 10.05(6)(k)-(q) and check if:

- 1.  Applying for Low Impact Development (LID) site design credits (as described in Stormwater Management Handbook Vol. 2, Chapter 3)

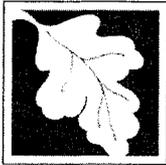
- 2.  A portion of the site constitutes redevelopment

- 3.  Proprietary BMPs are included in the Stormwater Management System.

- b.  No. Check why the project is exempt:

- 1.  Single-family house

**Online Users:**  
Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.



# WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

MassDEP File Number

Document Transaction Number

ACTON

City/Town

## C. Other Applicable Standards and Requirements (cont'd)

- 2.  Emergency road repair
- 3.  Small Residential Subdivision (less than or equal to 4 single-family houses or less than or equal to 4 units in multi-family housing project) with no discharge to Critical Areas.

## D. Additional Information

Applicants must include the following with this Notice of Intent (NOI). See instructions for details.

**Online Users:** Attach the document transaction number (provided on your receipt page) for any of the following information you submit to the Department.

- 1.  USGS or other map of the area (along with a narrative description, if necessary) containing sufficient information for the Conservation Commission and the Department to locate the site. (Electronic filers may omit this item.)
- 2.  Plans identifying the location of proposed activities (including activities proposed to serve as a Bordering Vegetated Wetland [BVW] replication area or other mitigating measure) relative to the boundaries of each affected resource area.
- 3.  Identify the method for BVW and other resource area boundary delineations (MassDEP BVW Field Data Form(s), Determination of Applicability, Order of Resource Area Delineation, etc.), and attach documentation of the methodology.
- 4.  List the titles and dates for all plans and other materials submitted with this NOI.

"Spruce Corner, Site Plan Special Permit Application" Sheets 3, 4, 7, 8

a. Plan Title

FORESITE Engineering

Scott P. Hayes, P.E.

b. Prepared By

July 6, 2010

c. Signed and Stamped by

1"=20'

d. Final Revision Date

e. Scale

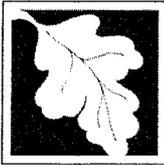
"Stormwater Report & Calculations for Spruce Corner"

July 12, 2010

f. Additional Plan or Document Title

g. Date

- 5.  If there is more than one property owner, please attach a list of these property owners not listed on this form.
- 6.  Attach proof of mailing for Natural Heritage and Endangered Species Program, if needed.
- 7.  Attach proof of mailing for Massachusetts Division of Marine Fisheries, if needed.
- 8.  Attach NOI Wetland Fee Transmittal Form
- 9.  Attach Stormwater Report, if needed.



# WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

MassDEP File Number

Document Transaction Number

ACTON

City/Town

## E. Fees

1.  Fee Exempt: No filing fee shall be assessed for projects of any city, town, county, or district of the Commonwealth, federally recognized Indian tribe housing authority, municipal housing authority, or the Massachusetts Bay Transportation Authority.

Applicants must submit the following information (in addition to pages 1 and 2 of the NOI Wetland Fee Transmittal Form) to confirm fee payment:

81	August 18, 2010
2. Municipal Check Number	3. Check date
82	August 18, 2010
4. State Check Number	5. Check date
BellaCasa Development, LLC	
6. Payor name on check: First Name	7. Payor name on check: Last Name

## F. Signatures and Submittal Requirements

I hereby certify under the penalties of perjury that the foregoing Notice of Intent and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge. I understand that the Conservation Commission will place notification of this Notice in a local newspaper at the expense of the applicant in accordance with the wetlands regulations, 310 CMR 10.05(5)(a).

I further certify under penalties of perjury that all abutters were notified of this application, pursuant to the requirements of M.G.L. c. 131, § 40. Notice must be made by Certificate of Mailing or in writing by hand delivery or certified mail (return receipt requested) to all abutters within 100 feet of the property line of the project location.

1. Signature of Applicant	<i>SCOTT HAYES, AGENT FOR APPLICANT</i>	2. Date	8/19/10
3. Signature of Property Owner (if different)		4. Date	
5. Signature of Representative (if any)	<i>SCOTT HAYES, P.E.</i>	6. Date	8/19/10

### For Conservation Commission:

Two copies of the completed Notice of Intent (Form 3), including supporting plans and documents, two copies of the NOI Wetland Fee Transmittal Form, and the city/town fee payment, to the Conservation Commission by certified mail or hand delivery.

### For MassDEP:

One copy of the completed Notice of Intent (Form 3), including supporting plans and documents, one copy of the NOI Wetland Fee Transmittal Form, and a **copy** of the state fee payment to the MassDEP Regional Office (see Instructions) by certified mail or hand delivery.

### Other:

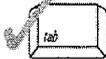
If the applicant has checked the "yes" box in any part of Section C, Item 3, above, refer to that section and the Instructions for additional submittal requirements.

The original and copies must be sent simultaneously. Failure by the applicant to send copies in a timely manner may result in dismissal of the Notice of Intent.



Massachusetts Department of Environmental Protection  
 Bureau of Resource Protection - Wetlands  
**NOI Wetland Fee Transmittal Form**  
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

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



**A. Applicant Information**

1. Applicant:

a. First Name West Acton Trio, LLC		b. Last Name	
c. Organization P.O. Box 401012			
d. Mailing Address Cambridge MA 02104			
e. City/Town (617) 230-3674		f. State MA	g. Zip Code 02104
h. Phone Number		i. Fax Number	j. Email Address markmyrealtor@yahoo.com

2. Property Owner (if different):

a. First Name		b. Last Name	
c. Organization			
d. Mailing Address			
e. City/Town		f. State	g. Zip Code
h. Phone Number		i. Fax Number	j. Email Address

3. Project Location:

232 Arlington Street		Acton
a. Street Address		b. City/Town

**B. Fees**

The fee should be calculated using the following six-step process and worksheet. **Please see Instructions before filling out worksheet.**

**Step 1/Type of Activity:** Describe each type of activity that will occur in wetland resource area and buffer zone.

**Step 2/Number of Activities:** Identify the number of each type of activity.

**Step 3/Individual Activity Fee:** Identify each activity fee from the six project categories listed in the instructions.

**Step 4/Subtotal Activity Fee:** Multiply the number of activities (identified in Step 2) times the fee per category (identified in Step 3) to reach a subtotal fee amount. Note: If any of these activities are in a Riverfront Area in addition to another Resource Area or the Buffer Zone, the fee per activity should be multiplied by 1.5 and then added to the subtotal amount.

**Step 5/Total Project Fee:** Determine the total project fee by adding the subtotal amounts from Step 4.

**Step 6/Fee Payments:** To calculate the state share of the fee, divide the total fee in half and subtract \$12.50. To calculate the city/town share of the fee, divide the total fee in half and add \$12.50.

To calculate filing fees, refer to the category fee list and examples in the instructions for filling out WPA Form 3 (Notice of Intent).





Massachusetts Department of Environmental Protection  
Bureau of Resource Protection - Wetlands  
**NOI Wetland Fee Transmittal Form**  
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

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



**A. Applicant Information**

1. Applicant:

a. First Name West Acton Trio, LLC		b. Last Name	
c. Organization P.O. Box 401012			
d. Mailing Address Cambridge			
e. City/Town (617) 230-3674		f. State MA	g. Zip Code 02104
h. Phone Number		i. Fax Number	j. Email Address markmyrealtor@yahoo.com

2. Property Owner (if different):

a. First Name		b. Last Name	
c. Organization			
d. Mailing Address			
e. City/Town		f. State	g. Zip Code
h. Phone Number		i. Fax Number	j. Email Address

3. Project Location:

232 Arlington Street		Acton
a. Street Address	b. City/Town	

**B. Fees**

The fee should be calculated using the following six-step process and worksheet. **Please see Instructions before filling out worksheet.**

**Step 1/Type of Activity:** Describe each type of activity that will occur in wetland resource area and buffer zone.

**Step 2/Number of Activities:** Identify the number of each type of activity.

**Step 3/Individual Activity Fee:** Identify each activity fee from the six project categories listed in the instructions.

**Step 4/Subtotal Activity Fee:** Multiply the number of activities (identified in Step 2) times the fee per category (identified in Step 3) to reach a subtotal fee amount. Note: If any of these activities are in a Riverfront Area in addition to another Resource Area or the Buffer Zone, the fee per activity should be multiplied by 1.5 and then added to the subtotal amount.

**Step 5/Total Project Fee:** Determine the total project fee by adding the subtotal amounts from Step 4.

**Step 6/Fee Payments:** To calculate the state share of the fee, divide the total fee in half and subtract \$12.50. To calculate the city/town share of the fee, divide the total fee in half and add \$12.50.

To calculate filing fees, refer to the category fee list and examples in the instructions for filling out WPA Form 3 (Notice of Intent).



Massachusetts Department of Environmental Protection  
Bureau of Resource Protection - Wetlands  
**NOI Wetland Fee Transmittal Form**  
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

**B. Fees** (continued)

Step 1/Type of Activity	Step 2/Number of Activities	Step 3/Individual Activity Fee	Step 4/Subtotal Activity Fee
Cat. 2.g. Point source Dis.	1	\$500	\$500.00
Cat. 3.b. Each Building	1	\$1,050	\$1,050.00

Step 5/Total Project Fee: \$1,550.00

Step 6/Fee Payments: \$1,550.00

Total Project Fee: a. Total Fee from Step 5  
\$762.50

State share of filing Fee: b. 1/2 Total Fee less \$12.50  
\$787.50

City/Town share of filling Fee: c. 1/2 Total Fee plus \$12.50

**C. Submittal Requirements**

- a.) Complete pages 1 and 2 and send with a check or money order for the state share of the fee, payable to the Commonwealth of Massachusetts.

Department of Environmental Protection  
Box 4062  
Boston, MA 02211

- b.) **To the Conservation Commission:** Send the Notice of Intent or Abbreviated Notice of Intent; a copy of this form; and the city/town fee payment.

**To MassDEP Regional Office** (see Instructions): Send a copy of the Notice of Intent or Abbreviated Notice of Intent; a copy of this form; and a copy of the state fee payment. (E-filers of Notices of Intent may submit these electronically.)



Town of Acton  
 472 Main Street  
 Acton, MA 01720  
 Telephone (978) 264-9622  
 Fax (978) 264-9630

Brian McMullen  
 Assistant Assessor

Locus: 230-232 ARLINGTON ST  
 Parcel: F2.A-70, -71, -83

Location	Parcel ID	Owner	Co-Owner	Mailing Address	City	ST	Zip
215 ARLINGTON ST	F2.A-20	CICCONE SCOTT A	CICCONE KELLY MORAN	141 NEW YOURK AV	LOS GATOS	CA	95020-8111
210 ARLINGTON ST	F2.A-29-1	THOMPSON DOUGLAS A		210 ARLINGTON ST	ACTON	MA	01720
3 WEST RD	F2.A-29-3	CHU YU-MEI		3 WEST RD	ACTON	MA	01720
5 WEST RD	F2.A-29-5	PLANTE RICHARD P	RHE ETTA	5 WEST RD	ACTON	MA	01720
7 WEST RD	F2.A-29-7	BERLIED JOHN C	BERLIED ROBERTA A	7 WEST RD	ACTON	MA	01720
9 WEST RD	F2.A-29-8	CHIAO PHILLIP CHEN HSI	CHIAO ANGELA SU-CHU PENG	9 WEST RD	ACTON	MA	01720
226 ARLINGTON ST	F2.A-29-10	PHILBRICK SCOTT D	SHARYON D	226 ARLINGTON ST	ACTON	MA	01720
35 SPRUCE ST	F2.A-33	HARRIS HELEN E	GRANEY MARK R ET AL	33 SPRUCE STREET	ACTON	MA	01720
221 ARLINGTON ST	F2.A-34	FLANNERY CECELIA JOAN		544 MASSACHUSETTS AVE	ACTON	MA	01720
219 ARLINGTON ST	F2.A-35	PETERSON N ROBERT	MORSE KAREN J	219 ARLINGTON ST	ACTON	MA	01720
34 SPRUCE ST	F2.A-39	GEIKE DAVID	ANN H	204 LARCH ROW	WENHAM	MA	01984
239 ARLINGTON ST	F2.A-44	KLINGER MICHAEL L	DRAGO M CAROLE	239 ARLINGTON ST	ACTON	MA	01720
235 ARLINGTON ST	F2.A-45	LOCKE CYNTHIA A		235 ARLINGTON ST	ACTON	MA	01720
227 ARLINGTON ST	F2.A-46	HARTMAN WILLIAM G	JANE LOUISE HARTMAN	227 ARLINGTON ST	ACTON	MA	01720
251 ARLINGTON ST	F2.A-51	GORDON RICHARD TRUSTEE	251 ARLINGTON STREET TRUST	C/O PAULA GORDON	394 AF ACTON	MA	01720
30 SPRUCE ST	F2.A-52	MAZZEO SANTO J	DORIS A	30 SPRUCE ST	ACTON	MA	01720
220 ARLINGTON ST	F2.A-53	RICHARDT ANDREW D	RICHARDT LAUREN	220 ARLINGTON ST	ACTON	MA	01720
245 ARLINGTON ST	F2.A-60	IJAN 2MA REALTY LLC		215 BUSINESS PARK DR	ARMONK	NY	10504
241 ARLINGTON ST	F2.A-61	MADIGAN JOHN C	C/O LR PROPERTIES LLC	PO BOX 745	HARVARD	MA	01451
250 ARLINGTON ST	F2.A-79.A	SMITH ADAM W C	ANDERSEN CHRISTIANA MCKERN,	250 ARLINGTON ST	ACTON	MA	01720
252 ARLINGTON ST	F2.A-79.B	MADDOX MARY PRICE		252 ARLINGTON ST	ACTON	MA	01720
240 ARLINGTON ST	F2.A-81	BOTTOS NICHOLAS A + CASSIANI N	TRUSTEES 240 ARLINGTON ST NC	253C SCHOOL ST	ACTON	MA	01720
15 SPRUCE ST	F2.A-82	MERRILL ERNEST O JR TRUSTEE	15 SPRUCE TRUST II	15 SPRUCE ST	ACTON	MA	01720
565 MASS AV	F2.A-90	COURNOYER ADELARD W	C/O DINNO RAIED AND DINNO SAA	565 MASS AV REALTY TRUST	56 ACTON	MA	01720
555 MASS AV	F2.A-91	BOTTOS LLC		253B SCHOOL STREET	ACTON	MA	01720
10 SPRUCE ST	F2.A-92	BOTTOS CASSIANI N TRUSTEE	SUCCESSOR TRUSTEE OF THE 20	253B SCHOOL ST	ACTON	MA	01720
11 SPRUCE ST	F2.A-93	BOTTOS NICHOLAS A TRUSTEE	BOTTOS CASSIANI N TRUSTEE	11 SPRUCE ST NOMINEE TRUS 2	ACTON	MA	01720
3 SPRUCE ST U2	F2.A-94-2	BITTERROOT GROUP LLC		PO BOX 796	ACTON	MA	01720
1 SPRUCE ST U3	F2.A-94-3	543-545 MASS AVE LMTD PTNRSP	NAOMI ROSENFELD	543 MASS AV	ACTON	MA	01720
5-9 SPRUCE ST U1	F2.A-97	PRESTI FAMILY LP	PRESTI MANAGEMENT CORP GP	585 MASS AVENUE	ACTON	MA	01720
553 MASS AV	F2.A-102	WEST ACTON AMERICAN/EXXON/MC	GILBARCO INC	ATTN: CMS MAILSTOP F-76	730C GREENSBORO	NC	22087

Brian McMullen  
Assistant Assessor

**Locus:** 230-232 ARLINGTON ST  
**Parcel:** F2.A-70, -71, -83

Location	Parcel ID	Owner	Co-Owner	Mailing Address	City	ST	Zip
531 MASS AV	F2.A-103	531 MASS AVE LLC		543 MASS AVE	ACTON	MA	01720
543 MASS AV	F2.A-112	543-545 MASSACHUSETTS AVENUE	LIMITED PARTNERSHIP	543 MASS AVE	ACTON	MA	01720
541 MASS AV	F2.A-113	541 MASS AVE LLC		543 MASS AVE	ACTON	MA	01720
535 MASS AV	F2.A-114	537 MASS AVE LLC		543 MASS AVE	ACTON	MA	01720
<b>MBTA</b>	<b>C/O TRANSIT REALTY ASSOCIATES, LLC</b>		<b>ATTN: VANESSA MERRITT</b>	<b>77 FRANKLIN ST 9TH FLOOR</b>	<b>BOSTON</b>	<b>MA</b>	<b>02110</b>

Abutters and owners of land directly opposite on any public or private street or way and abutters to the abutters within three hundred feet of the property line all as they appear on the most recent applicable tax list.

**HEARING NOTICES FOR ALL SPECIAL PERMITS MUST BE SENT TO THE PLANNING BOARD, TOWN HALL IN THE FOLLOWING TOWNS:**

- Boxborough, MA 01729
- Carlisle, MA 01741
- Maynard, MA 01754
- Stow, MA 01775
- Concord, MA 01742
- Westford, MA 01886
- Littleton, MA 01460
- Sudbury, MA 01776



Kimberly Hoyt  
Assessing Clerk  
Acton Assessors Office

11-Mar-09

**NOTIFICATION TO ABUTTERS  
UNDER THE MASSACHUSETTS WETLANDS PROTECTION ACT  
AND THE TOWN OF ACTON WETLANDS BYLAW**

In accordance with the second paragraph of Massachusetts General Laws Chapter 131, Section 40 and the Town of Acton Bylaws, you are hereby notified of the following:

The Applicant: WEST ACTON TRIO, LLC

Address P.O. BOX 401012 CAMBRIDGE, MA 02140

Phone: (617) 230-3674

has filed a Notice of Intent with the Acton Conservation Commission seeking permission to remove, fill, dredge or alter an Area Subject to Protection under the Wetlands Protection Act.

Applicant's Representative: FORESITE Engineering Associates, Inc.

Address 16 Gleasondale Road, Suite 1-1, Stow, MA 01775

Phone: (978) 461-2350

The address of the property where the activity is proposed 232 ARLINGTON STREET

Town Atlas Plate F-2A

Parcel 70, 71 & 83

Project Description Construction of a 2-family dwelling, utilities, drainage improvements, site grading and landscaping within 100 feet of a bordering vegetated wetland.

Copies of the Notice of Intent may be examined at the Conservation Office, Acton Town Hall, 472 Main Street, Acton. Between the hours of 9:00 A.M. and 4:30 P.M. Monday through Friday. For more information please call the Conservation Office at (978) 929-6634

A Public Hearing will be held at the Acton Town Hall, 472 Main Street, on Wednesday,  
SEPTEMBER 1, 2010 at 7:25 P.M.  
(date)

The notice of the public hearing, will be published at least five (5) days in advance in the Acton edition of the *Beacon* newspaper.

NOTE: You may also contact your local conservation commission or the nearest Department of Environmental Protection Regional Office for the information about this application or, the Wetlands Protection Act. Acton is in the Central Region. To contact DEP, call:

\*Central Region: 508-792-7650

Southeast Region: 508-946-2800

Northeast Region: 617-935-2160

Western Region: 413-784-1100

Administrative Office:  
17 Waban Street  
Wellesley, MA 02482-6310

Technical Office:  
251 West Central Street, Suite D-36  
Natick, MA 01760-3758

carr@carr-research-lab.com  
www.carr-research-lab.com

September 23, 2008

**WETLAND BORDER REPORT  
232 ARLINGTON STREET  
ACTON, MA**

On 23 September 2008 the wetland resource areas were delineated on a parcel known as 232 Arlington Street in Acton, MA. The wetland border was flagged using the criteria in the most recent edition of MA Wetland Protection Act (WPA) and Regulations 310 CMR 10.00 *et al* as well as the Acton Wetlands Protection Bylaw. Hydric soil indicators, vegetational changes, hydrological indicators, and topography were all considered for delineation purposes. The Bordering Vegetated Wetlands (BVW) flags are blue and are denoted with a CRL #.

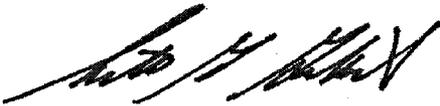
BVW was identified in the southeast corner of the property. The wetland border is denoted by flags CRL 1- through CRL 7 and follows a well-defined toe of filled slope. The mucky wetland is dominated by sensitive fern, jewelweed, and cattails with soils typified by 0-15"+ of 5YR2/1 muck under standing water. The upland is dominated by Norway maple, multiflora rose, honeysuckle, jewelweed, slippery elm, poison ivy, with soils typified by 0-15"+ of 10YR3/2 loamy fill. The entire edge of BVW is identical to a previous delineation found on-site by B&C Associates. Since this delineation is so clearly defined and further substantiated by another consultant, BVW Delineation Sheets were deemed unnecessary.

According to the 2006 MA Natural Heritage Atlas, this site *is not* located within an Estimated Habitat of Rare Wildlife, nor are there any certified vernal pools on or near the site. All proposed work within 100 feet of the delineated wetland requires the filing of a Notice of Intent with the Acton Conservation Commission. For assistance with filing, or if there are any questions concerning this report, please do not hesitate to call me.

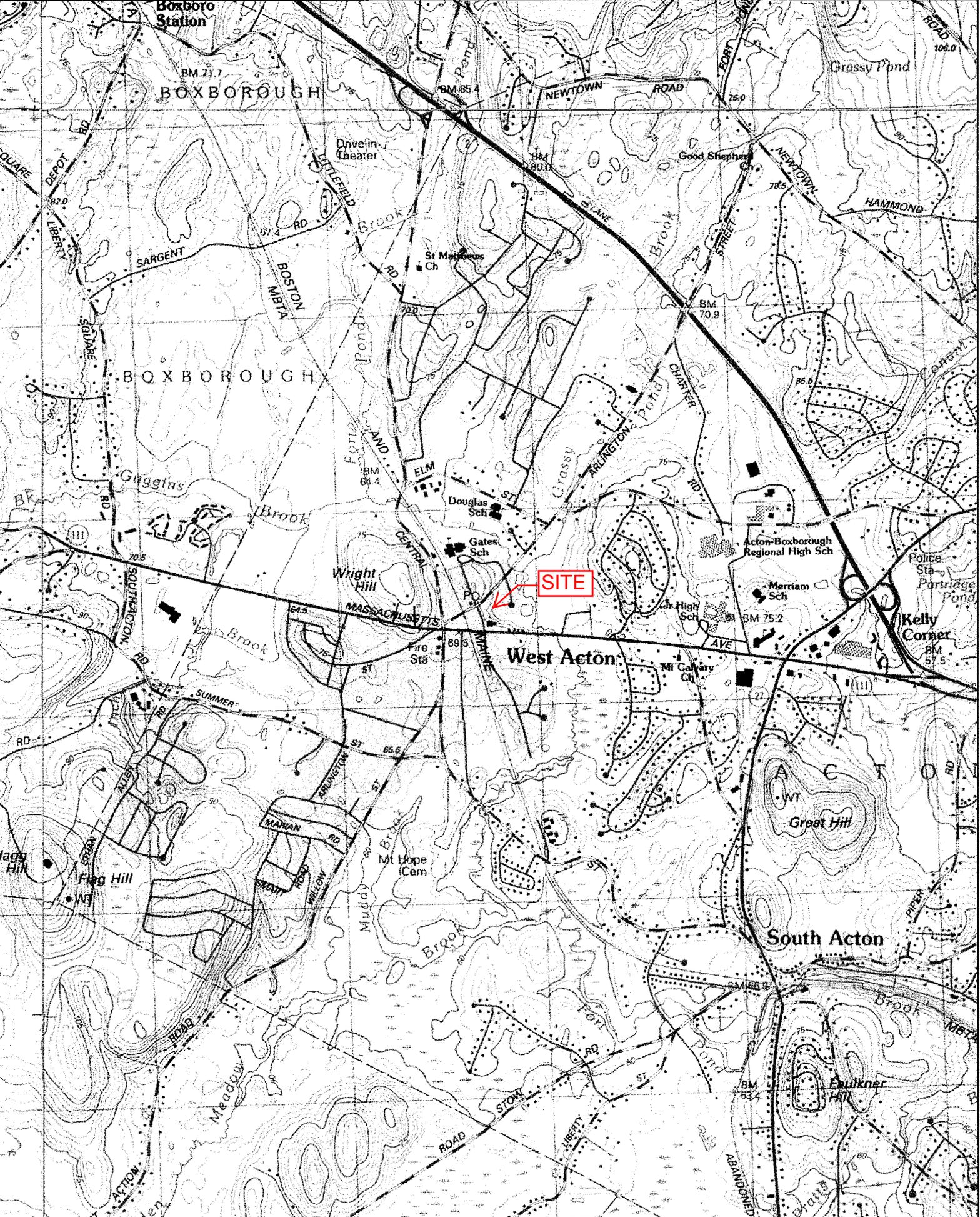
Sincerely,

*Carr Research Laboratory, Inc.*

by



Scott Goddard, PWS, CWS  
Senior Ecological Engineer and  
Project Manager



**PARKING SCHEDULE**

UNIT NO.	GAR. PKG	EXT. PKG	TOTAL
1	0	1	1
2	0	1	1
3	0	1	1
4	1	1	2
5	1	1	2
6	1	1	2
7	1	1	2
RETAIL	0	6	6
<b>TOTAL</b>	<b>4</b>	<b>13</b>	<b>17</b>

**PARKING NOTES:**

SECTION 6.3.11 OF THE ACTON ZONING BYLAW REQUIRES A MIN. OF TWO PARKING SPACES PER SINGLE FAMILY DWELLING UNIT. ALL PROPOSED PARKING SPACES MEET THE DIMENSIONAL REQUIREMENTS FOR STANDARD CAR PARKING SPACES ESTABLISHED IN SECTION 6.5 OF THE ACTON ZONING BYLAW. (SEE DETAIL ON SHEET 6).

N/F LR PROPERTIES, LLC MAP F-2A PARCEL 61 (241 ARLINGTON STREET)

**ZONING DATA**

ZONE: WEST ACTON VILLAGE

GROUNDWATER PROTECTION DISTRICT ZONE 3 & 4  
FLOOD PLAIN - NONE

**DEVELOPMENT DATA:**

EXISTING SITE: 2 SINGLE FAMILY DWELLINGS  
PROPOSED DEVELOPMENT: 4 DWELLING UNITS (2 DUPLEXES)  
3 APARTMENTS  
4,396 S.F. COMMERCIAL (RETAIL OR OFFICE)

**SEWAGE FLOW:**

(4) 3-BEDROOM UNITS + (3) 2-BEDROOM UNITS = 18 BEDROOMS  
21 BEDROOMS @ 110 GAL/DAY/BEDROOM = 1,980 GAL/DAY  
2,100 S.F. OFFICE @ 75 GAL/DAY/1,000 S.F. = 158 GAL/DAY  
TOTAL DAILY SEWAGE DESIGN FLOW = 1,980 + 158 = 2,138 GAL/DAY

**IMPERVIOUS COVER:**

EXISTING IMPERVIOUS COVER = 2,646 S.F. (7.19%)  
PROP. BUILDING COVERAGE = 7,002 S.F. (19.02%)  
PROP. IMPERVIOUS PAVING AND WALKS = 4,926 S.F. (13.4%)  
TOTAL PROPOSED IMPERVIOUS COVER = 11,923 S.F. (32.4%)

**FLOOR AREA RATIO**

TOTAL SITE AREA: 36,794 SQ.FT.  
AREA OF WETLANDS: -1,085 SQ.FT.  
DEVELOPABLE SITE AREA: 35,709 SQ.FT.  
NET FLOOR AREA PROPOSED: 19,068 SQ.FT.

