

Stanski and McNary, Inc.
Engineering - Planning - Surveying
80 Harris Street Acton, MA 01720 (978) 263-8585

Notice of Intent

Under the Massachusetts Wetland Protection Act,
G.L. c. 131, s. 40 &
Town of Acton Wetland Protection Bylaw – Chap. F

for

Mt. Calvary Lutheran Church
472 Massachusetts Ave.
Acton, MA 01720

Date: August 3, 2007



Applicant/Owner: Mt. Calvary Lutheran Church
472 Massachusetts Ave.
Acton, MA 01720

SM-3763

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Certified Abutters List / Affidavit / Notice to Abutters

Attachments:

- A. Project Narrative
- B. U.S.G.S. Map
- C. Bordering Vegetated Wetland Field Data Forms
- D. Drainage Calculations
- E. Site Plan (Sheet 1 thru 2) by Stamski and McNary, Inc. dated: September 3, 2007

Notice of Intent - WPA Form 3



WPA Form 3 – Notice of Intent

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

DEP 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 for GIS locator):

472 Massachusetts Ave

a. Street Address

Acton

b. City/Town

01720

c. Zip Code

Latitude and Longitude:

F-2

f. Assessors Map/Plat Number

d. Latitude

115

g. Parcel /Lot Number

e. Longitude

2. Applicant:

John

a. First Name

Rossmann

b. Last Name

Mt. Calvary Lutheran Church

c. Company

472 Massachusetts Ave., PO Box 986

d. Mailing Address

Acton

e. City/Town

978-590-0729

h. Phone Number

MA

f. State

01720

g. Zip Code

i. Fax Number

j. Email address

3. Property owner (if different from applicant):

Check if more than one owner

a. First Name

b. Last Name

c. Company

d. Mailing Address

e. City/Town

h. Phone Number

i. Fax Number

j. Email address

g. Zip Code

4. Representative (if any):

Stamski and McNary, Inc.

a. Firm

Joseph

b. Contact Person First Name

80 Harris Street

d. Mailing Address

Acton

e. City/Town

978-263-8585x202

h. Phone Number

978-263-9883

i. Fax Number

MA

f. State

01720

g. Zip Code

jm@stamskiandmcnary.com

j. Email address

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

\$1050.00

a. Total Fee Paid

\$512.50

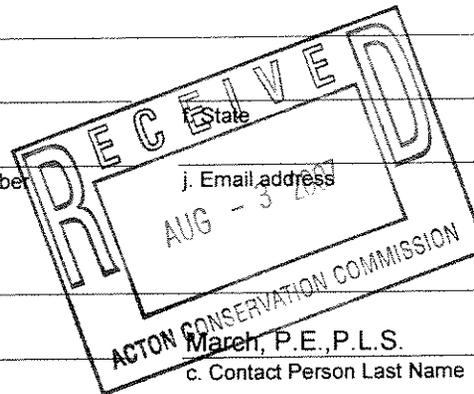
b. State Fee Paid

\$537.50 (+\$210 bylaw fee)

c. City/Town Fee Paid

6. General Project Description:

Building addition and parking lot reconfiguration with new stormwater management system.





WPA Form 3 – Notice of Intent

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

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A. General Information (continued)

7. Project Type Checklist:

- a. Single Family Home
- b. Residential Subdivision
- c. Limited Project Driveway Crossing
- d. Commercial/Industrial
- e. Dock/Pier
- f. Utilities
- g. Coastal Engineering Structure
- h. Agriculture – cranberries, forestry
- i. Transportation
- j. Other

8. Property recorded at the Registry of Deeds for:

Middlesex South _____

a. County

9618 _____

c. Book

212 _____

b. Page Number

d. Certificate # (if registered land) _____

9. Has work been performed on the property under an Order of Resource Area Delineation involving Simplified Review within 3 years of the date of this application?

- a. Yes
- b. No

If yes, no Notice of Intent or Request for Determination of Applicability may be filed for work within the 50-foot-wide area in the Buffer Zone along the resource area during the three-year term of an Order of Resource Area Delineation, or any Extended Order, or until the applicant receives a Certificate of Compliance, whichever is later.

10. Buffer Zone Only - Is the project located only in the Buffer Zone of a bordering vegetated wetland, inland bank, or coastal resource area?

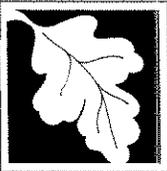
- a. Yes - answer 11 below, then skip to Section C.
- b. No - skip to Section B.

11. Buffer Zone Setback – For projects that involve work only in the buffer zone, select the applicable adjacent resource area (check one):

- a. BVW
- b. inland bank
- c. coastal resource area

The distance between the closest project disturbance and the associated resource area is:

5' (pavement
removal) _____



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

DEP File Number _____

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B. Resource Area Effects

1. Inland 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.

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

<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 _____	0 2. square feet _____
c. <input type="checkbox"/> Land Under Waterbodies and Waterways	1. square feet _____ 3. cubic yards dredged _____	2. square feet _____
d. <input type="checkbox"/> Bordering Land Subject to Flooding	1. square feet _____ 3. cubic feet of flood storage lost _____	2. square feet _____ 4. cubic feet of flood storage replaced _____
e. <input type="checkbox"/> Isolated Land Subject to Flooding	1. square feet _____ 2. cubic feet of flood storage lost _____	3. cubic feet of flood storage replaced _____
f. <input type="checkbox"/> Riverfront area	1. Name of Waterway (if available) _____	

For projects impacted by the riverfront area and a buffer zone of another resource area, add 50% to the total fee.

1. Width of Riverfront Area (check one):

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

2. Total area of Riverfront Area on the site of the proposed project: _____

Square Feet

3. Proposed alteration of the Riverfront Area:

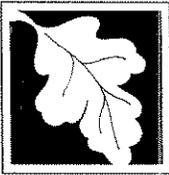
a. Total Square Feet _____

b. Square Feet within 100 ft. _____

c. Square Feet between 100 ft. and 200 ft. _____

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

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



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

Provided by DEP:

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B. Resource Area Effects

2. Coastal Resource Areas:

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.

<u>Resource Area</u>	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
a. <input type="checkbox"/> Designated Port Areas	Indicate size under Land Under the Ocean, below	
b. <input type="checkbox"/> Land Under the Ocean	1. Square feet _____	
	2. Cubic yards dredged _____	
c. <input type="checkbox"/> Barrier Beach	Indicate size under Coastal Beaches and/or Coastal Dunes below	
d. <input type="checkbox"/> Coastal Beaches	1. Square feet _____	2. Cubic yards beach nourishment _____
e. <input type="checkbox"/> Coastal Dunes	1. Square feet _____	2. Cubic yards dune nourishment _____
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., or 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 _____	2. Square feet restoration, rehab. _____
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 _____	

3. Limited Project:

Is any portion of the proposed activity eligible to be treated as a limited project subject to 310 CMR 10.24 or 310 CMR 10.53?

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

b. Limited Project _____



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C. Bordering Vegetated Wetland Delineation Methodology

Check all methods used to delineate the Bordering Vegetated Wetland (BVW) boundary:

1. Final Order of Resource Area Delineation issued by Conservation Commission or DEP (attached)
2. DEP BVW Field Data Form (attached)
3. Final Determination of Applicability issued by Conservation Commission or DEP (attached)
4. Other Methods for Determining the BVW Boundary (attach documentation):
 - a. 50% or more wetland indicator plants
 - b. Saturated/inundated conditions exist
 - c. Groundwater indicators
 - d. Direct observation
 - e. Hydric soil indicators
 - f. Credible evidence of conditions prior to disturbance
5. Other resource areas delineated: _____

D. 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/nhosp/nhregmap.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

Oct. 1, 2006 _____

b. Date of map

If yes, the project is 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 D.1.A, and include requested materials with this Notice of Intent (NOI); OR complete Section D.1.B, 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).*

A. Submit Supplemental Information for Endangered Species Review *

Percentage/acreage of property to be altered:

(1) within wetland Resource Area _____

percentage/acreage

(2) outside Resource Area _____

percentage/acreage

Assessor's Map or right-of-way plan of site _____

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

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



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

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Acton _____

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D. Other Applicable Standards and Requirements (cont.)

- 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 **
 - Project description (including description of impacts outside of wetland Resource Area & Buffer Zone)
 - Photographs representative of the site
 - MESA filing fee (fee information available at: <http://www.mass.gov/dfwele/dfw/nhosp/nhenvmesa.htm>)
Make check payable to "Natural Heritage & Endangered Species Fund" and **mail to NHESP** at above address

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

- Vegetation cover type map of site
- Project plans showing Priority & Estimated Habitat boundaries

B. OR Check One of the Following

- 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/nhosp/nhenvexemptions.htm>)
- Separate MESA review ongoing.

NHESP Tracking Number _____

Date submitted to NHESP _____

- Separate MESA review completed.
Include copy of NHESP "no Take" determination or valid Conservation & Management Permit with approved plan.
- * Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see www.nhosp.org 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.

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. 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:

Division of Marine Fisheries -
Southeast Marine Fisheries Station
Attn: Environmental Reviewer
838 South Rodney French Blvd.
New Bedford, MA 02744

North Shore - Hull to New Hampshire:

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

b. Not applicable – project is in inland resource area only



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D. Other Applicable Standards and Requirements (cont.)

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 DEP Website for ACEC locations). **Note:** electronic filers click on Website.

b. ACEC

4. 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

5. Is any activity within any Resource Area or Buffer Zone exempt from performance standards of the wetlands regulations, 310 CMR 10.00.

- a. Yes No If yes, describe which exemption applies to this project:

b. Exemption

6. Is this project subject to the DEP Stormwater Policy? a. Yes No

If yes, stormwater management measures are required. Applicants should complete the Stormwater Management Form and submit it with this form.

b. If no, explain why the project is exempt:

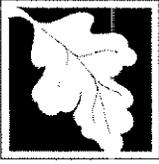
E. Additional Information

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. Other material identifying and explaining the determination of resource area boundaries shown on plans (e.g., a DEP BVW Field Data Form).
4. List the titles and dates for all plans and other materials submitted with this NOI.
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.

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

Provided by DEP:
DEP File Number _____
Document Transaction Number _____
City/Town _____

E. Additional Information (cont.)

- 8. Attach NOI Wetland Fee Transmittal Form
- 9. Attach Stormwater Management Form, if needed.

F. Fees

The fees for work proposed under each Notice of Intent must be calculated and submitted to the Conservation Commission and the Department (see Instructions and NOI Wetland Fee Transmittal Form).

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:

1. Municipal Check Number	<u>12095</u>	2. Check date	<u>6/28/07</u>
3. State Check Number	<u>12096</u>	4. Check date	<u>6/28/07</u>
5. Payor name on check: First Name	<u>MT CALVARY LUTHERAN CHURCH</u>		
6. Payor name on check: Last Name	_____		

G. 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 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.

Signature of Applicant	<u>John Kassina</u>	CHAIRMAN OF BUILDING COMMITTEE	Date	<u>7/19/07</u>
Signature of Property Owner (if different)	<u>Joseph Maud</u>	FOR STANSH AND MCNARY INC.	Date	<u>8/2/07</u>
Signature of Representative (if any)	_____	_____	Date	_____

For Conservation Commission:

Two copies of the completed Notice of Intent (Form 3), including supporting plans and documents; two copies of pages 1 and 2 of the NOI Wetland Fee Transmittal Form; and the city/town fee payment must be sent to the Conservation Commission by certified mail or hand delivery.

For DEP:

One copy of the completed Notice of Intent (Form 3), including supporting plans and documents; one copy of pages 1 and 2 of the NOI Wetland Fee Transmittal Form; and a copy of the state fee payment must be sent to the DEP Regional Office (see Instructions) by certified mail or hand delivery. (E-filers may submit these electronically.)



