Northbridge Assisted Living at Mashpee Commons
68 Great Neck Road, South
Mashpee, MA
Development of Regional Impact
Application to the Cape Cod Commission

1. Cape Cod Commission Application Cover Sheet
2. Deed
3. Owner Authorization Letter
4. Certified List of Abutters
5. Filing Fee (under separate cover)
6. Energy Star Builder Option Package
7. Massachusetts Historical Commission Project Notification Form
8. Detailed Project Description/Regional Policy Plan Standards
9. Written Design Narrative
10. Traffic Impact Analysis
11. LEED Certifiability Narrative
12. Nitrogen Loading
13. 21E Site Assessment (separate document)
14. Stormwater Report (Separate Document)
15. Erosion Sedimentation Control Plan
16. Massachusetts Endangered Species Act No Take Determination
17. Project Employment and Economic Impact Report
18. Mashpee Commons WWTF Consent Correspondence
19. Estimated Title 5 Flow Rate
20. Affirmative Action Marketing and Tennant Selection Plan
21. Information on Solid and Hazardous Waste
22. Natural Resource Inventory
23. Landscape Maintenance Plan
24. Integrated Pest Management Plan
25. Mashpee Wastewater Treatment Facility Discharge Reports
26. Permits or Actions
27. Executed Mashpee Selectmen Resolution ED1.3
28. Mashpee Water District Service Request
29. Lighting Fixture Detail sheets

Plans Listed on Next Page

A. Site/Civil Landscaping Plans

G-100 Title Sheet
V-100 Existing Conditions Plan
C-100 Layout and Materials Plan
C-101 Grading and Drainage Plan
C-102 Utility Plan
C-103 Erosion and Sedimentation Control Plan
C-200-203 Construction Details
L-100 Landscape Plan
L-101 Landscape Details

B. Architectural/Lighting Plans

A-1.1 First Floor Plans
A-1.2 Second Floor Plans
A-1.R Roof Plan
A-3.1 Exterior Elevations
A-3.2 Exterior Elevations
A-3.3 Exterior Elevations
A-3.4 Enlarged Elevations
A-4.1 Building Sections
L-1 Lighting Plan
L-2 Photometric Plan

Application Cover Sheet

Cape Cod Commission
3225 Main Street, PO Box 226
Barnstable, MA 02630
Tel: (508) 362-3828 • Fax: (508) 362-3136

For Commission Use Only

Date Received:
Fee ($):
Check No:
File No:

A Type of Application (check all that apply)

- [X] Development of Regional Impact (DRI)
- [ ] Hardship Exemption
- [ ] Limited DRI Review
- [ ] Jurisdictional Determination
- [ ] DRI Exemption
- [ ] Request for Joint MEPA/DRI Review

B Project Information

Project Name: Mashpee Commons Assisted Living

Total Site Acreage: 3.64 Acres

Project/Property Location: 68 Great Neck Road, Mashpee

Zoning: Commercial C-1

Brief Project Description:

Include total square footage of proposed and existing development, gross floor area, number of lots existing or to be created, specific uses, description of existing conditions, as applicable (attach additional sheets if necessary).

See Attached

C Owner(s) of Record

List the following information for all involved parcels. Provide copies of each Deed and Purchase and Sale Agreement and/or evidence of leasehold interest, if applicable, for all involved parcels. Proof of ownership/legal rights for Applicant(s) to proceed with the proposed development must be documented prior to the Commission deeming any application complete (attach additional sheets if necessary).

Map/Parcel	Owner's Name	Lot & Plan	Land Court Certificate of Title #	Registry of Deeds Book/Page #
See Attached				

There **ARE/ARE NOT** (circle one) court claims, pending or completed, involving this property (if yes, please attach relevant information).

XXXX

D Certification

I hereby certify that all information provided on this application form and in the required attachments is true and accurate to the best of my knowledge. I agree to notify the Cape Cod Commission of any changes on the information provided in this application, in writing, as soon as is practicable. I understand failure to provide the required information and any fees may result in a procedural denial of my project.
NOTE: For wireless communication facilities, a licensed carrier should be either an applicant or a co-applicant.

APPLICANT

Applicant(s) Name: The Northbridge Companies Tel: 781-272-2424 Fax: 781-272-0846

Address: 71 Third Avenue, Burlington, MA 01803

Signature: _____ Date: _____

CO-APPLICANT

Co-Applicant(s) Name: _____ Tel: _____ Fax: _____

Address: _____

Signature: _____ Date: _____

CONTACT

Contact: BSC Group Tel: 617-896-4510 Fax: _____

Address: c/o Russell Burke, 33 Waldo Street Worcester, MA 01608

Signature: _____ Date: _____

PROPERTY OWNER

Property Owner: GNRS-MA LLC Tel: _____ Fax: _____

Address: 46 Aborn Street, 4th Floor, Providence, RI 02903

Signature: _____ Date: _____

BILLABLE ENTITY

Name: The Northbridge Companies Tel: 781-272-2424 Fax: 781-272-0846

Address: 71 Third Avenue, Burlington, MA 01803

REQUIRED FILING MATERIALS

The following must be attached to the Application Form at the time of its filing:

- ☐ Certified List of Abutters (required for all application types except Attachment 5, Jurisdictional Determination). A list of abutting property owners within 300 feet of the boundaries of the development site and their addresses. Include both local and off-Cape addresses when applicable.
  - ☐ This list **must** be formatted in three columns consistent with the Standard Label Format designed to print on Avery Labels #5160.
  - ☐ List must be certified by the Town Assessor's office. Note: Assessor's offices may take up to 10 days to certify an abutter's list.
  - ☐ If there are more than 50 abutters, applicants must provide **three sets** of the certified list on self-adhesive labels.

- ☐ Required Filing Fee. Please calculate according to the Schedule of Fees (see Enabling Regulations, Section 14). Please make check payable to **BARNSTABLE COUNTY TREASURER.**

- ☐ An 8 1/2"x 11" copy of the U.S.G.S. quadrangle map of the area, containing sufficient information for the Commission to locate the site of the proposed development.

- ☐ Development Plans. File as required for each application type you are making. See list of Attachment(s) below for specific instructions.

- ☐ Permits or Actions. List of local, state, or federal agencies or boards from which a permit or other actions have, will, or may need to be sought. Include agency/board name, type of permit, date filed, and file number. If one of the listed permits or actions requires the filing of an Environmental Notification Form under the Massachusetts Environmental Policy Act (MEPA), please contact the Commission's Chief Regulatory Officer to discuss the potential for joint Commission and MEPA review. For information on MEPA regulations contact the Executive Office of Energy and Environmental Affairs, MEPA Unit, at (617) 626-1020. Please attach all relevant MEPA documents and describe the status of the MEPA filing.

Applicants must also submit the necessary attachment(s) based on the type of application(s) being made:

Attachment 1:	DRI Application Filing Procedures & Requirements
Attachment 2:	DRI Exemption Application Filing Procedures & Requirements
Attachment 3:	Hardship Exemption Application Filing Procedures & Requirements
Attachment 4:	Limited DRI Review Application Filing Procedures & Requirements
Attachment 5:	Jurisdictional Determination Application Filing Procedures & Requirements
Attachment 6:	Joint MEPA/DRI Review Application

Northbridge at Mashpee Commons

Project Description

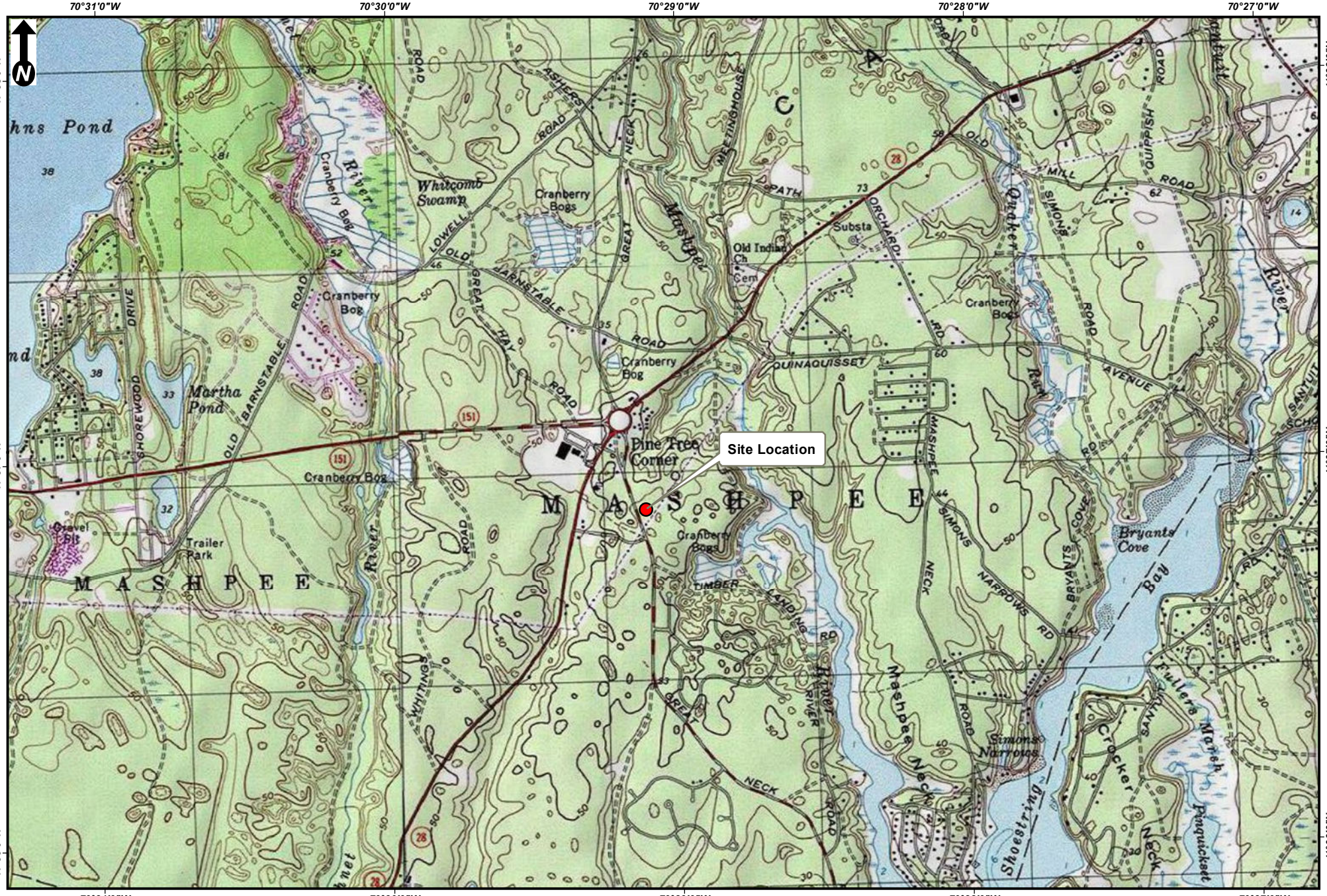
The proposed project is located on a wooded vacant site at 68 Great Neck Road South in Mashpee, Massachusetts. The site is abutted by a vacant parcel to the north, the Mashpee Water District Waste water treatment facility to the east, an Eversource electric transmission line in a 210 foot wide ROW on property to the south, and Great Neck Road South to the west. The site area is 3.645 acres in size (158,760 square feet).

The proposed building foot print is 0.82 acres (35, 724 square feet) with paved areas for parking driveways, sidewalks, and courtyards totaling 0.99 acres (43,529 square feet) representing a total impervious lot coverage of 1.82 acres (79, 253 square feet).

The project proposes the construction of an Assisted Living Facility in a two story structure containing a gross floor area of 64,826 square feet. The building specifications are shown in the following table:

Northbridge at Mashpee Commons			
FLOOR AREA			
32,994 S.F. First Floor			
31,832 S.F. Second Floor			
64,826 S.F. TOTAL			
UNIT MIX: ASSISTED LIVING			
Studio (Single Occupancy)	7 Apartments		
One Bedroom (Single Occupancy)	37 Apartments		
Shared (Double Occupancy)	8 Apartments		
TOTAL ASSISTED LIVING	*52 Apartments (60 beds)*		
MEMORY SUPPORT			
Studio (Single Occupancy)	13 Apartments		
One Bedroom (Single Occupancy)	1 Apartment		
Shared (Double Occupancy)	4 Apartments		
TOTAL MEMORY SUPPORT	*18 Apartments (22 beds)*		
TOTAL APARTMENTS COMBINED	*70 Apartments*		
TOTAL BEDS COMBINED	*82 Beds*		
AREA ANALYSIS			
	Assisted Living	Memory Support	Combined
Leasable	27,205 SF (53%)	6,797 SF (50%)	34,002 SF (52%)
Commons	8,048 SF (16%)	3,161 SF (23%)	11,209 SF (18%)
Administration	1,125 SF (2%)		1,125 SF (2%)
Service	4,337 SF (8%)	1,026 SF (8%)	5,363 SF (8%)
Circulation	10,417 SF (20%)	2,710 SF (19%)	13,127 SF (20%)
Gross Area	***51,132 SF***	***13,694 SF***	***64,826 SF***

Document Path: G:\GISPrj\2321600\Output\Maps\MXD\ReportMaps\NorthbridgeCommons_USGSLocus_20140623.mxd
Date Saved: 6/23/2014 10:03:40 AM



Scale:
1 inch = 2,000 feet
(page size: 8.5 X 11)

0 1,000 2,000
Feet

NORTHBRIDGE MASHPEE COMMONS

USGS Site Location Map
Mashpee, MA

Source: USGS, 1982-1990; MADOT, 2005; MassGIS, 2008

BSC GROUP

THIS DOCUMENT IS INTENDED FOR GENERAL PLANNING & INFORMATION PURPOSES ONLY. ALL MEASUREMENTS & LOCATIONS ARE APPROXIMATE

Bk 27029 Pg15 #2092
01-10-2013 @ 10:43a

After recording return to:
DarrowEverett LLP
One Turks Head Pl
Suite 1200
Providence, RI 02903

Plan Book 647 Page 94

Property Address:
Vacant land at Great Neck Road South, Mashpee, MA

MASSACHUSETTS QUITCLAIM DEED

I, ARNOLD B. CHACE, JR., of 46 Aborn Street, Providence, Rhode Island 02903 County, Massachusetts for the consideration of One Dollar ($1.00)

grant to GNRS-MA LLC, a Massachusetts limited liability company having a mailing address of 46 Aborn Street, 4th Floor, Providence, RI 02903,

with QUITCLAIM COVENANTS the following parcels of land:

Parcel I

That certain parcel of land situated in the Town of Mashpee, Barnstable County, Massachusetts, bounded and described as follows:

BEGINNING at a stake on the Great Neck Road "so-called" and at southwest corner of land now or formerly of Lydia Keeter;

THENCE Northerly by said road to the junction of Great Neck Road with Jobs Road "so-called";

THENCE Easterly across Jobs Road to land now or formerly of Matthias Amos;

THENCE Southeasterly to land now or formerly of Lydia Keeter;

THENCE Westerly by land now or formerly of Lydia Keeter to the first mentioned bound.

For title see deed of Carleton H. Collins and Erdine F. Swain to Arnold B. Chace, Jr. dated December 5, 1980, recorded in Barnstable County Registry of Deeds Book 3204 Page 279.

Parcel II

That certain parcel of land situated in the Town of Mashpee, Barnstable County, Massachusetts, bounded and described as follows:

NORTHERLY by land now or formerly of Arnold B. Chace, Jr., four hundred eighteen and 76/100 (418.76) feet;

NORTHEASTERLY by land now or formerly of Arnold B. Chace, Jr., two hundred eighty-six and 80/100 (286.80) feet;

SOUTHEASTERLY by land now or formerly of Arnold B. Chace, Jr., six hundred thirty-four and 82/100 (634.82) feet; and

WESTERLY by Great Neck Road, six hundred four and 17/100 (604.17) feet.

Said premises contain approximately 4.93 acres, as shown as Parcel 1A on a plan of land entitled "Plan of Land in Mashpee, Mass. for Bonita Trust, River Road Trust, Arnold B. Chace Jr., & Horizon Trust", dated May 29, 1985 and revised June 18, 1985, drawn by Baxter & Nye, Inc., Registered Land Surveyors, and recorded at the Barnstable County Registry of Deeds in Plan Book 400, Page 40.

Being the premises conveyed to the Grantor herein by Theodore A. Schilling by deed dated December 30th, 1986 and recorded at the Barnstable County Registry of Deeds in Book 5489, Page 138.

Said Parcel I and Parcel II being shown and designated as Lot 1, Lot 2, Lot 3 and Lot 4 on that plan entitled "Plan of Land at Great Neck Road South Mashpee, Massachusetts Prepared For Arnold B. Chace, Jr., prepared by BSS Design Engineering & Surveying, 164 Katharine Lee Bates Road, Falmouth Massachusetts 02540 dated November 27, 2012 and recorded herewith.

The consideration for this deed is such that no documentary stamps are required.

WITNESS MY HAND THIS 9TH DAY OF JANUARY, 2013.

Arnold B. Chace, Jr.

State of Rhode Island
County of Providence ss.

On this 9th day of January, 2013, before me, the undersigned notary public, personally appeared Arnold B. Chace, Jr., proved to me through satisfactory identification, which was personal knowledge, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed it voluntarily for its stated purpose.

Name:
My Commission Expires:

JOSEPH A. ENRIQUEZ NOTARY PUBLIC REG. # 753620 MY COMMISSION EXPIRES 1/03/2016 STATE OF RHODE ISLAND

State of Rhode Island
Joseph A. Enriquez - Notary Public
Commission No. 753620
My Commission Expires 1/03/2016

August 18, 2015

Town of Mashpee
16 Great Neck Road North
Mashpee, MA 02649

Cape Cod Commission
325 Main Street
Barnstable, MA 02630

RE: Mashpee Commons Assisted Living Facility
68 Great Neck Road South
Mashpee, MA Barnstable County
Parcel ID 74-27-0

Ladies and Gentlemen:

GNRS-MA LLC is the owner of the above referenced property which is further described in the deed recorded with the Barnstable County Registry of Deeds in Book 27029, Page 15. GNRS-MA LLC has entered into a purchase and sale agreement to sell the property to the Northbridge Companies for the development of an assisted living facility.

Please let this letter serve as the owner's authorization, subject to the terms and provisions of the purchase and sale agreement, to submit any and all applications to the Town of Mashpee and the Cape Cod Commission, and to pursue, negotiate, and obtain any and all permits/approvals for the development of an assisted living facility on the property.

Yours truly,

GNRS-MA LLC

By Arnold B. Chace Jr.

Name: Arnold B. Chace Jr.

Title: _____

Resubmission BOA:

RECEIVED
JUN 15 2015
BOARD OF ASSESSORS
OF MASHPEE

RECEIVED
JUN 25 2014
BOARD OF ASSESSORS
OF MASHPEE

TOWN OF MASHPEE BOARD OF ASSESSORS
16 Great Neck Rd North, Mashpee, MA 02649
Phone # (508) 539-1404
Fax # (508) 539-1142
e-mail: assessing@mashpeema.gov

REQUEST FOR ABUTTERS LIST

Please note that the Assessing Dept. will respond to this request within ten (10) business days.

ABUTTERS TO: MAP 74 PARCEL 27 Per e-mail 20 EXT 0

ADDRESS OF SUBJECT PARCEL: 68 Great Neck Rd

PLEASE CHECK THE TYPE OF ABUTTERS LIST THAT YOU ARE REQUESTING:
(Refer to requirements of the regulating authority requiring abutters list.)

_____ DIRECT ABUTTERS — Check box if this abutters list is for the Cape Cod Commission: ☑

_____ ALL PARCELS **WITHIN A 100 FOOT** RADIUS OF SUBJECT (usual for Conservation Commission & Historical Commission)

__X__ ALL PARCELS **WITHIN A 300 FOOT** RADIUS OF SUBJECT.

_____ ABUTTERS **TO THE ABUTTERS** WITHIN A 300 FOOT RADIUS OF SUBJECT

_____ OTHER (SPECIFY) _____

◄ ALL ABUTTERS LISTS ARE PRINTED WITH A MAP ON 8 ½ x 11 PAPER ►

• Standard mailing labels of abutters are available for an extra charge of $1.00 per page. (full or partial)

LABELS ___Yes_____ (YES or NO) NUMBER OF SETS OF LABELS 3 Per (e-mail) 3 @ CC Comm 3 @ Planning

REQUESTED BY: *(PLEASE PRINT)*

NAME: Russell J. Burke
BSC Group

ADDRESS: 33 Waldo St, Worcester, MA 01608

PHONE: 617-896-4510

DATE: June 13, 2015 (June 25, 2014)

SIGNATURE: Russell J. Burke

FEES:			QUANTITY	
	BASIC ABUTTERS LIST (one subject parcel)	5.00	1	$5.00
	MAILING LABELS		18	$1.00 PER PAGE 3 sets
	COMPLEX ABUTTERS LIST (multiple subject parcels)		____	$10.00 – $50.00 (varies by processing time)

TOTAL AMOUNT DUE: $ 23.00

Town of Mashpee

16 Great Neck Road North
Mashpee, Massachusetts 02649

Hours: Mon. - Fri., 8:30am - 4:30pm
Phone: (508) 539-1404
FAX: (508)-539-1142

Assessing Department
Jason R. Streebel, MAA
Director of Assessing

June 16, 2015

BSC Group
33 Waldo St.
Worcester, MA 01608

Attention: Russell J. Burke

To Whom It May Concern:

This letter certifies the attached abutter's list you requested for Map 74-27-0 with the property location of 68 Great Neck Rd. South in Mashpee. The Abutters list included herein lists all property owners within 300' of the property lines as established by the most recent tax list.

If you need any further information, please do not hesitate to contact our office.

Sincerely,

Susan Derome

Susan Derome
Principal Clerk

Cc: Gail Hanley
Cape Cod Commission
3225 Main Street
P.O. Box 226
Barnstable, MA 02630

Abutters to: 74-27-0

Certified by: Susan L Devine

TOWN OF MASHPEE, MA
BOARD OF ASSESSORS
16 Great Neck Rd., North, Mashpee, MA 02649

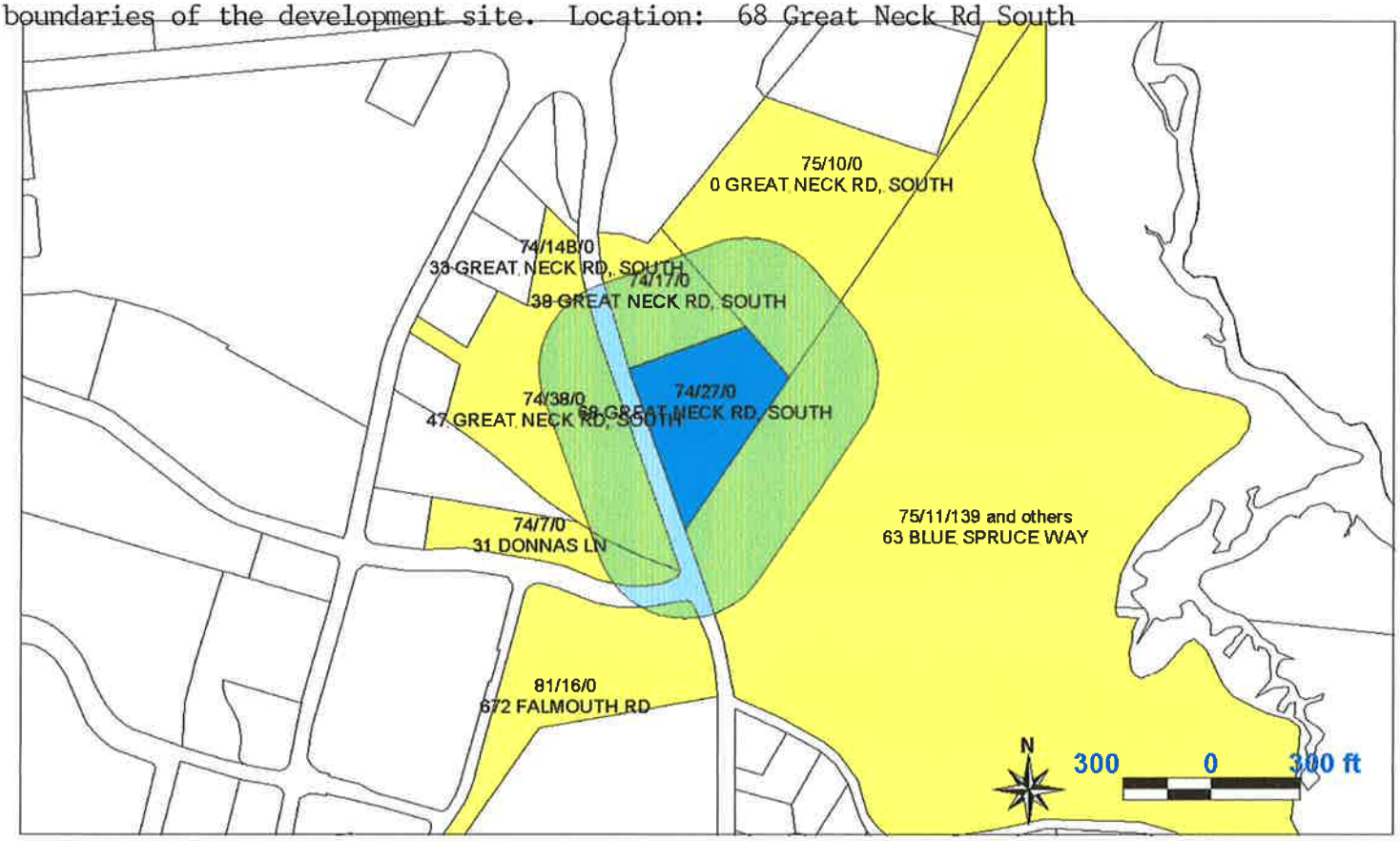
Date: June 16, 2015

CAPE COD COMMISSION ABUTTER'S LIST
Abutting property owners within 300 feet of the

Number of Abutters: 164

Abutters List Within 300 feet of Parcel 74/27/0

boundaries of the development site. Location: 68 Great Neck Rd South



Key	Parcel ID	Owner	Location	Mailing Street	Mailing City	ST	ZipCd/Country
6075	81-16-0-R	MASHPEE INVESTORS LLC C/O DPF MASHPEE LLC	672 FALMOUTH RD	518 17TH STREET - 17TH FLOOR	DENVER	CO	80202
5523	74-7-0-R	MASHPEE COMMONS L P	31 DONNAS LN	PO BOX 1530	MASHPEE	MA	02649
5542	74-38-0-R	MASHPEE COMMONS L P	47 GREAT NECK RD, SOUTH	PO BOX 1530	MASHPEE	MA	02649
5547	74-14B-0-R	HARDIGAN, JULIE TRUSTEE CB & G REALTY TRUST II	33 GREAT NECK RD, SOUTH	72 MAIN ST	BRIDGEWATER	MA	02324
5527	74-17-0-R	GNRS-MA LLC	38 GREAT NECK RD, SOUTH	46 ABORN STREET 4TH FLOOR	PROVIDENCE	RI	02903
5532	74-27-0-R	GNRS-MA LLC	68 GREAT NECK RD, SOUTH	46 ABORN STREET 4TH FLOOR	PROVIDENCE	RI	02903
5552	75-10-0-R	MASHPEE COMMONS L P	0 GREAT NECK RD, SOUTH	P O BOX 1530	MASHPEE	MA	02649
5553	75-11-0-E	WINDCHIME POINT DEV GROUP LP	90 GREAT NECK RD, SOUTH	397 NORTH STREET	HYANNIS	MA	02601
5554	75-11-1-R	FITZGERALD, ARLENE J TR ARLENE J FITZGERALD NOMINEE TR	1 BOBWHITE CRESCENT	PO BOX 1893	MASHPEE	MA	02649
5555	75-11-2-R	FOLEY, ROBERT D TRUSTEE ROBERT D FOLEY TRUST	2 BOBWHITE CRESCENT	2 BOBWHITE CRESCENT	MASHPEE	MA	02649
5556	75-11-3-R	CURLEY, SUSAN M	3 BOBWHITE CRESCENT	3 BOBWHITE CRESCENT	MASHPEE	MA	02649
5557	75-11-4-R	CONNELLY, CAROL A	4 BOBWHITE CRESCENT	4 BOBWHITE CRESCENT	MASHPEE	MA	02649-3401
5558	75-11-5-R	FORDE, JOAN MARGARET	5 BOBWHITE CRESCENT	5 BOBWHITE CRESCENT	MASHPEE	MA	02649
5559	75-11-6-R	VERNOVSKY, ILYA & TATYANA	6 BOBWHITE CRESCENT	655 SAW MILL BROOK PKWY #10	NEWTON	MA	02459
5560	75-11-7-R	BAGGETT, WALTER O & SHORTRIDGE BAGGETT, LILLIE M	7 BOBWHITE CRESCENT	7 BOBWHITE CRESCENT	MASHPEE	MA	02649-3560

Subject

Key	Parcel ID	Owner	Location	Mailing Street	Mailing City	ST	ZipCd/Country
5561	75-11-8-R	ROBINSON, RUTH LIFE ESTATE	8 BOBWHITE CRESCENT	8 BOBWHITE CRESCENT	MASHPEE	MA	02649
5562	75-11-9-R	SCANLON, ERIKA R	9 BOBWHITE CRESCENT	9 BOBWHITE CRESCENT	MASHPEE	MA	02649
5563	75-11-10-R	PROOS, EILEEN	10 BOBWHITE CRESCENT	10 BOBWHITE CRESCENT	MASHPEE	MA	02649
5564	75-11-11-R	TRACZYK, ARTHUR P ET AL TRS APT REALTY TRUST	11 BOBWHITE CRESCENT	11 BOBWHITE CRESCENT	MASHPEE	MA	02649
5565	75-11-12-R	JONAH, MICHAEL H & SHERYL J	12 BOBWHITE CRESCENT	229 MILLBROOK DRIVE	EAST LONGMEADOW	MA	01028
5566	75-11-13-R	LAGRIPPE, ANNE M	13 BOBWHITE CRESCENT	180 BEACON ST, APT 16A	BOSTON	MA	02116
5567	75-11-14-R	DEBARROS, DOMINGO K & DIOSA A	14 BOBWHITE CRESCENT	14 BOBWHITE CRESCENT	MASHPEE	MA	02649
16405	75-11-15-R	ST PIERRE, VINI & MARY TRUSTEE ST PIERRE MASHPEE REALTY TRUST	84 BLUE SPRUCE WAY	84 BLUE SPRUCE WAY	MASHPEE	MA	02649
16406	75-11-16-R	ELD, ALICE R LIFE ESTATE	82 BLUE SPRUCE WAY	82 BLUE SPRUCE WAY	MASHPEE	MA	02649
16407	75-11-17-R	SAVIOLI, FRANCES M	80 BLUE SPRUCE WAY	PO BOX 2293	MASHPEE	MA	02649
16408	75-11-18-R	CONNOLLY, FRANK R & SHEILA C	78 BLUE SPRUCE WAY	78 BLUE SPRUCE WAY	MASHPEE	MA	02649
16409	75-11-19-R	FEBEO, KAREN L	76 BLUE SPRUCE WAY	96 GAINSBOROUGH ST UNIT #203W	BOSTON	MA	02115
16410	75-11-20-R	JAYES, ROBERT L & DOROTHY J TR JAYES FAMILY TRUST	74 BLUE SPRUCE WAY	74 BLUE SPRUCE WAY	MASHPEE	MA	02649
16411	75-11-21-R	HOPKINS, JOHN E TR JOHN E HOPKINS REVOCABLE TRUST	72 BLUE SPRUCE WAY	72 BLUE SPRUCE WAY	MASHPEE	MA	02649
16412	75-11-22-R	APFEL, PAUL & BEATRICE	70 BLUE SPRUCE WAY	70 BLUE SPRUCE WAY	MASHPEE	MA	02649
16413	75-11-23-R	LYON, JANET L	68 BLUE SPRUCE WAY	68 BLUE SPRUCE WAY	MASHPEE	MA	02649
16437	75-11-24-R	CROCKER, FREDERICK & MAGDA	66 BLUE SPRUCE WAY	66 BLUE SPRUCE WAY	MASHPEE	MA	02649
16438	75-11-25-R	BISHOP, CHARLES O & BISHOP, JANE NICHOLS	64 BLUE SPRUCE WAY	64 BLUE SPRUCE WAY	MASHPEE	MA	02649
17102	75-11-26-R	SPEROU,L CHALAT T	89 BLUE SPRUCE WAY	57 BRIDLE PATH	SUDBURY	MA	02271
17107	75-11-27-R	DICK, JOHN W & NANCY J	87 BLUE SPRUCE WAY	87 BLUE SPRUCE WAY	MASHPEE	MA	02649
17112	75-11-28-R	CAMPBELL, ISABEL M TRUSTEE LIFE ESTATE	85 BLUE SPRUCE WAY	85 BLUE SPRUCE WAY	MASHPEE	MA	02649
16414	75-11-30-R	PRINCIPE, MICHAEL J JR & PRINCIPE, MARY ELLEN	2 GOLD LEAF LN	2 GOLD LEAF LN	MASHPEE	MA	02649
16415	75-11-31-R	BAKER, MARION & KILGROW MARY ANN	4 GOLD LEAF LN	4 GOLD LEAF LN	MASHPEE	MA	02649
16416	75-11-32-R	YATES, SHEILA M	6 GOLD LEAF LN	6 GOLD LEAF LN	MASHPEE	MA	02649
16417	75-11-33-R	BROWN, VINCENT G & J LORRAINE	8 GOLD LEAF LN	8 GOLD LEAF LN	MASHPEE	MA	02649
16418	75-11-34-R	HARDWICK, JEANNE L LIFE ESTATE	10 GOLD LEAF LN	10 GOLD LEAF LN	MASHPEE	MA	02649
16419	75-11-35-R	HAVALOTTI, JUANITA M	12 GOLD LEAF LN	PO BOX 801	MASHPEE	MA	02649
17101	75-11-36-R	YAFFE, ELLEN & EGAN, KATHLEEN M	14 GOLD LEAF LN	14 GOLD LEAF LN	MASHPEE	MA	02649
17106	75-11-37-R	PAIMBLANC, JEAN JACQUES & PIAMBLANC, ARLETTE D	16 GOLD LEAF LN	16 GOLD LEAF LN	MASHPEE	MA	02649
17111	75-11-38-R	OBERDORF, ALICE L	18 GOLD LEAF LN	18 GOLD LEAF LN	MASHPEE	MA	02649
17103	75-11-39-R	WILCOX, ELLEN S	20 GOLD LEAF LN	320 VENICE GOLD CLUB DRIVE	VENICE	FL	34444
17108	75-11-40-R	MCCANN, JAMES W & ANN MARIE	22 GOLD LEAF LN	22 GOLD LEAF LN	MASHPEE	MA	02649
17113	75-11-41-R	BARNICOAT, LORRAINE TRUSTEE LORRAINE BARNICOAT REVOC TRUST	24 GOLD LEAF LN	24 GOLD LEAF LN	MASHPEE	MA	02649
17104	75-11-42-R	HOLTEEN, LARUE S	29 GOLD LEAF LN	29 GOLD LEAF LN	MASHPEE	MA	02649
17109	75-11-43-R	BATTS, RICHARD M & BARBARA A	27 GOLD LEAF LN	27 GOLD LEAF LN	MASHPEE	MA	02649
17114	75-11-44-R	STOGEL, SUSAN D	25 GOLD LEAF LN	25 GOLD LEAF LN	MASHPEE	MA	02649
17105	75-11-45-R	MEDEIROS, JOSEPH L & JUDITH L	23 GOLD LEAF LN	437 FOX DEN CIR	NAPLES	FL	34104
17110	75-11-46-R	MURPHY, PHYLLIS M	21 GOLD LEAF LN	PO BOX 209	MASHPEE	MA	02649
17115	75-11-47-R	VERROS, ZACHARY & JEANNINE A T VERROS REVOCABLE TRUST	19 GOLD LEAF LN	19 GOLD LEAF LN	MASHPEE	MA	02649-3483
17121	75-11-49-R	MONARCH, MARY K TR KAIPAINEN DAUGHTERS RLTY TRUST	11 GOLD LEAF LN	11 GOLD LEAF LN	MASHPEE	MA	02649
16420	75-11-50-R	ALLEN, KEITH H & CLAIRE H	9 GOLD LEAF LN	PO BOX 2025	LEWISTON	ME	04241-2025

Key	Parcel ID	Owner	Location	Mailing Street	Mailing City	ST	ZipCd/Country
16421	75-11-51-R	POND, SUZANNE M ET AL TRS LINKHORN FAM REV LIVING TR AND	7 GOLD LEAF LN	c/o CAPE COD FIVE PO BOX 20	ORLEANS	MA	02653
16422	75-11-52-R	HUFNAGEL, VIRGINIA A	5 GOLD LEAF LN	58 MONOMOSCOY ROAD WEST	MASHPEE	MA	02649
16423	75-11-53-R	DICRISTINA, DORIS L & DYNAN SHEILA J	1 GOLD LEAF LN	1 A YACENDA DR	MORRIS PLAINS	NJ	07950-1259
16424	75-11-54-R	STANGER, KENNETH P & RUTHANN	83 BLUE SPRUCE WAY	418 EAGLETON COVE WAY	PALM BEACH GARDENS	FL	33418
16425	75-11-55-R	MERRILL, KATHERINE	81 BLUE SPRUCE WAY	81 BLUE SPRUCE WAY	MASHPEE	MA	02649
16426	75-11-56-R	DESMOND, CLIFFORD T & LYNN K	79 BLUE SPRUCE WAY	24 RONS WAY	FRAMINGHAM	MA	01701-7675
16427	75-11-57-R	WEISER, DAVID & MARIA	77 BLUE SPRUCE WAY	1104 W DIAMOND SHORE LOOP	HERNANDO	FL	34442
16428	75-11-58-R	MCMULLEN, CATHERINE	75 BLUE SPRUCE WAY	75 BLUE SPRUCE WAY	MASHPEE	MA	02649
16429	75-11-59-R	SPIVACK, MICHAEL S & SLESINSKI, CAROLYN A	73 BLUE SPRUCE WAY	73 BLUE SPRUCE WAY	MASHPEE	MA	02649
16430	75-11-60-R	MORRISON, MICHAEL & CARLA TRS MORRISON REVOCABLE TRUSTS	4 GREEN IVY LN	6 BASKIN ROAD	LEXINGTON	MA	02421
16431	75-11-61-R	WADLEIGH, RALPH JR & JUDITH TR WADLEIGH 2008 REALTY TRUST	6 GREEN IVY LN	6 GREEN IVY LN	MASHPEE	MA	02649
17275	75-11-62-R	LENK, CONSTANCE R TRUSTEE CONSTANCE R LENK 2005 TRUST	8 GREEN IVY LN	PO BOX 2036	MASHPEE	MA	02649
17293	75-11-63-R	WORTHINGTON, JAMES M & JAYNE M	10 GREEN IVY LN	7 CLIFTON ROAD	NATICK	MA	01760
17309	75-11-64-R	DUNCAN, JOHN T & PAMELA A	12 GREEN IVY LN	2938 FLORENTINE COURT	NAPLES	FL	34119
17274	75-11-65-R	FREY, MARILYN C	14 GREEN IVY LN	14 GREEN IVY LN	MASHPEE	MA	02649
17294	75-11-66-R	BAER, CYNTHIA M & BEST, DAVID J	16 GREEN IVY LN	PO BOX 365	TOLLAND	CT	06084
17310	75-11-67-R	CUMMINGS, JOSEPH P & TRUSTEES JCC REALTY TRUST	49 GOLD LEAF LN	49 GOLD LEAF LN	MASHPEE	MA	02649
17273	75-11-68-R	SEARING, JILL A TR JILL A SERRING REVOCABLE TRUST	47 GOLD LEAF LN	8 PRINCETON COURT	BASKING RIDGE	NJ	07920
17295	75-11-69-R	DASILVA, ISRAEL M & LEA S	45 GOLD LEAF LN	45 GOLD LEAF LN	MASHPEE	MA	02649
17311	75-11-70-R	LIGON, MATILDA	43 GOLD LEAF LN	43 GOLD LEAF LN	MASHPEE	MA	02649
17272	75-11-71-R	MICCICHE, MARGUERITE TR MICCICHE FAMILY IRREVOCABLE TR	35 GOLD LEAF LN	250 HAMMOND POND PKWY - 1006 S	NEWTON	MA	32275
17296	75-11-72-R	GOLDBERG, JOEL L & JEANNE	33 GOLD LEAF LN	133 UNDERHILL LANE	PEEKSKILL	NY	10566-6926
17312	75-11-73-R	CASSIDY, MARY K TRUSTEE CASSIDY FAMILY TRUST	31 GOLD LEAF LN	31 GOLD LEAF LN	MASHPEE	MA	02649
17263	75-11-74-R	BULLOCK, JAYNE L	26 GOLD LEAF LN	26 GOLD LEAF LN	MASHPEE	MA	02649
17280	75-11-75-R	KHOZOZIAN, JOHN H & MOORE STEPHANIE A	28 GOLD LEAF LN	128 UPLAND AVENUE	NEWTON	MA	02461
17297	75-11-76-R	NATELSON, GERALD & ROBERTA	30 GOLD LEAF LN	207 HOLIDAY DR	HALLANDALE BEACH	FL	33009
17264	75-11-77-R	HARRISON, CHERYL A TR C/O HARRISON, CHERYL A	34 GOLD LEAF LN	34 GOLD LEAF LN	MASHPEE	MA	02649
17281	75-11-78-R	MAIKAITH, JAMIE B TR JOANNE P STOCHL IRREVOC TRUST	36 GOLD LEAF LN	36 GOLD LEAF LN	MASHPEE	MA	02649
17299	75-11-79-R	QUINN, JUDITH E	38 GOLD LEAF LN	38 GOLD LEAF LN	MASHPEE	MA	02649
17265	75-11-80-R	PETZE, LEONARD J & CECILE L TR	40 GOLD LEAF LN	PO BOX 245	MASHPEE	MA	02649
17282	75-11-81-R	GENEST, LINDA J TRUSTEE LINDA J GENEST TRUST	42 GOLD LEAF LN	42 GOLD LEAF LN	MASHPEE	MA	02649
17307	75-11-82-R	WESTWOOD, ROLLIN M & HELEN I	44 GOLD LEAF LN	44 GOLD LEAF LN	MASHPEE	MA	02649
17266	75-11-83-R	POLLASTRI, LOUIS & T SYLVIA TR POLLASTRI 2014 REVOC TRUSTS	46 GOLD LEAF LN	62 RANGELEY ROAD	LUNENBURG	MA	01462
17283	75-11-84-R	HOCH, DAVID A TRUSTEE HOCH REALTY TRUST	48 GOLD LEAF LN	48 GOLD LEAF LN	MASHPEE	MA	02649
17298	75-11-85-R	GIENANDT, IRMGARD H	50 GOLD LEAF LN	50 GOLD LEAF LN	MASHPEE	MA	02649-2445
17267	75-11-86-R	WHEATLEY, SUSAN M TR SUSAN M WHEATLEY TRUST	52 GOLD LEAF LN	52 GOLD LEAF LN	MASHPEE	MA	02649
17284	75-11-87-R	SCANNELL, D JEAN	54 GOLD LEAF LN	54 GOLD LEAF LN	MASHPEE	MA	02649
17300	75-11-88-R	LEDWITH, EDWARD F JR ET AL TRS LEDWITH REVOCABLE TRUST	56 GOLD LEAF LN	56 GOLD LEAF LN	MASHPEE	MA	02649
17268	75-11-89-R	LIEBMAN, ARNOLD & STONE JUDITH	58 GOLD LEAF LN	11 RIVERSIDE DR - APT 3EW	NEW YORK	NY	10023
17285	75-11-90-R	MOONEY, JOSEPH J JR & MARION G	60 GOLD LEAF LN	60 GOLD LEAF LN	MASHPEE	MA	02649
17301	75-11-91-R	LATTANZI, LINDA M TR LATTANZI REALTY TRUST OF 2009	62 GOLD LEAF LN	160 WINTHROP AVENUE	REVERE	MA	02151

Key	Parcel ID	Owner	Location	Mailing Street	Mailing City	ST	ZipCd/Country
17269	75-11-92-R	BARDIS, JAMES M & ELIZABETH J	64 GOLD LEAF LN	26 CRYSTAL DR	STONEHAM	MA	02180-1381
17286	75-11-93-R	WILLIAMS, WILLIAM P & KELLY WILLIAMS DONNA	66 GOLD LEAF LN	110 MARY STREET	ARLINGTON	MA	02474
17316	75-11-94-R	BERENSON, LAWRENCE I & ET AL T BERENSON NOMINEE TRUST	68 GOLD LEAF LN	10601 WHITEWIND CIRCLE	BOYNTON BEACH	FL	33473
17270	75-11-95-R	SIGEL, DAVID M & DIANE H	70 GOLD LEAF LN	70 GOLD LEAF LN	MASHPEE	MA	02649
17287	75-11-96-R	HASKIN, BRUCE & CAROL	72 GOLD LEAF LN	49 CLIFTON AVENUE	MARBLEHEAD	MA	01945
17303	75-11-97-R	RAELIN, JOSEPH A & ABBY P TRS ABBY P RAELIN TRUST 2008	74 GOLD LEAF LN	294 NEHOIDEN STREET	NEEDHAM	MA	02492
17271	75-11-98-R	FITZPATRICK, EDWIN R & DONNA M	76 GOLD LEAF LN	76 GOLD LEAF LN	MASHPEE	MA	02649
17288	75-11-99-R	HARVEY, JOHN J & LYNN S	78 GOLD LEAF LN	78 GOLD LEAF LN	MASHPEE	MA	02649
17304	75-11-100-R	DEPAUL, ARTHUR W & DIANE	80 GOLD LEAF LN	80 GOLD LEAF LN	MASHPEE	MA	02649
17277	75-11-101-R	SULLIVAN, MARJORIE G	73 GOLD LEAF LN	73 GOLD LEAF LN	MASHPEE	MA	02649
17291	75-11-102-R	SULLIVAN, ROBERT & SUZANNE TRS GOLD LEAF LANE RLTY TR OF 2014	71 GOLD LEAF LN	22 BOBSLED DRIVE	NEEDHAM	MA	02494
17308	75-11-103-R	ENGLISH, KATHLEEN A & NOLAN, ROBERT W	69 GOLD LEAF LN	PO BOX 783	FALMOUTH	MA	02541
17314	75-11-104-R	KRUG, JOHN J & NANCY TRS KRUG 2013 REVOC LIVING TRUSTS	77 GOLD LEAF LN	77 GOLD LEAF LN	MASHPEE	MA	02649
17315	75-11-105-R	MARTIN, WILLIAM C JR & JOANNA	75 GOLD LEAF LN	6 N 372 SPLITRAIL LANE	SAINT CHARLES	IL	60175-6966
17278	75-11-106-R	LADD, TERRI L	35 RED CEDAR RD	PO BOX 802	MASHPEE	MA	02649
17289	75-11-107-R	MURPHY, MICHAEL A & KATHLEEN K	33 RED CEDAR RD	33 RED CEDAR RD	MASHPEE	MA	02649
17305	75-11-108-R	BRODY, MICHAEL & LISA	31 RED CEDAR RD	287 LANGLEY ROAD - UNIT 29	NEWTON	MA	02459
17279	75-11-109-R	DORNE, ERIC A & SUZANNE V	71 BLUE SPRUCE WAY	33 CASSANDRA LANE	NORTH KINGSTOWN	RI	02852
17290	75-11-110-R	SKINNER, LEWIS H & CYNTHIA P T SKINNER CAPE COD NOMINEE TRUST	39 RED CEDAR RD	39 RED CEDAR RD	MASHPEE	MA	02649
17306	75-11-111-R	BROWN, FRANK A III & DONNA D	37 RED CEDAR RD	37 RED CEDAR RD	MASHPEE	MA	02649
17276	75-11-112-R	TROOP, ANDREW M & SUSSMAN, ANDREA L	65 GOLD LEAF LN	12 DEER POND ROAD	SUDBURY	MA	01776
17292	75-11-113-R	BILIA, LINDA A	67 GOLD LEAF LN	2405 CONCORD CREEK TRAIL	CUMMING	GA	30041
17313	75-11-114-R	GOUDREAULT, GEORGE V & GOUDREAULT CATHERINE M	9 GREEN IVY LN	7951 KILKENNY WAY	NAPLES	FL	34112
14336	75-11-122-R	HOOVER, ROBERT J & ANN-BRITT	69 BLUE SPRUCE WAY	2 CROWNRIDGE RD	WESTBOROUGH	MA	01581
14337	75-11-123-R	SCHAIRER, VINCENT E	40 RED CEDAR RD	266 SHINING ROCK DRIVE	NORTHBRIDGE	MA	01534
14338	75-11-124-R	WORTH, JANET M	38 RED CEDAR RD	38 RED CEDAR RD	MASHPEE	MA	02649
14339	75-11-125-R	KERRIGAN, CHRISTINE	36 RED CEDAR RD	36 RED CEDAR RD	MASHPEE	MA	02649
14340	75-11-126-R	ROVNER, SIDNEY & SHARON H LIFE ESTATE	34 RED CEDAR RD	34 RED CEDAR RD	MASHPEE	MA	02649
14341	75-11-127-R	GAGE, JANET N TR JANET N GAGE TRUST	32 RED CEDAR RD	32 RED CEDAR RD	MASHPEE	MA	02649
14342	75-11-128-R	RICE, RONALD TR HAMPSTEAD NOMINEE RLTY TRUST	30 RED CEDAR RD	297 NORTH ST	HYANNIS	MA	02601
14328	75-11-130-R	GRAHAME, ROSE & TROPEANO, CONNIE	2 RED CEDAR RD	2 RED CEDAR RD	MASHPEE	MA	02649
14329	75-11-131-R	TOMASETTI, RAYMOND & KATHLEEN	4 RED CEDAR RD	4 DENISE DRIVE	ASHLAND	MA	01721-2117
14330	75-11-132-R	MITCHELL, SUSAN F	6 RED CEDAR RD	6 RED CEDAR RD	MASHPEE	MA	02649
14331	75-11-133-R	SLESINSKI, DOROTHY R & SLESINSKI, ROBERT F	8 RED CEDAR RD	8 RED CEDAR RD	MASHPEE	MA	02649
14332	75-11-134-R	KASTNER, WARREN F & ELLIOTT, TAHIA	10 RED CEDAR RD	10 RED CEDAR RD	MASHPEE	MA	02649
14333	75-11-135-R	TUTTLE, ALICE M & JOHN E	12 RED CEDAR RD	12 RED CEDAR RD	MASHPEE	MA	02649
14334	75-11-136-R	REILLY RONALD & SUSAN TRS & DALE, ROBERT J JR	14 RED CEDAR RD	22 RHAPSODY BEND DR	THE WOODLANDS	TX	77382
14335	75-11-137-R	GLENER, ELINOR	16 RED CEDAR RD	16 RED CEDAR RD	MASHPEE	MA	02649
14344	75-11-138-R	CLARK, JEAN F & LAWRENCE, DEBORAH L	61 BLUE SPRUCE WAY	61 BLUE SPRUCE WAY	MASHPEE	MA	02649
14345	75-11-139-R	SHLYAKTER, DINA	63 BLUE SPRUCE WAY	55 BROADLAWN PARK - APT 20B	CHESTNUT HILL	MA	02467
14346	75-11-140-R	RIPLEY, GEORGE W & RIPLEY, MADELINE PINTO	65 BLUE SPRUCE WAY	30 RIVENDELL DRIVE	SHELTON	CT	06484

Key	Parcel ID	Owner	Location	Mailing Street	Mailing City	ST	ZipCd/Country
14347	75-11-141-R	OMALLEY, MARTIN J TR REV LIVING TR MARTIN OMALLEY	67 BLUE SPRUCE WAY	67 BLUE SPRUCE WAY	MASHPEE	MA	02649
14348	75-11-142-R	DONAHOE, MARY R & HANSBERGER, JUDITH A	22 RED CEDAR RD	22 RED CEDAR RD	MASHPEE	MA	02649
14349	75-11-143-R	COLOCINO, BARBARA	20 RED CEDAR RD	20 RED CEDAR RD	MASHPEE	MA	02649
14350	75-11-144-R	PORCARO, ANIELLO JR & SHARON L	18 RED CEDAR RD	18 RED CEDAR RD	MASHPEE	MA	02649
14351	75-11-145-R	WEIBEL, FRANK E & ARLENE C	24 RED CEDAR RD	24 RED CEDAR RD	MASHPEE	MA	02649
14352	75-11-146-R	GOODALE, RAYMOND B & MARILYN H	26 RED CEDAR RD	26 RED CEDAR RD	MASHPEE	MA	02649
14353	75-11-147-R	ELIAS, HOWARD D	28 RED CEDAR RD	300 BOYLSTON STREET UNIT 806	BOSTON	MA	02116
14354	75-11-148-R	FOLEY, CHARLES D JR & NANCY A	29 RED CEDAR RD	29 RED CEDAR RD	MASHPEE	MA	02649
14355	75-11-149-R	MCHUGH, JUDITH A	27 RED CEDAR RD	27 RED CEDAR RD	MASHPEE	MA	02649
14356	75-11-150-R	MORRIS, ALLAN D	25 RED CEDAR RD	PO BOX 460	FORESTDALE	MA	02644-0460
14357	75-11-151-R	POND, ROBERT K	23 RED CEDAR RD	23 RED CEDAR RD	MASHPEE	MA	02649
14358	75-11-152-R	HART, NORMAN L & CATHERINE M	21 RED CEDAR RD	21 RED CEDAR RD	MASHPEE	MA	02649
14359	75-11-153-R	DOWNEY, PAUL F & SANDRA C	19 RED CEDAR RD	19 RED CEDAR RD	MASHPEE	MA	02649
14360	75-11-154-R	ODONNELL, CLAIRE L TR JF & CL ODONNELL REVOC TRUST	17 RED CEDAR RD	17 RED CEDAR RD	MASHPEE	MA	02649
14318	75-11-155-R	CASTELLI, STEPHEN F TR CASTELLI REALTY TRUST	15 RED CEDAR RD	19 DONALD LANE	BURLINGTON	MA	01803
14319	75-11-156-R	DEBITETTO, JAMES & DONNA MARIE	11 RED CEDAR RD	452 POUND RIDGE ROAD	BEDFORD	NY	10506
14320	75-11-157-R	EASTERBROOKS, MARION I	9 RED CEDAR RD	9 RED CEDAR RD	MASHPEE	MA	02649-3463
14321	75-11-158-R	DOWLING, JAMES E & JOANN M	7 RED CEDAR RD	7 RED CEDAR RD	MASHPEE	MA	02649
14322	75-11-159-R	FONTAINE, GEORGE C ET AL TR RED CEDAR REALTY TRUST	5 RED CEDAR RD	2650 LAKE SHORE DR # 202	RIVIERA BEACH	FL	33404 4605
14323	75-11-160-R	NICKERSON, KENNETH	3 RED CEDAR RD	BOX 16481011	SIOUX FALLS	SD	57186
14324	75-11-161-R	STERN, STEVEN C & KATHLEEN A	51 BLUE SPRUCE WAY	1 ROBSAN PLACE	NORTON	MA	02766
14325	75-11-162-R	PERRY, DEBORAH J TR KONING REALTY TRUST II	49 BLUE SPRUCE WAY	19 BONAIR AVENUE	BEDFORD	MA	01730
14327	75-11-163-R	THATCHER, PATRICIA E TR PATRICIA E THATCHER TRUST	47 BLUE SPRUCE WAY	47 BLUE SPRUCE WAY	MASHPEE	MA	02649
14326	75-11-164-R	JENSEN, CAROLYN E TRUSTEE JENSEN FAMILY NOMINEE TR 2010	45 BLUE SPRUCE WAY	45 BLUE SPRUCE WAY	MASHPEE	MA	02649
17119	75-11-48A-R	LIVIE, RICHARD E & DIANE M C/O FEEKS, JOSEPH B & SUSANNE	17 GOLD LEAF LN	17 GOLD LEAF LN	MASHPEE	MA	02649
17120	75-11-48B-R	STENSON, MARION L	15 GOLD LEAF LN	15 GOLD LEAF LN	MASHPEE	MA	02649

EGA
ARCHITECTS

August 10, 2015

Mashpee Commons – Northbridge Companies
Memory Care and Assisted Living
68 Great Neck Road South
Mashpee, MA 02649

Energy Narrative – Cape Cod Commission DRI Application

The project consists of a two-story, 64,936 SF Memory Care and Assisted Living building.

HVAC systems:

A. Boiler Room:

1. Multiple modular natural gas-fired, high efficiency boilers including all associated controls, piping, secondary circulators and venting (thru roof or sidewall).

2. Two (2) base-mounted, variable speed drive heating hot water pumps (equal to Taco FI), associated hydronic specialties and a complete system of fully insulated, reverse-return supply and return piping.

B. Resident Rooms:

1. Low profile, residential-grade hot water finned tube radiation (equal to Sterling 'Senior'). Radiation in each room is to be controlled by a 24V electric valve with (standalone) electric thermostat.

2. Resident bathrooms will each be ventilated by a high quality, low noise level ceiling exhaust fan (equal to Panasonic) that normally operates at low speed until an integral sensor detects bathroom occupancy when the fan operates at high speed.

3. Air conditioning will be provided by a thru-wall (built-in) room air conditioner (equal to Friedrich 'Wall Master') with unit-mounted controls and rigid interior winter cover.

C. Common Areas:

1. Commercial-grade hot water finned tube radiation (equal to Vulcan 'Dura Vane') controlled by 24V electric valves in conjunction with associated rooftop HVAC system zone.

2. Hot water cabinet heaters and horizontal propeller unit heaters (equal to Vulcan or Sterling) were required for supplemental heat (entries, vestibules, etc.).

3. High efficiency packaged cooling-only rooftop air conditioning units (equal to Trane 'Precedent') with 100% O.A. economizer and comparative enthalpy

controls. Systems shall include all associated ductwork, zoned hot water duct heating coil(s), grilles/diffusers and fire/smoke dampers.

4. Specialty exhaust fans and associated ductwork as/where required including commercial kitchen exhaust, clothes dryer vents, etc.

HVAC Energy efficiency features:

- Modular high efficiency condensing natural gas-fired heating hot water boilers
- Variable speed/variable volume (load-matching) heating hot water distribution system
- Individual automatic temperature controls throughout
- Energy Star-compliant thermal insulation on all piping and ductwork
- High efficiency common area rooftop air conditioning units with outside air economizers for 'free' cooling
- Incremental Energy Star-rated resident air conditioning units for maximum flexibility/minimum usage
- High efficiency electric motors in all mechanical units

All of the HVAC equipment efficiencies will be designed to comply with the Massachusetts stretch energy efficiency code.

Lighting:

Almost all lighting shall be low wattage, high efficiency LED fixtures, "Energy Star" or Design Lights Consortium (DLC) listed. Lighting shall conform to IES-NA recommendations and recommended practices. High efficiency linear fluorescent fixtures may be used in some areas where they are equivalent to or surpass LED efficiencies. All exterior fixtures shall be LED and pole/area lighting shall meet the IES-NA full cut-off classification with the lowest reasonable B.U.G. rating (**B**acklight, **U**plight, and **G**lare)

Building Envelope:

The building is designed to comply with the Massachusetts stretch energy efficiency code, and Assisted Living residential units will be energy modeled and will be HERS rated. Building Envelope will have a continuous air barrier and will comply with the following minimums:

- Ceiling/Roof: R-38 in attic; R-25 continuous if insulation above roof deck
- Exterior Walls: R-13 + 7.5 ci
- Slab-on-Grade: R-5 under entire slab-on-grade for Use I-1 (780 CMR 502.2.6.1)
- Windows: U-0.35; SHGC 0.40
- Doors: U-0.37

E1.1 – Redevelopment Audit
The project is new construction, so this requirement does not apply to this project.

E1.2 – Designed to Earn ENERGY STAR Certification
For the Memory Care (commercial) portion of the building and associated common spaces, the project will be designed to achieve an Energy Star score of 75 or higher. See attached Energy Star Statement of Design Intent (SEDI).

E1.3 – ASHRAE/LEED Standards
The building envelope will comply with ASHRAE 90.1-2010 Section 5.4.

E1.4 – Multi-family Projects (BOP)
For the Assisted Living (low-rise multifamily) portion of the building, all of the systems will be designed to incorporate the Energy Star program requirements for climate zone 5, based on the Energy Star Builder Option Package. Refer to the enclosed Builder Options Package checklist.

E1.5 – On-site Renewable Energy Generation
Not Applicable

ENERGY STAR® Statement of Energy Design Intent (SEDI)[1]

Mashpee Commons Assisted Living and Memory Care

LEARN MORE AT energystar.gov

80

ENERGY STAR® Design Score[2]

Primary Property Function: Senior Care Community

Gross Floor Area (ft^2): 64,936

Estimated Date of Certification of Occupancy: June 2017

Date Generated: August 07, 2015

1. This form may be used to apply for the ENERGY STAR Designed to Earn. This form was generated from Portfolio Manager's target finder: http://www.portfoliomanager.energystar.gov/targetfinder.
2. The ENERGY STAR Score is based on total source energy. The scale is 1-100. A score of 75 is the minimum to be eligible for the ENERGY STAR.

Property & Contact Information for Design Project

Property Address
Mashpee Commons Assisted Living and Memory Care
68 Great Neck Road South
Mashpee, Massachusetts 02649

Property ID: 4465087

Project Architect
Al Crepeau
,
(978) 462-5515

Architect Of Record
EGA, P.C.
1 Vernon St.
Newburyport, MA 01950
(978) 462 - 5515

Owner Contact
Ray Mitrano - WaypointKLA
,
(617) 875-2501

Property Owner
Northbridge Companies
71 Third Ave., Burlington, MA 01803
(781) 272 - 2424

Estimated Design Energy

Fuel Type	Usage	Energy Rate ($/Unit)
Electric - Grid	584,424 kWh (thousand Watt-hours)	$ 0.15/kWh (thousand Watt-hours)
Natural Gas	31,850 therms	$ 1.00/therms

Estimated Design Use Details

Senior Care Community	
Gross Floor Area	64,936 Sq. Ft.
Number of Commercial Washing Machines	2
Percent That Can Be Cooled	All of it - 100%
Total Number of Residential Living Units	70
Licensed Bed Capacity	105.2 ← default value
Number of Commercial Refrigeration/Freezer Units	1
Number of Computers	20
Number of Residential Electronic Lift Systems	6
Number of Residential Washing Machines	4
Maximum Resident Capacity	82
Percent That Can Be Heated	All of it - 100%
Average Number of Residents	70
Number of Workers on Main Shift	40

Design Energy and Emission Results

Metric	Design Project	Median Property	Estimated Savings
ENERGY STAR Score (1-100)	**80**	50	N/A
Energy Reduction (from Median)(%)	**-21.2**	0	N/A
Source Energy Use Intensity (kBtu/ft²/yr)	**147**	187	40
Site Energy Use Intensity (kBtu/ft²/yr)	**79**	101	22
Source Energy Use (kBtu/yr)	**9,605,582**	12,188,030	2,582,448
Site Energy Use (kBtu/yr)	**5,179,054**	6,571,437	1,392,383
Energy Costs ($)	**119,513**	151,644	32,131
Total GHG Emissions (Metric Tons CO2e)	**362**	459	97

Designed to earn the ENERGY STAR: Application Checklist

This section is only required if you are using this document to apply for Designed to Earn the ENERGY STAR. All design projects that achieve an EPA energy performance score of 75 or higher are eligible for this certification.

1) Does the intended function or use for the property match the criteria of a property type that's eligible to receive an ENERGY STAR score? ☑ **Yes** ☐ **No/Not Sure**

If you are not sure that your property design is eligible for a design ENERGY STAR score, please describe the property's major functions:

2) Is the design project at least 95% complete with construction documents? ☐ **Yes** ☑ **No**

If no, please explain:

The project is in Design Development. Project design information was entered into the Energy Star Portfolio Manager and a SEDI was generated as part of the Cape Cod Commission DRI submission.