FLOOR AREA RATIO =  $\frac{\text{NET FLOOR AREA}}{\text{DEVELOPABLE SITE AREA}} < 0.40$

FLOOR AREA RATIO =  $\frac{20,295 \text{ S.F.}}{35,709 \text{ S.F.}} = 0.568$

NOTE: ALL FLOOR AREA ABOVE F.A.R. OF 0.4 IS RESIDENTIAL FLOOR AREA MEETING THE PROVISION OF FOOTNOTE 12 IN THE TABLE OF STANDARD DIMENSIONAL REQUIREMENTS (ZBL SEC. 5) FOR INCREASE OF THE F.A.R. TO A MAX. OF 0.7



**NOTES:**

- NO FILL CONTAINING HAZARDOUS MATERIALS OR WASTE SHALL BE USED ON SITE.
- LIMIT OF CLEARING SHALL BE CLEARLY STAKED IN THE FIELD PRIOR TO THE START OF CONSTRUCTION AND SHALL BE OBSERVED AS THE LIMIT OF ALL WORK.
- ALL CATCH BASIN SUMPS AND STORM WATER BASINS SHALL BE CLEANED FOLLOWING CONSTRUCTION AND ANNUALLY THEREAFTER.
- NO EARTH OR CONSTRUCTION DEBRIS SHALL BE HAULED EXCEPT BETWEEN THE HOURS OF 9 AM AND 4PM ON WEEKDAYS.
- TRAVELLED IMPERVIOUS SURFACES SHALL BE CONSTRUCTED OF BITUMINOUS ASPHALTIC CONCRETE, TYPE 1, LAID IN TWO COURSES, A 2" BINDER COURSE AND A 1" FINISH (TOP) COURSE. EXCEPT WHERE ECO-STONE PERMEABLE PAVERS ARE PROPOSED.
- ALL STUMPS SHALL BE EITHER GROUND ON SITE WITH A STUMP GRINDER OR REMOVED FROM THE SITE FOR PROPER DISPOSAL.
- CONTRACTOR SHALL CONTACT DIGSAFE AT (888) 344-7233 AT LEAST 72 HOURS BEFORE EXCAVATING ON PUBLIC OR PRIVATE PROPERTY.
- THIS SITE LIES WITHIN TOWN OF ACTON GROUNDWATER PROTECTION DISTRICT ZONES 3 & 4.
- NO PORTION OF THE SITE LIES WITHIN THE 100 YEAR FLOODPLAIN. REF. F.I.R.M. 250176 REV. 1/6/08.
- ALL ELEVATIONS REFER TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). BENCHMARK TRANSFERRED FROM RM 3 TOP CENTERLINE UPSTREAM HEADWALL OF RT. 111 BRIDGE OVER FORT POND BROOK (ELEV. = 202.76).
- ALL PROPOSED WATER MAINS, SERVICES, AND HYDRANTS SHALL BE INSTALLED IN ACCORDANCE WITH THE SPECIFICATIONS OF THE ACTON WATER SUPPLY DISTRICT.
- PRESSURE TREATED WOOD GUARD RAIL SHALL BE INSTALLED ALONG THE TOP OF THE PROPOSED CONCRETE BLOCK RETAINING WALL SHOWN ALONG THE SOUTH EDGE OF THE SITE ACCESS DRIVEWAY (SEE DETAIL).
- SITE SHALL BE GRADED TO ENSURE RUNOFF AWAY FROM STREETS, BUILDINGS AND ABUTTING PROPERTY AND TO PREVENT POOLING OF DRAINAGE.
- THERE ARE NO KNOWN UNDERGROUND STORAGE TANKS ON SITE AND NONE ARE PROPOSED AS PART OF THIS DEVELOPMENT.
- NO DUMPSTER IS PROPOSED; EACH DWELLING UNIT OWNER SHALL BE RESPONSIBLE FOR THAT UNIT'S TRASH REMOVAL.
- BORDERING VEGETATED WETLANDS WERE DELINEATED BY CARR RESEARCH LABORATORY, INC. IN SEPTEMBER OF 2008.
- ACCESS DRIVEWAY AND CURB ROUNDINGS PROPOSED ARE SUFFICIENT TO ACCOMMODATE, AT A MINIMUM, AN SU-30 DESIGN VEHICLE.
- ALL FOUND SURVEY MONUMENTS SHALL BE MARKED IN THE FIELD PRIOR TO CONSTRUCTION, AND SHALL BE REPAIRED OR REPLACED IF ANY DAMAGE OCCURS DURING CONSTRUCTION.
- ROOF DRAIN LEADERS FROM UNITS 1-3 ARE TO BE PIPED TO ECO-STONE PAVEMENT BED IN MAIN ACCESS DRIVE. ROOF DRAIN LEADERS FROM UNITS 4-5 ARE TO BE PIPED TO ECO-STONE PAVEMENT BED IN UNIT 4-5 DRIVE.
- ROOF DRAIN LEADERS FROM UNITS 6-7 ARE TO DISCHARGE TO RETENTION BASIN.

ZONING REQUIREMENTS	MIN. OR MAX.	PROVIDED
MINIMUM LOT AREA:	NR	36,794 S.F.
MINIMUM LOT FRONTAGE:	NR	183.93' (ARLINGTON ST.) 93.00' (SPRUCE ST.)
MINIMUM LOT WIDTH:	NR	113' ±
MINIMUM FRONT YARD:	5-FT	5-FT
MINIMUM SIDE & REAR YARD:	NR	3.5-FT
MINIMUM OPEN SPACE:	NR	23,236 S.F. ± (63%)
MAXIMUM FLOOR AREA RATIO:	0.40*	0.568
MAXIMUM BUILDING HEIGHT:	36-FT	33'-2"

\* FLOOR AREA RATIO MAY BE INCREASED TO 0.70 PROVIDED THAT FOR EVERY 1,000 S.F. OF NON-RESIDENTIAL NET FLOOR AREA ABOVE A FLOOR AREA RATIO OF 0.40 AN AT LEAST EQUAL AMOUNT OF RESIDENTIAL NET FLOOR AREA IS PROVIDED SIMULTANEOUSLY. THE PROPOSED DEVELOPMENT MEETS THIS CRITERIA.

**"SPRUCE CORNER"**  
ARLINGTON STREET & SPRUCE STREET  
WEST ACTON, MASSACHUSETTS

---

**SITE DEVELOPMENT PLAN**  
SHEET 03 OF 11

---

SITE LOCATION: **232 ARLINGTON STREET**  
ACTON, MASSACHUSETTS 01720  
ASSESSORS MAP: F-2A PARCELS 70, 71 & 83

---

PREPARED FOR: **WEST ACTON TRIO, LLC**  
P.O. BOX 401012  
CAMBRIDGE, MASSACHUSETTS 02140

---

DATE: JULY 6, 2010 SCALE: 1" = 20'  
Phone: (978) 461-2350  
Fax: (978) 841-4102

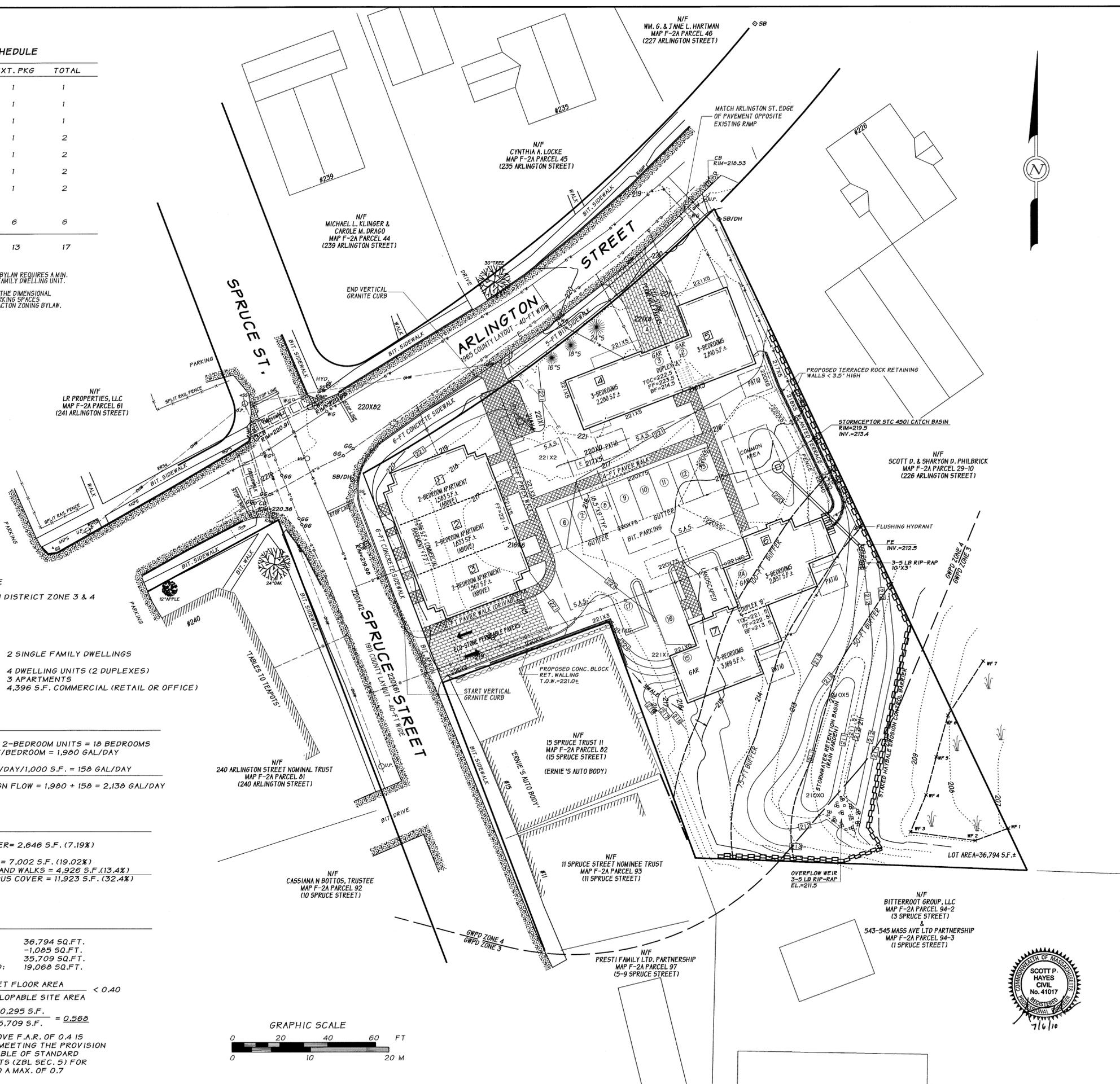
---

ENGINEERING SURVEYING PLANNING



**FORESITE ENGINEERING**  
16 Gleasondale Road Suite 1-1  
Stow, Massachusetts 01775  
www.foresite1.com

COPYRIGHT 2010, FORESITE ENGINEERING ASSOCIATES, INC. 1495512.2D



**OPERATION AND MAINTANACE PLAN**

Inspection and maintenance shall be the responsibility of the owner or site contractor during the construction of the development. After completion of construction the inspection and maintenance of the drainage system shall be the responsibility of the drainage system within the right of way will become the sole responsibility of the site owner.

Current Owner:  
West Acton Trio, LLC  
P.O. Box 401012  
Cambridge, MA 02140

The effective functioning of the proposed drainage system is dependent upon periodic inspection and maintenance. All components of the system shall be inspected and maintained regularly as outlined below for each system component.

**BMP Inspection & Maintenance Procedures:**

**Stormceptor STC 4501 Catch Bash:**

Stormceptor should be maintained annually, when sized correctly, after a spill event or if, oil and sediment levels exceed maintenance volumes, as below. Maintenance should be part of Standard Operating Procedure.

**Inspection Procedure**

Determine the length of sampler required, consult the owner's manual or contact the local manufacturing representative for this information. Assemble the sampler sections (top, middle, and bottom) to the correct length. Locate the 6" (50mm) oil port visible from surface, usually located near the outlet riser pipe. Lower the Sludge Judge to the bottom of the tank. The float valve opens allowing materials to flow in. When the bottom has been reached and the pipe has been filled to the surface level, tug slightly on the rope as the Sludge Judge is raised. This sets the check valve trapping the mixture inside. When the sampler has been raised the amount of oil and sediment can be read using the 1-ft. increments marked on the pipe sections. To release the material in the Sludge Judge? touch the pin extending from the bottom section against a hard surface such as a pail. This will open the check valve to drain the sample. Maintenance should be performed once the oil and sediment reach the recommended depths. Maintenance should be the sediment depth exceeds eight inches (8").

**Maintenance Procedure**

Maintenance is performed using a vacuum truck. A catch basin vacuum truck is not recommended for maintenance. Remove cover from unit from grade, lower hose through by-pass chamber and into treatment chamber. Vacuum trucks are able to remove material from a maximum distance of 32 feet below grade - additional charges may apply if installation is deeper. In the event of a spill or excessive buildup of oil or other hydrocarbons, a hazmat pumper must be used to remove the layer of chemicals on the top of the water level.

**Detention Basin:**

**Inspection Procedure**

Preventive maintenance should be performed at least twice a year, and ideally sediment should be removed from pretreatment BMP's after every major storm event during construction. Once the basin has been online, inspections should occur after every major storm event for the first to ensure proper stabilization and function. Attention should be paid to how long water remains standing in the basin after a storm; standing water within the basin 48 to 72 hours after a storm indicates that the infiltration capacity may have been compromised. Factors responsible for clogging (such as upland sediment erosion, excessive compaction of soils and low spots should be repaired immediately. Thereafter, the detention basin should be inspected at least twice per year. Important items to check for include: differential settlement, cracking, erosion, leakage, tree growth on the embankments, condition of rip-rap, sediment accumulations and the health of the turf.

**Maintenance Procedure**

At least twice a year, the buffer area, side slopes and basin bottom should be mowed. Grass clippings and accumulated organic matter should be removed to prevent the formation of an impervious organic mat. Trash and debris should also be removed at this time. Deep tilling can be used to break up a clogged surface area. Any tilled areas should be re-vegetated immediately. Sediments should be removed from the basin as necessary. Removal procedures should not take place until the floor of the basin is thoroughly dry. Light equipment which will not compact the underlying soil should be used to remove the top layer. The remaining soil should be deeply tilled and re-vegetated as soon as possible. Pretreatment devices associated with basins should be inspected and cleaned as necessary, at least twice per year.

**Permeable Pavers:**

- Inspect permeable pavers on a regular basis after installation, once a month for about 4-6 months after installation. After this period, inspect the pavers annually, particularly after there has been heavy rain or storms, for this is the time when the drainage voids can become clogged with organic debris.
- Sweep and vacuum permeable pavers a minimum of once a year, preferably in the spring after snowmelt utilizing street sweepers with vacuum brushes. This will clean out the voids in the paver system and restore permeability.
- Apply high pressure hosing to the pavers after sweeping and vacuuming. Check that the voids are still filled with manufacturer approved jointing aggregate, and, if not, re-fill the joints with aggregate as necessary.
- Repair or replace damaged or broken pavers found during each inspection as necessary.

**GENERAL**

THE PURPOSE OF THIS PLAN IS TO PROVIDE THE SITE CONTRACTOR WITH A MEANS FOR EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION.

**EROSION CONTROL NOTES:**

- PRIOR TO THE BEGINNING OF CONSTRUCTION ALL EROSION CONTROL BARRIERS SHALL BE INSTALLED. THE LOCATIONS SHALL BE STAKED IN THE FIELD BY A REGISTERED PROFESSIONAL ENGINEER OR LAND SURVEYOR.
- PRIOR TO THE BEGINNING OF CONSTRUCTION THE CRUSHED STONE CONSTRUCTION ENTRANCE SHALL BE INSTALLED THE FULL WIDTH OF THE CONSTRUCTION ENTRANCES (SEE DETAIL).
- MAINTAINED REGULARLY.
- SUFFICIENT HAYBALES SHALL BE STACKED ON SITE AND KEPT THE EROSION CONTROL BARRIERS SHALL BE INSPECTED AND WHEN NECESSARY.
- NO SITE ALTERATION SHALL BE DONE WITHIN ANY RESOURCE AREA OR BUFFER ZONE WITHOUT FIRST OBTAINING AN ORDER OF CONDITIONS FROM THE ACTON CONSERVATION COMMISSION.
- EXISTING VEGETATION SHALL BE RETAINED WHERE FEASIBLE. FOR EMERGENCIES. PROPOSED HAYBALES SHALL BE REPLACED

**SLOPE STABILIZATION**

- DENUDED SLOPES SHALL NOT BE UNATTENDED OR EXPOSED FOR EXCESSIVE PERIODS OF TIME, SUCH AS THE INACTIVE WINTER SEASON.
- NO LATER THAN OCTOBER 31 OF EACH CALENDAR YEAR, THE DEVELOPER SHALL STABILIZE ALL EXPOSED SOILS AND OTHER VULNERABLE OR SENSITIVE AREAS IN A MANNER ACCEPTABLE TO THE DESIGN ENGINEER AND/OR PLANNING BOARD. NO ADDITIONAL DISRUPTION MAY OCCUR EXCEPT IN ACCORDANCE WITH THE APPROVED CONSTRUCTION PLAN.
- TOPSOIL SHALL HAVE A SANDY LOAM TEXTURE RELATIVELY FREE OF SUBSOIL MATERIAL, STONES, ROOTS, LUMPS OF SOIL, TREE LIMBS, TRASH OR CONSTRUCTION DEBRIS.
- THE SEED MIX SHALL BE INOCULATED WITHIN 24 HOURS BEFORE MIXING AND PLANTING, WITH APPROPRIATE INOCULUM FOR EACH VARIETY.

**SEED MIXTURES**

MOWED AREAS (ALL FLATS AND SLOPES EQUAL TO OR LESS THAN 3:1)

MIXTURE	% BY WEIGHT	SEEDING DATES
RED FESCUE	75	APRIL 1 - JUNE 15
KENTUCKY BLUEGRASS	15	AUGUST 15 - OCTOBER 15
COLONIAL BENTGRASS	5	SPRING OR FALL
PERRENIAL RYEGRASS	5	SPRING OR FALL

UNMOWED AREAS (FLAT SLOPES GREATER THAN 3:1)

MIXTURE	% BY WEIGHT	SEEDING DATES
RED FESCUE	75	APRIL 1 - JUNE 15
KENTUCKY BLUEGRASS	5	AUGUST 15 - OCTOBER 15
COLONIAL BENTGRASS	5	SPRING OR FALL
PERRENIAL RYEGRASS	15	SPRING OR FALL

**VELOCITY CHECKDAMS**

THE CONTRACTOR SHALL PROVIDE VELOCITY CHECKDAMS ACROSS ALL UNPAVED PARKING LOT AREAS AT THE INTERVAL INDICATED BELOW:

GRADE OF LOT	INTERVALS BETWEEN CHECKDAMS
LESS THAN 4%	100 FT
4%-10%	50 FEET
OVER 10%	25 FEET

THE CONTRACTOR SHALL PROVIDE VELOCITY CHECKDAMS IN ALL UNVEGETATED OR UNPAVED CHANNELS AT INTERVALS INDICATED BELOW:

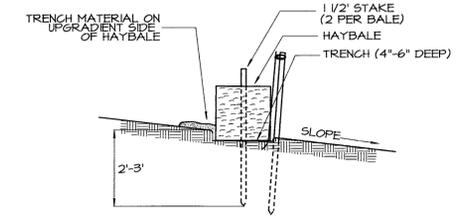
GRADE OF CHANNEL	INTERVALS BETWEEN CHECKDAMS
LESS THAN 3%	100 FT
3%-6%	50 FEET
OVER 6%	25 FEET

- CHECKDAMS SHALL BE OF HAYBALES (STAKED IF NECESSARY).
- CHECKDAMS SHALL BE INSTALLED AT THE END OF EACH WORKING DAY OR BEFORE STOPPAGE DUE TO RAIN.
- CHECKDAMS SHALL EXTEND COMPLETELY ACROSS GUTTER FLOW LINES AT RIGHT ANGLES TO THE CENTERLINE.

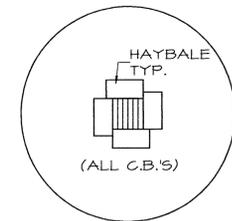
**CONSTRUCTION SEQUENCE**

DURING THIS SEQUENCE ALL EROSION CONTROL BARRIERS SHALL BE INSPECTED AND MAINTAINED REGULARLY. ALL DISTURBED AREAS SHALL BE STABILIZED BY WOOD CHIPS, MULCH, SEEDING OR SODDING AS SOON AS POSSIBLE AFTER GRADING IS COMPLETE. ALL EROSION CONTROL BARRIERS SHALL BE REMOVED UPON SATISFACTORY PERMANENT STABILIZATION OF SLOPES. THE SITE SHALL BE CONSTRUCTED IN ONE PHASE.

- INSTALL EROSION CONTROL BARRIERS.
- CLEAR AND GRUB PROPOSED LIMITS OF WORK.
- INSTALL CRUSHED STONE CONSTRUCTION ENTRANCE.
- ROUGH GRADE DETENTION BASIN AND UTILIZE FOR TEMPORARY SEDIMENTATION BASIN.
- INSTALL STORMCEPTOR 4501 CATCH BASIN AND OUTLET TO BASIN.
- INSTALL SEWAGE DISPOSAL SYSTEMS.
- INSTALL WATER UTILITIES AND FLUSHING HYDRANT.
- EXTEND UNDERGROUND UTILITIES INTO SITE, CAP & WITNESS.
- INSTALL VELOCITY CHECKDAMS AS NECESSARY.
- EXCAVATE, CONSTRUCT AND BACKFILL FOUNDATIONS.
- CONSTRUCT BUILDINGS, CONNECT ALL UTILITIES.
- COMPLETE GRADING AND COMPACTION OF AREAS TO BE PAVED.
- INSTALL BINDER COURSE OF PAVEMENT, AND INSTALL BERMS.
- INSTALL HAYBALES AROUND CATCHBASINS; INSTALL FILTER FABRIC UNDER GRATES.
- LOAM AND SEED ALL DISTURBED AREAS; COMPLETE SITE LANDSCAPING. PLACE FINISH COURSE OF PAVEMENT.
- SWEEP PAVEMENT AND REMOVE SEDIMENT AND SILT FROM CATCH BASINS AND SEDIMENT TRAP.
- STABILIZE ANY AND ALL REMAINING DISTURBED AREAS WITH LOAM & SEED.
- FOLLOWING CONSTRUCTION AND AFTER VEGETATION HAS BEEN WELL ESTABLISHED, REQUEST CONSERVATION COMMISSION APPROVAL TO REMOVE EROSION CONTROL BARRIERS FROM SITE.
- REQUEST CERTIFICATE OF COMPLIANCE FROM ACTON CONSERVATION COMMISSION.

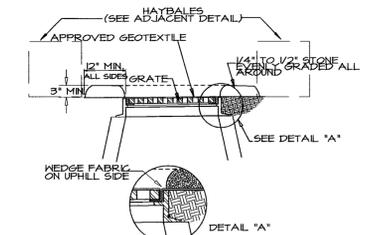
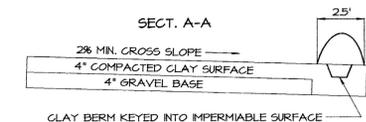
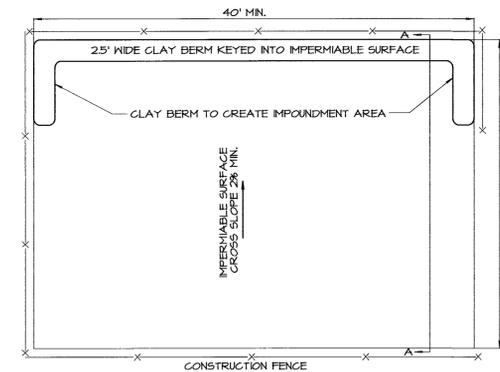


**HAYBALE WITH SILT FENCE  
EROSION CONTROL BARRIER**  
NO SCALE



**CATCHBASIN WITH HAYBALES**

NOTE: AN APPROVED FILTER FABRIC SHALL BE PLACED UNDER ALL CATCH BASIN GRATES DURING CONSTRUCTION

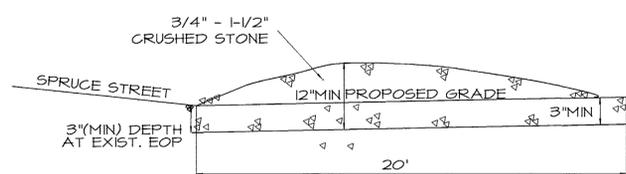


**FILTERED CATCHBASIN  
INLET**  
NOT TO SCALE

NOTE: ALL CATCHBASINS SHALL HAVE HAYBALES PLACED AROUND THEM AS SHOWN ON THE 'CATCHBASINS WITH HAYBALES' DETAIL UNTIL ALL CONSTRUCTION IS COMPLETE AND DISTURBED SLOPES ARE STABILIZED.