WPA Form 3 – Notice of Intent

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

Provided by DEP:

DEP File Number

Document Transaction Number

Acton

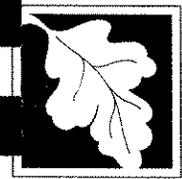
City/Town

G. Signatures and Submittal Requirements (cont.)

Other:

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

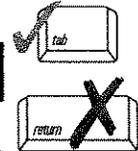
The original and copies must be sent simultaneously. Failure by the applicant to send copies in a timely manner may result in dismissal of the Notice of Intent.



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:

John Rossman Mt Calvary Lutheran Church
 a. First Name b. Last Name c. Company
472 Massachusetts Ave, PO Box 986
 d. Mailing Address
Acton MA 01720
 e. City/Town f. State g. Zip Code
978-590-0729
 h. Phone Number

2. Property Owner (if different):

 a. First Name b. Last Name c. Company

 d. Mailing Address

 e. City/Town f. State g. Zip Code

 h. Phone Number

3. Project Location:

472 Massachusetts Ave Acton
 a. Street Address b. City/Town

B. Fees

Notice of Intent (Form 3) or Abbreviated Notice of Intent (Form 4):

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).

ORIGINAL DOCUMENT HAS FLUORESCENT FIBERS AND VOID PANTOGRAPH AND MICROPRESS SIGNATURE LINE

MT. CALVARY EVANGELICAL LUTHERAN CHURCH

P.O. BOX 986
472 MASSACHUSETTS AVENUE
ACTON, MA 01720

PAY
TO THE
ORDER
OF

Town of Acton
Tax Collector's Office
472 Main Street
Acton, MA 01720-3995

Filing fee for review of site plan
⑆012096⑆ ⑆211371227⑆ 123616006⑆

12095

MIDDLESEX SAVINGS BANK
NATICK, MA 01760
53-7122 / 2113

DATE 6/28/2007
AMOUNT \$747.50

TWO SIGNATURES REQUIRED
IF OVER \$5000.00

Theresa A. Yates
AUTHORIZED SIGNATURE

MP

ORIGINAL DOCUMENT HAS FLUORESCENT FIBERS AND VOID PANTOGRAPH AND MICROPRESS SIGNATURE LINE

MT. CALVARY EVANGELICAL LUTHERAN CHURCH

P.O. BOX 986
472 MASSACHUSETTS AVENUE
ACTON, MA 01720

PAY
TO THE
ORDER
OF

Commonwealth of Massachusetts

Filing fee for review of site plan

⑆012096⑆ ⑆211371227⑆ 123616006⑆

12096

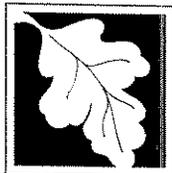
MIDDLESEX SAVINGS BANK
NATICK, MA 01760
53-7122 / 2113

DATE 6/28/2007
AMOUNT \$512.50

TWO SIGNATURES REQUIRED
IF OVER \$5000.00

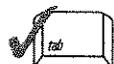
Theresa A. Yates
AUTHORIZED SIGNATURE

MP



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
Stormwater Management Form
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Important:
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Note:
This November 2000 version of the Stormwater Management Form supersedes earlier versions including those contained in DEP's Stormwater Handbooks.

A. Property Information

1. The proposed project is:
 - a. New development Yes No
 - b. Redevelopment Yes No
 - c. Combination Yes No (If yes, distinguish redevelopment components from new development components on plans).
2. Stormwater runoff to be treated for water quality is based on the following calculations:
 - a. 1 inch of runoff x total impervious area of post-development site for discharge to **critical areas** (Outstanding Resource Waters, recharge areas of public water supplies, shellfish growing areas, swimming beaches, cold water fisheries).
 - b. 0.5 inches of runoff x total impervious area of post-development site for other resource areas.

B. Stormwater Management Standards

DEP's Stormwater Management Policy (March 1997) includes nine standards that are listed on the following pages. Check the appropriate boxes for each standard and provide documentation and additional information when applicable.

Standard #1: Untreated stormwater

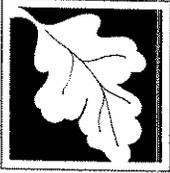
- a. The project is designed so that new stormwater point discharges do not discharge untreated stormwater into, or cause erosion to, wetlands and waters.

Standard #2: Post-development peak discharges rates

- a. Not applicable – project site contains waters subject to tidal action.

Post-development peak discharge does not exceed pre-development rates on the site at the point of discharge or downgradient property boundary for the 2-yr, 10-yr, and 100-yr, 24-hr storm.

- b. Without stormwater controls
- c. With stormwater controls designed for the 2-yr, and 10-yr storm, 24-hr storm.
- d. The project as designed will not increase off-site flooding impacts from the 100-yr, 24-hr storm.



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands
Stormwater Management Form
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Stormwater Management Standards (cont.)

Standard #3: Recharge to groundwater

Amount of impervious area (sq. ft.) to be infiltrated: 6,766 (Addition + new parking)
 a. square feet

Volume to be recharged is based on:

b. The following Natural Resources Conservation Service hydrologic soils groups (e.g. A, B, C, D, or UA) or any combination of groups:

<u>100</u>	<u>C</u>		
1. % of impervious area	2. Hydrologic soil group	3. % of impervious area	4. Hydrologic soil group
<u> </u>	<u> </u>	<u> </u>	<u> </u>
5. % of impervious area	6. Hydrologic soil group	7. % of impervious area	8. Hydrologic soil group
<u> </u>	<u> </u>	<u> </u>	<u> </u>

c. Site specific pre-development conditions: .1" 56 cf
 1. Recharge rate 2. Volume

d. Describe how the calculations were determined:

See attached Drainage Calculations by Stamski and McNary, Inc., dated August 3, 2007 under section entitled Roof Drain Infiltration Calculations.

e. List each BMP or nonstructural measure used to meet Standard #3 (e.g. dry well, infiltration trench).
Roofdrain infiltration chamber system

Does the annual groundwater recharge for the post-development site approximate the annual recharge from existing site conditions?

f. Yes No

Standard #4: 80% TSS Removal

a. The proposed stormwater management system will remove 80% of the post-development site's average annual Total Suspended Solids (TSS) load.

b. Identify the BMP's proposed for the project and describe how the 80% TSS removal will be achieved.

Street Sweeping, Deep Sump Hooded Catch Basins, and Water Quality Swale. See attached TSS Removal Calculations.



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands
Stormwater Management Form
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Stormwater Management Standards (cont.)

c. If the project is redevelopment, explain how much TSS will be removed and briefly explain why 80% removal cannot be achieved.

Street sweeping, deep sump/hooded catch basins, and water quality swale will yield a TSS removal rate of 80% for all of the required volume.

Standard #5: Higher potential pollutant loads

Does the project site contain land uses with higher potential pollutant loads

a. Yes No b. If yes, describe land uses:

c. Identify the BMPs selected to treat stormwater runoff. If infiltration measures are proposed, describe the pretreatment. (Note: If the area of higher potential pollutant loading is upgradient of a critical area, infiltration is not allowed.)

Standard #6: Protection of critical areas

Will the project discharge to or affect a critical area?

a. Yes No b. If yes, describe areas:

c. Identify the BMPs selected for stormwater discharges in these areas and describe how BMPs meet restrictions listed on pages I-27 and I-28 of the Stormwater Policy Handbook – Vol. I:

See Stormwater Policy Handbook Vol. I, page I-23, for land uses of high pollutant loading (see Instructions).

See Stormwater Policy Handbook Vol. I, page I-25, for critical areas (see Instructions).



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

B. Stormwater Management Standards (cont.)

Note:
 components of
 redevelopment
 projects which
 plan to develop
 previously
 undeveloped
 areas do not fall
 under the scope
 of Standard 7.

Standard #7: Redevelopment projects

Is the proposed activity a redevelopment project?

a. Yes No

b. If yes, the following stormwater management standards have been met:

This standard would require that the Stormwater Management Standards be met to the extent practicable. The project has been designed to meet new construction standards and all standards to the extent practicable. See attached drainage calculations.

c. The following stormwater standards have not been met for the following reasons:

d. The proposed project will reduce the annual pollutant load on the site with new or improved stormwater control.

Standard #8: Erosion/sediment control

a. Erosion and sediment controls are incorporated into the project design to prevent erosion, control sediments, and stabilize exposed soils during construction or land disturbance.

Standard #9: Operation/maintenance plan

a. An operation and maintenance plan for the post-development stormwater controls have been developed. The plan includes ownership of the stormwater BMPs, parties responsible for operation and maintenance, schedule for inspection and maintenance, routine and long-term maintenance responsibilities, and provision for appropriate access and maintenance easements extending from a public right-of-way to the stormwater controls.

Site Plan

b. Plan/Title

7/3/07

c. Date

d. Plan/Title

e. Date



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
Stormwater Management Form
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

C. Submittal Requirements

DEP recommends that applicants submit this form, as well as, supporting documentation and plans, with the Notice of Intent to provide stormwater management information for Commission review consistent with the wetland regulations (310 CMR 10.05 (6)(b)) and DEP's Stormwater Management Policy (March 1997). If a particular stormwater management standard cannot be met, information should be provided to demonstrate how equivalent water quality and water quantity protection will be provided. DEP encourages engineers to use this form to certify that the project meets the stormwater management standards as well as acceptable engineering standards. For more information, consult the Stormwater Management Policy.

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

D. Signatures

Mt. Calvary Lutheran Church
Applicant Name

8/2/07
Date

Signature

Joseph March, P.E., P.L.S./Stanski and McNary, Inc.
Representative (if any)

8/2/07
Date

Joseph March For STANSKI AND McNARY, INC.
Signature

Certified Abutters List / Affidavit / Notice to Abutters

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: Mt. Calvary Lutheran Church
Address 472 Massachusetts Ave, PO Box 986; Acton, MA 01720 Phone: 978-590-0729

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: Stanski and McNary, Inc.
Address 80 Harris Street; Acton MA 01720 Phone: (978) 263-8585

The address of the property where the activity is proposed 472 Massachusetts Ave, Acton, MA
Town Atlas Plate/Map F2 Parcel/Lot 115

Project Description: Building addition, playground relocation and parking lot reconfiguration with new stormwater management system.

Copies of the Notice of Intent may be examined at the Conservation Office, Acton Town Hall, 472 Main Street, Acton. Between the hours of 8:00 A.M. and 4:30 P.M. Monday through Friday. For more information please call the Conservation Office at 978-264-9631.

A Public Hearing will be held at the Acton Town Hall, 472 Main Street, on Wednesday,
September 5, 2007 at 7:45 P.M.
(date)

The notice of the public hearing, will be published at least five (5) days in advance in the *Beacon* newspaper or *Metrowest Daily News*.