3) Is the property unoccupied and not yet generating energy bills? ☑ **Yes** ☐ **No**

4) Do energy calculations account for the whole building intended operations and all energy sources? ☑ **Yes** ☐ **No**

5) Is the Architect of Record (AOR) an ENERGY STAR partner? ☐ **Yes** ☑ **No**

6) Will the AOR review the SEDI with building owner before they sign the Owner Letter of Intent? ☑ **Yes** ☐ **No**

7) Do the AOR and Building Owner agree that EPA may use information from this document in ENERGY STAR program materials? ☑ **Yes** ☐ **No**

8) Are you seeking other qualifications for this design project? ☑ **Yes** ☐ **No**

If so, please select all that apply:

- ☐ AIA 2030 Commitment
- ☐ Architecture 2030 Challenge
- ☐ Federal, State or Local Disclosure Ordinance
- ☐ Green Globes
- ☑ LEED 2009 Certifiability
- ☐ Other, please indicate: _____

Building Envelope Compliance Documentation — Part I

Project Name: Northbridge at Mashpee Assisted Living and Memory Care		
Project Address: 68 Great Neck Road South		Date: Mashpee
Designer of Record: MA		Telephone: (978) 462-5515
Contact Person: Al Crepeau		Telephone: same as above
City: Mashpee, MA	Climate Zone: 5	Criteria Table: 5.5-5

Mandatory Provisions Checklist

Insulation (§ 5.4.1)

- ☑ Insulation Materials are installed in accordance with manufacturer's recommendations and in such a manner as to achieve rated R-value of insulation
  - ☐ Exception: for metal building roofs or metal building walls.
- ☑ Loose-fill insulation is not used in attic roof spaces when the slope of the ceiling is more than three in twelve.
- ☑ Attic eave vents have baffling to deflect the incoming air above the surface of the insulation.
- ☑ Insulation is installed in a permanent manner in substantial contact with the inside surface.
- ☑ Batt insulation installed in floor cavities is supported in a permanent manner by supports no greater than 24 in. o.c.
- ☑ Lighting fixtures, HVAC, and other equipment are not be recessed in ceilings in such a manner to affect the insulation thickness unless.

Exceptions:

- ☐ The recessed area is less than one percent.
- ☐ The entire roof, wall, or floor is covered with insulation to the full depth required.
- ☐ The effects of reduced insulation are included in calculations using an area weighted averages.

- ☑ Roof insulation is not installed over suspended ceiling with removable ceiling panels.
- ☑ Exterior insulation is covered with a protective material to prevent damage. Insulation is protected in attics and mechanical rooms where access is needed.
- ☐ Foundation vents do not interfere with the insulation. N/A
- ☑ Insulation materials in ground contact have a water absorption rate no greater than 0.3 percent.

Fenestration and Doors (§ 5.4.2)

- ☑ U-factors are determined in accordance with NFRC 100. U-factors for skylights shall be determined for a slope of 20° above the horizontal.

Exceptions:

- ☐ U-factors are taken from A.8.1 for skylights.
- ☐ U-factors are taken from A.8.2 other fenestration products.
- ☐ U-factors are taken from A.7 for opaque doors.
- ☐ U-factors are derived from DASMA 105 for garage doors.

- ☑ Solar heat gain coefficient (SHGC) is determined in accordance with NFRC 200.

Exceptions:

- ☐ SHGC is determined by multiplying the shading coefficient (SC) by 0.86. Shading coefficient is determined using a spectral data file determined in accordance with NFRC 300.
- ☐ SHGC for the center of glass is used. SHGC is determined using a spectral data file determined in accordance with NFRC 300.
- ☐ SHGC is taken from § A8.1 for skylights.
- ☐ SHGC is taken from § A8.2 for vertical fenestration.

- ☑ Visible light transmittance is determined in accordance with NFRC 200.

Air Leakage (§ 5.4.3)

- ☑ The *building envelope* is sealed, caulked, gasketed, and/or weather-stripped to minimize air leakage.
- ☑ Air leakage through fenestration and doors is less than 0.4 cfm/ft² (1.0 cfm/ft² for glazed swinging entrance doors and for revolving doors) when tested in accordance with NFRC 400.

Exceptions:

- ☐ Field fabricated fenestration and doors.
- ☐ For garage *doors* tested in accordance with DASMA 105.

- ☐ Cargo doors and loading dock doors are equipped with weatherseals in climates zones 3 through 8. N/A
- ☑ Entrance doors have vestibules.

Exceptions:

- ☐ Climate zone 1 or 2
- ☑ Building is less than four stories.
- ☐ Doors not intended as building entrance.
- ☐ Doors open from dwelling unit(s).
- ☐ Doors open from spaces smaller than 3,000 ft².
- ☐ Building has revolving doors.
- ☐ Doors for vehicular movement or material handling.

ENERGY STAR Qualified Homes
Builder Option Package Notes

2004/2006 IECC Climate Zone [1] – 5	ENERGY STAR Window Zone [11] – Northern

The requirements for the ENERGY STAR Builder Option Package (BOP) are specified in the checklist below.

To qualify as ENERGY STAR using this BOP, a home must meet the requirements specified and be verified and field-tested in accordance with the HERS Standards by a RESNET-accredited Provider. Note that compliance with these guidelines is not intended to imply compliance with all local code requirements that may be applicable to the home to be built.[2]

Home Address: Northbridge at Mashpee Assisted Living and Memory Care 68 Great Neck Road South City: Mashpee State: EGA, P.C.

Building System	Inspection Guidelines	To be rater verified	Rater Verified	Must Correct	NA
Cooling Equipment (Where Provided)	Right-sized [3] ≥ 13 SEER A/C; OR		☐	☐	☑
	Right-sized [3] ≥ 14.5 SEER/ 12 EER/ 8.5 HSPF ENERGY STAR qual. HP [4]		☐	☐	☐
Heating Equipment	≥ 90 AFUE gas furnace; OR		☑	☐	☐
	Right-sized [3] ≥ 14.5 SEER/ 12 EER/ 8.5 HSPF ENERGY STAR qual. HP [4]; OR		☐	☐	☐
	≥ 85 AFUE boiler; OR		☐	☐	☐
	≥ 85 AFUE oil furnace		☐	☐	☐
Thermostat [4]	ENERGY STAR qualified thermostat (except in zones with mass radiant heat)		☑	☐	☐
Ductwork	Leakage [5]: ≤ 4 CFM to outdoors / 100 sq. ft.; AND		☑	☐	☐
	Insulation [6]: ≥ R-6 insulation on ducts in unconditioned spaces		☑	☐	☐
Envelope	≤ 5 ACH50	Infiltration [7,8]	☑	☐	☐
	≤ Reference UA	UA Alternative Approach [9]; OR	☐	☐	☑
	≥ 38 R-Value	Ceiling Insulation [9]; AND (if applicable)	☑	☐	☐
	≥ 30 R-Value	Cathedral Ceiling Insulation [9]; AND (if app.)	☐	☐	☑
	≥ 19 R-Value	Wood Frame Wall Insulation [9]; OR (if app.)	☐	☐	☐
	≥ 13 + 5 R-Value	Wood Frame Wall Insulation and Sheathing[9]; AND (if app.)	☑	☐	☐
	≥ 30 R-Value	Floor Over Unconditioned Space Insulation [9]; AND (if app.)	☐	☐	☑
	≥ 10 R-Value	Crawlspace Wall Insulation Continuous [9]; OR (if app.)	☐	☐	☑
	≥ 13 R-Value	Crawlspace Wall Insulation Framed [9]; AND (if app.)	☐	☐	☑
	≥ 10 R-Value	Basement Wall Insulation Continuous [9]; OR (if app.)	☐	☐	☑
	≥ 13 R-Value	Basement Wall Insulation Framed [9]; AND (if app.)	☐	☐	☑
	≥ 10 R-Value	Slab Insulation [9]; AND	☑	☐	☐
	Completed Thermal Bypass Inspection Checklist [10]	Will be completed	☐	☐	☐
Windows [11,12,13]	≤ 0.40 U-Value		☐	☐	☐
	Any SHGC		☐	☐	☐
Water Heater [14,15]	Gas (EF): 40 Gal = 0.61 | 60 Gal = 0.57 | 80 Gal = 0.53		☐	☐	☐
	Electric (EF): 40 Gal = 0.93 | 50 Gal = 0.92 | 80 Gal = 0.89		☐	☐	☐
	Oil or Gas [16]: Integrated with space heating boiler		☑	☐	☐
Lighting and Appliances [17,18]	Five or more ENERGY STAR qualified appliances, light fixtures, water heaters, ceiling fans equipped with lighting fixtures, and/or ventilation fans		☑	☐	☐

ENERGY STAR Qualified Homes
Builder Option Package Notes

2004/2006 IECC Climate Zone [1] – 5	ENERGY STAR Window Zone [11] – Northern

1. The appropriate climate zone shall be determined by the 2004 International Residential Code (IRC), Figure N1101.2.
2. Where requirements of the local codes, manufacturers' installation instructions, engineering documents, or regional ENERGY STAR programs overlap with the requirements of these guidelines, EPA offers the following guidance:
    a. In cases where the overlapping requirements exceed the ENERGY STAR guidelines, these overlapping requirements shall be met;
    b. In cases where overlapping requirements conflict with a requirement of these ENERGY STAR guidelines (e.g., slab insulation is prohibited to allow visual access for termite inspections), then the conflicting requirement within these guidelines shall not be met. Furthermore, qualification shall still be allowed if the rater has determined that no equivalent option is available that could meet the intent of the conflicting requirement of these ENERGY STAR guidelines (e.g., switching from exterior to interior slab edge insulation).
3. Cooling equipment shall be sized according to the latest editions of ACCA Manuals J and S, ASHRAE 2001 Handbook of Fundamentals, or an equivalent procedure. Maximum oversizing limit for air conditioners and air-source and ground-source heat pumps is 15% with the following two exceptions: single-speed air-source and ground-source heat pumps in buildings with heating loads that exceed cooling loads have a limit of 25% and multi-stage heat pumps do not have a strict limit, but should be sized to allow adequate humidity control in the cooling mode. The following operating conditions shall be used in the sizing calculations and verified where reviewed by the rater:

    Outdoor temperatures shall be the 99.0% design temperatures as published in the ASHRAE Handbook of Fundamentals for the home's location or most representative city for which design temperature data are available. Note that a higher outdoor air design temperature may be used if it represents prevailing local practice by the HVAC industry and reflects extreme climate conditions that can be documented with recorded weather data; Indoor temperatures shall be 75 F for cooling; Infiltration rate shall be selected as "tight", or the equivalent term.

    In specifying equipment, the next available size may be used. In addition, indoor and outdoor coils shall be matched in accordance with ARI standards.

    The stated efficiency requirements are aligned with the increased requirements for ENERGY STAR labeled central air conditioners and air-source heat pumps that went into effect as of January 1, 2009. Equipment manufactured before January 1 is still eligible to earn the ENERGY STAR based on the old performance level. Therefore, there will be a transition period when labeled equipment is commercially available at both the old and new performance levels. Builders must transition to equipment meeting these new ENERGY STAR requirements as stocks of equipment qualified at the old performance levels are exhausted.
4. Homes with heat pumps in Climate Zones 4 and 5 must have an HSPF ≥ 8.5, which exceeds the ENERGY STAR minimum of 8.2 HSPF. Homes with heat pumps in Climate Zones 6, 7, and 8 cannot be qualified using this BOP, but can earn the label using the ENERGY STAR Performance Path requirements. In homes in all Climate Zones with heat pumps that have programmable thermostats, the thermostat must have "Adaptive Recovery" technology to prevent the excessive use of electric back-up heating.
5. Ducts must be sealed and tested to be ≤ 4 CFM to outdoors / 100 sq. ft. of conditioned floor area, as determined and documented by a RESNET-certified rater using a RESNET-approved testing protocol. If *total* duct leakage is ≤ 4 CFM to outdoors / 100 sq.ft. of conditioned floor area, then leakage to outdoors does not need to be tested. Duct leakage testing can be waived if all ducts and air handling equipment are located in conditioned space (i.e., within the home's air and thermal barriers) AND the envelope leakage has been tested to be ≤ 3 ACH50 OR ≤ 0.25 CFM 50 per sq. ft. of the building envelope. Note that mechanical ventilation will be required in this situation.
6. EPA recommends, but does not require, locating ducts within conditioned space (i.e., inside the air and thermal barriers), and using a minimum of R-4 insulation for ducts inside conditioned space to prevent condensation.
7. Envelope leakage must be determined by a RESNET-certified rater using a RESNET-approved testing protocol.
8. To ensure consistent exchange of indoor air, whole-house mechanical ventilation is recommended, but not required.

ENERGY STAR Qualified Homes
Builder Option Package Notes

2004/2006 IECC Climate Zone [1] – 5	ENERGY STAR Window Zone [11] – Northern

9. Insulation levels of a home must meet or exceed Sections N1102.1 and N1102.2 of the 2004 IRC. These sections allow for compliance to be determined by meeting prescriptive insulation requirements, by using U-factor alternatives, or by using a total UA alternative. These sections also provide guidance and exceptions that may be used. However, note that the U-factor for steel-frame envelope assemblies addressed in Section N1102.2.4 shall be calculated using the ASHRAE zone method, or a method providing equivalent results, and not a series-parallel path calculation method as is stated in the code. Additionally, Section N1102.2.2, which allows for the reduction of ceiling insulation in space constrained roof/ceiling assemblies, shall be limited to 500 sq. ft. or 20% of ceiling area, whichever is less. In all cases, insulation shall be inspected to Grade I installation as defined in the RESNET Standards by a RESNET-certified rater.

   Note that the fenestration requirements of the 2004 IRC do not apply to the fenestration requirements of the National Builder Option Package. Therefore, if UA calculations are performed, they must use the IRC requirements (with the exception of fenestration) plus the fenestration requirements contained in the national BOP. For more information, refer to the "Codes and Standards Information" document.

10. The Thermal Bypass Inspection Checklist must be completed for homes to earn the ENERGY STAR label.

11. The window performance levels match ENERGY STAR Program Requirements for Residential Windows, Doors, and Skylights— version 4.0, with additional requirements for climate zones 2 and 4. Additional information about version 5.0 of the program requirements for windows, which is more stringent and offers additional savings, can be found at www.energystar.gov/windows.

12. All decorative glass and skylight window area counts toward the total window area to above-grade conditioned floor area (WFA) ratio. For homes with a WFA ratio >18%, the following additional requirements apply:

    a. In IRC Climate Zones 1, 2, and 3, an improved window SHGC is required, and is determined by:
    Required SHGC = [0.18 / WFA] x [ENERGY STAR SHGC]
    Where the ENERGY STAR SHGC is the minimum required SHGC of the climate-appropriate window specified in this BOP.

    b. In IRC Climate Zones 4, 5, 6, 7, and 8, an improved window U-Value is required, and is determined by:
    Required U-Value = [0.18 / WFA] x [ENERGY STAR U-Value]
    Where the ENERGY STAR U-Value is the minimum required U-Value of the climate-appropriate window specified in this BOP.

13. Up to 0.75% WFA may be used for decorative glass that does not meet ENERGY STAR requirements. For example, a home with total above-grade conditioned floor area of 2,000 sq. ft. may have up to 15 sq. ft. (0.75% of 2,000) of decorative glass.

14. More efficient water heating equipment represents a significant opportunity for energy savings and a meaningful way to differentiate ENERGY STAR qualified homes from those with standard equipment. An ENERGY STAR qualified water heater not only satisfies the Water Heater efficiency requirements, but also counts toward the requirement for five or more ENERGY STAR qualified lighting products or appliances as detailed in the Lighting and Appliances guideline.

15. To determine domestic hot water (DHW) EF requirements for additional tank sizes, use the following equations:

    Gas DHW EF ≥ 0.69 - (0.002 x Tank Gallon Capacity); Electric DHW EF ≥ 0.97 - (0.001 x Tank Gallon Capacity).

16. In homes with gas or oil hydronic space heating, water heating systems must have an efficiency ≥ 0.78 EF. This may be met through the use of an instantaneous water heating system or an indirect storage system with a boiler that has a system efficiency ≥ 85 AFUE. Homes with tankless coil hot water heating systems cannot be qualified using this BOP, but can earn the label using the ENERGY STAR Performance Path requirements.

17. Any combination of ENERGY STAR qualified products listed may be installed to meet this requirement. ENERGY STAR qualified ventilation fans include range hood, bathroom, and inline fans. ENERGY STAR qualified lighting fixtures installed in the following locations shall not be counted: storage rooms (e.g., closets, pantries, sheds), or garages. Eligible appliances include ENERGY STAR qualified refrigerators, dish washers, and washing machines.

18. Efficient lighting fixtures represent a significant opportunity for persistent energy savings and a meaningful way to differentiate ENERGY STAR qualified homes from those meeting minimum code requirements. To learn more about the benefits of increasing the use of efficient fixtures through the installation of the ENERGY STAR Advanced Lighting Package (ALP), refer to www.energystar.gov/alp.

Professional Verification

I Al Crepeau (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: Date: 9/11/15

Verifying Professional

____ _____

,

(____)____-_____

_____

Note: When applying for the ENERGY STAR Designed to Earn, the signature of the Verifying Professional must match the stamp.

Verifying Professional Stamp (if applicable)

BSC GROUP
Thoughtfully transforming our environments

TRANSMITTAL

33 WALDO STREET, WORCESTER, MA 01608 ■ www.bscgroup.com
TEL 508-792-4500 800-288-8123 ■ FAX 508-792-4509

To: Massachusetts Historical Commission
220 Morrissey Boulevard
Boston, Massachusetts 02125

Date: June 23, 2014
Proj. No.: 23216.00
Project: Northbridge Mashpee Commons
MHC Project Notification Form

We are sending you:

☑ Attached ☐ Under Separate Cover

Via:

Delivery Tracking No.: _____

☑ Overnight Delivery ☐ Picked Up By Recipient ☐ Regular Mail ☐ Taxi
☐ Messenger ☐ Direct From Printer ☐ Other: _____

The following item(s):

☐ Change Order ☐ Drawings ☐ Prints ☐ Samples
☐ Copy of Letter ☐ Photocopies ☐ Reports ☐ Specifications
☐ Digital Media ☐ Plans ☑ Other: MHC PNF & Attachments

No. of Copies	Drawing No.	Date or Revision	Description

This information is:

☐ For Your Information ☐ No Exceptions Taken ☐ Resubmit ___ copies for approval
☐ Unchecked ☐ Furnish as Corrected ☐ Return ___ corrected prints
☐ Preliminary ☐ Rejected ☐ Submit ___ copies for distribution
☐ Revised Plans ☐ Revise & Resubmit ☐ Final Plans
☑ Sent for Your Review & Comment

Remarks: Please review the enclosed PNF and Attachments (USGS Site Locus, Concept Plan, and Aerial Site Overview). Please do not hesitate to contact me if you have any questions or require additional information. MHC conclusions should be sent to my attention at The BSC Group, Inc., 33 Waldo Street, Worcester, MA 01608.

Signed: Mary Ellen Radovanic

From: Mary Ellen Radovanic, AICP, (617) 896-4506, Mradovanic@bscgroup.com

cc: The Northbridge Companies

Note: If enclosures are not as noted, please contact us immediately.

APPENDIX A MASSACHUSETTS HISTORICAL COMMISSION
220 MORRISSEY BOULEVARD
BOSTON, MASS. 02125
617-727-8470, FAX: 617-727-5128

PROJECT NOTIFICATION FORM

Project Name: Northbridge Mashpee Commons

Location / Address: 68 Great Neck Road South

City / Town: Mashpee, Massachusetts

Project Proponent

Name: The Northbridge Companies

Address: 71 Third Avenue

City/Town/Zip/Telephone: Burlington, MA 01803

Agency license or funding for the project (list all licenses, permits, approvals, grants or other entitlements being sought from state and federal agencies).

Agency Name	Type of License or funding (specify)
Cape Cod Commission[1]	Development of Regional Impact
USEPA	National Pollution Discharge Elimination System (NPDES): General Permit for Stormwater Discharges and Construction Dewatering Activities/Stormwater Pollution Prevention Plan (SWPPP)

Project Description (narrative):

The Northbridge Companies (Proponent) proposes to build a residential assisted living and care facility at 68 Great Neck Road South called Northbridge Mashpee Commons (the Project). The Project site is approximately 5.0 acres.

Does the project include demolition? If so, specify nature of demolition and describe the building(s) which are proposed for demolition.

There are no existing structures on the Project site so no demolition will occur.

Does the project include rehabilitation of any existing buildings? If so, specify nature of rehabilitation and describe the building(s) which are proposed for rehabilitation.

There are no existing structures on the Project site, so no rehabilitation will occur.

[1] The Cape Cod Commission is not a state agency, but rather a regional planning commission with authority to review and regulate "Developments of Regional Impact", or DRIs. A PNF is required as part of the DRI review process.

APPENDIX A (continued)

Does the project include new construction? If so, describe (attach plans and elevations if necessary).

The Project involves construction of a new assisted living and care facility. A Conceptual Design Plan is attached for reference, but please note that this design is preliminary and subject to change during the planning process. The new building is expected to have a ground floor footprint of approximately 33,400 square feet. Parking and internal driveways are estimated to be approximately 35,700 square feet.

To the best of your knowledge, are any historic or archaeological properties known to exist within the project's area of potential impact? If so, specify.

To the best of our knowledge there are no historic or archaeological properties known to existing within the Project site. The Town of Mashpee GIS online mapping system indicates that the Project is within an area designated as having moderate sensitivity for pre-contact resources.
(source: http://www.mapsonline.net/mashpeema/public.html)

What is the total acreage of the project area?

Woodland	Approximately 4.7 acres	Productive Resources:	
Wetland	0 acres	Agriculture	0 acres
Floodplain	0 acres	Forestry	0 acres
Open Space	0 acres	Mining/Extraction	0 acres
Developed	Approximately 0.3* acres	Total Project Acreage	Approximately 5.0 acres

* Developed area is a gravel access road used by the sewer department.

What is the acreage of the proposed new construction? Total developed area will be approximately 2.9 acres.

What is the present land use of the project area?

The Project area is undeveloped and forested, with the exception of a gravel road used to access the adjacent wastewater treatment facilities. The road is situated within a 30-foot wide sewer/utility easement. There is also a 105-foot electric company easement along the southeast edge of the property. Easements are shown in the Conceptual Design Plan.

Please attach a copy of the section of the USGS quadrangle map which clearly marks the project location.

A USGS Site Locus and Aerial Overview are attached.

This Project Notification Form has been submitted to the MHC in compliance with 950 CMR 71.00.

Signature of Person submitting this form: Mary Ellen Radovanic Date: 6-23-2014

Name: Mary Ellen Radovanic, AICP

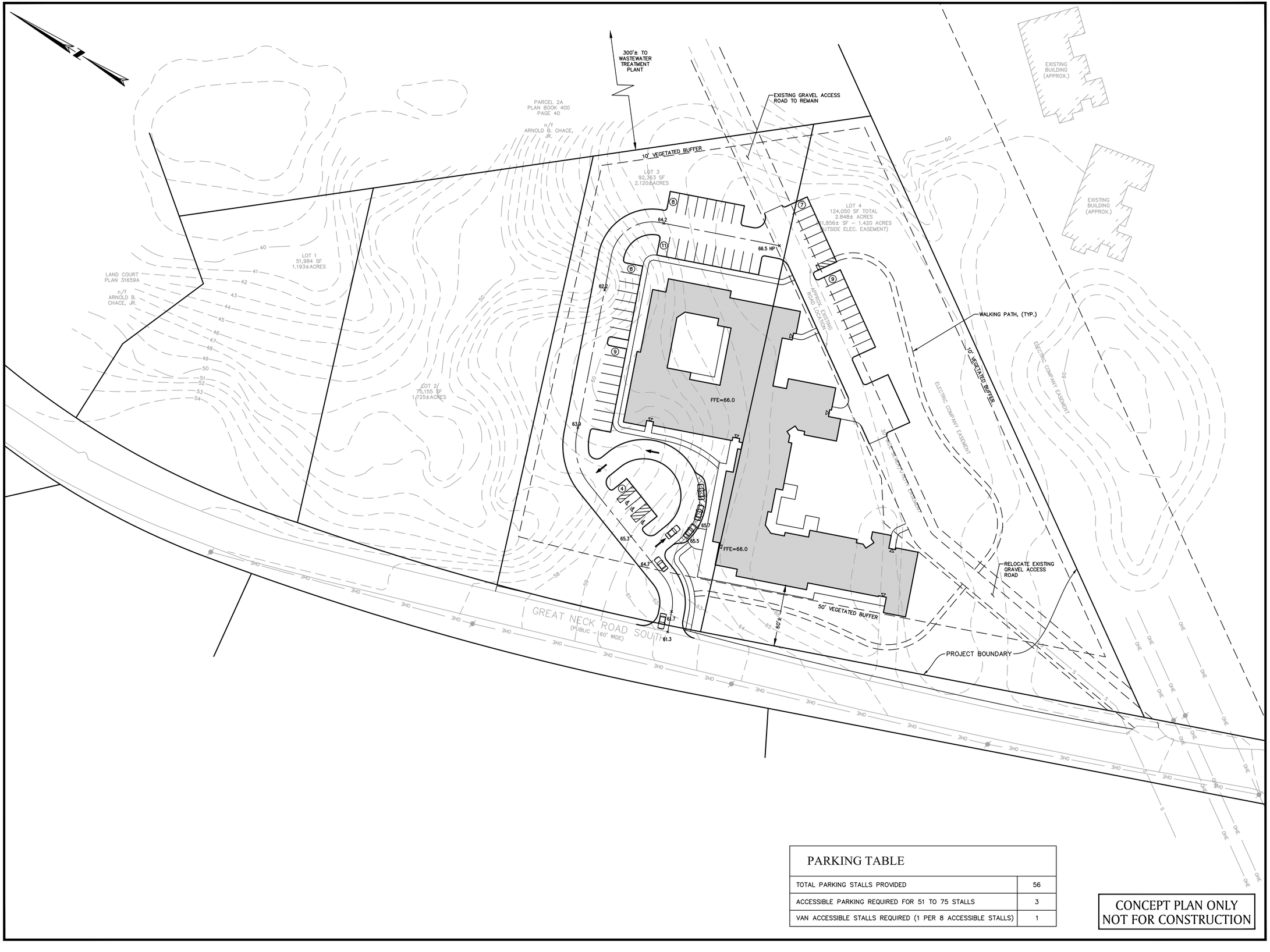
Address: BSC Group, Inc., 33 Waldo Street

City/Town/Zip: Worcester, MA 01608

Telephone: (617) 896-4506, Mradovanic@bscgroup.com

REGULATORY AUTHORITY

950 CMR 71.00: M.G.L. c. 9, §§ 26-27C as amended by St. 1988, c. 254.



PARKING TABLE	
TOTAL PARKING STALLS PROVIDED	56
ACCESSIBLE PARKING REQUIRED FOR 51 TO 75 STALLS	3
VAN ACCESSIBLE STALLS REQUIRED (1 PER 8 ACCESSIBLE STALLS)	1

CONCEPT PLAN ONLY
NOT FOR CONSTRUCTION

NORTHBRIDGE MASHPEE COMMONS

GREAT NECK ROAD SOUTH
IN
MASHPEE
MASSACHUSETTS
(BARNSTABLE COUNTY)

CONCEPT PLAN

JUNE 9, 2014

REVISIONS:

NO.	DATE	DESC.

PREPARED FOR:
THE NORTHBRIDGE COMPANIES
71 THIRD AVENUE
BURLINGTON, MA 01803

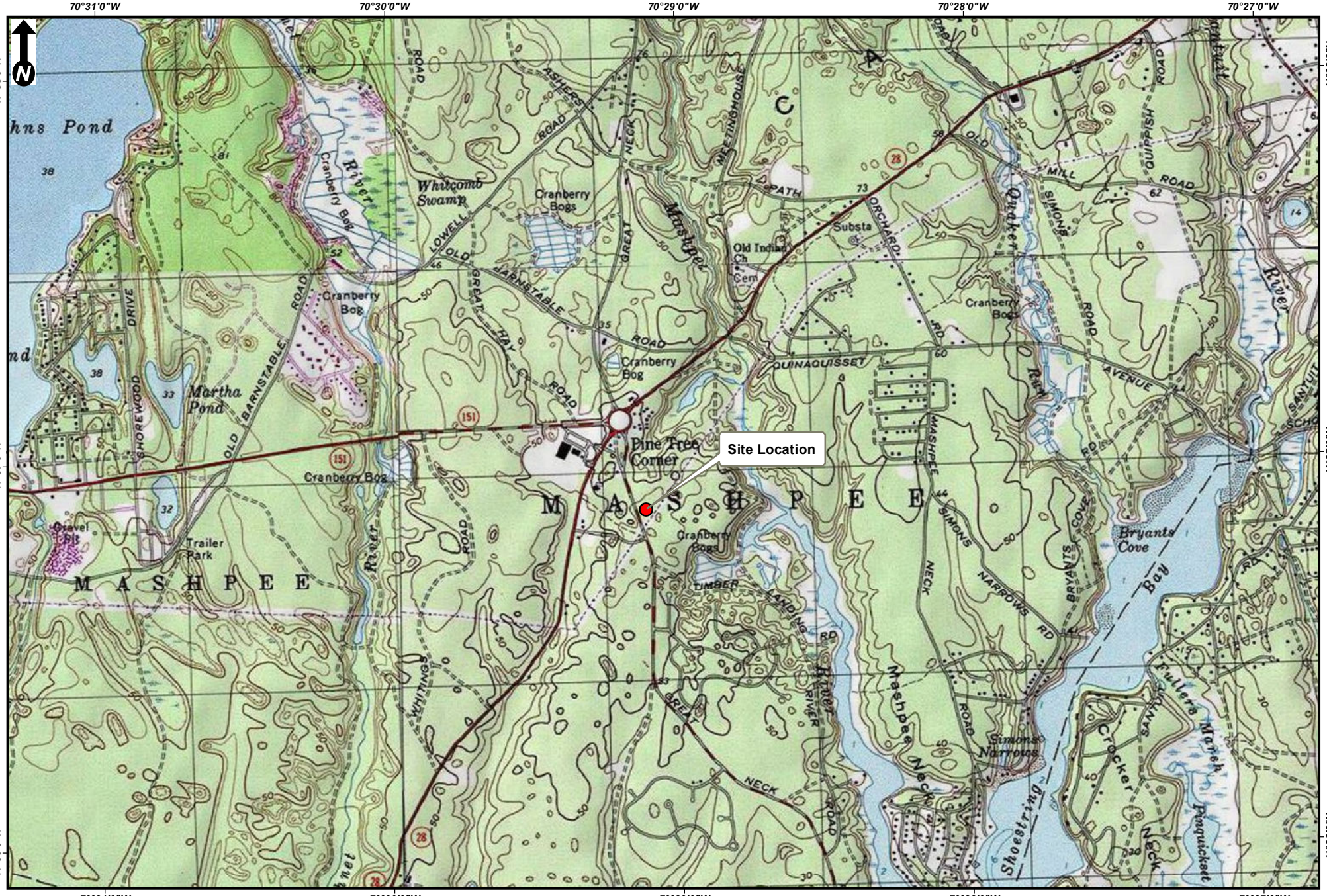
BSC GROUP
15 Elkins Street
Boston, Massachusetts
02127
617 896 4300

© 2014 BSC Group, Inc.

SCALE: 1" = 40'
0 20 40 80 FEET

FILE: P:\Prj\2321600\Civil\Drawings\...
DWG. NO:
JOB. NO: 2.3216.00
SHEET 1 of 1

Document Path: G:\GISPrj\2321600\Output\Maps\MXD\ReportMaps\NorthbridgeCommons_USGSLocus_20140623.mxd
Date Saved: 6/23/2014 10:03:40 AM



Scale:
1 inch = 2,000 feet
(page size: 8.5 X 11)

0 1,000 2,000
Feet

NORTHBRIDGE MASHPEE COMMONS

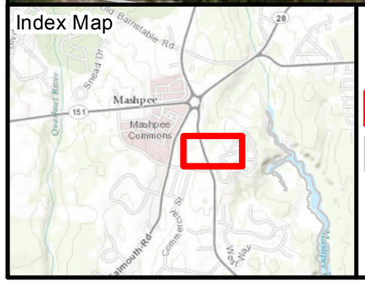
USGS Site Location Map
Mashpee, MA

Source: USGS, 1982-1990; MADOT, 2005; MassGIS, 2008

BSC GROUP

THIS DOCUMENT IS INTENDED FOR GENERAL PLANNING & INFORMATION PURPOSES ONLY. ALL MEASUREMENTS & LOCATIONS ARE APPROXIMATE

File Location: G:\GISPrj\2321600\Output\Maps\MXD\ReportMaps\NorthbridgeCommons_AerialOverview_20140623.mxd
Date Saved: 6/23/2014 9:58:52 AM



Legend

Roads

NorthBridge Mashpee Commons Project Site

Parcel Boundary

1 inch = 100 feet

0 100 200

Feet

N

Source:
-MassGIS
Basemap & Environmental Data
-Aerial & Topo Imagery
ESRI, DigitalGlobe, GeoEye, i-cubed, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., AEX, GEBCO, USDA, USGS, FAO, NPS, NRCAN, GeoBase, Getmapping, Aerogrid, IGP, IGN, Kadaster NL, Ordnance Survey, ESRI japan, METI, ESRI China (Hong Kong), swisstopo, & the GIS User Community

NORTHBRIDGE MASHPEE COMMONS

Project Site Aerial Overview

68 Great Neck Road South
Mashpee, MA

BSC GROUP

THIS DOCUMENT IS INTENDED FOR GENERAL PLANNING & INFORMATION PURPOSES ONLY. ALL MEASUREMENTS & LOCATIONS ARE APPROXIMATE

SENDER: *COMPLETE THIS SECTION*

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Mass. Historical Comm.
220 Morrissey Blvd.
Boston, MA
02125

COMPLETE THIS SECTION ON DELIVERY

A. Signature

X

☐ Agent
☐ Addressee

B. Received by *(Printed Name)*

C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☑ Certified Mail® ☐ Priority Mail Express™
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ Collect on Delivery

4. Restricted Delivery? *(Extra Fee)* ☐ Yes

2. Article Number
(Tra 7014 0150 0000 7417 5372

PS Form 3811, July 2013 Domestic Return Receipt

LAND USE

LU1 - Compact Growth and Resource Protection

Goal: To minimize adverse impacts on the land by using land efficiently and protecting sensitive resources, and to create vibrant communities by directing growth and redevelopment to appropriate locations.

LU1.1 Development Location

Development and redevelopment shall be consistent with the category of desired land use where the project is located as well as the characteristics of that category, both as identified on the Regional Land Use Vision Map. Notwithstanding this requirement, the Commission may find that development and redevelopment has met this requirement, if, in its discretion, it finds each of the following:

1. The proposed project is a redevelopment, or the expansion of a previously approved DRI; and,

2. The Commission finds that the proposed development does not present a threat to the resources and/or characteristics intended to be protected and maintained by its land use category.

This standard does not apply until the town has an endorsed Land Use Vision Map nor shall it apply to developments that are not designated on the Regional Land Use Vision Map.

Response: *The Town of Mashpee has not endorsed the Land Use Vision Map. Therefore the proposed project is unable to respond as to whether the site is located in an Economic Center, Industrial and Service Trade Area, Village or Resource Protection Area based on the Regional Land Use Vision Map. The site is located in the C-1 (commercial) zoning district, as identified on the Town of Mashpee zoning map. The site is within the Mashpee Commons master planned community which has longstanding plans for commercial mixed use development of its property in this locus as evidenced by the current C-1 Commercial zoning designation which radiates from the Mashpee rotary and includes the proposed peoject site. The proposed commercial use is consistent with local zoning. As of the date of this application, according to the Commission records, Mashpee has a Local Comprehensive Plan (LCP) that has been certified by the Commission as consistent with the Regional Policy Plan. Based on materials submitted for the record from the applicant and the town of Mashpee, the project is consistent with the goals and objectives identified in the Town's LCP, created to provide a long-range focus for Mashpee's land use planning and growth management activities. The Action Plan of the Land Use & Growth Management section of the LCP specifically calls for the development and adoption of zoning regulations for congregate care and assisted living facilities, and the appendix includes a proposed by-law authorizing these uses in commercial areas. On page 9-8 of Chapter 9, "Action Plan," it is stated under "Zoning and Regulatory Issues" that "in order to enhance our tax base while not increasing school costs, the Town should specifically allow, encourage and possibly provide incentives for, residences that are age-restricted to persons over ss ... [including] nursing homes, 'congregate care' and 'assisted living' facilities." Mashpee Town Meeting adopted such a by-law in October 2013, allowing such uses in commercial zones such as the C-1 zone in which the proposed project is proposed. As a "Congregate Care/ Assisted Living facility," defined by the Zoning Bylaw of the Town of Mashpee, the proposed project is consistent with the goals and objectives of the Town of Mashpee's land use planning and growth management activities.*

LU1.2 Compact Development

Nonresidential development and redevelopment shall be clustered on the site and with adjacent uses to the maximum extent possible by incorporating features, as applicable, such as multistory buildings, mixed use development, minimal setbacks from the street, limited and/or shared parking, and a pedestrian friendly design that encourages walking, biking and transit. All residential subdivisions of five or more lots and all commercial subdivisions of land shall cluster the proposed development unless inconsistent with local bylaws. Cluster plans shall use site designs that maximize contiguous open space, respect the natural topography and character of the

site and employ shared wastewater treatment, community water supply alternatives and Low Impact Development (LID) landscaping to allow more compact development.

Response: *The proposed development is a mixed use development which incorporates commercial and service uses to compliment and support the residential assisted living population. Assisted living communities' targeted population are seniors requiring varying degrees of assistance while promoting as much independence as possible for its residents. The building design and layout balances compact development objectives to the amount practable while still addressing the needs of it resident population. Specifically single level environments reduce the mobility challenges for the ambulatory limitations common in the resident population, Additionally multi level formats introduce segmentation in the living environment of the community. The proposed project is a single building with a combination of one and two stories.. The existing topography of the site was a major consideration in the overall design of the development. Where possible, stormwater biofiltration and underground infiltration basins will utilize naturally existing low areas in order to minimize site work and maintain existing drainage patterns on the site.*

LU1.3 Redevelopment/Reuse
DRIs are encouraged to incorporate redevelopment and/or reuse of existing buildings or developed sites in appropriate locations.

Response: *There are no existing buildings on the property. Existing unpaved access drives running northeasterly along the southern portion the site will remain to serve the development and the waste water treatment plant adjacent to the north east property line.*

LU1.4 Reuse of Historic Buildings
DRIs within Economic Centers or Villages as identified on the Regional Land Use Vision Map involving an historic structure are encouraged to include its rehabilitation and reuse in accordance with federal standards for treatment of historic properties.

Response: *Not applicable. There are no existing buildings on the site*.

LU1.5 Location of Municipal Offices
New municipal offices are encouraged to locate in Village Centers and designated Economic Centers in order to reinforce the character, vitality, and economic viability of these areas.

Response: *Not applicable. This project does not include municipal office buildings.*

LU2 - Capital Facilities and Infrastructure
Goal: To use capital facilities and infrastructure efficiently and in a manner that is consistent with Cape Cod's environment, character, and economic strengths, and that reinforces traditional village-centered development patterns.

Response:*The proposed project is located within the nexus of the greater Mashpee Commons Center Development. It is located where existing infrastructure is present or contemplated. The site is within walking distance to Mashpee commons which is a major regional commercial center that is also the location where the two major bus routes of the Cape Cod regional Transit Authority (CCRTA) intersect*.

LU2.1 Connections to Existing Infrastructure
Proposed or expanded infrastructure shall support compact development patterns, and in towns with a Land Use Vision Map, shall support the land use categories and characteristics of designated Economic Centers, Industrial and Service Trade Areas, and Villages, that have been designated on the Regional Land Use Vision Map.

Response: *While the site is unable to respond to this policy with respect to the Reguional Land Use Vision Map, the project site is in a location that is contemplated for the proposed development as evidenced by the presence of a WWTP adjoining the site, the local commercial zoning designation, and the Town of Mashpee Comprehensive Plan Public Survey results indicated a strong support for commercial, retail, and residential development in the rotary area and other commercial areas which may include 2 or 3 story buildings. The site abuts the Mashpee Commons Wastewater Treatment Facility which has agreed to provide service to the proposed project and public water service will be provided by the Mahpee Water District*

LU2.2 Co-location of Telecommunication Facilities
New wireless telecommunications facilities shall be required to demonstrate the commitment of two or more co-locators into the design of the facility. Additional guidance on the location and design of wireless facilities can be found in Guidelines for DRI Review of Wireless Communication Towers, Technical Bulletin 97-001, as amended.

Response: *Not applicable.*

LU2.3 Co-locate Public Infrastructure
Developments of Regional Impact proposing additional infrastructure should co-locate with or allow co-location of public services, infrastructure, and utilities and utilize existing rights-of-way.

Response: *This project proposes to connect to municipal water service, , gas, electric, and cable services. These services exist on Great Neck Road South. The Project will connect with the existing wastewater treatment plant via a proposed shared lift station to be constructed on adjoining land owned by the seller. No additional infrastructure is proposed.*

LU2.4 Access to Emergency Responders
The construction of new wireless telecommunication facilities should provide access to emergency responders into the design of the facility.

Response: *Not applicable*.

LU3 - Rural Lands
Goal: To preserve and enhance rural land uses, including agriculture, that are environmentally compatible with the Cape's natural resources in order to maintain opportunities to enjoy the traditional occupations, economic diversity, and scenic resources associated with rural lands, and to support activities that achieve greater food independence for Cape Cod.

LU3.1 Buffers to Agricultural Uses
New development adjacent to rural landscapes and those lands in active agricultural production shall maintain or provide a thickly vegetated buffer of sufficient width to prevent conflicts between the development and existing uses.

Response: *Not applicable. This project is not located adjacent to rural landscapes or lands in active agricultural production.*

LU3.2 Impacts to Agricultural Lands
Development unrelated to agricultural operations shall be designed so as to avoid or minimize development on lands capable of sustained agricultural production as evidenced by soils, recent agricultural use, and/or surrounding agricultural use.

Response: *The project site is not located on or adjacent to lands supporting recent or active agricultural operations.*

LU3.3 Best Management Practices
Management practices such as those developed by the Cape Cod Cooperative Extension and the Natural Resources Conservation Service are encouraged to maintain the productivity of agricultural lands and minimize the use of chemical fertilizers and pesticides and manage manure that could adversely impact the environment or water quality.

Response: *Not applicable.*

ECONOMIC DEVELOPMENT

ED1 - Low-impact and Compatible Development
Goal: To promote the design and location of development and redevelopment to preserve the Cape's environment and cultural heritage, use infrastructure efficiently, minimize adverse impacts, and enhance the quality of life for Cape Codders.

Minimum Performance Standards

ED1.1 Location in Economic Centers
Development shall be located in Economic Centers or Industrial and Service Trade Areas, or where appropriate, Villages as designated on the Regional Land Use Vision Map unless waived in accordance with ED1.3. For towns without a Land Use Vision Map or developments not designated on the Regional Land Use Vision Map, all DRIs shall meet the waiver requirements under ED1.3. This standard does not apply to residential subdivisions or wireless communication towers.

Response: *Not applicable. The Town of Mashpee has not endorsed the Land Use Vision Map, thereby rendering the proposed project unable to respond to whether the site is located in an Economic Center, Industrial and Service Trade Area, Village or Resource Protection Area based on the Regional Land Use Vision Map. However the site is designated in an area designated as a Regional Growth Center in the Land Use and Growth Managemetn element of the Mashpee Comprehensive Plan and located in the C-1 (commercial) zoning district clustered around the Mashpee Rotary, as identified on the Town of Mashpee zoning map. The site is within the Mashpee Commons master planned community which has longstanding plans for commercial mixed use development of its property in this locus as evidenced by the current commercial zoning designation which radiates from the Mashpee Rotary and includes the proposed peoject site. The proposed commercial use is consistent with local zoning. Additionally the results from the Town of Mashpee Comprehensive Plan Public Survey indicated a strong support for commercial, retail, and residential development in the Mashpee Rotary area and other commercial areas which may include 2 or 3 story buildings.*

ED1.2 Industrial and Service Trade Areas
Industrial and Service Trade Areas shall be reserved for light industry, warehousing, business-to-business wholesale, research and development facilities, and other uses related to the development, production, and/or distribution of goods. For towns without a Land Use Vision Map or developments not designated on the Regional Land Use Vision Map, all DRIs shall meet the waiver requirements under ED1.3.

Response: *Not applicable. This project is not located in Industrial and Service Trade Areas.*

ED1.3 Waiver
The Commission may waive ED1.1 and/or ED1.2 if the applicant demonstrates that new development meets four of the stated criteria:

Response:

- Green Design
  The project is designed to be , at a minimum, LEED/New Construction-certifiable at the base level. *The projects is designed to achieve at least 40 points To Be LEED/New Construction certifiable*

- Shared Infrastructure
  The project will be served by a shared existing wastewater treatment facility, with excess capacity and is proposed to serve the development of adjoining properties within Mashpee Commons.

- Emerging Industry Clusters
  The project is designed to and will accommodate a business within the region's Emerging Industry Clusters, which include education industries and other high-skill, high-wage, knowledge-based business activities.

- Municipal Endorsement
  An endorsement from the Board of Selectmen through a resolution (copy attached) states the project is consistent with local planning as evidenced by the local zoning designation and the Mashpee Commons Master Development Plan and the capital improvement and infrastructure planning for the area.

ED1.4 Resource-based Economic Areas
Development shall not eliminate or significantly impair the current and future function of working agricultural land, working waterfronts and harbors, fin- and shellfishing grounds, and recreational areas.

Response: *The project complies as it is not located in or adjacent to any of the aforementioned areas.*

ED2 - A Balanced Economy
Goal: To promote a balanced regional economy with a broad business, industry, employment, cultural, and demographic mix capable of supporting year-round and quality employment opportunities.

Minimum Performance Standards

ED2.1 Gaming
Development shall not involve Class III gaming given the stresses it places on the region's environment, transportation infrastructure, and economy.

Response: *Not Applicable.*

ED2.2 Quality Employment Opportunities
DRIs are encouraged to provide competitive wages consistent with the state average for that industry, employer-supported medical and retirement benefits packages, training opportunities beyond that need to perform the current job, and opportunities for advancement.

Response: *The proposed project will generate employment opportunites that offer competitive wages and benefits in addition to training opportunites for current jobs and advancement opportunity.*

ED2.3 Employee Housing
Commercial developments are encouraged to provide housing for 10 percent of their year-round employees. This may be fulfilled by providing actual units or through participation in the Housing Assistance Corporation's Employer Assisted Housing Program (or its equivalent) for 10 percent of year-round employees.

Response: *Not Applicable*

ED3 - Regional Income Growth
Goal: To promote economic activity that retains and attracts income to the region and benefits residents, thus increasing economic opportunity for all.

ED3.1 Local Labor and Service Providers
Commercial DRIs are encouraged to employ a majority of local residents and use a majority of local contractors, suppliers, professional service providers, and products during the planning, construction, and operational phases of the project.

Response: The proposed project complies

ED3.2 Local Ownership
Commercial DRIs are encouraged to allow for local ownership of non-formula businesses consistent with the economic, environmental and community character goals of this RPP.

Response: *Not Applicable*

ED3.3 Diverse Employment Opportunities
Commercial DRIs are encouraged to employ or directly benefit residents with disabilities, minorities, elderly, unemployed, and under-employed residents, and/or hires minority- and women-owned contractors.

Response: *The proposed project will reach out to minority and underemployed residents.*

ED3.4 Regional Export Growth
Commercial DRIs are encouraged to export goods and services not previously exported.

Response: *Not Applicable*

ED3.5 Regional Import Substitution
Commercial DRIs are encouraged to provide goods and services locally that were previously imported into the region.

Response: *Not Applicable*

ED3.6 Value-added Manufacturing
Commercial DRIs are encouraged to add value to goods prior to their final sale not previously added locally.

Response: *Not Applicable*

ED3.7 Local Fiscal Impact
Commercial DRIs are encouraged to have a positive net fiscal impact on the community in which it is located.

Response: *The proposed project will generate tax revenues in excess of the services it will receive and have a net positive fiscal impact on the community (refer to the Economic and Fiscal Impact Analysis).*

ED4 - Infrastructure Capacity
Goal: To provide adequate capital facilities and infrastructure that meet community and regional needs, expand community access to services, and improve the reliability and quality of services.

Response: *Not applicable. The project does not include the development of telecommunications facilities.*

WATER RESOURCES

WR1 - General Aquifer Protection
Goal: To maintain the hydrogeologic balance and quality of Cape Cod's aquifer, considering such factors as groundwater withdrawals, wastewater disposal, stormwater recharge, and adequate surface water levels.

WR1.1 Five-ppm Nitrogen Loading Standard
All development and redevelopment shall not exceed a 5-parts per million (ppm) nitrogen loading standard for impact on groundwater unless an alternative standard applies in accordance with the water resources classification system as described in the Water Resources planning section found on page 27. Guidance on methodology to meet this standard can be found in Cape Cod Commission Nitrogen Loading Technical Bulletin 91-001, as amended.

Response*: Nitrogen loading calculations, prepared in accordance with Technical Bulletin 91-001, are included with this DRI application. The anticipated nitrogen loading for this project is 2 ppm.*

WR1.2 Identification of Drinking Water Wells
Development and redevelopment shall identify their proposed drinking water wells and existing private drinking water wells on abutting properties within 400 feet and assess the impact of the development on the water quality of these wells and all other existing wells that may potentially be affected by the proposed development. Septic systems and other sources of contamination shall be sited to avoid adversely affecting downgradient existing or proposed wells.

Response: *There are no known existing or proposed drinking water wells within 400 feet of the project site. Septic systems are not proposed as part of this development.*

WR1.3 Groundwater Study Requirement
Developments of Regional Impact that withdraw more than 20,000 gallons of water per day shall demonstrate through a groundwater study that the project will not have adverse impacts on groundwater levels or adjacent surface waters and wetlands. The study shall include mapping of surface water morphology and comparison of existing and affected water-table fluctuations.

Response: *Not applicable. The proposed domestic water demand for the project does not exceed 20,000 gallons*.

WR1.4 Cluster Development
All residential subdivisions of five or more lots and all commercial subdivisions of land shall cluster the proposed development unless inconsistent with local bylaws. Cluster plans shall use site designs that maximize contiguous open space, respect the natural topography and character of the site, and employ shared wastewater treatment,

community water supply alternatives and Low Impact Development (LID) landscaping to allow more compact development.

Response: *The proposed development is locarted in a single building , and complies with the intent to cluster the development to maximize one contiguous open space. Natural topography will be preserved to the maximum extent practicable, and the character of the existing site will be maintained. Shared wastewater treatment is proposed as part of this proposed development. Landscaping will be provided that utilizes native non invasive plant species that are drought tolerant.*

WR1.5 Turf and Landscape Management Plan
Development and redevelopment shall adopt Best Management Practices such as a turf and landscape management plan that incorporates water conservation measures including the use of native and drought tolerant plantings and the use of drip irrigation, and minimizes the amount of pesticides and chemical fertilizers.

Response: *See attached Turf and Landscape Management Plan.*

WR1.6 Management of Water Withdrawals/Wastewater Discharges
Water withdrawals and wastewater discharges are encouraged to be managed so that they do not adversely affect surface water resources, wetlands, private wells, or the safe yield of the aquifer.

Response: *The project proposes to extend the existing distirct water distribution system into the development. Fire hydrants will be provided in accordance with local and State requirements. Stormwater runoff will be managed largely through surface treatment and the provision of underground infiltration basins throughout the development. Prior to discharge, stormwater runoff from impervious surfaces will be pre-treated through the use of bioretention filtration systems in accordance with the Massachusetts Stormwater Management Standards. All facilities have been sized to accommodate up to the 100-year design storm.*

WR1.7 Use of Water-conservation Technologies
Development and redevelopment are encouraged to use water-conservation technologies or other strategies to obtain a 40-percent reduction of water use.

Response: The units will include water efficient toilets and shower heads. The proposed planting schedule includes native drought tolerant species

WR1.8 Alternatives to Chemical Fertilizers and Pesticides
Development and redevelopment are encouraged to utilize alternatives to synthetic chemical fertilizers and pesticides in favor of organic and biological methods.

Response: Acknowledged. See Attached Landscape Maintence Plan

WR1.9 Greater Protection of Groundwater/Surface Water
Development and redevelopment are encouraged to attain greater groundwater or surface water protection than provided for in the Minimum Performance Standards.

Response: *Stormwater infiltration systems will be designed to maximize the vertical separation from groundwater. The increased separation will provide a higher level of nitrogen removal, resulting in greater protection of groundwater.*

WR1.10 Wastewater and Stormwater Reuse
Development and redevelopment are encouraged to incorporate reuse of wastewater and stormwater for irrigation.

Response: Wastewater is to be directed to a shared waste water treaement facility adjacent to the site. Stormwater shall be initially surface treated then infiltrated via bio retention basins or infiltration chambers

WR2 - Drinking Water Quality & Quantity (Wellhead Protection Areas & Potential Water Supply Areas)
Goal: To maintain the overall quality and quantity of Cape Cod's groundwater to ensure a sustainable supply of untreated high-quality drinking water.

WR2.1 Five-ppm Nitrogen Loading Standard
The maximum nitrogen loading standard for impact on groundwater shall be 5 ppm for development and redevelopment unless a cumulative impact analysis indicates a more stringent loading standard is necessary.

Response: *Nitrogen loading calculations, prepared in accordance with Technical Bulletin 91-001, are included with this DRI application. The anticipated nitrogen loading for this project is 2 ppm. Based on the Cape Cod Commissions Regulatory maps, the proposed development is not located within a wellhead protection area or potential water supply area.*

WR2.2 Prohibition on Hazardous Materials/Wastes
Development and redevelopment that involves the use, treatment, generation, handling, storage, or disposal of Hazardous Materials or Hazardous Wastes, with the exception of household quantities, shall not be permitted in Wellhead Protection Areas, except as provided in WM1.2 and WM1.3.

Response: *With the exception of minimal household quantities, there will be no use, treatment, generation, handling, storage or disposal of Hazardous Materials or Hazardous Wastes at this site.*

WR2.3 Restrictions on Public and Private Wastewater Treatment Facilities
Public and private wastewater or treatment facilities with Title 5 design flows greater than 10,000 gallons per day shall not be permitted in Wellhead Protection Areas, except as provided in MPS WR5.2 below and subject to MPS WR6.1 through WR6.9.

Response: *Not Applicable*

WR2.4 Prohibited Uses under State Regulations
Uses prohibited in Zone IIs by state regulations shall not be permitted.
In addition to the above standards WR2.1 to WR2.4, for areas mapped as Potential Public Water Supply Areas, the following minimum performance standards shall apply. The Commission may determine that WR2.5 and WR2.6 do not apply provided that supporting information from the Town or Water District demonstrates to the Commission that the area will not be considered as potential water supply areas.

Response: *Not Applicable*

WR2.5 Future Well Site Restrictions
No development shall be permitted within 400 feet of an identified future well site.

Response: *The project will not be located within 400 of an identified future well site.*

WR2.6 One-ppm Nitrogen Loading Standard
The maximum nitrogen loading standard for impact on groundwater shall be 1 ppm for development. Guidance on methodology to meet this standard can be found in Cape Cod Commission Nitrogen Loading Technical Bulletin 91-001, as amended.

Response: *See Nitorgen Loading calculations*

WR3 - Marine Water Embayments and Estuaries (Marine Water Recharge Areas)
Goal: To preserve and restore the ecological integrity of marine water embayments and estuaries.

WR3.1 Critical Nitrogen Load fir Standard Development
In watersheds to estuaries/embayments where a critical nitrogen load has been determined, through either Total Maximum Daily Load (TMDL) or a Massachusetts Estuaries Project accepted technical report, development/redevelopment shall not exceed the critical nitrogen loading standards for impact on marine ecosystems, except as provided in WR3.3 The Commission shall maintain a list and map of estuary/embayment critical nitrogen loading standards that ashall be the basis ofr applying this MPS; the list and map will be updated on a regular basis as TMDL's are approved by the Massachusetts Department of Envorinmental Protection and the U.S. Environmental Protection Agency.

Response: *Please refer to the attached Nitrogen Loading Calculations and the monthly groundwater discharge reports for the Mashpee Commons Wastewater Treatment facility*

WR 3.4 Nitogen Offset Contributions
In watersheds to estuaries/embayments where developlent and redevelopment must meet wither WR3.1 or WR3.2, development/redevelopment may meet these standards by providing an equivilant nitrogen offset contribution to be used to meet the intent of WR3.1or WR3.2 as provided in the following paragraph.

Response: The project will be served by the Mashpee Commons Wastewater Treatment facility which has agreed to accept wastewater from the project and which currently treats and has additional treatment capacity for nearby land uses.

WR4 - Freshwater Ponds and Lakes (Freshwater Recharge Areas)
Goal: To preserve and restore the ecological integrity of freshwater ponds and lakes.

Response: *Not Applicable*

WR5 – Water Quality Improvement Areas (Water Quality Impaired Areas)
Goal: To improve impaired water quality in Wellhead Protection, Marine Water Recharge, and Freshwater Recharge Areas.

Response: *Not Applicable*

Minimum Performance Standards

WR5.1 Nitrogen Loading Standard
Development and redevelopment shall not exceed the nitrogen loading standards for Wellhead Protection Areas or an identified marine water quality standard as applicable. Where existing development within the watershed exceeds the identified loading standard or where there are documented marine water quality problems, nitrogen loading from development and redevelopment shall be maintained or improved.

Response: *Not applicable. The project is not located in a Water Quality Improvement Area.*

WR5.2 Public and Private Wastewater Treatment Facilities

Use of public and private wastewater treatment facilities shall be as follows: Within Water Quality Improvement Areas that are in Wellhead Protection Areas, public and private wastewater treatment facilities may be used to remediate existing problems; within Water Quality Improvement Areas that are in Freshwater and/or Marine Water Recharge Areas, public and private wastewater treatment facilities may be used in conjunction with any development or redevelopment.

Response: *Not applicable. The project is not located in a Water Quality Improvement Area.*

WR5.3 Monetary Contribution in Designated Mapped Areas
Development and redevelopment in designated Economic Centers, Industrial and Service Trade Areas, Villages, and Growth Incentive Zones within Water Quality Improvement Areas that have been identified as requiring comprehensive wastewater treatment solutions shall, in the Commission's discretion, be required to provide a monetary contribution, not to exceed $20 per gallon of design flow of wastewater per day, towards community wastewater facility planning or implementation efforts that may include infrastructure for wastewater management, if in the Commission's judgment, such contribution would assist in the planning or implementation of such infrastructure. In towns without a Land Use Vision Map, this MPS shall only apply to development and redevelopment in Water Quality Improvement Areas.

Response: *Not applicable. The project is not located in a Water Quality Improvement Area*.

WR5.4 Nitrogen Loading Standard in Impaired Areas
For Impaired Areas outside of other mapped water resource areas, development and redevelopment shall generally meet a 5-ppm nitrogen loading standard for impact on groundwater, but the standard may be increased where it can be demonstrated to the Commission that such increase will cause no adverse impact on ponds, wetlands, marine waters, public or private drinking water supply wells, and potential water supply wells as identified under Goal WR2.

Response: *Not applicable. The project is not located in a Water Quality Improvement Area.*

WR5.5 Alternative Water Supply in Designated Mapped Areas
Development in designated Economic Centers, Industrial and Service Trade Areas, Villages, or Growth Incentive Zones in areas serviced by private water supplies shall connect to public water supply, and at the Commission's discretion, shall connect existing development to public water supply in the event that said development impacts such existing development. In towns without a Land Use Vision Map, this MPS shall apply only to Impaired Areas.

Response: *Not applicable. The project is not located in a Water Quality Improvement Area.*

Best Development Practices

WR5.6 Chapter 21E Site Assessments
Development and redevelopment are encouraged to submit Chapter 21E site assessments or other water quality information indicating the condition of the site relative to hazardous waste.

Response: *A Phase I environmental assessment of the site has been conducted and is included in this submission.*

WR5.7 Reduction of Nitrogen Loading in Water Quality Improvement Areas
Development and redevelopment in Water Quality Improvement Areas within Marine Water Recharge Areas are encouraged to reduce nitrogen loading by providing for the removal of 2 kilograms of nitrogen for each kilogram added.

Response: *Not applicable. The project is not located in a Water Quality Improvement Area.*

WR6 - Public and Private Wastewater Treatment Facilities

Goal: To encourage the use of public and private wastewater treatment facilities in appropriate areas where they will provide environmental or other public benefits and where they can be adequately managed and maintained.

The following Minimum Performance Standards shall apply to development and redevelopment proposing public and private wastewater treatment facilities.

Response: *Not Applicable*

WR6.1 Private Wastewater Treatment Facilities

Private treatment facilities shall be permitted only if the implementation timetable of an approved Comprehensive Wastewater Management Plan indicates that there are no feasible public treatment facility options available within three years of the proposed date of construction of a project.

Response: *Not applicable. A wastewater treatment facility is not proposed for this project.*

WR6.2 Tertiary Treatment

All public and private wastewater treatment facilities with greater than a design flow of 10,000 gallons per day shall be designed to achieve tertiary treatment with denitrification that meets a maximum 5-ppm total nitrogen effluent discharge standard either through advanced treatment to achieve 5 ppm in the effluent or 5 ppm in groundwater at the downgradient property boundary. The standard may be increased to 10 ppm total nitrogen for redevelopment in Impaired Areas where it can be demonstrated to the Commission that such increase will cause no adverse impact on ponds, wetlands, marine waters, public or private drinking water supply wells, and potential water supply wells.

Response: *Not applicable. A wastewater treatment facility is not proposed for this project.*

WR6.3 Hydrologic Balance

Sewage treatment facilities and their collection and discharge areas shall maintain the hydrologic balance of the aquifer and demonstrate that there are no negative ecological impacts to surface waters.

Response: *Not applicable. A wastewater treatment facility is not proposed for this project.*

WR6.4 Development Density Limitations

The construction of private wastewater treatment facilities shall not allow development to occur at a higher density than would be allowed by local zoning unless anticipated and approved through a Commission approved Comprehensive Wastewater Management Plan.

Response: *Not applicable. The construction of a wastewater treatment facility is not proposed for this project*.

WR6.5 Ownership and Maintenance of Treatment Facilities

The construction of private wastewater treatment facilities shall be consistent with municipal capital facilities plans as applicable. Development and redevelopment using private wastewater treatment facilities shall specify that the municipality shall have the opportunity to assume ownership and maintenance responsibilities for such facilities where desired by the municipality.

Response: Not applicable. *The construction of a wastewater treatment facility is not proposed for this project.*

WR6.6 Restrictions in FEMA Flood Zones/Other Sensitive Areas
Public and private wastewater treatment facilities shall not be constructed in FEMA V-Zones and floodways, Areas of Critical Environmental Concern (ACECs), wetlands and buffer areas, barrier beaches, coastal dunes, or critical wildlife habitats. Public and private wastewater treatment facilities may be constructed in FEMA A-Zones only to remediate water quality problems from existing development within such A-Zones and consistent with MPS CR2.2 and CR2.8.

Response: *Not applicable. The construction of a wastewater treatment facility is not proposed for this project.*

WR6.7 Long-term Ownership of Treatment Facilities
The long-term ownership, operation, maintenance and replacement of private wastewater treatment facilities shall be secured as a condition of approval in accordance with Commission, state, and local guidelines.

Response: *Not applicable. The construction of a wastewater treatment facility is not proposed for this project.*

WR6.8 Sludge Disposal
Applications for approval of public and private wastewater treatment facilities shall include a plan for sludge disposal.

Response: *Not applicable. The construction of a wastewater treatment facility is not proposed for this project.*

WR6.9 Operation, Monitoring, and Compliance Agreement
Private wastewater treatment facilities greater than 2,000 gallons per day (gpd) design flow that require advanced treatment efficiencies greater than that allowed by a DEP permit to meet Commission Minimum Performance Standards, shall demonstrate operation, monitoring and compliance through a Operation, Monitoring and Compliance agreement between the Board of Health and the Cape Cod Commission.