**RE-FUELING STATION DETAIL**

- RE-FUELING STATION TO BE LOCATED OUTSIDE 100' BVN BUFFER ZONE
- RE-FUELING AND MAINTANAGE OF ALL VEHICLES SHALL BE LIMITED TO THE RE-FUELING STATION.
- THE SURFACE OF THE RE-FUELING STATION SHALL BE MAINTAINED AS IMPERVIOUS FOR THE PURPOSE OF PREVENTING CHEMICAL INFILTRATION IN THE EVENT OF A SPILL.
- AT THE COMPLETION OF CONSTRUCTION, THE SURFACE OF THE RE-FUELING STATION SHALL BE REMOVED AND HAULED OFF SITE.
- IN THE EVENT OF A SPILL, DEP SHALL BE NOTIFIED IMMEDIATELY. DEP SPILL HOTLINE 1-888-304-1133



**TEMPORARY CRUSHED STONE ENTRANCE DETAIL**  
NOT TO SCALE  
NOTE: PURPOSE IS TO REMOVE MUD FROM TIRES AND PREVENT ANY EROSION ONTO SPRUCE STREET DURING CONSTRUCTION

**"SPRUCE CORNER"**  
ARLINGTON STREET & SPRUCE STREET  
WEST ACTON, MASSACHUSETTS

**EROSION & SEDIMENTATION CONTROL PLAN**  
SHEET 04 OF 11

SITE LOCATION:  
**232 ARLINGTON STREET**  
ACTON, MASSACHUSETTS 01720  
ASSESSORS MAP: F-2A PARCELS 70, 71 & 83

PREPARED FOR:  
**WEST ACTON TRIO, LLC**  
P.O. BOX 401012  
CAMBRIDGE, MASSACHUSETTS 02140

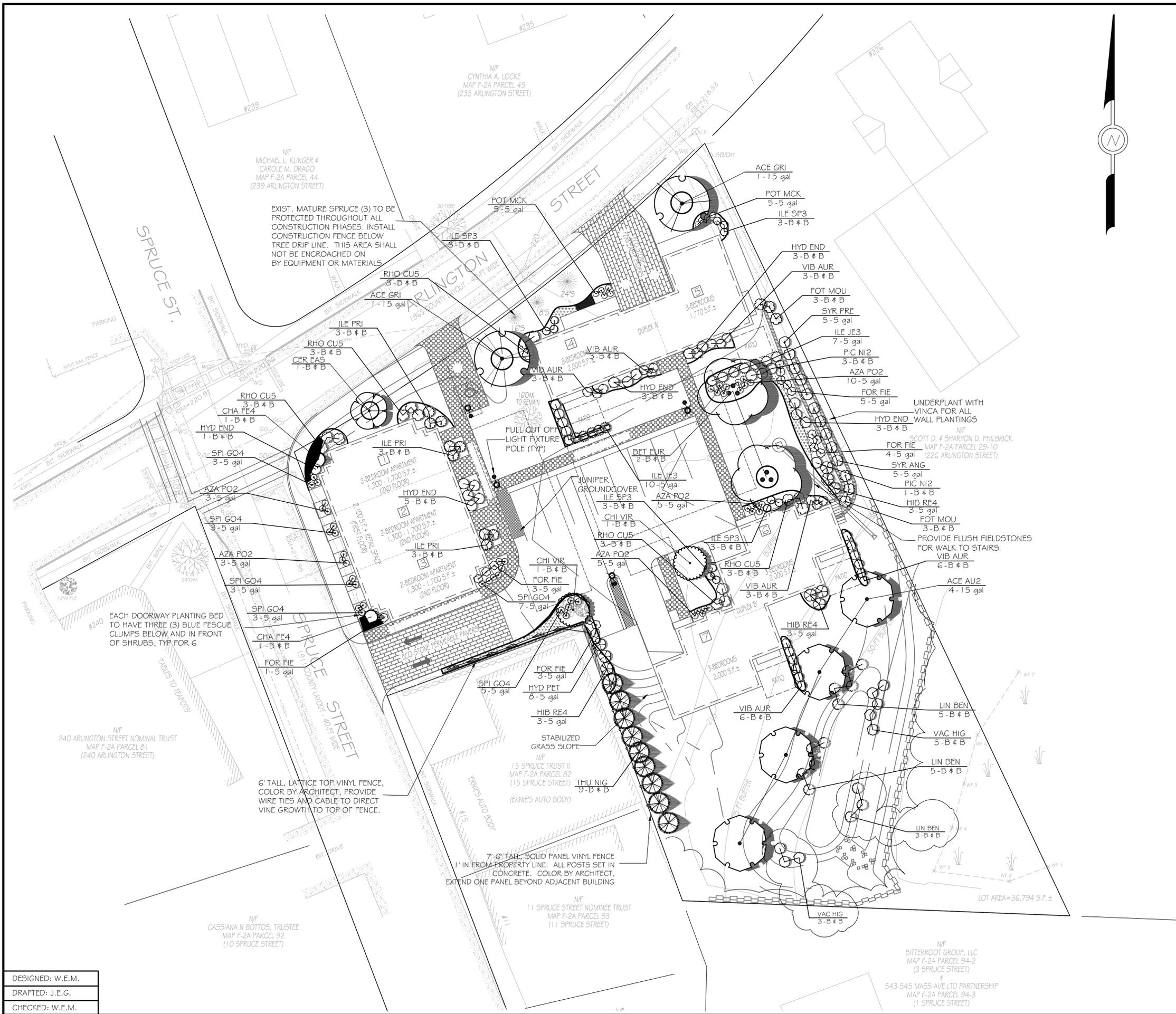
DATE: JULY 6, 2010 SCALE: AS NOTED

Phone: (978) 461-2350  
Fax: (978) 641-4102

ENGINEERING  
SURVEYING  
PLANNING

**FORESITE ENGINEERING**  
16 Gleasondale Road Suite 1-1  
Stow, Massachusetts 01775  
www.foresite1.com

COPYRIGHT 2010, FORESITE ENGINEERING ASSOCIATES, INC. 14955ED.2D



- PLAN NOTES:**
1. PLANTS SHALL NOT BE INSTALLED UNTIL SELECTED AND APPROVED BY LANDSCAPE ARCHITECT.
  2. IN THE CASE OF A CONFLICT BETWEEN THE PLANTING SCHEDULE AND THE LANDSCAPE PLAN, THE GREATER NUMBER OF PLANTS EITHER DEPICTED OR SPECIFIED SHALL BE ADHERED TO.
  3. REFER TO CIVIL SITE PLANS FOR INFORMATION REGARDING STRUCTURAL LOCATIONS, UNDERGROUND UTILITIES (PROPOSED AND EXISTING), AND OTHER CONSTRUCTION ITEMS.
  4. LOCATION OF INDIVIDUAL PLANTS AND PLANT GROUPINGS SHALL BE MODIFIED IN THE FIELD TO ENSURE EQUAL SPACING AND THE CORRECT PLANT SPACING. PLANT SPACING SHALL BE EVENLY SPACED IN STAGGERED ROWS OR RADIAL ARCS. PRIOR TO PERMANENT PLACING, SPACING, ALIGNMENT AND PAVING FIELD LOCATION OF TREES AND SHRUBS SHALL BE REVIEWED AND APPROVED BY THE LANDSCAPE ARCHITECT.
  5. THE SPECIES AND VARIETIES LISTED SHALL BE ADHERED TO IN ALL CASES. WHERE SUBSTITUTIONS ARE PROPOSED, THE CONTRACTOR SHALL PROVIDE THE OWNER A LISTING OF PRICE DIFFERENTIALS AND ALL SUBSTITUTIONS SHALL BE APPROVED BY THE LANDSCAPE ARCHITECT.
  6. ALL PLANTS AND PLANTING METHODS SHALL BE IN CONFORMANCE WITH THE RECOMMENDED STANDARD SPECIFICATIONS FOR PLANTINGS AS COMPILED AND ISSUED BY THE ASSOCIATED LANDSCAPE CONTRACTORS OF MASSACHUSETTS INC.
  7. ALL PLANTING BEDS SHALL RECEIVE A MINIMUM OF 6" SCREENED LOAM AND A MINIMUM OF 4" OF SHREDED BARK MULCH.
  8. ALL PLANTS SHALL BE WARRANTED FOR A MINIMUM OF ONE YEAR FROM THE DATE OF COMPLETION OF THE PROJECT. SHOULD ANY PLANTS DIE OR PRESENT UNDESIRABLE DIE-BACK OR DISEASE DAMAGE, THEY SHOULD BE REPLACED AT NO ADDITIONAL COST TO THE OWNER, WITH THE REPLACEMENT PLANTS MEETING THE ORIGINAL SPECIFICATIONS.
  9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING WATER FOR A MINIMUM OF SIX WEEKS AFTER THE COMPLETION OF CONSTRUCTION.
  10. THE CALIPER OF THE TREE SHALL BE MEASURED ONE FOOT ABOVE THE ROOTBALL OR GROUND LINE WHICHEVER IS GREATER.
  11. PLANTING SEASON: SPRING PLANTING SHALL OCCUR BETWEEN APRIL 1ST AND JULY 1ST FALL PLANTING FOR ALL DECIDUOUS TREES, SHRUBS, AND GROUND COVER SHALL OCCUR BETWEEN AUGUST 15TH AND OCTOBER 30TH, PROVIDED THAT ADEQUATE WATER IS PROVIDED. FALL PLANTING FOR ALL EVERGREEN TREES, SHRUBS AND GROUND COVER SHALL OCCUR BETWEEN AUGUST 15TH AND NOVEMBER 15TH.
  12. CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE AWAY FROM THE BUILDING FOUNDATION, STRUCTURES, AND PLANTING BEDS.
  13. DO NOT INSTALL ANY PLANTINGS UNTIL ADJACENT CONSTRUCTION WHICH MAY DAMAGE OR DISTURB OR OTHERWISE HAVE DELETERIOUS EFFECTS ON THE PLANTS HAS BEEN COMPLETED.
  14. EXISTING SPRUCE TREES AND 16" OAK TO REMAIN, SHALL BE PROTECTED THROUGHOUT ALL CONSTRUCTION PHASES. INSTALL CONSTRUCTION FENCE BELOW EACH TREE'S DRIPLINE. NO INTRUSION BY MEN, EQUIPMENT OR MATERIALS SHALL BE PERMITTED INSIDE THE FENCED AREA.



*Willie Murray*  
 Rev #1; Sept. 1, 2010 - Basin Planting

LANDSCAPE PLAN  
 ACTON, MASSACHUSETTS  
 PREPARED FOR  
**WEST ACTON TRIO, LLC.**  
 232 ARLINGTON STREET  
 ACTON, MA 01720  
 SCALE: 1/16" = 1' - 0" DATE: JULY, 2010

PREPARED BY  
**PLACES**  
*Site Consultants, Inc.*  
 PLANNING - LANDSCAPE ARCHITECTURE  
 CIVIL ENGINEERING - SURVEYING  
 694 MAIN STREET, SUITE 3  
 HOLDEN, MA 01520-1862  
 508.829.0333 Fax 508.829.0904  
 EMAIL [places@verizon.net](mailto:places@verizon.net)  
 PROJECT NO. 10-620 PLAN NO. 10-620-LA-1

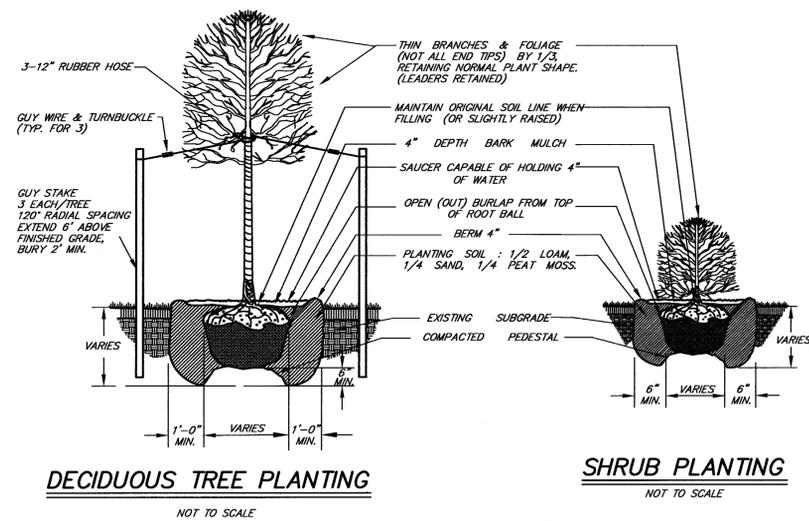
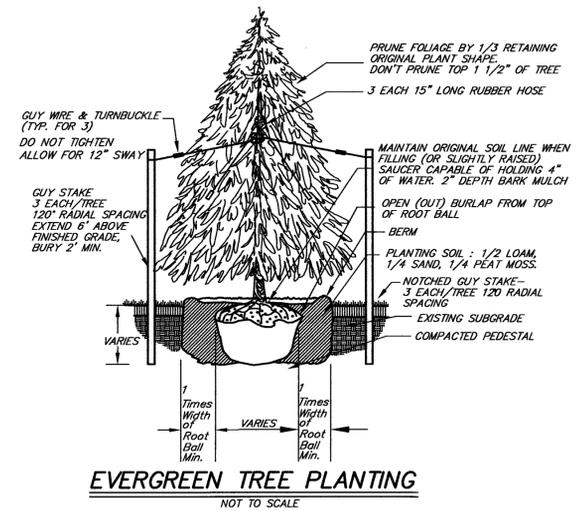
DESIGNED: W.E.M.  
 DRAFTED: J.E.G.  
 CHECKED: W.E.M.

NF  
 BITTERROOT GROUP, LLC  
 MAP F-2A PARCEL 94-2  
 (3 SPRUCE STREET)  
 &  
 543-545 MASS AVE LTD PARTNERSHIP  
 MAP F-2A PARCEL 94-3  
 (1 SPRUCE STREET)

PLANT SCHEDULE

TREES	CODE	QTY	COMMON NAME / BOTANICAL NAME	CONT	CAL	SIZE	FIELD4	REMARKS
	ACE AU2	4	Autumn Blaze Maple / <i>Acer freemanii</i> 'Autumn Blaze'	15 gal	2"Cal	12-15' H		
	ACE GRI	2	Paperbark Maple / <i>Acer gnseum</i>	15 gal	1.75"Cal	12-15' H		
	BET EUR	2	Multi-Trunk European White Birch / <i>Betula pendula</i>	B # B	Triple Stem	8' - 10' Ht		
	CER EAS	1	Eastern Redbud Multi-trunk / <i>Cercis canadensis</i>	B # B	Triple Stem	8' - 10' Ht	MULTI-STEM SPECIMEN	
	CHA FE4	2	Fernspray Gold Hinoki False Cypress / <i>Chamaecypans obtusa</i> 'Fernspray Gold'	B # B		6' - 8' Ht.		
	CHI VIR	2	White Flaxnetree / <i>Chionanthus virginicus</i>	B # B	2"Cal	8' - 10' Ht	6-8' spread	
	THU NIG	9	Nigra Cedar / <i>Thuja occidentalis</i> 'Nigra'	B # B		8' - 10' Ht	BUFFER/SCREEN	
SHRUBS	CODE	QTY	COMMON NAME / BOTANICAL NAME	CONT	REMARKS			
	AZA PO2	26	Popcorn Azalea / <i>Azalea arborescens</i> Popcorn	5 gal	Yellow summer flowering			
	FOR FIE	13	Fiesta Forsythia / <i>Forsythia x intermedia</i> 'Fiesta'	5 gal	Wide, compact with variegated leaves			
	FOT MOU	6	Mountain Witchhazel / <i>Fothergilla major</i>	B # B				
	HIB RE4	9	Red Heart Rose-of-Sharon / <i>Hibiscus synacus</i> 'Red Heart'	5 gal				
	HYD PET	8	Climbing Hydrangea / <i>Hydrangea anomala petiolaris</i> 'Miranda'	5 gal				
	HYD END	15	Endless Summer / <i>Hydrangea macrophylla</i> 'Balmer' TM	B # B				
	ILE JE3	17	Columnar Japanese Holly / <i>Ilex crenata</i> 'Jersey Pinnacle'	5 gal	Upright to form hedge			
	ILE SP3	12	Winterberry / <i>Ilex verticillata</i> 'Sparkleberry'	B # B	Uniform, multistem			
	ILE PRI	9	Blue Prince Holly / <i>Ilex x meserveae</i> 'Blue Prince' TM	B # B				
	LIN BEN	10	Spicebush / <i>Lindera benzoin</i>	B # B				
	PIC NI2	4	Nest Spruce / <i>Picea abies</i> 'Nidiformis'	B # B	Blue color emphasis			
	POT MCK	10	McKay's White Bush Cinquefoil / <i>Potentilla fruticosa</i> 'McKay's White'	5 gal				
	RHO CUS	15	Catawba Rhododendron / <i>Rhododendron catawbiense</i> 'Cunningham White'	B # B	4' Ht # Spr.			
	SPI GO4	19	Goldflame Spirea / <i>Spiraea x bumalda</i> 'Goldflame'	5 gal				
	SYR ANG	5	Common Lilac / <i>Syringa vulgaris</i> 'Angel White'	5 gal				
	SYR PRE	5	Donald Wyman Lilac / <i>Syringa x prestoniae</i> 'Donald Wyman'	5 gal				
	VAC HIG	5	Highbush Blueberry / <i>Vaccinium corymbosum</i>	B # B				
	VIB AUR	24	Korean Spice Viburnum / <i>Viburnum carlesii</i> 'Aurora'	B # B	3' Ht # Spr.			

GROUND COVERS	CODE	QTY	COMMON NAME / BOTANICAL NAME	CONT	FIELD2	FIELD3	REMARKS
	HEM DAR	100 sf	Daylily / <i>Heemerocallis</i> x 'Dark Eyed Magic' TM	flat @ 12" oc			
	HOS MON	19 sf	Hosta / <i>Hosta montana</i> 'Aureomarginata'	1 gal @ 18" oc			
	JUN PRI	194 sf	Prince Of Wales Juniper / <i>Juniperus horizontalis</i> 'Prince of Wales'	1 gal @ 12" oc			



GRASS AND SLOPE COVER SPECIFICATIONS

- All disturbed areas, including slopes and the detention basin, shall be graded and stabilized by planting or other method as shown or specified on the plans.
- A minimum of 6" of loam shall be applied to all surfaces to be seeded. Loam shall be uniformly applied, shaped and smoothed.
- Loam acidity shall be checked and adjusted to a pH of 6.5, apply lime at a minimum rate of 50 lbs per 1,000 square feet, if necessary. (If permitted by the Orders of Conditions only).
- Organic—slow release fertilizer of a type 5-2-2 applied at a rate of 50 lbs per 500 square feet. (If permitted by the Orders of Conditions only).
- Rake a seed bed using a york rake or hand raking to a minimum depth of 3" thoroughly incorporating lime and fertilizer.
- Seeding may be performed by hand, mechanical or tractor mounted spreader. Hydroseeding is recommended.
- Seeding before April 15 or after November 1, shall be reapplied between these dates if a minimum germination of 90%, determined by surface area coverage, has not occurred or if the surface area has eroded or become un-stabilized.
- SEEDING:
  - HAND SEEDING:
    - Seed shall be applied by hand or broadcast spreader to provide a uniform distribution of seed.
    - Seed shall be lightly raked into a depth of 1/2"-1", with all raking to be perpendicular to the slope.
    - Seed is to be rolled with a water ballast roller to insure contact of seed with soil, do not compact soil.
    - Area shall be mulched using seed-free straw to adequately cover the area to a depth of 1/2"-1", insuring a uniform cover of 75% of the surface area.
    - Mulch shall be secured by means of secured landscape fabric, erosion control netting (3/4" - 1" mesh), or other biodegradable material which will insure adequate cover until the surface has grown to 90% germination, or according to the manufacturer's instructions.
  - HYDROSEEDING:
    - Hydroseeding is encouraged for all areas, especially for large areas and steep slopes.
    - Hydroseeding shall be performed in a single uniform layer.
    - A track equipped machine shall travel perpendicular to any slope to provide compacted surface depressions for hydroseeding to catch. Such tracks shall be a minimum of three (3') feet on center for the total length of the slope.
    - Application rates on slopes greater than 3:1 (horizontal to vertical) or greater shall have a minimum seeding rate of 4lbs/1000sf.
    - A latex or fiber tackifier shall be used on all areas at the rate recommended by the manufacturer and on all slopes identified above (No. 4), a minimum rate of 50 lbs. of tackifier per 500 gals of water shall be used.
    - Fertilizer and lime may be incorporated into the hydroseed mixture in the quantities and type identified previously. (If permitted by the Orders of Conditions only).

- SEED MIXTURE
    - All seed shall be of the previous year's crop and shall have a quantified mixture analysis attached. No more than 1.0% of total mixture shall consist of weed seed species.
    - SEED MIXTURE TYPE "A": Seed mixtures for lawn areas shall consist of a standard lawn mix containing a minimum of 80% perennial species, and shall conform to the following standards: Minimums (by total weight of mix):
      - 40% Kentucky Bluegrass
      - 20% Chewings Fescue
      - 20% Perennial Ryegrass
      - 20% Annual Rye or other annual species
- \*\* No more than 20% of the total mix, by weight, shall consist of annual rye or other annual species. Apply at a rate of 4 lbs per 1,000 square feet, or 170 lbs. per acre.

LANDSCAPE PLAN  
ACTON, MASSACHUSETTS  
PREPARED FOR  
WEST ACTON TRIO, LLC.  
232 ARLINGTON STREET  
ACTON, MA 01720

SCALE: 1/16" = 1' - 0" DATE: JULY, 2010  
PREPARED BY

**PLACES**  
Site Consultants, Inc.

PLANNING - LANDSCAPE ARCHITECTURE  
CIVIL ENGINEERING - SURVEYING  
694 MAIN STREET, SUITE 3  
HOLDEN, MA 01520-1862  
508.829.0333 Fax 508.829.0904  
EMAIL places@verizon.net  
PROJECT NO. 10-G20 PLAN NO. 10-G20-LA-2



DESIGNED: W.E.M.  
DRAFTED: J.E.G.  
CHECKED: W.E.M.

# STORMWATER REPORT AND CALCULATIONS

FOR

## “SPRUCE CORNER”

A Proposed Mixed Use Development at

232 Arlington Street  
Acton, Massachusetts



July 12, 2010

**Prepared for:**

West Acton Trio, LLC  
P.O. Box 401012  
Cambridge, Massachusetts 02140

**Prepared by:**

FORESITE Engineering Associates, Inc.  
16 Gleasondale Road, Suite 1-1  
Stow, Massachusetts 01775



# CONTENTS

I. Introduction

II. Methodology & References

III. Results

IV. Conclusions

Appendix A: Portion of USGS Quadrangle, Maynard, Massachusetts, 1987 (Ref. 40271-DR-TM-025); Scale: 1:25,000

Appendix B: Soil descriptions from “Interim Soil Survey of Middlesex County, Massachusetts”, published by USDA, 1995

Appendix C: Pre-development Drainage Plan (1”=40’)

Appendix D: Post-development Drainage Plan (1”=40’)

Appendix E: Deep Observation Test and Percolation Test Results

Appendix F: Stormceptor Sizing Report & Manufacturers Inspection and Maintenance Procedures

Appendix G: Stormwater Operation & Maintenance Plan

Appendix H: DEP Checklist for Stormwater Report

Appendix I: HydroCAD Output

## I. Introduction

The site of the proposed “Spruce Corner” development is a 0.84 acre tract of land located at the southeast corner of Arlington Street and Spruce Street in the West Acton village identified on Acton Assessors Maps as Map F2A Parcels 70, 71 & 83. The project site is located within the West Acton Village (WAV) zoning district and abuts the Village Residential (VR) zone to the east and across Arlington Street to the north. The project site is currently used for residential purposes and contains two single family dwellings and an accessory garage. There are currently no other structures on the site and all uses of the site are residential or accessory to residential uses (single family dwellings with accessory yard and garden areas).

According to the United States Department of Agriculture (USDA) Soil Survey of Middlesex County the soils on site are Merrimac series. These soils are deep outwash deposits that exhibit rapid permeability at the surface layer and very rapid permeability in the substratum (Hydrologic Soil Group A) and typically have a relatively deep water table. Hinckley and Merrimac soils have no major limitations for building site development or for local roads and streets making the site well suited to development, sewage disposal, and storm water recharge systems. The soils were evaluated in the field to verify these conditions. Deep observation test holes and percolation tests were conducted throughout the site and the results of those tests are documented in Appendix E.

The development proposal for the site involves demolition of the two existing dwellings and garage, clearing of vegetation, grading, and construction of 3 structures – 2 duplex residences and a building at the corner of Arlington Street and Spruce Street with approximately 4,396 square feet of commercial space in the basement and on the first floor and (3) 2-bedroom apartments on the second and third floors. Appurtenant to the principal use of the buildings is construction of access drives, parking areas, walkways, drainage and sewerage infrastructure and extension of utilities from Arlington Street and Spruce Street to serve the buildings on site. The change in surface cover (from pervious vegetated cover to impervious cover and less pervious lawn) and the alteration of grade, increase the rate and volume of runoff from the site. Runoff is collected in the drainage system and treated to meet DEP Stormwater Management Policy standards where necessary. Increases in the rate and volume of runoff are managed with infiltrative measures such as a retention/detention basin and pervious pavers where feasible. All infiltrative measures have been sized to effectively manage storm water from the proposed development for the 2-year, 10-year, 25-year and 100-year design storms.

## II. Methodology & References

### *Methodology:*

SCS TR-55 & SCS TR-20 utilizing HydroCAD (v 8.0) software.

### *References:*

A Guide to Hydrologic Analysis Using SCS Methods, Richard McCuen, copyright 1982, Prentice Hall, Inc.

Interim Soil Survey of Middlesex County, Massachusetts, 1995

USGS Quadrangle Map, Maynard, Massachusetts, 1987

## III. Results

The drainage study area was divided into 2 sections (or subcatchments as they are defined in the HydroCAD software) each of which drains to a different off-site location. Under pre-development conditions these areas are defined as Subcatchment 1S (draining off site north towards Arlington Street), and Subcatchment 2S (draining off site south to wetlands). Table 1 below shows the key of each off-site area as it is referenced in the HydroCAD calculations in Appendix H.

**TABLE 1**

**Pre-development & Post-development Comparison Areas**

Description	Pre-development	Post-development
Off-site north to Arlington Street	1S	20R
Off-site south to wetlands	2S	21R

The off-site areas were analyzed for rate and volume of runoff under existing conditions for the 2-yr, 10-yr, 25-yr, and 100-yr design storms and the results are shown in Table 2. Under post-development conditions increases in runoff from development activities are controlled with the implementation of stormwater detention and recharge Best Management Practices (BMP's). Comparison of the off site rates and volumes of runoff under pre-development conditions to the off site runoff to the same areas under post-development conditions illustrates the effectiveness of the proposed stormwater controls. The results in Table 2 clearly show that off site runoff rates and volumes are effectively maintained or reduced by the proposed drainage system for the design storms analyzed.