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: 508-946-2700

Northeast Region: 978-694-3200
Western Region: 413-784-1100



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

John McMullen
 Assistant Assessor

Locus: 472 MASS AV
 Parcel ID: F2-115

Parcel ID	Owner	Co-Owner	Mailing Address	City	ST	Zip
F2-106-5	LOCKLIN RONALD M	LOCKLIN LISA J	463 MASS AVENUE	ACTON	MA	01720
F2-107	WINDERS DAVID J	BARBARA	461 MASS AVENUE	ACTON	MA	01720
F2-108	JACOBY THOMAS M	REBECCA	457 MASS AVE	ACTON	MA	01720
F2-114	LINCOLN AVE LTD PARTNERSHIP		BOX 882	ACTON	MA	01720
F2-116	DAVIS PLACE LLC		8 WHITTIER PLACE	SUITE 2 BOSTON	MA	02114-1412
F2-123	PHALEN HELEN		P.O. BOX 885	ACTON	MA	01720
F2-124	CAMPBELL THOMAS E IV		155 PROSPECT STREET	ACTON	MA	01720
F2-125	OI ALLEN W		146 PROSPECT ST	ACTON	MA	01720
F2-125-1	PHALEN HELEN		P.O. BOX 885	ACTON	MA	01720
F2-127	KULA LARS E	MILES JULIA S	138 PROSPECT ST	ACTON	MA	01720
F2-127-1	PROTASOWICKI DANIEL	PROTASOWICKI ROCIO	132 PROSPECT ST	ACTON	MA	01720
F2-128-6	ANSELMO BRUCE E	NANCY L	8 MALLARD ROAD	ACTON	MA	01720
F2-128-14	LEE SUN H	LEE WON B	10 MALLARD ROAD	ACTON	MA	01720
F2-128-20	ZHANG SHIYONG	JIN XINDAN	12 MALLARD RD	ACTON	MA	01720
F2-128-25	OSIT LESLIE J	OSIT IRENE E	14 MALLARD RD	ACTON	MA	01720

any owner of land sharing a common boundary or corner with the site of the proposed activity (100 feet) in any direction, including land located directly across a street, way, creek, river, stream, brook or canal. The above are as they appear on the most recent applicable taxes.

Denbury D. Hoyt
 Denbury D. Hoyt
 Assessing Clerk
 Town Assessors Office
 28-Jun-07

AFFIDAVIT OF SERVICES
Under the Massachusetts Wetlands Protection Act
(to be submitted to the Massachusetts Department of
Environmental Protection and the Conservation Commission
when filing a Notice of Intent)

I, Joseph March, hereby certify under the pains and penalties of perjury that on 8/3/07 I gave notification to abutters in compliance with the second paragraph of Massachusetts General Laws Chapter 131, Section 40, and the DEP Guide to Abutter Notification dated April 8, 1994, in connection with the following matter:

A Notice of Intent filed under the Massachusetts
Wetlands Protection Act by Mt. Calvary Lutheran
Church with the Acton Conservation Commission for
property located at 472 Massachusetts Ave.

The form of the notification, and a list of the abutters to whom it was given and their addresses, are attached to this Affidavit of Service.

Name:

Joseph March

Date: 8/3/07

Attachment A
Project Narrative

Project Narrative

Mt. Calvary Church
473 Massachusetts Ave.

Wetland Resources

The potential for regulated wetlands and related areas on the site was investigated in accordance with the Massachusetts Wetlands Protection Act (MGL Ch. 131 s. 40) and its associated regulations (310 CMR 10.00) and the Town of Acton Wetland Protection Bylaw. The wetland resource areas on the site are presumed to be significant to the interest of the WPA, which include protection of public and private water supply, protection of groundwater supply, flood control, storm damage prevention, prevention of pollution, and protection of wildlife habitat. Additionally, the resource areas are significant to the interest of the local wetland bylaw, including those mentioned above and the following: erosion and sedimentation control, water quality, water pollution control, surface water protection, fisheries, and freshwater shellfish.

Existing Site Conditions

The site is located at 482 Massachusetts Avenue in Acton, Massachusetts, and is approximately 5.5 acres in size. The site of Mount Calvary Lutheran Church presently contains a one story church building, a pre-school playground and two parking lots with parking spaces for 78 vehicles.

The existing parking lot to the rear of the building does not currently employ any stormwater management practices. Runoff from the parking lot flows directly to the Bordering Vegetated Wetlands on the property.

Bordering Vegetated Wetlands

There are two areas of Bordering Vegetated Wetland (BVW) located on site, one area between the existing church and Prospect Street and another to the rear of the parking lot at the rear of the church. The BVW boundaries were field delineated by B & C Associates.

Proposed Site Conditions

The expansion project will include the addition of classroom space for religious education purposes, the relocation of an existing playground and the addition of 11 parking spaces to the rear parking lot for a total of 89 on site. The project goals were to not only construct a building addition but to resurface the existing rear parking lot with a one inch wearing course of pavement. The existing parking lot to the rear of the building will be reconfigured to improve maneuverability while also moving parking spaces away from the existing wetlands. By redesigning the existing poorly configured parking lot and adding only 853 square feet of parking lot, the additional 11 parking spaces could be added. The 11 new parking spaces will be situated significantly further from the wetlands than the existing pavement. In one area, the pavement will be removed and a new stormwater management system water quality swale will be constructed at the location. Curbing will be installed around the entire perimeter of the parking lot to insure no direct runoff to the nearby wetlands. The parking lot will also include a new drainage system with two catch basins that will direct the runoff to the water quality swale. The building

addition will have its own roof drain infiltration system. These BMP's will significantly improve water quality compared to the existing site conditions.

Buffer Zone

The BVW projects a 100 foot Buffer Zone onto the site. The majority of the Buffer Zone has been altered by the development of the existing site. The local wetland bylaw prohibits certain activities within the Buffer Zone as well as other setback areas. The following outlines the prohibition and the projects respective compliance:

Section 3.2 Wetland Setbacks for New Activities

0-foot setback for wetland-dependent structures (drain outfalls, weirs, etc), fences, and structures necessary for upland access where reasonable alternative access is unavailable.

The proposed stormwater management water quality swale outlet pipe will be situated approximately 3' off the edge of the BVW. The Water Quality Swale (WQS) will be constructed in an area currently covered by pavement situated in the lowest corner of the existing parking lot. The location was selected in order to collect all of the runoff from the reconfigured parking lot in order to achieve maximum water quality benefits. The center of the berm for the WQS is no closer to the wetland than the existing edge of pavement which is 5' off.

Section 3.3 Wetland Setbacks for Existing Structures

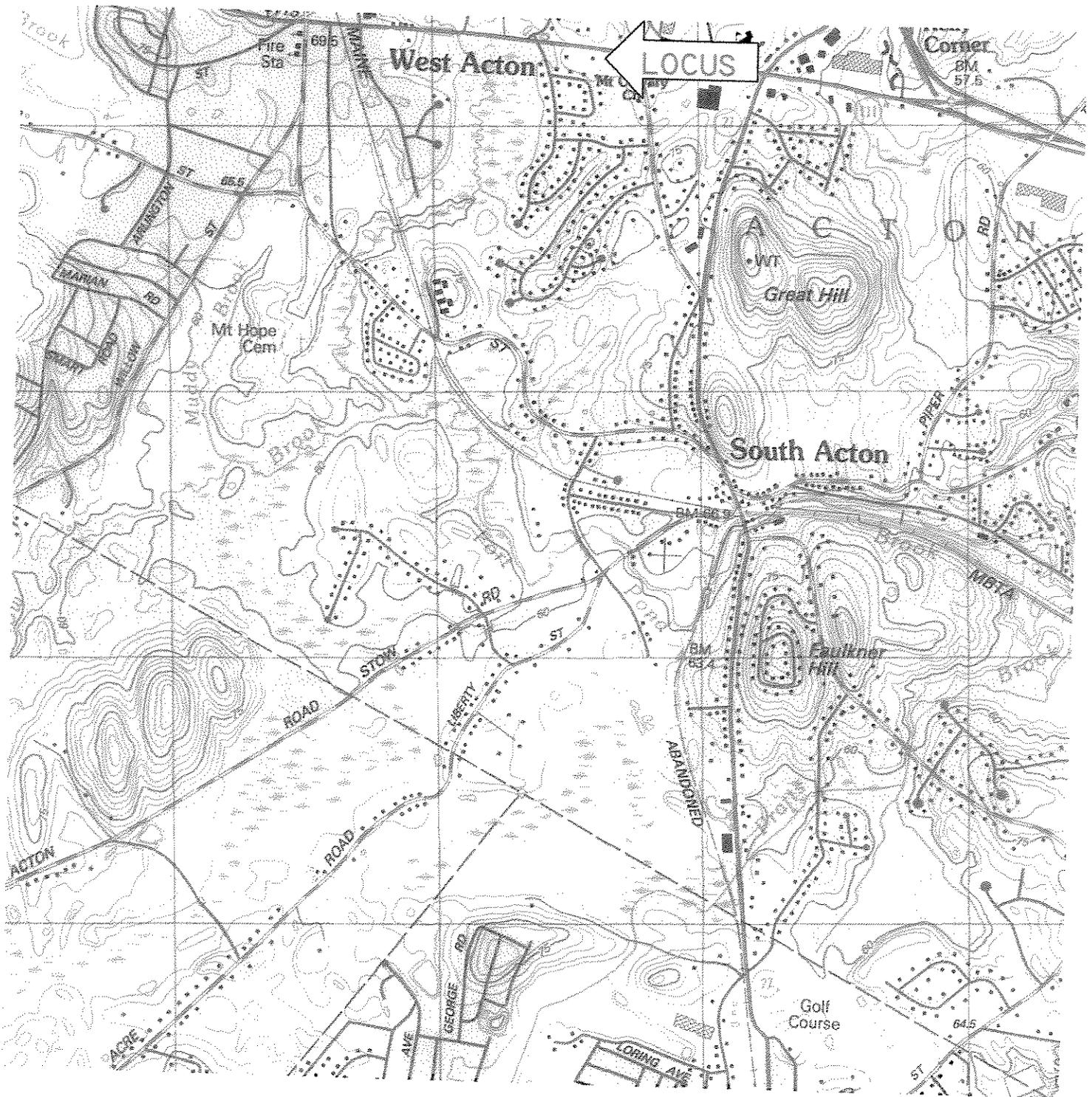
No new activity shall be commenced and no new structure shall be located closer to the edge of a Wetland Resource Area than existing non-conforming like Activity or structures...

The proposed building addition is situated 72' from the edge of the BVW while the existing building is 20 feet from the BVW. The existing parking lot is 4' from the BVW at its closest location, while the proposed new parking lot will be situated 10' from the BVW. An existing shed which is 13' from the BVW will be relocated to a site 17' from the BVW.

Summary of Site Improvements

The proposed addition and reconfiguration of the parking lot will improve the functionality of the church and will result in a significant improvement of the water quality flowing off the parking areas due to the installation of the new stormwater management system.