Response: *Not applicable The construction of a wastewater treatment facility is not proposed for this project.*

Best Development Practices

WR6.10 Improvement of Existing Wastewater Treatment
Development and redevelopment are encouraged to increase aggregation and improve the level of treatment of existing wastewater flows.

Response: *Not applicable. The site is undeveloped and there are no existing wastewater flows.*

WR6.11 Water Quality Remediation
When allowing additional development in areas where existing high-density development or large numbers of failing septic systems have led to public health or water quality problems, development is encouraged to install a private wastewater treatment facility or DEP-approved alternative systems with enhanced nitrogen removal as a remedial measure.

Response: *There are no known water quality issues or failing septic systems in the development area, this area is served by a Wastewater Treatment Facility.*

WR7 - Stormwater Quality

Goal: To protect the overall water quality of the aquifer and its resources by minimizing impervious surfaces and improving stormwater quality as much as possible.

WR7.1 No New Direct Discharges of Untreated Stormwater
New direct discharge of untreated stormwater, parking-lot runoff, and/or wastewater into marine and fresh surface water and natural wetlands shall not be permitted.

Response: *There are no proposed direct discharges of untreated stormwater runoff and/or wastewater into marine, fresh surface water or natural wetlands.*

WR7.2 On-Site Infiltration
Stormwater for all roadways and parking areas shall be managed and infiltrated on site, close to the source, to minimize runoff and maximize water quality treatment. Stormwater water quality treatment shall be provided for the first inch of rainfall (25-year 24-hour storm) consistent with 310 CMR and the Massachusetts Stormwater Management Handbook to attain 80-percent total suspended solids removal and to reduce nutrients. All designs shall provide for at least 44-percent total suspended solids removal shall be designed prior to discharge into structured infiltration systems.

Response: *The proposed development has been designed in accordance with these requirements.*

WR7.3 Roof Runoff
Roof runoff shall be managed separately and directly infiltrated unless there is an identified rooftop water quality concern that requires additional treatment or management.

Response*: Rooftop runoff will be treated initially with rain gardens or tree box filters then directed ito on site underground infiltration systems.*

WR7.4 Biofiltration Practices
Stormwater design for the first inch of stormwater flow from development parking and roadways shall use biofiltration practices including, but not limited to, vegetated swales and filter strips, constructed wetlands, tree box filters, bio-retention basins and rain gardens for treatment of stormwater runoff. Bioretention areas shall be constructed in accordance with the Massachusetts Storm Water Management Volume One: Stormwater Policy Handbook, March 1997. Approved biofiltration areas may be counted as open space within Wellhead Protection Areas.

Response: *Tree box filtration systems are proposed throughout the development and have been designed in accordance with the Massachusetts Stormwater Handbook, as referenced above.*

WR7.5 Structured Infiltration Devices
Structured infiltration devices shall be used to accommodate frozen flow conditions and storms that exceed the 25-year 24-hour storm and designed to be consistent with the Massachusetts Stormwater Standards under 310 CMR10 and the Massachusetts Storm Water Management Handbook.

Response: *Underground structured infiltration devices have been designed in accordance with the Massachusetts Stormwater Standards under 310 CMR10 and the Massachusetts Storm Water Management Handbook.*

WR7.6 Impervious Surfaces

Roadway and parking design shall limit impervious surfaces. Parking lots shall be designed for the minimum required by the town in accordance with MPS TR2.9. Overflow peak parking design shall be constructed from pervious materials such as porous pavement, permeable pavers, or biomaterial such as grass pavers unless inconsistent with local bylaws. Bioretention shall be incorporated into parking islands and roadway perimeters. Permeable paving shall be encouraged where appropriate.

Response: *The proposed drive aisles within the development have been designed to meet the minimum requirements in order to minimize impervious surface area Due to the unique charateristics of assisted living comuites the applicant is seeking a reductionin the amount of required parking spaces for this project which will further reduce the imperious surface area.*

WR7.7 Structured Infiltration Devices in Designated Mapped Areas
Structured detention basins, infiltration basins and galleries may be used for redevelopment in Impaired Areas, Economic Centers, Industrial and Service Trade Areas, Villages, and Growth Incentive Zones. In towns without a Land Use Vision Map, this MPS shall only apply to redevelopment in Impaired Areas.

Response: *Underground structured infiltration devices have been designed in accordance with the Massachusetts Stormwater Standards under 310 CMR10 and the Massachusetts Storm Water Management Handbook.*

WR7.8 Minimum Two-foot Separation to Groundwater
New infiltration basins or other stormwater leaching structures shall maintain a minimum two-foot separation between points of infiltration and maximum high water table except as required under MPS CR3.4. Guidance on the high groundwater adjustment methodology can be found in Estimation of High Groundwater Levels for Construction and Land Use Planning, Technical Bulletin 92-001, as amended.

Response: *All proposed infiltration facilities have been designed with a minimum vertical separation of 2 feet to the seasonal high groundwater elevation.*

WR7.9 Best Management Practices during Construction
Construction best management practices for erosion and sedimentation controls shall be specified on project plans to prevent erosion, control sediment movement and stabilize exposed soils.

Response: *An Erosion & Sedimentation Control Plan has been prepared for the proposed development and is included with the submitted project plans.*

WR7.10 Stormwater Maintenance and Operation Plan
Development and redevelopment shall submit a Professional Engineer-certified stormwater maintenance and operation plan demonstrating compliance with the Massachusetts Stormwater Guidelines including a schedule for inspection, monitoring, and maintenance. The plan shall identify the parties responsible for plan implementation, operation and maintenance. The identified responsible party shall keep documentation of the maintenance and inspection records and make these available to the Commission or local board of health upon request. One year from completion of the system, a Professional Engineer shall inspect the system and submit a letter certifying that the system was installed and functions as designed.

Response: *A Stormwater Operation & Maintenance Plan is included within the Stormwater Report and is consistent with the above requirements.*

WR7.11 Shut-off Valve in Wellhead Protection Areas
In Wellhead Protection Areas, stormwater systems for land uses that have a high risk of contaminating groundwater, such as vehicle maintenance areas and loading docks, shall install a mechanical shut-off valve or other flow-arresting device between the catch basin or other stormwater-capture structure draining this area and the leaching structures.

Response: *Not applicable. The proposed development is not within Wellhead Protection Areas.*

WR7.12 Road Widths
DRIs are encouraged to limit roadway lane widths to 9 feet (18 feet total for two-lane roadways) to minimize runoff from impervious surfaces.

Response: *The proposed drive aisles within the development have been designed to meet the minimum requirements in order to minimize impervious surface area.*

COASTAL RESOURCES

Response: *The proposed project is not located in a Coastal Resource Area. Therefore, the minimum performance standards do not apply.*

MARINE RESOURCES

Response: *The proposed project is not located in a Marine Resource Area. Therefore, the minimum performance standards do not apply.*

WETLANDS

Response: *The proposed project is not located within 100 feet of a wetland resource area, nor do any exist on the project site. Therefore, the minimum performance standards do not apply.*

WILDLIFE AND PLANT HABITAT

WPH1 - Prevent Loss, Minimize Adverse Impact, and Maintain Diversity
Goal: To prevent loss or degradation of critical wildlife and plant habitat, to minimize the adverse impact of new development on wildlife and plant habitat, and to maintain existing populations and species diversity.

Minimum Performance Standards

WPH1.1 Natural Resources Inventory
Applications for Developments of Regional Impact that propose to alter undeveloped areas shall contain a natural resources inventory. Such inventory shall identify the presence and location of wildlife and plant habitat, including vernal pools, and serve as a guide for the layout of the development. Developments shall be planned to minimize adverse impacts to wildlife and plant habitat. Guidance on preparation of natural resources inventories

can be found in Development of Regional Impact Guidelines for Natural Resources Inventory (Plant and Wildlife Habitat Assessment), Technical Bulletin 92-002, as amended.

Response: The Natural Resource Inventory has been prepared and is attached hereto.

WPH1.2 Clearing and Grading
Clearing of vegetation and alteration of natural topography shall be minimized, with native vegetation planted as needed to enhance or restore wildlife habitat. Standing specimen trees shall be protected. The Commission may require designation of building envelopes (for structures, driveways, lawns, etc.), where appropriate, to limit removal of vegetation.

Response: The site has been design to minimiz the extent of clearing snd grading. Native non invasive plantings are proposed.

WPH1.3 Wildlife and Plant Habitat
Fragmentation of wildlife and plant habitat shall be minimized by the establishment of greenways and wildlife corridors of sufficient width to protect not only edge species but also species that inhabit the interior forest, as well as by the protection of large unfragmented areas, and the use of open space or cluster development. Wildlife shall be provided with opportunities for passage under or across roads and through developments where such opportunities will maintain the integrity of wildlife corridors. Fencing shall not be constructed so as to interfere with identified wildlife migration corridors.

Response: The property will not contain fencing or other physical barriers that will interfere with wildlife migration.

WPH1.4 Rare Species
DRIs within critical wildlife and plant habitat areas shall submit the development proposal to the Massachusetts Natural Heritage Program for review and comment. DRIs that would adversely affect habitat of local populations of rare wildlife and plants shall not be permitted. Development may be permitted where the proponent can demonstrate that such development will not adversely affect such habitat. A wildlife and plant habitat management plan may be required as a condition of approval when development or redevelopment is permitted in critical wildlife and plant habitat areas.

Response: *The Natural Heritage and Endangered Species Program issued a determination (NHESP File No: 00-7563) dated November 13, 2013for the Trout Pond area which includes the proposed project site and found that development within the project site will not result in a prohibited take of state listed rare species. A copy of the determination is included in the application package*

WPH1.5 Vernal Pools
Where a project site is located adjacent to a vernal pool (as defined herein), development shall be prohibited within a 350-foot undisturbed buffer around these resources. New stormwater discharges shall be located a minimum of 100 feet from vernal pools.

Response: *Not Applicable as no vernal pools are located on or within 350 feet of the site*

WPH1.6 Invasive Species
Development on sites where a natural resources inventory identifies the presence of invasive plant species shall provide and implement a management and restoration plan detailing the management of, and where possible, the

eradication of the invasive species present, and for revegetating the site with native species. A current listing of invasive species can be found on the web at www.massnrc.org/mipag/invasive.htm.

Response: Invasive species identified in the natural resource inventory shall be eradicated. Proposed plantings on the site will be native and non invasive

Best Development Practices

WPH1.7 Habitat Restoration
Measures to restore altered or degraded upland habitat areas are encouraged where ecologically appropriate (for example, sandplain grasslands, pine barrens, etc.).

Response: Th project will provide off site mitigation at a ratio of two to one for developed areas

WPH1.8 Un-development
In redevelopment projects in sensitive or significant habitats, including mapped estimated or priority habitat as identified by the Natural Heritage Program, efforts to remove existing development from sensitive or significant habitat areas are encouraged.

Response: *Development has been designed to minimize the disturbed area.*

OPEN SPACE AND RECREATION

OS1 - Open Space and Natural Resources
Goal: To preserve and enhance the availability of open space that provides wildlife habitat and recreational opportunities, and protects the region's natural resources and character.

OS1.1 Clustering of Development
Development or redevelopment within Significant Natural Resource Areas, as illustrated on the Cape Cod Significant Natural Resource Area (SNRA) Map, as amended, shall be clustered away from sensitive resources and maintain a continuous corridor to preserve interior wildlife habitat. Where a property straddles the boundary of an area shown on the SNRA map, development shall be clustered outside the boundary.

Response: *The proposed project is consistent with this Minimum Performance Standard.*

OS1.2 Open Space Connections
Preserved open space within proposed developments shall be designed to be contiguous and interconnecting with adjacent open space, and shall be subject to permanent protection under Article 97 of the Massachusetts state constitution, or similar conservation mechanism. Additional guidance on dedication of open space for Developments of Regional Impact can be found in the Guidelines for Calculation and Provision of Open Space in Developments of Regional Impact, Technical Bulletin 94-001, as amended.

Response: *The proposed project is consistent with this Minimum Performance Standard.*

OS1.3 Open Space Requirements

All development, excepting municipal projects serving municipal purposes, that qualifies as a DRI shall provide permanently restricted upland open space in accordance with the proportional calculation described below:

Total Development Area to Total Open Space Provided

Proportion Required	Location of Development
2:1	Development in Growth Incentive Zones/Economic Centers
1:2	Development in Significant Natural Resource Areas
1:1	Development in all other areas

For towns without designated Economic Centers, a DRI shall comply with the open space requirements based on its location relative to SNRA.

Calculation Based on Development Area
A project's open space requirement is calculated in direct proportion to the project's development area. For the purposes of calculating the open space requirement, the development area for new development and redevelopment is any previously undisturbed upland area (including upland areas that are functioning as habitat) affected by "development" as defined in the Definitions section of this document. Additional guidance can be found in Guidelines for Calculation and Provision of Open Space in DRIs, Technical Bulletin 94-001, as amended.

Protection of Areas with Highest Natural Resource Values
Open space shall be designed to protect those portions of the site with the highest natural resource values as identified by a natural resources inventory. Within open space areas, the maximum amount of natural vegetation shall be maintained. Where development is located in more than one area as identified in the chart above, open space totals shall be determined for each area and added together. Where new development is proposed within Significant Natural Resource Areas, open space shall be provided within these areas. The requirements for Significant Natural Resource Areas shall apply to projects located in Growth Incentive Zones/Economic Centers that are located within a Significant Natural Resource Area, with exceptions as noted in Minimum Performance Standard OS1.7.

Provision of Off-Site Open Space
Where appropriate and at the Cape Cod Commission's discretion, credit may be obtained for set aside of off-site open space or a contribution of funds may be made to the town, state, land trust, or the Compact of Cape Cod Conservation Trusts' Land Fund for open space acquisition at a rate determined by the calculation specified below and to be updated annually per town in the Guidelines for Calculation and Provision of Open Space in Developments of Regional Impact, Technical Bulletin 94-001, as amended. The Commission shall give priority to towns when determining the recipient of off-site open space donations or cash contributions. Off-site open space shall be provided in the town where development is proposed, unless the Commission finds, in consultation with the relevant towns, that the provision of off-site open space in an adjacent community on Cape Cod is appropriate.

Calculation of Cash Mitigation Open Space Option

On an annual basis, Commission staff shall calculate the per acre cash equivalent for open space for each town based on the following formula: Select all residentially zoned developable parcels in excess of two acres from town assessor's data. Determine per acre value for each of these properties, sort by value, remove top and bottom 10 percent of properties. The average of the remaining properties is the per acre open space value for that town for current assessor's data.

The per-acre open space value may be adjusted by a reasonable inflation factor for years where current assessor's data is not available.

Credit for Stormwater Low Impact Development
In public water supply Wellhead Protection Areas, stormwater management structures may be counted toward meeting the open space requirement where Low Impact Development (LID) Best Management Practices are used for stormwater infiltration (for example, vegetated swales, rain gardens and bio-retention areas).

Restrictions on Open Space Credit
No credit may be obtained for land that is set aside as open space on a residential lot on which a dwelling exists or may be built, unless the lot is at least three acres in size. No credit may be obtained for areas that have been dedicated as open space prior to the date of a DRI application.

Redevelopment within Growth Incentive Zones/Economic Centers
As an incentive for infill and redevelopment in appropriate locations, redevelopment within Growth Incentive Zones/Economic Centers is not required to provide open space. For the purposes of this exception only, redevelopment shall include projects expanding into greenfields, not to exceed 50 percent of the pre-existing development area on the site. Requirements for the protection of rare species, wetlands and vernal pool buffers shall continue to be met, if relevant. For towns without designated Economic Centers, this provision shall not apply.

Protection of Farmland
In the design of developments, and in the consideration of on-site or off-site open space, agricultural soils and agricultural uses shall be protected. In suitable locations and where conflicts with sensitive habitats and/or state law do not arise, conservation restrictions may reserve the right to farm.

Removal of SNRA Designation for the Calculation of Open Space Requirement
Notwithstanding the foregoing, where an applicant can provide the following documentation required by subsections 1, 2, or 3 below, and where Commission staff has recommended such removal, the Commission in its discretion may remove the Significant Natural Resources Area designation from all or a portion of the subject property for which the facts in subsections 1, 2, or 3 apply, and open space requirements may be reduced consistent with the chart, Total Development Area to Total Open Space Provided, above, without the SNRA requirements.

1) For projects located within a Potential Public Water Supply Area, provide written supporting information from the Town or Water District that demonstrates to the Commission that the area will not be considered as a potential public water supply area.

2) For projects located within an estimated or priority habitat for rare species as mapped by the Natural Heritage and Endangered Species Program, provide written supporting information from the Natural Heritage and Endangered Species Program that demonstrates to the Commission that the area is no longer considered endangered species habitat, and that NHESP will be changing the Natural Heritage Atlas to that effect.

3) For projects located within mapped DEP wetland areas, provide written supporting information from a wetlands specialist that an onsite field evaluation establishes that no wetland resources as defined in the RPP are present on or within 100 feet of the proposed development site.

Response: The proposed project will result in the development of 3.64 acres of land. Based on the project's location within a SNRA, approximately 7.28 acres of dedicated open space are required for this project. The applicant has been instructed that it will not credit anu mitigation open space on site. As such, the proposed project falls short of the required open space by approximately 7.28acres. The applicant proposes to address this deficiency through the dedication of 7.28 acres of off site open space.

OS2 - Passive/Active Recreation
Goal: To preserve and enhance opportunities for passive and active recreation to meet the needs of both residents and visitors.

Best Development Practices

OS2.1 Recreation Needs
Recreational needs as identified in the 2000 Statewide Comprehensive Outdoor Recreation Plan, Local Comprehensive Plans, and local and regional open space plans should be addressed in the development of projects on Cape Cod. Such needs include opportunities for wildlife study, expansion of trail corridors, protection of scenic roadways, development and expansion of access for the disabled, additional public beaches, and water-based recreational opportunities with associated parking facilities to the extent these minimize alteration of natural shorelines and do not harm wildlife habitat.

Response: *Passive recreation in the form of walking trails is proposed for this development. The applicant proposes to provide a continuous walking trail that can be accessed from the right-of-way and will loop around the perimeter of the developed area. Benches will also be provided at several locations along the trails.*

OS2.2 Provision of Recreation Areas
New development should provide suitable recreation and play areas to meet the needs of the residents of that development such as playing fields, playgrounds, basketball courts, or bicycle and walking paths.

Response: *As stated previously, walking trails and park benches will be provided for passive recreation within the dedicated open space of this development.*

TRANSPORTATION

TR1 - Safety

Goal: To improve safety and eliminate hazards for all users of Cape Cod's transportation system.

TR1.1 No Degradation of Safety
Regardless of project traffic generation, DRIs shall not degrade safety for pedestrians, bicyclists, or motor vehicle operators or passengers.

Response: *This project does not propose to change the existing roadway alignment or geometry on any of the study area roadways or intersections, therefore no safety degradations are expected to occur due to this project*.

TR1.2 Crash Frequency at Key Locations

Review of crash frequency over the most recent three years shall be required on all intersections of regional roads as well as at local road intersections with regional roads that are used by a project for access to the regional road network, where the DRI is expected to increase traffic by 25 vehicle trips or more during the project's peak hour. The most recent three available years of crash data shall be reviewed; the source(s) of the data shall be approved by the Cape Cod Commission staff. The applicant shall collect and submit crash data using the methodology identified in the Cape Cod Commission Guidelines for Transportation Impact Assessment, Technical Bulletin 96-003, revised January 9, 2003, as amended.

Response: *Crash data for the Town of Mashpee were provided by the Massachusetts Department of Transportation (MassDOT) and were reviewed for the most recent three years on record (2009 – 2011). During this time period, no crashes were recorded along the corridor of Great Neck Road South between Donna's Lane and the Mashpee Rotary. Since the study area is limited to the intersection of Great Neck Road South at the proposed Site Driveway, no crash analysis is necessary as the intersection does not currently exist.*

A detailed crash analysis and additional crash information can be found in the Traffic Impact Study.

TR1.3 Identification of Safety Impacts

The applicant shall identify safety impacts at road and intersection locations with three or more crashes per year where the project is expected to add 25 or more peak-hour trips. If applicable, funds to implement safety improvements shall be deducted from the transportation mitigation payment. The applicant shall be required to implement the needed safety improvements as determined by the Commission prior to obtaining a final Certificate of Compliance and shall be responsible for the safety improvements even if the cost of these safety improvements exceeds the transportation mitigation payment amount. Remaining transportation funds shall be paid to the County of Barnstable, prior to obtaining a final Certificate of Compliance, to be used for transportation-related purposes within the area affected by the DRI. All measures to mitigate safety impacts shall be consistent with Goal TR3 and it's supporting Minimum Performance Standards.

Response: *Based on discussions with the CCC, the study area is comprised of only the intersection of Great Neck Road South and the Site Driveway. As discussed above, no crashes were recorded along the corridor of Great Neck Road South between Donna's Lane and the Mashpee Rotary.*

The proposed Project consist of 82 beds of assisted living facility, which, taking into account the required 25% trip reduction, is expected to generate 11 net new trips during the weekday morning peak hour (7 entering, 4 exiting), 22 net new trips during the weekday afternoon peak hour (10 entering, 12 exiting), and 163 net new trips on a daily basis during weekdays.

Based on available traffic count data from the Mashpee 2012 Traffic Counting Report, approximately 55% of vehicles travel to/from the north and 45% of vehicles travel to/from the south on Great Neck Road. These same travel patterns were then applied to the trip distribution for the proposed Assisted Living facility.

These travel patterns would result in 6 new vehicle trips during the weekday morning peak hour and 12 new vehicle trips during the weekday afternoon peak hour traveling to/from the Mashpee Rotary in the north. The remaining 5 and 10 new vehicle trips during the weekday morning and afternoon peak hours, respectively, would travel to/from the south on Great Neck Road.

In summary, no intersection adjacent to the Project site is expected to add 25 or more peak-hour trips and is a location with three or more crashes per year. Based on the guidelines set forth in TR1.3, no safety improvements are required.

TR1.4 Standards for Driveway Construction

All access and egress locations for DRIs shall meet local, county, and/or state and federal access management bylaws, technical bulletins, standards, and/or policies for driveway spacing and separation from the nearest intersections. Redevelopment projects that are unable to meet this standard and have no other roadway access shall meet spacing and separation distances to the greatest extent feasible. DRIs with frontage on more than one street shall be restricted to access and egress via the lower volume road when deemed appropriate by the Commission. The width of driveway and/or curb-cut openings to serve DRIs shall not exceed 12 feet per travel lane, except where deemed appropriate by the Commission. Driveway openings of more than 24 feet shall include a center pedestrian refuge island where deemed appropriate by the Commission.

Response: T*he proposed site will be served by a single 24-foot driveway. The driveway will meet all applicable local, state and federal regulations.*

TR1.5 Route 6 Access/Egress

To reduce safety conflicts between local and through traffic, DRIs located within limited-access portions of Route 6, as defined by the Massachusetts Highway Department, shall not be allowed to create new direct access or egress onto Route 6 in Bourne (Scenic Highway), Eastham, Wellfleet, Truro, or Provincetown unless no alternative access or egress is available. DRIs that utilize existing access or egress onto any of these sections of Route 6 shall be allowed provided that there is no increase in expected daily or peak-hour traffic volumes utilizing those driveways during the summer and provided the historic crash rate for the driveway does not exceed three crashes per year based on the most recent three-year crash history.

Response: *Not applicable. This Project is not located within limited access portions of Route 6 and will not create new direct access or egress onto Route 6.*

TR1.6 Sight-distance Obstructions

Human-made objects such as signage, utility poles and boxes, and lighting to service DRIs shall be located to minimize visual obstruction and possible safety conflicts for the traveling public, including glare or other distractions for drivers, bicyclists, and pedestrians. New utility service and relocation of existing utility service shall be placed underground, where deemed feasible and appropriate by the Commission. Further, landscaping and plantings shall be selected and placed in a manner that does not create obstructions to safe sight distances for motorists, bicyclists, and pedestrians.

Response: *The proposed street signage, utility poles, boxes, street lighting, etc., as well as all landscaping features shall be located in a way that does not impede sight distance for motorists, bicyclists, and pedestrians.*

TR1.7 Bicyclists and Pedestrians Safety and Access/Egress Requirements

Site planning and access/egress for DRIs shall minimize adverse impacts on the adjacent road system and shall adequately and safely accommodate all users including pedestrians, bicyclists, and motorists. DRIs with drive-up windows shall be designed to confine the maximum expected vehicle queue on site to not interfere with traffic on public roadways.

Response: *This project does not propose to change the roadway alignment or geometry on any of the adjacent roadways or intersections. Therefore, it is not expected to impact the existing pedestrian or bicycle safety requirements. Access and egress to the site will be from a single driveway onto Great Neck Road South. This project will not have any drive-up windows.*

TR1.8 Sight-distance Requirements

Acceptable sight distances shall be met and maintained at all access and/or egress locations for DRIs regardless of project traffic generation. At a minimum, sight distances shall meet the stricter of the Massachusetts Highway Department and American Association of State Highway Transportation Officials guidelines for safe-stopping sight distances.

Response: *As part of the Traffic Impact Study, the available stopping sight distances (SSD) and intersection sight distances (ISD) were measured at the intersection of the proposed driveway and Great Neck Road South. The posted speed limit on Great Neck Road is 45 MPH. Field measurements indicated that the minimum required SSD and the minimum desired ISD were met based on AASHTO[1] guidelines. Additional sight distance analyses can be found in the Traffic Impact Study.*

TR1.9 Mitigation Timing
Transportation mitigation to address or offset safety concerns at a minimum shall occur prior to issuing a Final Certificate of Compliance for the DRI.

Response: *Noted.*

TR1.10 Transportation Safety
DRIs are encouraged to promote and assist in improving transportation safety on Cape Cod.

Response: *Noted*

TR1.11 Curb Cuts
DRIs are encouraged to minimize, eliminate, and/or consolidate curb cuts.

Response: *A single access drive will service the proposed project*. An existing driveway access to the wastewater treatment plant will be relocated within its prescribed easement..

TR2 - Traffic Reduction/Transportation Balance and Efficiency
Goal: To reduce and/or offset the expected increase in motor vehicle trips on public roadways, reduce dependency on automobiles, and reduce air and noise pollution. To promote a balanced and efficient transportation system that includes alternatives to automobile travel.

TR2.1 Trip Reduction Outside Growth Incentive Zones or Economic Centers
DRIs located outside Growth Incentive Zones or Economic Centers, or DRIs in towns without designated Economic Centers shall implement adequate and acceptable measures to reduce and/or offset 25 percent of the expected increase in site traffic resulting from the DRI on a daily basis. Examples of acceptable trip-reduction plans to reduce site traffic are available in the Cape Cod Commission Guidelines for Transportation Impact Assessment, Technical Bulletin 96-003, Revised January 9, 2003, as amended.

Response: *Using rates from the ITE Trip Generation Manual, the Project is expected to generate 218 trips on a daily basis. The project is located outside of an Economic Center, therefore the Proponent must make provisions for the reduction of 55 project trips on a daily basis.*

Based on the examples of acceptable trip reduction measures and the methods that are appropriate for this project, the proponent plans to implement trip reduction measures consistent with Technical Bulletin 96-003 to offset 25 percent (55 daily trips) of the expected increase in site traffic. It is expected that this 25 percent

[1] *A Policy on Geometric Design of Highways and Streets, AASHTO, (6th ed, 2011)*

reduction in project trips will be attained via non-auto methods of transportation, including bus service, pedestrian access, and bicycle access.

The Cape Cod Regional Transit Authority (CCRTA) provides bus service via the SeaLine bus line, with a stop at Mashpee Commons / Stop & Shop. Donna's Lane is located just 200 feet south of the Project driveway on Great Neck Road. Donna's Lane provides wide shoulders for bicycle accommodation and sidewalks for pedestrian accommodation.

TR2.2 Trip Reduction Inside Growth Incentive Zones or Economic Centers
DRIs located within Growth Incentive Zones or Economic Centers shall implement adequate and acceptable measures to reduce and/or offset 12.5 percent of the expected increase in site traffic resulting from the development on a daily basis. Examples of acceptable trip-reduction plans to reduce site traffic are available in the Cape Cod Commission Guidelines for Transportation Impact Assessment, Technical Bulletin 96-003, Revised January 9, 2003, as amended. DRIs in towns without designated Economic Centers shall comply with MPS TR2.1.

Response: *Not applicable. The project site is not located in a Growth Incentive Zone or an Economic Center.*

TR2.3 Interconnections
DRIs shall implement procedures to allow connections (vehicular and pedestrian) between parcels to minimize curb cuts, driveways, and vehicle turning maneuvers. DRIs shall provide vehicular and pedestrian connections on the project site and connect to the adjacent property if an interconnect agreement can be reached. The DRI shall agree to allow a future connection if an agreement cannot be reached with the adjacent property owner at this time.

Response: *The proposed relocation and of the waste water treatment plant access drive to separate the truck traffic from the Assisted Living entrance will connect and share a portion of the project's driveway in the rear of the building opposite the main entrance way.*

TR2.4 Incentives for Connections between Adjacent Properties
DRIs that allow for site traffic to travel conveniently and safely to adjacent properties without traveling on or crossing a public way or that allow for mixed-use development that minimizes dependence on automobile travel shall be allowed a 10-percent traffic credit apportioned between the two properties or, if greater, a traffic credit as outlined in the Institute of Transportation Engineers Trip Generation Handbook, October 1998, or another acceptable methodology subject to Commission approval.

Response: *The property will share a driveway with the wastewater treatment facility to the rear of the proeprty. On the south there is a electric transmission right of way which discourages shared access due to operational and safety concerns. To the north is a vacant parcel with no present development plans..*

TR2.5 Estimating Trip Reduction
The estimates of the number of trips reduced through proposed trip-reduction measures including trip-reduction support measures, transportation services, economic incentives, and locating on a transit line shall be based on an analysis that is accepted and approved by the Commission based upon the methodology provided by the Cape Cod Commission Guidelines for Transportation Impact Assessment, Technical Bulletin 96-003, as amended.

Response: *The estimated number of trips to be reduced was based upon the methodology contained in the Cape Cod Commission Guidelines for Transportation Impact Assessment, Technical Bulletin 96-003, as amended. The Proponent understands that these numbers will be reviewed and approved by the Cape Cod Commission.*

TR2.6 Bus Stops, Turn-outs, and Shelters
Where appropriate, the Commission may require construction of a bus stop and/or bus turn-out and/or bus shelter as part of DRI approval either internal to the property or along the property's roadway frontage.

Response: *The project is not located on a bus route. Bus stops and/or bus turn-outs and/or bus shelters are not envisioned for this project, and are not proposed as part of this DRI Application. The applicant will provide shuttle service for it employees to the CCRTA bus stops located at nearby Mashpee Commons market place where the two major east and west bus routes intersect.*

TR2.7 Bicycle and Pedestrian Accommodations
DRIs shall accommodate the needs of bicyclists, pedestrians, and other non-automobile users in site planning and roadway and/or intersection changes. Site design shall minimize motor vehicle interaction with bicycles and pedestrians while accommodating pedestrian and bicycle access and circulation.

Response: *No sidewalks or bike lanes are located on Great Neck Road South. Donna's Lane is the nearest cross street, located approximately 200 feet south of the project site, and provides wide shoulders for bicycle accommodation and sidewalks for pedestrian accommodation.*

TR2.8 Preservation of Frontage
Where deemed appropriate by the Commission, DRIs shall provide appropriate rights-of-way along their street frontage to accommodate expected needs for bicycle and pedestrian accommodation and/or relocation of utilities. DRIs shall also provide for pedestrian and bicyclist connections across their property to allow for possible future connections with adjoining properties, where necessary. Construction of bicycle and pedestrian sidewalks, paths and/or connections may be required by the Commission.

Response: *Great Neck Road South has a 60 feet ROW. While presently configured as a two lane roadway with 11 foot travel lanes and a 4 foot shoulder, there is room to accommodate future bike and pedestrian travel. See response to TR2.7 above.*

TR2.9 Parking Spaces
The maximum parking allowed for DRIs shall be no more than the minimum number of spaces required by the town(s) in which the DRI is located unless, in the Commission's discretion, a greater number of spaces are justified by a parking analysis accepted by the Commission.

Response: *The proposed project is an assisted living/memory care facility. It has been the experience of the applicant that in other similar facilities it operates, most of the residents do not drive or own cars. Therefore the project proposes to provide fewer than the required minimum number of spaces required under the Mashpee Zoning Bylaw and seek a waiver from the Planning Board.*

TR2.10 Acceptable Trip-reduction Strategies
To meet the requirements of Goal TR2 and the applicable Minimum Performance Standards, DRIs may, at the applicant's option, utilize the following strategies to meet the portion of the trip-reduction requirements not otherwise met:

(a) Cash payment: Payment of funds per expected daily trip to be reduced or offset. The amount of payment shall be calculated based upon the estimated cost of funding for alternatives to automobile transportation or the estimated cost of vacant developable land within the town in which the project is located and shall be subject to Commission approval. The amount of payment shall also be commensurate with the number of vehicle trips to be reduced or offset.

(b) Project-specific strategies: Implementation and/or construction of measures to reduce vehicular travel.

(c) Any combination of (a) and (b).

Response: *As discussed in response to TR2.1, the Applicant proposes to meet the requirements of Goal TR2 by way of project specific trip reduction measures. The reduction in project trips is expected to be attained via non-auto methods of transportation including transit, bicycle, and pedestrian trips. Further information is available in the Traffic Analysis Report.*

TR2.11 Other Trip-reduction Strategies

To meet the requirements of Goal TR2 and the applicable Minimum Performance Standards, the Commission may, at its discretion, allow DRIs to utilize the following strategies to meet the portion of the trip-reduction requirements not otherwise met:

(a) Preserve land: The conservation of vacant developable land, in excess of other RPP open space requirements, as permanent open space. Examples of acceptable vacant developable land and the trip credit calculations are available in the Cape Cod Commission Guidelines for Transportation Impact Assessment, Technical Bulletin 96-003, Revised January 9, 2003, as amended.

(b) Remove existing development: The removal of existing development and conservation of the land as permanent open space, in excess of other RPP open space requirements; the development must be removed and the land returned to a natural and/or landscaped state, as determined by the Commission.

(c) A payment of funds per expected daily trip to be reduced or offset. The funds shall be used to support alternatives to automobile travel in the town within which the project is located, including but not limited to traffic monitoring, planning, design, engineering, acquisition, implementation, marketing, and operation or the purchase of vacant land for protection of open space in excess of other RPP or municipal requirements. The amount of payment per daily trip to be reduced shall be based upon the estimated cost of funding for alternatives to automobile transportation or the estimated cost of developable land within the town in which the project is located. The amount of payment shall also be commensurate with the number of vehicle trips to be reduced or offset.

(d) Any combination of (a), (b), or (c).

Specifics regarding location of land to be preserved and estimating trip-reduction value: The land shall be located within the town(s) containing the DRI and shall be appropriately development restricted to protect the trip-reduction benefit. The trip-reduction credit for all options above shall be calculated by the Commission based on the estimated amount of net traffic that the proposal will remove taking into consideration size, location, zoning, accessibility, current land use, any trip-generation data available for existing developments, and future land use. In deciding whether to allow land as a traffic mitigation strategy, the Commission may consider but is not limited to issues of enforceability of land restrictions, whether the land is within a Growth Incentive Zone or designated Economic Center, current adjacent land uses, town zoning and plans, input from local and state officials, and overall land-use goals in the RPP.

Response: *Not applicable. The Applicant proposes to meet the requirements of Goal TR2 by way of project specific trip reduction measures.*

TR2.12 Trip-generation Credit

The Commission may allow a DRI to exceed the requirements of this section and receive a corresponding reduction in trip generation for the purpose of meeting MPS TR3.4.

Response: *As discussed below in response to TR3.4, the Project study area only consists of the single intersection of the Project Driveway at Great Neck Road. As this intersection does not currently exist, Levels of Service will not worsen at this location.*

TR2.13 Inflation Factor
Where deemed appropriate by the Commission, an annual inflation rate, determined at the time of the DRI decision, shall be applied to any trip-reduction payment amounts. The period of increase shall be from the date of the Commission DRI decision until the funds are paid. Guidance on the inflation rate can be found in the Cape Cod Commission Guidelines for Transportation Impact Assessment, Technical Bulletin 96-003, as amended.

Response: *Noted.*

TR2.14 Uses of Trip-reduction Funds
Funds collected for trip reduction shall be used only to support projects or strategies that encourage alternatives to automobile travel. These include but are not limited to planning, design, or construction of alternatives to automobile travel such as bicycle paths and sidewalks; supporting, marketing, or promoting transit or shuttle services; the purchase of land for the creation of bicycle or pedestrian ways; the purchase of land capable of generating trips and the preservation of such land in a way that permanently prohibits trip generation; and/or the monitoring of traffic volumes, speeds, and vehicle classification. Such funds shall be used within the town in which the development has impacts or shall be divided between towns based on the DRI's impact area. Funds not accessed within five years of receipt may be, at the Executive Director's discretion after written notification to the town, distributed to the Cape Cod Regional Transit Authority or successor agencies to fund public transit on Cape Cod.

Response: *Noted.*

TR2.15 - TR2.21

The Minimum Performance Standards for TR2.15 – TR2.21 do not apply as the proposed project is a residential subdivision.

TR3 - Level of Service
Goal: To maintain or improve travel times and Level of Service on roads and intersections and to ensure that all road and intersection construction or modifications are consistent with community character, historic resources, and scenic resources.

TR3.1 Operational Requirements
Regardless of traffic volumes, Level of Service analysis shall be required at all access and/or egress points onto the road system for DRIs. All new access and/or egress onto the road system for DRIs shall operate at Level of Service C or better during the project's peak hour for a maximum of five years after project occupancy, except that Level of Service D or better shall be allowed for a minimum of five years after project occupancy for projects located within designated Economic Centers or Growth Incentive Zones. For towns without designated Economic Centers, the Level of Service C standard shall apply. For unsignalized driveways, the Level of Service standards shall be met for each turning or non-turning maneuver; for signalized driveways, the Level of Service standards shall apply to the overall intersection Level of Service.

Response: *The Project is not located within an Economic Center or Growth Incentive Zone, therefore the intersection of the Project driveway with Great Neck Road is required to operate at LOS C for each turning or non-turning maneuver.*

Capacity analyses have been performed in the Traffic Impact Study for this location under future Year 2019 Build conditions, under a five-year planning horizon. Under future Build conditions, all approaches are expected to operate at LOS B or better during both the weekday morning and afternoon peak hours. Additional capacity analyses discussions can be found in the Traffic Impact Study.

TR3.2 Credit for Trip-reduction Mitigation
For the purpose of meeting the requirements of Goal TR3 and the supporting Minimum Performance Standards, DRIs shall be allowed to reduce their estimated trip generation by 25 percent after compliance with all Minimum Performance Standards under Goal TR2.

Response: *Not applicable since the study area consists of only the intersection of Great Neck Road and the Project driveway, which is not an existing intersection.*

TR3.3 Traffic Studies
DRIs shall provide an appropriate traffic study in accordance with the Cape Cod Commission Guidelines for Transportation Impact Assessment, Technical Bulletin 96-003, as amended, as determined by the Commission in consultation with the town and the applicant. The traffic study shall identify and include analysis for the area impacted by the development. Guidance on providing a traffic study can be found in the Cape Cod Commission Guidelines for Transportation Impact Assessment, Technical Bulletin 96-003, as amended.

Response: *A Traffic Impact Study, meeting the requirements of the Cape Cod Commission, has been prepared by BSC Group, Inc. and is included with this DRI Application.*

TR3.4 Mitigation of Congestion Impacts Required
DRIs shall provide for full mitigation of adverse impacts on all road links, and at all intersections that are used by the DRI, including but not limited to bridges, intersections, rotaries, roundabouts, interchanges, and U-turns where the DRI is expected to increase peak-hour traffic after traffic adjustments in compliance with the Minimum Performance Standards supporting Goal TR2. At all adversely impacted locations, mitigation shall be proposed and funded to maintain year-round Level of Service at "no-build" conditions as measured by travel speeds, control delay, density, and/or flow rate as defined by the Highway Capacity Manual 2000 or its successor documents.

Response: *As discussed in the response to TR3.2, the study area consists of only the intersection of Great Neck Road and the Project driveway, which is not an existing intersection. Therefore No Build analysis were not performed.*

TR3.5 Mitigation Fee
At impact locations, as specified in MPS TR3.4, where the increase is less than 25 peak hour trips, DRIs may make a payment per peak-hour trip to comply with MPS TR3.4. The fee shall be $5,000 per peak-hour trip up to a maximum of 25 peak-hour trips.

Funds collected for congestion mitigation shall be used to support projects or strategies that encourage alternatives to automobile travel consistent with MPS TR3.12 or to support actual expansion of roadway capacity including but not limited to planning, engineering, permitting, and construction. Such funds shall be used within the town in which the development is located or shall be divided between towns based on the development's impact area. The determination of how these funds are utilized shall be determined by the town impacted by the DRI, in consultation with Cape Cod Commission staff. Funds not accessed within 10 years of receipt may, at the

Executive Director's discretion, be distributed to the Cape Cod Regional Transit Authority or successor agency(ies) to fund public transit on Cape Cod.

Response: *Based on discussions with the CCC, the Applicant will make a payment of funds to Barnstable County, as outlined below in response to TR3.6.*

TR3.6 "Fair-share" Payments
In lieu of construction and/or implementation of measures to mitigate adverse traffic impacts prior to a final Certificate of Compliance, the Commission, at its discretion, may allow a payment of funds to Barnstable County to meet the requirements of MPS TR3.4 commensurate with the DRI's impact. As determined by the Commission, in considering whether to allow such payments, the Commission will take into account factors including but not limited to safety, congestion, area land uses, community character, environmental impacts, seasonal traffic variations, input from public officials, public testimony, and may include costs for 20 years of operations and maintenance, where necessary. Guidance on payment methodology can be found in the Guidelines for Transportation Impact Assessment, Technical Bulletin 96-003, as amended.

Funds collected for congestion mitigation shall be used to support projects or strategies that encourage alternatives to automobile travel consistent with MPS TR3.12 or to support actual expansion of roadway capacity including but not limited to planning, engineering, permitting, and construction. Such funds shall be used within the town in which the development is located or shall be divided between towns based on the development's impact area. The determination of how these funds are utilized shall be determined by the town impacted by the DRI, in consultation with Cape Cod Commission staff. Funds not accessed within 10 years of receipt may, at the Executive Director's discretion, be distributed to the Cape Cod Regional Transit Authority or successor agency(ies) to fund public transit on Cape Cod.

Response: *Based on discussions with the CCC, the applicant will make a payment of funds to Barnstable County to meet the requirements of MPS TR3.4 commensurate with the DRI's impact. Based on the Transit Equivalency spreadsheet calculations provided by CCC, the Applicant estimates a mitigation payment in the amount of $101,900.*

TR3.7 Restrictions on Road Widening or New Signals
Road and intersection widening and new traffic signals shall not be used as actual mitigation or to support mitigation payments under MPS TR3.6 in local or regional historic districts. Road widening, intersection widening, and/or new traffic signals proposed as mitigation for DRIs or used to support development of payment mitigation plans under MPS TR3.6 shall be consistent with community character and not degrade scenic or natural resources.

Response: *This project does not propose any road widening, intersection widening, or new traffic signals.*

TR3.8 Year-round Structural Mitigation
Road widening, intersection widening, and new traffic signals shall be allowed as mitigation for DRIs only if the Commission finds that the improvement will have substantial benefit to the transportation system throughout most of the year. Road widening, intersection widening, and new traffic signals necessary to accommodate strictly summer travel demand shall not be allowed as part of development and redevelopment.

Response: *This project does not propose any road widening, intersection widening, or new traffic signals.*

TR3.9 Bicycle and Pedestrian Accommodation
All road and intersection widening and new traffic signals or modification of existing traffic signals required as DRI mitigation shall include appropriate bicycle and pedestrian accommodation.

Response: *This project does not propose any road widening, intersection widening, or new traffic signals.*

TR3.10 Preserve Existing Rights-of-Way
Existing transportation rights-of-way shall be preserved for transportation uses as well as to limit trip generation.

Response: *Existing transportation rights-of-way through the Project site will be preserved.*

TR3.11 No Capacity Increases on Controlled-access Highways
DRIs shall not increase the mainline capacity of limited-access highways on Cape Cod, including portions of Route 6, Route 3, and the Route 25 extension within Barnstable County. No additional travel lanes shall be allowed. Appropriate improvements to safety and traffic flow (such as additional ramps, improved merge areas, traffic signals, etc.) at the existing interchanges along limited-access highways shall be a permissible mitigation strategy, as long as such mitigation complies with standards regarding historic character, community character, and environmental impact as well as seasonal versus year-round need.

Response: *The project is not expected to directly impact any limited access highway.*

TR3.12 Consistency with Other Plans
All roadway infrastructure projects proposed as DRI mitigation, including but not limited to roadway segment widening, intersection widening, new traffic signals, interchange ramp changes, and grade separation, shall be consistent with local and regional plans, including but not limited to Local Comprehensive Plans, and the Cape Cod Metropolitan Planning Organization's latest Regional Transportation Plan.

Response: *Not Applicable*.

TR3.13 Operation and Maintenance Costs
Where deemed appropriate by the Commission, all new traffic signals under town jurisdiction proposed as DRI mitigation shall include payments for 20 years of operations and maintenance costs. All new traffic signals used to support development of payment mitigation plans under MPS TR3.6 shall include payments for 20 years of operations and maintenance. The funds shall be paid in a single payment. The applicant shall calculate the operation and maintenance costs in accordance with the Cape Cod Commission Guidelines for Transportation Impact Assessment, Technical Bulletin 96-003, Revised January 9, 2003, as amended.

Response: *This project does not propose any new traffic signals.*

TR3.14 Traffic-monitoring Devices
Where deemed appropriate by the Commission, all roadway widening, intersection signals, and other roadway capacity alterations proposed as DRI mitigation to accommodate automobile travel shall include continuous year-round traffic-recording devices to monitor traffic volumes, vehicle classification, and travel speeds, and shall include devices to access the data remotely both at the data-collection site and at the data-processing site. Where deemed appropriate by the Commission, the applicant shall make a payment of funds to support maintenance and operation of the devices for 20 years.

The applicant shall determine traffic-counting equipment costs based on the Cape Cod Commission Guidelines for Transportation Impact Assessment Technical Bulletin 96-003, Revised January 9, 2003, as amended.

Response: *The Project does not propose any roadway widening, intersection signals, or other roadway capacity alterations.*

TR3.15 Inflation Factor
Where deemed appropriate by the Commission, an annual inflation rate, determined at the time of the DRI decision, shall be applied to all congestion mitigation payments. The period of increase shall be from the date of the final Commission decision until the funds are paid.

Response: *Noted.*

TR3.16 Use of Congestion Mitigation Funds
Funds collected for congestion mitigation shall be used to support projects or strategies that encourage alternatives to automobile travel consistent with MPS TR2.13 or to support actual expansion of roadway capacity including but not limited to planning, engineering, permitting, and construction. Such funds shall be used within the town in which the development is located or shall be divided between towns based on the development's impact area. Funds not accessed within 10 years of receipt may, at the Executive Director's discretion, be distributed to the Cape Cod Regional Transit Authority or successor agencies to fund public transit on Cape Cod.

Best Development Practices

Response: *Noted.*

TR3.17 Automatic Data Collection
DRIs are encouraged to provide for or contribute to automatic data collection and information-based technologies in the region beyond the requirements of MPS TR3.14 that assist travelers in making efficient travel decisions regarding travel mode and time of travel.

Response: *Noted.*

TR3.18 Consistency with Federal and State Plans
Transportation mitigation is encouraged to be consistent with federal and state acts and plans, including the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) and successor transportation acts and amendments, the Clean Air Act Amendments of 1990, the Americans with Disabilities Act, Massachusetts laws regarding access for disabled persons, the Massachusetts State Implementation Plan, the Metropolitan Planning Organization's Regional Transportation Plan, and the applicable Local Comprehensive Plan.

Response: *Not Applicable.*

WASTE MANAGEMENT

WM1 - Hazardous Materials and Waste Management
Goal: To protect Cape Cod's water resources by prohibiting activities that contaminate the water supply, and to support actions by households and businesses that promote the handling, storage, and disposal of hazardous materials and wastes in an environmentally sound manner.

Minimum Performance Standards

WM1.1 Hazardous Materials/Waste Restrictions
Development and redevelopment that involves the use, treatment, generation, handling, storage, or disposal of Hazardous Materials and/or Hazardous Wastes, with the exception of Household Quantities or less, shall not be allowed within Wellhead Protection Areas and Potential Public Water Supply Areas, except as provided in WM1.2 and WM1.3.

Response: *Northbridge at Mashpee Commons will not use, treat, generate, handle, store , or dispose of hazardous materials or wastes resulting from the proposed development, other than normal household quantites. The proposed project is not located within a Wellhead Protection Area or a Potential Public Water Supply Area.*

WM1.2 Credit for Redevelopment
Redevelopment within Wellhead Protection Areas that involves use, treatment, generation, handling, storage, or disposal of Hazardous Materials and/or Hazardous Wastes may be allowed to exceed the limits in WM1.1 provided that the quantity of hazardous materials is less than the quantity from the prior use and provided adequate documentation of the previous volume is approved by the Commission.

Response: *Not applicable. The proposed project is not redevelopment.*

WM1.3 Credit for Removal of Development
Development and redevelopment within Wellhead Protection Areas that involves the use, treatment, handling, storage, or disposal of Hazardous Materials and/or Hazardous Wastes may be allowed to exceed the quantity limits of hazardous materials in WM1.1 up to, but not exceeding the amount, that the development or redevelopment permanently eliminates at another facility, project, or site within the same Wellhead Protection Area and provided adequate documentation of the volume eliminated is approved by the Commission.

Response: *The proposed project does not involve the use, treatment, handling, storage, or disposal of Hazardous Materials and/or Hazardous Waste nor is it located within a Wellhead Protection Area or a Potential Public Water Supply Area.*

WM1.4 Pollution Prevention and Emergency Response Plan
Development and redevelopment in Wellhead Protection Areas and Potential Public Water Supply Areas shall prepare a Pollution Prevention and Emergency Response plan for both the construction phase and normal operations that identifies potential contamination sources, threats of Hazardous Material and Hazardous Waste releases to the environment, describes material storage and handling details, containment and contingency plans for spill response, and documents regular inspection and employee education opportunities.

Response: *The proposed project is not located withinin a Wellhead Protection Area or a Potential Water Supply Area*.

WM1.5 Compliance with Massachusetts Hazardous Waste Regulations
Any development or redevelopment that uses, handles, generates, treats, or stores Hazardous Waste shall be in compliance with Massachusetts Hazardous Waste Regulations, 310 CMR 30.0 for the purposes of Cape Cod Commission review by providing the Commission with evidence of the following:

(a) registration with or notification to the Massachusetts Department of Environmental Protection as a generator of Hazardous Waste;

(b) a written plan or protocol to manage the Hazardous Waste prior to disposal;

(c) a signed contract with a registered, licensed company to dispose of the Hazardous Waste.

Response: *Written protocol for hazardous waste disposal have been prepared and submitted as part of this application to establish policies for the proper disposal/recycling of items containing hazardous materials such as televisions, computers, batteries, fluorescent bulbs, and other such items*

Best Development Practices

WM1.6 Elimination of Hazardous Materials/Waste
Development and redevelopment is encouraged to eliminate Hazardous Materials or Hazardous Waste handled, treated, generated, used, or stored at a pre-existing facility, site, or project.

Response: Not applicable as the proposed facility *will not use, treat, generate, handle, store , or dispose of hazardous materials or wastes resulting from the proposed development, other than normal household quantites*..

WM2 - Solid Waste Management
Goal: To manage solid waste using an integrated solid waste management system that includes waste reduction, recycling, and composting, and to divert 60 percent of municipal solid waste from incinerator and landfill facilities through recycling and composting programs by 2012.

Minimum Performance Standards

WM2.1 Construction Waste
Development and redevelopment projects shall address the disposal of construction waste at both the construction and post-construction phases of development or redevelopment. To do so, a plan shall be provided to demonstrate how the applicant proposes to handle solid wastes, construction and demolition (C&D) wastes, and recyclable materials currently categorized by the Massachusetts Department of Environmental Protection (DEP) as a waste ban material.

Response: *The proposed project will comply with all applicable solid waste regulations.*

WM2.2 C&D Waste Plan
If C&D waste is to be generated as a part of the proposed development or redevelopment, a plan shall be provided that specifies:

- a listing of C&D wastes that will be generated during the development or redevelopment;
- the method for separating, storing, transporting, and disposing of gypsum (wall board and sheetrock) from the remainder of the waste stream; and
- the methods that will be used to recycle or dispose of those remaining materials in the C&D waste stream.

Response: *Since this project is new development, and there are no buildings or facilities on site, the amount of solid waste generated will be limited to construction debris which will be collected in on site containers and hauled to a separation/recycling facility. Gypsum containing wallboard and sheetrock waste will be separated and deposited into designated dumpster for disposal. On site clearing will be limited to approximately 3 acres of the site. The stumps will be grounded in place and most trees will be ground with the chips to be used on-site or shipped to wood chip fired facilities. Trees of sufficient size and grade will be sold for lumber .*

WM2.3 Post-construction Waste
A solid waste and recycling management plan shall be provided that identifies how both solid wastes and recyclable materials will be handled in the post-construction phase of the development. In particular, the applicant shall provide a plan detailing how waste ban materials (particularly plastic, glass containers, and cardboard) will be collected, stored on site, and recycled.

Response: *The facility will implement an integrated waste management plan separation and recycling program recyclables will be handled for the proposed new facility, primarily through dedicated recycling rooms*

throughout the buildings, and several larger onsite containers dedicated to one or more recyclables streams, as described in the Waste management Plan.

WM2.4 Food-waste Recycling
A post-construction management plan shall be provided by those developments (primarily supermarkets) generating significant amounts of food wastes to demonstrate how an applicant will recycle organic materials. A plan shall specify, at a minimum:

- the anticipated amounts of organic wastes to be generated;
- the manner by which the organic wastes will be stored on site prior to being sent off site; and
- the destination of the organic waste materials that will be composted.

The organics recycling program shall be consistent with the standards outlined in the DEP voluntary Supermarket Recycling Program Certification guidelines.

Response: *The approximate amount of food waste the proposed project would generate approximately 27,375 pounds or 13.7 tons per year. Based on this information, and it is our understanding that MPS WM2-4 refers to supermarkets as a type of development that produces a "significant amount" of food waste (225 tons per year or more). Therefore as the proposed project will not generate a "significant amount" of food or compostable waste according to MPS WM2.4 this MPS does not apply to the project*.

ENERGY

Goal E1: Emissions amd Energy Use
To promote a healthy and sustainable economic, natural, built and social environment by reducing greenhouse gas emissions and energy costs through design and construction practices that increase energy conservation, promote energy efficiency, and promote self sufficiency through the use of locally distributed renewable energy.

Minimum Performace Standards
Minimum Performance Standards E1.1-E1.6 shall not apply to the following: wireless communication facilities, wastewater treatment facilities, landfills, or air traffic control towers.

E1.1 Redevelopment Energy Audit**:**
Redevelopment shall perform an energy audit of exisiting conditions and incorporate recommendations into the project design. Guidance on audit components can be found in Technical Bulletin 09-002, Development of Regional Impact Guidelines for Energy Compliance, as amended.

Response: *Not Applicable*

E1.2 Designed to Earn ENERGY STAR® Certification: Nonresidential development and redevelopment shall be designed to earn the ENERGY STAR ®Target Rating of 75 or higher

Response: *The proposed project has been designed to earn an ENERGY STAR Certification of 75 or greater. See attached Energy Star Statement of Design Intent (SEDI).*

E1.3 ANSI/LEED Standards: Nonresidential development and redevelopment shall comply with current ANSI/ASHRAE/IESNA Standard 90.1-2007, Section 5.4 – Insulation, Fenestration, and Doors or current perquisite LEED-certified standard, or successor standards designated by the Commission.

Response: *The building will comply with ASHRAE 90.1.2010 Section 5.4*

E1.4 Multi-family Projects: All multi-family residential projects (townhouses, condominimums, apartments) shall be designed according to current ENERGY STAR ® National Attached Builder Option Package specifications.

Response: *The proposed project has been designed in accordance with current ENERGY STAR National Attached Builder Option Package .*

E1.5 On-site Renewable Energy Generation: Except for mixed-use projects located in designated Economic Centers as identified on the Regional Land Use Vision Map, non-residential commercial development and redevelopment involving net new construction shall provide a minimum of 10 percent of a building's projected annual electrical demand (kWh) through on-site renewable energy generation. In the case of redevelopment, the 10-percent calculation shall be based solely on the gross floor area of the additional new development in excess of 10,000 square feet. EPA average energy-intensity levels by building type and square feet are used as a baseline to calculate the 10-percent energy demand. In addition, applicants may provide an energy model to determine annual site-demand input for their project. Guidance on calculating energy demand can be found in Technical Bulletin 09-002, as amended. The Commission may waive this requirement if:
-The project provides 5 percent of electrical demand through on-site renewable energy systems and participates in the Cape Light Compact Green Program for 100 percent of their remaining electricity needs.
-The project is LEED Certificable
-or-
-The project demonstrates compliance with six of the following
-Installs ENERGY STAR compliance with six of the following:
-Installs a ENERGY STAR compliant reflective roofing, or vegetated roof.
-Re-uses exisiting structures (including shell and non-shell).
-Incorporates renewable energy.
-Installs a geothermal heating system.
-Incorporates passive solar design.
-Installs energy-conserving landscapes (for example, native species).
-Complies with ANSI standards (6.4-HVAC 7.4-Load Calculations, Equipment Efficiency, Service Hot Water Piping Insulation, Service Controls, Pools, Heat Traps, 9.4 – Lighting Control, Tandem Wiring, Exit Signs, Exterior Grounds Lighting).

Response: *Not Applicable as the project is residential*

E1.6 Alternative Method of Meeting MPS E1.1 through E1.5: to meet the requirements of Goal E1 and applicable Minimum Performace Standards, commercial DRIs may, at the applicant's option, provide 25 percent or more of their projected annual electrical deman (kWh) through on-site renewable energy.

Response: *Not Applicable*

E1.7 Clear Area: All WECFs shall maintain a Clear Area surrounding the base of the turbine equal to at least 1.5 times the height of the WECF, or the WECF manufacturer's fall zone, setback, or clear area specification, whichever is greater. The Clear Area setback shall be measured from the base of the turbine.

Response: *Not Applicable*

E1.8 Noise: Allapplicants for a WECF greater than 660 KW shall perfrom a noise study and fund a Cape Cod Commission approved consultants's review of the noise study, and adhere to a setback of 10 times the rotor dimeter of the proposed turbine from the nearest receptor, or residentially zoned parcel, unless the applicant can demonstrate through a noise study, to the satisfaction of the Cape Cod Commission, that the projected sound levels including both ambient and infrasound, would result in minimal impacts to occupants within a reduced setback. All DRIs shall, after consulting with the Commission's noise consultant, prepare a plan which specifies reduced operating procedures, including decommissioning plan, which address and mitigate noise compliants that may arise during operation of the WECF Components of a noise study can be found in Technical Bulletin 11-001.
Response: *Not Applicable*

E1.9 Shawdow Flicker: All applicants for a WECF shall conduct an impact study of shadow flicker on receptors which will be affected by the proposaed WECF. All DRIs with shadow flicker effects on receptots shall require the Applicant to submit for review and approval by the Commission a mitigation plan which specifies operational controls, landscaping, or other means that mitigate shadow flicker events to less than 10 hours per year.

Response: *Not Applicable*

E1.10 Decommissioning: Any WECF that has not been operational for more than 120 consecutive days shall be dismanteled and removed from the site by the owner, operator, and/or other parties as designated by the decommissioning plan unless a written waiver is obtained for good cause shown from the Cape Cod Commisssion'e Executive Director. The applicant shall also provide security in a form and amount satisfactory to the Cape Cod Commission. The security shall cover over the life the WECF the cost of decommissioning and removing any abandoned or damaged WECF. This security shall be in place and payable to the town or Commission on demand for the life of the WECF. All WECF DRI decisions shall contain a written decommissioning plan, which also addresses removal of the meterological (or "met") tower.

Response: *Not Applicable*

E1.11 Municipal WECF Waiver: Because of the procedural, legal and poltical safeguards applicable to town appropriations and the use of town ownedland, Minimum Performace Standards E.180E1.10 shall not apply to one Municipal WECF 250 KW or less on a single parcel.

Response: *Not Applicable*

AFFORDABLE HOUSING

AH1 - Promotion and Creation of Affordable Housing
Goal: To promote the provision of fair, decent, safe, affordable housing for rental or purchase that meets the needs of present and future Cape Cod residents. At a minimum, each town should seek to raise its affordable housing stock to 7.5 percent of all year-round units by 2010, and 10 percent of all year-round units by 2015.

Minimum Performance Standards

AH1.1 Residential Requirement
Residential construction and redevelopment projects of 10 units or more shall provide at least 10 percent of the proposed units as affordable units. In lieu of providing such units on site, the applicant may satisfy these

requirements by providing comparable housing units off site through the purchase of existing units, redevelopment, new construction, a contribution of land that can support as of right the required number of affordable units or a cash contribution as described in MPS AH1.3. A contribution of land shall be accompanied by a development plan acceptable to the Commission.

Response: *The project proposes to provide seven (7) affordable units, and is therefore consistent with this requirement.*

AH1.2 Ten-percent Requirement for Subdivisions of 10-plus Lots
Residential subdivision plans of 10 lots or more shall provide at least 10 percent of the proposed lots as affordable housing sites. In lieu of providing such lots on site, the applicant may develop, or contribute comparable off-site lot(s) that can support as of right, the required number of affordable units. The applicant may also offer comparable housing units off site through the purchase of existing units, redevelopment, or new construction. The applicant may also provide a cash contribution as described in MPS AH1.3. A contribution of land shall be accompanied by a development plan acceptable to the Commission.

Response: *Not applicable. The project does not propose the subdivision of land into lots for housing sites*

AH1.3 Cash-contribution Option
In lieu of providing such units or lots on site, an applicant may provide a cash contribution of equivalent value for funding or purchase of affordable housing that (a) has a plan acceptable to the Commission to expend those funds within the same time frame as the applicant's development, and (b) will result in a greater number of units or lots than had they been created on site. The method and timing of the payment(s) shall be secured as a condition of development approval.

Equivalent value shall be determined through one of the following methods: (a) for lot subdivisions, current appraised value of the affordable lots; (b) for ownership projects, the difference between the affordable sales price(s) and the market sales price(s) of similar bedroom units within the project; (c) for rental projects, the difference in appraised value between the value of the project with and without the affordable units. The appraiser shall be selected by the Commission from a list approved by the Commission and the applicant and shall be paid for by the applicant.

Response: *Not applicable*

AH1.4 Calculation of Affordable Units
For the purposes of calculating the 10-percent affordable housing contribution, all numbers shall be rounded to the highest whole figure.

Response: *Noted. Of the proposed 70 units 7 will be affordqable*

AH1.5 Off-site Option Criteria
Prior to the rendering of a DRI decision by the Commission, an applicant shall demonstrate to the Commission that off-site lots are buildable and/or units habitable per federal Housing Quality Standards (24 CFR 200.925 or 200.926). In the event that the off-site lots or units do not meet those standards as determined by Commission staff, an acceptable alternate contribution shall be required.

Response: Not applicable

AH1.6 Location of Off-site Option

For DRIs, the units or lots resulting from Minimum Performance Standards AH1.1, AH1.2, and AH1.3 shall be in the town where the DRI is located.

Response: *Complies*

AH1.7 Timing of Off-site Contributions
For DRIs, all affordable housing contributions shall be made prior to the conveyance of any of the subdivision lots or the issuance of a building permit for the project, whichever occurs first.

Response: *Does not apply since the project proposes to provide onsite affordable housing in accordance with the Minimum Performance Standards.*

AH1.8 Timing and Mix of Affordable Units
For DRIs, development of affordable housing shall take place at the same rate and within the same time frame as the development of the market-rate units. There shall be a similar proportion of affordable and market-rate units in those DRIs with a mix of unit/bedroom sizes and/or in those DRIs with a mixture of housing types (for example, ownership and rental; independent living and assisted living, etc.).