**TABLE 2**

**Pre-development & Post-development Off-site Rates and Volumes of Runoff**

<b>2-YR STORM</b>	<b>PRE-DEVELOPMENT</b>		<b>POST-DEVELOPMENT</b>	
<b>Area</b>	<b>Rate, Q (cfs)</b>	<b>Volume, V (cu.ft)</b>	<b>Rate, Q (cfs)</b>	<b>Volume, V (cu.ft.)</b>
North (1S vs 20R)	0.00	37	0.00	11
South (2S vs 21R)	0.03	432	0.00	6

<b>10-YR STORM</b>	<b>PRE-DEVELOPMENT</b>		<b>POST-DEVELOPMENT</b>	
<b>Area</b>	<b>Rate, Q (cfs)</b>	<b>Volume, V (cu.ft)</b>	<b>Rate, Q (cfs)</b>	<b>Volume, V (cu.ft.)</b>
North (1S vs 20R)	0.03	121	0.01	85
South (2S vs 21R)	0.27	1,570	0.03	132

<b>25-YR STORM</b>	<b>PRE-DEVELOPMENT</b>		<b>POST-DEVELOPMENT</b>	
<b>Area</b>	<b>Rate, Q (cfs)</b>	<b>Volume, V (cu.ft)</b>	<b>Rate, Q (cfs)</b>	<b>Volume, V (cu.ft.)</b>
North (1S vs 20R)	0.05	189	0.02	149
South (2S vs 21R)	0.59	2,530	0.34	645

**Table 2 (Cont'd)**

**Pre-development & Post-development Off-site Rates and Volumes of Runoff**

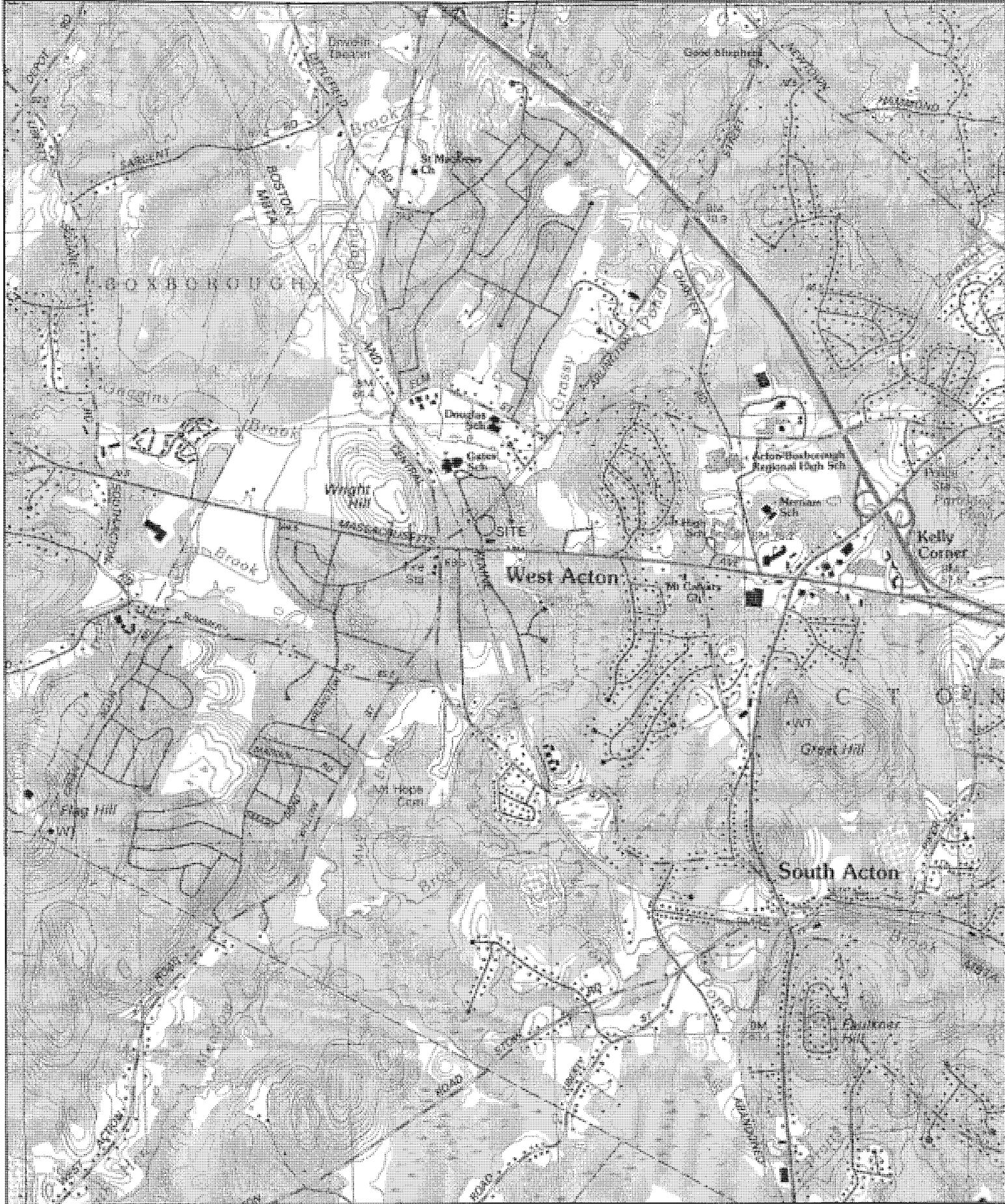
<b>100-YR STORM</b>	<b>PRE-DEVELOPMENT</b>		<b>POST-DEVELOPMENT</b>	
<b>Area</b>	<b>Rate, Q (cfs)</b>	<b>Volume, V (cu.ft)</b>	<b>Rate, Q (cfs)</b>	<b>Volume, V (cu.ft.)</b>
North (1S vs 20R)	0.10	320	0.08	320
South (2S vs 21R)	1.22	4,409	1.21	1,953

**IV. Conclusions**

The proposed drainage system adequately controls both the rate and volume of runoff from proposed site improvements at Spruce Corner. There is no increase in runoff rate or volume from the site above predevelopment rates and volumes to the same off-site areas. The proposed stormwater management controls proposed sufficiently detain and recharge the increase in runoff generated by development to similar or lesser rates and volumes as under predevelopment conditions. Runoff from impervious surfaces subject to vehicular traffic is properly pretreated with a Stormceptor water quality catch basin prior to being directed to the proposed detention basin for detention and infiltration. All storm water controls have been sized to properly manage storm events up to and including the 100-year, 24 hour design storm. Runoff rates and volumes are reduced or maintained following development and runoff quality is greatly improved through implementation of the proposed stormwater BMP's. Additionally, the proposed retention basin will fully drain from a maximum depth of 18 inches to 0" in approximately 9 hours. The proposed site development plan meets or exceeds the standards set forth in the Massachusetts Department of Environmental Protection's Stormwater Management Policy.

## **Appendix A**

Portion of USGS Quadrangle Map, Maynard, Massachusetts, 1987  
(Scale: 1:25,000)



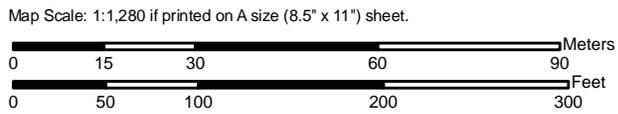
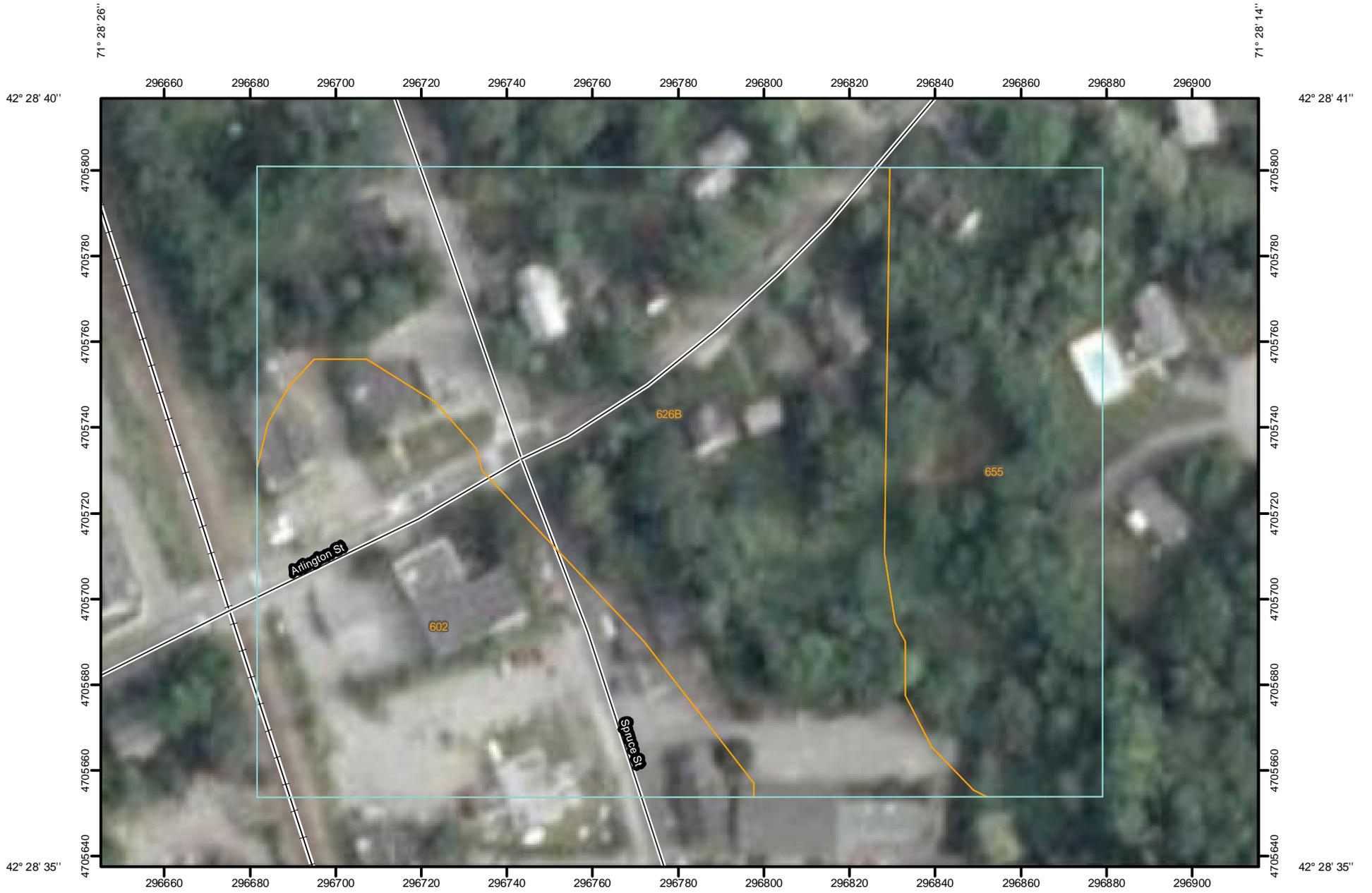
Name: MAYNARD  
Date: 7/12/2010  
Scale: 1 inch equals 2000 feet

Location: 042° 28' 25.5" N 071° 28' 17.1" W  
Caption: USGS MAYNARD QUADRANGLE, 1987

## **Appendix B**

Soil descriptions from “Interim Soil Survey of Middlesex County,  
Massachusetts”, published by USDA, 1995

Soil Map—Middlesex County, Massachusetts  
(232 ARLINGTON STREET, ACTON)



## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils

 Soil Map Units

### Special Point Features

-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot
-  Spoil Area
-  Stony Spot

 Very Stony Spot

 Wet Spot

 Other

### Special Line Features

-  Gully
-  Short Steep Slope
-  Other

### Political Features

 Cities

### Water Features

-  Oceans
-  Streams and Canals

### Transportation

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

## MAP INFORMATION

Map Scale: 1:1,280 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:25,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
Coordinate System: UTM Zone 19N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts  
Survey Area Data: Version 8, Mar 13, 2009

Date(s) aerial images were photographed: 7/28/2003

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

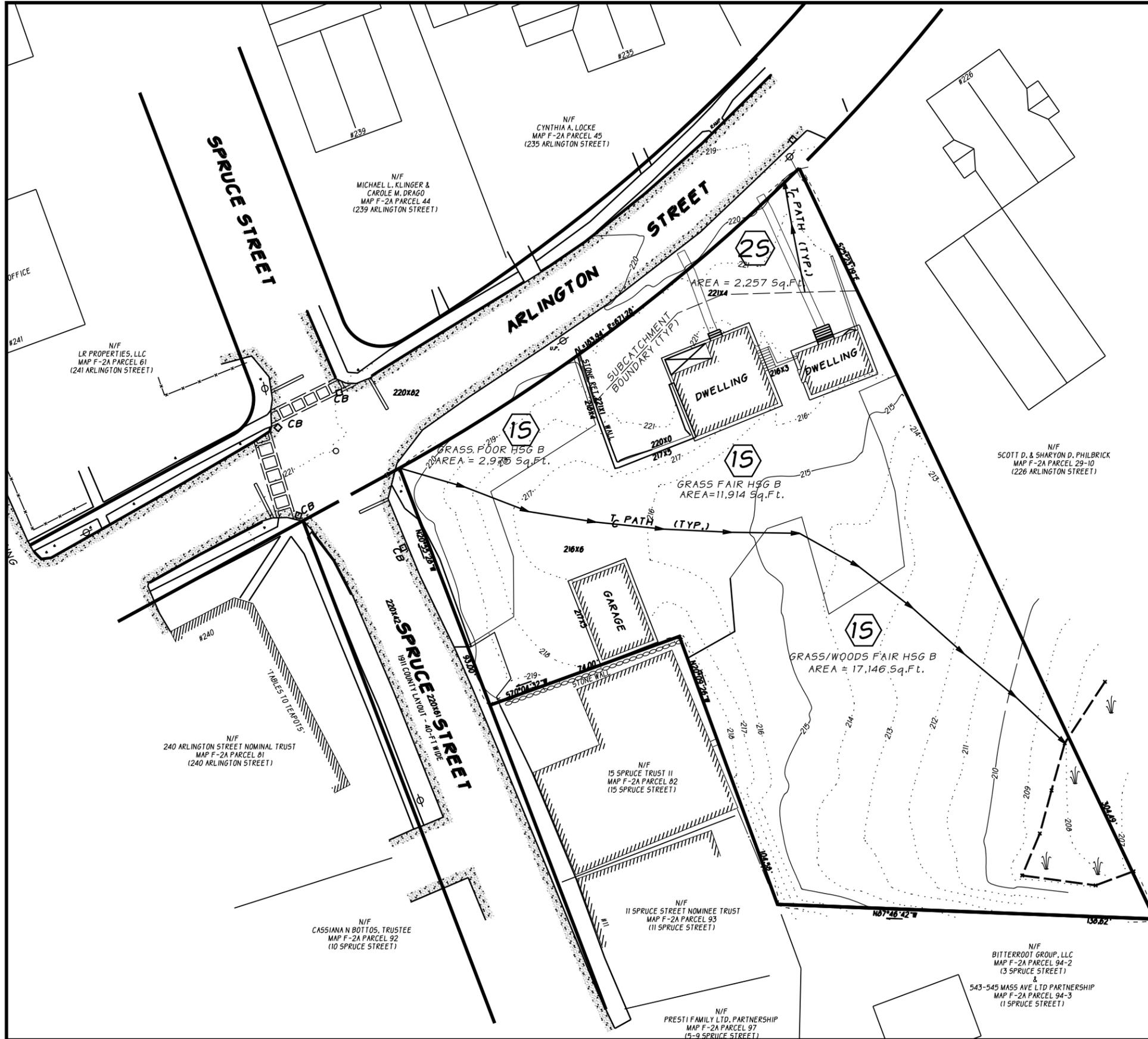
Middlesex County, Massachusetts (MA017)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
602	Urban land	1.9	26.3%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	3.5	49.5%
655	Udorthents, wet substratum	1.7	24.2%
<b>Totals for Area of Interest</b>		<b>7.2</b>	<b>100.0%</b>

MERRIMAC series consists of nearly level to steep, deep (5+ ft.), somewhat excessively drained soils on glacial outwash plains, terraces and kames. They formed in water-sorted, sandy glacial material. Merrimac soils have friable fine sandy loam and sandy loam surface soil and subsoil with moderately rapid permeability over a loose stratified sand and gravel substrata at 18 to 30 inches with rapid permeability. They have few limitations for most uses.

MERRIMAC-URBAN LAND COMPLEX consists of nearly level to undulating, deep, somewhat excessively drained Merrimac soils and areas of urban land. Although urban development has altered the soils and landscapes on these areas, the soil can be identified at widely separated points, and the general nature of the area can be determined. Broad delineations are made on the map. This map unit consists of about 75 percent Merrimac and similar soils and at least 25 percent urban land and other disturbed areas. Urban land consists of streets, parking lots, buildings, and other structures. For information on Merrimac soils, see "Merrimac" series description.

## **Appendix C**

Pre-development Drainage Plan  
(Scale: 1" = 40')



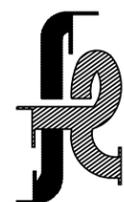
NOTE: ALL SOILS ON SITE ARE MERRIMAC URBAN LAND COMPLEX  
NRCS HYDROLOGIC SOIL GROUP A

**PRE-DEVELOPMENT DRAINAGE PLAN  
SPRUCE CORNER  
ARLINGTON ST. & SPRUCE STREET  
ACTON, MASSACHUSETTS**

PREPARED FOR:  
**WEST ACTON TRIO, LLC**  
P.O. BOX 401012  
CAMBRIDGE, MASSACHUSETTS 02140

DATE: JULY 6, 2010  
SCALE: 1 INCH = 40 FEET

www.foresitel.com



**FORESITE  
ENGINEERING**  
ENGINEERING SURVEYING PLANNING

16 Gleasondale Road Suite 1-1  
Stow, Massachusetts 01775

Phone: (978) 461-2350

1495PRE.2D

## **Appendix D**

Post-development Drainage Plan  
(Scale: 1" = 40')



NOTE: ALL SOILS ON SITE ARE MERRIMAC URBAN LAND COMPLEX  
NRCS HYDROLOGIC SOIL GROUP A

**POST-DEVELOPMENT DRAINAGE PLAN**  
**SPRUCE CORNER**  
ARLINGTON ST. & SPRUCE STREET  
ACTON, MASSACHUSETTS

PREPARED FOR:  
**WEST ACTON TRIO, LLC**  
P.O. BOX 401012  
CAMBRIDGE, MASSACHUSETTS 02140

DATE: JULY 6, 2010  
SCALE: 1 INCH = 40 FEET

www.foresitel.com



16 Gleasondale Road Suite 1-1  
Stow, Massachusetts 01775

Phone: (978) 461-2350

1495POST.2D

## **Appendix E**

Deep Observation Test and Percolation Test Results





Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

B. Site Information (Continued)

6. Current Water Resource Conditions (USGS): 03/09 Range: [ ] Above Normal [X] Normal [ ] Below Normal

7. Other references reviewed: USGS Topo Quadrangle

C. On-Site Review (minimum of two holes required at every proposed primary and reserved disposal area)

Deep Observation Hole Number: 409-1 Date: 4/27/09 Time: 9:00AM Weather: Sunny, 70's

1. Location

Ground Elevation at Surface of Hole: 213.0 Location (identify on plan): See Sketch

2. Land Use: None (e.g., woodland, agricultural field, vacant lot, etc.) None Surface Stones 3-5% Slope (%) Brushland Vegetation Outwash Plain Landform See Sketch Position on Landscape (attach sheet)

3. Distances from: Open Water Body >200' feet Drainage Way 60' feet Possible Wet Area 60' feet Property Line 50' feet Drinking Water Well ND feet Other feet

4. Parent Material: Glacial Outwash Unsuitable Materials Present: [ ] Yes [X] No

If Yes: [ ] Disturbed Soil [ ] Fill Material [ ] Impervious Layer(s) [ ] Weathered/Fractured Rock [ ] Bedrock

5. Groundwater Observed: [X] Yes [ ] No If yes: 76" Depth Weeping from Pit Depth Standing Water in Hole

Estimated Depth to High Groundwater: 56" inches 208.33 elevation



Commonwealth of Massachusetts

City/Town of Acton

**Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal**

**C. On-Site Review (Continued)**

Deep Observation Hole Number: 409-1

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12"	A	10YR3/2				SL			Weak	Dry	
12-22"	Bw	10YR5/8				SL			Weak	Dry	
22-120"	C	2.5YR5/4	56"	10YR5/8 2.5Y6/1	>5%	S	>90%	<10%	Weak	Moist	

Additional Notes:

---



---



---



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (Continued)

Deep Observation Hole Number: 409-2 Date: 4/27/09 Time: 9:15 AM Weather: Sunny, 70's

1. Location

Ground Elevation at Surface of Hole: 213.9 Location (identify on plan): See Sketch

2. Land Use: Yard (e.g., woodland, agricultural field, vacant lot, etc.), None Surface Stones, 3-5% Slope (%), Lawn Vegetation, Outwash Plain Landform, See Sketch Position on Landscape (attach sheet)

3. Distances from: Open Water Body >200' feet, Drainage Way >100' feet, Possible Wet Area >100' feet, Property Line 40' feet, Drinking Water Well ND feet, Other

4. Parent Material: Glacial Outwash Unsuitable Materials Present: Yes No

If Yes: Disturbed Soil, Fill Material, Impervious Layer(s), Weathered/Fractured Rock, Bedrock

5. Groundwater Observed: Yes No If yes: 68" Depth Weeping from Pit, Depth Standing Water in Hole

Estimated Depth to High Groundwater: 60" inches, 208.90 elevation



Commonwealth of Massachusetts

City/Town of Acton

**Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal**

**C. On-Site Review (Continued)**

Deep Observation Hole Number: 409-2

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-30"	A	10YR3/2				SL			Weak	Dry	
30-60"	Bw	10YR5/8				SL			Weak	Dry	
60-110"	C	2.5Y5/4	60"	10YR5/8 2.5Y6/1	>5%	LS	>50%	>10%	Weak to mod. Firm	Moist	Boulders @ 110"

Additional Notes:

---



---



---



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (Continued)

Deep Observation Hole Number: 409-3 Date: 4/27/09 Time: 9:30 AM Weather: Sunny, 70's

1. Location

Ground Elevation at Surface of Hole: 215.5 Location (identify on plan): See Sketch

2. Land Use: Yard (e.g., woodland, agricultural field, vacant lot, etc.), None Surface Stones, 3-5% Slope (%), Lawn Vegetation, Outwash Plain Landform, See Sketch Position on Landscape (attach sheet)

3. Distances from: Open Water Body >200' feet, Drainage Way >100' feet, Possible Wet Area >100' feet, Property Line 40' feet, Drinking Water Well ND feet, Other

4. Parent Material: Glacial Outwash Unsuitable Materials Present: [ ] Yes [X] No

If Yes: [ ] Disturbed Soil [ ] Fill Material [ ] Impervious Layer(s) [ ] Weathered/Fractured Rock [ ] Bedrock

5. Groundwater Observed: [X] Yes [ ] No If yes: 60" Depth Weeping from Pit, Depth Standing Water in Hole

Estimated Depth to High Groundwater: 54" inches, 211.00 elevation



Commonwealth of Massachusetts

City/Town of Acton

**Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal**

**C. On-Site Review (Continued)**

Deep Observation Hole Number: 409-3

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12"	A	10YR3/2				SL			Weak	Dry	
12-34"	Bw	10YR5/8				SL			Weak	Dry	
34-112"	C	2.5Y5/4	54"	10YR5/8 2.5Y6/1	>5%	LS	>50%	>10%	Weak to mod. Firm	Moist	Boulders @ 112"

Additional Notes:

---



---



---



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (Continued)

Deep Observation Hole Number: 409-4 Date: 4/27/09 Time: 9:50 AM Weather: Sunny, 70's

1. Location

Ground Elevation at Surface of Hole: 215.6 Location (identify on plan): See Sketch

2. Land Use: Yard (e.g., woodland, agricultural field, vacant lot, etc.), None Surface Stones, 3-5% Slope (%), Lawn Vegetation, Outwash Plain Landform, See Sketch Position on Landscape (attach sheet)

3. Distances from: Open Water Body >200' feet, Drainage Way >100' feet, Possible Wet Area >100' feet, Property Line 70' feet, Drinking Water Well ND feet, Other

4. Parent Material: Glacial Outwash Unsuitable Materials Present: [ ] Yes [X] No

If Yes: [ ] Disturbed Soil [ ] Fill Material [ ] Impervious Layer(s) [ ] Weathered/Fractured Rock [ ] Bedrock

5. Groundwater Observed: [X] Yes [ ] No If yes: 64" Depth Weeping from Pit, Depth Standing Water in Hole

Estimated Depth to High Groundwater: 58" inches, 210.77 elevation



Commonwealth of Massachusetts

City/Town of Acton

**Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal**

**C. On-Site Review (Continued)**

Deep Observation Hole Number: 409-4

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-14"	A	10YR3/2				SL			Weak	Dry	
14-30"	Bw	10YR5/8				SL			Weak	Dry	
30-112"	C	2.5Y5/4	58"	10YR5/8 2.5Y6/1	>5%	LS	>50%	>10%	Weak to mod. Firm	Moist	Boulders @ 112"

Additional Notes:

---



---



---



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (Continued)

Deep Observation Hole Number: 409-5 Date: 4/27/09 Time: 10:00 AM Weather: Sunny, 70's

1. Location

Ground Elevation at Surface of Hole: 215.0 Location (identify on plan): See Sketch

2. Land Use: Yard (e.g., woodland, agricultural field, vacant lot, etc.) None Surface Stones 3-5% Slope (%) Lawn Vegetation Outwash Plain Landform See Sketch Position on Landscape (attach sheet)

3. Distances from: Open Water Body >200' feet Drainage Way >100' feet Possible Wet Area >100' feet Property Line 70' feet Drinking Water Well ND feet Other feet

4. Parent Material: Glacial Outwash Unsuitable Materials Present: [ ] Yes [X] No

If Yes: [ ] Disturbed Soil [ ] Fill Material [ ] Impervious Layer(s) [ ] Weathered/Fractured Rock [ ] Bedrock

5. Groundwater Observed: [X] Yes [ ] No If yes: 63" Depth Weeping from Pit Depth Standing Water in Hole

Estimated Depth to High Groundwater: 46" inches 211.17 elevation



Commonwealth of Massachusetts

City/Town of Acton

**Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal**

**C. On-Site Review (Continued)**

Deep Observation Hole Number: 409-5

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-18"	A	10YR3/2				SL			Weak	Dry	
18-30"	Bw	10YR5/8				SL			Weak	Dry	
30-104"	C	2.5Y5/4	46"	10YR5/8 2.5Y6/1	>5%	LS	>50%	>10%	Weak to mod. Firm	Moist	Boulders @ 104"

Additional Notes:

---



---



---



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (Continued)

Deep Observation Hole Number: 409-6 Date: 4/27/09 Time: 10:20 AM Weather: Sunny, 70's

1. Location

Ground Elevation at Surface of Hole: 215.6 Location (identify on plan): See Sketch

2. Land Use: Yard (e.g., woodland, agricultural field, vacant lot, etc.), None Surface Stones, 3-5% Slope (%), Lawn Vegetation, Outwash Plain Landform, See Sketch Position on Landscape (attach sheet)

3. Distances from: Open Water Body >200' feet, Drainage Way >100' feet, Possible Wet Area >100' feet, Property Line 70' feet, Drinking Water Well ND feet, Other

4. Parent Material: Glacial Outwash Unsuitable Materials Present: Yes No

If Yes: Disturbed Soil, Fill Material, Impervious Layer(s), Weathered/Fractured Rock, Bedrock