Attachment B
U.S.G.S. Map



U.S.G.S. LOCUS MAP
(not to scale)

Attachment C
Bordering Vegetated Wetland
Field Data Forms

DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Form

Applicant: Mt. Calvary Lutheran Church Prepared by: B. & C. Associates Inc. Project location: 472 Massachusetts Ave., Acton DEP File #: _____

Check all that apply:

- Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
- Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
- Method other than dominance test used (attach additional information)

Section I. Vegetation Observation Plot Number: 1 Transect Number: A Date of Delineation: 9/26/05

A. Sample Layer and Plant Species (by common/scientific name)	B. Percent Cover (or basal area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category *
Herbaceous:				
Rough-stemmed Goldenrod	38.0	36%	Yes	FAC
Jewelweed	20.5	19%	Yes	FACW
Woodbine	20.5	19%	Yes	FACU
Reed Canary Grass	20.5	19%	Yes	FACW+
Smartweed	3.0	3%	No	FACW
Poison Ivy	3.0/105.5	3%	No	FAC
Shrubs:				
Old Field Raspberry	10.5	33%	Yes	FACU-
European Buckthorn	10.5	33%	Yes	FAC
American Elm	10.5/31.5	33%	Yes	FACW-
Saplings:				
None				
Lianas:				
American Bittersweet	20.5	60%	Yes	FACU-
Poison Ivy	10.5	31%	Yes	FAC
Woodbine	3.0/34.0	9%	No	FACU
Overstory:				
Red Maple	345.8	54%	Yes	FAC
American Elm	296.7/642.5	46%	Yes	FACW-

* Use an asterisk to mark wetland indicator plants: plant species listed in the Wetlands Protection Act (MGL c.131, s.40); plants in the genus *Sphagnum*; plants listed as FAC, FAC+, FACW-, FACW, FACW+, or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

Vegetation conclusion:
 Number of dominant wetland indicator plants: 8 Number of dominant non-wetland Indicator plant: 3

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants? **YES**

**Section II. Indicators of Hydrology
Hydric Soil Interpretation**

1. Soil Survey

Is there a published soil survey for this site? YES

title/date: Middlesex County 3/91

map number: 1

soil type mapped: Merrimac-Urban land Complex

hydric soil inclusions:

Are field observations consistent with soil survey? YES

Remarks:

2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
A	0-4"	10 YR 3/3	

Remarks:

Refusal @ 4"
Sample Point at edge of parking lot

3. Other: 29'0" to Wetland Flag # 8
9'7" to Wetland Flag # 9

Conclusion: Is soil hydric? NO

Other Indicators of Hydrology: (check all that apply and describe)

- Site inundated: _____
- Depth to free water in observation hole: _____
- Depth to soil saturation in observation hole: _____
- Water marks: _____
- Drift lines: _____
- Sediment deposits: _____
- Drainage patterns in BVW: _____
- Oxidized rhizospheres: _____
- Water-stained leaves: _____
- Recorded data (stream, lake, or tidal gauge; aerial photo; other): _____
- Other: _____

Vegetation and Hydrology Conclusion

Number of wetland indicator plants Yes No
 ≥ number of non-wetland indicator plants

Wetland hydrology present:
 hydric soil present

other indicators of hydrology
 present

Sample location is in a BVW

DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Form

Applicant: Mt. Calvary Lutheran Church Prepared by: B & C Associates Inc. Project location: 472 Massachusetts Ave., Acton DEP File #: _____

Check all that apply:
 Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
 Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
 Method other than dominance test used (attach additional information)

Section I. Vegetation Observation Plot Number: 2 Transect Number: A Date of Delineation: 9/26/05

A. Sample Layer and Plant Species (by common/scientific name)	B. Percent Cover (or basal area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category *
Herbaceous:				
Jewelweed	38.0	36%	Yes	FACW
Skunk Cabbage	38.0	36%	Yes	OBL
Woodbine	10.5	10%	No	FACU
Sedges	10.5	10%	No	FACW+
Upright Woodsorrell	3.0	3%	No	UPL
Poison Ivy	3.0	3%	No	FAC
Rough-stemmed Goldenrod	3.0/106.0	3%	No	FAC
Shrubs:				
Multiflora Rose	20.5	31%	Yes	FACU
Poison Sumac	10.5	16%	Yes	OBL
American Elm	10.5	16%	Yes	FACW-
Winterberry	10.5	16%	Yes	FACW+
Highbush Blueberry	10.5	16%	Yes	FACW-
European Buckthorn	3.0/65.5	5%	No	FAC
Saplings:				
Crabapple	10.5/10.5	100%	Yes	
Lianas:				
American Bittersweet	20.5	40%	Yes	FACU-
Poison Ivy	20.5	40%	Yes	FAC
Woodbine	10.5/51.5	20%	Yes	FACU
Overstory:				
Red Maple	424.0	59%	Yes	FAC
American Elm	296.7/720.7	41%	Yes	FACW-

* Use an asterisk to mark wetland indicator plants: plant species listed in the Wetlands Protection Act (MGL c.131, s.40); plants in the genus *Sphagnum*; plants listed as FAC, FAC+, FACW-, FACW, FACW+, or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

Vegetation conclusion:
 Number of dominant wetland indicator plants: 9 Number of dominant non-wetland indicator plant: 3

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants? **YES**

**Section II. Indicators of Hydrology
Hydric Soil Interpretation**

Other Indicators of Hydrology: (check all that apply and describe)

- Site inundated: _____
- Depth to free water in observation hole: 2.2"
- Depth to soil saturation in observation hole: 0"
- Water marks: _____
- Drift lines: _____
- Sediment deposits: _____
- Drainage patterns in BWV: _____
- Oxidized rhizospheres: _____
- Water-stained leaves: _____
- Recorded data (stream, lake, or tidal gauge; aerial photo; other): _____
- Other: _____

1. Soil Survey

Is there a published soil survey for this site? **YES**

title/date: Middlesex County 3/91

map number: 1

soil type mapped: Swansea Muck

hydric soil inclusions:

Are field observations consistent with soil survey? **YES**

Remarks:

2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
O _A	0-24"	10 YR 2/1	

Vegetation and Hydrology Conclusion

Number of wetland indicator plants
≥ number of non-wetland indicator plants

Yes	<input checked="" type="checkbox"/>
No	<input type="checkbox"/>

Wetland hydrology present:
hydric soil present

<input checked="" type="checkbox"/>
<input type="checkbox"/>

other indicators of hydrology
present

<input checked="" type="checkbox"/>
<input type="checkbox"/>

Sample location is in a BWV

<input checked="" type="checkbox"/>
<input type="checkbox"/>

Remarks:

3. Other: 33'10" to Wetland Flag # 8
11'0" to Wetland Flag # 9
10'11" Downgradient from A1

Conclusion: Is soil hydric? **YES**

DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Form

Applicant: Mt. Calvary Lutheran Church Prepared by: B & C Associates Inc. Project location: 472 Massachusetts Ave., Acton DEP File #: _____

- Check all that apply:
- Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
 - Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
 - Method other than dominance test used (attach additional information)

Section I. Vegetation Observation Plot Number: 1 Transect Number: B Date of Delineation: 9/26/05

A. Sample Layer and Plant Species (by common/scientific name)	B. Percent Cover (or basal area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category *
Herbaceous:				
Upland Grasses	38.0	64%	Yes	UPL
Common Dandelion	3.0	5%	No	FACU-
Common Blue Violet	3.0	5%	No	FAC
Common Plantain	3.0	5%	No	FACU
Rough-stemmed Goldenrod	3.0	5%	No	FAC
Jewelweed	3.0	5%	No	FACW
Beggar Ticks	3.0	5%	No	FACW-
Skunk Cabbage	3.0/59.0	5%	No	OBL
Shrubs:				
American Elm	20.5	51%	Yes	FACW-
White Ash	10.5	26%	Yes	FACU
Japanese Barberry	3.0	8%	No	FACU
Silky Dogwood	3.0	8%	No	FACW
Arrowwood	3.0/40.5	8%	No	FAC
Saplings:				
None				
Lianas:				
Poison Ivy	10.5	44%	Yes	FAC
New England Grape	10.5	44%	Yes	NI
Woodbine	3.0/24.0	13%	No	FACU
Overstory:				
Red Maple	1360.6/1360.6	100%	Yes	FAC

* Use an asterisk to mark wetland indicator plants: plant species listed in the Wetlands Protection Act (MGL c. 131, s.40); plants in the genus *Sphagnum*; plants listed as FAC, FAC+, FACW-, FACW, FACW+, or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

Vegetation conclusion:
 Number of dominant wetland indicator plants: 3 Number of dominant non-wetland indicator plant: 2
 Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants? YES
 If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability or Notice of Intent. BC 0509-02 MA DEP: 3/95

**Section II. Indicators of Hydrology
Hydric Soil Interpretation**

Other Indicators of Hydrology: (check all that apply and describe)

- Site inundated: _____
- Depth to free water in observation hole: _____
- Depth to soil saturation in observation hole: _____
- Water marks: _____
- Drift lines: _____
- Sediment deposits: _____
- Drainage patterns in BVW: _____
- Oxidized rhizospheres: _____
- Water-stained leaves: _____
- Recorded data (stream, lake, or tidal gauge; aerial photo; other): _____
- Other: _____

1. Soil Survey

Is there a published soil survey for this site? **YES**

title/date: Middlesex County 3/91

map number: 1

soil type mapped: Charlton-Hollis-Rock outcrop complex

hydric soil inclusions:

Are field observations consistent with soil survey? **YES**

Remarks:

2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
A	0-15"	10 YR 4/3	

Remarks: Refusal @ 15"

3. Other: 8'10" to Wetland Flag # 53
26'3" to Wetland Flag # 54

Conclusion: Is soil hydric? **NO**

Vegetation and Hydrology Conclusion

Yes No

Number of wetland indicator plants
≥ number of non-wetland indicator plants

Wetland hydrology present:
hydric soil present

other indicators of hydrology
present

Sample location is in a BVW

DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Form

Applicant: Mt. Calvary Lutheran Church Prepared by: B & C Associates Inc. Project location: 472 Massachusetts Ave., Acton DEP File #: _____

- Check all that apply:
- Vegetation alone presumed adequate to delineate BWV boundary: fill out Section I only
 - Vegetation and other indicators of hydrology used to delineate BWV boundary: fill out Sections I and II
 - Method other than dominance test used (attach additional information)

Section I. Vegetation Observation Plot Number: 2 Transect Number: B Date of Delineation: 9/26/05

A. Sample Layer and Plant Species (by common/scientific name)	B. Percent Cover (or basal area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category *
Herbaceous:				
Skunk Cabbage	63.0	78%	Yes	OBL
White Wood Aster	3.0	4%	No	FACW+
New York Aster	3.0	4%	No	FAC
Rough-stemmed Goldenrod	3.0	4%	No	FAC
Poison Ivy	3.0	4%	No	FACU
Woodbine	3.0	4%	No	FACW
Jewelweed	3.0/81.0	4%	No	
Shrubs:				
White Ash	20.5	35%	Yes	FACU
American Elm	10.5	18%	Yes	FACW-
Arrowwood	10.5	18%	Yes	FAC
Winterberry	10.5	18%	Yes	FACW+
Silky Dogwood	3.0	5%	No	FACW
Japanese Barberry	3.0/58.0	5%	No	FACU
Saplings:				
None				
Lianas:				
New England Grape	20.5	60%	Yes	NI
Poison Ivy	10.5	31%	Yes	FAC
Woodbine	3.0/34.0	9%	No	FACU
Overstory:				
Red Maple	1369.6/1369.6	100%	Yes	FAC

* Use an asterisk to mark wetland indicator plants: plant species listed in the Wetlands Protection Act (MGL c. 131, s.40); plants in the genus *Sphagnum*; plants listed as FAC, FAC+, FACW-, FACW, FACW+, or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

Vegetation conclusion:
 Number of dominant wetland indicator plants: 6 Number of dominant non-wetland indicator plant: 1
 Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants? YES
 If vegetation alone is presumed adequate to delineate the BWV boundary, submit this form with the Request for Determination of Applicability or Notice of Intent. BC 0509-02 MA DEP: 3/95

**Section II. Indicators of Hydrology
Hydric Soil Interpretation**

Other Indicators of Hydrology: (check all that apply and describe)

- Site inundated: _____
- Depth to free water in observation hole: _____
- Depth to soil saturation in observation hole: _____
- Water marks: _____
- Drift lines: _____
- Sediment deposits: _____
- Drainage patterns in BWV: _____
- Oxidized rhizospheres: _____
- Water-stained leaves: _____
- Recorded data (stream, lake, or tidal gauge; aerial photo; other): _____
- Other: _____

1. Soil Survey

Is there a published soil survey for this site? **YES**

title/date: Middlesex County 3/91

map number: 1

soil type mapped: Charlton-Hollis-Rock outcrop complex

hydric soil inclusions: Yes

Are field observations consistent with soil survey? **NO**

Remarks:

2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
A	0-6"	10 YR 2/2	

Remarks: Refusal @ 6"

3. Other: 12'1" to Wetland Flag # 53
26'7" to Wetland Flag # 54
13'9" Downgradient from B1

Conclusion: Is soil hydric? **YES**

Vegetation and Hydrology Conclusion

Number of wetland indicator plants Yes No
 ≥ number of non-wetland indicator plants Yes No

Wetland hydrology present: hydric soil present Yes No

other indicators of hydrology present Yes No

Sample location is in a BWV Yes No

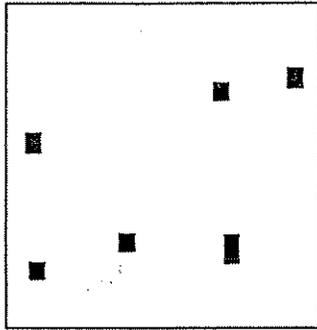
Hydric Soil Indicators

Most hydric soils have a soil horizon with a chroma of 0, 1, or 2 below the A-horizon. These are referred to as low-chroma colors. (Reminder: the Munsell Soil Color Charts are used to determine soil colors.) Generally, when evaluating mineral soils for low-chroma colors or other evidence of saturation, look for indicators directly below the A-horizon and within the top 12 inches of the soil surface. In areas where the O-horizon is less than 8 inches thick, soil depths are measured from the bottom of the O-horizon. When the O-horizon is 8 inches or greater (for histosols and soils with histic epipedons), such depths are measured from the soil surface. The soil surface is the top of the mineral soil; or, for soils with an O-horizon, the soil surface is measured from the top of the O-horizon. Fresh leaf or needle fall that has not undergone observable decomposition (the litter layer) is excluded from soil and may be separately described.