Response: *The project will be a seventy (70) unit senior housing community made up of fifty-two (52) assisted living units and eighteen (18) memory care units. The project proposes to provide seven (7) affordable units made up of two (2) will be assisted living studios, four (4) assisted living one bedrooms, and one (1) memory care unit. The applicant proposes the memory care unit may be satisfied as either a studio unit, or a bed in a companion unit. The proposed affordable housing units will be developed within the same timeframe as the market-rate units.*

AH1.9 Integration and Size of Affordable Units
On-site affordable housing units created by this section shall be integrated with the rest of the development and shall be compatible in exterior design, appearance, construction, and quality of materials with other units. For DRIs, location of the affordable units and construction specifications shall be approved by the Commission prior to the start of construction. To ensure that affordable units qualify for the state's Subsidized Housing Inventory (SHI), both on site and off site affordable housing units shall meet the Department of Housing and Community Development's Local Initiative Program (LIP) unit size guidelines.

Response: *The proposed on-site affordable housing units will comply with this requirement.*

AH1.10 ENERGY STAR® Requirement
Newly constructed affordable housing units created by this section shall meet at least the minimum ENERGY STAR® construction standard.

Response: *The proposed affordable housing units will meet the minimum ENERGY STAR® construction standard.*

AH1.11 Pricing and Rents of Affordable Units
For ownership DRIs, the affordable sales prices shall be calculated using the Barnstable County HOME Consortium methodology and guidelines. For rental DRIs, the affordable rents shall be the "high" HOME rents, as published annually by the US Department of Housing and Urban Development (HUD). If comprehensive services are included in the monthly rent (for example, continuing-care retirement communities (CCRC), assisted living, and/or skilled nursing facility projects), and the monthly rent exceeds the limits set forth by the HOME Program, the Commission shall utilize existing state housing program guidelines (for example, MassHousing's Elder Choice program, the Massachusetts Department of Housing and Community Development's CCRC

guidelines, etc.) to determine the amount of household income that must be devoted to rent and services. Prior to the occupancy of the affordable units, the applicant shall demonstrate that the occupants are income-eligible in accordance with HOME Consortium guidelines.

Response: *The proposed affordable housing units will comply with this requirement.The maximum monthly rent for the affordable <u>assisted</u> living units are as follows:*

AL Studio Unit – 75% of the income of a household at the 80% AMI.
AL One Bedroom Unit – 75% of the income of a household at the 80% AMI based upon the HUD standard of using the income of a 1.5 person household for a one bedroom unit.
The maximum monthly rent for the affordable <u>memory care</u> living unit is as follows:
ALZ Unit - 75% of the income of a household at the 80% AMI.

Tha affordable rents for the Assisted Living and Memory Care units shall be inclusive of the following:

The Standard Package for the Assisted Living Units includes the following:
<u>Included in the rate:</u>

a. *Electric, HVAC, utilities*
b. *3 of meals*
c. *One time per week, clean and sanitize kitchen and bathroom areas and dust surfaces*
d. *ADL Care 30 minutes per day*
e. *Scheduled Transportation*
f. *Emergency call system*
g. *Activities*
h. *Access to Other amenities- salon/ barber, therapy, massages.*

<u>Not included in the rate and subject to additional costs are the following:</u>

a. *Cable/ telephone*
b. *Furnishings*
c. *ADL Care over 30 minutes a day*
d. *Unscheduled/ private transportation*
e. *Use of salon/ barber, therapy, massages.*
f. *SAMM/ LMA Med management*
g. *Skilled Care/ Medical Treatment not offered*

The Standard Package for the Memory Care Unit includes the following:
<u>Included in the rate:</u>

a. *Memory care housing unit*
b. *Electric, HVAC, utilities*
c. *3 meals per day*
d. *Level of housekeeping - same*
e. *60 minutes per day of ADL care*
f. *Standard Transportation*
g. *Hourly checks*
h. *Activities*
i. *Access to Other amenities- salon/ barber, therapy, massages.*

Not included in the rate and subject to additional costs are the following:

a. *Cable/ telephone*
b. *Furnishings*
c. *ADL Care over 60 minutes a day*
d. *Unscheduled/ private transportation*
e. *Use of salon/ barber, therapy, massages.*

AH1.12 Permanent Affordability
Affordable housing units created by this section shall use affordable housing restrictions that are recorded at the Barnstable County Registry of Deeds and that require the units to remain affordable in perpetuity.

Response: The proposed affordable housing units shall remain affordable in perpetuity.

AH1.13 Monitoring of Affordability
A monitoring agreement between the applicant and a third party organization acceptable to the Commission with experience in affordable housing income verification shall be required for all affordable housing developed under this section. For rental DRIs, the monitoring agent shall be responsible for certifying initial tenant income eligibility, rents, and compliance with the affirmative marketing and tenant-selection plan; thereafter, the agent shall annually certify income eligibility and rents. For ownership DRIs, the monitoring agent shall be responsible for certifying initial buyer income eligibility and compliance with the affirmative marketing and buyer selection plan.

Response: *Acknowledged*

AH1.14 No Reduction in Number of Existing Units
For DRIs, residential and/or commercial construction, redevelopment, or subdivision development projects resulting in the reduction of non-condemned residential units shall not be allowed except in the discretion of the Commission.

Response*: Not applicable. There are no existing affordable housing units since the project site is undeveloped.*

Best Development Practices

AH1.15 Location of Affordable Housing
Affordable housing is encouraged as part of residential development in designated Economic Centers, Villages, and Growth Incentive Zones and convenient to transportation corridors. The Commission encourages the use of redeveloped properties for affordable housing in these locations.

Response*: Not applicable. The project site is not located within an Economic Center or a Growth Incentive Zone and there are no existing properties to redevelop.*

AH 1.16 Priority for Affordable Rental Housing
DRIs are encouraged to create rental housing for all age groups as the region's priority affordable housing need, as identified in the 2005–2009 HUD Consolidated Plan.

Response: *Noted.*

AH 1.17 Moderate-income Homeownership
Residential DRIs are encouraged to provide units that are affordable to moderate-income households (those between 80 and 120 percent of area median income).

Response: *Noted.*

AH2 - Fair Housing/Equal Opportunity

Goal: To promote equal opportunity in housing and give special consideration to meeting the housing needs of the most vulnerable segments of the Cape's population, including but not limited to homeless individuals and families, very low income (50 percent of median income), low income (51–80 percent of median income), single heads of household, racial minorities, and others with special needs.

Minimum Performance Standards

AH2.1 Non-discrimination

In all of its actions the Commission and project proponents shall work to prevent discrimination in housing because of race, color, creed, religion, sex, national origin, primary language, age, political affiliation, source of income, disability, sexual orientation, or any other consideration prohibited by law, and shall not knowingly approve any development that so discriminates.

Response: *Noted.*

AH2.2 Visitability and/or Accessibility Requirement

Residential construction and redevelopment projects shall provide at least 10 percent of the affordable units, or one unit, whichever is greater, of the proposed units as either legally handicapped accessible unit(s) or unit(s) that meet visitability standards: one entrance with zero steps; 32-inch clear passage through all interior main-floor doors; and at least one half bath on the main floor.

Response*: One (1) of the proposed affordable housing units will be a legally handicapped accessible unit*.

AH2.3 Affirmative Marketing and Selection of Buyers/Tenants

For DRIs, the applicant shall submit a marketing plan to the Commission for its consideration and approval that describes how the affordable units will be affirmatively and fairly marketed to potential home buyers and/or renters. The plan shall include a description of the lottery process to be utilized for selecting the home buyers and/or renters. The lottery shall have either one pool for all applicants or two pools: a regional resident pool for up to 70 percent of the units and all applicants in the second pool. The marketing and selection plan shall be consistent with the state's LIP guidelines so that the affordable units will qualify for the state's Subsidized Housing Inventory.

Response: *The affirmative marketing plan for Northbridge at Mashpee Commons is included as part of the application package.*

AH2.4 Relocation Requirement

Residential construction, redevelopment, or subdivision development projects resulting in dislocation of existing residential occupants shall be subject to the provisions of the federal Uniform Relocation Act.

Response: *Not applicable. The proposed project does not entail the dislocation of any residential occupants.*

AH3 - Community Participation

Goal: To promote the participation of all segments of the community to address the housing needs of Cape Cod residents, with particular attention to the needs of low- and moderate-income households.

Response: *Standards AH3.1 through AH3.5 do not apply because the proposed project is not a commercial DRI.*

HERITAGE PRESERVATION AND COMMUNITY CHARACTER

HPCC1 - Historic, Cultural, and Archaeological Resources

Goal: To protect and preserve the important historic and cultural features of Cape Cod's landscape and built environment that are critical components of the region's heritage and economy.

Minimum Performance Standards

HPCC1.1 Historic Structures

An historic structure's form, massing, and key character-defining features, including the relationship to its site and setting, shall be preserved. Additions and alterations to historic structures shall be consistent with the building's architectural style and shall not diminish its historic and architectural significance. Removal or alteration of distinguishing original stylistic features or examples of skilled craftsmanship of historic or aesthetic significance shall be prohibited unless the Commission determines that such removal or alteration will not have a significant negative impact on the integrity of the historic property, surrounding historic district, or otherwise distinctive neighborhood. Demolition is considered only if a building or structure is found no longer eligible for listing on the National Register or no longer contributing to the historic significance of the district. There is a presumption in favor of retaining all National Register-eligible structures, and all contributing structures in an historic district due to the determination of significance by the Massachusetts Historical Commission and/or the National Park Service. If a demolition request is based upon structural instability or deterioration, a technical report prepared by a registered architect or engineer may be required, detailing the nature and extent of the problems and a reasonably adequate estimate of the cost to correct them. The Commission may hire its own structural engineer to evaluate the property and verify the content of the applicant's report, and the applicant may be required to pay a portion of that cost.

Response: *Not applicable. The site is undeveloped and there are no existing structures on the property.*

HPCC1.2 Cultural Landscapes

The distinguishing original features of an historic or cultural landscape shall be preserved. New development adjacent to or within historic or cultural landscapes shall be located to retain the distinctive qualities of such landscapes and shall be designed to maintain the general scale and character-defining features of such landscapes. In particular, historic agricultural lands and other working agricultural lands shall be retained to prevent further loss of these dwindling resources that speak to the Cape's agricultural past.

Response: *A Project Notification Form has been submitted to the Massachusetts Historical Commission for review in accordance with the requirements of the Cape Cod Commission.*

HPCC1.3 Archaeological Sites

Where development is proposed on or adjacent to known archaeological sites or sites with high archaeological sensitivity as identified by the Massachusetts Historical Commission (MHC) or the Local Historical Commission during the review process, it shall be configured to maintain and/or enhance such resources where possible. A predevelopment investigation of such sites shall be required early in the site planning process to serve as a guide for layout of the development. Archaeological sites determined eligible for listing on the National Register of Historic Places shall be preserved and protected from disturbance.

In reviewing projects affecting historic resources, the Commission will refer to the Secretary of the Interior's Standards for Rehabilitation of Historic Properties and other current guidelines and bulletins prepared by the National Park Service Heritage Preservation Services Division. The MHC has agreed to review any projects that require a state or federal license, permit or funding, as defined by the National Historic Preservation Act, for their

conformance with the Secretary of the Interior's Standards for Treatment of Historic Properties and for their effects on the historic significance of the property and any surrounding historic district. The MHC will also assist the Commission in reviewing other projects that will affect properties listed on the State or National Registers of Historic Places. A town's Local Historical Commission and, where appropriate, the Massachusetts Commission on Indian Affairs will also assist the Commission in reviewing projects that will affect properties with historic and archaeological significance.

Response: *A Project Notification Form has been submitted to the Massachusetts Historical Commission for review in accordance with the requirements of the Cape Cod Commission.*

Best Development Practices

HPCC1.4 Local Preservation Efforts
Development projects that do not include an historic preservation or rehabilitation component are encouraged to contribute to public or nonprofit preservation efforts in the community.

Response: *Noted.*

HPCC1.5 Preservation Restrictions
Protection of significant historic structures, cultural landscapes, and archaeologically sensitive areas is encouraged through conservation restrictions or preservation restrictions that ensure their long-term preservation.

Response: *A Project Notification Form has been submitted to the Massachusetts Historical Commission for review in accordance with the requirements of the Cape Cod Commission.*

HPCC2 - Community Character/Site and Building Design
Goal: To encourage redevelopment of existing structures as an alternative to new construction, and to ensure that development and redevelopment respect the traditions and distinctive character of historic village centers and outlying rural areas consistent with Designing the Future to Honor the Past, Design Guidelines for Cape Cod, Technical Bulletin 96-001, as amended.

Minimum Performance Standards

Project Siting Standards

HPCC2.1 Strip Development
Creation or extension of strip development shall not be permitted. Reuse, redevelopment, or infill within existing strip developments in a way that does not extend the linear nature of the development or increase traffic conflicts may be permitted.

Response: *Not applicable. The proposed project site plan positions the building to the front of the site with parking removed locted removed from the street view, thereby eliminating the "sea of pavement" common to strip developments. The site plan flows perpendicular from the street which precludes a linear development pattern along this portion of Great Neck Road South*

HPCC2.2 Protection of Existing Roadway Character
New development proposed on local and regional roadways shall be sized such that it can be accommodated without significant changes to the existing character of the roadway. Any necessary structural improvements shall be consistent with the existing character of the roadway, unless the Commission and the community deem alternatives appropriate.

Response: *There are no proposed changes to an existing roadway. As noted in HPCC2.1 the proposed site plan seeks to preserve the exisitn character of the existing roadway.*

HPCC2.3 Avoid Adverse Visual Impacts
New development shall be sited and designed to avoid Adverse Visual Impacts to Scenic Resources. Visual Impact Assessments (VIA) shall be required for DRI review of any WECF in the Cape Cod Ocean Planning Area as defined in the Cape Cod Ocean Management Plan dated October 2011 and shall be conducted in accordance with Technical Bulletin #12-001, as amended. VIA may be required as part of DRI review of other Development based upon staff recommendation and vote of the Regulatory Committee that a VIA is necessary to evaluate impacts from the Development.

Response: *The project will be designed to avoid adverse visual impacts to Scenic Resources, should it be determined that the project site is located in a Scenic Resource area.*

Building Design Standards

HPCC2.4 Consistency with Regional Context or Surrounding Distinctive Area
All development and redevelopment shall be consistent with the region's traditional development patterns, reflecting features such as modest building mass, height, scale, roof shape, roof pitch, building materials, and proportions between doors and windows. In areas with a distinctive character, such as historic districts, village centers, cultural landscapes, and historic properties, any design shall be consistent with the character of the area and reflect the surrounding context. Distinctive features of the area such as proximity to the street, views to historic structures, water and/or landscapes, and significant open spaces shall be preserved. A building design narrative is required as part of the DRI application to justify how the building relates to the surrounding context. Contemporary design and green design are encouraged and sometimes required in response to standards in the Energy chapter under Goal E.1, but must be supported by the design narrative.

Response: *Refer to the Design Narrative included as part of the application package*

HPCC2.5 Footprints over 15,000 Square Feet
For all new development, no individual structure shall exceed a footprint of 15,000 square feet unless it is designed as multiple distinct massings differentiated by significant variations in roofline and building footprint, or is fully screened. The method of screening shall be consistent with the character of the surrounding area, but shall typically consist of traditionally scaled frontage buildings within developed areas, and vegetated buffers of 200 feet in depth in outlying areas. Redevelopment projects may expand to a single massing of 50,000 square feet without full screening if the expansion occurs on previously developed impervious or landscaped areas.

Response: *The proposed building has been designed to be consistent with the architectural venrnacular of Cape Cod in terms of is elements, materials, massing. The use of a sloped roof with dormer and gabled features minimizes the roof massing. Additionally the articulated building elevations with bump outs porches, building height, and varied fenestration creates multiple distinct massings. The proposed building is designed as multiple attached massings, with each element less than 15,000 square feet, thus meeting the RPP standard for maintaining smaller building masses. The proposed building concept is of a central two-story shingle style mansion with a low slope roof, large overhangs, bay windows, and a covered porch that wraps around the first level to make the building more inviting to residents and guests by creating a smaller scale architectural component along the sides of the building that are closest to the street. The central two-story building will be flanked by 1½ story wings that will extend away to the south and east. These wings will have steeper sloped roofs and roof dormers to help break up the building massing and create building element rhythms appropriate for the size and scale of the building. The building layout is essentially double-loaded access corridors which are broken*

and offset to allow for the volume to seem smaller and as an assemblage of separate buildings which are pulled together to be more interesting than a simpler monolithic massing. The ends of building wings will have building components that are broken and rotated from the typical to create more interesting architecture and to allow for the design to incorporate more traditional scales and patterns. At the more visible ends and corners, the building massing concept will be enhanced by fenestration rhythms and patterns consistent with shingle style and Cape Cod vernacular design. The building is sited with the longer building elevation perpendicular to the road frontage thereby reducing the visual impact. The project is also screened by existing natural vegetation and proposed plantings to limit its visibility from adjacent roadways.

HPCC2.6 Building Forms and Facades
For all development and redevelopment involving new construction, the massing, facades, and roof configuration of a building shall be varied. If a building facade is more than 50 feet in length, it shall include a minimum of 10 feet of variation in the building footprint (set-back or projection in the building wall) for every 50 feet of facade length, and related changes in the roofline in order to reduce the apparent mass of the building.

Response: *Complies*.

HPCC2.7 Non-traditional Materials and Designs
In industrial parks or areas not visible from scenic or regional roadways or other distinctive areas noted above in MPS HPCC2.4, use of nontraditional materials, forms, and site designs may be appropriate. In such areas, maintenance of adequate buffers on the subject property shall be required to ensure that the proposed development is screened from view.

Response: *The exterior materials to be used to finish this building will be predominantly red cedar wood shingles with red cedar wood pergola and trellis structures, recycled fly-ash trim boards to match size and shape of traditional trim as found on Cape Cod and shingle style architecture. The windows will be of varying sizes but will be of white vinyl and will have 4 over 1 muntin patterns. The roof will be covered with architectural grade asphalt shingles of a neutral color as well as EPDM membrane roofing in recessed areas not in view by surrounding areas. The building colors are yet to be determined but will want to be consistent with typical Cape Cod design.*

Parking and Landscaping Standards

HPCC2.8 Parking to the Side or Rear of Buildings
The building and layout of all parking lots shall follow good design practices and reinforce regional development patterns. Parking for all development shall be located to the rear or the side of a building or commercial complex unless such location would have an adverse or detrimental impact on environmental or visual features on the site. In such cases, alternative means of minimizing environmental or visual impacts of the proposed parking shall be required.

Response: *Complies. The majority of the rear side drive and parking areas are located within an existing gravel access road and easement for the waste water treatment facility which neighbors the property to the east. This design allows for the access road, service drive and parking to share drive area and to reduce the total area of impervious surface and to allow for greater undisturbed area.*

The off street parking is separated into four zones along the perimeter drive which extends to the service entrance at the rear of the building. The parking for the barrier free vehicles is inside the front entry drop-off loop to reduce travel distances for the mobility impaired. The majority of the spaces are located on the back side of the property. These spaces will be screened from the entry side by the building, as will the remaining parking areas.

HPCC2.9 Landscaping Improvements for Redevelopment
Redevelopment shall significantly improve buffers between parking areas and the street, as well as interior parking-lot landscaping, and shall provide facade improvements and frontage buildings, as necessary and if appropriate, to improve the visual character of the site.

Response: *Complies*

HPCC2.10 Landscape Plan Requirements
All development shall provide landscaping that integrates buildings with their environment, enhances architectural features, fosters sustainable practices, clearly divides parking lots into smaller areas, includes tree planting, and provides amenities for pedestrians. All development shall implement a landscape plan that addresses the functional aspects of landscaping, such as drainage and innovative stormwater technologies, erosion prevention, screening and buffering, provision for shade, and energy conservation. When vegetative buffers are necessary to prevent adverse visual impacts from new development, existing vegetation shall be retained and unaltered in the buffer area. A maintenance agreement shall be provided by all development for a minimum of three growing seasons to insure vegetation is properly established.

Response: *A Landscape Plan has been prepared and included with the DRI Application. The plan is consistent with this standard.*

Lighting, Signage and Roadway Appurtenances

HPCC2.11 Exterior Lighting
Site lighting and exterior building lights in all development shall meet the following standards. This Minimum Performance Standard shall not apply to aviation warning or marking lights as may be required by the Federal Aviation Administration.

- Employ ”shoe-box” type or decorative fixtures, consistent with the architectural theme of the development and which are fully shielded.
- Use a mounting configuration that creates a total cutoff of all light at less than ninety (90) degrees from vertical (flood, area, and up-lighting are prohibited).
- Provide total cutoff of all light at the property lines of the parcel to be developed.
- Meet a maximum initial horizontal foot-candle level of not more than 8.0 foot-candles, as measured directly below the luminaire(s) at grade.

Additional guidance can be found in Technical Bulletin 95-001, as amended.

Response: *The proposed lighting meets these requirements as depicted on the Lighting Plan submitted as part of the application package*.

HPCC2.12 Signage
The installation of billboards, off-site advertising (except approved directional signs), and internally lit or flashing signs shall not be permitted. The size and color of all signs shall be in scale and compatible with the surrounding buildings and street. When more than one sign is used, the graphics shall be coordinated to present a unified image. Wooden signs, either painted or carved, are usually most appropriate.

Response: *The proposed signage complies with these requirements.*

HPCC2.13 Underground Utilities

All utilities for development including cable shall be placed underground except where the presence of natural features such as wetlands or archaeological resources prevent such placement.

Response: *The proposed utilities will be placed underground in accordance with this requirement. All site utilities will be located underground and the emergency power generator and electrical transformer (if required) shall be located away from view from the street and to the rear side of the building.*

HPCC2.14 Roadway Appurtenances
Ornamental signals and mast arms shall be required when the town and the Commission deem it appropriate. Crosswalks shall be constructed of a different texture. In historic areas, the design of roadway appurtenances shall be consistent with historic district styles.

Response: *Noted*.

Best Development Practices

HPCC2.15 Conservation Restrictions for Landscapes and Viewsheds
Maintaining the integrity of natural landforms and broad, open views of the landscape as seen from any public way or waterway is encouraged and should include long-term protection through conservation restrictions or other means.

Response: *Not applicable*

HPCC2.16 Specimen Trees and Original Topography
Preserving the distinguishing original features of a site such as specimen trees, existing plantings, and topography is encouraged.

Response: Preservation of existing topography has been considered in the design of the proposed development. No specimen trees were identified on the project site. .

HPCC2.17 Impervious Parking Areas
Shared parking, on-street parking, and community parking lots are encouraged in order to reduce the amount of land devoted to parking. In individual developments, methods to reduce exposed paved areas such as parking underground or in a portion or the building's first floor, separate parking structures consistent with the Commission's Design Manual, and use of alternate paving materials are encouraged.

Response: *The proposed project will seek a reduction in the amount of required parking base on the proponents experience with other assisted living communites it owns and operates. This will reduce the amount of impervious coverage*

HPCC2.18 Public Open Spaces, Public Art, and Related Amenities
Public open spaces with benches and amenities, as well as public artworks, are encouraged in developments accessible to the public.

Response: *Open areas with walkways, bendches, and amenties will be provided for residents and their guests*.

HPCC2.19 Multiple Stories to Reduce Building Footprint

Two-story buildings are encouraged to reduce the building footprint and to incorporate mixed use into the design of buildings.

Response: *The proposed building concept is of a central two-story shingle style mansion with a low slope roof, large overhangs, bay windows, and a covered porch that wraps around the first level to make the building more inviting to residents and guests by creating a smaller scale architectural component along the sides of the building that are closest to the street. The central two-story building will be flanked by 1½ story wings that will extend away to the south and east. These wings will have steeper sloped roofs and roof dormers to help break up the building massing and create building element rhythms appropriate for the size and scale of the building.*

HPCC2.20 Underground Utilities Roadway improvement projects associated with DRIs are encouraged to include undergrounding of overhead utilities.

Response: *The proposed utilities will be placed underground in accordance with this requirement.*

EGA
ARCHITECTS

NORTHBRIDGE AT MASHPEE
DESIGN NARRATIVE

The Northbridge at Mashpee is a proposed assisted living residence with a memory support unit located in Mashpee, MA at 68 Great Neck Road South.

Site Design

The building will be located on approximately five acres and is bounded by Great Neck Road South to the west, a power line easement to the south, a wastewater treatment facility to the east and undeveloped land to the north. The project will maintain a 50' vegetated buffer along Great Neck Road South and a 10' vegetated buffer on the remaining edges of the property. Each of the vegetated buffer zones will be augmented with additional landscaping to enhance screening of the project in accordance with The Design Guidelines for Cape Cod.

The entrance to the property is adjacent to the main entrance side of the building to reduce the amount of drive area required to enter the site and reach the drop off area.

The off street parking is separated into four zones along the perimeter drive which extends to the service entrance at the rear of the building. The parking for the barrier free vehicles is located inside the front entry drop-off loop to reduce travel distances for the mobility impaired. The majority of the spaces are located on the back (east) side of the property. These spaces will be screened from the entry side by the building, as will the remaining parking areas.

All site utilities will be located underground and the emergency power generator and electrical transformer (if required) shall be shielded from view from the street and located adjacent to the service area of the building (south).

The building service access area is located on the south facing side of the building and will not be visible from the street and will be screened from neighboring properties by fencing and landscaping.

The landscape design approach is to integrate native species to enhance existing preserved vegetated areas to create a harmonious lush landscape in accordance with The Design Guidelines for Cape Cod.

The project will include a new sidewalk connection to Great Neck Road South which will continue into the property adjacent to the main entrance and wrap around the building along the drive system. There will also be a gravel walking path around the remainder of the property to create a loop for site accessibility. The project will include bike racks to encourage alternate transportation for staff and visitors.

Building Design

The program for the project consists of 52 assisted living residential apartments with common areas such as a parlor, living room, café, pub, dining room, activity room and a

library. There will also be a memory support neighborhood for 18 apartments which will contain 22 beds. This neighborhood will include a breakfast bar, living rooms, dining rooms, activity room, and brain gym as well as other support spaces. This neighborhood will be arranged around a central courtyard which will allow residents free access to the outdoors while reducing the concern of elopement.

There will also be spaces to be used by both the assisted living and the memory support residents which will be the theater, wellness offices, a spa and a beauty salon. The project will also include a community room which exists to allow members of the surrounding community to have a space for gathering and become familiar with the residence. The project will also contain administration and service and support spaces such as a commercial kitchen, laundry rooms, offices and spaces to house mechanical and electrical systems.

The proposed building concept is of a central two-story shingle style mansion with a low slope roof, large overhangs, bay windows, and a covered porch that wraps around the first level to make the building more inviting to residents and guests by creating a smaller scale architectural component along the sides of the building that are closest to the street. The central two-story building will be flanked by 1½ story saltbox style wings that will extend away to the south and east. These wings will have steeper sloped roofs and roof dormers to help break up the building massing and create building element rhythms appropriate for the size and scale of the building. The building layout is essentially double-loaded access corridors which are broken and offset to allow for the volume to seem smaller and as an assemblage of separate buildings which are pulled together to be more interesting than a simpler monolithic massing. The ends of building wings will have building components that are broken and rotated from the typical to create more interesting architecture and to allow for the design to incorporate more traditional scales and patterns. At the more visible ends and corners, the building massing concept will be enhanced by fenestration rhythms and patterns consistent with shingle style and Cape Cod vernacular design.

The exterior materials to be used to finish this building will be predominantly stained cedar wood shingles on the two-story mansion portion of the building and painted cementitious lap siding on the 1 ½ story saltbox style wings with stained cedar pergola and trellis structures, painted fly-ash trim boards to match size and shape of traditional trim as found on Cape Cod and shingle style architecture. The windows will be of varying sizes but will be of white vinyl and will have a 4 over 1 grill pattern. The roof will be covered with architectural grade asphalt shingles of a neutral color as well as EPDM membrane roofing in recessed areas not in view by surrounding areas. The building colors are yet to be finalized but will want to be consistent with typical Cape Cod design.

The intent of the building design is to create a project that blends harmoniously with the natural and man-made beauty and style of traditional Cape Cod as outlined within The Design Guidelines for Cape Cod.

Traffic Impact Study

Northbridge Facility – Mashpee Commons

Mashpee, MA

June 2015

Prepared for:

The Northbridge Companies
71 Third Avenue
Burlington, MA 01803

Prepared by:

BSC GROUP
15 Elkins Street
Boston, MA 02127
(617)896-4300

Executive Summary

BSC Group has evaluated traffic impacts associated with the proposed assisted living facility on Great Neck Road in Mashpee, Massachusetts. This development proposes to construct an assisted living facility consisting of 70 units with 82 beds of both assisted living and memory care units. The property is to be located on the east side of Great Neck Road, north of Donna's Lane

This study includes a review of existing traffic and roadway conditions, as well as a review of the recent history of crashes at study area intersections. This report identifies background traffic growth for study area roadways, estimates additional traffic generated by the proposed development, and evaluates traffic impacts due to project-generated traffic. The impacts of additional traffic associated with this development are evaluated under a five-year planning horizon (Year 2020). The findings of the study are summarized below.

- Taking into account the 25% reduction in project trips as required by the CCC, the proposed project is expected to generate:
    - 11 site-trips (7 entering, 4 exiting) during the weekday morning peak hour,
    - 22 site-trips (10 entering, 12 exiting) during the weekday afternoon peak hour, and
    - 163 site-trips on a weekday daily basis
- The minimum required SSD and minimum desired ISD were available in both directions on Great Neck Road, for the posted speed of 45 MPH. BSC recommends that the Proponent maintain clear sight triangles in both directions along Great Neck Road adjacent to the property at the proposed Site Driveway in order to maintain or improve upon these sight distances.
- Under 2020 future Build conditions, the proposed Site Driveway westbound approach is expected to operate at Level of Service (LOS) B during both the weekday morning and afternoon peak hours.

It is the opinion of BSC Group that the existing roadway network will be able to accommodate the new vehicle trips associated with the proposed 70-unit assisted living development on Great Neck Road in Mashpee, Massachusetts.

Table of Contents

LIST OF TABLES

LIST OF FIGURES

Chapter 1: Introduction

BSC Group, Inc. (BSC) has prepared this Traffic Impact Study (TIS) to evaluate the potential impacts on the local transportation network associated with the proposed assisted living facility on Great Neck Road in Mashpee, Massachusetts. This study includes a review of existing traffic and roadway conditions in the vicinity of the project site, as well as a review of the recent history of crashes at study area intersections. This report identifies background traffic growth for study area roadways, estimates additional traffic generated by the proposed development and evaluates traffic impacts due to project-generated traffic.

1.1. Project Background

WaypointKLA proposes to construct an assisted living facility consisting of 70 units with 82 beds of both assisted living and memory care units. The property is to be located on the east side of Great Neck Road, north of Donna's Lane.

This Project will undergo the Cape Cod Commission (CCC) process as a Development of Regional Impact (DRI) because the estimated trips being generated by the project will exceeding one or more of the following thresholds: 25 peak hour trips or 250 daily trips. As such, this TIS has been prepared in accordance with the Cape Cod Commission Guidelines[1]. BSC has been and will continue to coordinate with the CCC and Town of Mashpee officials throughout this process.

1.2. Study Area Intersections and Existing Roadway Conditions

Based on discussions with the CCC, the intersection of Great Neck Road at the Site Driveway was selected to be the one intersection to be studied. The locus of the project site is displayed in Figure 1. The findings of the field inventory are summarized below.

Great Neck Road at Site Driveway

Great Neck Road is classified as a rural principal arterial that is under the jurisdiction of the Town of Mashpee. It generally runs in a north-south direction from Red Brook Road in the south through the Mashpee Rotary to Main Street in the north. Great Neck Road provides one general-use travel lane in each direction. The posted speed limit on Great Neck Road in the vicinity of the

[1] *Guidelines for Transportation Impact Assessment*, Overall Guidelines for DRI Transportation Impact Assessment, Revised January 9, 2003

project site is 45 MPH. There are no sidewalks on Great Neck Road in the vicinity of the project site.

The Site Driveway will intersect Great Neck Road to form an unsignalized T-intersection, with the Site Driveway under stop-control.

1.3. Existing Traffic Volumes

Existing traffic data was obtained from the Cape Cod Traffic Counting Report[2]. The report indicates that the most recent traffic counts located on Great Neck Road South south of the Mashpee Rotary in the Town of Mashpee were conducted between August 5-7, 2013. A summary of these daily and peak hour traffic volumes is presented in Table 1.

Table 1: Traffic Volume Summary

Location	Weekday Daily Volume[a]	Weekday Morning Peak Hour			Weekday Afternoon Peak Hour		
		Traffic Volume[b]	K-Factor[c]	Dir. Dist.[d]	Traffic Volume[b]	K-Factor[c]	Dir. Dist.[d]
Great Neck Road South south of Mashpee Rotary	9,630	700	7.3	55% NB	751	7.8	56% NB

[a] *Measured in vehicles per day*
[b] *Measured in vehicles per hour*
[c] *Percentage of daily traffic during the peak hour*
[d] *Directional Distribution*

Based on the data obtained from the ATR counts, the average weekday two-way volume on Great Neck Road South is approximately 9,630 vehicles per day (vpd). Two-way peak hour demands during the weekday are approximately 7% of the daily volumes during the morning peak hour and approximately 8% of the daily volumes during the afternoon peak hour.

The existing 2013 traffic volumes were increased by a rate of one-half percent over two years to obtain the 2015 Baseline traffic volumes. Traffic count data obtained from the Cape Cod Traffic Counting Report are contained in the Appendix.

1.4 Seasonal Adjustments

Guidelines from the CCC and MassDOT were reviewed in order to adjust the existing traffic count data. The CCC indicates that traffic counts should be no more than two years old and should be performed between April and November. Since the traffic counts obtained from the Cape Cod Traffic Counting Report meet these conditions, no adjustments were made based on CCC guidelines.

1.5. Crash Data

Crash data for the study area intersections were obtained from the Massachusetts Department of Transportation (MassDOT) for the most recent three years on record (2010 – 2012). During this time period, no crashes were recorded along the corridor of Great Neck Road South between Donna's Lane and the Mashpee

[2] 2012 Traffic Counting Report for Cape Cod Massachusetts, Cape Cod Commission, April 2013

Rotary. Since the study area is limited to the intersection of Great Neck Road South at the proposed Site Driveway, no crash analysis is necessary as the intersection does not currently exist.

1.6. Sight Distance Analysis

The sight distances at the proposed project driveway on Great Neck Road were evaluated in accordance with MassDOT guidelines and procedures established by the American Association of State Highway and Transportation Officials (AASHTO) *A Policy on Geometric Design of Highways and Streets (6th ed, 2011)*. The available sight distance was compared to the minimum requirements for two sight distance criteria: Stopping Sight Distance (SSD) and Intersection Sight Distance (ISD).

SSD is the required distance for vehicles on the major road to stop in time to avoid a collision with a stationary object. ISD, or "corner sight distance", is the distance needed for a vehicle to enter the major roadway from the minor roadway without interfering with traffic operations on the major road. According to AASHTO and MassDOT guidelines, *"If the available sight distance for an entering or crossing vehicle is at least equal to the appropriate stopping sight distance for the major road, then drivers have sufficient sight distance to anticipate or avoid collisions"*[3]. This means that at a minimum, the appropriate SSD should be provided at the intersection.

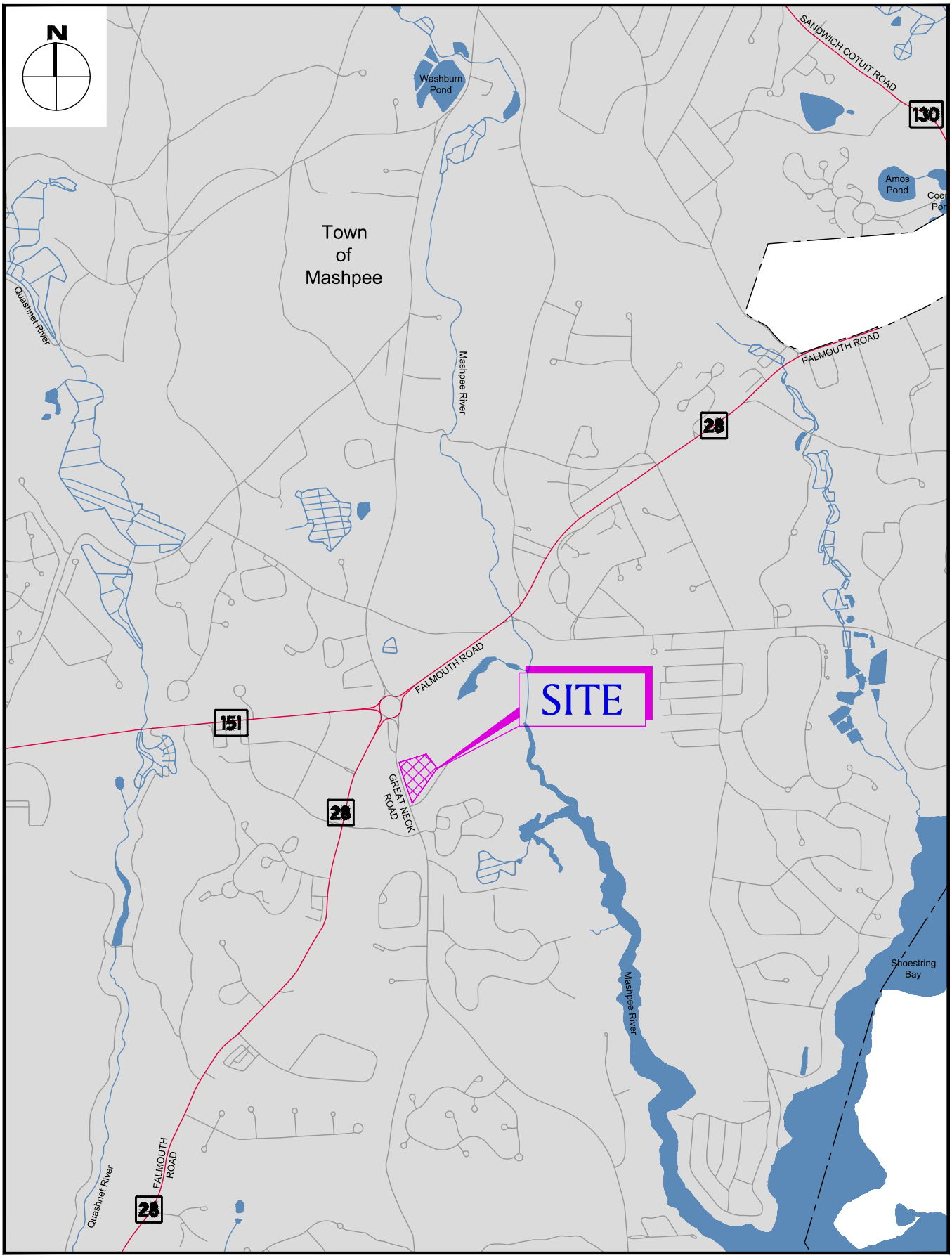
The posted speed limit on Great Neck Road is 45 MPH. The minimum sight distances based on this speed are compared to the available sight distances below, in Table 2.

Table 2: Sight Distance

Location	Available (feet)	Min. Required (feet) Posted 45 MPH	
STOPPING SIGHT DISTANCE			
Great Neck Road at Site Driveway, traveling northbound	645	360	
Great Neck Road at Site Driveway, traveling southbound	640	360	
INTERSECTION SIGHT DISTANCE		Min. Required (feet) Posted 45 MPH	Desired (feet) Posted 45 MPH
Site Driveway (looking south [left] on Great Neck Road)	485	360	430
Site Driveway (looking north [right] on Great Neck Road)	550	360	496

As indicated above in Table 2, the minimum required SSD and minimum desired ISD were available in both directions on Great Neck Road, for the posted speed of 45 MPH. BSC recommends that the Proponent maintain clear sight triangles in both directions along Great Neck Road adjacent to the property at the proposed Site Driveway in order to maintain or improve upon these sight distances.

[3] *A Policy on Geometric Design of Highways and Streets, AASHTO, (6th ed, 2011)*



Project Location Map
Northbridge Facility - Mashpee Commons
Mashpee, MA

SCALE: 1" = 2000'
0 500' 1000' 2000'

Figure 1

BSC GROUP

Chapter 2 Future Conditions

Future traffic conditions within the study area were projected to gain an understanding of the impacts of the proposed development on the adjacent transportation network.

Two future scenarios were analyzed to determine future traffic conditions under a five-year time horizon, which is the minimum time horizon required according to CCC guidelines. The first scenario, the Future No-Build Condition, examines vehicular traffic conditions five years into the future (in 2020). The second scenario, the Future Build Condition, examines the impact on traffic operations within the study area by trips generated by the proposed development.

2.1 Future No-Build Traffic Volumes

In order to evaluate traffic impacts associated with the proposed development, future No-Build Condition traffic volumes were examined to provide a baseline condition for comparison. The No-Build Condition traffic volumes were projected for the year 2020 based on existing traffic volume data.

Future No-Build Condition traffic volume projections generally consist of background growth, and traffic generated from specific proposed developments in the study area. Typically, background growth is a function of future land development, increased economic activity, and changes in travel patterns.

2.1.1 Specific Planned Developments and Growth Rate

Based on discussions with the CCC and the Town of Mashpee, trips are only available for one known project, Bridges at Mashpee. This project involves the construction of a 60-bed (54 unit) memory care assisted living development to be located in an area bounded by Nathan Ellis Highway (Route 151) in the south and Old Barnstable Road in the west. Anticipated site-specific trips from this project have been included in the future No Build volumes.

In addition to this project, the Mashpee Commons is another known future project in the area. However, at the time of writing this report, no specifics were known regarding the development of this project or number of trips.

The CCC recommended a one-half percent growth rate, however it was decided to increase this number and use a two percent growth rate. It is assumed that the two percent growth rate would accommodate any trips associated with the

Mashpee Commons project, as well as any other potential specific developments that may not be included in the No Build analysis.

Figure 2 displays both the 2015 Baseline traffic volumes and the 2020 future No Build volumes, which include 2015 Baseline traffic volumes grown by two percent compounded per year over a five-year planning horizon, plus the addition of project trips associated with the above specific developments.

2.2 Build Conditions

The future Build condition involves the construction of 70 units (82 beds) of an assisted living facility. In order to evaluate the effect of the project on traffic in the study area, vehicle trips associated with the proposed development were projected, distributed, and assigned to the adjacent roadway network.

2.2.1 Site Access / Circulation

Access and egress to the project site will be via a single proposed two-way driveway off of Great Neck Road South. The driveway will be located towards the North end of the Project site and provide access to parking lots as well as a drop-off are in front of the building entrance.

2.2.2 Project Generated Traffic

To estimate the trip generation characteristics of the proposed development, the Institute of Transportation Engineers (ITE) Trip Generation manual (9th ed. 2012) was employed. The Trip Generation manual is widely used by traffic engineers for this application. The manual provides vehicle-trip generation projections for a number of land uses.

Trips generated by the proposed project were estimated using ITE Land Use Code (LUC) 254 – Assisted Living. All peak hour trips were generated using rates for the peak hour of generator time period.

As required by the CCC Regional Policy Plan (RPP)[4], Transportation Demand Management (TDM) measures will be incorporated by the project in order to reduce trips by 25 percent. Table 3 presents the anticipated trip generation volumes based on the above criteria, and taking into account the required 25 percent trip reduction.

[4] Cape Cod Regional Policy Plan, 2009, amended 2012, Minimum Performance Standards TR2.1

Table 3: Trip Generation

	Weekday Daily	Weekday Morning Peak Hour			Weekday Afternoon Peak Hour		
		Enter	Exit	Total	Enter	Exit	Total
82 Beds of Assisted Living Facility*	218	10	5	15	14	15	29
25% Trip Reduction	55	3	1	4	4	3	7
Net New Trips	*163*	*7*	*4*	*11*	*10*	*12*	*22*

*based on ITE LUC 254 – Assisted Living

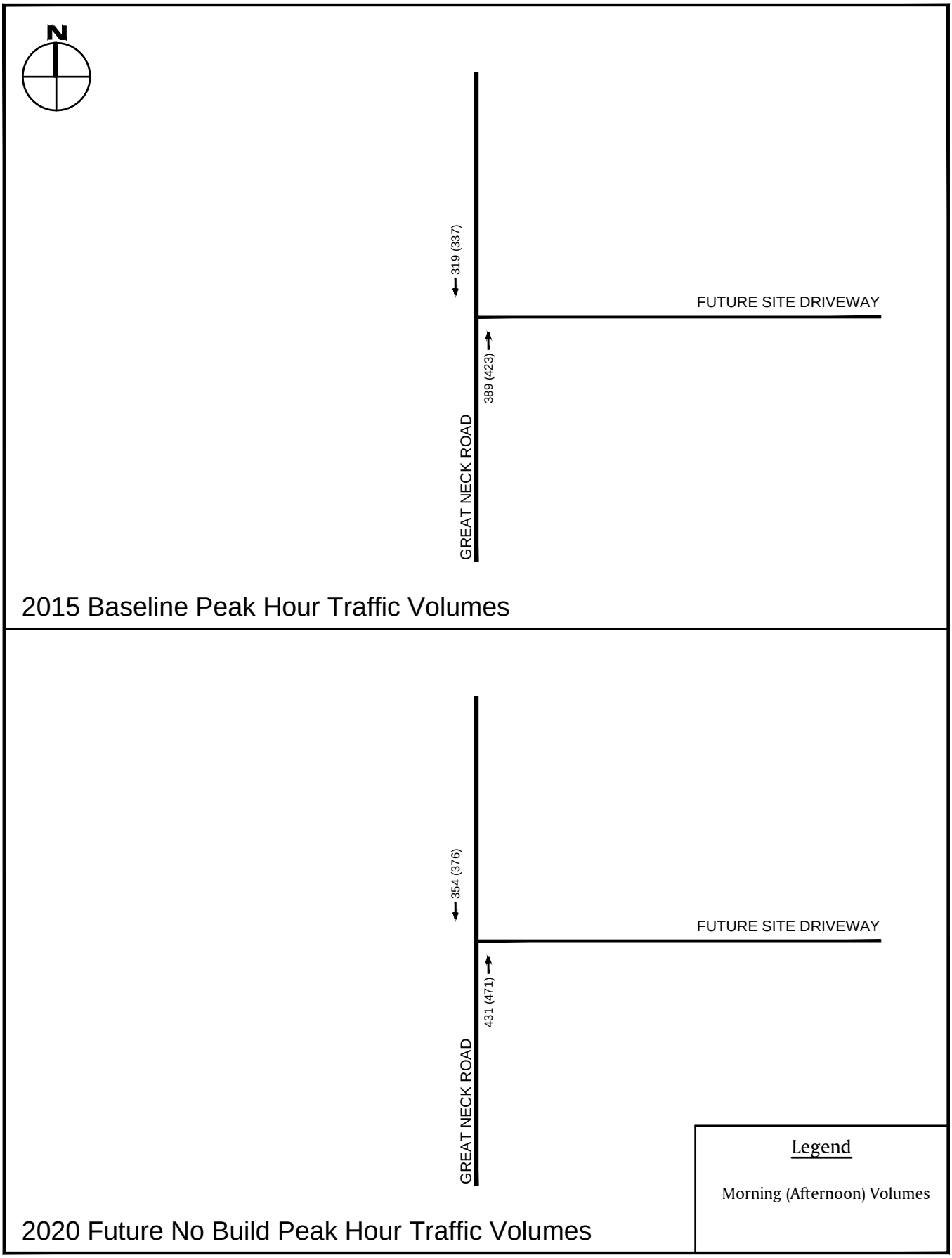
As can be seen from Table 3, the project is expected to generate 11 net new trips during the weekday morning peak hour (7 entering, 4 exiting), 22 net new trips during the weekday afternoon peak hour (10 entering, 12 exiting), and 163 net new trips on a daily basis during weekdays. Trip generation calculations are contained in the Appendix.

2.2.3 Trip Distribution and Assignment

In order to assess the traffic impacts related to the new traffic volumes generated by the proposed residential subdivision, trips must be distributed onto the roadway network.

BSC reviewed available traffic count data from the Mashpee 2012 Traffic Counting Report available on the CCC website. This report contained daily automatic traffic recorder data on Great Neck Road south of the Mashpee Rotary. Based on these data, it was identified that approximately 55% of vehicles travel to/from the north and 45% of vehicles travel to/from the south on Great Neck Road. These same travel patterns were then applied to the trip distribution for the proposed Assisted Living facility. These trip distribution patterns were presented to the CCC and approved in a response memorandum.

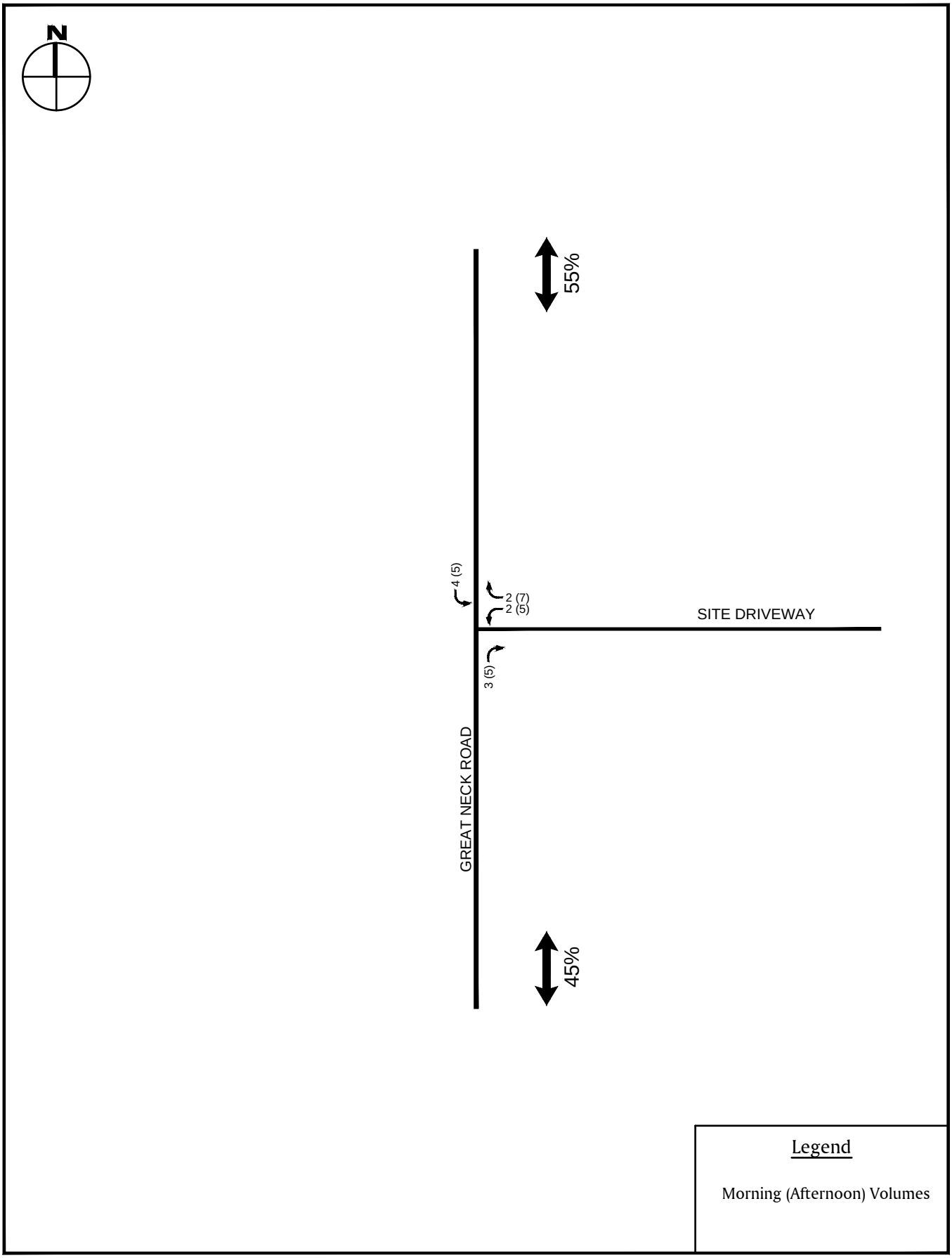
Figure 3 illustrates trip distribution patterns and expected traffic volumes generated by the project (see Table 3). Year 2020 Build Condition peak hour traffic volumes, which consist of the addition of project-generated traffic to No Build peak hour traffic volumes, are displayed in Figure 4.



2015 Baseline & 2020 Future No Build Peak Hour Traffic Volumes
Northbridge Facility - Mashpee Commons
Mashpee, MA

Figure 2
Not to Scale

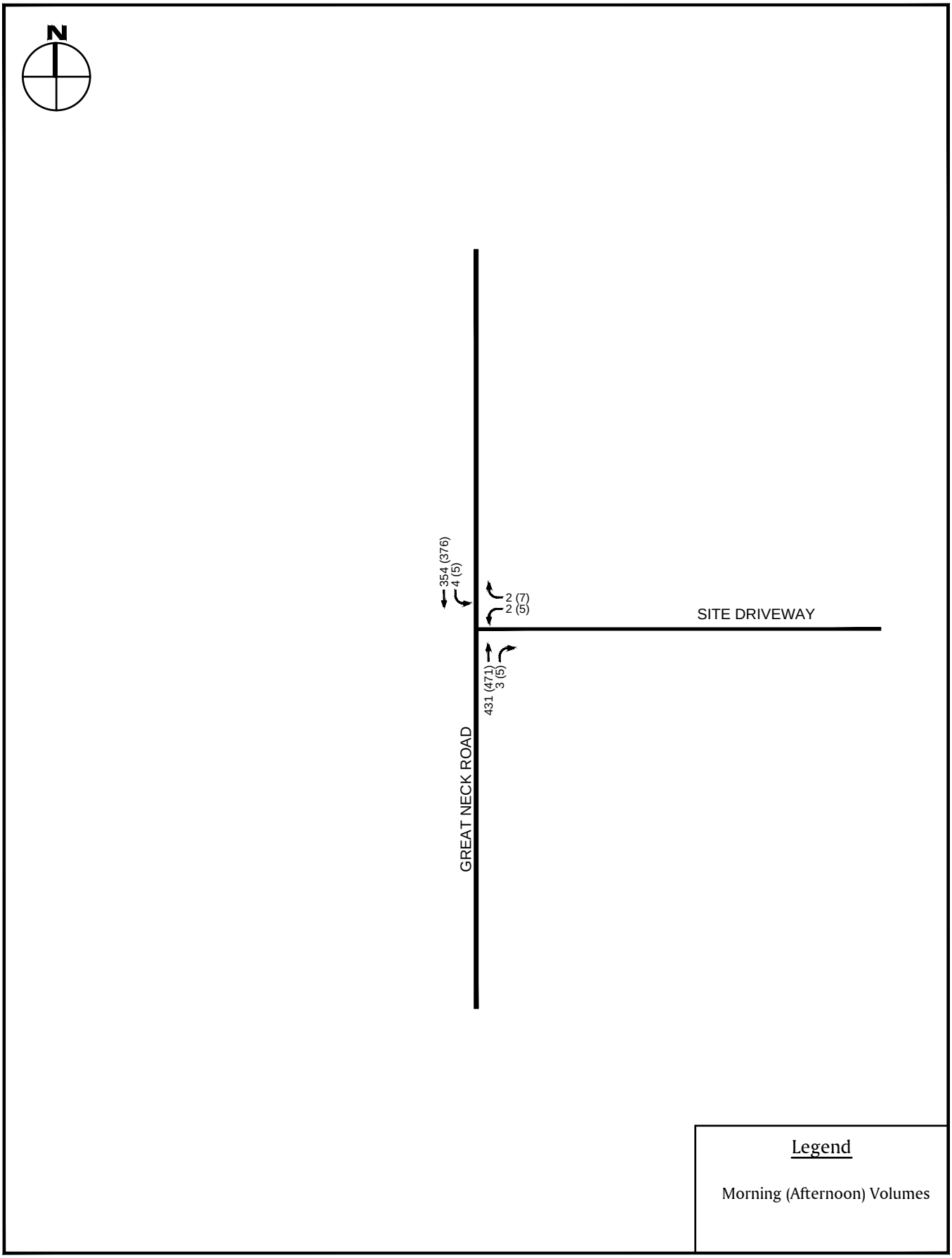
BSC GROUP



Trip Distribution & Site-Generated Vehicle Trips
Northbridge Facility - Mashpee Commons
Mashpee, MA

Figure 3
Not to Scale

BSC GROUP



2020 Future Build Peak Hour Traffic Volumes
Northbridge Facility - Mashpee Commons
Mashpee, MA

Figure 4
Not to Scale

BSC GROUP

Chapter 3 Traffic Impact Analysis

3.1 Capacity Analysis

Measuring existing traffic volumes and projecting future traffic volumes quantifies traffic flow within a study area. To assess quality of flow, capacity analyses were conducted at study area intersection for the Future Build condition. The capacity analyses provide a standardized indication of the ability of the intersections to accommodate traffic demands placed upon them.

3.1.1 Levels of Service Criteria

A primary result of capacity analyses is the assignment of Levels of Service (LOS) to traffic facilities under various traffic flow conditions. Analyses were conducted using methods defined in the Highway Capacity Manual 2000 (TRB, 2000) for signalized and unsignalized intersections. The concept of Level of Service is defined as a qualitative measure describing operational conditions within a traffic stream and their perception by motorists.

A Level of Service definition generally describes these conditions in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. In so doing, Level of Service provides an index to quality of traffic flow.

Six Levels of Service are defined for each type of facility. They are given letter designations, from A to F, with LOS A representing the best operating conditions and LOS F representing the worst. Since the Level of Service of a traffic facility is a function of traffic flows placed upon it, an intersection may operate at a wide range of Levels of Service, depending on time of day, day of week, or period of year.

The average delay per vehicle approaching an intersection is used to quantify the Level of Service at a particular intersection. This is discussed briefly below, and LOS designations are defined in Table 4. Average delay measures the mean stopped delay experienced by vehicles entering an intersection during the design period. Average delay is measured for each individual turning movement that must yield the right of way, and for the intersection as a whole, if signalized (including through vehicles that experience no delay).

Table 4: Level of Service Designations

Category	Unsignalized Delay (sec/veh)
LOS A	0.0 – 10.0
LOS B	10.1 – 15.0
LOS C	15.1 – 25.0
LOS D	25.1 – 35.0
LOS E	35.1 – 50.0
LOS F	50.1 +

Source: Transportation Research Board, Highway Capacity Manual, National Research Council, 2000.

3.1.2 Operating Conditions

The results of the capacity analysis for the study area intersections evaluated are summarized below. The Synchro traffic analysis software package (Version 8) was employed to evaluate operating conditions at the unsignalized intersection. This software uses methodology based on the Highway Capacity Manual (2000 edition) to conduct the analyses, and is accepted for use by the Massachusetts Department of Transportation (MassDOT). Intersection capacity analysis worksheets are contained in the Appendix.

The results of the capacity analysis for the 2020 Build condition are summarized below in Table 5 for the weekday morning and afternoon peak hours. The queue length shown in the tables below is the 95th percentile queue length, or the maximum back of queue.

Table 5: LOS Summary – 2020 Build Conditions

	2020 Build Condition			
	Ave. Delay (sec)	LOS	V/C Ratio	Queue Length (feet)
Weekday Morning Peak Hour				
Great Neck Road at Site Driveway				
Site Driveway WB LR	13.7	B	0.01	1
Great Neck Road NB TR	0.0	A	0.28	0
Great Neck Road SB LT	0.1	A	0.00	0
Weekday Afternoon Peak Hour				
Great Neck Road at Site Driveway				
Site Driveway WB LR	14.2	B	0.03	2
Great Neck Road NB TR	0.0	A	0.30	0
Great Neck Road SB LT	0.2	A	0.01	0

Abbreviations: EB = Eastbound, WB = Westbound, NB = Northbound, SB = Southbound, L = Left, T

Under future Build conditions, the Site Driveway westbound approach is expected to operate at LOS B during both the weekday morning and afternoon peak hours. The Great Neck Road southbound left/through approach is expected to operate at LOS A during both the weekday morning and afternoon peak hours.

Chapter 4 Recommendations

4.1 Transportation Demand Management

Based on the requirements of the CCC RPP, the Minimum Performance Standard TR2.1 indicates that for a DRI located outside of a Growth Incentive Zone or Economic Center, the project "shall implement adequate and acceptable measures to reduce and/or offset 25 percent of the expected increase in site traffic resulting from the DRI on a daily basis." It is expected that this 25% reduction in project trips will be attained via non-auto methods of transportation, including bus service, pedestrian access, and bicycle access.

The Cape Cod Regional Transit Authority (CCRTA) provides bus service via the SeaLine bus line, with a stop at Mashpee Commons / Stop & Shop. This line runs between Hyannis and Woods Hole, with stops throughout southern Cape Cod, including the Cape Cod mall, Osterville, and Falmouth. From Monday through Saturday, the bus service runs approximately once per hour, with a one-way fare costing $2. Additional information about this route, including maps and schedules, can be found in the Appendix.

Donna's Lane is located just 200 feet south of the Project driveway on Great Neck Road. Donna's Lane provides wide shoulders for bicycle accommodation and sidewalks for pedestrian accommodation.

4.2 Mitigation of Congestion Impacts

The CCC RPP Minimum Performance Standard TR3.4 indicates that "DRIs shall provide for full mitigation of adverse impacts on all road links, and at all intersections that are used by the DRI. . . " As specified in TR3.5, "where the increase is less than 25 peak hour trips, DRIs may make a payment per peak-hour trips to comply". The Proponent has committed to providing the fees for this purpose, which total an estimated $101,900. Calculations for this fee are included in the Appendix.

Chapter 5 Conclusions

BSC Group has evaluated traffic impacts associated with the proposed 70-unit assisted living development to be located on Great Neck Road in Mashpee, Massachusetts. Using standard traffic engineering practices, this Traffic Impact Study has:

- Reviewed existing traffic and roadway conditions in the vicinity of the site;
- Determined background traffic growth for the study area between 2015 and 2020
- Estimated and distributed the additional vehicular traffic that will be generated by the proposed assisted living development; and
- Presented an evaluation of traffic impacts due to the proposed assisted living development.

The findings of this study are summarized below:

- After accounting for the 25% reduction in project trips as required by the CCC, the proposed project is expected to generate 11 site trips (7 entering, 4 exiting) during the weekday morning peak hour, 22 site trips (10 entering, 12 exiting) during the weekday afternoon peak hour, and 163 site trips on a daily basis during the weekday.
- The minimum required SSD and minimum desired ISD were available in both directions on Great Neck Road, for the posted speed of 45 MPH. BSC recommends that the Proponent maintain clear sight triangles in both directions along Great Neck Road adjacent to the property at the proposed Site Driveway in order to maintain or improve upon these sight distances.
- Under 2020 future Build conditions, the proposed Site Driveway westbound approach is expected to operate at Level of Service (LOS) B during both the weekday morning and afternoon peak hours.

It is the opinion of BSC Group that the existing roadway network will be able to accommodate the new vehicle trips associated with the proposed assisted living development on Great Neck Road in Mashpee, Massachusetts.