5. Groundwater Observed: Yes No If yes: 60" Depth Weeping from Pit Depth Standing Water in Hole

Estimated Depth to High Groundwater: 52" inches 211.27 elevation



Commonwealth of Massachusetts

City/Town of Acton

**Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal**

**C. On-Site Review (Continued)**

Deep Observation Hole Number: 409-6

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-22"	A	10YR3/2				SL			Weak	Dry	
22-36"	Bw	10YR5/8				SL			Weak	Dry	
36-102"	C	2.5Y5/4	52"	10YR5/8 2.5Y6/1	>5%	LS	>50%	>10%	Weak to mod. Firm	Moist	Boulders @ 102"

Additional Notes:

---



---



---



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (Continued)

Deep Observation Hole Number: 409-7 Date: 4/27/09 Time: 10:45 AM Weather: Sunny, 70's

1. Location

Ground Elevation at Surface of Hole: 216.3 Location (identify on plan): See Sketch

2. Land Use: Yard (e.g., woodland, agricultural field, vacant lot, etc.), None Surface Stones, 3-5% Slope (%), Lawn Vegetation, Outwash Plain Landform, See Sketch Position on Landscape (attach sheet)

3. Distances from: Open Water Body >200' feet, Drainage Way >100' feet, Possible Wet Area >100' feet, Property Line 30' feet, Drinking Water Well ND feet, Other feet

4. Parent Material: Glacial Outwash Unsuitable Materials Present: [ ] Yes [X] No

If Yes: [ ] Disturbed Soil [ ] Fill Material [ ] Impervious Layer(s) [ ] Weathered/Fractured Rock [ ] Bedrock

5. Groundwater Observed: [X] Yes [ ] No If yes: 70" Depth Weeping from Pit, 210.97 elevation, 64" inches Estimated Depth to High Groundwater: 210.97 elevation



Commonwealth of Massachusetts

City/Town of Acton

**Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal**

**C. On-Site Review (Continued)**

Deep Observation Hole Number: 409-7

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-15"	A	10YR3/2				SL			Weak	Dry	
15-28"	Bw	10YR5/8				LS			Weak	Dry	
28-108"	C	2.5Y5/4	64"	10YR5/8 2.5Y6/1	>5%	S	>50%	>10%	Weak	Moist	Boulders @ 108"

Additional Notes:

---



---



---



Commonwealth of Massachusetts

City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (Continued)

Deep Observation Hole Number: 409-8 Date: 4/27/09 Time: 11:30 AM Weather: Sunny, 70's

1. Location

Ground Elevation at Surface of Hole: 216.8 Location (identify on plan): See Sketch

2. Land Use: Yard (e.g., woodland, agricultural field, vacant lot, etc.), Lawn Vegetation, Outwash Plain Landform, None Surface Stones, 3-5% Slope (%), See Sketch Position on Landscape (attach sheet)

3. Distances from: Open Water Body >200' feet, Drainage Way >100' feet, Possible Wet Area >100' feet, Property Line 30' feet, Drinking Water Well ND feet, Other

4. Parent Material: Glacial Outwash Unsuitable Materials Present: Yes No

If Yes: Disturbed Soil, Fill Material, Impervious Layer(s), Weathered/Fractured Rock, Bedrock

5. Groundwater Observed: Yes No If yes: 74" Depth Weeping from Pit Depth Standing Water in Hole

Estimated Depth to High Groundwater: 66" inches 211.30 elevation



Commonwealth of Massachusetts

City/Town of Acton

**Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal**

**C. On-Site Review** (Continued)

Deep Observation Hole Number: 409-8

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-20"	A	10YR3/2				SL			Weak	Dry	
20-35"	Bw	10YR5/8				LS			Weak	Dry	
35-100"	C	2.5Y5/4	66"	10YR5/8 2.5Y6/1	>5%	S	>50%	>10%	Weak	Moist	Boulders @ 100"

Additional Notes:

---



---



---



# Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

## C. On-Site Review (Continued)

**Deep Observation Hole Number:** 409-9      4/27/09      12:30 PM      Sunny, 70's  
Date      Time      Weather

1. Location

Ground Elevation at Surface of Hole: 221.1      Location (identify on plan): See Sketch

2. Land Use      Yard      None      3-5%  
(e.g., woodland, agricultural field, vacant lot, etc.)      Surface Stones      Slope (%)  
Lawn      Outwash Plain      See Sketch  
Vegetation      Landform      Position on Landscape (attach sheet)

3. Distances from:      Open Water Body      >200'      Drainage Way      >100'      Possible Wet Area      >100'  
feet      feet      feet      feet      feet  
Property Line      30'      Drinking Water Well      ND      Other      \_\_\_\_\_  
feet      feet      feet      feet      feet

4. Parent Material: Glacial Outwash      Unsuitable Materials Present:       Yes       No

If Yes:       Disturbed Soil       Fill Material       Impervious Layer(s)       Weathered/Fractured Rock       Bedrock

5. Groundwater Observed:       Yes       No      If yes:      \_\_\_\_\_      \_\_\_\_\_  
Depth Weeping from Pit      Depth Standing Water in Hole  
Estimated Depth to High Groundwater:      60"      216.10  
inches      elevation



Commonwealth of Massachusetts

City/Town of Acton

**Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal**

**C. On-Site Review (Continued)**

Deep Observation Hole Number: 409-9

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-14"	A	10YR3/2				SL			Weak	Dry	
14-32"	Bw	10YR5/8				LS			Weak	Dry	
32-120"	C	2.5Y5/4	60"	10YR5/8 2.5Y6/1	>5%	S	>50%	>10%	Weak	Dry	

Additional Notes:

---



---



---



## Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

### D. Determination of High Groundwater Elevation

1. Method Used:

- |  |                    |                    |
|--|--------------------|--------------------|
| <input type="checkbox"/> Depth observed standing water in observation hole         | A. _____<br>inches | B. _____<br>inches |
| <input type="checkbox"/> Depth weeping from side of observation hole               | A. _____<br>inches | B. _____<br>inches |
| <input checked="" type="checkbox"/> Depth to soil redoximorphic features (mottles) | A. 46"<br>inches   | B. 52"<br>inches   |
| <input type="checkbox"/> Groundwater adjustment (USGS methodology)                 | A. _____<br>inches | B. _____<br>inches |

2.

Index Well Number _____	Reading Date _____	Index Well Level _____
Adjustment Factor _____	Adjusted Groundwater Level _____	

### E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

- Yes       No

b. If yes, at what depth was it observed?      Upper boundary: 36"  
inches      Lower boundary: 102"  
inches



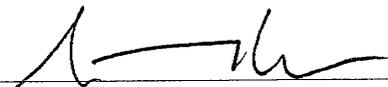
Commonwealth of Massachusetts

City/Town of Acton

# Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

## F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

  
 \_\_\_\_\_  
 Signature of Soil Evaluator  
 Scott Hayes, PE SE#1030  
 \_\_\_\_\_  
 Typed or Printed Name of Soil Evaluator / License #  
 Justin Snair  
 \_\_\_\_\_  
 Name of Board of Health Witness

5/1/09  
 \_\_\_\_\_  
 Date  
 July 1995  
 \_\_\_\_\_  
 Date of Soil Evaluator Exam  
 Acton Health Department  
 \_\_\_\_\_  
 Board of Health

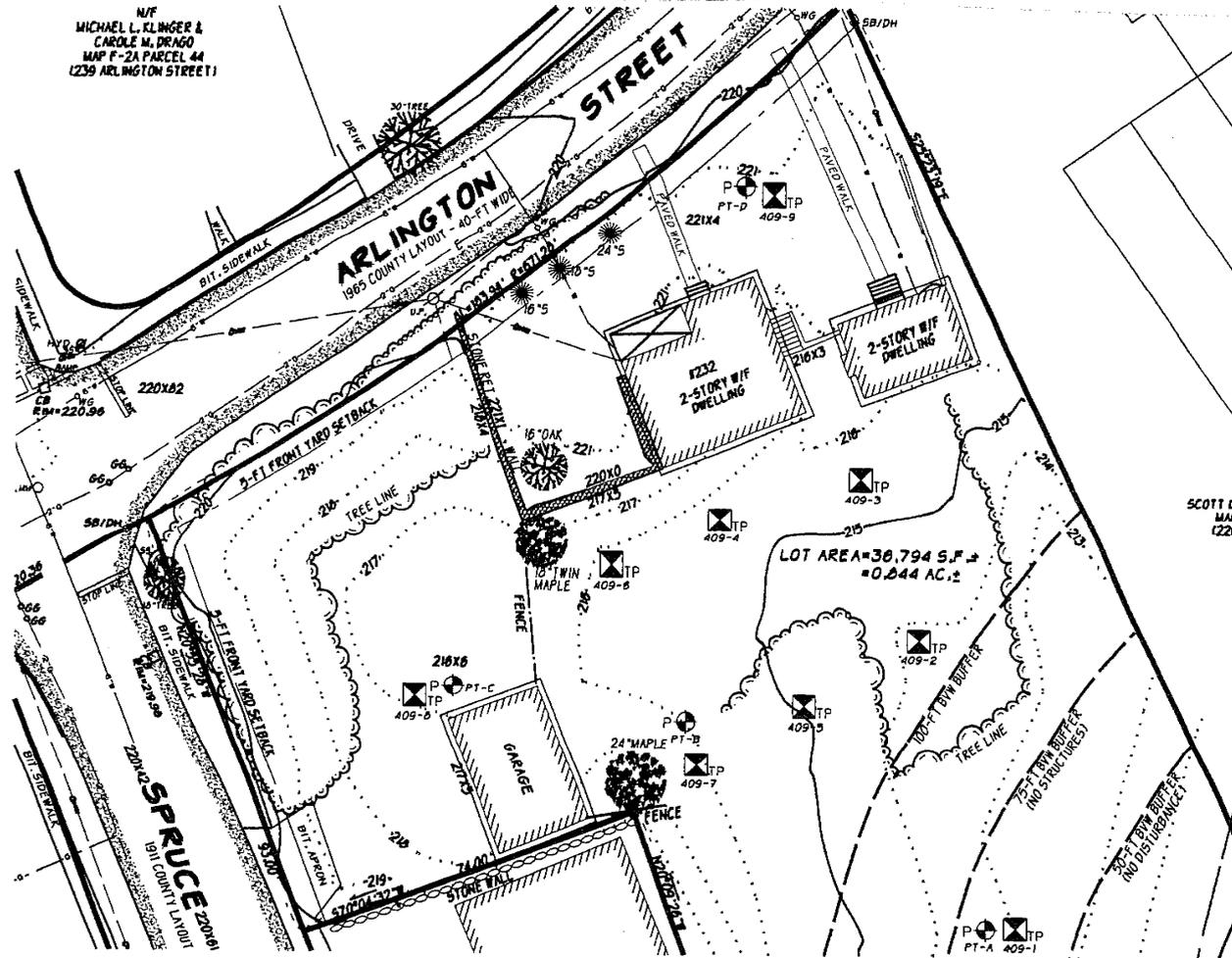
**Note:** In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.



# Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

## Field Diagrams

Use this sheet for field diagrams:





Commonwealth of Massachusetts  
 City/Town of Acton  
**Percolation Test**  
**Form 12**

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

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



**A. Site Information**

West Acton Trio, LLC  
 Owner Name  
 232 Arlington Street  
 Street Address or Lot #  
 Acton MA 01720  
 City/Town State Zip Code  
 Mark Roderick (617) 230-3674  
 Contact Person (if different from Owner) Telephone Number

**B. Test Results**

	4/27/09 Date	9:30 AM Time	4/27/09 Date	12:05 AM Time
Observation Hole #	PT-A		PT-B	
Depth of Perc	44"		52"	
Start Pre-Soak	9:32		12:05	
End Pre-Soak	24 Gal. Applied < 15 Min.		24 Gal. Applied < 15 Min.	
Time at 12"	Could not saturate		Could not saturate	
Time at 9"				
Time at 6"				
Time (9"-6")				
Rate (Min./Inch)	<2 MPI		<2 MPI	
	Test Passed: <input checked="" type="checkbox"/>		Test Passed: <input checked="" type="checkbox"/>	
	Test Failed: <input type="checkbox"/>		Test Failed: <input type="checkbox"/>	

Scott Hayes, PE, FORESITE Engineering

Test Performed By:

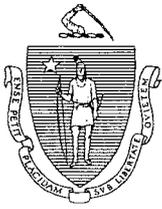
Justin Snair, Acton Health Dept.

Witnessed By:

Comments:

\_\_\_\_\_

\_\_\_\_\_



Commonwealth of Massachusetts  
 City/Town of Acton  
**Percolation Test**  
 Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

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



**A. Site Information**

West Acton Trio, LLC  
 Owner Name  
232 Arlington Street  
 Street Address or Lot #  
Acton MA 01720  
 City/Town State Zip Code  
Mark Roderick (617) 230-3674  
 Contact Person (if different from Owner) Telephone Number

**B. Test Results**

	<u>4/27/09</u> Date	<u>12:29 PM</u> Time	<u>4/27/09</u> Date	<u>1:07 PM</u> Time
Observation Hole #	<u>PT-C</u>		<u>PT-D</u>	
Depth of Perc	<u>44"</u>		<u>60"</u>	
Start Pre-Soak	<u>12:29 PM</u>		<u>1:07 PM</u>	
End Pre-Soak	<u>24 Gal. Applied &lt; 15 Min.</u>		<u>24 Gal. Applied &lt; 15 Min.</u>	
Time at 12"	<u>Could not saturate</u>		<u>Could not saturate</u>	
Time at 9"	_____		_____	
Time at 6"	_____		_____	
Time (9"-6")	_____		_____	
Rate (Min./Inch)	<u>&lt;2 MPI</u>		<u>&lt;2 MPI</u>	
	Test Passed:	<input checked="" type="checkbox"/>	Test Passed:	<input checked="" type="checkbox"/>
	Test Failed:	<input type="checkbox"/>	Test Failed:	<input type="checkbox"/>

Scott Hayes, PE, FORESITE Engineering  
 Test Performed By:  
Justin Snair, Acton Health Dept.  
 Witnessed By:  
 \_\_\_\_\_  
 Comments:  
 \_\_\_\_\_  
 \_\_\_\_\_

## **Appendix F**

Stormceptor Sizing Report & Manufacturers Inspection and Maintenance  
Procedures



## Stormceptor Design Summary

### PCSWMM for Stormceptor

#### Project Information

Date	7/7/2010
Project Name	SPRUCE CORNER
Project Number	1495
Location	ACTON MA

#### Designer Information

Company	FORESITE ENGINEERING
Contact	SCOTT HAYES

#### Notes

N/A
-----

#### Drainage Area

Total Area (ac)	0.244
Imperviousness (%)	75

The Stormceptor System model STC 450i achieves the water quality objective removing 90% TSS for a Fine (organics, silts and sand) particle size distribution.

#### Rainfall

Name	BOSTON WSFO AP
State	MA
ID	770
Years of Records	1948 to 2005
Latitude	42°21'38"N
Longitude	71°0'38"W

#### Water Quality Objective

TSS Removal (%)	80
-----------------	----

#### Upstream Storage

Storage (ac-ft)	Discharge (cfs)
0	0

#### Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
<b>STC 450i</b>	<b>90</b>
STC 900	94
STC 1200	95
STC 1800	95
STC 2400	96
STC 3600	96
STC 4800	97
STC 6000	97
STC 7200	98
STC 11000	99
STC 13000	99
STC 16000	99



### Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

Fine (organics, silts and sand)							
Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s	Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s
20	20	1.3	0.0013				
60	20	1.8	0.0051				
150	20	2.2	0.0354				
400	20	2.65	0.2123				
2000	20	2.65	0.9417				

### Stormceptor Design Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal.
- Only the STC 450i is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 450i to STC 7200 may accommodate multiple inlet pipes.
- Inlet and outlet invert elevation differences are as follows:

#### Inlet and Outlet Pipe Invert Elevations Differences

Inlet Pipe Configuration	STC 450i	STC 900 to STC 7200	STC 11000 to STC 16000
Single inlet pipe	3 in.	1 in.	3 in.
Multiple inlet pipes	3 in.	3 in.	Only one inlet pipe.

- Design estimates are based on stable site conditions only, after construction is completed.
- Design estimates assume that the storm drain is not submerged during zero flows. For submerged applications, please contact your local Stormceptor representative.
- Design estimates may be modified for specific spills controls. Please contact your local Stormceptor representative for further assistance.
- For pricing inquiries or assistance, please contact Rinker Materials 1 (800) 909-7763 [www.rinkerstormceptor.com](http://www.rinkerstormceptor.com)

## **Stormceptor® STC Inspection and Maintenance Information**

### **Stormceptor® Inspection and Maintenance**

Regular inspection and maintenance is a proven, cost-effective way to maximize water resource protection for all stormwater pollution control practices, and are required to insure proper functioning of the Stormceptor System. Both inspection and maintenance of the Stormceptor system is easily performed from the surface. Stormceptor's patented technology has no moving parts, simplifying the inspection and maintenance process.

Please refer to the following information and guidelines before conducting inspection and maintenance activities.

#### ***When is inspection needed?***

- Post-construction inspection is required prior to putting the Stormceptor System into service.
- Routine inspections are recommended during the first year of operation to accurately assess the sediment accumulation.
- Specifically for New Jersey installations, regulations require all BMPs to be inspected a minimum four times per year and after every storm with greater than one inch of rainfall.
- Inspection frequency in subsequent years is based on the maintenance plan developed in the first year.
- Inspections should also be performed immediately after an oil, fuel or other chemical spill.

#### ***When is maintenance cleaning needed?***

- For optimum performance, the unit should be cleaned out once the sediment depth reaches 15% of the unit's total storage capacity (see Table 1). Generally, the minimum cleaning frequency is once annually, although the frequency can be based on historical inspection results.
- The unit should be cleaned out immediately after an oil, fuel or chemical spill.

Table 1

<b>Sediment Maintenance Depth* and Oil Capacity</b>		
<b>STC Model</b>	<b>Sediment Depth* (inches)</b>	<b>Oil Capacity (gallons)</b>
450i	8	86
900	8	251
1200	10	251
1800	15	251
2400	12	840

3600	17	840
4800	15	909
6000	18	909
7200	15	1059
11000	17	2797
13000	20	2797
16000	17	3055
* based on 15% of the lower chamber volume		

**What conditions can compromise the Stormceptor System performance?**

- If the system is not maintained regularly and fills with sediment and debris beyond the capacity indicated in Table 1, sediment removal efficiency may be reduced.
- If an oil spill(s) exceeds the oil capacity of the system, subsequent spills may not be captured.
- If debris clogs the inlet of the system, removal efficiency of sediment and hydrocarbons may be reduced.
- If a downstream blockage occurs, a backwater condition may occur in the system and removal efficiency of sediment and hydrocarbons may be reduced.

**What training is required?**

The Stormceptor System is inspected and maintained by professional vacuum cleaning service providers with experience in the maintenance of underground tanks, sewers and catch basins. For typical inspection and maintenance activities, no specific supplemental training is required for the Stormceptor System. Information provided in this document or the Stormceptor Operation and Maintenance Manual (provided to the system owner) contains sufficient guidance to maintain the system properly.

In unusual circumstances, such as if a damaged component needs replacement or some other condition requires manned entry into the vessel, confined space entry procedures must be followed. Only professional maintenance service providers trained in these procedures should enter the vessel. Service provider companies typically have personnel who are trained and certified in confined space entry procedures according to local, state, and federal standards.

**What equipment is typically required for inspection?**

- Manhole access cover lifting tool
- Oil dipstick
- Sediment probe
- Flashlight
- Camera
- Data log
- Safety cones and caution tape
- Hard hat, safety shoes, safety glasses, and chemical-resistant gloves

**How is the Stormceptor System inspected?**

- The Stormceptor System can be inspected through a standard surface manhole

access cover.

- Sediment and oil depth inspections are performed with a sediment probe and oil dipstick. Oil depth is measured through the oil inspection port. Sediment depth can be measured through the oil inspection port or exit riser pipe.
- Inspections also involve a visual inspection of the internal components of the system.

***What equipment is typically required for maintenance?***

- Vacuum truck equipped with water hose and jet nozzle
- Small pump and tubing for oil removal
- Manhole access cover lifting tool
- Oil dipstick
- Sediment probe
- Flashlight
- Camera
- Data log
- Safety cones and caution tape
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Gas analyzer, respiratory gear, and safety harness for specially trained personnel if confined space entry is required

***How is the Stormceptor System maintained?***

- The Stormceptor System can be maintained through a standard surface manhole access cover.
- Insert the oil dipstick into the oil inspection port. If oil is present, pump off the oil layer into separate containment using a small pump and tubing.
- Maintenance cleaning of accumulated sediment is performed with a vacuum truck.
- For 6-ft diameter models and larger, the vacuum hose is inserted into the lower chamber via the 24-inch outlet riser pipe.
- For 4-ft diameter model, the removable drop tee is lifted out, and the vacuum hose is inserted into the lower chamber via the 12-inch drop tee hole.
- Using the vacuum hose, decant the water from the lower chamber to the sanitary sewer, if permitted by the local regulating authority, or into a separate containment tank.
- Remove the sludge from the bottom of the unit using the vacuum hose.
- Re-fill the lower chamber with water where required by the local jurisdiction.
- Units that have not been maintained regularly, have surpassed the maximum recommended sediment capacity, or contain damaged components may require manned entry by trained personnel using proper confined space entry procedures.

***What is required for proper disposal?***

- Disposal requirements for recovered pollutants may vary depending on local guidelines. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste.

### **What about oil spills?**

- Petroleum-based pollutants captured by the Stormceptor system (oil/chemical/fuel spills) should be removed and disposed of by a licensed waste management company.
- Although Stormceptor captures virtually all free oil, a sheen at the outlet **does not** mean the unit isn't working. A rainbow or sheen can be visible at oil concentrations of less than 10 mg/L (ppm).

### **What factors affect the costs involved with inspection/maintenance?**

- Inspection and maintenance costs are based on unit size, sediment/oil/hazardous material loads, transportation distances, tipping fees, disposal requirements and other local regulations.

### **System schematic and component functions**

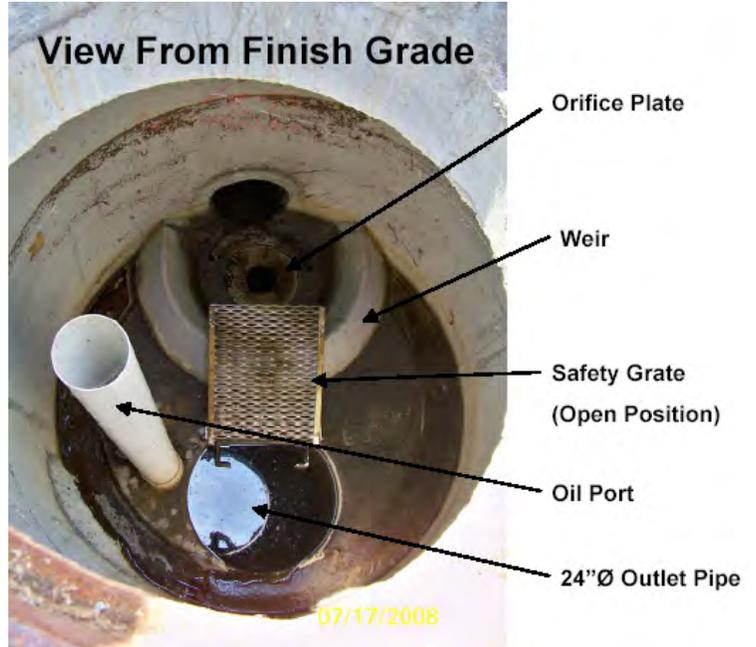
Below is a schematic of the Stormceptor System with key components identified and their functions briefly described.



- **Manhole access cover** – provides access to the subsurface components
- **Precast reinforced concrete structure** – provides the vessel's watertight structural support
- **Fiberglass insert** – separates vessel into upper and lower chambers
- **Weir** – directs incoming stormwater and oil spills into the lower treatment chamber
- **Orifice plate** – controls water flow rate into the lower treatment chamber and prevents scour of accumulated pollutants
- **Inlet drop tee** – conveys stormwater into the lower treatment chamber and splits flow into two opposite tangential streams
- **Fiberglass skirt** – provides double-wall containment of hydrocarbons
- **Outlet riser pipe** – conveys treated water to the upper chamber; primary vector access port for sediment removal

- **Oil inspection port** – primary access for measuring oil depth and oil removal
- **Safety grate** – safety measure to cover riser pipe in the event of manned entry into vessel

The Stormceptor System has no moving parts to wear out and therefore maintenance activities are generally focused on pollutant removal.



The depth of sediment can be measured from the surface by using a sediment probe or dipstick tube equipped with a ball check valve and inserted through the 24-inch outlet riser pipe. Oil level can similarly be checked through the oil inspection port.



A maintenance worker stationed on the surface uses a vacuum hose to evacuate water, sediment, and debris from the system.

***Purchasing replacement parts***

Since there are no moving parts in the Stormceptor System, broken, damaged, or worn parts are not typically encountered. However, if replacement parts are necessary, they may be obtained by contacting the following supplier of authentic Stormceptor components.

In New Jersey, contact:

Camtek Construction Products Corp.  
3481 Treeline Drive  
Murrysville, PA 15668  
Phone: (724) 327-3400

The benefits of regular inspection and maintenance are many – from ensuring maximum operation efficiency, to keeping maintenance costs low, to the continued protection of natural waterways – and provide the key to Stormceptor’s long and effective service life.

# **Appendix G**

Stormwater Operation & Maintenance Plan

**STORMWATER OPERATION & MAINTENANCE  
PLAN FOR  
“SPRUCE CORNER”**

**232 Arlington Street  
Acton, Massachusetts**

July 12, 2010

**Prepared for:**  
West Acton Trio, LLC  
P.O. Box 401012  
Cambridge, Massachusetts 02140

**Prepared By:**  
FORESITE Engineering Associates, Inc.  
16 Gleasondale Road, Suite 1-1  
Stow, Massachusetts 01775  
Phone (978) 461-2350

# TABLE OF CONTENTS

- 1 Project Description
- 2 Planned Erosion & Sedimentation Controls  
During Construction
- 3 Long Term Inspection & Maintenance Measures  
After Construction
- 4 Illicit Discharge Compliance Statement

## **1. Project Description**

The site of the proposed “Spruce Corner” development is a 0.84 acre tract of land located at the southeast corner of Arlington Street and Spruce Street in the West Acton village identified on Acton Assessors Maps as Map F2A Parcels 70, 71 & 83. The project site is located within the West Acton Village (WAV) zoning district and abuts the Village Residential (VR) zone to the east and across Arlington Street to the north. The project site is currently used for residential purposes and contains two single family dwellings and an accessory garage. There are currently no other structures on the site and all uses of the site are residential or accessory to residential uses (single family dwellings with accessory yard and garden areas).

According to the United States Department of Agriculture (USDA) Soil Survey of Middlesex County the soils on site are Merrimac series. These soils are deep outwash deposits that exhibit rapid permeability at the surface layer and very rapid permeability in the substratum (Hydrologic Soil Group A) and typically have a relatively deep water table. Hinckley and Merrimac soils have no major limitations for building site development or for local roads and streets making the site well suited to development, sewage disposal, and storm water recharge systems. The soils were evaluated in the field to verify these conditions. Deep observation test holes and percolation tests were conducted throughout the site and the results of those tests are documented in Appendix E.