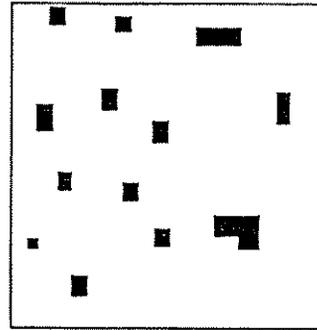
The following is a list of some hydric soil indicators - any of which can be used to identify the presence of wetland hydrology:

- ◆ Histosols (organic soils). Histosols are soils with at least 16 inches of organic material measured from the soil surface.
- ◆ Histic epipedons. These are soils with 8 to 16 inches of organic material measured from the soil surface.
- ◆ Sulfidic material. A strong "rotten egg" smell generally is noticed immediately after the soil test hole is dug.
- ◆ Gleyed soils. Soils that are predominantly neutral gray, or occasionally greenish or bluish gray in color within 12 inches from the bottom of the O-horizon. (The Munsell Soil Color Charts have special pages for gleyed soils.)
- ◆ Soils with a matrix chroma of 0 or 1 and values of 4 or higher within 12 inches from the bottom of the O-horizon.
- ◆ Within 12 inches from the bottom of the O-horizon, soils with a chroma of 2 or less and values of 4 or higher in the matrix, and mottles with a chroma of 3 or higher.
- ◆ Within 12 inches from the bottom of the O-horizon, soils with a matrix chroma of 3 and values of 4 or higher, with 10 percent or more low-chroma mottles, as well as indicators of saturation (i.e., mottles, oxidized rhizospheres, concretions, nodules) within 6 inches of the soil surface.

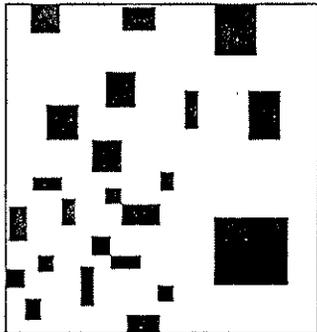
Charts for Estimating Percent Redoximorphic Features



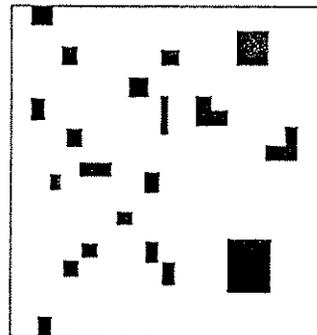
2%



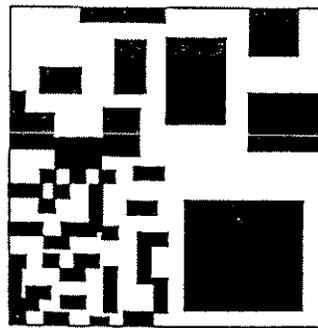
5%



20%



10%



50%

AGIMMIST
50% FFA
2-20 common
50% FFA

Stamski and McNary, Inc.

Engineering - Planning - Surveying

80 Harris Street Acton, MA 01720 (978) 263-8585

Drainage Calculations

For

**Mt Calvary Lutheran Church
ACTON, MA**



August 3, 2007

Applicant and Owner

Mount Calvary Lutheran Church
472 Massachusetts Ave
Acton, MA 01720

Attachment D
Drainage Calculations

Table of Contents

- **Narrative**
- **Pre-Development Hydrology**
- **Post Development Hydrology**
- **Water Quality Volume Calculations**
- **Infiltration Trench/Chamber**
- **Storm Sewer Design**

Narrative

STORMWATER MANAGEMENT

The site is located at 482 Massachusetts Avenue in Acton, Massachusetts, and is approximately 5.5 acres in size. The site of Mount Calvary Lutheran Church presently contains a one story church building, pre-school playground and parking for 78 vehicles. The expansion project will include the addition of classroom space for religious education purposes and will add 11 parking spaces for a total of 89. The project goals were to not only design a building addition but to resurface the existing rear parking lot with a one inch wearing course of pavement. By redesigning the existing poorly configured parking lot to the rear of the church and adding only 853 square feet of parking lot, the additional 11 parking spaces could be added.

The stormwater analysis and design were performed by comparing the site prior to and after development and adhering to the Stormwater Management Policy with the design.

The Natural Resources Conservation Service (N.R.C.S.) soil survey report for Middlesex County and associated soil maps for Acton indicate that soils on site consist of Charlton-Hollis-Rock outcrop complex, Merrimac-Urban land complex, Swansea muck and Whitman fine sandy loam. These soils have been assigned to Hydrologic Groups C, A, D and D respectively.

Pre-Development

The Pre-Development Drainage Map shows the present condition of the Mount Calvary Lutheran Church site. The surface coverage consists of the church building, playground, wetlands, some open grass areas, woods and two paved parking lots. Only the areas to the rear of the church and rear parking lot were analyzed because all other areas will remain the same. The existing parking lot to the rear of the building does not currently employ any stormwater management practices. Runoff from the parking lot flows directly to the Bordering Vegetated Wetlands on the property.

Post-Development

The fully developed site will contain the existing church building with the newly constructed additional classrooms and relocated bark mulch playground. The existing parking lot to the rear of the building will be reconfigured to improve maneuverability while also moving parking spaces away from the existing wetlands. The 11 new parking spaces will be situated significantly further from the wetlands than the existing pavement. In one area the pavement will be removed and a new stormwater management system water quality swale will be constructed at the location. Curbing will be install around the entire perimeter of the parking lot to insure no direct runoff to the nearby wetlands. The parking lot will also include a new drainage system with two catch basins that will direct the runoff to the water quality swale. The building addition will have its own roof drain infiltration system.

Compliance with the MA DEP Stormwater Management Policy

The following describes the drainage system and the projects compliance with the Stormwater Management Policy's Performance Standards.

Standard #1 Untreated Direct Discharge of Stormwater:

No new direct discharges of untreated stormwater are proposed. Runoff from the point source will be treated with Best Management Practices (BMP) prior to discharge.

Runoff will be treated with a combination of BMP's. These include catch basins, roof drain infiltration structures, water quality swales and street sweeping.

Standard #2 Post-Development Peak Discharge:

The Stormwater Management Policy requires that peak discharge rates for the 2-year and 10-year storm events not be increased from pre-development conditions. Furthermore, the 100-year storm event will not increase flooding impacts offsite. Attenuation of peak discharge rates will be accomplished by using infiltration and detention.

The following table summarizes the peak runoff rates.

Discharge Summary Table

	2 year storm		10 year storm		100 year storm	
	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)
	2.67	2.25	4.93	4.69	8.12	7.65

Detailed calculations are attached.

Standard #3 Recharge to Groundwater:

This standard prescribes the stormwater volume that must be recharged to groundwater based on the existing site soil conditions. The Natural Resources Conservation Service (NRCS, formerly SCS) Middlesex Soils map indicated that the site contains soils in hydrologic group A,B,C and D. The Stormwater Management Policy requires 0.4, 0.25, 0.1 and 0 inches of runoff over the total impervious area to be recharged in areas with soils of respective hydrologic groups. This is achieved through the use of the roof drain infiltration system which is designed to infiltrate the entire 100 year volume of flow from the proposed addition.

Standard #4 80% TSS Removal:

According to the guidelines provided in the Stormwater Management Performance Standards, 80% Total Suspended Solids (TSS) removal is required for the total increase in impervious area associated with the project. This standard requires 0.5 inches of runoff from impervious surfaces to be treated when not in a critical area. All of the proposed point source discharges that will treat runoff from impervious surfaces are outside of critical areas. Through the use of Street sweeping (10%), deep sump hooded catch basins (25%), water quality swale (70%), an overall TSS removal efficiency of 80% is achieved.

Additional treatment of runoff from impervious areas will be provided with infiltration of roof runoff from the proposed addition which will have a TSS removal rate of 80%.

Standard #5 Higher Potential Pollutant Loads:

The site is not considered to have a "Higher Potential Pollutant Load" as defined in the Stormwater Management Policy.

Standard #6 Protection of Critical Areas:

All of the proposed point source discharges that will treat runoff from impervious surfaces are outside of "Critical Areas".

Standard #7 Redevelopment Projects:

Though the reconfiguration of the parking lot and removal of pavement could be considered a redevelopment project, the design complies with the more stringent requirements of new construction and includes significant stormwater management improvements.

Standard #8 Erosion/Sediment Control:

Erosion and sediment controls are incorporated into the project design to prevent erosion, control sediment movement, and stabilize exposed and disturbed soils during construction.

Temporary erosion and sedimentation controls include minimizing areas of exposed soil, directing and controlling runoff, and rapidly stabilizing exposed areas. Prior to the commencement of construction, trenched siltation fences and haybales will be placed down gradient of work areas. Stockpiled soils will be contained within siltation fence or staked haybales. Soils left exposed for extended period of time will be mulched and seeded for temporary vegetative cover. Following construction, exposed areas will be permanently vegetated with appropriate ground cover.

Erosion and sedimentation control measures will be maintained throughout all phases of construction. Inspections will be made regularly and after rainfalls exceeding 0.5 inches in a 24 hour period during construction. The contractor will be required to inspect erosion and sedimentation control measures at the end of each workday, when precipitation is forecast, and after each rainfall. All measures will be inspected prior to each weekend. The contractor will replace and repair any malfunctioning or damaged controls measures including vegetative stabilization.

Long term erosion and sedimentation control will be realized through the use of the Best Management Practices described previously. Areas where soils have been disturbed will be loamed and vegetated with lawn, trees, and shrubs.

Standard #9 Operation and Maintenance Plan:

The owner of the stormwater system will be the owner of the property. The owner will be responsible for operation and maintenance. See attached Site Plan.

Design Basis

1. The rational method ($Q=CIA$) was used as a basis for sizing pipes. Runoff Coefficients: $C=0.15$ for woods, 0.20 for grass/landscaped areas, 0.76 for gravel, and 0.9 for impervious surfaces.
2. The 100-year storm was used for sizing pipes. Rainfall intensity values were taken from the U.S. Weather Bureau Technical Paper 40.
3. The United States Department of Agriculture Natural Resource Conservation Service (N.R.C.S.) TR55 methodology was used to determine off-site rates of runoff.
4. The twenty-four hour rainfall, taken from N.R.C.S. publications, is 6.4 inches for the 100-year storm, 4.5 inches for the 10 year storm, and 3.1 inches for the 2-year storm event.
5. The hydrologic calculations were performed using the computer program: "Hydraflow Hydrographs 2004", by Intelisolve.
6. The soil types of the site were taken from the N.C.R.S. Soil Survey Map for Acton.