List of Appendices

Appendix A: Traffic Count Data

Cape Cod Commission

3225 Main Street
Barnstable, Ma 02630
www.capecodcommission.org

Site: 20246
Location: Great Neck Rd South S of Mashpee Rotary
Town: Mashpee
Counters: TRM-9

Site Code: 20246
Station ID:

Latitude: 0' 0.000 Undefined

Start Time	05-Aug-13 Mon	06-Aug-13 Tue	07-Aug-13 Wed	08-Aug-13 Thu	09-Aug-13 Fri	10-Aug-13 Sat	11-Aug-13 Sun	Week Average	Weekday Average
12:00 AM	*	29	40	*	*	*	*	34	34
01:00	*	15	13	*	*	*	*	14	14
02:00	*	8	8	*	*	*	*	8	8
03:00	*	3	7	*	*	*	*	5	5
04:00	*	21	19	*	*	*	*	20	20
05:00	*	89	86	*	*	*	*	88	88
06:00	*	240	204	*	*	*	*	222	222
07:00	*	435	462	*	*	*	*	448	448
08:00	*	572	593	*	*	*	*	582	582
09:00	*	613	695	*	*	*	*	654	654
10:00	*	654	**744**	*	*	*	*	699	699
11:00	*	**664**	728	*	*	*	*	696	696
12:00 PM	*	716	716	*	*	*	*	716	716
01:00	*	668	**751**	*	*	*	*	710	710
02:00	*	645	735	*	*	*	*	690	690
03:00	**769**	**733**	*	*	*	*	*	751	751
04:00	736	704	*	*	*	*	*	720	720
05:00	710	667	*	*	*	*	*	688	688
06:00	555	527	*	*	*	*	*	541	541
07:00	517	391	*	*	*	*	*	454	454
08:00	425	371	*	*	*	*	*	398	398
09:00	258	263	*	*	*	*	*	260	260
10:00	129	155	*	*	*	*	*	142	142
11:00	62	89	*	*	*	*	*	76	76
Total	4161	9272	5801	0	0	0	0		
Percentage	43.3%	96.4%	60.3%	0.0%	0.0%	0.0%	0.0%		
AM Peak		11:00	10:00						
Vol.		664	744						
PM Peak	15:00	15:00	13:00						
Vol.	769	733	751						
Total								9616	9616

Cape Cod Commission

3225 Main Street
Barnstable, Ma 02630
www.capecodcommission.org

Site: 20246
Location: Great Neck Rd South S of Mashpee Rotary
Town: Mashpee
Counters: TRM-9

Site Code: 20246
Station ID:

Latitude: 0' 0.000 Undefined

Start	05-Aug-13		Tue		Wed		Thu		Fri		Sat		Sun		Weekday Ave	
Time	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB
12:00 AM	*	*	17	12	25	15	*	*	*	*	*	*	*	*	21	14
01:00	*	*	8	7	9	4	*	*	*	*	*	*	*	*	8	6
02:00	*	*	2	6	1	7	*	*	*	*	*	*	*	*	2	6
03:00	*	*	1	2	1	6	*	*	*	*	*	*	*	*	1	4
04:00	*	*	2	19	6	13	*	*	*	*	*	*	*	*	4	16
05:00	*	*	41	48	46	40	*	*	*	*	*	*	*	*	44	44
06:00	*	*	105	135	104	100	*	*	*	*	*	*	*	*	104	118
07:00	*	*	201	234	234	228	*	*	*	*	*	*	*	*	218	231
08:00	*	*	261	311	285	308	*	*	*	*	*	*	*	*	273	310
09:00	*	*	318	295	316	379	*	*	*	*	*	*	*	*	317	337
10:00	*	*	285	**369**	**344**	**400**	*	*	*	*	*	*	*	*	314	**384**
11:00	*	*	**328**	336	341	387	*	*	*	*	*	*	*	*	**334**	362
12:00 PM	*	*	**341**	375	319	**397**	*	*	*	*	*	*	*	*	330	386
01:00	*	*	332	336	**357**	394	*	*	*	*	*	*	*	*	**344**	365
02:00	*	*	287	358	356	379	*	*	*	*	*	*	*	*	322	368
03:00	327	442	339	394	*	*	*	*	*	*	*	*	*	*	333	418
04:00	293	**443**	284	**420**	*	*	*	*	*	*	*	*	*	*	288	**432**
05:00	**331**	379	292	375	*	*	*	*	*	*	*	*	*	*	312	377
06:00	256	299	229	298	*	*	*	*	*	*	*	*	*	*	242	298
07:00	235	282	185	206	*	*	*	*	*	*	*	*	*	*	210	244
08:00	205	220	208	163	*	*	*	*	*	*	*	*	*	*	206	192
09:00	137	121	172	91	*	*	*	*	*	*	*	*	*	*	154	106
10:00	76	53	96	59	*	*	*	*	*	*	*	*	*	*	86	56
11:00	37	25	56	33	*	*	*	*	*	*	*	*	*	*	46	29
Total	1897	2264	4390	4882	2744	3057	0	0	0	0	0	0	0	0	4513	5103
Day	4161		9272		5801		0		0		0		0		9616	
AM Peak			11:00	10:00	10:00	10:00									11:00	10:00
Vol.			328	369	344	400									334	384
PM Peak	17:00	16:00	12:00	16:00	13:00	12:00									13:00	16:00
Vol.	331	443	341	420	357	397									344	432

Comb. Total	4161	9272	5801	0	0	0	0	9616

ADT ADT 9,565 AADT 9,565

Appendix B: Trip Generation Calculations

LUC 254 - Assisted Living

82 Beds

	Weekday Daily	Weekday AM	Weekday PM
rate	2.66	0.18	0.35
enter		67%	47%
exit		33%	53%

	Weekday Daily	Weekday AM	Weekday PM
trips	218	15	29
enter		10	14
exit		5	15

25% reduction	55	4	7
		3	4
		1	3

net new trips	163	11	22
		7	10
		4	12

source: ITE Trip Generation Manual, 9th Edition, 2012

Appendix C: Capacity Analysis Worksheets

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	2	2	431	3	4	354
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	2	468	3	4	385
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	864	470			472	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	864	470			472	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	100			100	
cM capacity (veh/h)	323	593			1090	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	4	472	389
Volume Left	2	0	4
Volume Right	2	3	0
cSH	419	1700	1090
Volume to Capacity	0.01	0.28	0.00
Queue Length 95th (ft)	1	0	0
Control Delay (s)	13.7	0.0	0.1
Lane LOS	B		A
Approach Delay (s)	13.7	0.0	0.1
Approach LOS	B		

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	32.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	5	7	471	5	5	376
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	8	512	5	5	409
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	934	515			517	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	934	515			517	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	99			99	
cM capacity (veh/h)	293	560			1048	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	13	517	414
Volume Left	5	0	5
Volume Right	8	5	0
cSH	406	1700	1048
Volume to Capacity	0.03	0.30	0.01
Queue Length 95th (ft)	2	0	0
Control Delay (s)	14.2	0.0	0.2
Lane LOS	B		A
Approach Delay (s)	14.2	0.0	0.2
Approach LOS	B		

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	35.1%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix D: Transit Information

SeaLine - Hyannis and Falmouth/Woods Hole

CCRTA provides daily bus service, Monday through Friday, from 5:30 a.m. to 8:15 p.m, and Saturday from 9:00 a.m. to 8:15 p.m. leaving downtown Hyannis at the Hyannis Transportation Center travelling to the Woods Hole docks in Falmouth. The SeaLine travels from downtown Hyannis, along Route 28 to Centerville and Osterville Centers, to Mashpee Commons, Falmouth Center, and the Falmouth bus terminal to Woods Hole. Passengers may board the SeaLine at any of the scheduled bus stops or they may flag the bus down anywhere along the bus route. The SeaLine connects at the Hyannis Transportation Center with the H2O Line, the Barnstable Villager, and the P&B/Bonanza bus service to Boston/Providence. In the summer the SeaLine also connects with the Hyannis Area Trolley at the HTC and the WHOOSH Trolley at the Falmouth Mall.

Use the Sealine Hyannis-Falmouth/Woods Hole for:

- Barnstable Municipal Airport (on request)
- Barnstable Senior Center (on request)
- Boys & Girls Club, Mashpee (on request)
- Mashpee Medical Center (on request)
- Steamship Authority

Quick Links:

» Schedule: Hyannis to Woods Hole
» Schedule: Woods Hole to Hyannis
» Map of this route
» Fares for the Sealine - Hyannis to Woods Hole

SEALINE HYANNIS - WOODS HOLE

Effective September 3, 2013 through June 20, 2014
MONDAY through SATURDAY

NextBus Stop# ***	Departs	AM							PM							
32	St. Francis/Pope John Paul	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	3:20	- -	- -	- -	- -
33	Sturgis Charter School - Main St	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	5:20	- -
1	Hyannis Transportation Center	5:30*	6:30*	7:30*	8:30*	9:30	10:30	11:30	12:30	1:30	2:30	3:30	- -	4:30	5:30	6:30
32	St. Francis/Pope John Paul	- -	- -	- -	- -	- -	- -	- -	- -	- -	2:35	- -	- -	- -	- -	- -
33	Sturgis Charter School - Main St												3:30			
17	Cape Cod Mall Entrance/Rte. 28	5:35*	6:35*	7:35*	8:35*	9:35	10:35	11:35	12:35	1:35	2:40	3:35	- -	4:35	5:35	6:35
35	Sturgis Charter School - West Main	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	3:33	- -	- -	- -
134	West Main @ Star Market	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	3:37	- -	- -	- -
18	West Main Street & Rte. 28	5:39*	6:39*	7:39*	8:39*	9:39	10:39	11:39	12:39	1:39	2:44	3:39	3:41	4:39	5:39	6:39
19	Centerville (Old Stage & Main)	- -	- -	7:44*	8:44*	9:44	10:44	11:44	12:44	1:44	2:47	3:44	3:46	4:44	5:44	6:44
20	Osterville (Tower Hill Rd.)	- -	- -	7:52*	8:52*	9:52	10:52	11:52	12:52	1:52	2:55	3:52	3:53	4:52	5:52	6:52
21	Marstons Mills Marketplace	5:45*	6:45*	8:03*	9:03*	10:03	11:03	12:03	1:03	2:03	3:06	4:03	4:03	5:03	6:03	7:03
22	Mashpee Commons/Stop & Shop	5:54*	6:54*	8:12*	9:12*	10:12	11:12	12:12	1:12	2:12	3:15	4:12	4:10	5:12	6:12	7:12
23	South Cape Village-Marshalls	- -	- -	8:19*	9:19*	10:19	11:19	12:19	1:19	2:19	3:21	4:19	- -	5:19	6:19	7:19
24	Comm Health Center of Cape Cod	- -	- -	8:23*	9:23*	10:23	11:23	12:23	1:23	2:23	3:26	4:23	- -	5:23	6:23	7:23

	Cape Cod																
140	Seacoast Shored Blvd.			8:29*	9:29*	10:29	11:29	12:29	1:29	2:29	3:31	4:29	- -	5:29	6:29	7:29	
25	East Falmouth	6:02*	7:02*	8:31*	9:31*	10:31	11:31	12:31	1:31	2:31	3:33	4:31	- -	5:31	6:31	7:31	
28	Rte. 28 @ Jones Road	6:10*	7:10*	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	
29	Falmouth Mall	- -	- -	8:41*	9:41*	10:41	11:41	12:41	1:41	2:41	3:44	4:41	- -	5:41	6:41	7:41	
30	Falmouth Bus Depot	6:16*	7:16*	8:48*	9:48*	10:48	11:48	12:48	1:48	2:48	3:51	4:48	- -	5:48	6:48	7:48	
31	Woods Hole	6:26*	7:26*	8:59*	9:59*	10:59	11:59	12:59	1:59	2:59	4:02	4:59	- -	5:59	6:59	7:59	

Symbol Legend:
- - No Service.
* No service at these times Saturdays.
~No service weekends and school vacations.
REQ On Request.

SEALINE WOODS HOLE - HYANNIS

Effective September 3, 2013 through June 20, 2014
MONDAY through SATURDAY

NextBus Stop# ***	Departs	AM				PM											
31	Woods Hole	- -	6:45*		- -	8:30*	9:30	10:30	11:30	12:30	1:30	2:30	3:30	4:30	5:30	6:30	7:30
30	Falmouth Bus Depot	- -	6:56*		- -	8:42*	9:42	10:42	11:42	12:42	1:42	2:42	3:42	4:42	5:42	6:42	7:42
29	Falmouth Mall	- -	7:02*	7:02*	- -	8:49*	9:49	10:49	11:49	12:49	1:49	2:49	3:49	4:49	5:49	6:49	7:49
25	East Falmouth	- -	7:11*	7:11*	- -	8:59*	9:59	10:59	11:59	12:59	1:59	2:59	3:59	4:59	5:59	6:59	7:59
140	Seacoast Shored Blvd.	- -	7:14*	7:14*		9:02*	10:02	11:02	12:02	1:02	2:02	3:02	4:02	5:02	6:02	7:02	8:02
24	Comm Health Center of Cape Cod	- -	- -	- -	- -	9:07*	10:07	11:07	12:07	1:07	2:07	3:07	4:07	5:07	6:07	7:07	8:07
23	South Cape Village/Marshalls	- -	7:20*	- -	- -	9:11*	10:11	11:11	12:11	1:11	2:11	3:11	4:11	5:11	6:11	7:11	8:11
22	Mashpee Commons/Stop & Shop	7:15*	7:26*	7:24*	7:15*	9:18*	10:18	11:18	12:18	1:18	2:18	3:18	4:18	5:18	6:18	7:18	8:18
21	Marstons Mills Marketplace	- -	7:34*	7:33*		9:27*	10:27	11:27	12:27	1:27	2:27	3:27	4:27	5:27	6:27	7:27	8:27
20	Osterville (Tower Hill Rd.)	- -	- -		- -	9:37*	10:37	11:37	12:37	1:37	2:37	3:37	4:37	5:37	6:37	7:37	8:37
19	Centerville (Old Stage & Main)	- -	- -		- -	9:45*	10:45	11:45	12:45	1:45	2:45	3:45	4:45	5:45	6:45	7:45	8:45
18	West Main Street & Rte. 28	- -	7:41*	7:40*	- -	9:51*	10:51	11:51	12:51	1:51	2:51	3:51	4:51	5:51	6:51	7:51	8:51
134	West Main @ Star Market	- -		7:42*	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
32	St Francis/Pope John Paul	7:45*	- -	7:47*	7:45*	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
17	Cape Cod Mall Entrance/Rte. 28	- -	7:44*		- -	9:55*	10:55	11:55	12:55	1:55	2:55	3:55	4:55	5:55	6:55	7:55	8:55
34	Sturgis Charter School - South St.	7:50*	- -	7:52*	7:50*	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
35	Sturgis Charter School - West Main St	7:57*	- -	7:59*	7:57*	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
1	Hyannis Transportation Center	- -	7:47*	- -	- -	9:58*	10:58	11:58	12:58	1:58	2:58	3:58	4:58	5:58	6:58	7:58	8:58

Symbol Legend:
- - No Service.
* No service at these times Saturdays.
~No service weekends and school vacations.
REQ On Request.

Sealine - Hyannis to Woods Hole Map

SeaLine Fares

CCRTA Fares	Adults and Youth	People 60 and older People with disabilities**
One-way ride	$2	$1
PASSES		
Day Pass	$6	$3
Monthly Pass *(Unlimited Rides)*	$60	$30
TRANSFERS		
To WHOOSH Trolley	FREE	FREE
To other CCRTA buses	$2	$1

- Exact fare only. Drivers will not make change.
- Children age five and younger, with an adult, ride free.

** Also, persons holding Medicare cards. Transit Access Passes for disabled persons available from the RTA 508-775-8504 Ext. 200.

CCRTA buses have bike racks. Space is limited.

Pets: service animals are welcome, but pets are not allowed unless in a secure carrier.

CCRTA buses are accessible to people who use wheelchairs and others with limited mobility.

Ride and Save!

Buy 31 day passes from the CCRTA drivers, at the Plymouth and Brockton ticket counter or at the CCRTA administrative office at the Hyannis Transportation Center.

Translation for 140 languages by ALS
CAPITA
Translation and interpreting

Hyannis Transportation Center
800-352-7155
215 Iyannough Road
Hyannis, MA 02601

©2009 Cape Cod Regional Transit Authority
Designed and Powered by c4.net

Appendix E: Mitigation Calculation Worksheet

Transit Equivalency:
Example Calculation
(Updated March 2014)

Line									
1.								29	trips
2.								4.68	mile(s)
3.	Determine % of total VMT	75.0%	x	29	x	4.68	=	102	VMT
4.						Year of DRI Approval		2014	
5.						Transit Cost		$ 71.05	per hour
6.						Bus Capacity		30	seats
7.						Bus Operating Speed		20	mph
8.						Assume 100% Occupancy			
9.	Cost per passenger	$71.05	÷	30	÷	20	=	$0.12	per mile
10.		Daily Cost		102	x	$0.12	=	$12.08	per day
11.		First Year Cost		365	x	$12.08	=	$4,409	
	Analysis for One Time Payment								
12.						Transit Inflation Rate	=	2.0%	
13.						Interest Earned on Escrow	=	0.5%	
14.						Years of Operation	=	20	
15.						Factor based on inflation, interest, & years of operation	=	23.107	
		20	years of operation, one time payment is						
16.				23.107	x	$4,409	=	$101,900	

Notes:

Yellow cells must be updated to reflect the specifics of the project.

Gray cells must be udated to reflect the most current available costs and rates.

Consult CCC staff for the current available costs and rates.

BSC GROUP

MEMORANDUM

15 ELKINS STREET, BOSTON, MA 02127 ■ www.bscgroup.com
TEL 617-896-4300 ■ 800-288-8123 ■ FAX 617-896-4301

To:	Cape Cod Commission	**Date:**	November 9, 2015
From:	Joanna Kavalaris, PE, PTOE	**Proj. No.**	23216.00
Re:	Northbridge at Mashpee Commons – DRI Supplemental Transportation Information		

BSC Group (BSC) submitted a Traffic Impact Study dated June 2015 as part of a DRI application for a proposed 70-unit assisted living facility to be located on Great Neck Road in Mashpee, Massachusetts. On October 14, 2015, the Cape Cod Commission (CCC) provided responses via email and requested additional traffic information in order to complete their review. This memo will respond to these comments.

Comment 1:
[The applicant should provide the following supplemental information as part of its DRI submission:]
Updated crash analysis reflecting a review of crash data from the most recent three years on record (2011-2013).

Response:
The traffic study included crash data between the years 2010-2012 in the corridor of Great Neck Road South between Donna's Lane and the Mashpee Rotary. Since the study area is limited to the intersection of the Site Driveway with Great Neck Road, crash data was only reviewed along the corridor.

BSC has reviewed the most recent crash data available for the year 2013 in the above-mentioned corridor. The records show that during this time, one crash occurred along the corridor. This crash was a single vehicle crash with a non-fatal injury, occurring during nighttime hours. Additional data about this crash has been attached to this memo.

Comment 2:
[The applicant should provide the following supplemental information as part of its DRI submission:]
A summary of the total number of parking spaces proposed on site with a comparison to the number of spaces required under local zoning.

Response:
The Town of Mashpee zoning requirements for an assisted living facility indicate one parking space per dwelling unit plus one parking space per employee. Discussions with Waypoint KLA, the Client, indicate that during any peak shift, there are estimated to be maximum 22 employees. The Project consists of 70 assisted living dwelling units, resulting in 92 required parking spaces per Town of Mashpee zoning.

The Client has provided a parking matrix based on parking utilization data collected at other existing Northbridge facilities. This data indicates that at the highest utilization during shift 2 (3PM to 11PM), 62 parking spaces will be required for the assisted living facility. The site contains 64 parking spaces, which is two parking spaces above the number of spaces anticipated to be needed by the Client, based on historical data for similar sites.

In summary, the Town of Mashpee zoning requires 92 parking spaces according to the site use, while the Project is providing 64 parking spaces.

Comment 3:
Additionally, Commission transportation staff highlights Minimum Performance Standard (MPS) TR2.8 Preservation of Frontage that relates to sidewalk connectivity:

> Where deemed appropriate by the Commission, DRIs shall provide appropriate rights-of-way along their street frontage to accommodate expected needs for bicycle and pedestrian accommodation and/or relocation of utilities. **DRIs shall also provide for pedestrian and bicyclist connections across their property to allow for possible future connections with adjoining properties, where necessary. Construction of bicycle and pedestrian sidewalks, paths and/or connections may be required by the Commission.** [emphasis added]

Under DRI review, Commission transportation staff will recommend to the Commission for its consideration the desirability of a sidewalk connection to Donna's Lane given the roadway's proximity to the site. Such a connection would allow pedestrians to safely access many destinations and services as well as regional transportation options from the site. The applicant may choose to address this issue at this time with supplemental application materials.

Response:
The existing right-of-way on Great Neck Road is 60 feet in width in the vicinity of the project site. The Client will work with the Town of Mashpee to install a sidewalk along the Project property frontage within the Town right-of-way. It should be noted that there is undeveloped land south of the Project property; pedestrian access should be coordinated with all property owners in the vicinity in order to connect this sidewalk to the existing sidewalk on the south side of Donna's Lane. Bicycle access is provided by way of shoulders on Great Neck Road.

cc:

EGA
ARCHITECTS

August 10, 2015

Mashpee Commons – Northbridge Companies
Memory Care and Assisted Living
68 Great Neck Road South
Mashpee, MA 02649

LEED Certifiability Narrative – Cape Cod Commission DRI Application

The project consists of a two-story, 64,936 SF Memory Care and Assisted Living building. The project will be designed to meet or exceed the LEED Certified level, achieving a minimum of 40 points plus a potential additional 17 points – refer to attached LEED checklist. The project is using the LEED 2009 version of the rating system. The following narrative describes the strategies for achieving a minimum Certified-level rating.

Sustainable Sites 19 points

SS Prerequisite 1 – Construction Activity Pollution Prevention

An erosion and sedimentation control plan has been created and will be implemented for all construction activities associated with the project. The plan will accomplish the following objectives: prevent loss of soil during construction by stormwater runoff and/or wind erosion; prevent sedimentation of storm sewers or receiving streams; prevent pollution of the air with dust and particulate matter.

The storm water pollution prevention measures contained in the SWPPP shall be at least the minimum required by Local Regulations. The Contractor shall provide additional measures to prevent pollution from stormwater discharges in compliance with the National Pollution Discharge Elimination System (NPDES) Phase II permit requirements and all other local, state and federal requirements.

SS Credit 1 – Site Selection 1 point

The site being developed does not meet any of the following criteria:

- *Prime Farmland as defined by the US Department of Agriculture*
- *Previously undeveloped land whose elevation is lower than 5 feet above the elevation of the 100-year flood as defined by FEMA*
- *Land specifically defined as habitat for any species on federal or state threatened or endangered lists*
- *Land within 100 feet of any wetlands…, and isolated wetlands or areas of special concern identified by state or local rule, or within setback distances from wetlands (state or local regulations, rule or law)*
- *Previously undeveloped land that is within 50 feet of a water body…consistent with the terminology of the Clean Water Act*
- *Land that prior to acquisition of the project was public parkland*

SS Credit 2 – Development Density and Community Connectivity 5 points

Option 2 – Community Connectivity:

- *Located on previously developed site;*
- *Within ½ mile of a residential area or neighborhood with an average density of 10 units per acre net – site abuts neighborhood on Blue Spruce Way*

- *Within ½ mile of at least 10 basic services: Mashpee Commons or South Cape Village include:*
  - *Supermarket*
  - *Bank*
  - *Restaurant*
  - *Cleaners*
  - *Beauty Salon*
  - *Post Office*
  - *Pharmacy*
  - *Convenience Store*
  - *Mashpee Public Library*
  - *Hardware*

SS Credit 4.1 – Alternative Transportation – Public Transportation Access **6 points**

Option 2 – Bus Stop Proximity:

- *The project is located within ¼ mile from bus stop at Mashpee Commons which serves 2 (or more) CCRTA bus routes. CCRTA also offers a "Dial-a-Ride" service which picks up and drops off riders at the building.*
- *Additionally, a private shuttle, owned and operated by the building operator, is available for groups of residents, visitors and staff from the front door to local destinations. Rides for groups of residents would be staff-supervised.*

SS Credit 4.2 – Alternative Transportation – Bicycle Storage and Changing Rooms **1 point**

Case 1 – Commercial or Institutional Projects:

- *Secure bicycle racks or storage will be provided within 200 yards of a building entrance for 3% or more of all building users (all building users will be used for the purposes of the calculation; however, residents are elderly requiring assisted living services, and will not be cycling).*
- *Shower and changing area that serves staff and visitors will be provided in the building for 0.5% of FTE occupants*

SS Credit 4.4 – Alternative Transportation – Parking Capacity **2 points**

Option 1 – Parking capacity to meet but not exceed minimum local zoning requirements. The current number of proposed parking spots is less than the minimum per Mashpee Zoning Requirements. The project is requesting a waiver from the Town of Mashpee's permit granting authority to reduce parking to 61 spaces, thereby satisfying zoning requirements. There will also be a designated vanpool parking space and drop-off/pickup area.

SS Credit 6.1 – Stormwater Design – Quantity Control **1 point**

Compliance Path: Option 1 - Existing Imperviousness Is Less Than Or Equal To 50% (Largely Undeveloped Sites)

Post-development stormwater runoff from 100% of the proposed impervious surfaces will be collected and routed to pre-treatment BMPs including treebox filters and bioretention areas (raingardens). From here, pretreated stormwater will be routed to one of three (3) subsurface stormwater infiltration systems located throughout the site. The systems have varying number of chambers, but each consist of StormTech MC-3500 leaching chambers installed within a bed of crushed stone. Each system has been designed to reduce the peak rate and

volume of runoff from 1, 2, 25 and 100-year, 24-hour storms to levels below the pre-development condition.

SS Credit 6.2 – Stormwater Design – Quality Control 1 point

This credit requires that the post-development site captures and treats stormwater runoff from 90% of the impervious surfaces on site, and achieves a minimum level of 80% total suspended solids (TSS) removal. The proposed site has been designed to capture and treat stormwater runoff from 100% of the proposed impervious surfaces onsite (the actual level of TSS removal will depend on final site design, but will be at least 80%).

This credit will be achieved using a combination of structural and non-structural measures including stormwater bioretention filtration units (treebox filters) and bioretention areas (raingardens). These systems have been designed to exceed the requirements of the MA DEP Stormwater Management Standards and in accordance with the BMP guidelines contained in the Stormwater Handbook.

As part of the narrative, a description of the pollutant removal and function of each BMP will provided once the design is final and the drainage calculations complete.

SS Credit 7.2 – Heat Island Effect – Roof 1 point

Roofing materials will be used for a minimum of 75% of the roof surface that have an SRI equal to or greater than 78 (low-slope <=2:12) and 29 (>2:12). For flat (low-slope) and steep-sloped roofs, membrane roofing and asphalt shingles with high SRI will be used.

SS Credit 8 – Light Pollution Reduction 1 point

Interior Lighting: Option 1: Automatic dimming of all non-emergency interior luminaires within direct line of site to any openings in the envelope by at least 50% between 11 p.m. and 5 a.m. Manual or occupant-sensing after-hours override may be provided, as long as the override lasts no more than 30 minutes. Resident units will be lights-out between 11 p.m. and 5 a.m. except night lights. Common areas will be kept on a minimal "night light" circuit between 11 p.m. and 5 a.m.

Exterior Lighting: Exterior lighting to be Dark Sky Compliant and full cutoff, and will be designed to comply with ASHRAE/IESNA 90.1-2007 requirements for LZ2. A photometric study will be provided to show that there will be no light escaping property lines.

Water Efficiency 2 points

WE Prerequisite 1 – Water Use Reduction – 20% Reduction

20% Water Use Reduction will be achieved by specifying low-flow plumbing fixtures, including:

- *Water Closets: 1.28 GPF or better*
- *Lavatory Faucets: 0.5 GPM aerators*
- *Kitchen Sinks: 1.5 GPM faucet aerators*
- *Shower Heads: 1.5 GPM or better*

WE Credit 1 – Water Efficient Landscaping **2 points**

Option 1 – Reduce by 50%: This reduction will be achieved by plant species selection and using a highly efficient irrigation system.

Energy and Atmosphere 9 points

EA Prerequisite 1 – Fundamental Commissioning of Building Energy Systems

Fundamental commissioning will be conducted for HVAC&R systems, lighting and domestic hot water systems.

EA Prerequisite 2 – Minimum Energy Performance

Option 3 – Prescriptive Compliance Path – The design will comply with the requirements in the Advanced Buildings Core Performance Guide, Sections 1 & 2.

EA Prerequisite 3 – Fundamental Refrigerant Management

The project will use zero chlorofluorocarbon (CFC)-based refrigerants in new base building HVAC&R systems.

EA Credit 1 – Optimize Energy Performance **3 points**

Option 3 – Prescriptive Compliance Path – The design will comply with the requirements in the Advanced Buildings Core Preformance Guide, Sections 1 & 2, and will implement at least 6 of the strategies listed in Section 3: Enhanced Performance.

EA Credit 3 – Enhanced Commissioning **2 points**

In addition to the commissioning (Cx) activities required for EA Prerequisite 1, an independent commissioning authority (CxA) will report directly to the Owner and will lead, review and oversee the completion of all Cx activities, including:

- *At least 1 Cx design review of basis of design & design documents prior to mid-CD's. Back-check the review comments in the subsequent design submissions.*
- *Review contractor submittals related to systems being commissioned, for compliance with the owner's project requirements & basis of design. Cx review of submittals to be concurrent with architect or engineer-of-record review, and comments submitted to the design team and owner.*
- *CxA to develop systems manual that provides future operating staff the information needed to understand and optimally operate the commissioned systems.*
- *CxA to verify that requirements for training operating personnel and building occupants have been completed.*
- *CxA to review operation of the building with the O&M staff and occupants within 10 months after substantial completion. A plan for resolving any outstanding Cx-related issues will be included.*

EA Credit 4 – Enhanced Refrigerant Management **2 points**

Option 2: Refrigerants and equipment that use refrigerants will be selected, such that emission of compounds that contribute to ozone depletion and global climate change will be minimized or eliminated. R-410a to be used throughout, and good AC system maintenance practices will be followed, including reclaiming refrigerant when any system is opened. The project does not contain gaseous displacement-type fire protection systems.

EA Credit 6 – Green Power **2 points**

The project plans to engage in at least a 2-year Green Power contract with Cape Light Compact, providing at least 35% of the building's electricity from renewable sources, as defined by the Center for Resource Solutions' Green-e Energy product certification requirements.

Materials and Resources 4 points

MR Prerequisite 1 – Storage and Collection of Recyclables

Recyclable collection areas will be designated and provided throughout the building, including common spaces. Dedicated space for storage of recyclable materials will be provided in utility rooms.

MR Credit 2 – Construction Waste Management **2 points**

The project will develop and implement a construction waste management plan that identifies the materials to be diverted from disposal, and whether the materials will be sorted on-site or commingled. The plan will target 75% of the debris to be recycled or salvaged.

MR Credit 4 – Recycled Content **1 point**

The project will use materials will recycled content such that the sum of postconsumer recycled content plus ½ the preconsumer content constitutes at least 10%, based on cost, of the total value of the materials in the project.

MR Credit 5 – Regional Materials **1 point**

The project will use materials or products that have been extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site for a minimum of 10%, based on cost, of the total materials value. A weighed percentage will be used in calculations for products or materials where only a fraction thereof is extracted, harvested, or recovered and manufactured locally.

Indoor Environmental Quality 10 points

EQ Prerequisite 1 – Minimum Air Quality Performance

Case 1 – Mechanically Ventilated Spaces: Requirements of Sections 4 through 7 of ASHRAE Standard 62.1-2007 (with errata but without addenda) will be met. Mechanical ventilation systems will be designed using the ventilation rate procedure.

Case 2 – Naturally Ventilated Spaces: Naturally ventilated buildings will comply with ASHRAE Standard 62.1-2007, Paragraph 5.1 (with errata but without addenda).

EQ Prerequisite 2 – Environmental Tobacco Smoke (ETS) Control

Option 1 – Smoking will be prohibited in the building and on-property within 25 feet of entries, outdoor air intakes and operable windows. Signage will be provided to allow smoking only in designated areas.

EQ Credit 2 – Increased Ventilation **1 point**

All rooftop units will be capable of free cooling using outside air up to 100% of total supply. While outdoor air conditions are appropriate (a significant % of the time on

the Cape), these units serving all common areas will be providing increased ventilation often exceeding the 30% benchmark.

EQ Credit 4.1 – Low-Emitting Materials – Adhesives and Sealants 1 point

Adhesives, sealants and sealant primers used on the interior of the building will comply with the SCAQMD Rule #1168 VOC limits. Aerosol adhesives will comply with Green Seal Standard for Commercial Adhesives G-36 requirements.

EQ Credit 4.2 – Low-Emitting Materials – Paints and Coatings 1 point

Paints and coatings used on the interior of the building will comply with the following criteria, as applicable to project scope:

- *Paints and coating applied to interior walls and ceilings must not exceed the VOC limits established in Green Seal Standard GS-11, Paints, 1st edition.*
- *Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates must not exceed the VOC limit of 250g/L established in Green Seal Standard GC-03, Anti-Corrosive Paints, 2nd edition.*
- *Clear wood finishes, floor coatings, stains, primers and shellacs applied to interior elements must not exceed the VOC limits established in the SCAQMD Rule 1113, Architectural Coatings.*

EQ Credit 4.3 – Low-Emitting Materials – Flooring Systems 1 point

Option 1:

- *Carpets: Carpet and Rug Institute Green Label Plus program*
- *Carpet cushion: Carpet and Rug Institute Green Label program*
- *Carpet adhesive: will comply with VOC limits set in EQ Credit 4.1 (50g/L)*
- *Hard surface flooring: certified as compliant with FloorScore*
- *If non-carpet flooring constitutes at least 25% of finished floor area, credit may be achieved by using FloorScore certified flooring for 100% of non-carpet finish flooring.*
- *Floor sealers & stains: will meet SCAQMD Rule 1113, Architectural Coatings*
- *Tile setting adhesives & grout: will meet SCAQMD Rule 1168 VOC limits.*

EQ Credit 5 – Indoor Chemical and Pollutant Source Control 1 point

The building is being designed to minimize and control the entry of pollutants into buildings and later cross-contamination of regularly occupied areas through the following strategies:

- *Entry vestibule with permanent entryway system*
- *Negative pressure and exhaust of housekeeping areas, laundry and copy rooms*
- *Minimum MERV-13 air filters at returns and outside air intake.*

EQ Credit 6.2 – Controllability of Systems – Thermal Comfort 1 point

Individual comfort controls will be provided for a minimum of 50% of building occupants to enable adjustments to meet individual needs and preferences. Comfort system controls will be provided for all shared multi-occupant spaces to enable adjustments that meet group needs and preferences.

Individual heating temperature control will be provided in virtually all areas of the building, and individual cooling control will be provided in each apartment.

EQ Credit 7.1 – Thermal Comfort – Design 1 point

HVAC systems and the building envelope will be designed to meet the requirements of ASHRAE 55-2004.

EQ Credit 7.2 – Thermal Comfort – Verification **1 point**

The owner is willing to conduct a thermal comfort survey of building occupants within 6 to 18 months after occupancy, including developing a plan for corrective action if the survey indicate that more than 20% of occupants are dissatisfied with the thermal comfort of the building.

EQ Credit 8.1 – Daylight and Views – Daylight **1 point**

The building is being designed with a goal of achieving daylight in at least 75% of regularly occupied spaces.

EQ Credit 8.2 – Daylight and Views – Views **1 point**

The building is being designed to achieve a direct line of sight to the outdoor environment via vision glazing between 30 inches and 90 inches above the finish floor for building occupants in 90% of all regularly occupied areas.

Innovation and Design Process 1 points

ID Credit 2 – LEED Accredited Professional **1 point**

At least 1 principal participant of the project team is a LEED Accredited Professional:

- *Brian Yergatian, P.E., LEED AP, BSC Group*
- *Ana Gordan, RA, LEED AP BD+C, EGA, P.C.*

Regional Priority Credits 3 points

RP Credits 1.1 through 1.4 **3 points**

The following regional priority credits are being pursued:

- *SS Credit 1 – Site Selection*
- *SS Credit 2 – Development Density and Community Connectivity*
- *SS Credit 6.2 – Stormwater Design – Quality Control*

The following credits may be pursued if further study deems them feasible:

SS Credit 4.3 – Alternative Transportation – Low-Emitting and Fuel-Efficient Vehicles **3 points**

Option 1 – (4) preferred parking spaces for ZEV and highly fuel-efficient vehicles can be designated if additional LEED points are required.

EA Credit 5 – Measurement and Verification **3 points**

Could potentially achieve this credit by establishing appropriate benchmark energy levels (with input from Cx Agent) and preparing a report comparing actual gas/electric usage in the first year against those benchmarks.

EQ Credit 3.1 – Construction IAQ Management Plan – During Construction **1 point**

The project team will examine specific requirement, cost of meeting those requirements including documentation, and contractors being on board with achieving the credit.

EQ Credit 3.2 – Construction IAQ Management Plan – Before Occupancy **1 point**

The project team will examine specific requirement, cost of meeting those requirements including documentation, and contractors being on board with achieving the credit.

EQ Credit 6.1 – Controllability of Systems – Lighting **1 point**

Individual lighting controls will be provided for 90% (minimum) of the building occupants to enable adjustments to suit individual task needs and preferences. Lighting controls for all shared multi-occupant spaces will be provided to enable adjustments that meet group needs and preferences.

Lighting control options specific to this project type and assisted living / memory care occupants will be studied.

LEED 2009 for New Construction and Major Renovations

Project Checklist

Northbridge at Mashpee Assisted Living & Memory Care

8/17/15

Sustainable Sites — Possible Points: 26

Y	?	N			
Y			Prereq 1	Construction Activity Pollution Prevention	
1			Credit 1	Site Selection	1
5			Credit 2	Development Density and Community Connectivity	5
		1	Credit 3	Brownfield Redevelopment	1
6			Credit 4.1	Alternative Transportation—Public Transportation Access	6
1			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
	3		Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3
2			Credit 4.4	Alternative Transportation—Parking Capacity	2
		1	Credit 5.1	Site Development—Protect or Restore Habitat	1
		1	Credit 5.2	Site Development—Maximize Open Space	1
1			Credit 6.1	Stormwater Design—Quantity Control	1
1			Credit 6.2	Stormwater Design—Quality Control	1
		1	Credit 7.1	Heat Island Effect—Non-roof	1
1			Credit 7.2	Heat Island Effect—Roof	1
1			Credit 8	Light Pollution Reduction	1

Water Efficiency — Possible Points: 10

Y	?	N			
Y			Prereq 1	Water Use Reduction—20% Reduction	
2		2	Credit 1	Water Efficient Landscaping	2 to 4
		2	Credit 2	Innovative Wastewater Technologies	2
		4	Credit 3	Water Use Reduction	2 to 4

Energy and Atmosphere — Possible Points: 35

Y	?	N			
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
3		16	Credit 1	Optimize Energy Performance	1 to 19
		7	Credit 2	On-Site Renewable Energy	1 to 7
2			Credit 3	Enhanced Commissioning	2
2			Credit 4	Enhanced Refrigerant Management	2
	3		Credit 5	Measurement and Verification	3
2			Credit 6	Green Power	2

Materials and Resources — Possible Points: 14

Y	?	N			
Y			Prereq 1	Storage and Collection of Recyclables	
		3	Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
		1	Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements	1
2			Credit 2	Construction Waste Management	1 to 2
		2	Credit 3	Materials Reuse	1 to 2

Materials and Resources, Continued

Y	?	N			
1		1	Credit 4	Recycled Content	1 to 2
1		1	Credit 5	Regional Materials	1 to 2
		1	Credit 6	Rapidly Renewable Materials	1
		1	Credit 7	Certified Wood	1

Indoor Environmental Quality — Possible Points: 15

Y	?	N			
Y			Prereq 1	Minimum Indoor Air Quality Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
		1	Credit 1	Outdoor Air Delivery Monitoring	1
1			Credit 2	Increased Ventilation	1
	1		Credit 3.1	Construction IAQ Management Plan—During Construction	1
	1		Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
1			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
1			Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
1			Credit 4.3	Low-Emitting Materials—Flooring Systems	1
		1	Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
1			Credit 5	Indoor Chemical and Pollutant Source Control	1
	1		Credit 6.1	Controllability of Systems—Lighting	1
1			Credit 6.2	Controllability of Systems—Thermal Comfort	1
1			Credit 7.1	Thermal Comfort—Design	1
1			Credit 7.2	Thermal Comfort—Verification	1
1			Credit 8.1	Daylight and Views—Daylight	1
1			Credit 8.2	Daylight and Views—Views	1

Innovation and Design Process — Possible Points: 6

Y	?	N			
		1	Credit 1.1	Innovation in Design: Specific Title	1
		1	Credit 1.2	Innovation in Design: Specific Title	1
		1	Credit 1.3	Innovation in Design: Specific Title	1
		1	Credit 1.4	Innovation in Design: Specific Title	1
		1	Credit 1.5	Innovation in Design: Specific Title	1
1			Credit 2	LEED Accredited Professional	1

Regional Priority Credits — Possible Points: 4

Y	?	N			
1			Credit 1.1	Regional Priority: Specific Credit	1
1			Credit 1.2	Regional Priority: Specific Credit	1
1			Credit 1.3	Regional Priority: Specific Credit	1
		1	Credit 1.4	Regional Priority: Specific Credit	1

48	9	53	**Total**	Possible Points: **110**

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

LEED AP BD+C

GREEN BUILDING CERTIFICATION INSTITUTE CERTIFIES THAT

Ana Gordan

HAS ATTAINED THE DESIGNATION OF

LEED ACCREDITED PROFESSIONAL

with a Building Design + Construction Specialty

by demonstrating the knowledge and understanding of green building practices and principles needed to support the use of the LEED® Green Building Rating System™.

694-AP-BD+C

CREDENTIAL ID

05 DEC 2010

ISSUED

04 DEC 2016

VALID THROUGH

GAIL VITTORI, GBCI CHAIRPERSON

MAHESH RAMANUJAM, GBCI PRESIDENT

PROJECT NO	**2-3216.00**
LOCATION	Great Neck Road South, Mashpee
CALC BY	Brian G. Yergatian, PE
DATE	8/12/15

BSC GROUP
Thoughtfully transforming our environments

NITROGEN LOADING CALCULATIONS

APPLICATION/USE: Residential

EXISTING

LOT SIZE:	158,760	s.f.

IMPERVIOUS SURFACES:		
Roof Area	0	s.f.
Paved Area	0	s.f.

NATURAL AREA:	158,760	s.f.
lawn	0	s.f.

TITLE V FLOW:		
Existing	0	gpd

PROPOSED - TITLE V

LOT SIZE:	158,760	s.f.

IMPERVIOUS SURFACES:		
Roof Area	35,506	s.f.
Paved Area	46,974	s.f.

NATURAL AREA:	76,280	s.f.
lawn	12,810	s.f.

TITLE V FLOW:		
Proposed	0	gpd

RECHARGE

18	in/yr	**1.5** ft/yr	Natural Areas
40	in/yr	**3.3** ft/yr	Off Impervious Surfaces

EXISTING

WASTEWATER

0 gpd x 3.785 L/gal. = 0 L/d x 35 mg/L = 0 mg/d

IMPERVIOUS SURFACES:

Roof

0 s.f. x 40 in/yr x ft/12in x 28.32 L/ft^3 x 1yr/365d = 0 L/d

0 mg/d x 0.75 mg/L = 0 mg/d

Paved

0 s.f. x 40 in/yr x ft/12in x 28.32 L/ft^3 x 1yr/365d = 0 L/d

0 mg/d x 1.5 mg/L = 0 mg/d

LAWN

0 s.f. x 3 $lbs/1000ft^2$*yr x 1 yr/365d x 454,000 mg/lb x 0.25 = 0 mg/d

NATURAL

158,760 s.f. x 1.5 ft/yr x 28.32 L/ft^3 x 1yr/365d = 18,477 L/d

$$\frac{0 + 0 + 0 + 0}{0 + 0 + 0 + 18{,}477} =$$ **0.0 ppm**

PROPOSED - TITLE V

WASTEWATER

0	gpd	x	3.785 L/gal.	=	0	L/d	x	35 mg/L	=	0	mg/d

***35 mg/L x % nitrogen removal per alternative treatment:** 0 %

IMPERVIOUS SURFACES:

Roof

35,506	s.f.	x	40	in/yr	x	ft/12in	x	28.32	L/ft^3	x	1yr/365d	=	9,183 L/d
			9183	mg/d	x	0.75	mg/L	=					6,887 mg/d

Paved

46,974	s.f.	x	40	in/yr	x	ft/12in	x	28.32	L/ft^3	x	1yr/365d	=	12149 L/d
			12149	mg/d	x	1.5	mg/L	=					18,223 mg/d

LAWN

12,810	s.f.	x	3	$lbs/1000ft^2*yr$	x	1	yr/365d	x	454,000	mg/lb	x	0.25	= 11,950 mg/d

NATURAL

76,280	s.f.	x	1.5	ft/yr	x	28.32	L/ft^3	x	1yr/365d	=			8,878 L/d

0	+	6887	+	18223	+	11950	=	**1.2 ppm**
0	+	9183	+	12149	+	8878		

With Alternative Treatment? **NO**

Nitrogen Reduction: 0 %

Proposed Nitrogen Loading: **1.2 ppm**

PROPOSED - ACTUAL

WASTEWATER

0	gpd x 3.785 L/gal x (2.5/8 **)	0	L/d	x	35	mg/L	=	0 mg/d

** Assume 2.5 people/unit

***35 mg/L x % nitrogen removal per alternative treatment:** 0 %

IMPERVIOUS SURFACES:

Roof

35,506	s.f.	x	40 in/yr x ft/12in x 28.32 L/ft^3 x 1yr/365d	=				9,183 L/d
			9183 mg/d x 0.75 mg/L	=				6,887 mg/d

Paved

46,974	s.f.	x	40 in/yr x ft/12in x 28.32 L/ft^3 x 1yr/365d	=				12149 L/d
			12149 mg/d x 1.5 mg/L	=				18,223 mg/d

LAWN

12,810	s.f.	x	3 $lbs/1000ft^2$*yr x 1 yr/365d x 454,000 mg/lb x 0.25	=				11,950 mg/d

NATURAL

76,280	s.f.	x	1.5 ft/yr x 28.32 L/ft^3 x 1yr/365d	=				8,878 L/d

0	+	6887	+	18223	+	11950	=	**1.2 ppm**
0	+	9183	+	12149	+	8878		

SUMMARY

Proposed	Title V Flow	=	**1.2 PPM**
	Actual	=	**1.2 PPM**

Final Calculation = (Title V Flow + Actual) / 2 = **1.2 PPM**

The Isosceles Group
50 Congress Street | Boston, MA 02109
Tel: 617.330.2800 | Fax: 617.330.2801

July 20, 2015
Project Number 15-038

Mr. Stephen Ordway
Director of Acquisitions & Development
The Northbridge Companies
71 Third Avenue
Burlington, MA 01803

RE: Phase I Environmental Site Assessment (ESA)
Trout Pond Lots 3 and 4
68 Great Neck Road South
Mashpee, Massachusetts

Dear Mr. Ordway:

This letter report presents the results of a Phase I Environmental Site Assessment (Phase I ESA) of property referred to herein as Trout Pond Lots 3 and 4, at 68 Great Neck Road South, in Mashpee, Massachusetts (the Property).

The purpose of this Phase I ESA is to evaluate the presence, or potential presence, of Recognized Environmental Conditions (RECs) at the Property, in accordance with the requirements of the ASTM Environmental Site Assessment Standard 1527-13 for Phase I Environmental Site Assessments (ASTM Standard), and EPA's All Appropriate Inquiry Final Rule 40 C.F.R. Part 312 (AAI Rule).

RECs are defined in the ASTM Standard as the presence, or likely presence, of any hazardous substances or petroleum products on a property, under conditions that indicate an existing release, a past release, or a material threat of a release, of any hazardous substance or petroleum products into structures on the Property, or into the ground, groundwater, or surface water of the Property. [1]

Statement of Environmental Professional

This Phase I ESA is based on work performed, observations made, and documents previously reviewed by or under the direction of M. Margret Hanley of the Isosceles Group (Isosceles) in 2013 on behalf of The Northbridge Companies (Northbridge), and more recently, between July 7 and 16, 2015 under the terms of our agreement with Northbridge dated July 7, 2015 a copy of which is attached as Appendix A.

I declare that, to the best of my professional knowledge and belief, I meet the definition of *Environmental Professional* as defined in §312.10 of 40 CFR 312, and that I have the specific qualifications based on education, training, and experience to assess the nature, history, and setting of the subject Property.

[1] ASTM Standard 1527-13, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process, dated November 2013.

I have developed and performed the all appropriate inquiries in conformance with the standards and practices set forth in 40 CFR Part 312. Supporting documentation of my qualifications as the person conducting the site reconnaissance and interviews reported herein are attached to this report.

Isosceles performed this Phase I ESA in conformance with the scope and limitations of ASTM Practice E 1527 for the Property located at 68 Great Neck Road South, in Mashpee, Massachusetts. Any exceptions to, or deletions from this practice, as of the date of this report, are described in Section 4.5 of this report.

Phase I ESA Report

1.0 Summary of Findings

During the performance of this Phase I ESA, Isosceles did not identify the presence of any REC at the Property, and no further assessment is recommended.

The likely historical use of herbicides along the electrical company easement on Lot 4 is identified as a *De Minimus* condition.

The ASTM definitions of RECs, Historical RECs, and *De Minimus* Conditions, and a detailed discussion of the basis for our findings, are presented in Section 9 of this report.

2.0 Structure and Limitations of Phase I ESA

This Phase I ESA was performed in conformance with the scope and limitations of ASTM Practice E 1527-13. Exceptions to, or deletions from this practice, as of the date of this report are described in Section 4.6 of this report.

Information that was obtained during this Phase I ESA is attached as Appendices, or is referenced herein. Where appropriate, links to documents that are available from publically available on-line sources are provided.

Plans depicting the location and layout of the Property are presented in Figures 1 and 2. A surveyed plan of the Property dated November 27, 2012 is included in Appendix C.

This report incorporates information for the Property that was obtained by Isosceles in 2013 during the preparation of an ASTM Phase I ESA Report on behalf of Northbridge, which was not finalized.

Because the Property has not been developed, this Phase I ESA did not include an assessment of the presence or absence of lead paint, asbestos, radon, or naturally occurring materials in the buildings at the Property, nor was the regulatory compliance history of the Property owner considered.

This Phase I ESA did not include an assessment of the presence or absence of asbestos, lead paint, radon, or naturally occurring materials (including mold) at the Property, or past or current compliance of the Property owner or tenants, with state or federal environmental regulations. This assessment does not, nor is it intended to address the presence or absence of wetlands at the Property, or the status of the Property, in regards to the Massachusetts Wetlands Protection Act (310 CMR 10.00).

Subsurface investigations were not performed as part of the Phase I ESA. Therefore, our opinions regarding the presence or absence of RECs are based only upon visual observations made during site reconnaissance, the historical land use information reviewed to date, and our review of the results of subsurface investigations performed by others at, or adjacent to the Property.

Information regarding conditions at the Property that was not available to Isosceles during the Phase I ESA may result in a change in the opinions presented in this letter report.

Northbridge acknowledges that the Phase I ESA is intended to satisfy one of the requirements to qualify for the *innocent landowner*, *contiguous property owner*, or *bona fide prospective purchaser* limitations on Comprehensive Environmental Response, Compensation and Liability Act (42U.S.C. §9601)(CERCLA) liability, and to demonstrate that it has met the requirements for *"all appropriate inquiry"* into the previous ownership and uses of the Property consistent with good commercial or customary practice" as defined at 42 U.S.C. §9601(35)(B).

Northbridge also acknowledges that this Phase I ESA is presumed to be valid for the purpose of meeting CERCLA requirements for "all appropriate inquiry" for up to 180 days following the date of the final Phase I ESA Report.[2] If within this period the assessment will be used by a different *user* than the *user* for whom the assessment was originally prepared, the subsequent *user* must also satisfy the User's Responsibilities set forth in the ASTM Standard. Documentation of the responsibilities of the users of this Phase I ESA Report, who are not cited in this proposal, is not the responsibility of Isosceles under this Scope of Work. Other users and environmental professionals may use information presented in the Phase I ESA report described herein after 180 days, provided that they independently verify that such information was generated in accordance with the ASTM Standard, but such information shall not be used without an updated investigation of conditions likely to affect RECs in connection with the Property. Additional tasks may be necessary to document conditions that may have changed materially since the completion of the Phase I ESA, proposed herein.

3.0 Property Identification and Ownership

3.1 Location

Trout Pond Lots 3 and 4 (the Property) consist of 4.93 acres of undeveloped land located approximately 2.5 miles south of Mashpee Town Hall and 0.2 miles south of the intersection of Routes 28, and 151, Great Neck Road South and Great Neck Road North (Figure 1). The Property is located to the east of and abutting Great Neck Road South in Mashpee, Massachusetts (Figure 2).

The Property is currently identified as Map 74 Lot 27 (Parcel ID 74-27-0-R), by the Town of Mashpee Assessor's Office (Appendix C). The Property has been subdivided into Lots 3 and 4.

The property is zoned by the town of Mashpee as C1 (Commercial 1).[3]

[2] See ASTM Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process (E 1527 – 13), Section 4.6 *Continued Viability of Environmental Site Assessment*, and Section 6, *Users Responsibilities.*

[3] http://mashpeema.virtualtownhall.net/pages/mashpeema_planning/Pre-made%20Maps

The United States Geologic Survey (USGS) map for the Property are the Cotuit MA Quadrangle (41070-E4) dated 1974.

The UTM Coordinates for the Property are 376222.1 (X) and 4607873.5 (Y); (Latitude (North): 41.6149-41º 36' 53.64"and Longitude (West): 70.4856-70º 29' 8.16").

The Property is located within the nominal development area of Mashpee Commons, a mixed use development. Under the Mashpee Commons Master Plan, the Property is within the area described as the Future Trout Pond Neighborhood. [4]

3.2 Current Use and Layout

The Property is undeveloped land that contains an electric company easement, a sewer/utility easement, an unpaved road which transects the southernmost parcel (Lot 4), and an unpaved road which borders the southernmost parcel (Figure 2).

3.3 Ownership and Management

The owner of the Property is identified by the Town of Mashpee as:

Arnold B. Chace Jr.
C/O GNRS-MA LLC
46 Aborn Street, 4th Floor
Providence RI 02903

The Property is managed by Mashpee Commons. The contact for Mashpee Commons and the owner's representative is:

Thomas Feronti
Construction Manager
Mashpee Commons
22 Steeple Street, 2nd Floor
Mashpee, MA 02649
Tel. 508-477-5400
(Tom@mashpeecommons.com)

4.0 Scope of Work

This Phase I ESA is based on work performed, observations made, and documents reviewed by Isosceles between July 7 and 16, 2015 under the terms of our agreement with Northbridge, a copy of which is attached as Appendix A. The Phase I ESA was performed by or under the direct supervision of an environmental professional, as defined in the AAI Rule.

[4] http://www.capecodcommission.org/resources/regulatory/DRIdecisions/TR98049MashpeeComPDenial.pdf

4.1 Records Review

Our records review included documents obtained during Isosceles' preparation of a Draft Phase I ESA of the Property in May 2013, and private records that pertain to the potential presence of a REC at the Property and at adjacent properties. [5]

Updated publicly available records were also obtained, including state and federal database information regarding the use and disposal of hazardous materials; files maintained or published by the MassDEP and other agencies, and documents maintained by certain departments of the Town of Mashpee, Massachusetts are described in Section 8.

Isosceles also requested in writing that the current owner of the Property, and the current Property Manager, Mashpee Commons, provide updated information regarding activities and conditions which are relevant to the assessment of potential RECs at the Property.

Additional documents that were provided to Isosceles in response to our request are summarized in Section 8.

4.2 Property Reconnaissance

Isosceles performed reconnaissance of the Property on July 15, 2015.

4.3 Interview With Owner, Occupants, and Other Knowledgeable Parties

Isosceles interviewed Thomas Feronti, Construction Manager of Mashpee Commons on July 13, and 16, 2015.

4.4 Subsurface Investigations

No Subsurface Investigations were performed by Isosceles as part of this Phase I ESA.

4.5 Request for Environmental Disclosure

The ASTM Standard Practice for Environmental Site Assessments (Phase I Environmental Site Assessment Process (E 1527 – 3) requires that persons or entities that intend to use or rely upon a Phase I ESA Report disclose information that is relevant to the identification of recognized environmental conditions (RECs) at the subject property to the Environmental Professional performing the Phase I ESA.

Isosceles has provided Northbridge with an Environmental Disclosure Questionnaire as a means of disclosing relevant knowledge or information regarding the presence, or potential presence of RECs at the Property.

---

[5] Section 4.7.1 of the ASTM Environmental Site Assessment Standard 1527-13 for Phase I Environmental Site Assessments *states that* "subject to the requirements set forth in Section 4.6 of the Standard, *users* and *environmental professionals* may use information in prior *environmental site assessments* provided such information was generated as a result of procedures that meet or exceed the requirements of this practice. However, such information shall not be used without current investigation of conditions likely to affect *recognized environmental conditions* in connection with the *property*. Additional tasks may be necessary to document conditions that may have changed materially since the prior *environmental site assessment* was conducted.

4.6 Exceptions and Deviations

The findings presented in this Phase I ESA Update were based on data reviewed by Isosceles. Based on the totality of the information presented herein, it is Isosceles' opinion that the information obtained during this Phase I ESA Update is sufficient to identify RECs, including potential and historical RECs, at the Property, as defined by ASTM. No data gaps were identified.

5.0 Property Description

5.1 Property and Vicinity Characteristics

The Property consists of 4.93 acres of undeveloped land currently identified as Map 74 Lot 27 (Parcel ID 74-27-0-R), by the Town of Mashpee Assessor's Office (Appendix B). The Property has been subdivided into Lots 3 and 4.

The Property is undeveloped with an electric company easement, a sewer/utility easement and two gravel roads on the southernmost parcel (Lot 4) (Figure 2).

The electrical easement is maintained by Commonwealth Electric Company, a subsidiary of NSTAR. The sewer easement is held by Mashpee Commons.

One gravel road is located approximately on the sewer utility easement and connects Great Neck Road South to a Wastewater Treatment Plant (WWTP) on the abutting property to the east. Another unpaved road extends from Great Neck Road South to the east, along the electric easement which borders Parcel 4 to the south.

The Property is bounded to the west by Great Neck Road South. The abutting parcel to the north is undeveloped land managed by Mashpee Commons, referred to as Lot 2. Land to the east is also owned and managed by Mashpee Commons and is the location of a WWTP. Land to the south is a residential development referred to Windchime Condominiums.

When developed, the Property will be provided water by The Mashpee Water District, which obtains its water from five currently active wells all located in the Town of Mashpee, and will be sewered by the Mashpee Commons sewer system, which discharges to the WWTP to the northeast of the Property. Treated effluent from the WWTP is discharged to sand beds east of the WWTP. According to information provided by Mr. Thomas Feronti of Mashpee Commons, groundwater flow is to east towards Trout Pond and Mashpee River, which is consistent with our understanding of hydrogeological properties of the Property and vicinity. This indicates that groundwater which receives effluent from the WWTP flows to the east, away from the Property.

No storm water management structures are present at the Property.

Information regarding the abutting properties that was obtained online from the Mashpee Assessor's office is presented in Appendix B.

5.2 Environmental Setting

5.2.1 Geology and Hydrogeology

Subsurface investigations were not performed as part of this Phase I ESA. Therefore, information regarding the environmental setting is based on our general understanding of the site vicinity, and on information reviewed as part of this Phase I ESA.

In summary, the surficial geology of the Property consists primarily of glacially deposited sands and gravel that are typical of water laid sediments formed close to a melting glacial ice margin.

Soil surface texture in general area of target property is reported to be Loamy Coarse Sand. Soils have high infiltration rates. They are deep, well drained to excessively drained sands and gravel.

Investigations of geologic or hydrologic conditions have not been performed at the Property. The United States Geological Survey (USGS) reports that groundwater is approximately 44- 52 feet below the ground surface at wells located less than .25 miles to the east-southeast of the Property (Appendix D).

Depth to bedrock is not known but is likely to be greater than 50 feet.

Based on a plan of groundwater contours of the adjacent property to the east, which was provided to Isosceles by Thomas Feronti, and the geologic setting of the Property, groundwater flow at the Property is to the north and east, toward Trout Pond (Figure 1 and Appendix C).

The Property is not located within the mapped Zone II of the Town of Mashpee Water Supply Wells (Appendix D). [6]

5.2.2. Wetlands, Flood Zones, and Natural Resources

This Phase I ESA does not address the presence or extent of wetlands at the Property.

The Property is not located within a 100 or 500 Year Flood Zone, as defined by the Federal Emergency Management Agency (FEMA).[7]

The Property is located within NHESP Natural Priority Habitat of rare species.[8]

5.2.2 Water Resources

The Property, when developed, will be provided with potable water by Mashpee Water District which obtains water from five active wells all located in the Town of Mashpee.

According to the Consumer Confidence Report (CCR) issued by Mashpee Water District in 2015, water provided to the residents of Mashpee meets and exceeds the federal and state drinking water standards.[9]

---

[6] http://maps.massgis.state.ma.us/images/dep/omv/wspviewer.htm
[7] See Environmental Data Resources, Inc. (EDR) for Trout Pond Lots 3 & 4, Great Neck Road South, Mashpee, MA, dated July 9, 2015, a copy of which is attached as Appendix D
[8] http://maps.massgis.state.ma.us/map_ol/oliver.php
[9] http://www.mashpeewaterdistrict.com/images/2015/Mashpee%20Water%20Qual%20Rpt%201-15%20REV3.pdf

The closest Mashpee District Water Supply Well is located approximately three quarters of a mile to the northeast of the Property and is likely cross gradient of the Property (Appendix D). The Sea Mist Resort, which is located approximately 2000 feet to the southwest of the Property, also maintains a water supply well. Based on our understanding of the hydrogeologic setting, this well is likely cross gradient from the Property.

The Property is not located within the mapped Zone I or Zone II of the Mashpee Water District Supply Wells, or the Sea Mist Resort Wells.

5.2.3 Applicable Groundwater and Soil MCP Standards

Groundwater and soil the Property are currently subject to the RCGW-1and RCS-1 reporting requirements, respectively, under the MCP.[10] The presence of hazardous materials or oil in the environment, in excess of Reportable Concentrations (RCs), or a release of hazardous materials in excess of the Reportable Quantities listed in the Massachusetts Oil and Hazardous Material List (MOHML), must be reported to DEP. [11] RCs are based, in part, on the environmental setting of a location of a release.

6.0 Property History

6.1 Ownership and Historical Land Use

The history of the property described below is based upon our review of (i) historical aerial photographs and topographic maps (Appendix E and G); (ii) a copy of the deed for the Property dated December 6, 1986, which was provided by Thomas Feronti; (iii) our review of selected documents maintained online by the Barnstable County Registry of Deeds; and other documents regarding Mashpee Commons which are available online (Appendix D)

In summary, the Property has been undeveloped woodland since at least 1938. The Property was as formerly owned by Theodore A. Schilling, of Osterville, Barnstable County. It was sold to Arnold B. Chace in December, 1986. (Appendix C)

In the early 2000's, the development plan for Mashpee Commons, which included the Property and the abutting land to the north and east was permitted by the Commonwealth of Massachusetts, and the Town of Mashpee. According to Thomas Feronti, the predecessor to Mashpee Commons LP was Fields Point Corporation. Fields Point Corporation was liquidated in 1986 with the Mashpee Commons land remaining under the ownership of Fields Point Limited Partnership. In 1995, the name was changed from Fields Point Limited Partnership to Mashpee Commons Limited Partnership.

Portions of the Mashpee Commons area to the west of Great Neck Road South and Falmouth Road were developed in the 1980's and included both commercial and residential uses. According to Thomas Feronti, in 1986 the WWTP facility for the Mashpee Commons was constructed on the parcel of land to the northeast of the Property. The WWTP facility includes a wastewater treatment plant, and leaching beds for treated effluent. The WWTP is operated by White Water, Inc. on behalf of Mashpee Commons.

[10] The RCS-1 (for soil) is based on a presumption of unrestricted public access, proximity to residential property. The RCGW-1 (for groundwater) is based on the location of the Property within a medium to high yield aquifer. A change in these or other conditions at the Property could result in a change in the applicable standards for reporting releases of hazardous materials or oil at the Property. See 310 CMR 40.0300.
[11] See: (310 CMR 40.0310)

During Isosceles' visit to the Property on May 8, 2013, Thomas Feronti of Mashpee Commons explained the layout of the WWTP, which is located on the abutting property to the northeast. In summary, wastewater flows through a force main through the east side of the Property to distribution boxes and 3 underground pre-treatment tanks, and finally to the WWTP at the abutting property.