The development proposal for the site involves demolition of the two existing dwellings and garage, clearing of vegetation, grading, and construction of 3 structures – 2 duplex residences and a building at the corner of Arlington Street and Spruce Street with approximately 4,396 square feet of commercial space in the basement and on the first floor and (3) 2-bedroom apartments on the second and third floors. Appurtenant to the principal use of the buildings is construction of access drives, parking areas, walkways, drainage and sewerage infrastructure and extension of utilities from Arlington Street and Spruce Street to serve the buildings on site. The change in surface cover (from pervious vegetated cover to impervious cover and less pervious lawn) and the alteration of grade, increase the rate and volume of runoff from the site. Runoff is collected in the drainage system and treated to meet DEP Stormwater Management Policy standards where necessary. Increases in the rate and volume of runoff are managed with infiltrative measures such as a retention/detention basin and pervious pavers where feasible.

## **2. Planned Erosion and Sedimentation Control Measures During Construction**

### **Haybales/Siltation Fence**

Staked hay bales with silt fence are proposed to be installed, as shown on the site plan, around the perimeter and up gradient of the bordering vegetated wetlands. The siltation barrier will be installed prior to the commencement of any work on-site and in accordance with the design plans. An additional supply of hay bales shall be on-site to replace and/or repair hay bale fencing that is

disturbed. The lines of hay bales shall be inspected and maintained on a weekly basis during construction.

### **Storm Drain Inlet Protection**

A temporary storm inlet protection filter or hay bales will be placed around all catch basin units during construction. The purpose of the filter is to prevent the inflow of sediments into the closed drainage system. The filter or hay bales shall remain in place until a permanent vegetative cover is established and the transport of sediment is no longer a potential hazard. The filter shall be inspected and maintained on a weekly basis and after every storm event during construction. Storm drain inlet protection shall be removed upon completion of site improvements and stabilization of site.

### **Surface Stabilization**

The surface of all disturbed areas shall be stabilized during and after construction. Temporary measures shall be taken during construction to prevent erosion and siltation. All disturbed slopes will be stabilized with a permanent vegetative cover. Some or all of the following measures will be utilized on this project as conditions may warrant.

- a. Temporary Seeding
- b. Temporary Mulching
- c. Permanent Seeding
- d. Placement of Sod
- e. Hydroseeding
- f. Placement of Hay
- g. Placement of Jute Netting

### **Inspection and Maintenance of Stormceptor 450i Catch Basin**

The performance of the Stormceptor 450i catch basin will be limited during construction by filter fabric and haybale inlet protection proposed to keep sediments out of the system. The Stormceptor shall be inspected after every rainfall event during construction and cleaned of sediments and debris as necessary (typically when sediment depth in the sump reaches 8" or greater).

### **3. Long-Term Inspection and Maintenance Measures After Construction**

#### **Stormwater Management System Owners & Party Responsible for Maintenance:**

West Acton Trio, LLC  
P.O. Box 041012  
Cambridge, MA 02140

#### **Erosion Control**

Eroded sediments can adversely affect the performance of the stormwater management system. Eroding or barren areas should be re-vegetated immediately.

#### **Debris and Litter Removal**

Trash may collect in the BMP's, potentially causing clogging of the facilities. All debris and litter shall be removed from the site as soon as possible upon discovery, and after each storm event.

#### **Inspection and Maintenance of Catch Basin**

The Stormceptor 450i catch basin shall be inspected four (4) times per year in the first year following construction, and if necessary, maintenance shall be performed so that it functions as designed. The Stormceptor shall be cleaned twice per year, and when sediment depth reaches 8 inches or greater. Inlet and outlet pipes should be checked for clogging. At a minimum, inspection of the catch basin shall be performed during the last week of April and the first week of October each calendar year.

#### **Detention Basin**

Detention basin should be inspected at least semi-annually, and maintenance and repairs made as necessary. Additional inspections should be scheduled regularly during the first few months to make sure the covering vegetation is adequately established. Repairs and reseedings should be done as required. Basins slopes should be mowed at least once per year. Grass clippings should be removed. The grass must not be cut too often or shorter than four inches, in order to maintain the effectiveness of the basin. Sediment and debris should be removed from the basin manually (by hand), at least once per year, before vegetation is adversely impacted. Care should be taken to protect the water quality basins from snow removal and disposal practices and off-street parking.

## **Parking Lot Sweeping**

Parking lot sweeping shall be conducted once per year during late spring. The period immediately following winter snowmelt when roads and other accumulated sediment are washed off shall be swept. Conventional mechanical sweepers or vacuum type sweepers demonstrate higher removal efficiencies and shall be utilized.

## **4. Illicit Discharge Compliance Statement**

(1) Prohibition of Illicit Discharges.

(a) Prohibition. No person shall throw, drain, discharge, cause to be discharged, or allow others under their control to discharge into the storm sewer system or watercourse any materials other than stormwater, including but not limited to pollutants or waters containing pollutants.

(b) Exemptions. The following non-stormwater discharges are excluded from (a) above:

(1) waterline flushing or other potable water sources;

(2) landscape irrigation or lawn watering;

(3) diverted, natural riparian habitat and/or wetland flows;

(4) rising ground water, ground water infiltration to storm drains, and/or uncontaminated pumped groundwater;

(5) foundation or footing drains (not including active ground water dewatering systems) and crawl space pumps;

(6) air conditioning condensation;

(7) springs;

(8) other water sources determined by the Massachusetts Department of Environmental Protection, in writing, as not containing pollutants that cause or contribute to waterway degradation, including but not limited to a violation of applicable water quality standards and/or degradation of the biotic integrity of surface water bodies and their floodplains.

# **Appendix H**

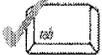
DEP Checklist for Stormwater Report



# 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.<sup>1</sup> 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 8<sup>2</sup>
- 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.

<sup>1</sup> 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.

<sup>2</sup> 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.

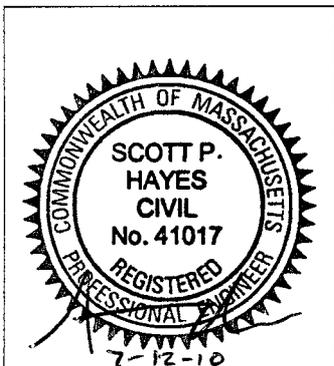
*Note:* Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that 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



  
Signature and Date 7-12-10

## 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 Field<sup>1</sup>
- 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.

<sup>1</sup> 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

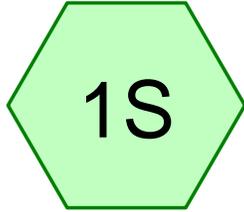
- The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
  - Name of the stormwater management system owners;
  - Party responsible for operation and maintenance;
  - Schedule for implementation of routine and non-routine maintenance 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.

# **Appendix I**

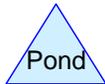
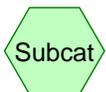
HydroCAD Output



NORTH TO ARLINGTON STREET



SOUTH TO WETLANDS



**Drainage Diagram for SPRUCE CORNER - Pre-development**  
Prepared by FORESITE Engineering Associates, Inc. 7/7/2010  
HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

## SPRUCE CORNER - Pre-development

Prepared by FORESITE Engineering Associates, Inc.

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

Page 2

7/7/2010

### Area Listing (all nodes)

<u>Area (sq-ft)</u>	<u>CN</u>	<u>Description (subcats)</u>
17,146	43	Woods/grass comb., Fair, HSG A (2S)
13,970	49	50-75% Grass cover, Fair, HSG A (1S,2S)
2,975	68	<50% Grass cover, Poor, HSG A (2S)
2,703	98	Paved parking & roofs (1S,2S)
<hr/>		
36,794		

**SPRUCE CORNER - Pre-development**

Type III 24-hr 2-yr Rainfall=3.20"

Prepared by FORESITE Engineering Associates, Inc.

Page 3

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/7/2010

---

Time span=6.00-28.00 hrs, dt=0.01 hrs, 2201 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: NORTH TO ARLINGTON STREET**

Runoff Area=2,257 sf Runoff Depth=0.20"

Flow Length=50' Tc=2.6 min CN=53 Runoff=0.00 cfs 37 cf

**Subcatchment 2S: SOUTH TO WETLANDS**

Runoff Area=34,537 sf Runoff Depth=0.15"

Flow Length=275' Tc=6.2 min CN=51 Runoff=0.03 cfs 432 cf

**Total Runoff Area = 36,794 sf Runoff Volume = 469 cf Average Runoff Depth = 0.15"**

**92.65% Pervious Area = 34,091 sf 7.35% Impervious Area = 2,703 sf**

**SPRUCE CORNER - Pre-development**

Type III 24-hr 2-yr Rainfall=3.20"

Prepared by FORESITE Engineering Associates, Inc.

Page 4

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/7/2010

**Subcatchment 1S: NORTH TO ARLINGTON STREET**

Runoff = 0.00 cfs @ 12.33 hrs, Volume= 37 cf, Depth= 0.20"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-28.00 hrs, dt= 0.01 hrs

Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
2,056	49	50-75% Grass cover, Fair, HSG A
201	98	Paved parking & roofs
2,257	53	Weighted Average
2,056		Pervious Area
201		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	25	0.0400	0.17		<b>Sheet Flow, TR-55 SHEET FLOW</b> Grass: Short n= 0.150 P2= 3.20"
0.2	25	0.0700	1.85		<b>Shallow Concentrated Flow, SH. CONC. UPLAND FLOW</b> Short Grass Pasture Kv= 7.0 fps
2.6	50	Total			

**Subcatchment 2S: SOUTH TO WETLANDS**

Runoff = 0.03 cfs @ 12.44 hrs, Volume= 432 cf, Depth= 0.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-28.00 hrs, dt= 0.01 hrs

Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
17,146	43	Woods/grass comb., Fair, HSG A
11,914	49	50-75% Grass cover, Fair, HSG A
2,975	68	<50% Grass cover, Poor, HSG A
2,502	98	Paved parking & roofs
34,537	51	Weighted Average
32,035		Pervious Area
2,502		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		<b>Sheet Flow, TR-55 SHEET FLOW</b> Grass: Short n= 0.150 P2= 3.20"
2.1	150	0.0300	1.21		<b>Shallow Concentrated Flow, OVERLAND FLOW (GRASS)</b> Short Grass Pasture Kv= 7.0 fps
1.4	100	0.0550	1.17		<b>Shallow Concentrated Flow, OVERLAND FLOW (WOODS)</b> Woodland Kv= 5.0 fps
6.2	275	Total			

**SPRUCE CORNER - Pre-development**

*Type III 24-hr 10-yr Rainfall=4.50"*

Prepared by FORESITE Engineering Associates, Inc.

Page 5

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/7/2010

---

Time span=6.00-28.00 hrs, dt=0.01 hrs, 2201 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: NORTH TO ARLINGTON STREET**

Runoff Area=2,257 sf Runoff Depth=0.64"

Flow Length=50' Tc=2.6 min CN=53 Runoff=0.03 cfs 121 cf

**Subcatchment 2S: SOUTH TO WETLANDS**

Runoff Area=34,537 sf Runoff Depth=0.55"

Flow Length=275' Tc=6.2 min CN=51 Runoff=0.27 cfs 1,570 cf

**Total Runoff Area = 36,794 sf Runoff Volume = 1,691 cf Average Runoff Depth = 0.55"**

**92.65% Pervious Area = 34,091 sf 7.35% Impervious Area = 2,703 sf**

**SPRUCE CORNER - Pre-development**

Type III 24-hr 10-yr Rainfall=4.50"

Prepared by FORESITE Engineering Associates, Inc.

Page 6

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/7/2010

**Subcatchment 1S: NORTH TO ARLINGTON STREET**

Runoff = 0.03 cfs @ 12.07 hrs, Volume= 121 cf, Depth= 0.64"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-28.00 hrs, dt= 0.01 hrs

Type III 24-hr 10-yr Rainfall=4.50"

Area (sf)	CN	Description
2,056	49	50-75% Grass cover, Fair, HSG A
201	98	Paved parking & roofs
2,257	53	Weighted Average
2,056		Pervious Area
201		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	25	0.0400	0.17		<b>Sheet Flow, TR-55 SHEET FLOW</b> Grass: Short n= 0.150 P2= 3.20"
0.2	25	0.0700	1.85		<b>Shallow Concentrated Flow, SH. CONC. UPLAND FLOW</b> Short Grass Pasture Kv= 7.0 fps
2.6	50	Total			

**Subcatchment 2S: SOUTH TO WETLANDS**

Runoff = 0.27 cfs @ 12.13 hrs, Volume= 1,570 cf, Depth= 0.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-28.00 hrs, dt= 0.01 hrs

Type III 24-hr 10-yr Rainfall=4.50"

Area (sf)	CN	Description
17,146	43	Woods/grass comb., Fair, HSG A
11,914	49	50-75% Grass cover, Fair, HSG A
2,975	68	<50% Grass cover, Poor, HSG A
2,502	98	Paved parking & roofs
34,537	51	Weighted Average
32,035		Pervious Area
2,502		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		<b>Sheet Flow, TR-55 SHEET FLOW</b> Grass: Short n= 0.150 P2= 3.20"
2.1	150	0.0300	1.21		<b>Shallow Concentrated Flow, OVERLAND FLOW (GRASS)</b> Short Grass Pasture Kv= 7.0 fps
1.4	100	0.0550	1.17		<b>Shallow Concentrated Flow, OVERLAND FLOW (WOODS)</b> Woodland Kv= 5.0 fps
6.2	275	Total			

**SPRUCE CORNER - Pre-development**

Type III 24-hr 25-yr Rainfall=5.30"

Prepared by FORESITE Engineering Associates, Inc.

Page 7

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/7/2010

---

Time span=6.00-28.00 hrs, dt=0.01 hrs, 2201 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: NORTH TO ARLINGTON STREET**

Runoff Area=2,257 sf Runoff Depth=1.00"

Flow Length=50' Tc=2.6 min CN=53 Runoff=0.05 cfs 189 cf

**Subcatchment 2S: SOUTH TO WETLANDS**

Runoff Area=34,537 sf Runoff Depth=0.88"

Flow Length=275' Tc=6.2 min CN=51 Runoff=0.59 cfs 2,530 cf

**Total Runoff Area = 36,794 sf Runoff Volume = 2,718 cf Average Runoff Depth = 0.89"**

**92.65% Pervious Area = 34,091 sf 7.35% Impervious Area = 2,703 sf**

**SPRUCE CORNER - Pre-development**

Type III 24-hr 25-yr Rainfall=5.30"

Prepared by FORESITE Engineering Associates, Inc.

Page 8

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/7/2010

**Subcatchment 1S: NORTH TO ARLINGTON STREET**

Runoff = 0.05 cfs @ 12.06 hrs, Volume= 189 cf, Depth= 1.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-28.00 hrs, dt= 0.01 hrs

Type III 24-hr 25-yr Rainfall=5.30"

Area (sf)	CN	Description
2,056	49	50-75% Grass cover, Fair, HSG A
201	98	Paved parking & roofs
2,257	53	Weighted Average
2,056		Pervious Area
201		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	25	0.0400	0.17		<b>Sheet Flow, TR-55 SHEET FLOW</b> Grass: Short n= 0.150 P2= 3.20"
0.2	25	0.0700	1.85		<b>Shallow Concentrated Flow, SH. CONC. UPLAND FLOW</b> Short Grass Pasture Kv= 7.0 fps
2.6	50	Total			

**Subcatchment 2S: SOUTH TO WETLANDS**

Runoff = 0.59 cfs @ 12.12 hrs, Volume= 2,530 cf, Depth= 0.88"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-28.00 hrs, dt= 0.01 hrs

Type III 24-hr 25-yr Rainfall=5.30"

Area (sf)	CN	Description
17,146	43	Woods/grass comb., Fair, HSG A
11,914	49	50-75% Grass cover, Fair, HSG A
2,975	68	<50% Grass cover, Poor, HSG A
2,502	98	Paved parking & roofs
34,537	51	Weighted Average
32,035		Pervious Area
2,502		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		<b>Sheet Flow, TR-55 SHEET FLOW</b> Grass: Short n= 0.150 P2= 3.20"
2.1	150	0.0300	1.21		<b>Shallow Concentrated Flow, OVERLAND FLOW (GRASS)</b> Short Grass Pasture Kv= 7.0 fps
1.4	100	0.0550	1.17		<b>Shallow Concentrated Flow, OVERLAND FLOW (WOODS)</b> Woodland Kv= 5.0 fps
6.2	275	Total			

**SPRUCE CORNER - Pre-development**

Type III 24-hr 100-yr Rainfall=6.60"

Prepared by FORESITE Engineering Associates, Inc.

Page 9

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/7/2010

---

Time span=6.00-28.00 hrs, dt=0.01 hrs, 2201 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: NORTH TO ARLINGTON STREET**

Runoff Area=2,257 sf Runoff Depth=1.70"

Flow Length=50' Tc=2.6 min CN=53 Runoff=0.10 cfs 320 cf

**Subcatchment 2S: SOUTH TO WETLANDS**

Runoff Area=34,537 sf Runoff Depth=1.53"

Flow Length=275' Tc=6.2 min CN=51 Runoff=1.22 cfs 4,409 cf

**Total Runoff Area = 36,794 sf Runoff Volume = 4,729 cf Average Runoff Depth = 1.54"**

**92.65% Pervious Area = 34,091 sf 7.35% Impervious Area = 2,703 sf**

**SPRUCE CORNER - Pre-development**

Type III 24-hr 100-yr Rainfall=6.60"

Prepared by FORESITE Engineering Associates, Inc.

Page 10

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/7/2010

**Subcatchment 1S: NORTH TO ARLINGTON STREET**

Runoff = 0.10 cfs @ 12.05 hrs, Volume= 320 cf, Depth= 1.70"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-28.00 hrs, dt= 0.01 hrs

Type III 24-hr 100-yr Rainfall=6.60"

Area (sf)	CN	Description
2,056	49	50-75% Grass cover, Fair, HSG A
201	98	Paved parking & roofs
2,257	53	Weighted Average
2,056		Pervious Area
201		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	25	0.0400	0.17		<b>Sheet Flow, TR-55 SHEET FLOW</b> Grass: Short n= 0.150 P2= 3.20"
0.2	25	0.0700	1.85		<b>Shallow Concentrated Flow, SH. CONC. UPLAND FLOW</b> Short Grass Pasture Kv= 7.0 fps
2.6	50	Total			

**Subcatchment 2S: SOUTH TO WETLANDS**

Runoff = 1.22 cfs @ 12.10 hrs, Volume= 4,409 cf, Depth= 1.53"

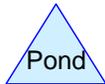
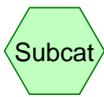
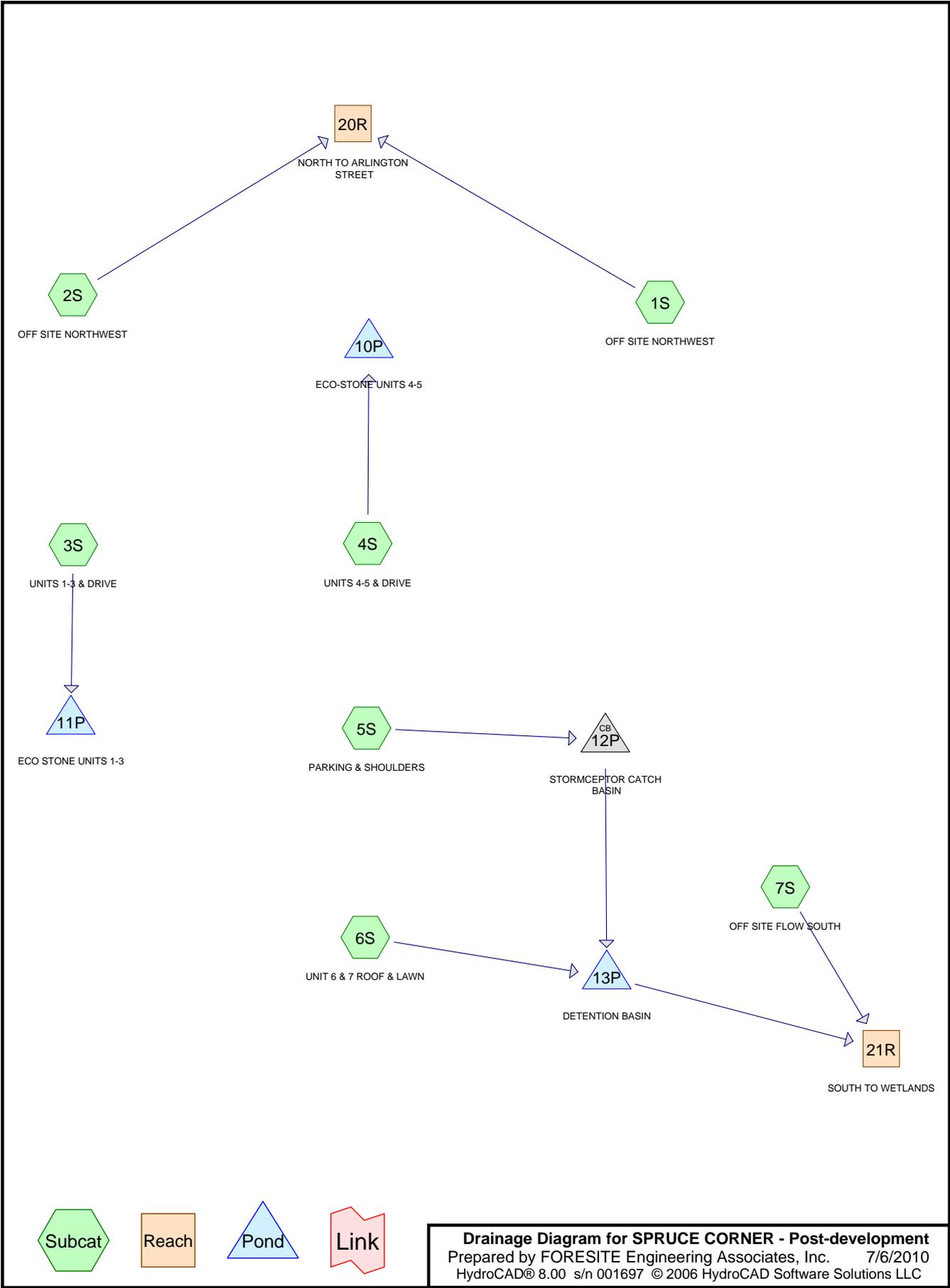
Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-28.00 hrs, dt= 0.01 hrs

Type III 24-hr 100-yr Rainfall=6.60"

Area (sf)	CN	Description
17,146	43	Woods/grass comb., Fair, HSG A
11,914	49	50-75% Grass cover, Fair, HSG A
2,975	68	<50% Grass cover, Poor, HSG A
2,502	98	Paved parking & roofs
34,537	51	Weighted Average
32,035		Pervious Area
2,502		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	25	0.0300	0.15		<b>Sheet Flow, TR-55 SHEET FLOW</b> Grass: Short n= 0.150 P2= 3.20"
2.1	150	0.0300	1.21		<b>Shallow Concentrated Flow, OVERLAND FLOW (GRASS)</b> Short Grass Pasture Kv= 7.0 fps
1.4	100	0.0550	1.17		<b>Shallow Concentrated Flow, OVERLAND FLOW (WOODS)</b> Woodland Kv= 5.0 fps
6.2	275	Total			



**Drainage Diagram for SPRUCE CORNER - Post-development**  
 Prepared by FORESITE Engineering Associates, Inc. 7/6/2010  
 HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

## SPRUCE CORNER - Post-development

Prepared by FORESITE Engineering Associates, Inc.

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

Page 12

7/6/2010

### Area Listing (all nodes)

<u>Area (sq-ft)</u>	<u>CN</u>	<u>Description (subcats)</u>
16,901	39	>75% Grass cover, Good, HSG A (1S,2S,3S,5S,6S,7S)
4,003	43	Woods/grass comb., Fair, HSG A (7S)
11,923	98	Paved parking & roofs (2S,4S,5S,6S)
3,967	98	Paved roads w/curbs & sewers (3S)
<hr/>		
36,794		

**SPRUCE CORNER - Post-development**

Type III 24-hr 2-YR Rainfall=3.20"

Prepared by FORESITE Engineering Associates, Inc.

Page 13

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: OFF SITE NORTHWEST** Runoff Area=924 sf Runoff Depth>0.00"  
Flow Length=50' Slope=0.0300 '/' Tc=1.8 min CN=39 Runoff=0.00 cfs 0 cf

**Subcatchment 2S: OFF SITE NORTHWEST** Runoff Area=3,092 sf Runoff Depth>0.04"  
Flow Length=35' Slope=0.0300 '/' Tc=1.6 min CN=45 Runoff=0.00 cfs 11 cf

**Subcatchment 3S: UNITS 1-3 & DRIVE** Runoff Area=4,557 sf Runoff Depth>2.17"  
Flow Length=25' Slope=0.0300 '/' Tc=0.3 min CN=90 Runoff=0.32 cfs 824 cf

**Subcatchment 4S: UNITS 4-5 & DRIVE** Runoff Area=2,541 sf Runoff Depth>2.97"  
Flow Length=20' Slope=0.0500 '/' Tc=0.2 min CN=98 Runoff=0.22 cfs 628 cf

**Subcatchment 5S: PARKING & SHOULDERS** Runoff Area=10,640 sf Runoff Depth>1.61"  
Flow Length=110' Slope=0.0100 '/' Tc=0.7 min CN=83 Runoff=0.56 cfs 1,427 cf

**Subcatchment 6S: UNIT 6 & 7 ROOF & LAWN** Runoff Area=10,050 sf Runoff Depth>0.04"  
Flow Length=225' Slope=0.0400 '/' Tc=2.7 min CN=45 Runoff=0.00 cfs 37 cf

**Subcatchment 7S: OFF SITE FLOW SOUTH** Runoff Area=4,990 sf Runoff Depth>0.01"  
Flow Length=125' Slope=0.0400 '/' Tc=4.1 min CN=42 Runoff=0.00 cfs 6 cf

**Reach 20R: NORTH TO ARLINGTON STREET** Inflow=0.00 cfs 11 cf  
Outflow=0.00 cfs 11 cf

**Reach 21R: SOUTH TO WETLANDS** Inflow=0.00 cfs 6 cf  
Outflow=0.00 cfs 6 cf

**Pond 10P: ECO-STONE UNITS 4-5** Peak Elev=217.75' Storage=59 cf Inflow=0.22 cfs 628 cf  
Outflow=0.08 cfs 628 cf

**Pond 11P: ECO STONE UNITS 1-3** Peak Elev=217.56' Storage=37 cf Inflow=0.32 cfs 824 cf  
Outflow=0.21 cfs 823 cf

**Pond 12P: STORMCEPTOR CATCH BASIN** Peak Elev=213.78' Inflow=0.56 cfs 1,427 cf  
12.0" x 45.0' Culvert Outflow=0.56 cfs 1,427 cf

**Pond 13P: DETENTION BASIN** Peak Elev=211.12' Storage=595 cf Inflow=0.56 cfs 1,463 cf  
Discarded=0.05 cfs 1,440 cf Primary=0.00 cfs 0 cf Outflow=0.05 cfs 1,440 cf

**Total Runoff Area = 36,794 sf Runoff Volume = 2,932 cf Average Runoff Depth = 0.96"**  
**56.81% Pervious Area = 20,904 sf 43.19% Impervious Area = 15,890 sf**

**SPRUCE CORNER - Post-development**

Type III 24-hr 2-YR Rainfall=3.20"

Prepared by FORESITE Engineering Associates, Inc.