Pre-Development Hydrology

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
	SCS Runoff	2.67	2	726	9,218	---	---	---	<no description>

Hydrograph Summary Report

Hydrograph No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
	SCS Runoff	4.93	2	726	16,821	---	---	---	<no description>

Hydrograph Summary Report

Hydrograph No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
	SCS Runoff	8.12	2	726	27,978	---	---	---	<no description>

Worksheet 2: Runoff curve number and runoff

SM-3763

Project: MT. CALVARY LUTHERAN CHURCH By TJR Date 07/25/07
 Location: 472 MASSACHUSETTS AVENUE Checked _____ Date _____
 Circle one: Present Developed _____

1. Runoff curve number (CN)

Soil name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area Acres	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4		
D SWANSEA WHITMAN	WOODS, GOOD CONDITION	77			0.40	30.72
D SWANSEA WHITMAN	OPEN SPACE, GOOD CONDITION	80			0.01	0.48
D SWANSEA WHITMAN	IMPERVIOUS (PAVEMENT)	98			0.08	8.28
C CHARLTON	WOODS, GOOD CONDITION	70			0.26	18.41
C CHARLTON	OPEN SPACE, GOOD CONDITION	74			0.31	22.94
C CHARLTON	IMPERVIOUS (PAVEMENT)	98			0.48	47.04
A MERRIMAC	WOODS, GOOD CONDITION	30			0.09	2.70
A MERRIMAC	OPEN SPACE, GOOD CONDITION	39			0.01	0.47
A MERRIMAC	IMPERVIOUS (PAVEMENT)	98			0.16	15.39
Totals =					1.80	146.43

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{146.43}{1.80} = 81.28 ; \text{ Use CN} = \boxed{81.3}$$

2. Runoff

Frequency..... yr
 Rainfall, P (24-hour)..... in
 Runoff, Q..... in
 (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
2	10	100
3.1	4.5	6.5
1.41	2.57	4.37

Worksheet 3: Time of Concentration (Tc) or travel time (Tt)

SM-3763

Project: MT. CALVARY LUTHERAN CHURCH By TJR Date 07/25/07

Location: 472 MASSACHUSETTS AVENUE Checked _____ Date _____

Circle one: Present Developed _____
 Circle one: Tc Tt through _____
 subarea _____

Sheet flow (Applicable to Tc only)

1. Surface Description (table 3-1)
2. Mannings roughness coeff., n (table 3-1)
3. Flow length, L (total L <= 300 ft)
4. Two-yr 24-hr rainfall, P2
5. Land Slope, s
6. $Tt = 0.007 (nL)^{0.8} / (P2^{0.5} s^{0.4})$

Compute Tt

Segment ID	AB			
	WOODS			
	0.4			
ft	50			
in	3.1			
ft/ft	0.13			
hr	0.10			0.10

Shallow concentrated Flow

7. Surface Description (paved or unpaved)
8. Flow Length, L
9. Watercourse slope, s
10. Average Velocity, V (figure 3-1)
11. $Tt = L / 3600V$

Compute Tt

Segment ID	BC	CD	DE	
	UNPAVED	PAVED	UNPAVED	
ft	33.51	54.4	202.49	
ft/ft	0.03	0.04	0.04	
ft/s	3.75	3.82	4.19	
hr	0.00	0.00	0.01	0.02

Channel flow

12. Cross sectional flow area, a
13. Wetted perimeter, pw
14. Hydraulic radius, $r = a/wp$
15. Channel Slope, s
16. Manning's roughness coeff., n
17. $V = 1.49 r^{2/3} s^{1/2} / n$
18. Flow length, L
19. $Tt = L / 3600V$

Compute r

Compute V

Compute Tt

Segment ID				
sf				
ft				
ft				
ft/ft				
ft/s				
ft				
hr				0.00

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)

hr	0.12
min	7.2

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Thursday, Jul 26 2007, 10:59 AM

Hyd. No. 1

<no description>

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Drainage area = 1.80 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 3.10 in
Storm duration = 24 hrs

Peak discharge = 2.67 cfs
Time interval = 2 min
Curve number = 81.3
Hydraulic length = 0 ft
Time of conc. (Tc) = 7.2 min
Distribution = Type III
Shape factor = 484

Hydrograph Discharge Table

Hydrograph Volume = 9,218 cuft

(Printed values >= 95% of Qp)

Time -- Outflow (hrs cfs)

12.10	2.67 <<
12.13	2.62

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Thursday, Jul 26 2007, 10:59 AM

Hyd. No. 1

<no description>

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Drainage area = 1.80 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 4.50 in
Storm duration = 24 hrs

Peak discharge = 4.93 cfs
Time interval = 2 min
Curve number = 81.3
Hydraulic length = 0 ft
Time of conc. (Tc) = 7.2 min
Distribution = Type III
Shape factor = 484

Hydrograph Discharge Table

Hydrograph Volume = 16,821 cuft

(Printed values >= 95% of Qp.)

Time -- Outflow (hrs cfs)

12.10	4.93 <<
12.13	4.77

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Thursday, Jul 26 2007, 10:59 AM

Hyd. No. 1

<no description>

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Drainage area = 1.80 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 6.40 in
Storm duration = 24 hrs

Peak discharge = 8.12 cfs
Time interval = 2 min
Curve number = 81.3
Hydraulic length = 0 ft
Time of conc. (Tc) = 7.2 min
Distribution = Type III
Shape factor = 484

Hydrograph Volume = 27,978 cuft

(Printed values >= 95% of Qp.)

Hydrograph Discharge Table

Time -- Outflow
(hrs cfs)

12.10	8.12 <<
12.13	7.81

...End

Post-Development Hydrology

POST-DEVELOPMENT
DRAINAGE MAP

IN
ACTION, MASSACHUSETTS
(MIDDLESEX COUNTY)
FOR: STEWART ROBERTS ASSOC. INC.
SCALE: 1" = 20' AUGUST 3, 2007

STAMSKI AND McNARY, INC.
REGISTERED PROFESSIONAL ENGINEERS
PLANNING - SURVEYING

0 10 20 30 40 50 60 80 FT
(S78.3rdingale day) 472 Massachusetts Ave SH-3763

TOTAL EXISTING SPACES = 78

LEGEND:

- EXISTING CONTOUR
- PROPOSED CONTOUR
- NOW OR FORMERLY
- SOIL TYPE LINE
- SUBCATCHMENT DIVIDE
- TIME OF CONCENTRATION
- SOIL NUMBER/SOIL NAME
- HYDROLOGIC GROUP

UTILITY NOTE:

ALL UNDERGROUND UTILITIES SHOWN HERE WERE COMPILED ACCORDING TO AVAILABLE RECORD PLANS FROM VARIOUS UTILITY COMPANIES. THE LOCATION OF UTILITIES SHOWN ON THIS PLAN IS BASED ON RECORD PLANS AND FIELD SURVEY. THE ACTUAL LOCATIONS MUST BE DETERMINED IN THE FIELD BEFORE DESIGNING, EXCAVATING, BLASTING, INSTALLING, BACKFILLING, OR REMOVING UTILITIES. THE ENGINEER HAS BEEN ADVISED THAT THOSE IN CONTROL OF UTILITIES NOT SHOWN ON THIS PLAN, SEE CHAPTER 20C, ACT 200A MASS. REGS. WE ASSUME NO LIABILITY FOR INACCURATELY SHOWN UTILITIES. THE ENGINEER HAS BEEN ADVISED THAT INAPPROPRIATE PUBLIC UTILITY ENGINEERING DEPARTMENT MUST BE CONSULTED. DG SAFE TELL. NO. 1-888-344-7233.

RECORD OWNER
M. CALVERT LUTHERAN CHURCH
ACTON, MASSACHUSETTS

REFERENCE
MIDDLESEX REGISTRY OF DEEDS
DEED BOOK 9618 PAGE 212
PLAN 859 OF 1960

DATUM
NATIONAL GEODETIC VERTICAL
DAUM OF 1928.

N/A
UNDEVELOPED
PARTNERSHIP

SUBCATCHMENT 1B
0.74 AC

SUBCATCHMENT 1A
0.94 AC

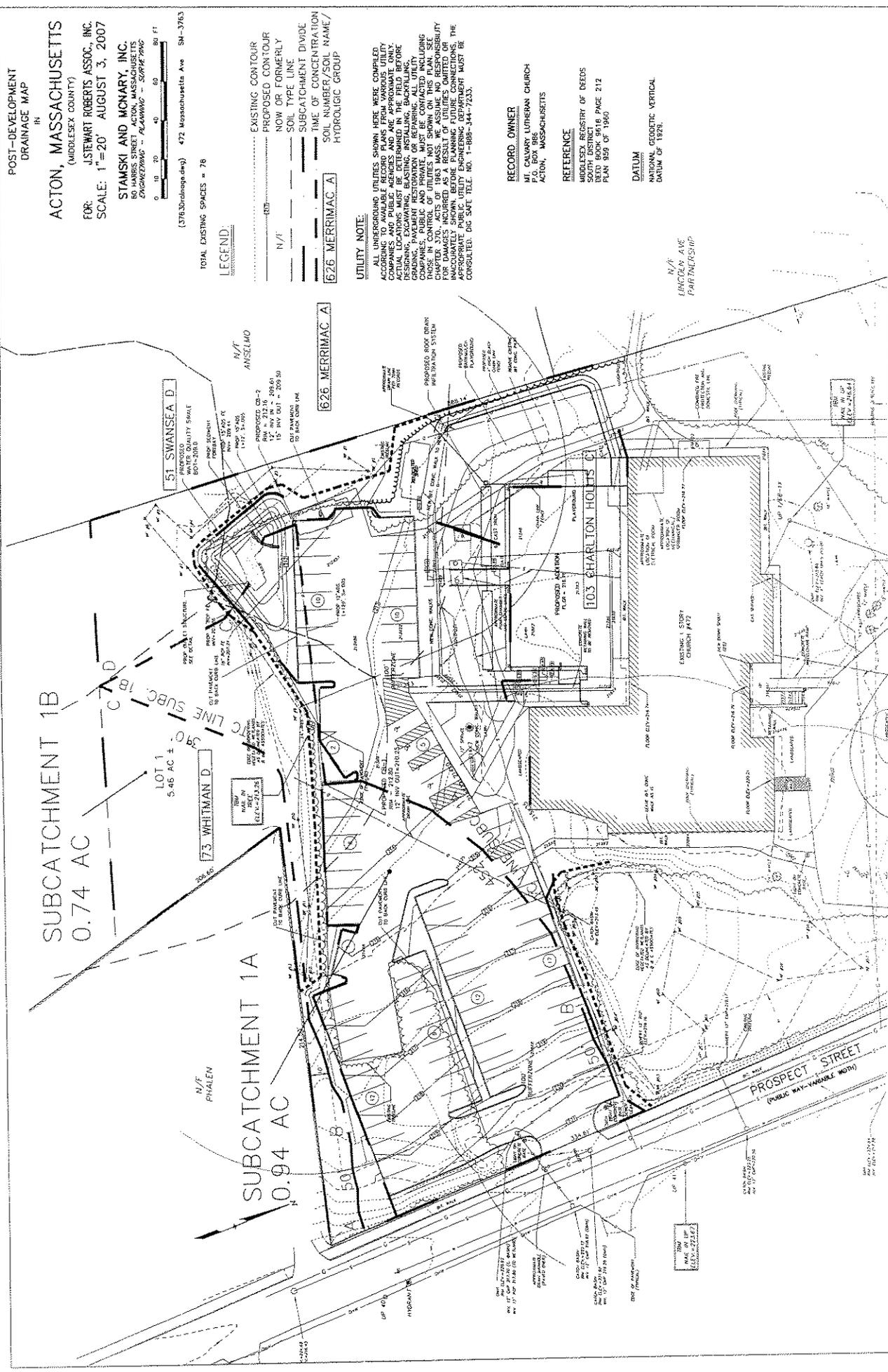
51 SWANSEA D
PROPOSED 12" DIA. STURCO
80%+ 20% B.C.