Treatment at the WWTP originally consisted of a Rotating Batch Contactor (RBC), clarifiers, denitrification filters and Ultraviolet system. According to Isosceles communications with Mr. Feronti in July 2015, recent improvements were made to the WWTP to accommodate future development within the Mashpee Commons, and included the installation of a Membrane Bioreactor, expansion of the sand bed, and the installation of another underground pretreatment tank.

Treated wastewater is discharged to sand beds east of the WWTP building and allowed to percolate through the ground. These discharges are reported to be down gradient from the Property. Sludge generated at the WWTP is periodically removed and disposed of off-site. Monitoring wells are located between the leaching beds, and Trout Pond, to the east. According to Mr. Feronti, an easement is in place for the sewer force main.

The abutting land to the north (Parcel 2) is also owned by Arnold B Chace Jr., and is currently undeveloped (Figure 2). Limited clearing of this property appears to have occurred between 1997 and 2006. According to Thomas Feronti, this parcel of land was the proposed site of a performing arts center, but that development was not initiated.

6.2 Environmental Investigations and Reports

No previously prepared environmental reports for the Property were provided to Isosceles by the current owner of the Property, nor were any other specific investigations of the property identified during this Phase I ESA.

Isosceles attempted to obtain copies of the Draft and Final Environmental Investigation Report (DEIR and FEIR), which were prepared during the permitting of the Mashpee Commons Development. Copies of the table of contents of each of these reports were provided to Isosceles by Thomas Feronti of Mashpee Commons. Relevant information regarding the potential presence of RECS at the Property was not indicated in the table of contents.

Town of Mashpee files reviewed by Isosceles during this Phase I ESA did not result in the identification of any environmental reports regarding the Property.

Isosceles reviewed the DEP listing of locations where releases of oil or hazardous materials are reported to have occurred, and did not note any reported releases at or adjacent to the Property. Release conditions that were reported to DEP that were within .5 miles of the Property are discussed in Section 8, below.

7.0 Property Visit Summary and Observations

7.1 Property Visits

A representative of Isosceles visited the Property on May 8 and 13, 2013, and on July 15, 2015.

May 2013

Dunja Pavlovic of Isosceles visited the offices of the Mashpee Commons at 22 Steeple Street on May 8, 2013 and interviewed Thomas Feronti, Construction Manager of Mashpee Commons.

Mr. Feronti accompanied Ms. Pavlovic on her visit to the Property and the adjacent land to the east and north. Ms. Pavlovic observed conditions along the electrical easement, unaccompanied.

Ms. Pavlovic returned to the Property on May 13, 2013 to document conditions along the electrical easement to the south.

During Isosceles initial visit to the Property in May 2013, the weather was warm and overcast. Isosceles was permitted to walk through and around the entire perimeter of the Property, and was able to view the Property without restriction. No physical obstructions that could obscure the ground surface were noted.

Photographs that were taken during our visit to the Property in May 13, 2013 are presented in Appendix F.

The Property was heavily vegetated with mature pine trees and bushes. The ground surface was visible.

The Property was observed to be undeveloped. An electric company easement and a sewer/utility easement are located on the southern parcel (Lot 4). No evidence of historical development, such as stone walls, foundations, or other structures was observed.

A gravel road that provides access from Great Neck Road South to the Mashpee Commons WWTP, on the adjacent property to the east, is located along the sewer utility easement, which is also the location of a subsurface force main that conveys sanitary waste to the WWTP.

An unpaved access road off of Great Neck Road is also present within the electrical utility easement, beneath electrical lines, at the southern boundary of the property.

A few piles of gravel that appeared to be the result of plowing were observed along the access road to the wastewater treatment plant and gravel road on the southern boundary of the Property.

No piles of trash were observed on the Property, although a few plastic bags, bottles and sheets of newspaper were noted on the ground surface along the Great Neck Road South and the gravel road on the southern boundary of the Property. Some dead vegetation was noted under power lines.
In summary, during our reconnaissance of the Property in May 2013, no evidence of the use, storage or disposal of oil or hazardous material was identified. No evidence of drums, ponds, or underground storage tanks (USTs) was observed at the Property. No odors, or stained soil was noted. Some dead vegetation was noted under the electrical lines at the southern boundary of the Property, but appears to be consistent with the use of herbicides within the electrical easement.

The land to the west of Great Neck Road South was observed to be undeveloped. Construction material was stored at a small portion of this location along Great Neck Road South.

In May 2013, the abutting parcel to the north (Trout Pond Lot 2) was undeveloped. During Isosceles visit on May 8, 2013, a few brush piles and wood chip piles were noted on semi-circle gravel road on Lot 2. Isosceles understands that portion of Lot 2 was previously cleared for the planned development of a Performing Arts Center, and the brush piles and wood chip piles may be related to that effort.

Land to the east of the Property contains the Mashpee Commons WWTP, which services Mashpee Commons, North Market Street (owned by Mashpee Commons), a fire station, a police station, and a senior center and library.

Land to the south of the Property is developed with residential condominiums.

July 15, 2015

During the July 15, 2015 visit to the Property, the weather was cloudy with occasional rain. Dunja Pavlovic of Isosceles walked through and around the entire perimeter of the Property, and was able to view the Property without restriction. No physical obstructions that could obscure the ground surface were noted. The Property was heavily vegetated with mature pine trees and bushes. The ground surface was barely visible due to dense vegetation.

Conditions at the Property and adjacent parcels were similar to those observed on May 8 and 13, 2013, apart from conditions at a parcel to the northeast of the Property where WWTP is located. Since 2013, additional sand beds were added at the WWTP to the northwest of the original beds. Several sewer manholes and confined space entry notices were added to the southwest of the WWTP building. Two storage trailers, building material, and two empty 55 gallon drums were observed to the southwest of the WWTP building.

Dead vegetation under the electrical lines at the southern boundary of the Property observed in May 2013 was not observed during July 2015 visit.

Photographs that were taken during July 15, 2015 visit to the Property are presented in Appendix F.

8.0 Records Review

8.1 Public Records

8.1.1. Database Review

Isosceles obtained a database report for the Property from Environmental Data Resources, Inc. (EDR) dated July 09, 2015 (Appendix D). This report presents the results of an electronic search for environmental records for the Property, and land within one (1) mile of the Property. The database search is consistent with the requirements of ASTM E 1527-05, and includes the following sources of information:

Federal Sources:

- National Priority List (NPL)
- Proposed National Priority List (Proposed NPL)
- National Priority List Deletions (Delisted NPL)
- Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS)
- CERCLIS-No Further Action Planned
- Corrective Action Report (CORRACTS)
- Resource Conservation and Recovery Information System (RCRIS)
- Emergency Response Notification System (ERNS)
- Superfund Consent Decrees (CONSENT)
- Records of Decision (ROD)
- National Priority List Deletions (Delisted NPL)

- Hazardous Materials Information Reporting System (HMIRS)
- Mines Master Index File
- Federal Superfund Liens (NPL Liens)
- PCB Activity Database System (PADS)
- RCRA Administrative Tracking System (RAATS)
- Toxic Substance Control Act (TSCA)
- FIFRA/TSCA Tracking System (FTTS INSP)

State Sources:

- Site Transition List (LUST)
- Underground Storage Tank Database (AST)
- Historical Spill List (MA Spills)
- State Hazardous Waste Site (SHWS)
- Solid Waste Facility Database/Transfer Stations (SWF/LF)

The Property is not identified on any data base reported by EDR. However, two SHWS locations within one half mile of the Property are identified. Both of these locations are also identified on the DEP listing of MCP Disposal Sites and are discussed below.

8.1.2. DEP Sites and EPA Enforcement Databases

A copy of DEP's listing of MCP Disposal Sites for Mashpee, Massachusetts, updated on June 30 2015, is presented in Appendix D.

The following locations within one half mile of the Property are identified by DEP as the location of a release of oil or hazardous material:

- Two reportable conditions occurred at the Mobil station located at 548 Falmouth Road which is approximately 0.2 miles to the northwest of the Property. The release condition identified as RTN No. 4-0011080 was reported to DEP on January 19, 1995 and appears to be associated with the detection of Volatile Organic Compounds (VOCs) in soil during the removal of USTs. This release condition was closed with a class B-1 RAO. A copy of the RAO is available online and was reviewed by Isosceles. [12]

  A second release condition at the Mobile Station at 548 Falmouth Road was reported to DEP on April 16, 2005 (RTN No. 4-0019030). This condition was due to an accidental release of 20 gallons of gasoline. This release was remediated and closed under a Class A-1 RAO on June 20, 2005. A copy of the RAO is available online and was reviewed by Isosceles.[13]

- A release of 30 gallons of hydraulic fluid occurred at 681 Falmouth Rd, which is approximately 2000 feet to the southwest of the Property. It was reported to DEP on May 1, 2005. This release location is referred to as Deer Crossing, and was remediated and closed under a Class A-1 RAO. A copy of the Class A-1 RAO is available online and was reviewed by Isosceles.[14]

[12] http://public.dep.state.ma.us/fileviewer/DefaultScanned.aspx?documentid=128275.
[13] http://public.dep.state.ma.us/fileviewer/DefaultScanned.aspx?documentid=168589.
[14] http://public.dep.state.ma.us/fileviewer/DefaultScanned.aspx?documentid=168590

Based on the information presented online by DEP and reviewed by Isosceles, It is Isosceles' opinion that these conditions have been assessed and/or remediated in accordance with the MCP, and are not likely to affect conditions at the Property.

Isosceles also obtained the following documents from DEP that are relevant to the evaluation of potential RECs at the Property:

- Massachusetts Department of Environmental Protection Source Water Assessment and Protection (SWAP) Report for Mashpee Water District May 2003.[15]

Isosceles also reviewed the Environmental Protection Agency (EPA) Enforcement and Compliance History (ECHO) Database, which is available online at http://www.epa-echo.gov/echo/ (Appendix D). No entity or location listed on the EPA ECHO database is located within a quarter mile of the Property, apart from Mobil station referred to above.

8.1.3. Aerial Photographs

Aerial Photographs of the Property for the period 1938-2012 were obtained from EDR in 2013 and are presented in Appendix E. The date and scale of aerial photographs provided by EDR are as follows:

- 1938 Aerial Photograph. Scale: 1"=500'
- 1971 Aerial Photograph. Scale: 1"=500'
- 1973 Aerial Photograph. Scale: 1"=500'
- 1986 Aerial Photograph. Scale: 1"=1000'
- 1991 Aerial Photograph. Scale: 1"=750'
- 1995 Aerial Photograph. Scale: 1"=500'
- 2006 Aerial Photograph. Scale: 1"=500'
- 2008 Aerial Photograph. Scale: 1"=500'
- 2010 Aerial Photograph. Scale: 1"=500'
- 2012 Aerial Photograph. Scale: 1"=500'

Information presented in these photographs is consistent with the historical information presented in Section 5, and our observations at the Property on July 15, 2015.

8.1.4 Fire Insurance Maps

According to EDR's 2013 report, Sanborn Fire Insurance Maps are not available for the Property (Appendix D).

8.1.5 Historical Topographic Maps

Historical Topographic Maps of the Property for the period 1893-1985 were obtained from EDR in 2013 and are presented in Appendix G. The date and scale of aerial photographs provided by EDR are as follows:

- 1893 Historical Topographic Map. Scale: 1"=62500'

[15] http://www.mass.gov/eea/docs/dep/water/drinking/swap/sero/4172039.pdf

- 1942 Historical Topographic Map. Scale: 1"=25000'
- 1949 Historical Topographic Map. Scale: 1"=24000'
- 1961 Historical Topographic Map. Scale: 1"=24000'
- 1974 Historical Topographic Map. Scale: 1"=25000'
- 1985 Historical Topographic Map. Scale: 1"=50000'

Information presented in these photographs is consistent with the information presented in Section 5.

8.1.6 Municipal/Public Records

8.1.6.1 Mashpee Board of Health, Building Department, Planning Department, Conservation Commission, and Public Works

Isosceles visited the office of the Mashpee Board of Health (BOH), Building Department, Planning Department, Conservation Commission, and Public Works on May 8, 2013, and requested files for the Property and vicinity and vicinity that would be relevant to the evaluation of RECs.

No files regarding the Property were maintained by the Mashpee BOH. Isosceles was advised by Glen E. Harrington of Mashpee BOH that there are no private water supply wells at nearby properties. Records maintained by the BOH showed that there were two private wells defined as Non-Community Public Water Systems at 33 Great Neck Road South, approximately 0.1 miles northwest of the Property. The wells' records date back to 1986 and show that they were declassified at 1993 due to the connection of the Mashpee Water District Public Water Supply to that location.

The Mashpee Building Department shares files with Mashpee BOH. No files regarding the Property were maintained by the Mashpee Building Department.

The Planning Department was closed during Isosceles' visit on May 8, 2013. During subsequent phone conversation with Town Planner Mr. Thomas Fudala, it was established that aerial photos from 1951, 1984 and 1997 were available. Photos are consistent with aerial photographs obtained from EDR and show that there was no development on the Property, apart from gravel road leading to wastewater treatment plant visible on 1997 photo.

No files regarding the Property or surrounding properties were maintained by the Mashpee Conservation Commission. The Conservation Agent that communicated with Isosceles was Andrew McManus.

No files regarding the Property or surrounding properties were maintained by the Mashpee Public Works. Isosceles was referred to the CCR report for the Mashpee Water District, which is available on line.

Isosceles subsequently visited the office of the Mashpee Board of Health (BOH), Building Department, and Conservation Commission on July 15, 2015. No new information regarding the Property has been filed with these municipal departments since Isosceles May 2013 file review.

8.1.6.2 Mashpee Fire Department.

Isosceles visited the Mashpee Fire Department on May 8, 2013, and requested files for the Property and vicinity, and was advised at that time that the all file reviews would be performed by a representative of the Mashpee Fire Department, and would be forwarded to Isosceles upon completion.

On June 4, 2013, Isosceles was contacted by Inspector Joel Clifford of the Mashpee Fire Department by e-mail that no records of any underground storage tank or any fluid spills for the Property, and no records on file for the permitted storage of any fluids were found.

Isosceles contacted Mr. Clifford again on July 13, 2015, and in an e-mail, requested any relevant files that the Mashpee Fire Department may have regarding the use, storage or release of oil or hazardous materials (OHM), and the historical presence of Underground Storage Tanks (USTs) or above ground storage tanks (ASTs) at the Property. As of the date of this report, Isosceles has not received a response from the Mashpee Fire Department.

8.1.6.3 The Mashpee Water District

The Property, when developed, will be provided with potable water by Mashpee Water District. The most recent CCR for the Mashpee Water District dated 2015 is available on the Mashpee Water District website.[16] According to the CCR, water provided to the residents of Mashpee meets and exceeds the federal and state drinking water standards.

8.1.6.4 Mashpee GIS, Assessor's Office and Barnstable County Registry of Deeds

Property index cards for the Parcel that contains the Property and for the adjacent parcels were obtained from Mashpee Assessor's Office and are included in Appendix B.

Additionally, Isosceles reviewed the Property information that was provided by Mashpee Commons in their Response to Request for Information (RFI) sent by Isosceles. These documents were used to verify the historical ownership of the Property, as described in Section 6.1 of this report. The documents are included in Appendix C (Book 3205, Pages 279-280; Book 5489, Pages 138-139).

8.2 Private Sources of Information

Isosceles requested that the owner of the Property provide available information regarding previous environmental investigations, and the storage, use and disposal of oil or hazardous materials at the Property in a memorandum dated April 29, 2013.

Thomas Feronti responded to our request for information in writing on May 3, 2013, and subsequently provided Isosceles with the following documents:

- Topographic Plan of Land, East Steeple Street to Trout Pond at Mashpee Commons, Mashpee, Massachusetts, November 6, 2007 (Appendix C)
- The deed for each parcel of land from Barnstable County of Deeds (Appendix C)

Additionally, Thomas Feronti provided Isosceles with the following documents:

- A figure taken a from document titled Geohydrologic Study, Proposed Treatment Plant, Mashpee, Massachusetts, GZA, 1986 (Appendix C)
- Electronic version of Topographic Plan of Land, East Steeple Street to Trout Pond at Mashpee Commons, Mashpee, Massachusetts, BSS Design, November 6, 2007 (Appendix C)
- Copies of Table of Contents of DEIR and FEIR prepared for Mashpee Commons (not included in this report).

[16] http://www.mashpeewaterdistrict.com/images/2015/Mashpee%20Water%20Qual%20Rpt%201-15%20REV3.pdf

- Water Resources section of The Master Plan for Mashpee Commons Final Environmental Report and Development of Regional Impact Submittal, Sanborn, Head & Associates, December 29, 2000 (Appendix C)

In 2013, Kristin Gowdy, Portfolio Manager of The Northbridge Companies, provided Isosceles with the following document:

- Plan of Land At Great Neck Road South Mashpee, Massachusetts Prepared For Arnold B. Chase, Jr., BSS Design, November 27, 2007 (Appendix C).

According to Mr, Feronti and Mr. Steve Ordway of Northbridge, no new survey plans of the Property have been prepared since May 2013.

In e-mail communications with Isosceles during the week of July 13-17th, 2015 in response to our written request for information dated July 9, 2015, Mr. Feronti advised Isosceles that no additional information regarding the Property has been developed since May 2013. He confirmed that the planned improvements to the WWTP at the abutting parcel to the northeast had been completed.

8.3 Interview of Knowledgeable Persons

During the performance of this Phase I ESA, M. Margret Hanley of Isosceles interviewed Mr. Thomas Feronti, Construction Manager of Mashpee Commons regarding the current and historical use of and conditions at the Property.

9. Findings of Phase I ESA

9.1 Identification of Recognized Environmental Conditions (RECs)

A REC is defined as the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the Property.

During the performance of this Phase I ESA Update, Isosceles did not identify the presence of any REC at the Property.

9.2 Identification of Historical RECs

Historical RECs are defined by ASTM as an environmental condition which in the past would have been considered a REC, but which may or may not be considered a REC currently.

No historical RECs were identified at the Property during this Phase I ESA.

9.3 De Minimus Conditions.

A *De Minimus* Condition is defined by ASTM as a condition which does not present a threat to human health or the environment, and generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies.

The observation of limited areas of stressed or dead vegetation under the electrical power lines along the easement on Lot 4 of the Property is consistent with the recent use of herbicides. The application of herbicides along utility lines in not prohibited under the MCP, and is specifically permitted under 333 CMR 11.00 which contains provisions for the use of herbicides as part of vegetation management in support of the functioning and use of rights-of-way areas.

We note that the electrical lines within the easement are maintained by NSTAR, which has issued a Vegetation Management Plan (VPM), which addresses the use of herbicides along right of ways, to the Massachusetts Department of Agricultural Resources. A copy of the VMP is available online at http://www.mass.gov/eea/docs/agr/pesticides/rightofway/vmp/nstar-vmp2013-2017feb-draft.pdf.

It is Isosceles' opinion that the presence of stressed or dead vegetation under utility lines due the use of herbicides in accordance with state regulation is a De Minimus condition, as defined by ASTM.

10. Qualifications of Environmental Professional

This Phase I ESA is based on work performed, observations made, and documents reviewed by the Isosceles Group (Isosceles) between July 7 and July 16, 2015, a copy of which is attached as Appendix A.

Ms. Hanley LSP of the Isosceles Group meets the definition of *Environmental Professional* as defined in §312.10 of 40 CFR 312, has the specific qualifications based on education, training, and experience to assess the nature, history, and setting of the subject Property.

Supporting documentation as to Ms. Hanley's qualifications as the person conducting the site reconnaissance and interviews reported herein are attached to this report as Appendix H.

Please let me know if you have any questions regarding the findings of this Phase I ESA Update.

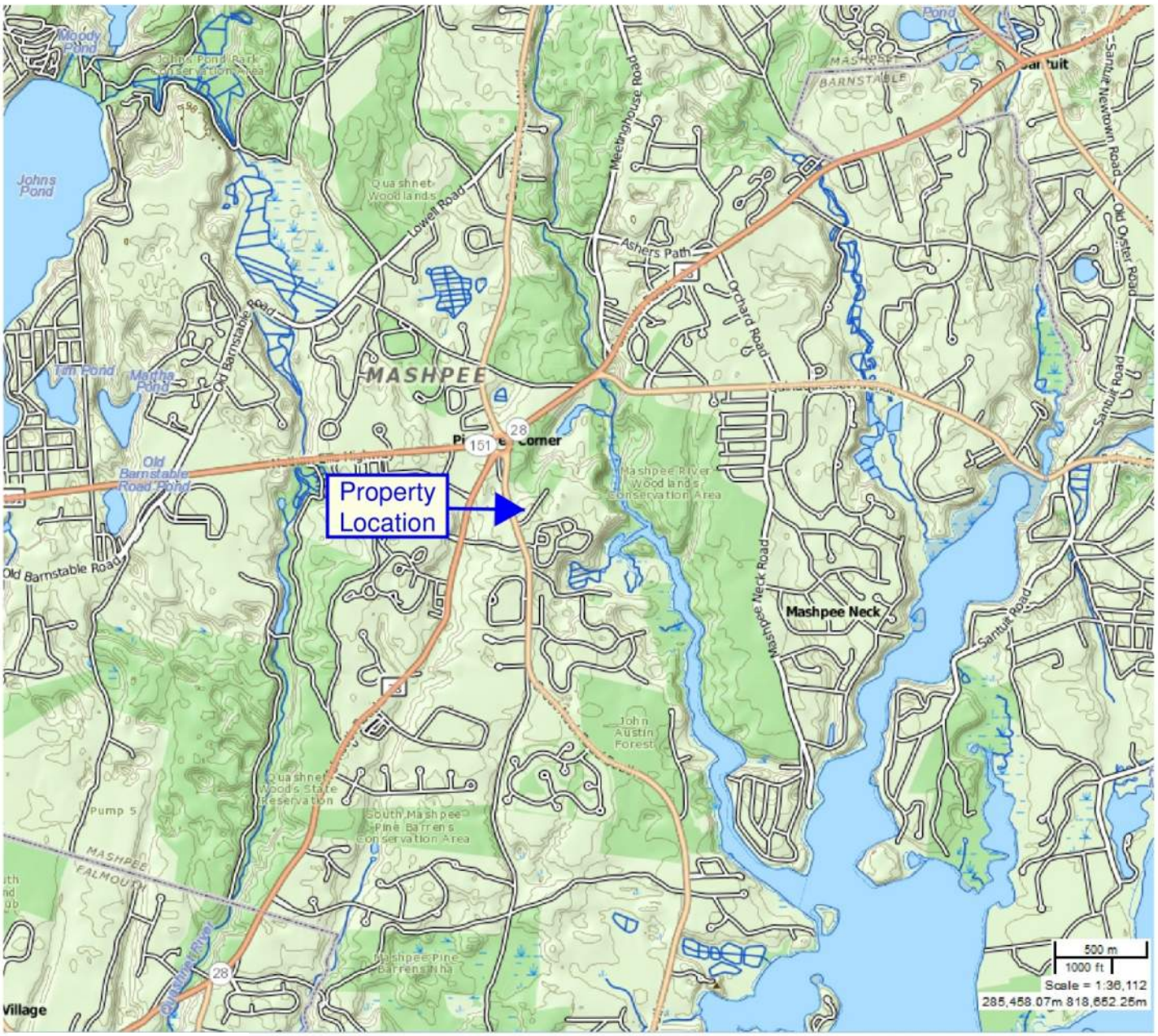
Sincerely,

THE ISOSCELES GROUP

M. Margret Hanley LSP
Principal

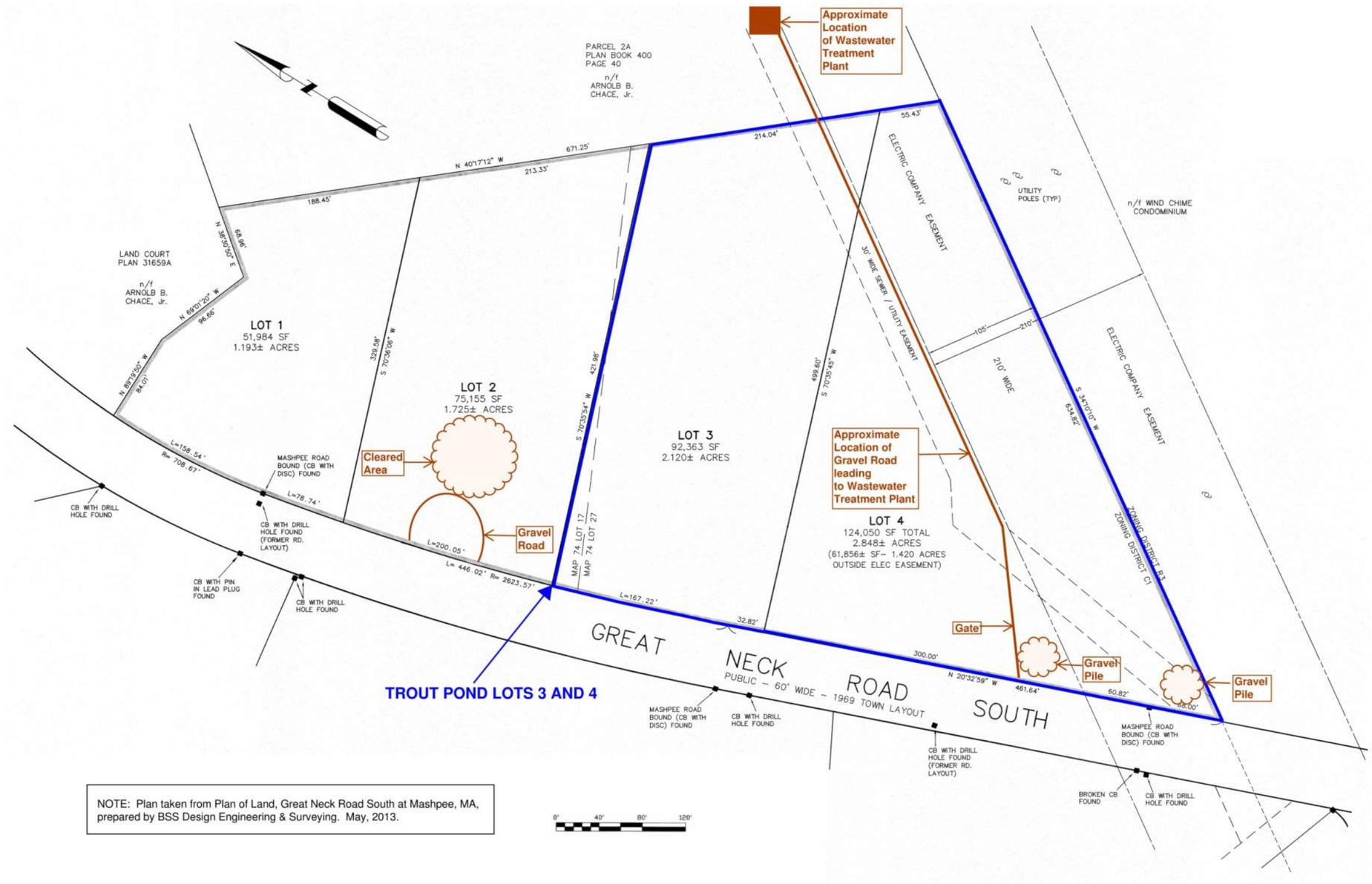
Attachments:

68 Great Neck Road South, Mashpee, MA



MassGIS Online Mapping

Phase I Environmental Site Assessment Trout Pond Lots 3 and 4 Great Neck Road South Mashpee, MA	Figure 1. Property Location	
The Isosceles Group	ISO 15-038	July 2015



NOTE: Plan taken from Plan of Land, Great Neck Road South at Mashpee, MA, prepared by BSS Design Engineering & Surveying. May, 2013.

Phase I Environmental Site Assessment Trout Pond Lots 3 and 4 Great Neck Road South Mashpee, MA	Figure 2. Plan of Property	
The Isosceles Group	ISO 15-038	July 2015

Appendix A

Agreement with Northbridge Companies

The Isosceles Group
50 Congress Street | Boston, MA 02109
Tel: 617.330.2800 | Fax: 617.330.2801

July 7, 2015
Project Number 15-038

Mr. Stephen Ordway
Director of Acquisitions & Development
The Northbridge Companies
71 Third Avenue
Burlington, MA 01803

RE: Phase I Environmental Site Assessment (ESA)
Trout Pond Lots 3 and 4
Great Neck Road South
Mashpee, Massachusetts

Dear Mr. Ordway:

Thank you for asking The Isosceles Group (Isosceles) to provide environmental consulting services to The Northbridge Companies (Northbridge) in support of its acquisition of land referred to as Trout Pond Lots 3 and 4 on Great Neck Road, in Mashpee, Massachusetts (the Property).

This document is intended to confirm your authorization to perform a Phase I Environmental Site Assessment (Phase I ESA) of the Property in general accordance with the ASTM Environmental Site Assessment Standard 1527-13 for Phase I Environmental Site Assessments, and to assist Northbridge in the evaluation of existing and potential environmental liabilities that may be identified during the Phase I ESA. The SOW (SOW) for the Phase I ESA is described below.

Background

The Property consists of two parcels of undeveloped land (Lots 3 and 4) that occupy approximately 4.9 acres of land to the east of and abutting Great Neck Road South in Mashpee, Massachusetts. The Property is bounded to the south by a former railroad easement. Current electric company and sewer/utility easements transect the southernmost parcel (Lot 4). Residential developments are located to the south and west of the Property.

The Property is located within an area identified by the Massachusetts Department of Environmental Protection (DEP) as a potential medium yield aquifer, but is not located within a mapped well head protection area for a public water supply. Public water supply wells and the associated well head protection area are located approximately 1000 feet to the southeast of the Property.

The Property is identified by DEP as the estimated habitat of a rare species.

Isosceles performed a Phase I ESA of this Property in April and May 2013 on behalf of Northbridge, and prepared a Draft Report. However, the report was not finalized.

Compliance with the ASTM Standard requires that Phase I ESA's must be updated after 180days.

Phase I ESA Scope of Work

Lot 3 & 4

The purpose of the Phase I ESA is to (i) evaluate the presence, or potential presence, of RECs at ~~Lot 10~~ in accordance with the ASTM Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process (E 1527 – 13); (ii) to satisfy one of the requirements to qualify for the *innocent landowner*, *contiguous property owner*, or *bona fide prospective purchaser* limitations on Comprehensive Environmental Response, Compensation and Liability Act (42U.S.C. §9601)(CERCLA) liability; and (iii) to demonstrate that it has met the requirements for *"all appropriate inquiry"* into the previous ownership and uses of The Property consistent with good commercial or customary practice" as defined at 42 U.S.C. §9601(35)(B).

Based on our understanding of the conditions at the Property and the surrounding properties, as described above, the following SOW is proposed:

1. **Phase I Assessment consistent with ASTM Standards (ASTM-1527-05).** This assessment includes the following elements:

   a. Record Review

   Isosceles will obtain reasonably accessible public and private records that pertain to the known and potential presence of RECs at the Property that have either been developed, or have been made available to the public, which includes the following:

   Public Records: Federal and State database information for land within .5 mile of the Property, including information for NPL, CERCLIS, RCRA, State Hazardous Waste Sites, State Landfill and Solid Waste Disposal Sites, Underground Storage Tanks (USTs) , Leaking Underground Storage Tanks (LUSTs), and Institutional Controls and/or Land Use Restrictions that may apply to the Property. The data-base information is typically obtained through an electronic database service. Isosceles will also review published topographic and geologic maps for the Property and vicinity.

   This SOW includes the review of files maintained on-line by the Massachusetts Department of Environmental Protection (MADEP) Bureau of Waste Site Cleanup (BWSC) regarding the Property, and adjacent land.

   Isosceles will obtain documents from the Mashpee Fire Department regarding the use, storage, or release of petroleum hazardous materials or oil, at the Property since 2009. Isosceles will also seek to obtain documents regarding the Property at the Mashpee Department of Public Works, Health Department, Assessors' office, and Water Department.

   Private Records: Isosceles will request that Northbridge and the current property owner provide the following information:

- A copy of the Deed or Title to the Property;
- The most recently prepared ALTA/ACSM Plan of the Property;
- Boring and monitoring well installation logs, and test pit logs for investigations performed at the Property, if any;
- Environmental Assessment Reports, letters, memoranda, or documents prepared by, or for, the owners of the Property, including, but not limited to: sewer discharge permits; National Pollution Discharge and Elimination System (NPDES) Permits or permit exclusions; air permits; hazardous waste generators' identification documents or disposal manifests; Resource Conservation and Recovery Act (RCRA) permits; wastewater testing results, Underground Storage Tank (UST) installation and removal permits; hazardous materials or oil spill reports; previously prepared Phase I ASTM reports; and notifications or submittals made to DEP.
- As-built floor plans for previous buildings at the Property, if determined to have been present;
- A summary of current and recent tenants of the property;
- A summary of hazardous material or oil currently or recently used or stored at the Property;
- Plans or documents that identify where hazardous materials or oil are, or have recently been used, stored, or disposed of, at the Property; and
- Documents pertaining to the nature, maintenance, and ownership of the electrical transformers that may be present at the Property.

Isosceles will attempt to obtain copies (hard copy and/or electronic copies, where possible) of all documents that are reviewed during the Phase I ESA. This proposal assumes that Isosceles will obtain up to 100 pages, or incur up to $100.00 in document reproduction costs, as part of this task. If the volume of relevant documents exceeds 100 pages, or $100 in reproduction costs, Isosceles will advise Northbridge and seek authorization to incur additional costs.

b. Property Reconnaissance

Isosceles will visit the Property to observe current uses and conditions. Isosceles reconnaissance will be limited to portions of the Property that are accessible. The presence of equipment, material storage, debris, or other physical obstructions that limit our view of the conditions at the Property (including snow cover) may result in a qualification of our findings.

Pending our review of the documents that are provided by the owner and occupant, Isosceles may recommend additional reconnaissance at the Property. Isosceles assumes that the Property reconnaissance can be completed in one (1) day.

c. Interviews with Owner and Occupants

Isosceles will attempt to interview persons who are knowledgeable of the activities at the Property to obtain information regarding the use, handling and/or disposal of hazardous materials and conditions that may be relevant to the presence of a REC at the Property. Isosceles assumes that the interviews with knowledgeable persons can be performed during the Property reconnaissance, or by telephone.

d. Asbestos/Radon/Lead Survey

We have not been requested to include an asbestos, lead paint, mold, or radon survey in this proposal.

e. Documentation of Users Responsibilities

Isosceles will inquire, and will document in the Phase I ESA Report, the users responsibilities for disclosure under the ASTM Standard, and USEPA's requirements for all appropriate inquiry[1]. Specifically, Isosceles will request that Northbridge respond to the following questions:

- Is the user aware of any environmental liens or activity and use limitations currently recorded against or relating to the subject property?
- Did the user engage a title company or title professional to undertake a review of reasonably ascertainable recorded land title records and lien records?
- Is the user aware of any specialized knowledge or experience that is material to a REC in connection with the subject property?
- If the transaction involves the purchase of the subject property, is the purchase price significantly lower than the fair market value? If you concludc that there is a differcncc, have you considered whether the lower purchase price is because contamination is known or believed to be present at the property?
- Is the user aware of any commonly known or reasonably ascertainable information within the local community about the subject property that is material to a REC?

Documentation of the responsibilities of the users of this Phase I ESA Report, who are not cited in this proposal, is not the responsibility of Isosceles under this SOW.

f. Evaluation and Report

Isosceles will review the information obtained during the Phase I ESA Update, and render opinions based on the data, regarding evidence of RECs at the Property. If data collected or reviewed by Isosceles indicates the need for additional investigation, in order to assess the potential presence of RECs, we will notify you prior to the preparation of the draft Phase I ESA Report.

Isosceles will advise you and/or your counsel of our findings verbally prior to the preparation of the draft Report.

---

[1] See ASTM Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process (E 1527 – 13), Section 6, *Users Responsibilities.*

A draft Report that presents our opinions, a summary of the information reviewed, and observations made during the reconnaissance of the Property will be prepared, in general accordance with the ASTM guidelines for a Phase I ESA Report.

Following your review and approval of the Draft Report, an electronic copy (PDF) of the final Phase I ESA Report will be provided.

This proposal does not include the cost of preparing a final, hard copy version of the final report.

2. Preparation of Reliance Letter for Lender

Upon completion of the Phase I ESA Report, Isosceles will prepare a letter of reliance for lenders, joint venture partners, or other entities related to Northbridge. The reliance letter will require that reliance on the Phase I ESA Report be subject to acceptance of Isosceles' Standard Conditions for Engagement, dated August 1, 2009, a copy of which is attached to this proposal.

3. Evaluation of Recognized Environmental Conditions / Preparation of Documents for Insurance Providers

If requested, Isosceles will work with the current owner of the Property to address identified RECs, and /or develop a summary of the future requirements and costs associated with assessment, monitoring, and /or remediation of the RECs, to support the acquisition of Environmental Impairment Insurance. This task may include the evaluation and verification of the cost of installing, operating, or maintaining remediation or monitoring programs.

4. Meetings with Northbridge

At your request, Isosceles' staff will meet with Northbridge to discuss the findings of the Phase I ESA.

Schedule

Task 1: Isosceles has been requested to complete data collection and analyses associated with this Phase I ESA, and report its findings to Northbridge in a written report at the earliest possible date. Provided that we receive your authorization to proceed on or before July 8, 2015, we anticipate that the draft Phase I ESA Report can be completed and submitted to Northbridge for review on or before July 17, 2015.

Tasks 2, 3 and 4: Isosceles will prepare a reliance letter for Northbridge and its lenders, work with the existing property owner to address existing RECs, and perform an evaluation of costs associated with existing RECs, and attend meetings, at the direction of Northbridge. Please note that the reliance letter must be prepared and dated within six (6) months of the date of the final Phase I ESA Report.

Cost Estimate

Tasks 1 and 2: Isosceles will perform Tasks 1 and 2, as described above, and subject to the limitations cited below, for a lump sum fee of $ 2200.

Tasks 3 and 4: Isosceles will perform Tasks 3 and 4, at Northbridge's direction, on a time and materials basis, in accordance with our Schedule of Fees dated August 1, 2009.

Please note that this proposal does not include the cost of a radon gas, asbestos, mold, or lead paint survey, as described above. Additionally, this proposal and cost estimate does not cover the cost of duplicating more than 100 pages of files that may be maintained by the MassDEP, or the Town of Mashpee public offices.

Terms and Limitations

Isosceles will provide services in accordance with our Standard Conditions for Engagement, dated August 1, 2009, a copy of which is attached to this proposal.

As described herein, Isosceles intends to perform the Phase I ESA in general accordance with ASTM Standard E1527-05 for Phase I Environmental Site Assessments. Deviations from these standards will be identified in the Phase I ESA Report.

Some organizations have developed standards or guidelines for "Due Diligence" or environmental assessments that differ from the cited ASTM Standards. Isosceles does not represent that the Phase I Assessment proposed herein will meet the requirements or guidelines established by other parties.

Subsurface investigations are not proposed as part of this Phase I ESA Update. In the event that subsurface investigations are required, Isosceles will prepare a cost estimate for the work, for approval by Northbridge. If subsurface work is approved by Northbridge, we will request that Northbridge and the current owner of the Property provide Isosceles with documentation regarding the locations of buried utilities and other underground structures in areas of subsurface exploration. Isosceles will take reasonable precautions to avoid damage to buried utilities and other subsurface structures noted. If locations are not known, or cannot be confirmed, then there will be a degree of risk associated with conducting the exploration, to the current owner and Northbridge. In the absence of confirmed underground structure locations, Northbridge agrees to accept the risk of any damages and losses resulting from subsurface exploration work.

The Phase I ESA proposed in the letter does not include an assessment of the presence or absence of lead paint, radon gas, asbestos, bacteriological agents (including mold or fungus), or naturally occurring materials at the Property, or past or current compliance of the Property owner or tenants, with state or federal environmental regulations.

This proposal does not include the cost of preparing a hard copy version of the Final Report.

The estimation of future response actions and costs related to RECs, if identified, will be based on our understanding of the current requirements of the DEP, local agencies, and applicable federal regulations. Future changes in the state of federal policies or regulations could result in a change in the future response actions that may be required in order to achieve regulatory closure.

Isosceles' opinions regarding the presence of RECs will rely only upon the observations made during the Property reconnaissance; interviews with persons who are knowledgeable of the Property; the historical land use information reviewed as part of the Phase I ESA; and, if available, the reported results of subsurface investigations performed by others at, and adjacent to the Property. Information regarding conditions at the Property that was not made available to Isosceles during the Phase I ESA may result in a change in the opinions presented in the Phase I ESA Report.

Northbridge acknowledges that the Phase I ESA is intended to satisfy one of the requirements to qualify for the *innocent landowner*, *contiguous property owner*, or *bona fide prospective purchaser* limitations on Comprehensive Environmental Response, Compensation and Liability Act (42U.S.C. §9601)(CERCLA) liability, and to demonstrate that it has met the requirements for *"all appropriate inquiry"* into the previous ownership and uses of the Property consistent with good commercial or customary practice" as defined at 42 U.S.C. §9601(35)(B).

Northbridge also acknowledges that this Phase I ESA is presumed to be valid for the purpose of meeting CERCLA requirements for "all appropriate inquiry" for up to 180 days following the date of the final Phase I ESA Report.[2] If within this period the assessment will be used by a different *user* than the *user* for whom the assessment was originally prepared, the subsequent *user* must also satisfy the User's Responsibilities set forth in the ASTM Standard. Documentation of the responsibilities of the users of this Phase I ESA Report, who are not cited in this proposal, is not the responsibility of Isosceles under this Scope of Work. Other users and environmental professionals may use information presented in the Phase I ESA report described herein after 180 days, provided that they independently verify that such information was generated in accordance with the ASTM Standard, but such information shall not be used without an updated investigation of conditions likely to affect RECs in connection with the Property. Additional tasks may be necessary to document conditions that may have changed materially since the completion of the Phase I ESA, proposed herein.

Please call me at 617.330.2803 if you have any questions regarding this proposal.

If you find the terms of this proposal acceptable, please sign this letter in the space provided below and return one copy to our offices at 50 Congress Street, Boston, Massachusetts.

Thank you again for considering Isosceles.

THE ISOSCELES GROUP

---

[2] See ASTM Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process (E 1527 – 05), Section 4.6 *Continued Viability of Environmental Site Assessment*, and Section 6, *Users Responsibilities.*

M. Margret Hanley LSP
Principal

AGREED AND ACCEPTED:

(for Trout Pond Lots 3 and 4, Mashpee, Massachusetts)

The Northbridge Companies

By: _____

Name: Stephen Ordway

Title: Director

Date: 7/7/15

Appendix B

Assessor's Office Documents

Key: 5532 **Town of Mashpee - Fiscal Year 2015** 11/18/2014 5:49 pm SEQ #: 5,426

LEGAL

CURRENT OWNER	PARCEL ID	LOCATION
GNRS-MA LLC **46 ABORN STREET** **4TH FLOOR** **PROVIDENCE, RI 02903**	**74-27-0**	**68 GREAT NECK RD. SOUTH**

TRANSFER HISTORY	DOS	T	SALE PRICE	BK-PG (Cert)
GNRS-MA LLC	01/10/2013	V	1	27029-15
CHACE, ARNOLD B JR	12/30/1986	QS	451,130	5489-138
SCHILLING THEODORE A TR	03/30/1984	XX	35,000	4049-202

CLASS	CLASS%	DESCRIPTION	BN ID	BN	CARD
3900	**100**	**COM DEV LAND**			**1 of 1**

PMT NO	PMT DT	TY	DESC	AMOUNT	INSP	BY	1st	%
		7	CYCLICAL REV		09/04/2012	MRB	100	100
		7	CYCLICAL REV		07/06/2009	TWM	100	100
	04/05/2007	42	ABATEMENT IN		01/15/2007	JRS	100	100

LAND

CD	T	AC/SF/UN	Area	Infl-1	Infl-2	ADJ BASE	SAF	Topo	Lpi	VC	CREDIT AMT	ADJ VALUE
103	S	40,000	C-1 1.00	100 1.00	100 1.00	570,900	1.00	100 1.00	C08 3.30			524,240
300	A	4.012	C-1 1.00	E09 0.95	100 1.00	37,620	1.00	100 1.00	C08 3.30			150,930

TOTAL 4.930 Acres ZONING C1 FRNT 0

Area	C1
Infl-1	NO ADJUST
Infl-2	NO ADJUST

NOTE: EL ROW ALNG LWR SIDE 1A

ASSESSED	CURRENT	PREVIOUS
LAND	675,200	673,800
BUILDING	0	0
DETACHED	0	0
OTHER	0	0
TOTAL	**675,200**	**673,800**

DETACHED

TY	QUAL	COND	DIM/NOTE	YB	UNITS	ADJ PRICE	RCNLD

PHOTO [07/06/2009]

BLDG COMMENTS

BUILDING

BUILDING	CD	ADJ	DESC
MODEL			
STYLE			
QUALITY			
FRAME			

MEASURE		
LIST		
REVIEW		

BUILDING

YEAR BLT		SIZE ADJ	
NET AREA		DETAIL ADJ	
$NLA(RCN)		OVERALL	

CAPACITY	UNITS	ADJ

ELEMENT	CD	DESCRIPTION	ADJ

S	BAT	T	DESCRIPTION	UNITS	YB	ADJ PRICE	RCN

TOTAL RCN

CONDITION ELEM	CD

EFF.YR/AGE

COND	
FUNC	
ECON	
DEPR	% GD

RCNLD

Key: 5527

Town of Mashpee - Fiscal Year 2015

11/18/2014 5:49 pm SEQ #: 5,393

LEGAL

CURRENT OWNER	PARCEL ID	LOCATION
GNRS-MA LLC **46 ABORN STREET** **4TH FLOOR** **PROVIDENCE, RI 02903**	**74-17-0**	**38 GREAT NECK RD. SOUTH**

TRANSFER HISTORY	DOS	T	SALE PRICE	BK-PG (Cert)
GNRS-MA LLC	01/10/2013	V	1	27029-15
CHACE, ARNOLD B JR	12/05/1980	XX	65,000	3204-279

CLASS	CLASS%	DESCRIPTION	BN ID	BN	CARD
3900	**100**	**COM DEV LAND**			**1 of 1**

PMT NO	PMT DT	TY	DESC	AMOUNT	INSP	BY	1st	%
		7	CYCLICAL REV		09/04/2012	MRB	100	100
		7	CYCLICAL REV		07/06/2009	TWM	100	100

LAND

CD	T	AC/SF/UN	Area	Infl-1	Infl-2	ADJ BASE	SAF	Topo	Lpi	VC	CREDIT AMT	ADJ VALUE
103	S	40,000	C-1 1.00	100 1.00	100 1.00	311,400	1.00	100 1.00	C05 1.80			285,950
203	S	90,692	C-1 1.00	100 1.00	100 1.00	124,560	1.00	100 1.00	C05 1.80			259,330

TOTAL	3.000 Acres	ZONING	C1	FRNT	0
Area	C1	NOTE	NEAR WTR TRTMNT		
Infl-1	NO ADJUST				
Infl-2	NO ADJUST				

ASSESSED	CURRENT	PREVIOUS
LAND	545,300	528,100
BUILDING	0	0
DETACHED	0	0
OTHER	0	0
TOTAL	**545,300**	**528,100**

DETACHED

TY	QUAL	COND	DIM/NOTE	YB	UNITS	ADJ PRICE	RCNLD

PHOTO [07/06/2009]

BLDG COMMENTS

BUILDING

BUILDING	CD	ADJ	DESC
MODEL			
STYLE			
QUALITY			
FRAME			

MEASURE		
LIST		
REVIEW		

YEAR BLT		SIZE ADJ	
NET AREA		DETAIL ADJ	
$NLA(RCN)		OVERALL	

CAPACITY	UNITS	ADJ

ELEMENT	CD	DESCRIPTION	ADJ

S	BAT	T	DESCRIPTION	UNITS	YB	ADJ PRICE	RCN

TOTAL RCN

CONDITION ELEM	CD

EFF.YR/AGE

COND
FUNC
ECON
DEPR % GD

RCNLD

Key: 5552 **Town of Mashpee - Fiscal Year 2015** 11/18/2014 5:49 pm SEQ #: 5,448

LEGAL

CURRENT OWNER	PARCEL ID	LOCATION
MASHPEE COMMONS L P **P O BOX 1530** **MASHPEE, MA 02649**	**75-10-0**	**0 GREAT NECK RD. SOUTH**

TRANSFER HISTORY	DOS	T	SALE PRICE	BK-PG (Cert)
MASHPEE COMMONS L P	01/20/1994	B	260,000	9021-275
CHACE ARNOLD B JR	06/18/1986	XX	50,000	5145-63

CLASS	CLASS%	DESCRIPTION	BN ID	BN	CARD
4130	100	OTHER		1	1 of 1

PMT NO	PMT DT	TY	DESC	AMOUNT	INSP	BY	1st	%
		7	CYCLICAL REV		07/01/2014	MRB	100	100
		45	I & E FORMS		06/25/2014	SLD	100	100
2013-0201	09/04/2013	2	ADDITIONS	213,238			0	0
2005-234	05/25/2006	1	NEW CONST			SAL	0	100

LAND

CD	T	AC/SF/UN	Area		Infl-1		Infl-2		ADJ BASE	SAF	Topo		Lpi		VC	CREDIT AMT	ADJ VALUE
103	S	40,000	C-1	1.00	A09	0.75	100	1.00	233,550	1.00	100	1.00	C05	1.80			214,460
303	A	12.002	C-1	1.00	100	1.00	100	1.00	24,300	1.00	100	1.00	C05	1.80			291,650

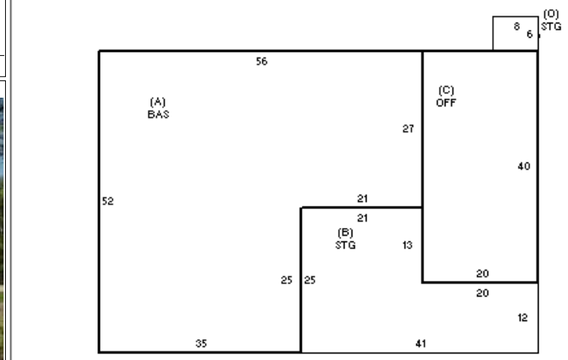
TOTAL	12.920 Acres	ZONING	C1	FRNT	0
Area	C1	NOTE	LOT 2A WAS 75-1;75-1 NOW 5AC 0- = EASEMENT VALUE OF TREATMENT PLANT REFLECTED IN COMMONS LAND.		
Infl-1	ACCESS-25				
Infl-2	NO ADJUST				

ASSESSED	CURRENT	PREVIOUS
LAND	506,100	497,200
BUILDING	156,600	155,900
DETACHED	0	0
OTHER	0	0
TOTAL	**662,700**	**653,100**

DETACHED

TY	QUAL	COND	DIM/NOTE	YB	UNITS	ADJ PRICE	RCNLD

PHOTO [05/25/2006]



BUILDING

BUILDING	CD	ADJ	DESC
MODEL	5		CIM
STYLE	58	0.91	UTILITY [100%]
QUALITY	B	1.25	GOOD [100%]
FRAME	2	1.03	MASONRY [100%]

MEASURE	7/1/2014	MRB
LIST	7/1/2014	MRB
REVIEW		

BLDG COMMENTS

Wstwtr Trtmnt Fclty / 180G gl per day / Percolcation
sand beds at rear / atu = vntng / Spclzd Fndtn - 16' dpth
n BAS area / no sprnklrs

YEAR BLT	1989	SIZE ADJ	1.058
NET AREA	3,187	DETAIL ADJ	0.916
$NLA(RCN)	$78	OVERALL	1.000

CAPACITY	UNITS	ADJ
STORIES	1	1.00
ROOMS	1	1.00
BEDROOMS	0	1.00
BATHROOMS	0	1.00
UNITS	1	1.00
HALFBATHS	1	1.00
% HEATED	100	1.00
% A/C	0	1.00
% SPRINKLERS	0	1.00

ELEMENT	CD	DESCRIPTION	ADJ
FOUNDATION	5	OTHER	1.00
EXT. COVER	15	CONC/ CC BLOCK	0.97
ROOF SHAPE	1	GABLE	1.00
ROOF COVER	1	ASPH/COMP SHIN	1.00
FLOOR COVER	10	CONCRETE	0.98
INT. FINISH	7	OTHER	1.00
HEATING/COOLING	1	FORCED AIR	1.00
FUEL SOURCE	2	GAS	1.00

S	BAT	T	DESCRIPTION	UNITS	YB	ADJ PRICE	RCN
A	BAS	L	BAS AREA	2,387	1989	71.84	171,474
+	STG	N	STORAGE	813		24.12	19,612
C	OFF	L	OFFICE	800	1989	71.84	57,469

TOTAL RCN	248,555

CONDITION ELEM	CD

EFF.YR/AGE	1990 / 23		
COND	37	37%	
FUNC	0		
ECON	0		
DEPR	37	% GD	63

RCNLD	$156,600

Key: 5542

Town of Mashpee - Fiscal Year 2015

11/18/2014 5:49 pm SEQ #: 5,437

LEGAL

CURRENT OWNER	PARCEL ID	LOCATION
MASHPEE COMMONS L P **PO BOX 1530** **MASHPEE, MA 02649**	**74-38-0**	**47 GREAT NECK RD. SOUTH**

TRANSFER HISTORY	DOS	T	SALE PRICE	BK-PG (Cert)
MASHPEE COMMONS L P		ZZ		-

CLASS	CLASS%	DESCRIPTION	BN ID	BN	CARD
3900	**100**	**COM DEV LAND**			**1 of 1**

PMT NO	PMT DT	TY	DESC	AMOUNT	INSP	BY	1st	%
		7	CYCLICAL REV		07/06/2009	TWM	100	100
		7	CYCLICAL REV		09/04/0112	MRB	100	100

LAND

CD	T	AC/SF/UN	Area		Infl-1		Infl-2		ADJ BASE	SAF	Topo		Lpi		VC	CREDIT AMT	ADJ VALUE
103	S	40,000	C-1	1.00	100	1.00	100	1.00	570,900	1.00	100	1.00	C08	3.30			524,240
203	S	352,040	C-1	1.00	100	1.00	100	1.00	171,270	1.00	S11	0.75	C08	3.30			1,384,160

TOTAL	9.000 Acres
Area	C1
Infl-1	NO ADJUST
Infl-2	NO ADJUST

ZONING C1 FRNT 0

NOTE: 74-13, 74-14--SPECIAL VARIANCE

ASSESSED	CURRENT	PREVIOUS
LAND	1,908,400	1,848,000
BUILDING	0	0
DETACHED	0	0
OTHER	0	0
TOTAL	**1,908,400**	**1,848,000**

DETACHED

TY	QUAL	COND	DIM/NOTE	YB	UNITS	ADJ PRICE	RCNLD

PHOTO [07/06/2009]

BLDG COMMENTS

BUILDING

BUILDING	CD	ADJ	DESC
MODEL			
STYLE			
QUALITY			
FRAME			

MEASURE		
LIST		
REVIEW		

YEAR BLT	
NET AREA	
$NLA(RCN)	

SIZE ADJ	
DETAIL ADJ	
OVERALL	

CAPACITY	UNITS	ADJ

ELEMENT	CD	DESCRIPTION	ADJ

S	BAT	T	DESCRIPTION	UNITS	YB	ADJ PRICE	RCN

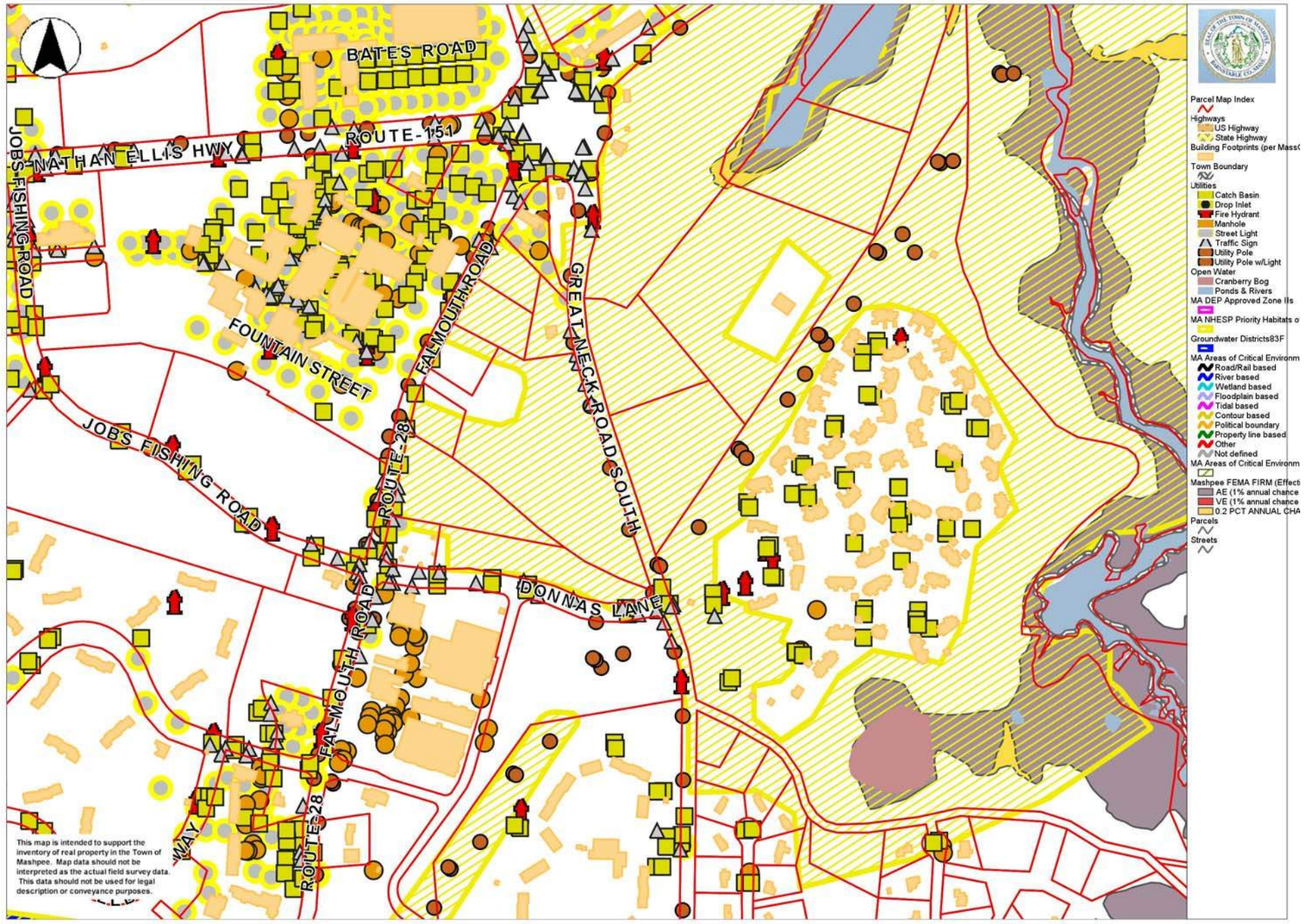
TOTAL RCN

CONDITION ELEM	CD

EFF.YR/AGE

COND
FUNC
ECON
DEPR % GD

RCNLD



0 680 1360 ft

Printed on 07/13/2015 at 05:42 PM

Property Plan

Appendix C

Assessor's Office Documents

GNRS – MA, LLC

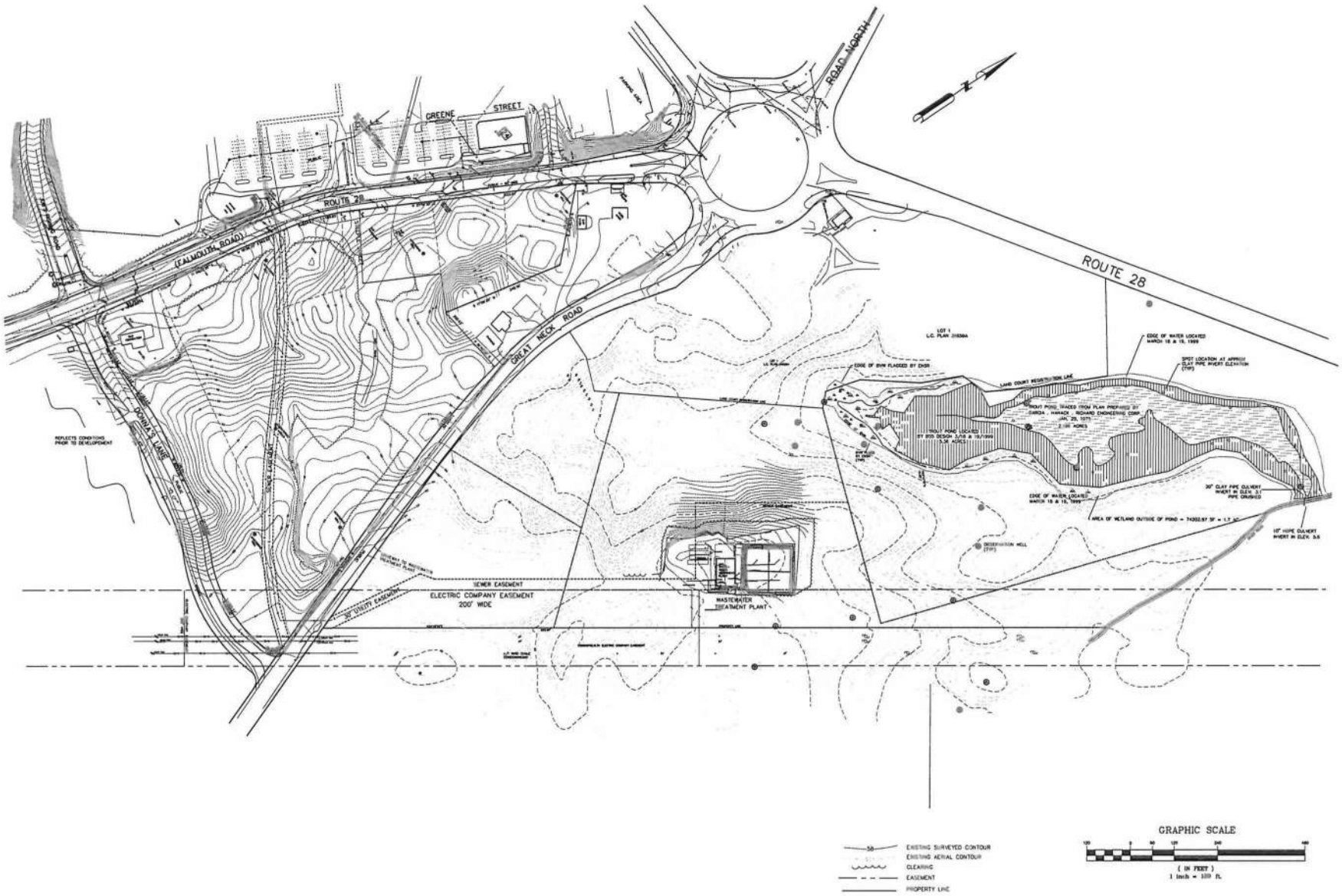
To: Margaret Hanley LSP, The Isosceles Group
From: Tom Feronti, Mashpee Commons LP
Re: Request for Information to Support ASTM Phase I Environmental Assessment (Phase I ESA), Trout Pond Lots 3 and 4, Great Neck Road South, Mashpee, Massachusetts; ISO Project No. 13-002
Date: April 30, 2013
Copy: Mr. Arnold B. Chace, GNRS-MA, LLC

In response to the Request for Information submitted on April 29, 2013, please see below for responses to the itemized requests:

1. The survey plan as prepared by BSS Design is attached as Attachment A.
2. The deed for each parcel of land is included as Attachment B.
3. The property has been undeveloped under the current ownership and no previous development of the property is known.
4. There are no, nor have there been previously, tenants located on either of the parcels.
5. There are neither Underground Storage Tanks nor Aboveground Storage Tanks known to be on either parcel.
6. There are no structures located on either parcel.
7. There has been no known storage, use, or disposal of hazardous materials on either parcel.
8. There are no monitoring wells located on either parcel. The monitoring wells located on surrounding parcels are identified on the survey plan as prepared by BSS Design.
9. There has been no previous testing on either property of Groundwater, Soil, or Surface Water.
10. There are no transformers located on either parcel.
11. There is no paved area on either parcel and, therefore, no NPDES Permits and/or Storm Water Certificates.
12. There are no existing on-site septic systems. The attached survey as prepared by BSS Design locates the sewer easement which includes the sewer line that connects to the existing Wastewater Treatment Facility on an adjoining parcel.
13. There are no chemicals stored on either parcel.
14. There are no, nor have there been, chemicals used on the property.
15. There are no tenants located on either parcel and, therefore, there are no waste disposal contractors under contract.
16. There have been no previous Environmental Reports completed for either parcel.
17. There is no known information regarding any hazardous materials at adjacent and/or upgradient properties.