Page 14

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

**Subcatchment 1S: OFF SITE NORTHWEST**

Runoff = 0.00 cfs @ 24.00 hrs, Volume= 0 cf, Depth&gt; 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
924	39	>75% Grass cover, Good, HSG A
924		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	10	0.0300	0.13		<b>Sheet Flow, SHEET FLOW</b> Grass: Short n= 0.150 P2= 3.20"
0.5	40	0.0300	1.21		<b>Shallow Concentrated Flow, OVERLAND FLOW</b> Short Grass Pasture Kv= 7.0 fps
1.8	50	Total			

**Subcatchment 2S: OFF SITE NORTHWEST**

Runoff = 0.00 cfs @ 15.28 hrs, Volume= 11 cf, Depth&gt; 0.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
2,792	39	>75% Grass cover, Good, HSG A
300	98	Paved parking & roofs
3,092	45	Weighted Average
2,792		Pervious Area
300		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	10	0.0300	0.13		<b>Sheet Flow, SHEET FLOW</b> Grass: Short n= 0.150 P2= 3.20"
0.3	25	0.0300	1.21		<b>Shallow Concentrated Flow, OVERLAND FLOW</b> Short Grass Pasture Kv= 7.0 fps
1.6	35	Total			

**Subcatchment 3S: UNITS 1-3 & DRIVE**

Runoff = 0.32 cfs @ 12.01 hrs, Volume= 824 cf, Depth&gt; 2.17"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Type III 24-hr 2-YR Rainfall=3.20"

**SPRUCE CORNER - Post-development**

Type III 24-hr 2-YR Rainfall=3.20"

Prepared by FORESITE Engineering Associates, Inc.

Page 15

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

Area (sf)	CN	Description
3,967	98	Paved roads w/curbs & sewers
590	39	>75% Grass cover, Good, HSG A
4,557	90	Weighted Average
590		Pervious Area
3,967		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	25	0.0300	1.23		<b>Sheet Flow, TR-55 SHEET FLOW</b> Smooth surfaces n= 0.011 P2= 3.20"

**Subcatchment 4S: UNITS 4-5 & DRIVE**

Runoff = 0.22 cfs @ 12.00 hrs, Volume= 628 cf, Depth> 2.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
2,541	98	Paved parking & roofs
2,541		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	20	0.0500	1.44		<b>Sheet Flow, TR-55 SHEET FLOW</b> Smooth surfaces n= 0.011 P2= 3.20"

**Subcatchment 5S: PARKING & SHOULDERS**

Runoff = 0.56 cfs @ 12.01 hrs, Volume= 1,427 cf, Depth> 1.61"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
7,980	98	Paved parking & roofs
2,660	39	>75% Grass cover, Good, HSG A
10,640	83	Weighted Average
2,660		Pervious Area
7,980		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0100	0.76		<b>Sheet Flow, TR-55 SHEET FLOW</b> Smooth surfaces n= 0.011 P2= 3.20"
0.3	90	0.0100	4.96	59.50	<b>Channel Flow, GUTTER FLOW</b> Area= 12.0 sf Perim= 42.0' r= 0.29' n= 0.013
0.7	110	Total			

**SPRUCE CORNER - Post-development**

Type III 24-hr 2-YR Rainfall=3.20"

Prepared by FORESITE Engineering Associates, Inc.

Page 16

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

**Subcatchment 6S: UNIT 6 & 7 ROOF & LAWN**

Runoff = 0.00 cfs @ 15.30 hrs, Volume= 37 cf, Depth&gt; 0.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
1,102	98	Paved parking & roofs
8,948	39	>75% Grass cover, Good, HSG A
10,050	45	Weighted Average
8,948		Pervious Area
1,102		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	25	0.0400	1.40		<b>Shallow Concentrated Flow, SHEET FLOW</b> Short Grass Pasture Kv= 7.0 fps
2.4	200	0.0400	1.40		<b>Shallow Concentrated Flow, OVERLAND FLOW</b> Short Grass Pasture Kv= 7.0 fps
2.7	225	Total			

**Subcatchment 7S: OFF SITE FLOW SOUTH**

Runoff = 0.00 cfs @ 21.52 hrs, Volume= 6 cf, Depth&gt; 0.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
4,003	43	Woods/grass comb., Fair, HSG A
987	39	>75% Grass cover, Good, HSG A
4,990	42	Weighted Average
4,990		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	25	0.0400	0.17		<b>Sheet Flow, SHEET FLOW</b> Grass: Short n= 0.150 P2= 3.20"
1.7	100	0.0400	1.00		<b>Shallow Concentrated Flow, OVERLAND FLOW</b> Woodland Kv= 5.0 fps
4.1	125	Total			

**Reach 20R: NORTH TO ARLINGTON STREET**

Inflow Area = 4,016 sf, Inflow Depth &gt; 0.03" for 2-YR event

Inflow = 0.00 cfs @ 15.28 hrs, Volume= 11 cf

Outflow = 0.00 cfs @ 15.28 hrs, Volume= 11 cf, Atten= 0%, Lag= 0.0 min

**SPRUCE CORNER - Post-development**

Type III 24-hr 2-YR Rainfall=3.20"

Prepared by FORESITE Engineering Associates, Inc.

Page 17

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

**Reach 21R: SOUTH TO WETLANDS**

Inflow Area = 25,680 sf, Inflow Depth > 0.00" for 2-YR event  
Inflow = 0.00 cfs @ 21.52 hrs, Volume= 6 cf  
Outflow = 0.00 cfs @ 21.52 hrs, Volume= 6 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

**Pond 10P: ECO-STONE UNITS 4-5**

Inflow Area = 2,541 sf, Inflow Depth > 2.97" for 2-YR event  
Inflow = 0.22 cfs @ 12.00 hrs, Volume= 628 cf  
Outflow = 0.08 cfs @ 11.90 hrs, Volume= 628 cf, Atten= 62%, Lag= 0.0 min  
Discarded = 0.08 cfs @ 11.90 hrs, Volume= 628 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 217.75' @ 12.13 hrs Surf.Area= 595 sf Storage= 59 cf

Plug-Flow detention time= 3.3 min calculated for 628 cf (100% of inflow)

Center-of-Mass det. time= 3.2 min ( 754.2 - 751.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	217.50'	595 cf	<b>ECO STONE PAVERS (Prismatic)</b> Listed below (Recalc) 1,488 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
217.50	595	0	0
218.00	595	298	298
218.50	595	298	595
219.00	595	298	893
220.00	595	595	1,488

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	<b>6.000 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.08 cfs @ 11.90 hrs HW=217.53' (Free Discharge)

**↑1=Exfiltration** (Exfiltration Controls 0.08 cfs)

**Pond 11P: ECO STONE UNITS 1-3**

Inflow Area = 4,557 sf, Inflow Depth > 2.17" for 2-YR event  
Inflow = 0.32 cfs @ 12.01 hrs, Volume= 824 cf  
Outflow = 0.21 cfs @ 11.97 hrs, Volume= 823 cf, Atten= 35%, Lag= 0.0 min  
Discarded = 0.21 cfs @ 11.97 hrs, Volume= 823 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

**SPRUCE CORNER - Post-development**

Type III 24-hr 2-YR Rainfall=3.20"

Prepared by FORESITE Engineering Associates, Inc.

Page 18

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

Peak Elev= 217.56' @ 12.07 hrs Surf.Area= 1,490 sf Storage= 37 cf

Plug-Flow detention time= 1.2 min calculated for 823 cf (100% of inflow)

Center-of-Mass det. time= 1.1 min ( 802.7 - 801.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	217.50'	1,192 cf	<b>ECO STONE PAVERS (Prismatic)</b> Listed below (Recalc) 2,980 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
217.50	1,490	0	0
218.00	1,490	745	745
218.50	1,490	745	1,490
219.00	1,490	745	2,235
219.50	1,490	745	2,980

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	<b>6.000 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.21 cfs @ 11.97 hrs HW=217.52' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.21 cfs)

**Pond 12P: STORMCEPTOR CATCH BASIN**

Inflow Area = 10,640 sf, Inflow Depth > 1.61" for 2-YR event  
 Inflow = 0.56 cfs @ 12.01 hrs, Volume= 1,427 cf  
 Outflow = 0.56 cfs @ 12.01 hrs, Volume= 1,427 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.56 cfs @ 12.01 hrs, Volume= 1,427 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 213.78' @ 12.01 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	213.40'	<b>12.0" x 45.0' long Culvert</b> CPP, square edge headwall, Ke= 0.500 Outlet Invert= 212.50' S= 0.0200 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior

**Primary OutFlow** Max=0.55 cfs @ 12.01 hrs HW=213.78' (Free Discharge)

↑**1=Culvert** (Barrel Controls 0.55 cfs @ 2.96 fps)

**Pond 13P: DETENTION BASIN**

Inflow Area = 20,690 sf, Inflow Depth > 0.85" for 2-YR event  
 Inflow = 0.56 cfs @ 12.01 hrs, Volume= 1,463 cf  
 Outflow = 0.05 cfs @ 12.77 hrs, Volume= 1,440 cf, Atten= 90%, Lag= 45.6 min  
 Discarded = 0.05 cfs @ 12.77 hrs, Volume= 1,440 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

**SPRUCE CORNER - Post-development**

Type III 24-hr 2-YR Rainfall=3.20"

Prepared by FORESITE Engineering Associates, Inc.

Page 19

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

Peak Elev= 211.12' @ 12.77 hrs Surf.Area= 1,187 sf Storage= 595 cf

Plug-Flow detention time= 128.8 min calculated for 1,440 cf (98% of inflow)

Center-of-Mass det. time= 119.5 min ( 954.4 - 834.9 )

Volume	Invert	Avail.Storage	Storage Description
#1	210.00'	2,060 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
210.00	0	0	0
210.50	380	95	95
211.00	1,085	366	461
211.50	1,520	651	1,113
212.00	2,271	948	2,060

Device	Routing	Invert	Outlet Devices
#1	Primary	211.51'	<b>10.0' long (Profile 1) Broad-Crested Rectangular Weir</b> Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59
#2	Discarded	0.00'	<b>2.000 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.05 cfs @ 12.77 hrs HW=211.12' (Free Discharge)

↳ **2=Exfiltration** (Exfiltration Controls 0.05 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=210.00' (Free Discharge)

↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

**SPRUCE CORNER - Post-development**

Type III 24-hr 10-YR Rainfall=4.50"

Prepared by FORESITE Engineering Associates, Inc.

Page 20

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: OFF SITE NORTHWEST** Runoff Area=924 sf Runoff Depth>0.11"  
Flow Length=50' Slope=0.0300 '/' Tc=1.8 min CN=39 Runoff=0.00 cfs 9 cf

**Subcatchment 2S: OFF SITE NORTHWEST** Runoff Area=3,092 sf Runoff Depth>0.30"  
Flow Length=35' Slope=0.0300 '/' Tc=1.6 min CN=45 Runoff=0.01 cfs 76 cf

**Subcatchment 3S: UNITS 1-3 & DRIVE** Runoff Area=4,557 sf Runoff Depth>3.40"  
Flow Length=25' Slope=0.0300 '/' Tc=0.3 min CN=90 Runoff=0.49 cfs 1,290 cf

**Subcatchment 4S: UNITS 4-5 & DRIVE** Runoff Area=2,541 sf Runoff Depth>4.26"  
Flow Length=20' Slope=0.0500 '/' Tc=0.2 min CN=98 Runoff=0.31 cfs 903 cf

**Subcatchment 5S: PARKING & SHOULDERS** Runoff Area=10,640 sf Runoff Depth>2.73"  
Flow Length=110' Slope=0.0100 '/' Tc=0.7 min CN=83 Runoff=0.94 cfs 2,416 cf

**Subcatchment 6S: UNIT 6 & 7 ROOF & LAWN** Runoff Area=10,050 sf Runoff Depth>0.30"  
Flow Length=225' Slope=0.0400 '/' Tc=2.7 min CN=45 Runoff=0.03 cfs 248 cf

**Subcatchment 7S: OFF SITE FLOW SOUTH** Runoff Area=4,990 sf Runoff Depth>0.19"  
Flow Length=125' Slope=0.0400 '/' Tc=4.1 min CN=42 Runoff=0.00 cfs 81 cf

**Reach 20R: NORTH TO ARLINGTON STREET** Inflow=0.01 cfs 85 cf  
Outflow=0.01 cfs 85 cf

**Reach 21R: SOUTH TO WETLANDS** Inflow=0.03 cfs 132 cf  
Outflow=0.03 cfs 132 cf

**Pond 10P: ECO-STONE UNITS 4-5** Peak Elev=218.05' Storage=131 cf Inflow=0.31 cfs 903 cf  
Outflow=0.08 cfs 903 cf

**Pond 11P: ECO STONE UNITS 1-3** Peak Elev=217.69' Storage=113 cf Inflow=0.49 cfs 1,290 cf  
Outflow=0.21 cfs 1,289 cf

**Pond 12P: STORMCEPTOR CATCH BASIN** Peak Elev=213.91' Inflow=0.94 cfs 2,416 cf  
12.0" x 45.0' Culvert Outflow=0.94 cfs 2,416 cf

**Pond 13P: DETENTION BASIN** Peak Elev=211.52' Storage=1,143 cf Inflow=0.94 cfs 2,664 cf  
Discarded=0.07 cfs 2,491 cf Primary=0.03 cfs 51 cf Outflow=0.10 cfs 2,543 cf

**Total Runoff Area = 36,794 sf Runoff Volume = 5,022 cf Average Runoff Depth = 1.64"**  
**56.81% Pervious Area = 20,904 sf 43.19% Impervious Area = 15,890 sf**

**SPRUCE CORNER - Post-development**

Type III 24-hr 10-YR Rainfall=4.50"

Prepared by FORESITE Engineering Associates, Inc.

Page 21

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

**Subcatchment 1S: OFF SITE NORTHWEST**

Runoff = 0.00 cfs @ 14.65 hrs, Volume= 9 cf, Depth&gt; 0.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-YR Rainfall=4.50"

Area (sf)	CN	Description
924	39	>75% Grass cover, Good, HSG A
924		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	10	0.0300	0.13		<b>Sheet Flow, SHEET FLOW</b> Grass: Short n= 0.150 P2= 3.20"
0.5	40	0.0300	1.21		<b>Shallow Concentrated Flow, OVERLAND FLOW</b> Short Grass Pasture Kv= 7.0 fps
1.8	50	Total			

**Subcatchment 2S: OFF SITE NORTHWEST**

Runoff = 0.01 cfs @ 12.30 hrs, Volume= 76 cf, Depth&gt; 0.30"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-YR Rainfall=4.50"

Area (sf)	CN	Description
2,792	39	>75% Grass cover, Good, HSG A
300	98	Paved parking & roofs
3,092	45	Weighted Average
2,792		Pervious Area
300		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	10	0.0300	0.13		<b>Sheet Flow, SHEET FLOW</b> Grass: Short n= 0.150 P2= 3.20"
0.3	25	0.0300	1.21		<b>Shallow Concentrated Flow, OVERLAND FLOW</b> Short Grass Pasture Kv= 7.0 fps
1.6	35	Total			

**Subcatchment 3S: UNITS 1-3 & DRIVE**

Runoff = 0.49 cfs @ 12.00 hrs, Volume= 1,290 cf, Depth&gt; 3.40"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-YR Rainfall=4.50"

**SPRUCE CORNER - Post-development**

Type III 24-hr 10-YR Rainfall=4.50"

Prepared by FORESITE Engineering Associates, Inc.

Page 22

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

Area (sf)	CN	Description
3,967	98	Paved roads w/curbs & sewers
590	39	>75% Grass cover, Good, HSG A
4,557	90	Weighted Average
590		Pervious Area
3,967		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	25	0.0300	1.23		<b>Sheet Flow, TR-55 SHEET FLOW</b> Smooth surfaces n= 0.011 P2= 3.20"

**Subcatchment 4S: UNITS 4-5 & DRIVE**

Runoff = 0.31 cfs @ 12.00 hrs, Volume= 903 cf, Depth&gt; 4.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-YR Rainfall=4.50"

Area (sf)	CN	Description
2,541	98	Paved parking & roofs
2,541		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	20	0.0500	1.44		<b>Sheet Flow, TR-55 SHEET FLOW</b> Smooth surfaces n= 0.011 P2= 3.20"

**Subcatchment 5S: PARKING & SHOULDERS**

Runoff = 0.94 cfs @ 12.01 hrs, Volume= 2,416 cf, Depth&gt; 2.73"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-YR Rainfall=4.50"

Area (sf)	CN	Description
7,980	98	Paved parking & roofs
2,660	39	>75% Grass cover, Good, HSG A
10,640	83	Weighted Average
2,660		Pervious Area
7,980		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0100	0.76		<b>Sheet Flow, TR-55 SHEET FLOW</b> Smooth surfaces n= 0.011 P2= 3.20"
0.3	90	0.0100	4.96	59.50	<b>Channel Flow, GUTTER FLOW</b> Area= 12.0 sf Perim= 42.0' r= 0.29' n= 0.013
0.7	110	Total			

**SPRUCE CORNER - Post-development**

Type III 24-hr 10-YR Rainfall=4.50"

Prepared by FORESITE Engineering Associates, Inc.

Page 23

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

**Subcatchment 6S: UNIT 6 & 7 ROOF & LAWN**

Runoff = 0.03 cfs @ 12.32 hrs, Volume= 248 cf, Depth&gt; 0.30"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-YR Rainfall=4.50"

Area (sf)	CN	Description
1,102	98	Paved parking & roofs
8,948	39	>75% Grass cover, Good, HSG A
10,050	45	Weighted Average
8,948		Pervious Area
1,102		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	25	0.0400	1.40		<b>Shallow Concentrated Flow, SHEET FLOW</b> Short Grass Pasture Kv= 7.0 fps
2.4	200	0.0400	1.40		<b>Shallow Concentrated Flow, OVERLAND FLOW</b> Short Grass Pasture Kv= 7.0 fps
2.7	225	Total			

**Subcatchment 7S: OFF SITE FLOW SOUTH**

Runoff = 0.00 cfs @ 12.43 hrs, Volume= 81 cf, Depth&gt; 0.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-YR Rainfall=4.50"

Area (sf)	CN	Description
4,003	43	Woods/grass comb., Fair, HSG A
987	39	>75% Grass cover, Good, HSG A
4,990	42	Weighted Average
4,990		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	25	0.0400	0.17		<b>Sheet Flow, SHEET FLOW</b> Grass: Short n= 0.150 P2= 3.20"
1.7	100	0.0400	1.00		<b>Shallow Concentrated Flow, OVERLAND FLOW</b> Woodland Kv= 5.0 fps
4.1	125	Total			

**Reach 20R: NORTH TO ARLINGTON STREET**

Inflow Area = 4,016 sf, Inflow Depth &gt; 0.25" for 10-YR event

Inflow = 0.01 cfs @ 12.30 hrs, Volume= 85 cf

Outflow = 0.01 cfs @ 12.30 hrs, Volume= 85 cf, Atten= 0%, Lag= 0.0 min

**SPRUCE CORNER - Post-development**

Type III 24-hr 10-YR Rainfall=4.50"

Prepared by FORESITE Engineering Associates, Inc.

Page 24

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

**Reach 21R: SOUTH TO WETLANDS**

Inflow Area = 25,680 sf, Inflow Depth > 0.06" for 10-YR event  
Inflow = 0.03 cfs @ 12.76 hrs, Volume= 132 cf  
Outflow = 0.03 cfs @ 12.76 hrs, Volume= 132 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

**Pond 10P: ECO-STONE UNITS 4-5**

Inflow Area = 2,541 sf, Inflow Depth > 4.26" for 10-YR event  
Inflow = 0.31 cfs @ 12.00 hrs, Volume= 903 cf  
Outflow = 0.08 cfs @ 11.75 hrs, Volume= 903 cf, Atten= 73%, Lag= 0.0 min  
Discarded = 0.08 cfs @ 11.75 hrs, Volume= 903 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 218.05' @ 12.28 hrs Surf.Area= 595 sf Storage= 131 cf

Plug-Flow detention time= 7.1 min calculated for 903 cf (100% of inflow)

Center-of-Mass det. time= 7.0 min ( 751.4 - 744.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	217.50'	595 cf	<b>ECO STONE PAVERS (Prismatic)</b> Listed below (Recalc) 1,488 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
217.50	595	0	0
218.00	595	298	298
218.50	595	298	595
219.00	595	298	893
220.00	595	595	1,488

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	<b>6.000 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.08 cfs @ 11.75 hrs HW=217.53' (Free Discharge)

**↑1=Exfiltration** (Exfiltration Controls 0.08 cfs)

**Pond 11P: ECO STONE UNITS 1-3**

Inflow Area = 4,557 sf, Inflow Depth > 3.40" for 10-YR event  
Inflow = 0.49 cfs @ 12.00 hrs, Volume= 1,290 cf  
Outflow = 0.21 cfs @ 11.93 hrs, Volume= 1,289 cf, Atten= 58%, Lag= 0.0 min  
Discarded = 0.21 cfs @ 11.93 hrs, Volume= 1,289 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

# SPRUCE CORNER - Post-development

Type III 24-hr 10-YR Rainfall=4.50"

Prepared by FORESITE Engineering Associates, Inc.

Page 25

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

Peak Elev= 217.69' @ 12.11 hrs Surf.Area= 1,490 sf Storage= 113 cf

Plug-Flow detention time= 2.6 min calculated for 1,289 cf (100% of inflow)

Center-of-Mass det. time= 2.5 min ( 791.5 - 789.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	217.50'	1,192 cf	<b>ECO STONE PAVERS (Prismatic)</b> Listed below (Recalc) 2,980 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
217.50	1,490	0	0
218.00	1,490	745	745
218.50	1,490	745	1,490
219.00	1,490	745	2,235
219.50	1,490	745	2,980

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	<b>6.000 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.21 cfs @ 11.93 hrs HW=217.52' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.21 cfs)

## Pond 12P: STORMCEPTOR CATCH BASIN

Inflow Area = 10,640 sf, Inflow Depth > 2.73" for 10-YR event  
 Inflow = 0.94 cfs @ 12.01 hrs, Volume= 2,416 cf  
 Outflow = 0.94 cfs @ 12.01 hrs, Volume= 2,416 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.94 cfs @ 12.01 hrs, Volume= 2,416 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 213.91' @ 12.01 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	213.40'	<b>12.0" x 45.0' long Culvert</b> CPP, square edge headwall, Ke= 0.500 Outlet Invert= 212.50' S= 0.0200 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior

**Primary OutFlow** Max=0.94 cfs @ 12.01 hrs HW=213.91' (Free Discharge)

↑**1=Culvert** (Barrel Controls 0.94 cfs @ 3.38 fps)

## Pond 13P: DETENTION BASIN

Inflow Area = 20,690 sf, Inflow Depth > 1.55" for 10-YR event  
 Inflow = 0.94 cfs @ 12.01 hrs, Volume= 2,664 cf  
 Outflow = 0.10 cfs @ 12.76 hrs, Volume= 2,543 cf, Atten= 89%, Lag= 44.9 min  
 Discarded = 0.07 cfs @ 12.76 hrs, Volume= 2,491 cf  
 Primary = 0.03 cfs @ 12.76 hrs, Volume= 51 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

**SPRUCE CORNER - Post-development**

Type III 24-hr 10-YR Rainfall=4.50"

Prepared by FORESITE Engineering Associates, Inc.

Page 26

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

Peak Elev= 211.52' @ 12.76 hrs Surf.Area= 1,550 sf Storage= 1,143 cf

Plug-Flow detention time= 188.3 min calculated for 2,543 cf (95% of inflow)

Center-of-Mass det. time= 163.0 min ( 990.0 - 827.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	210.00'	2,060 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
210.00	0	0	0
210.50	380	95	95
211.00	1,085	366	461
211.50	1,520	651	1,113
212.00	2,271	948	2,060

Device	Routing	Invert	Outlet Devices
#1	Primary	211.51'	<b>10.0' long (Profile 1) Broad-Crested Rectangular Weir</b> Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59
#2	Discarded	0.00'	<b>2.000 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.07 cfs @ 12.76 hrs HW=211.52' (Free Discharge)

↳ **2=Exfiltration** (Exfiltration Controls 0.07 cfs)

**Primary OutFlow** Max=0.03 cfs @ 12.76 hrs HW=211.52' (Free Discharge)

↳ **1=Broad-Crested Rectangular Weir** (Weir Controls 0.03 cfs @ 0.29 fps)

**SPRUCE CORNER - Post-development**

Type III 24-hr 25-YR Rainfall=5.20"

Prepared by FORESITE Engineering Associates, Inc.