73 WHITMAN D
PROPOSED 12" DIA. STURCO
80%+ 20% B.C.

626 MERRIMAC A

103 CHARLTON HOLTS C
PROPOSED 12" DIA. STURCO
80%+ 20% B.C.

PROSPECT STREET
(PUBLIC WAY-VARIABLE WIDTH)



Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	SCS Runoff	---	---	2.18	---	---	3.50	---	---	5.27	POST 1A
2	SCS Runoff	---	---	0.61	---	---	1.38	---	---	2.59	POST 1B
3	Reservoir	1	---	1.64	---	---	3.31	---	---	5.25	BASIN 1 DISCHARGE
4	Combine	2, 3	---	2.25	---	---	4.69	---	---	7.65	Total Discharge

Worksheet 2: Runoff curve number and runoff

SM-3763

Project: MT. CALVARY LUTHERAN CHURCH By TJR Date 07/25/07
 Location: 472 MASSACHUSETTS AVENUE Checked _____ Date _____
 Circle one: Present Developed

1. Runoff curve number (CN)

Soil name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area Acres	Product of CN x Area
		Table 2-2a	Fig. 2-3	Fig. 2-4		
D WHITMAN	IMPERVIOUS (PAVEMENT)	98			0.07	6.49
D WHITMAN	OPEN SPACE, GOOD CONDITION	80			0.01	0.67
D SWANSEA	OPEN SPACE, GOOD CONDITION	80			0.00	0.35
C CHARLTON	WOODS, GOOD CONDITION	70			0.01	0.84
C CHARLTON	OPEN SPACE, GOOD CONDITION	74			0.15	11.14
C CHARLTON	IMPERVIOUS (PAVEMENT)	98			0.53	51.84
A MERRIMAC	OPEN SPACE, GOOD CONDITION	39			0.06	2.34
A MERRIMAC	IMPERVIOUS (PAVEMENT)	98			0.11	10.78
Totals =					0.94	84.46

1/ Use only one CN source per line.

$$CN \text{ (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{84.46}{0.94} = 89.79 ; \text{ Use CN} = \boxed{89.8}$$

2. Runoff

Frequency..... yr
 Rainfall, P (24-hour)..... in
 Runoff, Q..... in
 (Use P and CN with table 2-1, fig. 2-1,
 or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
2	10	100
3.1	4.5	6.5
2.06	3.37	5.31

D-2

(210-VI-TR-55, Second Ed., June 1986)

Worksheet 3: Time of Concentration (Tc) or travel time (Tt)

SM-3763

Project: MT. CALVARY LUTHERAN CHURCH By TJR Date 07/25/07

Location: 472 MASSACHUSETTS AVENUE Checked _____ Date _____

Circle one: Present Developed
 Circle one: Tc Tt _____

Sheet flow (Applicable to Tc only)

1. Surface Description (table 3-1)
2. Mannings roughness coeff., n (table 3-1)
3. Flow length, L (total L <= 300 ft)
4. Two-yr 24-hr rainfall, P2
5. Land Slope, s
6. $Tt = 0.007 (nL)^{0.8} / (P2^{0.5} s^{0.4})$

Compute Tt

Segment ID	AB		
	PAVED		
	0.011		
ft	50		
in	3.1		
ft/ft	0.04		
hr	0.01		0.01

Shallow concentrated Flow

7. Surface Description (paved or unpaved)
8. Flow Length, L
9. Watercourse slope, s
10. Average Velocity, V (figure 3-1)
11. $Tt = L / 3600V$

Compute Tt

Segment ID	BC	CD	
	PAVED	UNPAVED	
ft	380.61	71.11	
ft/ft	0.03	0.03	
ft/s	3.40	3.52	
hr	0.03	0.01	0.04

Channel flow

12. Cross sectional flow area, a
13. Wetted perimeter, wp
14. Hydraulic radius, $r=a/wp$
15. Channel Slope, s
16. Manning's roughness coeff., n
17. $V = 1.49 r^{2/3} s^{1/2} / n$
18. Flow length, L
19. $Tt = L / 3600V$

Compute r

Compute V

Compute Tt

Segment ID			
sf			
ft			
ft			
ft/ft			
ft/s			
ft			
hr			0.00

hr	0.10
min	6.0

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Wednesday, Aug 1 2007, 10:32 AM

Hyd. No. 1

POST 1A

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Drainage area = 0.94 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 3.10 in
Storm duration = 24 hrs

Peak discharge = 2.18 cfs
Time interval = 2 min
Curve number = 89.8
Hydraulic length = 0 ft
Time of conc. (Tc) = 6.0 min
Distribution = Type III
Shape factor = 484

Hydrograph Volume = 6,586 cuft
(Printed values >= 95% of Qp.)

Hydrograph Discharge Table

Time -- Outflow
(hrs cfs)

12.07 2.18 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Wednesday, Aug 1 2007, 10:32 AM

Hyd. No. 1

POST 1A

Hydrograph type	= SCS Runoff	Peak discharge	= 3.50 cfs
Storm frequency	= 10 yrs	Time interval	= 2 min
Drainage area	= 0.94 ac	Curve number	= 89.8
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.0 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 10,798 cuft

(Printed values >= 95% of Qp.)

Hydrograph Discharge Table

Time -- Outflow
(hrs cfs)

12.07 3.50 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Wednesday, Aug 1 2007, 10:32 AM

Hyd. No. 1

POST 1A

Hydrograph type	= SCS Runoff	Peak discharge	= 5.27 cfs
Storm frequency	= 100 yrs	Time interval	= 2 min
Drainage area	= 0.94 ac	Curve number	= 89.8
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.0 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 16,678 cuft

(Printed values >= 95% of Qp.)

Hydrograph Discharge Table

Time -- Outflow
(hrs cfs)

12.07 5.27 <<

...End

Worksheet 2: Runoff curve number and runoff

SM-3763

Project: MT. CALVARY LUTHERAN CHURCH By TJR Date 07/25/07
 Location: 472 MASSACHUSETTS AVENUE Checked _____ Date _____
 Circle one: Present Developed

1. Runoff curve number (CN)

Soil name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area Acres	Product of CN x Area
		Table 2-2a	Fig. 2-3	Fig. 2-4		
D WHITMAN	WOODS, GOOD CONDITION	77			0.30	22.91
D WHITMAN	OPEN SPACE, GOOD CONDITION	80			0.01	0.80
D SWANSEA	WOODS, GOOD CONDITION	77			0.10	7.70
C CHARLTON	WOODS, GOOD CONDITION	70			0.07	4.90
C CHARLTON	OPEN SPACE, GOOD CONDITION	74			0.15	11.10
C CHARLTON	IMPERVIOUS (PAVEMENT)	98			0.02	1.57
A MERRIMAC	WOODS, GOOD CONDITION	30			0.06	1.80
A MERRIMAC	OPEN SPACE, GOOD CONDITION	39			0.02	0.78
A MERRIMAC	IMPERVIOUS (PAVEMENT)	98			0.01	1.27
Totals =					0.74	52.83

1/ Use only one CN source per line.

$$CN \text{ (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{52.83}{0.74} = 71.73 ; \text{ Use CN} = \boxed{71.7}$$

2. Runoff

Frequency..... yr
 Rainfall, P (24-hour)..... in
 Runoff, Q..... in
 (Use P and CN with table 2-1, fig. 2-1,
 or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
2	10	100
3.1	4.5	6.5
0.85	1.80	3.38

Worksheet 3: Time of Concentration (Tc) or travel time (Tt)

SM-3763

Project: MT. CALVARY LUTHERAN CHURCH By TJR Date 07/25/07

Location: 472 MASSACHUSETTS AVENUE Checked _____ Date _____

Circle one: Present Developed
 Circle one: Tc Tt

Sheet flow (Applicable to Tc only)

1. Surface Description (table 3-1)
2. Mannings roughness coeff., n (table 3-1)
3. Flow length, L (total L <= 300 ft)
4. Two-yr 24-hr rainfall, P2
5. Land Slope, s
6. $Tt = 0.007 (nL)^{0.8} / (P2^{0.5} s^{0.4})$

Segment ID	AB		
	WOODS		
	0.4		
ft	50		
in	3.1		
ft/ft	0.13		
hr	0.10		0.10

Compute Tt

Shallow concentrated Flow

7. Surface Description (paved or unpaved)
8. Flow Length, L
9. Watercourse slope, s
10. Average Velocity, V (figure 3-1)
11. $Tt = L / 3600V$

Segment ID	BC		
	UNPAVED		
ft	310.18		
ft/ft	0.04		
ft/s	3.96		
hr	0.02		0.02

Compute Tt

Channel flow

12. Cross sectional flow area, a
13. Wetted perimeter, pw
14. Hydraulic radius, $r = a/wp$
15. Channel Slope, s
16. Manning's roughness coeff., n
17. $V = 1.49 r^{2/3} s^{1/2} / n$
18. Flow length, L
19. $Tt = L / 3600V$

Segment ID			
sf			
ft			
ft			
ft/ft			
ft/s			
ft			
hr			0.00

Compute r

Compute V

Compute Tt

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)

hr	0.12
min	7.2

*USE MANNINGS VALUE OF DENSE GRASS
 (210-VI-TR-55, Second Ed., June 1986)

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Wednesday, Aug 1 2007, 10:32 AM

Hyd. No. 2

POST 1B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.61 cfs
Storm frequency	= 2 yrs	Time interval	= 2 min
Drainage area	= 0.74 ac	Curve number	= 71.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 7.2 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 2,292 cuft

(Printed values >= 95% of Qp.)

Hydrograph Discharge Table

Time -- Outflow
(hrs cfs)

12.10	0.60
12.13	0.61 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Wednesday, Aug 1 2007, 10:32 AM

Hyd. No. 2

POST 1B

Hydrograph type	= SCS Runoff	Peak discharge	= 1.38 cfs
Storm frequency	= 10 yrs	Time interval	= 2 min
Drainage area	= 0.74 ac	Curve number	= 71.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 7.2 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 4,830 cuft

(Printed values >= 95% of Qp.)

Hydrograph Discharge Table

Time -- Outflow
(hrs cfs)

12.10	1.38 <<
12.13	1.36

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Wednesday, Aug 1 2007, 10:32 AM

Hyd. No. 2

POST 1B

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Drainage area = 0.74 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 6.40 in
Storm duration = 24 hrs

Peak discharge = 2.59 cfs
Time interval = 2 min
Curve number = 71.7
Hydraulic length = 0 ft
Time of conc. (Tc) = 7.2 min
Distribution = Type III
Shape factor = 484

Hydrograph Volume = 8,847 cuft

(Printed values >= 95% of Qp.)