46 Aborn Street Providence, Rhode Island 02903 401-421-0254

Attachment A



BSS DESIGN

LAND SURVEYING
CIVIL ENGINEERING
LAND PLANNING

BSS Design, Incorporated
104 Nathaniel Lee Boies Rd
Falmouth Massachusetts 02540
508.540.8505 Fax 508.548.8515

TOPOGRAPHIC PLAN OF LAND
EAST STEEPLE STREET TO TROUT POND
AT
MASHPEE COMMONS
MASHPEE, MASSACHUSETTS

scale	1" = 120'
date	NOV. 6, 2007
drawn	RAR
checked	
job number	
revisions	
sheet	
title	
drawing number	

Attachment B

31021

We, CARLETON H. COLLINS, of Whistler Way, P. O. Box 237, Waquoit, Barnstable County, Massachusetts, and ERDINE F. SWAIN of Waquoit Highway, Waquoit, Barnstable County, Massachusetts, in consideration of SIXTY-FIVE THOUSAND AND 00/100 ($65,000.00) DOLLARS paid, grant to ARNOLD B. CHACE, JR. of P. O. Box 765, Great Island, West Yarmouth, Barnstable County, Massachusetts, with QUITCLAIM COVENANTS, the land in Mashpee, Barnstable County, Massachusetts, being more particularly bounded and described as follows:

BEGINNING At a stake on the Great Neck Road "so-called" and at southwest corner of land now or formerly of Lydia Keeter;

THENCE Northerly by said road to the junction of Great Neck Road with Jobs Road "so-called";

THENCE Easterly across Jobs Road to land now or formerly of Matthias Amos;

THENCE Southeasterly to land of Lydia Keeter;

THENCE Westerly by Land of Lydia Keeter to the first mentioned bound.

Containing about three acres, be the same more or less.

Being the same premises formerly owned by James Amos.

For title see deed of William H. Simons to Wallis F. Harlow dated February 17, 1921, recorded in Barnstable County Registry of Deeds Book 379 Page 527. See also estate of Wallis F. Harlow, Barnstable County Probate Case No. 35981 and Estate of Marion H. Collins, Barnstable County Probate Case No. 57140.

WITNESS our hands and seals this 5th day of December 1980.

Carleton H. Collins

Erdine F. Swain

COMMONWEALTH OF MASSACHUSETTS
DEEDS EXCISE
148.20

COMMONWEALTH OF MASSACHUSETTS

BARNSTABLE, ss.

December 5, 1980

Then personally appeared the above named [illegible] COLLINS and acknowledged the foregoing instrument to be his free act and deed, before me

Notary Public
My commission expires: 11/4/85

COMMONWEALTH OF MASSACHUSETTS

BARNSTABLE, ss.

December 5, 1980

Then personally appeared the above named ERELINE F. SWAIN and acknowledged the foregoing instrument to be her free act and deed, before me

Notary Public
My commission expires:

[illegible]
[illegible]
[illegible]
[illegible]

BARNSTABLE COUNTY
REGISTRY OF DEEDS
A TRUE COPY, ATTEST
JOHN F. MEADE, REGISTER

RECORDED DEC 5 80

 95325

QUITCLAIM DEED

I, THEODORE A. SCHILLING, of Barnstable (Osterville), Barnstable County, Massachusetts, Trustee of Horizon Realty Trust under a Declaration of Trust dated March 30, 1984 and recorded at the Barnstable County Registry of Deeds in Book 4049, Page 198,

for consideration of FOUR HUNDRED FIFTY-ONE THOUSAND ONE HUNDRED THIRTY-THREE AND 28/100 ($451,133.28) DOLLARS,

grant to ARNOLD B. CHACE, JR. of 731 Hospital Trust Building, Providence, R. I.,

with QUITCLAIM COVENANTS,

a certain parcel of vacant land situated in Mashpee, Barnstable County, Massachusetts, bounded and described as follows:

NORTHERLY by land now or formerly of the Grantee, four hundred eighteen and 76/100 (418.76) feet;

NORTHEASTERLY by land now or formerly of the Grantee, two hundred eighty-six and 80/100 (286.80) feet;

SOUTHEASTERLY by land now or formerly of the Grantor, six hundred thirty-four and 82/100 (634.82) feet; and

WESTERLY by Great Neck Road, six hundred four and 17/100 (604.17) feet.

Said premises contain approximately 4.93 acres, as shown as Parcel 1A on a plan of land entitled "Plan of Land in Mashpee, Mass. for Bonita Trust, River Road Trust, Arnold B. Chace Jr., & Horizon Trust", dated May 29, 1985 and revised June 18, 1985, drawn by Baxter & Nye, Inc., Registered Land Surveyors, and recorded at the Barnstable County Registry of Deeds in Plan Book 400, Page 40.

Being a part of the premises granted to me by Elise H. Otis by deed dated March 29, 1984 and recorded at the Barnstable County Registry of Deeds in Book 4049, Page 202.

WITNESS my hand and seal this 12th day of December, 1986.

HORIZON REALTY TRUST

Theodore A. Schilling, as Trustee
and not individually

COMMONWEALTH OF MASSACHUSETTS

BARNSTABLE, SS Dec 29, 1986

Then personally appeared the above-named Theodore A. Schilling, Trustee as aforesaid, and acknowledged the foregoing instrument to be his free act and deed as Trustee, before me,

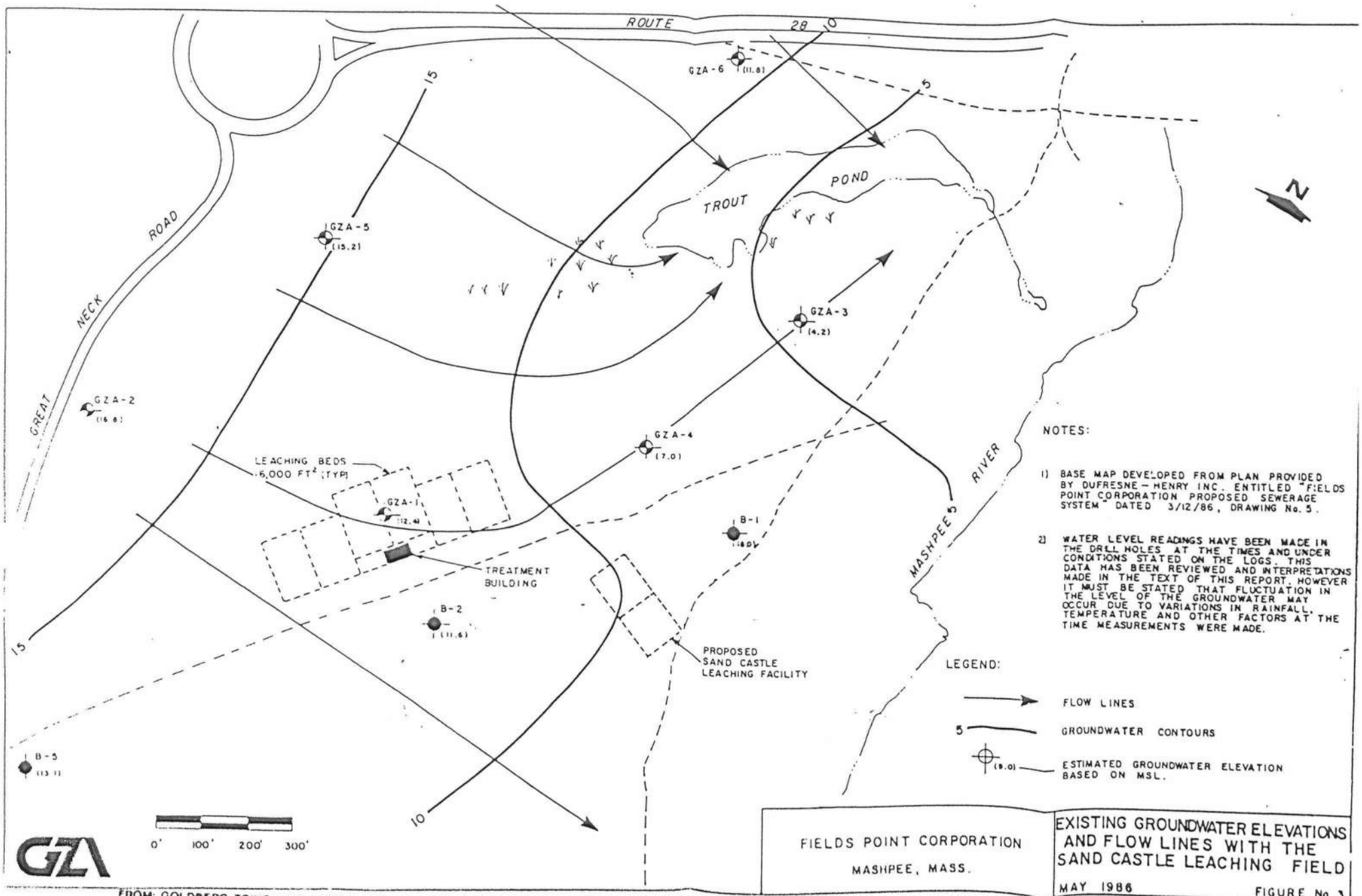
Notary Public
My commission expires: 12/4/92

CANCELLED

CANCELLED

DEC 30 86

BARNSTABLE COUNTY
REGISTRY OF DEEDS
A TRUE COPY, ATTEST
JOHN F. MEADE, REGISTER



FROM: GOLDBERG-ZOINO AND ASSOCIATES, INC. 1986. GEOHYDROLOGIC STUDY, PROPOSED TREATMENT PLANT, MASHPEE, MASSACHUSETTS. GZA, NEWTON UPPER FALLS, MA.

BSS
DESIGN

LAND SURVEYING
CIVIL ENGINEERING
LAND PLANNING

BSS Design, Incorporated
164 Katharine Lee Bates Rd
Falmouth Massachusetts 02540
508.540.8805 FAX 508.548.8313

TOPOGRAPHIC PLAN OF LAND
EAST STEEPLE STREET TO TROUT POND
AT
MASHPEE COMMONS
MASHPEE, MASSACHUSETTS

GREENE STREET
ROUTE 28
(FALMOUTH ROAD)
ROAD NORTH
ROUTE 28
BOB'S FISHING ROAD
DONNA'S LANE
GREAT NECK ROAD
PARKING AREA
PUBLIC
PUBLIC - 60' WIDE
SEWER EASEMENT
REFLECTS CONDITIONS
PRIOR TO DEVELOPEMENT
LOT 1
L.C. PLAN 31659A
LOT 2
L.C. PLAN 31659A
EDGE OF BVW FLAGGED BY ENSR
LAND COURT REGISTRATION LINE
EDGE OF WATER LOCATED
MARCH 18 & 19, 1999
SPOT LOCATION AT APPROX
CLAY PIPE INVERT ELEVATION
(TYP)
TROUT POND TRACED FROM PLAN PREPARED BY
GARCIA . HANACK . RICHARD ENGINEERING CORP.
JAN. 29, 1975
2.196 ACRES
TROUT POND LOCATED
BY BSS DESIGN 3/18 & 19/1999
5.36 ACRES
BVW FLAGS
BY ENSR
(TYP)
30" CLAY PIPE CULVERT
INVERT IN ELEV. 3.1
PIPE CRUSHED
EDGE OF WATER LOCATED
MARCH 18 & 19, 1999
AREA OF WETLAND OUTSIDE OF POND = 74202.87 SF = 1.7 AC
10" HDPE CULVERT
INVERT IN ELEV: 5.6
OBSERVATION WELL
(TYP)
RIVER ROAD
SEWER EASEMENT
ELECTRIC COMPANY EASEMENT
200' WIDE
30' UTILITY EASEMENT
DRIVEWAY TO WASTEWATER
TREATMENT PLANT
WASTEWATER
TREATMENT PLANT
PROPERTY LINE
COMMONWEALTH ELECTRIC COMPANY EASEMENT
n/f WMD CHASE
CONDOMINIUMS
922.87
S 34°10'10" E
EXISTING DRAINAGE EASEMENT
200' WIDE

58 EXISTING SURVEYED CONTOUR
57 EXISTING AERIAL CONTOUR
CLEARING
EASEMENT
PROPERTY LINE

GRAPHIC SCALE
120 0 60 120 240 480
(IN FEET)
1 inch = 120 ft.

scale	1" = 120'
date	NOV. 6, 2007
drawn	RAR
checked	
job number	
revisions	
sheet	
title	
drawing number	

5. WATER RESOURCES

The following responds to the comments in the *Certificate of the Secretary of Environmental Affairs on the Draft Environmental Impact Report* (4/28/00) and the Cape Cod Commission's *Subcommittee Review Report on the Mashpee Commons Master Plan* (4/12/00). The remainder of the comments is addressed in the report by SHA (see attachment 5.3).

Comment *All solid sumps should be at least 4 feet in depth unless adequate justification for shallower depths is provided.*

Response This requirement has been noted.

Comment *Clarification is needed on the ability of the Mashpee Water District to provide drinking water to the Trout Pond neighborhood.*

Response David Rich, Operations Manager of the Mashpee Water District, noted in a letter dated May 10, 2000 (see attachment 5.2) the following:

> "The areas of development which are under agreement to be serviced by the Mashpee Water District are the current Mashpee Commons area, Jobs Fishing Road, North Market Street, Whitings Road, East Steeple Street and Trout Pond.
>
> The District's obligation to supply is outlined in the existing utility agreement with Fields Point and is unchanged since the signing of said agreement. The agreement states, in part, that the District has sufficient supply to service the water supply needs of all the proposed development within the Mashpee Commons development."

Comment *Additional information is requested regarding potential impacts of the development on public water supply wells. Staff recommends that the applicant clarify if these wells are utilized and if so, what impacts might be expected from the development.*

Response Commission staff asked Mashpee Commons, L.P. to clarify whether certain wells are utilized. David Rich, of the Mashpee Water District, provided the following information. The properties known as Pine Tree Plaza, Kitchen Magician Restaurant, Offices of Doctors Dorzerta and Smith, and Michele's Kitchen (listed by Commission staff as Fabio's Restaurant) are all on district water. Pickwick's Restaurant (listed by the Commission) has burned down.

5.2

Mashpee Water District

10-B Cape Drive
Mashpee, Massachusetts 02649
Telephone 508-477-6767
Fax 508-539-0382

"for generations unborn"

RECEIVED
MAY 12 2000
By

May 10, 2000

Mr. Douglas Storrs
Point Gammon Limited Partnership
731 Hospital Trust Building
Providence, R.I., 02903

Re: Water Availability – Mashpee Commons

Dear Mr. Storrs:

Pursuant to our earlier conversation, I wish to clarify Mashpee Water District's position as to providing water supply to the future development of Mashpee Commons. The areas of development which are under agreement to be serviced by the Mashpee Water District are the current Mashpee Commons area, Jobs Fishing Road, North Market Street, Whitings Road, East Steeple Street and Trout Pond.

The District's obligation to supply is outlined in the existing utility agreement with Fields Point and is unchanged since the signing of said agreement. The agreement states, in part, that the District has sufficient supply to service the water supply needs of all the proposed development within the Mashpee Commons development. Agreed upon limits of development are listed in the attached capacity analysis.

If I can be of any further assistance to you in this matter, please feel free to contact me at any time.

Sincerely,

David Rich Jr.
Operations Manager

cc: commissioners

WATER RESOURCES

Introduction

The Scope of Work included in the MEPA Certificate (EOEA 5913) dated October 30, 1998, regarding the Notice of Project Change for the Mashpee Commons Master Plan, identified issues related to the water resource impacts associated with stormwater runoff, increased domestic wastewater generation, and increased water supply demand. Those issues were addressed in the Water Resources section of the Draft Environmental Impact Report (DEIR).

This section of the Final Environmental Impact Report (FEIR) responds to the water resource related comments on the DEIR provided by the State, the Cape Cod Commission (Commission), the Town of Mashpee (Town)and individual citizens. This portion of the FEIR has been prepared by Sanborn, Head & Associates, Inc. (SHA) on behalf of Mashpee Commons, L.P.

The proposed neighborhoods of Mashpee Commons represent an opportunity to demonstrate how increased awareness and improved technology can be applied to better manage nitrogen impacts than has been historically the case on Cape Cod and within the Popponesset Bay watershed. The project provides an opportunity to begin to restore the Bay's estuarian system.

The proposed build out of the five neighborhoods will incorporate mitigation to offset the potential change in nutrient loading to groundwater in the Popponesset Bay watershed. The proposed mitigation efforts will result in no net change in the total nitrogen loading. These efforts will begin the process of providing tertiary treatment to a larger portion of the watershed and with time will move toward an overall improvement compared to current conditions.

The following section of the FEIR provides responses to nine primary water resource related questions that were raised in the various comments to the DEIR. These nine questions are a combination of the comments, and are intended to respond to the underlying concern raised regarding how the total nitrogen loading impact from the proposed construction will be offset.

1. *How can the Mashpee Commons expansion be constructed without increasing the annual nitrogen load that enters the Mashpee River and Popponesset Bay?*

1.1 Response

This proposal follows the guidance of the Commission to estimate the entire total nitrogen loading that will result from new development. This will be a combination of land use related nitrogen loading in stormwater, and the domestic wastewater loading in the effluent of the expanded and upgraded Mashpee Commons wastewater treatment plant (WWTP).

Paul M. Sanborn = Charles L. Head = Mathew A. DiPilato
Duncan W. Wood = R. Scott Shillaber = Charles A. Crocetti = Daniel B. Carr
Sanborn, Head & Associates, Inc.
239 Littleton Road, Suite 1C = Westford, Massachusetts 01886
Fax (978) 392-0987 = Phone (978) 392-0900

The project design includes the collection and treatment of existing wastewater generated by properties near the Mashpee Rotary and within the Mashpee River watershed. The existing wastewater is currently discharged though conventional septic systems without the benefit of any form of nitrogen removal. The annual mass of nitrogen in the wastewater will be removed by a factor of approximately seven once the wastewater is connected to the expanded and upgraded WWTP.

A major goal of the design of the Mashpee Commons Master Plan expansion is to remove more nitrogen from the Mashpee River watershed than is added due to the project development. This reduction in overall nitrogen loading will begin to reverse the long term water quality concerns in Popponesset Bay that are the result of increased nutrient loading in a shallow estuary, due to in large part to existing development that is not served by a wastewater treatment system.

A direct reduction in nitrogen loading will result from the connection of existing properties to the WWTP as a direct regulatory offset. In addition, the construction of the expanded and upgraded WWTP and the infrastructure to collect and transport sewage to the WWTP will provide the Town with the opportunity to further expand the sewer system. This will continue to reduce the existing nitrogen loading that enters Popponesset Bay.

It is the intent of Mashpee Commons, L.P. to transfer the WWTP and the sewer system to the Town of Mashpee, whenever the Town is prepared to accept the ownership and operational responsibilities for the system. The feasibility of connecting existing untreated wastewater loads to a tertiary treatment system is the key element required, if the long-term degradation of water quality in Popponesset Bay is to be reversed.

2. *How was the future nitrogen loading from the Mashpee Commons neighborhoods estimated? How much off-site wastewater must be treated to result in a net reduction in nitrogen loading?*

Was the partial use of Title 5 estimates in the DEIR for Mashpee schools and other municipal buildings, an overstatement of the actual wastewater flows that will be collected and treated?

2.1 Overview of Loading Methodology

Certain limitations exist when estimating nitrogen loadings from land use runoff and from domestic wastewater. The same limitations apply when estimating the amount of nitrogen associated with both existing and proposed development. Given the requirement to off-set

new nitrogen loadings by the treatment of existing loads, it is necessary to apply a uniform methodology to both the estimated future loadings and the removed loadings that are being treated to earn nitrogen credits.

Following discussions with representatives of the Commission, the Town, and the Department of Environmental Protection, it was agreed that the methodology to estimate flow and nitrogen loads in the DEIR would be modified for the FEIR. The new methodology would focus on the more realistic annual average flow rates for both existing and future properties when evaluating the "no net increase" requirement of the Commission. It would use larger peak rates when designing the construction of the physical infrastructure.

The Mashpee Commons neighborhood expansion represents a true master plan for sequenced development where a series of linked and coordinated projects will occur over a long period of time. The anticipated use of a Development Agreement to manage the resource impacts of the entire multi-year project provides the regulatory framework under which future actual nitrogen loading performance data can be incorporated into the later portions of the site specific approvals.

The sections that follow and the referenced tables set forth the specific process used to define the nitrogen loadings from wastewater and land use change. The initial sections describe how the flow rates are estimated for both existing and future on-site properties and the future flows to be collected from off-site properties. The information provided below describes in step by step manner the data that was used and the assumptions that have been made to establish the flow estimates used in the "no net increase" regulatory balance and the design of the treatment plant capacity.

2.2 Peak Monthly, Peak Hourly, and Average Annual Flow

The Mashpee Commons wastewater treatment plant capacity will be designed to meet:

- The needs of the Mashpee Commons Master Plan's full 15 to 20 year build out; and
- The Commission's no net increase requirement by treating currently untreated wastewater.

The wastewater flows in Mashpee are characterized by large seasonal factors due to the large number of visitors to Mashpee in the warmer months (May to October) compared to the winter. It is anticipated that the seasonal variation will decrease with time as the land uses evolve to include a greater portion of year round homes and businesses. The capacity of the treatment system will need to be able to accept the average daily flow during the peak month

of the year. The sewer collection system will need to be able to accept, transport, and store peak daily flows during short-term peak periods that are several times the average daily flows during the peak month. The nitrogen balance in the watershed, and the allocation of treatment capacity to achieve no net annual increase, are based on annual average flows and wastewater characteristics, not peak daily or monthly conditions.

The proposed design will use the following terms and estimates for the purposes below:

- Peak Monthly Average Flow: this flow estimate will be used to design the storage, treatment, and disposal capacity of the plant.

- Peak Hourly Average Flow: this flow will be assumed to be equal to two times the Peak Monthly Average Flow, and will be used in the design of the hydraulic capacity of the collection system, equalization tanks, and pump stations.

- Average Annual Daily Flow: this flow estimate will factor in the seasonal variations of the different land uses connected to the treatment plant and will be used to determine the annual nitrogen loading into the Mashpee River watershed.

2.3 Treatment Plant Effluent Concentration

Table 1 presents the history of actual daily average wastewater flow by month from May 1995 through October 2000 at the Mashpee Commons WWTP. Table 1 also presents the measured total nitrogen in the effluent for all months that data is available. The total nitrogen data is missing due to sampling and/or laboratory problems for the two months of March 1998 and April 2000.

At the bottom of Table 1, the total nitrogen concentration in the WWTP effluent is calculated as an arithmetic average for three time spans. The flow weighted average is calculated for the same time periods. The flow weighted average is a more appropriate concentration to use when considering annual total nitrogen loading since it directly represents the total nitrogen mass loading based on the concentration and flow volume.

For the past 3 1/2 years the flow weighted average is 6.43 mg/l. This is greater than the performance base concentration of 5.76 mg/l that was used in the DEIR. The reason for the change is that the total nitrogen data from 2000 has been running at a higher average concentration than the preceding two years. This occurred as a result of a change in the personnel running the WWTP, and inaccurate loading of methanol which caused Total Nitrogen levels to rise abnormally.

Mashpee Commons, L.P. is confident that the plant's concentration during the next five years will improve and be documented before the second phase of the Mashpee Commons build out occurs. A renewed focus on the operation of the plant to control total nitrogen, and upgrade of the plant to include specific design improvements are intended to achieve a design effluent concentration of 4 mg/l.

Therefore when calculating future loadings from the treatment plant, a concentration of 6.43 mg/l has been used through 2005, and a concentration of 5 mg/l has been used after 2005. Mashpee Commons, L.P. anticipates that the Development Agreement will link the approval of the amount and type of new buildings for construction after 2005 to the documented performance, or nitrogen removal efficiency, of the plant after the upgrade to include enhanced nitrogen removal capacity.

2.4 Categories of Influent Flows and Available Data

The proposed expanded Mashpee Commons WWTP will service a variety of land uses and a mix of existing buildings and proposed new buildings in the Rotary area. The amount and type of available data varies regarding the actual wastewater generation and/or water consumption for each type of existing and proposed land use. Certain land use types are not currently connected to the treatment plant, but do have water consumption records. The estimation of future design flows utilized the appropriate available data for each category of future land use, and then combined the individual categorical estimates to obtain a total estimate. The basis of the estimate used for each category is described below:

2.4.1 Office, Retail, and Restaurant Flows

The existing Mashpee Commons complex consists of a mix of retail, office, and a high percentage of restaurant land uses. The total square footage of occupied space connected to the WWTP has slowly grown over the years (see Table 2), and the treated wastewater flow at the WWTP has slowly increased when year to year averages are compared (see Table 1). There is significant month to month and season to season variability in the wastewater flows due to variation in the intensity of activity within each property from summer to winter seasons. These fluctuations are anticipated to decrease significantly over time as the mix of new land uses included in the Mashpee Commons Master Plan will lead to greater year round residential occupancy and business activity.

Table 2 presents the land use parameter data that is used to develop a Title 5 flow estimate for the mix of uses that were connected to the WWTP during each of the past six summers.

Table 3 presents a summary of the total available Mashpee Commons leaseable space as of the summer season for the years 1994-2000, and the average daily wastewater flow at the WWTP split into two seasons (May to October, and November to April). May to October flow is concurrent for the same summer season as the leaseable space data. November to April data is for the winter following the leaseable space during summer season data.

The Title 5 estimated wastewater flows from Table 2 that correspond to the available summer space are also presented on Table 3. Using those Title 5 estimates, the average actual flow for the given season and year at the WWTP is expressed as a percentage of the connected Title 5 flow at the given point in time.

The peak monthly flow for each calendar year is also provided on Table 3 for comparison to the connected Title 5 estimate for the summer season of that year. The peak monthly flow as a percentage of the Title 5 flow rate is also presented for each year.

The most recent 5 1/2 years of actual average daily wastewater flow data indicates that the percentage of Title 5 flows has fluctuated as the overall flow increased when new space was added to the service area. There is a significant difference between the average summer and winter flows, but the percentages of Title 5 have varied from year to year within each season. The peak monthly flow has varied from year to year but tends to be approximately 125% of the average summer flow.

In order to estimate the future wastewater flows that will be generated by the expansion of Mashpee Commons, the proposed methodology is to calculate the Title 5 estimate for the mix of land uses projected for each phase of the Mashpee Commons Master Plan and then adjust that flow by the documented percentage of Title 5 experience from the past five years. This methodology is proposed for generating the portion of the total flows from Mashpee Commons associated with retail, office, cinema, and restaurant uses. These estimates are included in both the Peak Monthly Average Flow and the Average Annual Daily Flow for each phase of the projected build out.

The percentage of the Title 5 flows used for future estimates are the averages of the five years of data presented on Table 3. The percentage used for Peak Monthly Flow is 54.8%. The percentage used for Average Annual Daily Flow is 42.2% for May to October and 30.1% for November to April, and 36.2% for the year long annual average.

The proposed three phases of the Master Plan neighborhood build out of new retail, office, and restaurant space within the Mashpee Commons complex are presented on Table 4. Also

included in Table 4 is the already constructed and the already permitted build out that can be constructed in the future at the Village Center and North Market I neighborhoods since they will also be served by the treatment plant. The corresponding Title 5 flow for those land uses is calculated and then the actual historical experience adjustment made based on the percentages calculated in Table 3. The inclusion of Village Center and North Market I is appropriate when determining the future treatment and sewer system capacity requirements. Only the proposed neighborhoods, which are the subject of the FEIR, are included in the calculations for the nitrogen loading offset requirement under the Commission's regulations.

2.4.2 Future New Residential Properties at Mashpee Commons

The Mashpee Commons Master Plan includes a substantial increase in the residential component of the Mashpee Commons neighborhoods as part of the overall design to create a multi-use integrated community. There is no isolated historical flow data at the existing WWTP to demonstrate actual flows from the residential units. The 13 existing apartments are served by the same sewer system as the retail and office properties and the wastewater is not separately metered. The homes to be built do not have available water meter data that can be used to estimate sewage flows.

A major consideration in the design of wastewater treatment systems for homes on Cape Cod is the seasonality of the occupancy. The Commission developed a methodology that assigns an average number of occupants per unit based on the number of bedrooms in the unit as a function of the specific town. This approach recognizes that many homes are occupied at less than their full bedroom capacity most of the time that they are in use. However, the Commission's methodology does not directly consider seasonal variations in flow. An additional issue is whether the occupancy rates of homes on the Cape will increase with time as more of the residents become year round.

The approach utilized for the design of the future Mashpee Commons WWTP is to apply the Commission's methodology from Tech Bulletin 91-001 for the calculation of the future Mashpee Commons residential component of Average Annual Daily Flow. The Peak Monthly Average Flow for the residential component is estimated to be 25% larger than the Average Annual Daily Flow. Table 5 presents those calculations. The seasonal factor used for the residential flows is that the summer season is represented by the Commission's methodology estimates and the winter season is estimated as 80% of the summer flow.

2.4.3 Future New Hotels at Mashpee Commons

The Mashpee Commons Master Plan includes 140 beds of hotel space. The Title 5 design criteria for hotels is 110 gpd/room. The actual wastewater generated by a hotel is a function of whether the hotel primarily provides overnight accommodations or whether it also has a significant banquet, meeting, and seminar trade.

Two hotel land uses are programmed at Mashpee Commons. The 120-bedroom facility at East Steeple Street will be focused on overnight guests and function as a hotel, but not as a major conference center. It will however accept smaller conferences of up to 50 people. The 20 bedroom hotel use programmed at Job Fishing Road is anticipated to function simply as a bed and breakfast with no conference facilities.

Water consumption data for three Cape Cod hotels or motels were obtained to provide an indication of actual annual water consumption at similar facilities.

The Admiralty Inn in Falmouth has 98 rooms plus 28 townhouse suites and is open year round. The suites contain at least two rooms each so the entire facility is considered to be a 154-room hotel. It also has a small conference space for up to 50 people, a restaurant, and indoor and outdoor pools. Based on Town of Falmouth Water Department billing records, the Admiralty Inn consumed 23,032,000 gallons of water between July 26, 1995 and July 20, 2000 -- a period of 1,819 days, or about 5 years. That equals 12,662 gallons per day on average, or 82 gallons per day per room.

The Best Western in Falmouth (d.b.a. Falmouth Marina Hotel) has 63 rooms, provides a continental breakfast only, has an outdoor swimming pool, but has no conference room facilities. From March 24, 1997 through July 7, 2000 a period of 1,200 days, the motel consumed 5,619,000 gallons or 74 gallons per day per room.

The third facility was the Motel 6 in South Yarmouth with 89 rooms, indoor and outdoor pools, but no conference facilities or on-site restaurant. The water department receptionist looked up the data but would not provide a copy of the billing records. SHA was told 300,000 units were consumed per year. SHA believes in this case the units were cubic feet of water rather than gallons, which based on 89 rooms, is about 69 gallons per day per room.

Based on this sampling of data, for the 120 room hotel in East Steeple Street that will have a small conference facility, SHA has projected flows at 90 gallons per day per room for the May through October time frame, and 70 gallons per day per room for November to April. SHA has projected 110 gallons per day per room for the Peak Monthly Flow estimate.

For the 20 room smaller facility in Jobs Fishing Road, wastewater generation rates have been projected at 80 gallons per day per room for the May through October time frame, and 60 gallons per day per room for the November to April time frame. A rate of 110 gallons per day per room has been used for the Peak Monthly Flow estimate. Table 6 presents the data used for the hotel wastewater flow estimates.

2.4.4 Existing Municipal and Quasi-Municipal Flows

The existing municipal and quasi-municipal buildings in the vicinity of the Mashpee Rotary are currently served by the municipal water system, and on-site septic systems. Thus there is available data for actual domestic water consumption based on water utility billings, but there is no direct data documenting the volume of wastewater generated per day, month, or year. The average between the Title 5 estimate for each building and the actual water bill flow data was used in the DEIR to represent a future potential flow. The Town commented that the use of Title 5 was an overstatement of true flows, especially at the Middle School where there are no showers in use, but the original Title 5 design provided for showers.

The wastewater estimates for the municipal and quasi municipal properties has been modified to be based only on the available water consumption data since April 1997 in response to the Town's concerns. The direct use of historical water data for estimating future wastewater loadings may under estimate actual flows given that the buildings are not currently used at maximum capacity and are likely to experience an increased intensity of use, especially the public school buildings where increased enrollment is anticipated. The population of the Town of Mashpee is growing rapidly and thus the water consumption and wastewater generated at the schools will increase with time.

Table 7 presents the most recent three years of water billing data for each of the municipal and quasi-municipal buildings that are proposed to be provided sewer service during the first phase of the expansion of Mashpee Commons. The average of the water consumption data has been calculated for both a winter and a summer season. In order to allow for increased intensity of use, the year 2005 wastewater flows from these buildings has been estimated as 125% of the average for each season during the past three years. The water meter and/or water consumption data for each property, and the combined total future base estimates are presented on Table 7. Based on the observation that the water use in the municipal facilities will not remain constant as the community grows, the 2010 estimate is a 5% increase from 2005, and the 2015 estimate is 5% greater than 2010.

2.4.5 Land Use Total Nitrogen Loadings

The land use loads have been estimated from the loading rates specified by *Technical Bulletin 91-001 (Final), Nitrogen Loading, Cape Cod Commission, Water Resources Office*, April, 1992, and verbal discussions with the Commission staff. The ornamental landscaping nitrogen loading rate (1 lb. nitrogen/1000 square feet/year) and the reduction in pavement load of 25 percent due to use of current design Best Management Practices (BMPs) are based on discussions with Mr. Eichner of the Commission. The proposed BMPs include catch basins with inverted outlets and partial discharge to vegetated swales or detention areas, to reduce the nitrogen concentrations in stormwater runoff prior to infiltration.

The upper portion of Tables 8, 9, and 10 present the land use distribution for each of the new Mashpee Commons neighborhoods for each of the three target build out years. The annual land use loading expressed as kilograms of Total Nitrogen per year are calculated using the acres assigned to each land use and the loading rates developed by the Commission.

3. *How will the current Mashpee Commons treatment plant and the corresponding Groundwater Discharge Permit be modified?*

3.1 Treatment Plant Expansion and Upgrade

The Mashpee Commons Groundwater Discharge Permit will be modified to seek approval from the DEP for an expanded and upgraded treatment plant that can process a peak flow of at least 195,000 gpd and achieve an average of 4 mg/l Total Nitrogen. The design capacity of the plant is based on the total of the peak monthly flow estimates presented on Table 11. The potential to increase the plant capacity further in order to provide treatment capacity for more off-site existing wastewater than is required to achieve "no net increase" has been discussed with the Town of Mashpee Sewer Commission and will be part of the discussion leading to the anticipated Development Agreement.

It is proposed that this expansion will occur in two stages and the plant expansion will precede the needs of the Mashpee Commons expansion. The treatment technology to be applied at the time of each capacity expansion will be based on the most efficient and practical nitrate removal processes available. The specific effluent criteria for the future expansion permit has not yet been established by the Massachusetts Department of Environmental Protection (MADEP).

In the nitrogen loading analyses presented in response to Question #2, the actual flow weighted average for the period May 1997 through October 2000 (6.43 mg/l) has been

assumed to be representative of the effluent for the first expansion of the plant, and an effluent average of 5.0 mg/l total nitrogen has been assumed for the second expansion to the plant. This represents a conservative estimate of the total nitrogen loading since the upgraded treatment plant will be operational before 2005 and Mashpee Commons, L.P. plans to utilize a treatment technology designed to aehieve an average of 4 mg/l, regardless of the discharge permit criteria. Mashpee Commons, L.P. anticipates that the Groundwater Discharge Permit will have a higher concentration as the non-compliance criteria. The company is motivated to achieve the lowest feasible total nitrogen concentration in order to generate the greatest feasible improvement in the water quality that enters Popponesset Bay, concurrent with continued economic development in the Town.

Since the DEIR was submitted, two additional deep borings were completed in the vicinity of the proposed expansion area for the sand filter beds at the Mashpee Commons WWTP. Based on the permeability of the underlying soils, and the lack of any low permeability layer to a depth of 50 feet below the water table, the hydraulic capacity of the soil matrix below the discharge point to accept and transport the increased discharge flow will not be a constraint for a flow of up to 300,000 gpd.

3.2 Discharge Permit Effluent Criteria

The issue of whether MADEP will set lower effluent criteria for total nitrogen than the current criteria of 10 mg/l, which is the drinking water criteria, has been discussed with MADEP. Given the evolving nitrogen removal technology, it is possible that lower permit criteria will be utilized by MADEP in the future, but only after it is satisfied that the given technology can achieve a lower limit on a reliable month after month basis.

The proposed first stage expansion of the Mashpee Commons WWTP will provide an opportunity to verify the application of current nitrogen removal technology to a mid-sized treatment plant with a seasonally variable flow and waste loading. SHA anticipates that a permit criteria of 5.0 mg/l total nitrogen may be adopted with an average concentration of 4.0 mg/l achieved. The nitrogen loading calculations for years 2010 and 2015 have used 5 mg/l.

4. How much off-site wastewater will be required to achieve the "no net increase" criteria, and where will that wastewater come from?

4.1 No Net Increase Nitrogen Load Off-set Balancing

Tables 8, 9, and 10 include at the bottom of the page a box labeled "Combined Annual Total Nitrogen Loading" within which is an estimate of the quasi-municipal off-site wastewater

that is treated by the plant and the non-specific off-site wastewater. The quasi-municipal flow is from the municipal buildings plus Christ the King church and the Homeyer Village senior housing. Mashpee Commons, L.P. has discussed for several years with Town officials the advantages of treating the wastewater from these buildings as part of the Town's effort to improve water quality in the Mashpee River watershed.

The non-specific wastewater is from additional properties in the watershed that are currently using septic systems. Mashpee Commons, L.P. does not have a binding agreement with any other property to provide that wastewater at this time, but there are multiple candidates in close proximity to the Rotary and the sewer system that will be constructed.

For 2005, 5,000 gpd of non-specific wastewater will be required. For 2010 the non-specific wastewater requirement increases to 10,000 gpd, and then only slightly to 12,000 gpd for 2015. The maximum requirement of 12,000 gpd equates to only approximately 150 bedrooms of existing housing using the Commission's residential flow estimate methodology.

5. *How can Mashpee Commons proceed to construct new buildings based on nitrogen loading off-sets if the off-site wastewater needed to earn the nitrogen credits is not committed under contract to Mashpee Commons?*

5.1 Conditional Approval for Planned Growth vs. Actual Construction Constraints

Mashpee Commons, L.P. can not enter into contracts to obtain additional off-site wastewater from properties it does not control until it has secured at least conditional approval to proceed with the Mashpee Commons Master Plan and thus the motivation to expand the WWTP is in hand. The key to the actual management of the build out of the Mashpee Commons neighborhoods will be the Development Agreement. In that agreement, Mashpee Commons, L.P. anticipates a requirement that legally enforceable contracts must be finalized, to collect and treat the applicable volume of off-site wastewater, before the actual final permits to construct the new buildings in the proposed neighborhoods are issued.

It does not make realistic sense to negotiate with individual property owners, for the use of a treatment plant, until the benefits from the project that will provide that expanded plant capacity are accepted and approved at least conditionally by the regulatory community.

6. *How can anything be allowed to be built that will add new nitrogen load to the Mashpee River watershed, until the multi-year investigations of Popponesset Bay are completed and the Town has finalized it's wastewater management plan?*

6.1 Town's Wastewater Management Plan

The construction of a new upgraded treatment plant at Mashpee Commons and the expansion of the service area to include other existing properties in the Rotary area is not the final and only element of the Town's probable wastewater management plan. But all parties that have looked at the Town's overall growth patterns and the location of the nitrogen sensitive estuaries, concur that better treatment of wastewater in the Mashpee River watershed is one principle element of any future plan.

The key to long term water quality improvement within Popponesset Bay is to begin doing logical and reasonable steps to reduce the nutrient loading. Mashpee Commons, L.P. believes the wastewater system infrastructure to be constructed as part of the Master Plan can be the starting elements of a Town operated wastewater district. The Mashpee Sewer Commissioners have discussed this potential opportunity with Mashpee Commons, L.P. It is anticipated that arrangements to transfer the plant to the Town will be part of the Development Agreement.

7. *The stormwater management plan details are not as specific as those required by the Conservation Commission for smaller projects. How do we know that the drainage system will use the most current pollutant removal techniques?*

7.1 Stormwater Management Design Implementation

Most projects begin the permitting process based on a single lot or cluster of lots being developed at a single point in time. The Mashpee Commons project is unique in its attempt to plan for a long term 15 to 20 year build out of coordinated and integrated land uses. The level of site plan specific design has not occurred since the lot specific details will not be known until the applications are made for specific uses on lots within the project plan.

Mashpee Commons, L.P. is fully aware of the design evolution toward better stormwater management system design, and the implementation of these concepts through the Wetland Protection Act jurisdiction. Although most locations within the Master Plan development do not lie with a jurisdictional area of the Wetlands Protection Act, Mashpee Commons, L.P. accepts the responsibility to apply environmentally sensitive design features to all new development within the Mashpee River watershed.

8. *Who will pay for the treatment of wastewater from off-site properties that send wastewater to the Mashpee Commons plant, in order to earn nitrogen credits that allow new development under the "no net increase" regulatory approach?*

8.1 Entering Into Wastewater Agreements When Required

The specific agreements to collect and treat wastewater from off-site municipal and non-municipal properties have not yet been negotiated and entered into. The terms of who pays for the capital construction up front, who pays for the operating costs of the treatment system, and whether there will be a capital recovery mechanism to fund past investment and future maintenance and equipment replacement costs, are continuing to be worked out.

Mashpee Commons, L.P. is proceeding on the basis that if the regulatory community approves the Master Plan project concept, conditioned upon finalization of the necessary wastewater off-set agreements, that it will be able to reach such agreements by the time the proposed buildings are undertaken.

9. *Will increases in wastewater and stormwater flow from the proposed neighborhoods, including Trout Pond, significantly impact water quality in the pond?*

9.1 Trout Pond Wastewater Impacts and Stormwater Design

The expansion of the Mashpee Commons wastewater treatment plant sand infiltration beds to accept a larger flow rate may result in an increase in shallow groundwater flux through the Pond. Trout Pond is hydraulically isolated from the underlying aquifer by a thick organic muck layer. Given the level of water quality treatment proposed at the WWTP and the general isolation of groundwater from the pond, the design team has concluded that the Trout Pond water quality will not be degraded by the expansion of the WWTP.

A significant problem for Trout Pond, as an open water body, has been the lack of any flushing flow. It is a shallow impounded area that receives minimal surface water inflow. The design team concludes that the application of best management practices to the acres surrounding Trout Pond will manage water quality entering the pond. The direction of stormwater to the pond will actually improve its over all water quality when compared to the current condition, by allowing turn over of the water column.

Conclusion

The estimated water quality impacts associated with the development of the five proposed Mashpee Commons neighborhoods can be offset through a combination of the use of stormwater BMPs, tertiary treatment of wastewater and the collection and treatment of existing untreated wastewater.

The proposed capital investment in the community and the associated expansion of the existing WWTP provides the mechanism for phased economic development of both private and municipal interests, in conjunction with a pro-active effort to initiate the identified need to reduce the existing nitrogen loading within the Popponesset Bay watershed.

S:\DATA\1200\1247.1\Nov00\120600FEIR.wpd

Table 1: History of Actual Daily Average Daily Flow by Month and Total Nitrogen Loading from Mashpee Commons WWTP

Date	Total Nitrogen (mg/l)	Average Flowrate (gpd)	Q*total N	Avg. Flow by 6 Month Period (gpd)
May-95	12.47	8,935	111,419	
Jun-95	10.70	11,794	126,196	
Jul-95	11.45	15,121	173,135	
Aug-95	11.40	13,840	157,776	
Sep-95	5.43	11,441	62,125	
Oct-95	19.87	13,834	274,882	12,494
Nov-95	13.44	7,367	99,012	
Dec-95	10.69	8,590	91,827	
Jan-96	11.96	8,481	101,433	
Feb-96	20.45	5,192	106,176	
Mar-96	10.10	9,681	97,778	
Apr-96	19.80	7,771	153,866	7,847
May-96	7.73	8,466	65,442	
Jun-96	4.97	12,265	60,957	
Jul-96	5.40	15,403	83,176	
Aug-96	2.80	14,857	41,600	
Sep-96	3.40	11,342	38,563	
Oct-96	5.70	11,490	65,493	12,304
Nov-96	5.88	10,123	59,523	
Dec-96	9.66	9,120	88,099	
Jan-97	12.68	8,643	109,593	
Feb-97	15.77	9,162	144,485	
Mar-97	5.10	10,265	52,352	
Apr-97	2.10	12,795	26,870	10,018
May-97	3.40	12,807	43,544	
Jun-97	2.79	17,929	50,022	
Jul-97	3.79	19,221	72,848	
Aug-97	7.99	20,131	160,847	
Sep-97	6.44	15,420	99,305	
Oct-97	2.38	15,341	36,512	16,808
Nov-97	1.67	14,373	24,003	
Dec-97	2.87	14,354	41,196	
Jan-98	7.31	15,368	112,340	
Feb-98	4.89	15,887	77,687	
Mar-98		13,918		
Apr-98	10.80	14,735	159.138	14,773

Date	Total Nitrogen (mg/l)	Average Flowrate (gpd)	Q*total N	Avg. Flow by 6 Month Period (gpd)
May-98	7.20	14,787	106,466	
Jun-98	10.20	13,372	136,394	
Jul-98	6.60	20,511	135,373	
Aug-98	7.16	22,769	163,026	
Sep-98	7.43	13,785	102,423	
Oct-98	5.40	12,928	69,811	16,359
Nov-98	8.00	10,989	87,912	
Dec-98	1.13	11,505	13,001	
Jan-99	3.62	12,169	44,052	
Feb-99	10.65	11,717	124,786	
Mar-99	8.88	12,536	111,320	
Apr-99	5.42	12,536	67,945	11,909
May-99	4.60	13,679	62,923	
Jun-99	4.30	18,490	79,507	
Jul-99	5.20	31,318	162,854	
Aug-99	10.20	29,777	303,725	
Sep-99	4.89	20,593	100,700	
Oct-99	7.40	18,378	135,997	22,039
Nov-99	4.93	14,897	73,442	
Dec-99	3.46	15,352	53,118	
Jan-00	7.08	13,206	93,498	
Feb-00	10.94	14,691	160,720	
Mar-00	7.52	15,740	118,365	
Apr-00		16,878		15,127
May-00	7.14	18,873	134,753	
Jun-00	4.15	18,670	77,481	
Jul-00	7.08	25,850	183,018	
Aug-00	8.40	23,252	195,317	
Sep-00	10.73	18,106	194,277	
Oct-00	9.00	17,940	161,460	20,449

Effluent Total Nitrogen (mg/l)			
Date Iuterval	Arithmetic Average		Flowrate Weighted Average
May 95-Apr 98	8.38		7.58
May 97-Apr 00	6.07		6.14
May 97-Oct 00	7.03		6.43

Table 2: Title 5 Flow Estimates for Actual Constructed Properties Served by Mashpee Commons WWTP

Title 5 Wastewater Flow Design Estimates		
Office:	Wastewater flow for office use (gpd/1000 sq.ft.	75
Retail:	Wastewater flow for retail use (gpd/1000 sq.ft.)	50
Restaurant:	Wastewater flow for restaurant use (gpd/seat) =	35
Cinema:	Wastewater flow for cinemas (gpd/seat) =	3
Hair Salon:	Wastewater flow for hair salons (gpd/seat) =	100
Residential:	Wastewater flow for residential (gpd/bedroom)	110

Calendar Year	Office Use			Retail Use			Restaurant		Cinema		Hair Salon			Residential		Total Title 5 (gpd)
	Village (sq.ft.)	North M (sq.ft.)	Title 5 (gpd)	Village (sq.ft.)	North M (sq.ft.)	Title 5 (gpd)	Village (seats)	Title 5 (gpd)	Village (seats)	Title 5 (gpd)	Village (seats)	North M (seats)	Title 5 (gpd)	(bed-rooms)	Title 5 (gpd)	
1995	33,302	1,260	2,592	78,955	72,129	7,554	733	25,655	914	2,742	4	0	400	0	0	38,943
1996	33,465	1,260	2,604	79,087	72,153	7,562	720	25,200	914	2,742	4	0	400	0	0	38,508
1997	33,465	1,260	2,604	91,914	81,214	8,656	682	23,870	914	2,742	4	0	400	15	1,650	39,923
1998	33,465	1,260	2,604	91,914	81,214	8,656	682	23,870	914	2,742	4	0	400	15	1,650	39,923
1999	33,465	1,260	2,604	92,776	80,803	8,679	682	23,870	914	2,742	4	2	600	15	1,650	40,145
2000	33,465	1,260	2,604	101,470	80,803	9,114	664	23,240	914	2,742	4	2	600	15	1,650	39,950

Table 3:
Actual Mashpee Commons WWTP Flow as Percentage of Title 5 for Summer vs. Winter Seasons

Calendar Year	Leaseable Space	Average Daily WWTP Inflow		Title 5 Flow for Leaseable Space	Average Daily WWTP Inflow as % of Title 5 Flow		Month of Peak Monthly Flow	Peak Monthly Flow (gpd)	Peak Monthly Flow as % of Title 5
		May to Oct (gpd)	Nov to Apr (gpd)		May to Oct	Nov to Apr			
1995	225,577	12,494	7,847	38,943	32.1%	20.1%	July	15,121	38.8%
1996	230,271	12,304	10,018	38,508	32.0%	26.0%	July	15,403	40.0%
1997	259,724	16,808	14,773	39,923	42.1%	37.0%	August	20,131	50.4%
1998	259,966	16,359	11,909	39,923	41.0%	29.8%	August	22,769	57.0%
1999	260,810	22,039	15,127	40,145	54.9%	37.7%	July	31,318	78.0%
2000	260,590	20,449		39,950	51.2%		July	25,850	64.7%

Averages=	42.2%	30.1%	54.8%
Annual Average=	36.2%		

Table 4: Estimated Average Daily Wastewater Flows from Office, Retail, Restaurant, Cinema, and Hair Salon by Season for Three Future Buildout Levels (2005, 2010, 2015)

Title 5 Design Assumptions: (gpd = gallons per day)		
Office:	Wastewater flow for office use (gpd/1000 sq.ft.) =	75
Retail:	Wastewater flow for retail use (gpd/1000 sq.ft.) =	50
Restaurant:	Wastewater flow for restaurant use (gpd/seat) =	35
Cinema:	Wastewater flow for cinemas (gpd/seat) =	3
Hair Salon:	Wastewater flow for hair salons (gpd/seat) =	100

2005 Buildout	Office Use		Retail Use		Restaurant		Cinema		Hair Salon		Total
Neighborhood	(sq.ft.)	Title 5 (gpd)	(sq.ft.)	Title 5 (gpd)	(seats)	Title 5 (gpd)	(seats)	Title 5 (gpd)	(seats)	Title 5 (gpd)	Title 5 (gpd)
Village Center	111,900	8,393	190,656	9,533	921	32,235	914	2,742	4	400	53,302
North Market St. I	1,260	95	91,123	4,556	0	0	0	0	2	200	4,851
East Steeple St.	10,000	750	60,000	3,000	143	5,005	0	0	0	0	8,755
Jobs Fishing Rd.	30,100	2,258	24,500	1,225	49	1,715	0	0	0	0	5,198
North Market St. II	15,000	1,125	25,000	1,250	143	5,005	0	0	0	0	7,380
Trout Pond	0	0	0	0	0	0	0	0	0	0	0
Totals	168,260		391,279		1,256		914		6		79,485

2005 Office/ Restaurant/ Retail/Cinema/ Hair Salon Title 5 (gpd)	Est. Actual Avg. Daily Flow (gpd) May to Oct. 42.2% of Title 5	Est. Actual Avg. Daily Flow (gpd) Nov. to Apr. 30.1% of Title 5	Est. Monthly Peak (gpd) 54.8% of Title 5
79,485	33,542	23,954	43,585

Annual Average Daily Flow (gpd)	
36.2% of Title 5	28,748

2010 Buildout	Office Use		Retail Use		Restaurant		Cinema		Hair Salon		Total
Neighborhood	(sq.ft.)	Title 5 (gpd)	(sq.ft.)	Title 5 (gpd)	(seats)	Title 5 (gpd)	(seats)	Title 5 (gpd)	(seats)	Title 5 (gpd)	Title 5 (gpd)
Village Center	111,900	8,393	190,656	9,533	921	32,235	914	2,742	4	400	53,302
North Market St. I	1,260	95	91,123	4,556	0	0	0	0	2	200	4,851
East Steeple St.	35,000	2,625	115,000	5,750	286	10,010	0	0	0	0	18,385
Jobs Fishing Rd.	71,600	5,370	30,500	1,525	286	10,010	0	0	0	0	16,905
North Market St. II	30,000	2,250	50,000	2,500	143	5,005	0	0	0	0	9,755
Trout Pond	15,000	1,125	20,000	1,000	0	0	0	0	0	0	2,125
Totals	264,760		497,279		1,636		914		6		105,323

2010 Office/ Restaurant/ Retail/Cinema/ Hair Salon Title 5 (gpd)	Est. Actual Avg. Daily Flow (gpd) May to Oct. 42.2% of Title 5	Est. Actual Avg. Daily Flow (gpd) Nov. to Apr. 30.1% of Title 5	Est. Monthly Peak (gpd) 54.8% of Title 5
105,323	44,445	31,740	57,752

Annual Average Daily Flow (gpd)	
36.2% of Title 5	38,093

2015 Buildout	Office Use		Retail Use		Restaurant		Cinema		Hair Salon		Total
Neighborhood	(sq.ft.)	Title 5 (gpd)	(sq.ft.)	Title 5 (gpd)	(seats)	Title 5 (gpd)	(seats)	Title 5 (gpd)	(seats)	Title 5 (gpd)	Title 5 (gpd)
Village Center	111,900	8,393	190,656	9,533	921	32,235	914	2,742	4	400	53,302
North Market St. I	1,260	95	91,123	4,556	0	0	0	0	2	200	4,851
East Steeple St.	35,000	2,625	135,000	6,750	286	10,010	0	0	0	0	19,385
Jobs Fishing Rd.	71,600	5,370	30,500	1,525	286	10,010	0	0	0	0	16,905
North Market St. II	30,000	2,250	50,000	2,500	143	5,005	0	0	0	0	9,755
Trout Pond	40,000	3,000	45,000	2,250	0	0	0	0	0	0	5,250
Totals	289,760		542,279		1,636		914		6		109,448

2015 Office/ Restaurant/ Retail/Cinema/ Hair Salon Title 5 (gpd)	Est. Actual Avg. Daily Flow (gpd) May to Oct. 42.2% of Title 5	Est. Actual Avg. Daily Flow (gpd) Nov. to Apr. 30.1% of Title 5	Est. Monthly Peak (gpd) 54.8% of Title 5
109,448	46,186	32,983	60,014

Annual Average Daily Flow (gpd)	
36.2% of Title 5	39,585

Table 5 : Estimates of Residential Wastewater Flows for Three Buildout Periods (2005, 2010, 2015)

Cape Cod Commission Residential Wastewater Flow Estimate Equation fromTech Bulletin 91-001

For one bedroom units: Flow (gpd) = [(# of BR X 110 gpd/BR) + (# of units X 1.5 people/unit X 55 gpd/person)] / 2

For two or more BR units: Flow (gpd) = [(# of BR X 110 gpd/BR) + (# of units X 2.5 people/unit X 55 gpd/person)] / 2

2005	Village Center	Whitings Road	East Steeple	Jobs Fishing	Trout Pond	Total Units by Size	Total # of Bedrooms	Est. WW Flow by Unit Size
One BR units	65	23	21	19	0	128	128	12,320
Two BR units	2	6	4	17	0	29	58	5,184
Three BR Units	0	42	0	21	0	63	189	14,726
Four BR Units	0	20	0	0	0	20	80	5,775
Totals	67	91	25	57	0	240	455	
# of 1 BR units	65	23	21	19	0			
# of 2 BR+ units	2	68	4	38	0	**2005 Residential**		
# of bedrooms	69	241	29	116	0	**Wastewater Flow**		
Est. WW Flow (gpd)	6,614	18,879	2,736	9,776	0	**Estimate (gpd) =**		**38,005**

2010	Village Center	Whitings Road	East Steeple	Jobs Fishing	Trout Pond	Total Units by Size	Total # of Bedrooms	Est. WW Flow by Unit Size
One BR units	98	30	34	56	20	238	238	22,908
Two BR units	2	8	6	31	14	61	122	10,904
Three BR Units	0	56	0	21	8	85	255	19,869
Four BR Units	0	26	0	0	0	26	104	7,508
Totals	100	120	40	108	42	410	719	
# of 1 BR units	98	30	34	56	20			
# of 2 BR+ units	2	90	6	52	22	**2010 Residential**		
# of bedrooms	102	318	46	181	72	**Wastewater Flow**		
Est. WW Flow (gpd)	9,790	24,915	4,345	15,840	6,298	**Estimate (gpd) =**		**61,188**

2015	Village Center	Whitings Road	East Steeple	Jobs Fishing	Trout Pond	Total Units by Size	Total # of Bedrooms	Est. WW Flow by Unit Size
One BR units	98	30	34	56	38	256	256	24,640
Two BR units	2	8	6	31	26	73	146	13,049
Three BR Units	0	56	0	55	14	125	375	29,219
Four BR Units	0	26	0	0	0	26	104	7,508
Totals	100	120	40	142	78	480	881	
# of 1 BR units	98	30	34	56	38			
# of 2 BR+ units	2	90	6	86	40	**2015 Residential**		
# of bedrooms	102	318	46	283	132	**Wastewater Flow**		
Est. WW Flow (gpd)	9,790	24,915	4,345	23,788	11,578	**Estimate (gpd) =**		**74,415**

NOTE: The residential wastewater flow estimate base on the CCC's Tech Bulletin 91-001 methodology will be used for the May to October portion of the year. For November to April period, 80% of the May to October estimate will be used to reflect seasonality. The Peak Monthly flow for the residential component will be estimated as 125% of the Tech Bulletin 91-001 estimate.

Table 6: Estimated Wastewater Flows from Proposed MCLP Hotel Rooms

Neighborhood	Number of Hotel Rooms	May to October Period		November to April Period		Peak Monthly Wastewater Flow	
		Flow Rate per Room (gpd)	Average Daily Flow (gpd)	Flow Rate per Room (gpd)	Average Daily Flow (gpd)	Flow Rate per Room (gpd)	Peak Monthly Flow (gpd)
East Steeple Street	120	90	10,800	70	8,400	110	13,200
Jobs Fishing Road	20	80	11,200	60	8,400	110	15,400
TOTALS	140		22,000		16,800		28,600

Table 7: Water Consumption Data Used to Estimate Future Wastewater from Municipal and Quais-Municipal Properties to be Served by Mashpee Commons WWTP

Date of Meter Reading	Meter Reading (1,000 gals.)	Summer Water Consumption (gallons)	Winter Water Consumption (gallons)
POLICE DEPARTMENT			
4/9/97	840		
10/15/97	940	100,000	
4/8/98	990		50,000
10/8/98	1,070	80,000	
4/15/99	1,130		60,000
10/29/99	1,230	100,000	
4/28/00	1,350		120,000
10/30/00	1450	100,000	
Avg. 6 month usage =		95,000	76,667
Avg. Daily Use (gpd) =		519	419

Date of Meter Reading	Meter Reading (1,000 gals.)	Summer Water Consumption (gallons)	Winter Water Consumption (gallons)
FIRE DEPARTMENT			
4/9/97	820		
10/15/97	890	70,000	
4/8/98	960		70,000
10/8/98	1,040	80,000	
4/15/99	1,140		100,000
10/29/99	1,230	90,000	
4/28/00	1,310		80,000
10/30/00	1400	90,000	
Avg. 6 month usage =		82,500	83,333
Avg. Daily Use (gpd) =		451	455

Date of Meter Reading	Meter Reading (1,000 gals.)	Summer Water Consumption (gallons)	Winter Water Consumption (gallons)
MASHPEE PUBLIC LIBRARY			
4/11/97	153		
10/10/97	181	28,000	
4/8/98	208		27,000
10/6/98	233	25,000	
4/15/99	249		16,000
10/29/99	275	26,000	
4/28/00	298		23,000
10/30/00	331	33,000	
Avg. 6 month usage =		28,000	22,000
Avg. Daily Use (gpd) =		153	120

COOMBS ELEMENTARY SCHOOL			
4/10/97	5,450		
10/8/97	5,760	310,000	
4/8/98	6,300		540,000
10/7/98	6,630	330,000	
4/12/99	7,250		620,000
10/29/99	7,630	380,000	
4/28/00	8,040		410,000
10/30/00	8340	300,000	
Avg. 6 month usage =		330,000	523,333
Avg. Daily Use (gpd) =		1803	2860

QUASHNET MIDDLE SCHOOL			
4/10/97	3,770		
10/8/97	4,130	360,000	
4/8/98	4,590		460,000
10/7/98	4,960	370,000	
4/12/99	5,460		500,000
10/29/99	5,880	420,000	
4/28/00	6,400		520,000
10/30/00	6720	320,000	
Avg. 6 month usage =		367,500	493,333
Avg. Daily Use (gpd) =		2008	2696

CHRIST THE KING PARISH			
4/11/97	7,400		
10/10/97	7,700	300,000	
4/8/98	7,850		150,000
10/6/98	8,020	170,000	
4/15/99	8,210		190,000
10/29/99	8,390	180,000	
4/28/00	8,540		150,000
10/30/00	8710	170,000	
Avg. 6 month usage =		205,000	163,333
Avg. Daily Use (gpd) =		1120	893

HOMEYER VILLAGE			
4/x/97			
10/x/97		220,000	
4/x/98			230,000
10/x/98		290,000	
4/15/99	3,860		300,000
10/29/99	4,210	350,000	
4/28/00	4,570		360,000
10/30/00	4900	330,000	
Avg. 6 month usage =		297,500	296,667
Avg. Daily Use (gpd) =		1626	1621

BOYS AND GIRLS CLUB			
		0	0
4/28/00	30		30,000
10/30/00	60	30,000	
Avg. 6 month usage =		30,000	30,000
Avg. Daily Use (gpd) =		164	164

Property:	Summer Water Consumption (gpd)	Winter Water Consumption (gpd)
Police Department	519	419
Fire Department	451	455
Mashpee Public Library	153	120
Library Expansion (1.5X)	230	180
Coombs Elementary	1,803	2,860
Quashnet Middle School	2,008	2,696
Homeyer Village	1,626	1,621
Boys and Girls Club	164	164
Christ the King Church	1,120	893
Total of Recent Daily Use	8,074	9,408
Future Estimate at 125%	10,092	11,760
Est. Future Annual Avg. =	10,926	

Table 8: Estimated Annual Nitrogen Loading - 2005 Build Out
Expansion of Mashpee Commons with Proposed Off-site Wastewater Offsets

Input Variables:	
Lawn Nitrogen Loading (pounds N per 1000 sq ft/year)	3
Ornamental Landscaping (pounds N per 1000 sq ft/year)	1
Wash through to groundwater (% of fertilizer application)	25
Inches of rain per year that infiltrates from roofs and pavement	40
Pavement runoff nitrate concentration (mg/l)	1.5
Percent Reduction in pavement load due to BMPs	25
Roof runoff nitrate concentration (mg/l)	0.75
Treatment plant effluent total nitrogen concentration (mg/l)	6.43
Nitrogen concentration of untreated wastewater (mg/l)	35

Unit Conversions:
0.454 kg/pound
43560 sq ft/acre
28.317 liters/cu ft
12 inches/ft
1000000 mg/kg
365 days/yr
3.785 liters/gal.