Page 27

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: OFF SITE NORTHWEST**

Runoff Area=924 sf Runoff Depth>0.24"

Flow Length=50' Slope=0.0300 '/' Tc=1.8 min CN=39 Runoff=0.00 cfs 19 cf

**Subcatchment 2S: OFF SITE NORTHWEST**

Runoff Area=3,092 sf Runoff Depth>0.51"

Flow Length=35' Slope=0.0300 '/' Tc=1.6 min CN=45 Runoff=0.02 cfs 131 cf

**Subcatchment 3S: UNITS 1-3 & DRIVE**

Runoff Area=4,557 sf Runoff Depth>4.07"

Flow Length=25' Slope=0.0300 '/' Tc=0.3 min CN=90 Runoff=0.58 cfs 1,545 cf

**Subcatchment 4S: UNITS 4-5 & DRIVE**

Runoff Area=2,541 sf Runoff Depth>4.96"

Flow Length=20' Slope=0.0500 '/' Tc=0.2 min CN=98 Runoff=0.36 cfs 1,051 cf

**Subcatchment 5S: PARKING & SHOULDERS**

Runoff Area=10,640 sf Runoff Depth>3.36"

Flow Length=110' Slope=0.0100 '/' Tc=0.7 min CN=83 Runoff=1.15 cfs 2,975 cf

**Subcatchment 6S: UNIT 6 & 7 ROOF & LAWN**

Runoff Area=10,050 sf Runoff Depth>0.51"

Flow Length=225' Slope=0.0400 '/' Tc=2.7 min CN=45 Runoff=0.06 cfs 424 cf

**Subcatchment 7S: OFF SITE FLOW SOUTH**

Runoff Area=4,990 sf Runoff Depth>0.37"

Flow Length=125' Slope=0.0400 '/' Tc=4.1 min CN=42 Runoff=0.02 cfs 152 cf

**Reach 20R: NORTH TO ARLINGTON STREET**

Inflow=0.02 cfs 149 cf

Outflow=0.02 cfs 149 cf

**Reach 21R: SOUTH TO WETLANDS**

Inflow=0.34 cfs 645 cf

Outflow=0.34 cfs 645 cf

**Pond 10P: ECO-STONE UNITS 4-5**

Peak Elev=218.25' Storage=179 cf Inflow=0.36 cfs 1,051 cf

Outflow=0.08 cfs 1,051 cf

**Pond 11P: ECO STONE UNITS 1-3**

Peak Elev=217.78' Storage=165 cf Inflow=0.58 cfs 1,545 cf

Outflow=0.21 cfs 1,545 cf

**Pond 12P: STORMCEPTOR CATCH BASIN**

Peak Elev=213.98' Inflow=1.15 cfs 2,975 cf

12.0" x 45.0' Culvert Outflow=1.15 cfs 2,975 cf

**Pond 13P: DETENTION BASIN**

Peak Elev=211.56' Storage=1,205 cf Inflow=1.16 cfs 3,399 cf

Discarded=0.07 cfs 2,726 cf Primary=0.32 cfs 493 cf Outflow=0.39 cfs 3,219 cf

**Total Runoff Area = 36,794 sf Runoff Volume = 6,296 cf Average Runoff Depth = 2.05"**

**56.81% Pervious Area = 20,904 sf 43.19% Impervious Area = 15,890 sf**

**SPRUCE CORNER - Post-development**

Type III 24-hr 25-YR Rainfall=5.20"

Prepared by FORESITE Engineering Associates, Inc.

Page 28

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

**Subcatchment 1S: OFF SITE NORTHWEST**

Runoff = 0.00 cfs @ 12.37 hrs, Volume= 19 cf, Depth&gt; 0.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-YR Rainfall=5.20"

Area (sf)	CN	Description
924	39	>75% Grass cover, Good, HSG A
924		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	10	0.0300	0.13		<b>Sheet Flow, SHEET FLOW</b> Grass: Short n= 0.150 P2= 3.20"
0.5	40	0.0300	1.21		<b>Shallow Concentrated Flow, OVERLAND FLOW</b> Short Grass Pasture Kv= 7.0 fps
1.8	50	Total			

**Subcatchment 2S: OFF SITE NORTHWEST**

Runoff = 0.02 cfs @ 12.08 hrs, Volume= 131 cf, Depth&gt; 0.51"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-YR Rainfall=5.20"

Area (sf)	CN	Description
2,792	39	>75% Grass cover, Good, HSG A
300	98	Paved parking & roofs
3,092	45	Weighted Average
2,792		Pervious Area
300		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	10	0.0300	0.13		<b>Sheet Flow, SHEET FLOW</b> Grass: Short n= 0.150 P2= 3.20"
0.3	25	0.0300	1.21		<b>Shallow Concentrated Flow, OVERLAND FLOW</b> Short Grass Pasture Kv= 7.0 fps
1.6	35	Total			

**Subcatchment 3S: UNITS 1-3 & DRIVE**

Runoff = 0.58 cfs @ 12.00 hrs, Volume= 1,545 cf, Depth&gt; 4.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-YR Rainfall=5.20"

**SPRUCE CORNER - Post-development**

Type III 24-hr 25-YR Rainfall=5.20"

Prepared by FORESITE Engineering Associates, Inc.

Page 29

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

Area (sf)	CN	Description
3,967	98	Paved roads w/curbs & sewers
590	39	>75% Grass cover, Good, HSG A
4,557	90	Weighted Average
590		Pervious Area
3,967		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	25	0.0300	1.23		<b>Sheet Flow, TR-55 SHEET FLOW</b> Smooth surfaces n= 0.011 P2= 3.20"

**Subcatchment 4S: UNITS 4-5 & DRIVE**

Runoff = 0.36 cfs @ 12.00 hrs, Volume= 1,051 cf, Depth&gt; 4.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Type III 24-hr 25-YR Rainfall=5.20"

Area (sf)	CN	Description
2,541	98	Paved parking & roofs
2,541		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	20	0.0500	1.44		<b>Sheet Flow, TR-55 SHEET FLOW</b> Smooth surfaces n= 0.011 P2= 3.20"

**Subcatchment 5S: PARKING & SHOULDERS**

Runoff = 1.15 cfs @ 12.01 hrs, Volume= 2,975 cf, Depth&gt; 3.36"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Type III 24-hr 25-YR Rainfall=5.20"

Area (sf)	CN	Description
7,980	98	Paved parking & roofs
2,660	39	>75% Grass cover, Good, HSG A
10,640	83	Weighted Average
2,660		Pervious Area
7,980		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0100	0.76		<b>Sheet Flow, TR-55 SHEET FLOW</b> Smooth surfaces n= 0.011 P2= 3.20"
0.3	90	0.0100	4.96	59.50	<b>Channel Flow, GUTTER FLOW</b> Area= 12.0 sf Perim= 42.0' r= 0.29' n= 0.013
0.7	110	Total			

**SPRUCE CORNER - Post-development**

Type III 24-hr 25-YR Rainfall=5.20"

Prepared by FORESITE Engineering Associates, Inc.

Page 30

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

**Subcatchment 6S: UNIT 6 & 7 ROOF & LAWN**

Runoff = 0.06 cfs @ 12.10 hrs, Volume= 424 cf, Depth> 0.51"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-YR Rainfall=5.20"

Area (sf)	CN	Description
1,102	98	Paved parking & roofs
8,948	39	>75% Grass cover, Good, HSG A
10,050	45	Weighted Average
8,948		Pervious Area
1,102		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	25	0.0400	1.40		<b>Shallow Concentrated Flow, SHEET FLOW</b> Short Grass Pasture Kv= 7.0 fps
2.4	200	0.0400	1.40		<b>Shallow Concentrated Flow, OVERLAND FLOW</b> Short Grass Pasture Kv= 7.0 fps
2.7	225	Total			

**Subcatchment 7S: OFF SITE FLOW SOUTH**

Runoff = 0.02 cfs @ 12.32 hrs, Volume= 152 cf, Depth> 0.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-YR Rainfall=5.20"

Area (sf)	CN	Description
4,003	43	Woods/grass comb., Fair, HSG A
987	39	>75% Grass cover, Good, HSG A
4,990	42	Weighted Average
4,990		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	25	0.0400	0.17		<b>Sheet Flow, SHEET FLOW</b> Grass: Short n= 0.150 P2= 3.20"
1.7	100	0.0400	1.00		<b>Shallow Concentrated Flow, OVERLAND FLOW</b> Woodland Kv= 5.0 fps
4.1	125	Total			

**Reach 20R: NORTH TO ARLINGTON STREET**

Inflow Area = 4,016 sf, Inflow Depth > 0.45" for 25-YR event  
 Inflow = 0.02 cfs @ 12.08 hrs, Volume= 149 cf  
 Outflow = 0.02 cfs @ 12.08 hrs, Volume= 149 cf, Atten= 0%, Lag= 0.0 min

**SPRUCE CORNER - Post-development**

Type III 24-hr 25-YR Rainfall=5.20"

Prepared by FORESITE Engineering Associates, Inc.

Page 31

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

**Reach 21R: SOUTH TO WETLANDS**

Inflow Area = 25,680 sf, Inflow Depth > 0.30" for 25-YR event  
Inflow = 0.34 cfs @ 12.29 hrs, Volume= 645 cf  
Outflow = 0.34 cfs @ 12.29 hrs, Volume= 645 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

**Pond 10P: ECO-STONE UNITS 4-5**

Inflow Area = 2,541 sf, Inflow Depth > 4.96" for 25-YR event  
Inflow = 0.36 cfs @ 12.00 hrs, Volume= 1,051 cf  
Outflow = 0.08 cfs @ 11.70 hrs, Volume= 1,051 cf, Atten= 77%, Lag= 0.0 min  
Discarded = 0.08 cfs @ 11.70 hrs, Volume= 1,051 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 218.25' @ 12.33 hrs Surf.Area= 595 sf Storage= 179 cf

Plug-Flow detention time= 9.8 min calculated for 1,050 cf (100% of inflow)

Center-of-Mass det. time= 9.7 min ( 751.7 - 742.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	217.50'	595 cf	<b>ECO STONE PAVERS (Prismatic)</b> Listed below (Recalc) 1,488 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
217.50	595	0	0
218.00	595	298	298
218.50	595	298	595
219.00	595	298	893
220.00	595	595	1,488

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	<b>6.000 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.08 cfs @ 11.70 hrs HW=217.53' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

**Pond 11P: ECO STONE UNITS 1-3**

Inflow Area = 4,557 sf, Inflow Depth > 4.07" for 25-YR event  
Inflow = 0.58 cfs @ 12.00 hrs, Volume= 1,545 cf  
Outflow = 0.21 cfs @ 11.89 hrs, Volume= 1,545 cf, Atten= 64%, Lag= 0.0 min  
Discarded = 0.21 cfs @ 11.89 hrs, Volume= 1,545 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

**SPRUCE CORNER - Post-development**

Type III 24-hr 25-YR Rainfall=5.20"

Prepared by FORESITE Engineering Associates, Inc.

Page 32

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

Peak Elev= 217.78' @ 12.18 hrs Surf.Area= 1,490 sf Storage= 165 cf

Plug-Flow detention time= 3.7 min calculated for 1,544 cf (100% of inflow)

Center-of-Mass det. time= 3.6 min ( 787.7 - 784.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	217.50'	1,192 cf	<b>ECO STONE PAVERS (Prismatic)</b> Listed below (Recalc) 2,980 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
217.50	1,490	0	0
218.00	1,490	745	745
218.50	1,490	745	1,490
219.00	1,490	745	2,235
219.50	1,490	745	2,980

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	<b>6.000 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.21 cfs @ 11.89 hrs HW=217.52' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.21 cfs)

**Pond 12P: STORMCEPTOR CATCH BASIN**

Inflow Area = 10,640 sf, Inflow Depth > 3.36" for 25-YR event  
 Inflow = 1.15 cfs @ 12.01 hrs, Volume= 2,975 cf  
 Outflow = 1.15 cfs @ 12.01 hrs, Volume= 2,975 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.15 cfs @ 12.01 hrs, Volume= 2,975 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 213.98' @ 12.01 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	213.40'	<b>12.0" x 45.0' long Culvert</b> CPP, square edge headwall, Ke= 0.500 Outlet Invert= 212.50' S= 0.0200 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior

**Primary OutFlow** Max=1.15 cfs @ 12.01 hrs HW=213.97' (Free Discharge)

↑**1=Culvert** (Barrel Controls 1.15 cfs @ 3.55 fps)

**Pond 13P: DETENTION BASIN**

Inflow Area = 20,690 sf, Inflow Depth > 1.97" for 25-YR event  
 Inflow = 1.16 cfs @ 12.01 hrs, Volume= 3,399 cf  
 Outflow = 0.39 cfs @ 12.29 hrs, Volume= 3,219 cf, Atten= 66%, Lag= 16.4 min  
 Discarded = 0.07 cfs @ 12.29 hrs, Volume= 2,726 cf  
 Primary = 0.32 cfs @ 12.29 hrs, Volume= 493 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

**SPRUCE CORNER - Post-development**

Type III 24-hr 25-YR Rainfall=5.20"

Prepared by FORESITE Engineering Associates, Inc.

Page 33

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

Peak Elev= 211.56' @ 12.29 hrs Surf.Area= 1,609 sf Storage= 1,205 cf

Plug-Flow detention time= 167.3 min calculated for 3,219 cf (95% of inflow)

Center-of-Mass det. time= 138.3 min ( 961.2 - 823.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	210.00'	2,060 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
210.00	0	0	0
210.50	380	95	95
211.00	1,085	366	461
211.50	1,520	651	1,113
212.00	2,271	948	2,060

Device	Routing	Invert	Outlet Devices
#1	Primary	211.51'	<b>10.0' long (Profile 1) Broad-Crested Rectangular Weir</b> Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59
#2	Discarded	0.00'	<b>2.000 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.07 cfs @ 12.29 hrs HW=211.56' (Free Discharge)

↳ **2=Exfiltration** (Exfiltration Controls 0.07 cfs)

**Primary OutFlow** Max=0.32 cfs @ 12.29 hrs HW=211.56' (Free Discharge)

↳ **1=Broad-Crested Rectangular Weir** (Weir Controls 0.32 cfs @ 0.65 fps)

**SPRUCE CORNER - Post-development**

Type III 24-hr 100-YR Rainfall=6.60"

Prepared by FORESITE Engineering Associates, Inc.

Page 34

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: OFF SITE NORTHWEST**

Runoff Area=924 sf Runoff Depth>0.63"

Flow Length=50' Slope=0.0300 '/' Tc=1.8 min CN=39 Runoff=0.01 cfs 49 cf

**Subcatchment 2S: OFF SITE NORTHWEST**

Runoff Area=3,092 sf Runoff Depth>1.05"

Flow Length=35' Slope=0.0300 '/' Tc=1.6 min CN=45 Runoff=0.07 cfs 272 cf

**Subcatchment 3S: UNITS 1-3 & DRIVE**

Runoff Area=4,557 sf Runoff Depth>5.43"

Flow Length=25' Slope=0.0300 '/' Tc=0.3 min CN=90 Runoff=0.76 cfs 2,063 cf

**Subcatchment 4S: UNITS 4-5 & DRIVE**

Runoff Area=2,541 sf Runoff Depth>6.36"

Flow Length=20' Slope=0.0500 '/' Tc=0.2 min CN=98 Runoff=0.46 cfs 1,347 cf

**Subcatchment 5S: PARKING & SHOULDERS**

Runoff Area=10,640 sf Runoff Depth>4.65"

Flow Length=110' Slope=0.0100 '/' Tc=0.7 min CN=83 Runoff=1.58 cfs 4,124 cf

**Subcatchment 6S: UNIT 6 & 7 ROOF & LAWN**

Runoff Area=10,050 sf Runoff Depth>1.05"

Flow Length=225' Slope=0.0400 '/' Tc=2.7 min CN=45 Runoff=0.23 cfs 882 cf

**Subcatchment 7S: OFF SITE FLOW SOUTH**

Runoff Area=4,990 sf Runoff Depth>0.83"

Flow Length=125' Slope=0.0400 '/' Tc=4.1 min CN=42 Runoff=0.07 cfs 347 cf

**Reach 20R: NORTH TO ARLINGTON STREET**

Inflow=0.08 cfs 320 cf

Outflow=0.08 cfs 320 cf

**Reach 21R: SOUTH TO WETLANDS**

Inflow=1.21 cfs 1,953 cf

Outflow=1.21 cfs 1,953 cf

**Pond 10P: ECO-STONE UNITS 4-5**

Peak Elev=218.70' Storage=285 cf Inflow=0.46 cfs 1,347 cf

Outflow=0.08 cfs 1,347 cf

**Pond 11P: ECO STONE UNITS 1-3**

Peak Elev=218.02' Storage=312 cf Inflow=0.76 cfs 2,063 cf

Outflow=0.21 cfs 2,062 cf

**Pond 12P: STORMCEPTOR CATCH BASIN**

Peak Elev=214.09' Inflow=1.58 cfs 4,124 cf

12.0" x 45.0' Culvert Outflow=1.58 cfs 4,124 cf

**Pond 13P: DETENTION BASIN**

Peak Elev=211.63' Storage=1,315 cf Inflow=1.74 cfs 5,006 cf

Discarded=0.08 cfs 3,080 cf Primary=1.15 cfs 1,607 cf Outflow=1.23 cfs 4,686 cf

**Total Runoff Area = 36,794 sf Runoff Volume = 9,082 cf Average Runoff Depth = 2.96"**

**56.81% Pervious Area = 20,904 sf 43.19% Impervious Area = 15,890 sf**

**SPRUCE CORNER - Post-development**

Type III 24-hr 100-YR Rainfall=6.60"

Prepared by FORESITE Engineering Associates, Inc.

Page 35

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

**Subcatchment 1S: OFF SITE NORTHWEST**

Runoff = 0.01 cfs @ 12.08 hrs, Volume= 49 cf, Depth&gt; 0.63"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-YR Rainfall=6.60"

Area (sf)	CN	Description
924	39	>75% Grass cover, Good, HSG A
924		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	10	0.0300	0.13		<b>Sheet Flow, SHEET FLOW</b> Grass: Short n= 0.150 P2= 3.20"
0.5	40	0.0300	1.21		<b>Shallow Concentrated Flow, OVERLAND FLOW</b> Short Grass Pasture Kv= 7.0 fps
1.8	50	Total			

**Subcatchment 2S: OFF SITE NORTHWEST**

Runoff = 0.07 cfs @ 12.04 hrs, Volume= 272 cf, Depth&gt; 1.05"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-YR Rainfall=6.60"

Area (sf)	CN	Description
2,792	39	>75% Grass cover, Good, HSG A
300	98	Paved parking & roofs
3,092	45	Weighted Average
2,792		Pervious Area
300		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	10	0.0300	0.13		<b>Sheet Flow, SHEET FLOW</b> Grass: Short n= 0.150 P2= 3.20"
0.3	25	0.0300	1.21		<b>Shallow Concentrated Flow, OVERLAND FLOW</b> Short Grass Pasture Kv= 7.0 fps
1.6	35	Total			

**Subcatchment 3S: UNITS 1-3 & DRIVE**

Runoff = 0.76 cfs @ 12.00 hrs, Volume= 2,063 cf, Depth&gt; 5.43"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-YR Rainfall=6.60"

**SPRUCE CORNER - Post-development**

Type III 24-hr 100-YR Rainfall=6.60"

Prepared by FORESITE Engineering Associates, Inc.

Page 36

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

Area (sf)	CN	Description
3,967	98	Paved roads w/curbs & sewers
590	39	>75% Grass cover, Good, HSG A
4,557	90	Weighted Average
590		Pervious Area
3,967		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	25	0.0300	1.23		<b>Sheet Flow, TR-55 SHEET FLOW</b> Smooth surfaces n= 0.011 P2= 3.20"

**Subcatchment 4S: UNITS 4-5 & DRIVE**

Runoff = 0.46 cfs @ 12.00 hrs, Volume= 1,347 cf, Depth> 6.36"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Type III 24-hr 100-YR Rainfall=6.60"

Area (sf)	CN	Description
2,541	98	Paved parking & roofs
2,541		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	20	0.0500	1.44		<b>Sheet Flow, TR-55 SHEET FLOW</b> Smooth surfaces n= 0.011 P2= 3.20"

**Subcatchment 5S: PARKING & SHOULDERS**

Runoff = 1.58 cfs @ 12.01 hrs, Volume= 4,124 cf, Depth> 4.65"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Type III 24-hr 100-YR Rainfall=6.60"

Area (sf)	CN	Description
7,980	98	Paved parking & roofs
2,660	39	>75% Grass cover, Good, HSG A
10,640	83	Weighted Average
2,660		Pervious Area
7,980		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0100	0.76		<b>Sheet Flow, TR-55 SHEET FLOW</b> Smooth surfaces n= 0.011 P2= 3.20"
0.3	90	0.0100	4.96	59.50	<b>Channel Flow, GUTTER FLOW</b> Area= 12.0 sf Perim= 42.0' r= 0.29' n= 0.013
0.7	110	Total			

**SPRUCE CORNER - Post-development**

Type III 24-hr 100-YR Rainfall=6.60"

Prepared by FORESITE Engineering Associates, Inc.

Page 37

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

**Subcatchment 6S: UNIT 6 & 7 ROOF & LAWN**

Runoff = 0.23 cfs @ 12.06 hrs, Volume= 882 cf, Depth&gt; 1.05"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Type III 24-hr 100-YR Rainfall=6.60"

Area (sf)	CN	Description
1,102	98	Paved parking & roofs
8,948	39	>75% Grass cover, Good, HSG A
10,050	45	Weighted Average
8,948		Pervious Area
1,102		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	25	0.0400	1.40		<b>Shallow Concentrated Flow, SHEET FLOW</b> Short Grass Pasture Kv= 7.0 fps
2.4	200	0.0400	1.40		<b>Shallow Concentrated Flow, OVERLAND FLOW</b> Short Grass Pasture Kv= 7.0 fps
2.7	225	Total			

**Subcatchment 7S: OFF SITE FLOW SOUTH**

Runoff = 0.07 cfs @ 12.10 hrs, Volume= 347 cf, Depth&gt; 0.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Type III 24-hr 100-YR Rainfall=6.60"

Area (sf)	CN	Description
4,003	43	Woods/grass comb., Fair, HSG A
987	39	>75% Grass cover, Good, HSG A
4,990	42	Weighted Average
4,990		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	25	0.0400	0.17		<b>Sheet Flow, SHEET FLOW</b> Grass: Short n= 0.150 P2= 3.20"
1.7	100	0.0400	1.00		<b>Shallow Concentrated Flow, OVERLAND FLOW</b> Woodland Kv= 5.0 fps
4.1	125	Total			

**Reach 20R: NORTH TO ARLINGTON STREET**

Inflow Area = 4,016 sf, Inflow Depth &gt; 0.96" for 100-YR event

Inflow = 0.08 cfs @ 12.05 hrs, Volume= 320 cf

Outflow = 0.08 cfs @ 12.05 hrs, Volume= 320 cf, Atten= 0%, Lag= 0.0 min

**SPRUCE CORNER - Post-development**

Type III 24-hr 100-YR Rainfall=6.60"

Prepared by FORESITE Engineering Associates, Inc.

Page 38

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

**Reach 21R: SOUTH TO WETLANDS**

Inflow Area = 25,680 sf, Inflow Depth > 0.91" for 100-YR event  
Inflow = 1.21 cfs @ 12.08 hrs, Volume= 1,953 cf  
Outflow = 1.21 cfs @ 12.08 hrs, Volume= 1,953 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

**Pond 10P: ECO-STONE UNITS 4-5**

Inflow Area = 2,541 sf, Inflow Depth > 6.36" for 100-YR event  
Inflow = 0.46 cfs @ 12.00 hrs, Volume= 1,347 cf  
Outflow = 0.08 cfs @ 11.64 hrs, Volume= 1,347 cf, Atten= 82%, Lag= 0.0 min  
Discarded = 0.08 cfs @ 11.64 hrs, Volume= 1,347 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Peak Elev= 218.70' @ 12.40 hrs Surf.Area= 595 sf Storage= 285 cf

Plug-Flow detention time= 16.5 min calculated for 1,346 cf (100% of inflow)  
Center-of-Mass det. time= 16.4 min ( 754.8 - 738.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	217.50'	595 cf	<b>ECO STONE PAVERS (Prismatic)</b> Listed below (Recalc) 1,488 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
217.50	595	0	0
218.00	595	298	298
218.50	595	298	595
219.00	595	298	893
220.00	595	595	1,488

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	<b>6.000 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.08 cfs @ 11.64 hrs HW=217.53' (Free Discharge)  
↑**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

**Pond 11P: ECO STONE UNITS 1-3**

Inflow Area = 4,557 sf, Inflow Depth > 5.43" for 100-YR event  
Inflow = 0.76 cfs @ 12.00 hrs, Volume= 2,063 cf  
Outflow = 0.21 cfs @ 11.77 hrs, Volume= 2,062 cf, Atten= 73%, Lag= 0.0 min  
Discarded = 0.21 cfs @ 11.77 hrs, Volume= 2,062 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

# SPRUCE CORNER - Post-development

Type III 24-hr 100-YR Rainfall=6.60"

Prepared by FORESITE Engineering Associates, Inc.

Page 39

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

Peak Elev= 218.02' @ 12.29 hrs Surf.Area= 1,490 sf Storage= 312 cf

Plug-Flow detention time= 7.0 min calculated for 2,061 cf (100% of inflow)

Center-of-Mass det. time= 6.9 min ( 783.3 - 776.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	217.50'	1,192 cf	<b>ECO STONE PAVERS (Prismatic)</b> Listed below (Recalc) 2,980 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
217.50	1,490	0	0
218.00	1,490	745	745
218.50	1,490	745	1,490
219.00	1,490	745	2,235
219.50	1,490	745	2,980

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	<b>6.000 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.21 cfs @ 11.77 hrs HW=217.52' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.21 cfs)

## Pond 12P: STORMCEPTOR CATCH BASIN

Inflow Area = 10,640 sf, Inflow Depth > 4.65" for 100-YR event  
 Inflow = 1.58 cfs @ 12.01 hrs, Volume= 4,124 cf  
 Outflow = 1.58 cfs @ 12.01 hrs, Volume= 4,124 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.58 cfs @ 12.01 hrs, Volume= 4,124 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 214.09' @ 12.01 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	213.40'	<b>12.0" x 45.0' long Culvert</b> CPP, square edge headwall, Ke= 0.500 Outlet Invert= 212.50' S= 0.0200 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior

**Primary OutFlow** Max=1.58 cfs @ 12.01 hrs HW=214.09' (Free Discharge)

↑**1=Culvert** (Barrel Controls 1.58 cfs @ 3.82 fps)

## Pond 13P: DETENTION BASIN

Inflow Area = 20,690 sf, Inflow Depth > 2.90" for 100-YR event  
 Inflow = 1.74 cfs @ 12.01 hrs, Volume= 5,006 cf  
 Outflow = 1.23 cfs @ 12.08 hrs, Volume= 4,686 cf, Atten= 29%, Lag= 3.8 min  
 Discarded = 0.08 cfs @ 12.08 hrs, Volume= 3,080 cf  
 Primary = 1.15 cfs @ 12.08 hrs, Volume= 1,607 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

**SPRUCE CORNER - Post-development**

Type III 24-hr 100-YR Rainfall=6.60"

Prepared by FORESITE Engineering Associates, Inc.

Page 40

HydroCAD® 8.00 s/n 001697 © 2006 HydroCAD Software Solutions LLC

7/6/2010

Peak Elev= 211.63' @ 12.08 hrs Surf.Area= 1,708 sf Storage= 1,315 cf

Plug-Flow detention time= 133.0 min calculated for 4,684 cf (94% of inflow)

Center-of-Mass det. time= 98.7 min ( 914.8 - 816.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	210.00'	2,060 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
210.00	0	0	0
210.50	380	95	95
211.00	1,085	366	461
211.50	1,520	651	1,113
212.00	2,271	948	2,060

Device	Routing	Invert	Outlet Devices
#1	Primary	211.51'	<b>10.0' long (Profile 1) Broad-Crested Rectangular Weir</b> Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59
#2	Discarded	0.00'	<b>2.000 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.08 cfs @ 12.08 hrs HW=211.63' (Free Discharge)

↳ **2=Exfiltration** (Exfiltration Controls 0.08 cfs)

**Primary OutFlow** Max=1.14 cfs @ 12.08 hrs HW=211.63' (Free Discharge)

↳ **1=Broad-Crested Rectangular Weir** (Weir Controls 1.14 cfs @ 0.99 fps)