Hydrograph Discharge Table

Time -- Outflow
(hrs cfs)

12.10 2.59 <<
12.13 2.52

...End

Pond Report

Hydraflow Hydrographs by Intelisolve

Wednesday, Aug 1 2007, 10:32 AM

Pond No. 1 - BASIN 1

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	209.50	485	0	0
0.50	210.00	746	308	308
1.50	211.00	1,121	934	1,241
2.50	212.00	1,428	1,275	2,516

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise (in)	= 15.00	0.00	0.00	0.00
Span (in)	= 15.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 207.94	0.00	0.00	0.00
Length (ft)	= 16.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	0.00	0.00	0.00
Crest El. (ft)	= 211.00	209.50	0.00	0.00
Weir Coeff.	= 3.33	0.80	3.33	0.00
Weir Type	= Riser	60 degV	—	—
Multi-Stage	= Yes	Yes	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	209.50	0.00	—	—	—	0.00	—	—	—	—	0.00
0.05	31	209.55	4.50	—	—	—	0.00	0.00	—	—	—	0.00
0.10	62	209.60	4.50	—	—	—	0.00	0.00	—	—	—	0.00
0.15	92	209.65	4.50	—	—	—	0.00	0.01	—	—	—	0.01
0.20	123	209.70	4.50	—	—	—	0.00	0.01	—	—	—	0.01
0.25	154	209.75	4.50	—	—	—	0.00	0.02	—	—	—	0.02
0.30	185	209.80	4.50	—	—	—	0.00	0.04	—	—	—	0.04
0.35	215	209.85	4.50	—	—	—	0.00	0.06	—	—	—	0.06
0.40	246	209.90	4.50	—	—	—	0.00	0.08	—	—	—	0.08
0.45	277	209.95	4.50	—	—	—	0.00	0.11	—	—	—	0.11
0.50	308	210.00	4.50	—	—	—	0.00	0.14	—	—	—	0.14
0.60	401	210.10	4.50	—	—	—	0.00	0.22	—	—	—	0.22
0.70	494	210.20	4.50	—	—	—	0.00	0.33	—	—	—	0.33
0.80	588	210.30	4.50	—	—	—	0.00	0.46	—	—	—	0.46
0.90	681	210.40	4.50	—	—	—	0.00	0.61	—	—	—	0.61
1.00	774	210.50	4.50	—	—	—	0.00	0.80	—	—	—	0.80
1.10	868	210.60	4.50	—	—	—	0.00	1.01	—	—	—	1.01
1.20	961	210.70	4.50	—	—	—	0.00	1.26	—	—	—	1.26
1.30	1,055	210.80	4.50	—	—	—	0.00	1.54	—	—	—	1.54
1.40	1,148	210.90	4.50	—	—	—	0.00	1.85	—	—	—	1.85
1.50	1,241	211.00	4.50	—	—	—	0.00	2.20	—	—	—	2.20
1.60	1,369	211.10	4.50	—	—	—	1.69	2.58	—	—	—	4.27
1.70	1,496	211.20	7.45	—	—	—	4.77	2.68	—	—	—	7.45
1.80	1,624	211.30	9.45	—	—	—	7.80	1.65	—	—	—	9.45
1.90	1,751	211.40	9.80	—	—	—	8.42	1.38	—	—	—	9.80
2.00	1,879	211.50	10.04	—	—	—	8.79	1.24	—	—	—	10.04
2.10	2,006	211.60	10.24	—	—	—	9.08	1.16	—	—	—	10.24
2.20	2,133	211.70	10.43	—	—	—	9.31	1.10	—	—	—	10.41
2.30	2,261	211.80	10.60	—	—	—	9.53	1.07	—	—	—	10.60
2.40	2,388	211.90	10.77	—	—	—	9.72	1.04	—	—	—	10.76
2.50	2,516	212.00	10.94	—	—	—	9.87	1.03	—	—	—	10.90

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Wednesday, Aug 1 2007, 10:32 AM

Hyd. No. 3

BASIN 1 DISCHARGE

Hydrograph type = Reservoir
Storm frequency = 2 yrs
Inflow hyd. No. = 1
Max. Elevation = 210.83 ft

Peak discharge = 1.64 cfs
Time interval = 2 min
Reservoir name = BASIN 1
Max. Storage = 1,086 cuft

Storage Indication method used.

Outflow hydrograph volume = 6,547 cuft

Hydrograph Discharge Table

(Printed values >= 95% of Qp.)

Time (hrs)	Inflow cfs	Elevation ft	Civ A cfs	Civ B cfs	Civ C cfs	Civ D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.10	1.96	210.81	4.50	----	----	----	----	1.58	----	----	----	1.58
12.13	1.56	210.83 <<	4.50	----	----	----	----	1.64	----	----	----	1.64 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Wednesday, Aug 1 2007, 10:32 AM

Hyd. No. 3

BASIN 1 DISCHARGE

Hydrograph type = Reservoir
Storm frequency = 10 yrs
Inflow hyd. No. = 1
Max. Elevation = 211.05 ft

Peak discharge = 3.31 cfs
Time interval = 2 min
Reservoir name = BASIN 1
Max. Storage = 1,310 cuft

Storage Indication method used.

Outflow hydrograph volume = 10,759 cuft

(Printed values >= 95% of Qp.)

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.10	3.13	211.05 <<	4.50	---	---	---	0.91	2.40	---	---	---	3.31 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Wednesday, Aug 1 2007, 10:32 AM

Hyd. No. 3

BASIN 1 DISCHARGE

Hydrograph type	= Reservoir	Peak discharge	= 5.25 cfs
Storm frequency	= 100 yrs	Time interval	= 2 min
Inflow hyd. No.	= 1	Reservoir name	= BASIN 1
Max. Elevation	= 211.13 ft	Max. Storage	= 1,408 cuft

Storage Indication method used.

Outflow hydrograph volume = 16,639 cuft
(Printed values >= 95% of Qp.)

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Civ A cfs	Civ B cfs	Civ C cfs	Civ D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
2.07	5.27 <<	211.13 <<	5.41	---	---	---	2.64	2.61	---	---	---	5.25 <<
...End												

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Wednesday, Aug 1 2007, 10:32 AM

Hyd. No. 4

Total Discharge

Hydrograph type = Combine
Storm frequency = 2 yrs
Inflow hyds. = 2, 3

Peak discharge = 2.25 cfs
Time interval = 2 min

Hydrograph Volume = 8,839 cuft

(Printed values >= 95% of Qp.)

Hydrograph Discharge Table

Time (hrs)	Hyd. 2 + (cfs)	Hyd. 3 = (cfs)	Outflow (cfs)
12.10	0.60	1.58	2.18
12.13	0.61 <<	1.64 <<	2.25 <<

..End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Wednesday, Aug 1 2007, 10:32 AM

Hyd. No. 4

Total Discharge

Hydrograph type = Combine
Storm frequency = 10 yrs
Inflow hyds. = 2, 3

Peak discharge = 4.69 cfs
Time interval = 2 min

Hydrograph Volume = 15,589 cuft

(Printed values >= 95% of Qp.)

Hydrograph Discharge Table

Time (hrs)	Hyd. 2 + (cfs)	Hyd. 3 = (cfs)	Outflow (cfs)
12.10	1.38 <<	3.31 <<	4.69 <<

..End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Wednesday, Aug 1 2007, 10:32 AM

Hyd. No. 4

Total Discharge

Hydrograph type = Combine
Storm frequency = 100 yrs
Inflow hyds. = 2, 3

Peak discharge = 7.65 cfs
Time interval = 2 min

Hydrograph Volume = 25,486 cuft

(Printed values >= 95% of Qp.)

Hydrograph Discharge Table

Time (hrs)	Hyd. 2 + (cfs)	Hyd. 3 = (cfs)	Outflow (cfs)
12.07	2.40	5.25 <<	7.65 <<
12.10	2.59 <<	4.94	7.52

..End



Water Quality Volume Calculations

Water Quality Calculations:

SHEET 1

Project: Mount Calvary Church

By JEM Date 08/01/07

Location: ACTON, MA

Checked _____ Date _____

Storage

Impervious: 30,928 sf
 Required Water Quality Volume(1/2"): 1,237 cf

Filtration

Filtration rate w/ 6" Sand (Est.) = 8.27 in/hr
 1.91E-04 cfs/sf

Stormwater Basin 1
 Water Quality Swale

filtration time = 24 hrs
 Filter Area = 224 sf
 Volume = 1,482 cf

ELEV	Area sf	Cumm Volume cf
209	224	0
209.5	624	212

Storage Volume = 212

Storage Volume	+	Filtered Volume	=	Treated Volume		
212	+	1,482	=	1,694	>	1,237 OK

Storm Sewer Design

COMPUTED BY: TJR
 DESIGN STORM: 10 YEAR

DATE: 07/26/07

STORM SEWER DESIGN

(PVC)"n"=0.01
 (RCP)"n"=0.013
 (CI)"n"= 0.013

PROJECT: SM-3763
 LOCATION: CONCORD,MA

FROM	TO	LENGTH (FT)	TRIBUTARY AREA		TIME OF FLOW	RUNOFF COEFF. "C"	RAINFALL INTENSITY (IN/HR)	"Q" TOTAL RUNOFF (CFS)	SLOPE of PIPE (F/FT)	DIAM (IN)	MANN. "n"	CAPACITY FULL (CFS)	VELOCITY FULL (FPS)	DESIGN FLOW		TOTAL ENERGY HEAD (FT)	MANHOLE INVERT DROP (FT)	FALL IN PIPE (FT)	DRAIN INV. ELEVATION		GROUND SURFACE	
			INCR. (ACRES)	TOTAL (ACRES)										UPPER END (MIN)	TO SECTION (MIN)				VELOCITY HEAD (FT)	DEPTH OF FLOW (FT)	UPPER END	LOWER END
CB-1	CB-2	129			ERR		2.30	0.005	12	0.012	2.72	3.47	ERR	ERR	ERR	ERR	ERR	0.64	210.25	209.61	212.80	212.60
CB-2	BASIN-1	12			ERR	3.50	3.50	0.005	15	0.012	4.94	4.03	ERR	ERR	ERR	ERR	ERR	0.06	209.50	209.44	212.60	212.60

Infiltration Trench/Chamber

ROOF DRAIN INFILTRATION CALCULATIONS

JOB #: 3763

Calculated by: JEM
Date: 08/03/07

Proposed Building Area = 5895 S.F.

Building CN = 98

100 Yr Runoff Depth = 6.26"

100 Yr Runoff Volume = Runoff Depth x Building Area
= (6.26")/12 x 5895 S.F. = 3075 C.F.

Roof Drain Infiltration System

2 Cultec Infiltration Trenches (40' L x 5' W x 1.5' D)

Infiltrative Surface Area = $2 \times [40 \times (5 + 1.5 + 1.5)] = 640$ S.F.

Soil type = Charlton Hollis - Sandy Loam Soil

Assume 10 min/in Perc Rate

Daily Infiltration Rate = $1 \text{ in/min} \times 1 \text{ ft}/12 \text{ in} \times 60 \text{ min}/1 \text{ hr} \times 24 \text{ hrs}/1 \text{ day} = 12 \text{ ft/day}$

Infiltration Volume = $12 \text{ ft/day} \times 640 \text{ S.F.} = 7680 \text{ C.F./day}$

7680 C.F. . 3075 C.F.

OK

STORMWATER MANAGEMENT POLICY COMPLIANCE STANDARD 3 - RECHARGE TO GROUNDWATER

All new impervious in Charlton-Hollis (Hydrologic Group-C)

Recharge rate required: 0.1 inches

Total New Impervious (Building, Additional walkways & parking) = 6,766 sf

Required Recharge Volume = $6,766 \times 0.1/12 = 56$ cf

Roof Runoff Volume = $5,895 \text{ sf} \times 0.5 \text{ inch}/12 = 245 \text{ cf} > 56 \text{ cf}$ (OK)

Attachment E
Site Plan
Sheets 1 thru 2