LAND USE LOADING											
		Lawn Areas		Ornamental		Roof Areas		Pavement		Natural Areas	
	Total	14.82	kg/ac/yr	4.94	kg/ac/yr	3.08	kg/ac/yr	4.63	kg/ac/yr	0	kg/ac/yr
Neighborhood	Area (acres)	Area (acres)	Nitrogen (kg/yr)	Area (acres)	Nitrogen (kg/yr)	Area (acres)	Nitrogen (kg/yr)	Area (acres)	Nitrogen (kg/yr)	Area (acres)	Nitrogen (kg/yr)
Whitings Road	40.04	3.96	58.68	1.87	9.24	2.33	7.19	4.95	22.90	26.93	0.00
East Steeple St.	19.04	0.13	1.93	1.25	6.17	1.65	5.09	4.90	22.67	11.11	0.00
Jobs Fishing Rd.	25.59	0.65	9.63	0.75	3.70	2.50	7.71	6.00	27.75	15.69	0.00
North Market St. II	7.39	0.18	2.67	0.40	1.98	0.75	2.31	1.53	7.08	4.53	0.00
Great Neck Rd. So.	52.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	52.70	0.00
Trout Pond	41.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	41.30	0.00
Totals	186.06	4.92	72.91	4.27	21.09	7.23	22.30	17.38	80.39	152.26	0.00
			Total Land Use Loading =		197	**kg / year of Total Nitrogen**					

NEW PROPOSED ON-SITE MCLP WASTEWATER LOADING								
	Office, Retail, and Rest. (see Table 4)		**Hotel** (see Table 6)			**Residential** (see Table 5)	**Combined New Mashpee Commons Sources of Wastewater**	
Neighborhood	% of Title 5= 36.2% Title 5 (gpd)	Avg. Annual Daily Flow (gpd)	Number of Rooms Table 6	Flow per Room (gpd) =	Avg. Ann. Daily Flow (gpd)	Average Annual Daily Flow (gpd)	Total Average Annual Daily Flow (gpd)	Total New Nitrogen Loading (kg/yr) at 6.43 mg/l
Whitings Road	0	0	0		0	18,879	18,879	168
East Steeple St.	8,755	3,166	120	80	9,600	2,736	15,503	138
Jobs Fishing Rd.	5,198	1,880	20	70	1,400	9,776	13,056	116
North Market St. II	7,380	2,669	0		0	0	2,669	24
Trout Pond	0	0	0		0	0	0	0
Totals	21,333	7,715	140		11,000	31,391	50,107	445
			al On-site Wastewater Loading =		445	**kg / year of Total Nitrogen**		

COMBINED ANNUAL TOTAL NITROGEN LOADINGS				
Source of Nitrogen	Daily Avg. Flow (gpd)	Total Nitr. Conc. (mg/l)	Change in Nitrogen (mg/l)	Total Nitrogen (kg/yr)
Total Land Use Nitrogen				197
Total New On-Site Wastewater Nitrogen	50,107	6.43	6.43	445
Quasi-Municipal Off-Site Wastewater Nitrogen	10,926	35.00	-28.57	-431
Non-specific Off-site Wastewater Nitrogen	5,400	35.00	-28.57	-213
Net Change in Nitrogen Load				-3

Table 9: Estimated Annual Nitrogen Loading - 2010 Build Out
Expansion of Mashpee Commons with Proposed Off-site Wastewater Offsets

Input Variables:	
Lawn Nitrogen Loading (pounds N per 1000 sq ft/year)	3
Ornamental Landscaping (pounds N per 1000 sq ft/year)	1
Wash through to groundwater (% of fertilizer application)	25
Inches of rain per year that infiltrates from roofs and pavement	40
Pavement runoff nitrate concentration (mg/l)	1.5
Percent Reduction in pavement load due to BMPs	25
Roof runoff nitrate concentration (mg/l)	0.75
Treatment plant effluent total nitrogen concentration (mg/l)	5.00
Nitrogen concentration of untreated wastewater (mg/l)	35

Unit Conversions:
0.454 kg/pound
43560 sq ft/acre
28.317 liters/cu ft
12 inches/ft
1000000 mg/kg
365 days/yr
3.785 liters/gal.

	LAND USE LOADING										
		Lawn Areas		Ornamental		Roof Areas		Pavement		Natural Areas	
	Total	14.82	kg/ac/yr	4.94	kg/ac/yr	3.08	kg/ac/yr	4.63	kg/ac/yr	0	kg/ac/yr
Neighborhood	Area	Area	Nitrogen	Area	Nitrogen	Area	Nitrogen	Area	Nitrogen	Area	Nitrogen
	(acres)	(acres)	(kg/yr)	(acres)	(kg/yr)	(acres)	(kg/yr)	(acres)	(kg/yr)	(acres)	(kg/yr)
Whitings Road	40.04	5.28	78.24	2.49	12.30	3.10	9.56	6.60	30.53	22.57	0.00
East Steeple St.	19.04	0.25	3.70	2.40	11.86	3.00	9.25	9.20	42.56	4.19	0.00
Jobs Fishing Rd.	25.59	1.20	17.78	1.40	6.92	4.90	15.11	11.50	53.19	6.59	0.00
North Market St. II	7.39	0.29	4.30	0.75	3.70	1.35	4.16	1.53	7.08	3.47	0.00
Great Neck Rd. So.	52.70		0.00		0.00		0.00		0.00	52.70	0.00
Trout Pond	41.30	0.40	5.93	0.45	2.22	1.40	4.32	4.00	18.50	35.05	0.00
Totals	186.06	7.42	109.96	7.49	37.00	13.75	42.40	32.83	151.86	124.57	0.00

Total Land Use Loading = 341 kg / year of Total Nitrogen

	NEW PROPOSED ON-SITE MCLP WASTEWATER LOADING							
	Office, Retail, and Restaurant (Table 4)		Hotel (Table 6)			Residential (Table 5)	Combined New Mashpee Commons Sources of Wastewater	
Neighborhood	% of Title 5= 36.2%	Avg. Annual Daily Flow (gpd)	Number of Rooms Table 6	Flow per Room (gpd) =	Avg. Ann. Daily Flow (gpd)	Average Annual Daily Flow (gpd)	Total Average Annual Daily Flow (gpd)	Total New Nitrogen Loading (kg/yr) at
	Title 5 (gpd)							5.00 mg/l
Whitings Road	0	0	0		0	24,915	24,915	172
East Steeple St.	18,385	6,649	120	80	9,600	4,345	20,594	142
Jobs Fishing Rd.	16,905	6,114	20	70	1,400	15,840	23,354	161
North Market St. II	9,755	3,528	0		0	0	3,528	24
Trout Pond	2,125	769	0			6,298	7,066	49
Totals	47,170	17,060	140		11,000	51,398	79,458	549

al On-site Wastewater Loading = 549 kg / year of Total Nitrogen

COMBINED ANNUAL TOTAL NITROGEN LOADINGS				
Source of Nitrogen	Daily Avg. Flow (gpd)	Total Nitr. Conc. (mg/l)	Change in Nitrogen (mg/l)	Total Nitrogen (kg/yr)
Total Land Use Nitrogen				341
Total New On-Site Wastewater Nitrogen	79,458	5.00	5.00	549
Quasi-Municipal Off-Site Wastewater Nitrogen	11,472	35.00	-30.00	-476
Non-specific Off-site Wastewater Nitrogen	10,000	35.00	-30.00	-415
Net Change in Nitrogen Load				0

Table 10: Estimated Annual Nitrogen Loading - 2015 Build Out
Expansion of Mashpee Commons with Proposed Off-site Wastewater Offsets

Input Variables:	
Lawn Nitrogen Loading (pounds N per 1000 sq ft/year)	3
Ornamental Landscaping (pounds N per 1000 sq ft/year)	1
Wash through to groundwater (% of fertilizer application)	25
Inches of rain per year that infiltrates from roofs and pavement	40
Pavement runoff nitrate concentration (mg/l)	1.5
Percent Reduction in pavement load due to BMPs	25
Roof runoff nitrate concentration (mg/l)	0.75
Treatment plant effluent total nitrogen concentration (mg/l)	5.00
Nitrogen concentration of untreated wastewater (mg/l)	35

Unit Conversions:	
0.454	kg/pound
43560	sq ft/acre
28.317	liters/cu ft
12	inches/ft
1000000	mg/kg
365	days/yr
3.785	liters/gal.

	LAND USE LOADING										
		Lawn Areas		Ornamental		Roof Areas		Pavement		Natural Areas	
	Total	14.82	kg/ac/yr	4.94	kg/ac/yr	3.08	kg/ac/yr	4.63	kg/ac/yr	0	kg/ac/yr
Neighborhood	Area (acres)	Area (acres)	Nitrogen (kg/yr)	Area (acres)	Nitrogen (kg/yr)	Area (acres)	Nitrogen (kg/yr)	Area (acres)	Nitrogen (kg/yr)	Area (acres)	Nitrogen (kg/yr)
Whitings Road	40.04	5.28	78.24	2.49	12.30	3.10	9.56	6.60	30.53	22.57	0.00
East Steeple St.	19.04	0.25	3.70	2.50	12.35	3.31	10.21	9.42	43.57	3.56	0.00
Jobs Fishing Rd.	25.59	1.30	19.26	1.50	7.41	5.10	15.73	11.70	54.12	5.99	0.00
North Market St. II	7.39	0.29	4.30	0.75	3.70	1.35	4.16	1.53	7.08	3.47	0.00
Great Neck Rd. So.	52.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	52.70	0.00
Trout Pond	41.30	0.70	10.37	0.80	3.95	2.65	8.17	6.90	31.92	30.25	0.00
Totals	186.06	7.82	115.88	8.04	39.71	15.51	47.83	36.15	167.21	118.54	0.00

Total Land Use Loading = 371 **kg / year of Total Nitrogen**

	NEW PROPOSED ON-SITE MCLP WASTEWATER LOADING							
	Office, Retail, and Restaurant (Table 4)		**Hotel** (Table 6)			**Residential** (Table 5)	**Combined New Mashpee Commons Sources of Wastewater**	
Neighborhood	% of Title 5= 36.2%	Avg. Annual Daily Flow (gpd)	Number of Rooms Table 6	Flow per Room (gpd) =	Avg. Ann. Daily Flow (gpd)	Average Annual Daily Flow (gpd)	Total Average Annual Daily Flow (gpd)	Total New Nitrogen Loading (kg/yr) at
	Title 5 (gpd)							5.00 mg/l
Whitings Road	0	0	0		0	24,915	24,915	172
East Steeple St.	19,385	7,011	120	80	9,600	4,345	20,956	145
Jobs Fishing Rd.	16,905	6,114	20	70	1,400	23,788	31,302	216
North Market St. II	9,755	3,528	0		0	0	3,528	24
Trout Pond	5,250	1,899	0			11,578	13,476	93
Totals	51,295	18,552	140		11,000	64,625	94,177	651

al On-site Wastewater Loading = 651 **kg / year of Total Nitrogen**

COMBINED ANNUAL TOTAL NITROGEN LOADINGS				
Source of Nitrogen	Daily Avg. Flow (gpd)	Total Nitr. Conc. (mg/l)	Change in Nitrogen (mg/l)	Total Nitrogen (kg/yr)
Total Land Use Nitrogen				371
Total New On-Site Wastewater Nitrogen	94,177	5.00	5.00	651
Quasi-Municipal Off-Site Wastewater Nitrogen	12,046	35.00	-30.00	-499
Non-specific Off-site Wastewater Nitrogen	12,700	35.00	-30.00	-526
Net Change in Nitrogen Load				-4

Table 11: Combined Total Design Flows for Mashpee Commons WWTP
Three Build Out Target dates (2005, 2010, 2015)

2005	Average Daily Wastewater Flow		Peak Monthly WW Flow (Summer) (gpd)
	May to October (gpd)	November to April (gpd)	
Existing and Future MCLP Office, Retail, Cinema, Restaurant, Hair Salon	33,542	23,954	43,585
MCLP Hotel	22,000	16,800	28,600
Exist and Future MCLP Residential	38,005	30,404	47,506
Quasi-Public Off-Site	10,092	11,760	12,615
Non-specific Off-site (Nitrogen off-set)	5,940	4,860	7,425
TOTALS	109,579	87,778	139,731

2010	Average Daily Wastewater Flow		Peak Monthly WW Flow (Summer) (gpd)
	May to October (gpd)	November to April (gpd)	
Existing and Future MCLP Office, Retail, Cinema, Restaurant, Hair Salon	44,445	31,740	57,752
MCLP Hotel	22,000	16,800	28,600
MCLP Residential	61,188	48,950	76,484
Quasi-Public Off-Site	10,092	11,760	12,615
Non-specific Off-site (Nitrogen off-set)	11,000	9,000	13,750
TOTALS	148,725	118,250	189,202

2015	Average Daily Wastewater Flow		Peak Monthly WW Flow (Summer) (gpd)
	May to October (gpd)	November to April (gpd)	
Existing and Future MCLP Office, Retail, Cinema, Restaurant, Hair Salon	46,186	32,983	60,014
MCLP Hotel	22,000	16,800	28,600
MCLP Residential	74,415	59,532	93,019
Quasi-Public Off-Site	10,092	11,760	12,615
Non-specific Off-site (Nitrogen off-set)	13,970	11,430	17,463
TOTALS	166,663	132,505	211,711

PARCEL 2A
PLAN BOOK 400
PAGE 40
n/f
ARNOLB B.
CHACE, Jr.

N 40°17'12" W
671.25'
213.33'
188.45'
214.04'
55.43'

LAND COURT
PLAN 31659A
n/f
ARNOLB B.
CHACE, Jr.

N 38°30'50" E
68.96'
N 69°01'20" W
96.66'
N 89°19'50" W
84.01'

LOT 1
51,984 SF
1.193± ACRES

329.58'
S 70°36'06" W

LOT 2
75,155 SF
1.725± ACRES

S 70°35'54" W
421.98'

LOT 3
92,363 SF
2.120± ACRES

499.60'
S 70°35'45" W

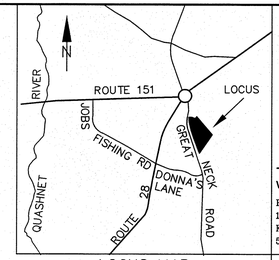
LOT 4
124,050 SF TOTAL
2.848± ACRES
(61,856± SF– 1.420 ACRES
OUTSIDE ELEC EASEMENT)

ELECTRIC COMPANY EASEMENT
30' WIDE SEWER / UTILITY EASEMENT
UTILITY POLES (TYP)
n/f WIND CHIME CONDOMINIUM
105'
210'
210' WIDE
S 34°10'10" W
634.82'
ELECTRIC COMPANY EASEMENT
ZONING DISTRICT R3
ZONING DISTRICT C1

L=158.54'
R= 708.67'
MASHPEE ROAD
BOUND (CB WITH
DISC) FOUND
L=78.74'
CB WITH DRILL
HOLE FOUND
CB WITH DRILL
HOLE FOUND
(FORMER RD.
LAYOUT)
L=200.05'
L= 446.02' R= 2623.57'
CB WITH PIN
IN LEAD PLUG
FOUND
CB WITH DRILL
HOLE FOUND
MAP 74 LOT 17
MAP 74 LOT 27
L=167.22'
32.82'
300.00'
N 20°32'59" W
461.64'
60.82'
68.00'

GREAT NECK ROAD SOUTH
PUBLIC – 60' WIDE – 1969 TOWN LAYOUT

MASHPEE ROAD
BOUND (CB WITH
DISC) FOUND
CB WITH DRILL
HOLE FOUND
CB WITH DRILL
HOLE FOUND
(FORMER RD.
LAYOUT)
MASHPEE ROAD
BOUND (CB WITH
DISC) FOUND
BROKEN CB
FOUND
CB WITH DRILL
HOLE FOUND



LOCUS MAP

THIS SURVEY AND PLAN CONFORM TO THE PROCEDURAL AND TECHNICAL STANDARDS FOR THE PRACTICE OF LAND SURVEYING IN THE COMMONWEALTH OF MASSACHUSETTS

12/5/12 Thomas J. Bunker
DATE PROFESSIONAL LAND SURVEYOR

NOTE: THIS PLAN IS BASED ON AN ON THE GROUND INSTRUMENT SURVEY.

I CERTIFY THAT THIS PLAN WAS MADE IN ACCORDANCE WITH THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS.

12/5/12 Thomas J. Bunker
DATE PROFESSIONAL LAND SURVEYOR

COMMONWEALTH OF MASSACHUSETTS
THOMAS JACKSON BUNKER
NO. 32883
REGISTERED PROFESSIONAL LAND SURVEYOR
12/5/12

Approval under the Subdivision Control Law NOT required.

MASHPEE PLANNING BOARD

Mary Elaine Waygan

Date: December 5, 2012

NO DETERMINATION AS TO COMPLIANCE WITH ZONING REQUIREMENTS HAS BEEN MADE OR INTENDED BY THIS ENDORSEMENT UNDER MGL CHAPTER 41, SECTION 81L

NOTES:
1. OWNER: ARNOLD B. CHACE, Jr
2. ASSESSOR'S PARCELS:
   MAP 74 LOT 27
   MAP 74 LOT 17
3. LOCUS IS WITHIN:
   ZONING DISTRICT: C1
   FLOOD ZONE: C
   BUILDING CODE WIND EXPOSURE CATEGORY: B
   ESTIMATED HABITAT OF RARE SPECIES
4. LOCUS IS NOT WITHIN:
   WIND–BORNE DEBRIS REGION
   ZONE II OF A PUBLIC WATER SUPPLY
   GROUNDWATER PROTECTION OVERLAY DISTRICT
   NEW SEABURY SPECIAL PERMIT AREA
   POPPONESSET OVERLAY DISTRICT
5. PLAN REFERENCES:
   LAND COURT PLAN 36950B
   PLAN BOOK 400 PAGE 40

0' 40' 80' 120'

BSS DESIGN
ENGINEERING & SURVEYING
www.bssdesign.com
BSS Design, Incorporated
164 Katharine Lee Bates Rd
Falmouth Massachusetts 02540
508.540.8805 FAX 508.548.8313

PLAN OF LAND
AT
GREAT NECK ROAD SOUTH
MASHPEE, MASSACHUSETTS
PREPARED FOR
ARNOLD B. CHACE, Jr.

scale 1"= 40'
date NOV 27, 2012
drawn TJB
checked
job number 12284
revisions

drawing number B21–11

Appendix D

Publically Available Database Search

Trout Pond Lots 3 & 4
47-30 GREAT NECK RD S
Mashpee, MA 02649

Inquiry Number: 3591217.3
April 30, 2013

EDR® Environmental Data Resources Inc

440 Wheelers Farms Road
Milford, CT 06461
800.352.0050
www.edrnet.com

Certified Sanborn® Map Report

4/30/13

Site Name:
Trout Pond Lots 3 & 4
47-30 GREAT NECK RD S
Mashpee, MA 02649

Client Name:
The Isosceles Group
50 Congress Street
Boston, MA 02109-4028

EDR Inquiry # 3591217.3

Contact: M Margret Hanley

EDR® Environmental Data Resources Inc

The complete Sanborn Library collection has been searched by EDR, and fire insurance maps covering the target property location provided by The Isosceles Group were identified for the years listed below. The certified Sanborn Library search results in this report can be authenticated by visiting www.edrnet.com/sanborn and entering the certification number. Only Environmental Data Resources Inc. (EDR) is authorized to grant rights for commercial reproduction of maps by Sanborn Library LLC, the copyright holder for the collection.

Certified Sanborn Results:

Site Name: Trout Pond Lots 3 & 4
Address: 47-30 GREAT NECK RD S
City, State, Zip: Mashpee, MA 02649
Cross Street:
P.O. # ISO 13-002
Project: Ph I ESA Trout Pond Lots 3 & 4
Certification # 4B06-41FC-9C55

UNMAPPED PROPERTY

This report certifies that the complete holdings of the Sanborn Library, LLC collection have been searched based on client supplied target property information, and fire insurance maps covering the target property were not found.

Sanborn® Library search results
Certification # 4B06-41FC-9C55

The Sanborn Library includes more than 1.2 million Sanborn fire insurance maps, which track historical property usage in approximately 12,000 American cities and towns. Collections searched:

- ✓ Library of Congress
- ✓ University Publications of America
- ✓ EDR Private Collection

The Sanborn Library LLC Since 1866™

Limited Permission To Make Copies

The Isosceles Group (the client) is permitted to make up to THREE photocopies of this Sanborn Map transmittal and each fire insurance map accompanying this report solely for the limited use of its customer. No one other than the client is authorized to make copies. Upon request made directly to an EDR Account Executive, the client may be permitted to make a limited number of additional photocopies. This permission is conditioned upon compliance by the client, its customer and their agents with EDR's copyright policy; a copy of which is available upon request.

Disclaimer - Copyright and Trademark notice

This Report contains certain information obtained from a variety of public and other sources reasonably available to Environmental Data Resources, Inc. It cannot be concluded from this Report that coverage information for the target and surrounding properties does not exist from other sources. NO WARRANTY EXPRESSED OR IMPLIED, IS MADE WHATSOEVER IN CONNECTION WITH THIS REPORT. ENVIRONMENTAL DATA RESOURCES, INC. SPECIFICALLY DISCLAIMS THE MAKING OF ANY SUCH WARRANTIES, INCLUDING WITHOUT LIMITATION, MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE OR PURPOSE. ALL RISK IS ASSUMED BY THE USER. IN NO EVENT SHALL ENVIRONMENTAL DATA RESOURCES, INC. BE LIABLE TO ANYONE, WHETHER ARISING OUT OF ERRORS OR OMISSIONS, NEGLIGENCE, ACCIDENT OR ANY OTHER CAUSE, FOR ANY LOSS OF DAMAGE, INCLUDING, WITHOUT LIMITATION, SPECIAL, INCIDENTAL CONSEQUENTIAL, OR EXEMPLARY DAMAGES. ANY LIABILITY ON THE PART OF ENVIRONMENTAL DATA RESOURCES, INC. IS STRICTLY LIMITED TO A REFUND OF THE AMOUNT PAID FOR THIS REPORT. Purchaser accepts this Report "AS IS". Any analyses, estimates, ratings, environmental risk levels or risk codes provided in this Report are provided for illustrative purposes only, and are not intended to provide, nor should they be interpreted as providing any facts regarding, or prediction or forecast of, any environmental risk for any property. Only a Phase I Environmental Site Assessment performed by an environmental professional can provide information regarding the environmental risk for any property. Additionally, the information provided in this Report is not to be construed as legal advice.

Copyright 2013 by Environmental Data Resources, Inc. All rights reserved. Reproduction in any media or format, in whole or in part, of any report or map of Environmental Data Resources, Inc., or its affiliates, is prohibited without prior written permission.

EDR and its logos (including Sanborn and Sanborn Map) are trademarks of Environmental Data Resources, Inc. or its affiliates. All other trademarks used herein are the property of their respective owners.

Trout Pond Lots 3 and 4
68 Great Neck Road South
Mashpee, MA 02649

Inquiry Number: 4349508.2s
July 09, 2015

The EDR Radius Map™ Report with GeoCheck®

EDR® Environmental Data Resources Inc

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

TABLE OF CONTENTS

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

Disclaimer - Copyright and Trademark Notice

This Report contains certain information obtained from a variety of public and other sources reasonably available to Environmental Data Resources, Inc. It cannot be concluded from this Report that coverage information for the target and surrounding properties does not exist from other sources. **NO WARRANTY EXPRESSED OR IMPLIED, IS MADE WHATSOEVER IN CONNECTION WITH THIS REPORT. ENVIRONMENTAL DATA RESOURCES, INC. SPECIFICALLY DISCLAIMS THE MAKING OF ANY SUCH WARRANTIES, INCLUDING WITHOUT LIMITATION, MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE OR PURPOSE. ALL RISK IS ASSUMED BY THE USER. IN NO EVENT SHALL ENVIRONMENTAL DATA RESOURCES, INC. BE LIABLE TO ANYONE, WHETHER ARISING OUT OF ERRORS OR OMISSIONS, NEGLIGENCE, ACCIDENT OR ANY OTHER CAUSE, FOR ANY LOSS OF DAMAGE, INCLUDING, WITHOUT LIMITATION, SPECIAL, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES. ANY LIABILITY ON THE PART OF ENVIRONMENTAL DATA RESOURCES, INC. IS STRICTLY LIMITED TO A REFUND OF THE AMOUNT PAID FOR THIS REPORT.** Purchaser accepts this Report "AS IS". Any analyses, estimates, ratings, environmental risk levels or risk codes provided in this Report are provided for illustrative purposes only, and are not intended to provide, nor should they be interpreted as providing any facts regarding, or prediction or forecast of, any environmental risk for any property. Only a Phase I Environmental Site Assessment performed by an environmental professional can provide information regarding the environmental risk for any property. Additionally, the information provided in this Report is not to be construed as legal advice.

Copyright 2015 by Environmental Data Resources, Inc. All rights reserved. Reproduction in any media or format, in whole or in part, of any report or map of Environmental Data Resources, Inc., or its affiliates, is prohibited without prior written permission.

EDR and its logos (including Sanborn and Sanborn Map) are trademarks of Environmental Data Resources, Inc. or its affiliates. All other trademarks used herein are the property of their respective owners.

EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-13) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

TARGET PROPERTY INFORMATION

ADDRESS

68 GREAT NECK ROAD SOUTH
MASHPEE, MA 02649

COORDINATES

Latitude (North):	41.6149000 - 41° 36' 53.64''
Longitude (West):	70.4857000 - 70° 29' 8.52''
Universal Tranverse Mercator:	Zone 19
UTM X (Meters):	376213.8
UTM Y (Meters):	4607873.5
Elevation:	61 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property Map:	41070-E4 COTUIT (DIGITAL), MA
Most Recent Revision:	1974
North Map:	41070-F4 SANDWICH (DIGITAL), MA
Most Recent Revision:	1972
West Map:	41070-E5 FALMOUTH, MA
Most Recent Revision:	1979

AERIAL PHOTOGRAPHY IN THIS REPORT

Portions of Photo from:	20120813
Source:	USDA

MAPPED SITES SUMMARY

Target Property Address:
68 GREAT NECK ROAD SOUTH
MASHPEE, MA 02649

Click on Map ID to see full detail.

MAP ID	SITE NAME	ADDRESS	DATABASE ACRONYMS	RELATIVE ELEVATION	DIST (ft. & mi.) DIRECTION
1		548 FALMOUTH RD	EDR US Hist Auto Stat	Lower	1074, 0.203, NW
2	MOBIL #2730	548 FALMOUTH RD	SHWS, LUST, UST, AST, RELEASE, Financial...	Lower	1330, 0.252, North
3	DEER CROSSING	681 FALMOUTH RD	SHWS, RELEASE	Lower	2033, 0.385, SW
4	INTERSECTION	RTE 28 AND QUINAQUIS	SHWS, RELEASE	Lower	2993, 0.567, NNE
5	MASHPEE DPW	350 MEETING HOUSE RD	SHWS, RELEASE	Lower	4899, 0.928, NNE

EXECUTIVE SUMMARY

TARGET PROPERTY SEARCH RESULTS

The target property was not listed in any of the databases searched by EDR.

DATABASES WITH NO MAPPED SITES

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records either on the target property or within the search radius around the target property for the following databases:

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL ---------- National Priority List
Proposed NPL ---------- Proposed National Priority List Sites
NPL LIENS ---------- Federal Superfund Liens

Federal Delisted NPL site list

Delisted NPL ---------- National Priority List Deletions

Federal CERCLIS list

CERCLIS ---------- Comprehensive Environmental Response, Compensation, and Liability Information System
FEDERAL FACILITY ---------- Federal Facility Site Information listing

Federal CERCLIS NFRAP site List

CERC-NFRAP ---------- CERCLIS No Further Remedial Action Planned

Federal RCRA CORRACTS facilities list

CORRACTS ---------- Corrective Action Report

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF ---------- RCRA - Treatment, Storage and Disposal

Federal RCRA generators list

RCRA-LQG ---------- RCRA - Large Quantity Generators
RCRA-SQG ---------- RCRA - Small Quantity Generators
RCRA-CESQG ---------- RCRA - Conditionally Exempt Small Quantity Generator

Federal institutional controls / engineering controls registries

US ENG CONTROLS ---------- Engineering Controls Sites List
US INST CONTROL ---------- Sites with Institutional Controls

LUCIS ---------- Land Use Control Information System

Federal ERNS list

ERNS ---------- Emergency Response Notification System

State and tribal landfill and/or solid waste disposal site lists

SWF/LF ---------- Solid Waste Facility Database/Transfer Stations

State and tribal leaking storage tank lists

LAST ---------- Leaking Aboveground Storage Tank Sites
INDIAN LUST ---------- Leaking Underground Storage Tanks on Indian Land

State and tribal registered storage tank lists

UST ---------- Summary Listing of all the Tanks Registered in the State of Massachusetts
AST ---------- Aboveground Storage Tank Database
INDIAN UST ---------- Underground Storage Tanks on Indian Land
FEMA UST ---------- Underground Storage Tank Listing

State and tribal institutional control / engineering control registries

INST CONTROL ---------- Sites With Activity and Use Limitation

State and tribal voluntary cleanup sites

INDIAN VCP ---------- Voluntary Cleanup Priority Listing

State and tribal Brownfields sites

BROWNFIELDS ---------- Completed Brownfields Covenants Listing

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS ---------- A Listing of Brownfields Sites

Local Lists of Landfill / Solid Waste Disposal Sites

ODI ---------- Open Dump Inventory
DEBRIS REGION 9 ---------- Torres Martinez Reservation Illegal Dump Site Locations
INDIAN ODI ---------- Report on the Status of Open Dumps on Indian Lands

Local Lists of Hazardous waste / Contaminated Sites

US CDL ---------- Clandestine Drug Labs
US HIST CDL ---------- National Clandestine Laboratory Register

Local Land Records

LIENS 2 ---------- CERCLA Lien Information

LIENS ---- Liens Information Listing

Records of Emergency Release Reports

HMIRS ---- Hazardous Materials Information Reporting System
RELEASE ---- Reportable Releases Database
SPILLS ---- Historical Spill List
SPILLS 80 ---- SPILLS 80 data from FirstSearch
SPILLS 90 ---- SPILLS 90 data from FirstSearch

Other Ascertainable Records

RCRA NonGen / NLR ---- RCRA - Non Generators / No Longer Regulated
DOT OPS ---- Incident and Accident Data
DOD ---- Department of Defense Sites
FUDS ---- Formerly Used Defense Sites
CONSENT ---- Superfund (CERCLA) Consent Decrees
ROD ---- Records Of Decision
UMTRA ---- Uranium Mill Tailings Sites
US MINES ---- Mines Master Index File
TRIS ---- Toxic Chemical Release Inventory System
TSCA ---- Toxic Substances Control Act
FTTS ---- FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
HIST FTTS ---- FIFRA/TSCA Tracking System Administrative Case Listing
SSTS ---- Section 7 Tracking Systems
ICIS ---- Integrated Compliance Information System
PADS ---- PCB Activity Database System
MLTS ---- Material Licensing Tracking System
RADINFO ---- Radiation Information Database
FINDS ---- Facility Index System/Facility Registry System
RAATS ---- RCRA Administrative Action Tracking System
RMP ---- Risk Management Plans
NPDES ---- NPDES Permit Listing
DRYCLEANERS ---- Regulated Drycleaning Facilities
ENF ---- Enforcement Action Cases
AIRS ---- Permitted Facilities Listing
TIER 2 ---- Tier 2 Information Listing
LEAD ---- Lead Inspection Database
INDIAN RESERV ---- Indian Reservations
SCRD DRYCLEANERS ---- State Coalition for Remediation of Drycleaners Listing
TSD ---- TSD Facility
MERCURY ---- Mercury Product Recyling Drop-Off Locations Listing
HW GEN ---- List of Massachusetts Hazardous Waste Generators
Financial Assurance ---- Financial Assurance Information Listing
GWDP ---- Ground Water Discharge Permits
LEAD SMELTERS ---- Lead Smelter Sites
US AIRS ---- Aerometric Information Retrieval System Facility Subsystem
EPA WATCH LIST ---- EPA WATCH LIST
US FIN ASSUR ---- Financial Assurance Information
COAL ASH EPA ---- Coal Combustion Residues Surface Impoundments List
PCB TRANSFORMER ---- PCB Transformer Registration Database
COAL ASH DOE ---- Steam-Electric Plant Operation Data
2020 COR ACTION ---- 2020 Corrective Action Program List
PRP ---- Potentially Responsible Parties

EXECUTIVE SUMMARY

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP ---------- EDR Proprietary Manufactured Gas Plants
EDR US Hist Cleaners ------- EDR Exclusive Historic Dry Cleaners

EDR RECOVERED GOVERNMENT ARCHIVES

Exclusive Recovered Govt. Archives

RGA LUST ---------- Recovered Government Archive Leaking Underground Storage Tank
RGA HWS ---------- Recovered Government Archive State Hazardous Waste Facilities List

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were identified in the following databases.

Elevations have been determined from the USGS Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified. Sites with an elevation equal to or higher than the target property have been differentiated below from sites with an elevation lower than the target property.
Page numbers and map identification numbers refer to the EDR Radius Map report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

Unmappable (orphan) sites are not considered in the foregoing analysis.

STANDARD ENVIRONMENTAL RECORDS

State- and tribal - equivalent CERCLIS

SHWS: Contains information on releases of oil and hazardous materials that have been reported to DEP.

A review of the SHWS list, as provided by EDR, and dated 04/10/2015 has revealed that there are 4 SHWS sites within approximately 1 mile of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
MOBIL #2730	***548 FALMOUTH RD***	***N 1/4 - 1/2 (0.252 mi.)***	***2***	***8***
Release Tracking Number / Current Status: 4-0019030 / RAO				
DEER CROSSING	***681 FALMOUTH RD***	***SW 1/4 - 1/2 (0.385 mi.)***	***3***	***14***
Release Tracking Number / Current Status: 4-0019056 / RAO				
INTERSECTION	***RTE 28 AND QUINAQUIS***	***NNE 1/2 - 1 (0.567 mi.)***	***4***	***16***
Release Tracking Number / Current Status: 4-0018583 / RAO				
MASHPEE DPW	***350 MEETING HOUSE RD***	***NNE 1/2 - 1 (0.928 mi.)***	***5***	***18***
Release Tracking Number / Current Status: 4-0017468 / RAO				

EXECUTIVE SUMMARY

State and tribal leaking storage tank lists

LUST: Sites within the Releases Database that have a UST listed as its source.

A review of the LUST list, as provided by EDR, and dated 04/10/2015 has revealed that there is 1 LUST site within approximately 0.5 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
MOBIL #2730	***548 FALMOUTH RD***	***N 1/4 - 1/2 (0.252 mi.)***	***2***	***8***
Release Tracking Number / Current Status: 4-0011080 / RAO				

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR US Hist Auto Stat: EDR has searched selected national collections of business directories and has collected listings of potential gas station/filling station/service station sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include gas station/filling station/service station establishments. The categories reviewed included, but were not limited to gas, gas station, gasoline station, filling station, auto, automobile repair, auto service station, service station, etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

A review of the EDR US Hist Auto Stat list, as provided by EDR, has revealed that there is 1 EDR US Hist Auto Stat site within approximately 0.25 miles of the target property.

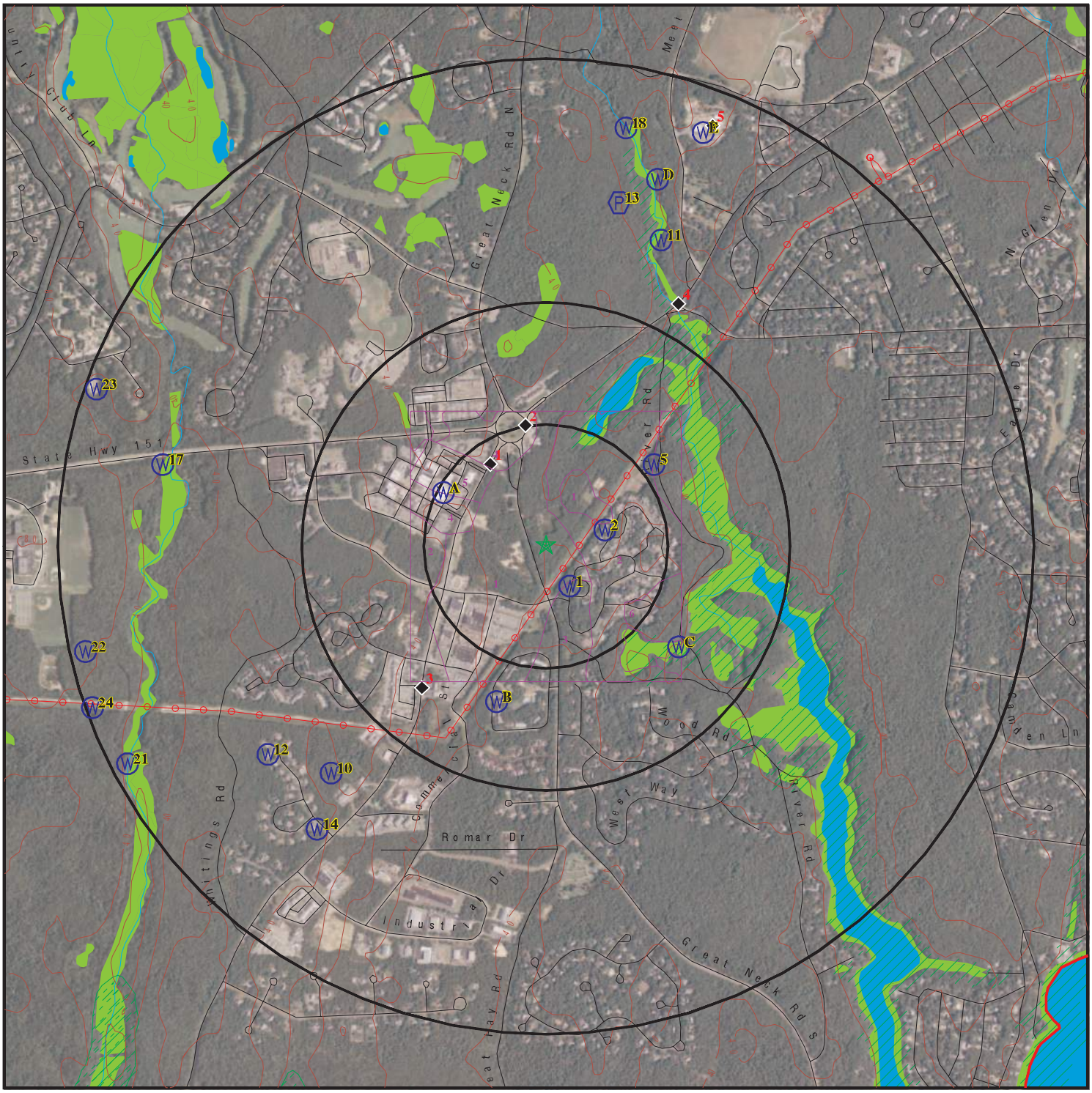
Lower Elevation	Address	Direction / Distance	Map ID	Page
Not reported	548 FALMOUTH RD	NW 1/8 - 1/4 (0.203 mi.)	1	8

EXECUTIVE SUMMARY

Due to poor or inadequate address information, the following sites were not mapped. Count: 1 records.

Site Name	Database(s)
AIRCRAFT RAMP	SHWS, RELEASE

OVERVIEW MAP - 4349508.2S



- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites

0 1/4 1/2 1 Miles

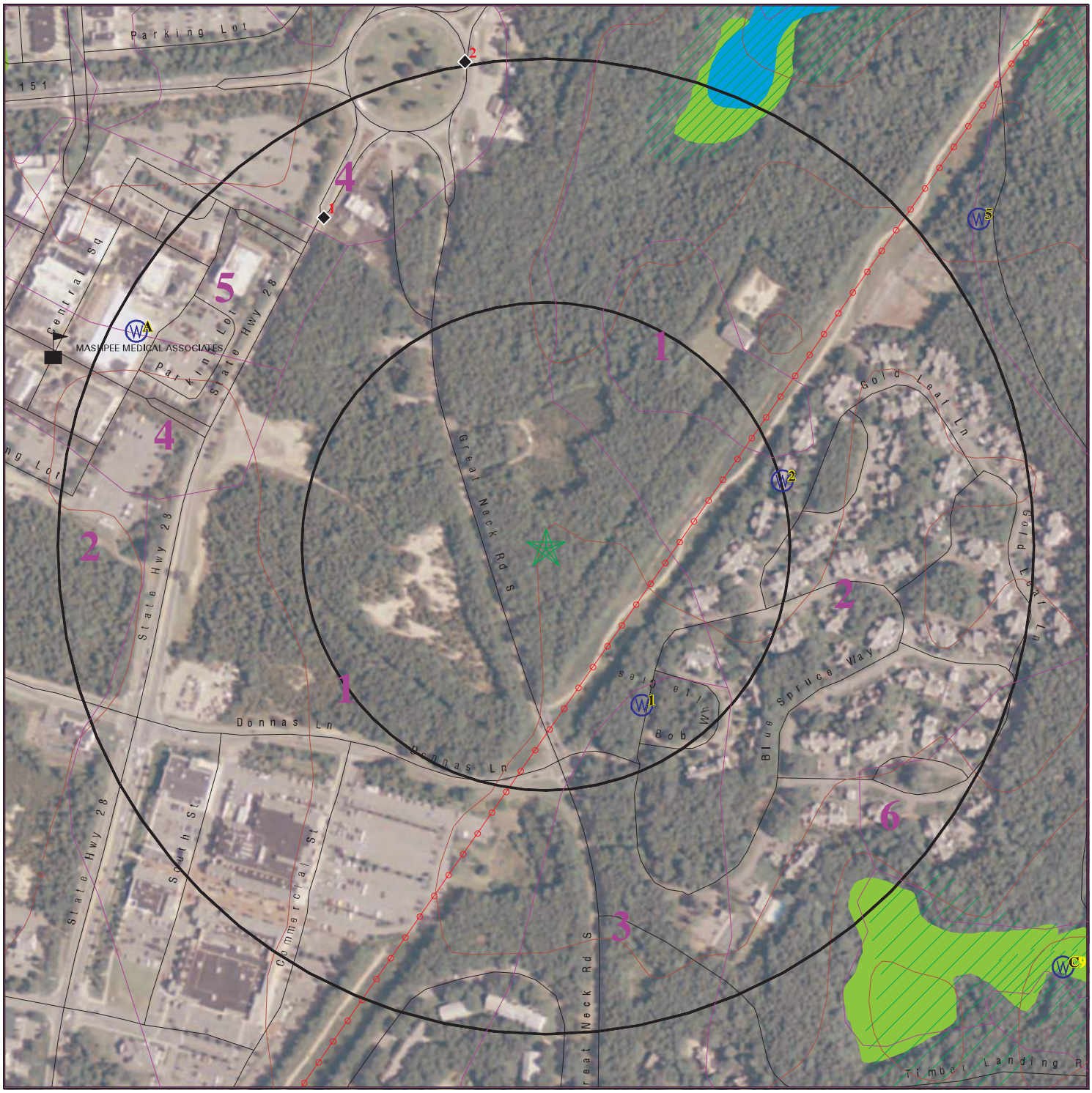
- Indian Reservations BIA
- County Boundary
- Power transmission lines
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- Areas of Critical Environmental Concern

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME:	Trout Pond Lots 3 and 4	CLIENT:	The Isosceles Group
ADDRESS:	68 Great Neck Road South Mashpee MA 02649	CONTACT:	M Margret Hanley
LAT/LONG:	41.6149 / 70.4857	INQUIRY #:	4349508.2s
		DATE:	July 09, 2015 1:54 pm

Copyright © 2015 EDR, Inc. © 2010 Tele Atlas Rel. 07/2009.

DETAIL MAP - 4349508.2S



- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- Sensitive Receptors
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Power transmission lines
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- Areas of Critical Environmental Concern

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME:	Trout Pond Lots 3 and 4	CLIENT:	The Isosceles Group
ADDRESS:	68 Great Neck Road South Mashpee MA 02649	CONTACT:	M Margret Hanley
LAT/LONG:	41.6149 / 70.4857	INQUIRY #:	4349508.2s
		DATE:	July 09, 2015 1:55 pm

Copyright © 2015 EDR, Inc. © 2010 Tele Atlas Rel. 07/2009.

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
STANDARD ENVIRONMENTAL RECORDS								
Federal NPL site list								
NPL	1.000		0	0	0	0	NR	0
Proposed NPL	1.000		0	0	0	0	NR	0
NPL LIENS	TP		NR	NR	NR	NR	NR	0
Federal Delisted NPL site list								
Delisted NPL	1.000		0	0	0	0	NR	0
Federal CERCLIS list								
CERCLIS	0.500		0	0	0	NR	NR	0
FEDERAL FACILITY	0.500		0	0	0	NR	NR	0
Federal CERCLIS NFRAP site List								
CERC-NFRAP	0.500		0	0	0	NR	NR	0
Federal RCRA CORRACTS facilities list								
CORRACTS	1.000		0	0	0	0	NR	0
Federal RCRA non-CORRACTS TSD facilities list								
RCRA-TSDF	0.500		0	0	0	NR	NR	0
Federal RCRA generators list								
RCRA-LQG	0.250		0	0	NR	NR	NR	0
RCRA-SQG	0.250		0	0	NR	NR	NR	0
RCRA-CESQG	0.250		0	0	NR	NR	NR	0
Federal institutional controls / engineering controls registries								
US ENG CONTROLS	0.500		0	0	0	NR	NR	0
US INST CONTROL	0.500		0	0	0	NR	NR	0
LUCIS	0.500		0	0	0	NR	NR	0
Federal ERNS list								
ERNS	TP		NR	NR	NR	NR	NR	0
State- and tribal - equivalent CERCLIS								
SHWS	1.000		0	0	2	2	NR	4
State and tribal landfill and/or solid waste disposal site lists								
SWF/LF	0.500		0	0	0	NR	NR	0
State and tribal leaking storage tank lists								
LUST	0.500		0	0	1	NR	NR	1
LAST	0.500		0	0	0	NR	NR	0
INDIAN LUST	0.500		0	0	0	NR	NR	0
State and tribal registered storage tank lists								
UST	0.250		0	0	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
AST	0.250		0	0	NR	NR	NR	0
INDIAN UST	0.250		0	0	NR	NR	NR	0
FEMA UST	0.250		0	0	NR	NR	NR	0
State and tribal institutional control / engineering control registries								
INST CONTROL	0.500		0	0	0	NR	NR	0
State and tribal voluntary cleanup sites								
INDIAN VCP	0.500		0	0	0	NR	NR	0
State and tribal Brownfields sites								
BROWNFIELDS	0.500		0	0	0	NR	NR	0
ADDITIONAL ENVIRONMENTAL RECORDS								
Local Brownfield lists								
US BROWNFIELDS	0.500		0	0	0	NR	NR	0
Local Lists of Landfill / Solid Waste Disposal Sites								
ODI	0.500		0	0	0	NR	NR	0
DEBRIS REGION 9	0.500		0	0	0	NR	NR	0
INDIAN ODI	0.500		0	0	0	NR	NR	0
Local Lists of Hazardous waste / Contaminated Sites								
US CDL	TP		NR	NR	NR	NR	NR	0
US HIST CDL	TP		NR	NR	NR	NR	NR	0
Local Land Records								
LIENS 2	TP		NR	NR	NR	NR	NR	0
LIENS	TP		NR	NR	NR	NR	NR	0
Records of Emergency Release Reports								
HMIRS	TP		NR	NR	NR	NR	NR	0
RELEASE	TP		NR	NR	NR	NR	NR	0
SPILLS	TP		NR	NR	NR	NR	NR	0
SPILLS 80	TP		NR	NR	NR	NR	NR	0
SPILLS 90	TP		NR	NR	NR	NR	NR	0
Other Ascertainable Records								
RCRA NonGen / NLR	0.250		0	0	NR	NR	NR	0
DOT OPS	TP		NR	NR	NR	NR	NR	0
DOD	1.000		0	0	0	0	NR	0
FUDS	1.000		0	0	0	0	NR	0
CONSENT	1.000		0	0	0	0	NR	0
ROD	1.000		0	0	0	0	NR	0
UMTRA	0.500		0	0	0	NR	NR	0
US MINES	0.250		0	0	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
TRIS	TP		NR	NR	NR	NR	NR	0
TSCA	TP		NR	NR	NR	NR	NR	0
FTTS	TP		NR	NR	NR	NR	NR	0
HIST FTTS	TP		NR	NR	NR	NR	NR	0
SSTS	TP		NR	NR	NR	NR	NR	0
ICIS	TP		NR	NR	NR	NR	NR	0
PADS	TP		NR	NR	NR	NR	NR	0
MLTS	TP		NR	NR	NR	NR	NR	0
RADINFO	TP		NR	NR	NR	NR	NR	0
FINDS	TP		NR	NR	NR	NR	NR	0
RAATS	TP		NR	NR	NR	NR	NR	0
RMP	TP		NR	NR	NR	NR	NR	0
NPDES	TP		NR	NR	NR	NR	NR	0
DRYCLEANERS	0.250		0	0	NR	NR	NR	0
ENF	TP		NR	NR	NR	NR	NR	0
AIRS	TP		NR	NR	NR	NR	NR	0
TIER 2	TP		NR	NR	NR	NR	NR	0
LEAD	TP		NR	NR	NR	NR	NR	0
INDIAN RESERV	1.000		0	0	0	0	NR	0
SCRD DRYCLEANERS	0.500		0	0	0	NR	NR	0
TSD	0.500		0	0	0	NR	NR	0
MERCURY	0.500		0	0	0	NR	NR	0
HW GEN	0.250		0	0	NR	NR	NR	0
Financial Assurance	TP		NR	NR	NR	NR	NR	0
GWDP	TP		NR	NR	NR	NR	NR	0
LEAD SMELTERS	TP		NR	NR	NR	NR	NR	0
US AIRS	TP		NR	NR	NR	NR	NR	0
EPA WATCH LIST	TP		NR	NR	NR	NR	NR	0
US FIN ASSUR	TP		NR	NR	NR	NR	NR	0
COAL ASH EPA	0.500		0	0	0	NR	NR	0
PCB TRANSFORMER	TP		NR	NR	NR	NR	NR	0
COAL ASH DOE	TP		NR	NR	NR	NR	NR	0
2020 COR ACTION	0.250		0	0	NR	NR	NR	0
PRP	TP		NR	NR	NR	NR	NR	0
EDR HIGH RISK HISTORICAL RECORDS								
EDR Exclusive Records								
EDR MGP	1.000		0	0	0	0	NR	0
EDR US Hist Auto Stat	0.250		0	1	NR	NR	NR	1
EDR US Hist Cleaners	0.250		0	0	NR	NR	NR	0
EDR RECOVERED GOVERNMENT ARCHIVES								
Exclusive Recovered Govt. Archives								
RGA LUST	TP		NR	NR	NR	NR	NR	0
RGA HWS	TP		NR	NR	NR	NR	NR	0
- Totals --		0	0	1	3	2	0	6

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted

NOTES:

TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one database

1
NW
1/8-1/4
0.203 mi.
1074 ft.

548 FALMOUTH RD
MASHPEE, MA 02649

EDR US Hist Auto Stat **1015548876**
N/A

Relative:
Lower

Actual:
45 ft.

EDR Historical Auto Stations:

Name:	MASHPEE MOBIL
Year:	2001
Address:	548 FALMOUTH RD
Name:	MOBIL OIL MASHPPE
Year:	2002
Address:	548 FALMOUTH RD
Name:	MOBIL OIL CORP
Year:	2009
Address:	548 FALMOUTH RD

2
North
1/4-1/2
0.252 mi.
1330 ft.

Relative:
Lower

Actual:
54 ft.

MOBIL #2730
548 FALMOUTH RD
MASHPEE, MA 02649

SHWS **U003096519**
LUST **N/A**
UST
AST
RELEASE
Financial Assurance
HW GEN

SHWS:

Release Tracking Number/Current Status:	4-0019030 / RAO
Release Town:	MASHPEE
Notification Date:	04/16/2005
Category:	TWO HR
Associated ID:	Not reported
Current Status:	**Response Action Outcome**
Status Date:	06/13/2005
Phase:	Not reported
Response Action Outcome:	A1 - A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.
Oil Or Haz Material:	Oil
Location Type:	COMMERCIAL
Source:	PIPE

Click here to access the MA DEP site for this facility:

Chemicals:

Chemical:	GASOLINE
Quantity:	20 gallons

Actions:

Action Type:	Immediate Response Action
Action Status:	Oral Approval of Plan or Action
Action Date:	4/16/2005
Response Action Outcome:	A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.
Action Type:	Release Disposition
Action Status:	Reportable Release under MGL 21E
Action Date:	4/16/2005
Response Action Outcome:	A permanent solution has been achieved. Contamination has been reduced

MOBIL #2730 (Continued) **U003096519**

to background or a threat of release has been eliminated.

Action Type: A Notice sent to a Potentially Responsible Party (PRP)
Action Status: A MassDEP piece of correspondence was issued (approvals, NORs, etc.
Action Date: 4/26/2005
Response Action Outcome: A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.

Action Type: Response Action Outcome - RAO
Action Status: RAO Statement Received
Action Date: 6/13/2005
Response Action Outcome: A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.

Action Type: RNF
Action Status: Reportable Release under MGL 21E
Action Date: 6/13/2005
Response Action Outcome: A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.

Action Type: Response Action Outcome - RAO
Action Status: Level I - Technical Screen Audit
Action Date: 6/20/2005
Response Action Outcome: A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.

LUST:

Facility:
Release Tracking Number/Current Status: 4-0011080 / RAO
Status Date: 05/19/1995
Source Type: UST
Release Town: MASHPEE
Notification Date: 01/19/1995
Category: 72 HR
Associated ID: Not reported
Phase: Not reported
Response Action Outcome: B1 - Remedial actions have not been conducted because a level of No Significant Risk exists.
Oil Or Haz Material: Oil

Location Type: COMMERCIAL
Source: UST

Click here to access the MA DEP site for this facility:

Chemicals:
Chemical: GASOLINE
Quantity: 129 gallons
Chemical: GASOLINE
Quantity: 129 parts per million

Actions:
Action Type: RLFA

MOBIL #2730 (Continued) **U003096519**

Action Status:	FOLFLD
Action Date:	1/19/1995
Response Action Outcome:	Remedial actions have not been conducted because a level of No Significant Risk exists.
Action Type:	Immediate Response Action
Action Status:	Oral Approval of Plan or Action
Action Date:	1/19/1995
Response Action Outcome:	Remedial actions have not been conducted because a level of No Significant Risk exists.
Action Type:	Release Disposition
Action Status:	Reportable Release under MGL 21E
Action Date:	1/19/1995
Response Action Outcome:	Remedial actions have not been conducted because a level of No Significant Risk exists.
Action Type:	A Notice sent to a Potentially Responsible Party (PRP)
Action Status:	A MassDEP piece of correspondence was issued (approvals, NORs, etc.
Action Date:	1/20/1995
Response Action Outcome:	Remedial actions have not been conducted because a level of No Significant Risk exists.
Action Type:	Immediate Response Action
Action Status:	Written Approval of Plan
Action Date:	1/20/1995
Response Action Outcome:	Remedial actions have not been conducted because a level of No Significant Risk exists.
Action Type:	Immediate Response Action
Action Status:	Written Plan Received
Action Date:	3/20/1995
Response Action Outcome:	Remedial actions have not been conducted because a level of No Significant Risk exists.
Action Type:	RNF
Action Status:	Reportable Release under MGL 21E
Action Date:	3/20/1995
Response Action Outcome:	Remedial actions have not been conducted because a level of No Significant Risk exists.
Action Type:	Response Action Outcome - RAO
Action Status:	RAO Statement Received
Action Date:	5/19/1995
Response Action Outcome:	Remedial actions have not been conducted because a level of No Significant Risk exists.
Action Type:	Immediate Response Action
Action Status:	Completion Statement Received
Action Date:	5/19/1995
Response Action Outcome:	Remedial actions have not been conducted because a level of No Significant Risk exists.

UST:

Facility:

MOBIL #2730 (Continued) **U003096519**

Facility ID:	1408
Owner Id:	10319
Owner:	GLOBAL MONTELLO GROUP CORPORATION
Owner Address:	PO BOX 549290
Owner City,St,Zip:	WALTHAM, MA 02454
Telephone:	(800) 997-7725
Description:	Gas Station
Fire Dept. ID:	1172
Date of Inspection:	03/27/2015

Tank ID:	1
Serial Number:	Not reported
Tank Status:	**Removed**
Status Date:	01/01/1995
Date Installed:	03/06/1967
Capacity:	6000
Contents:	Gasoline
Tank Type:	1 Wall
Tank Usage:	MV
Tank Material:	Cathodic
Tank Leak Detection:	Inventory Record-Keeping
Pipe Material:	Steel
Pipe Container:	1 Wall
Pipe Leak Detection:	Product Line Leak Detector
Above Ground:	No

Tank ID:	2
Serial Number:	Not reported
Tank Status:	**Removed**
Status Date:	01/01/1995
Date Installed:	03/06/1967
Capacity:	6000
Contents:	Gasoline
Tank Type:	1 Wall
Tank Usage:	MV
Tank Material:	Cathodic
Tank Leak Detection:	Inventory Record-Keeping
Pipe Material:	Steel
Pipe Container:	1 Wall
Pipe Leak Detection:	Product Line Leak Detector
Above Ground:	No

Tank ID:	3
Serial Number:	Not reported
Tank Status:	**Removed**
Status Date:	01/01/1995
Date Installed:	03/06/1977
Capacity:	8000
Contents:	Gasoline
Tank Type:	1 Wall
Tank Usage:	MV
Tank Material:	Cathodic
Tank Leak Detection:	Inventory Record-Keeping
Pipe Material:	Steel

MOBIL #2730 (Continued) **U003096519**

Pipe Container: 1 Wall
Pipe Leak Detection: Product Line Leak Detector
Above Ground: No

Tank ID: 4
Serial Number: Not reported
Tank Status: Removed
Status Date: 01/01/1995
Date Installed: 03/06/1967
Capacity: 4000
Contents: Gasoline
Tank Type: 1 Wall
Tank Usage: MV
Tank Material: Cathodic
Tank Leak Detection: Inventory Record-Keeping
Pipe Material: Steel
Pipe Container: 1 Wall
Pipe Leak Detection: Product Line Leak Detector
Above Ground: No

Tank ID: 5
Serial Number: Not reported
Tank Status: In Use
Status Date: Not reported
Date Installed: 04/01/1995
Capacity: 12000
Contents: Gasoline
Tank Type: 2 Walls
Tank Usage: MV
Tank Material: Reinforced
Tank Leak Detection: Interstitial Monitoring
Pipe Material: Reinforced
Pipe Container: 2 Walls
Pipe Leak Detection: Interstitial Space Monitor
Above Ground: No

Tank ID: 6
Serial Number: Not reported
Tank Status: In Use
Status Date: Not reported
Date Installed: 04/01/1995
Capacity: 12000
Contents: Gasoline
Tank Type: 2 Walls
Tank Usage: MV
Tank Material: Reinforced
Tank Leak Detection: Interstitial Monitoring
Pipe Material: Reinforced
Pipe Container: 2 Walls
Pipe Leak Detection: Interstitial Space Monitor
Above Ground: No

Tank ID: 7

MOBIL #2730 (Continued) **U003096519**

Serial Number:	Not reported
Tank Status:	**In Use**
Status Date:	Not reported
Date Installed:	04/01/1995
Capacity:	12000
Contents:	Gasoline
Tank Type:	2 Walls
Tank Usage:	MV
Tank Material:	Reinforced
Tank Leak Detection:	Interstitial Monitoring
Pipe Material:	Reinforced
Pipe Container:	2 Walls
Pipe Leak Detection:	Interstitial Space Monitor
Above Ground:	No

AST:

Facility ID:	1408
Owner Id:	4442
Owner:	EXXONMOBIL OIL CORPORATION
Owner Address:	PO BOX 22087
Owner City,St,Zip:	GREENSBORO, NC 27420
Telephone:	(800) 253-8054
Description:	Gas Station
Fire Dept. ID:	1172
Date of Inspection:	3/12/2008
Inspector:	George W Nice
Overfill Prevention:	Not reported
Spill Prevention:	Not reported

Tank Info:

Tank ID:	8
Serial Number:	Not reported
Tank Status:	In Use
Capacity:	500
Contents:	Fuel Oil
Tank Use:	Not reported
Tank Material:	Steel
Tank Construction:	1 Wall
Tank Leak Detection:	Inventory Record-Keeping
Pipe Material:	Not reported
Pipe Construction:	Not reported
Pipe Leak Detection:	Not reported
Aboveground:	Yes

Release:

Release Tracking Number/Current Status:	4-0011080 / RAO
Primary ID:	Not reported
Official City:	MASHPEE
Notification:	01/19/1995
Category:	72 HR
Status Date:	05/19/1995
Phase:	Not reported
Response Action Outcome:	B1 - Remedial actions have not been conducted because a level of No Significant Risk exists.
Oil / Haz Material Type:	Oil

MOBIL #2730 (Continued) **U003096519**

Click here to access the MA DEP site for this facility:

Release Tracking Number/Current Status:	4-0019030 / RAO
Primary ID:	Not reported
Official City:	MASHPEE
Notification:	04/16/2005
Category:	TWO HR
Status Date:	06/13/2005
Phase:	Not reported
Response Action Outcome:	A1 - A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.
Oil / Haz Material Type:	Oil

Click here to access the MA DEP site for this facility:

MA Financial Assurance 2:

Facility Id:	1408
Description:	Gas Station
Work Phone:	(800) 997-7725

HW GEN:

EPA Id:	MAD985289032
RCRA Generator Status:	VSQG
State Generator Status:	VQG-MA

---

3 **DEER CROSSING** **SHWS S107405499**
SW **681 FALMOUTH RD** **RELEASE N/A**
1/4-1/2 **MASHPEE, MA 02649**
0.385 mi.
2033 ft.

Relative:
Lower

Actual:
24 ft.

SHWS:

Release Tracking Number/Current Status:	4-0019056 / RAO
Release Town:	MASHPEE
Notification Date:	05/01/2005
Category:	TWO HR
Associated ID:	Not reported
Current Status:	**Response Action Outcome**
Status Date:	08/30/2005
Phase:	Not reported
Response Action Outcome:	A1 - A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.
Oil Or Haz Material:	Oil
Location Type:	COMMERCIAL

Click here to access the MA DEP site for this facility:

Chemicals:

Chemical:	HYDRAULIC FLUID
Quantity:	30 gallons

Actions:

Action Type:	Release Disposition
Action Status:	Reportable Release under MGL 21E

DEER CROSSING (Continued) **S107405499**

Action Date: 5/1/2005
Response Action Outcome: A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.

Action Type: Immediate Response Action
Action Status: Oral Approval of Plan or Action
Action Date: 5/1/2005
Response Action Outcome: A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.

Action Type: A Notice sent to a Potentially Responsible Party (PRP)
Action Status: A MassDEP piece of correspondence was issued (approvals, NORs, etc.
Action Date: 5/9/2005
Response Action Outcome: A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.

Action Type: RNF
Action Status: Reportable Release under MGL 21E
Action Date: 7/1/2005
Response Action Outcome: A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.

Action Type: Response Action Outcome - RAO
Action Status: RAO Statement Received
Action Date: 8/30/2005
Response Action Outcome: A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.

Action Type: Immediate Response Action
Action Status: Completion Statement Received
Action Date: 8/30/2005
Response Action Outcome: A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.

Action Type: Immediate Response Action
Action Status: Written Plan Received
Action Date: 8/30/2005
Response Action Outcome: A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.

Release:
Release Tracking Number/Current Status: 4-0019056 / RAO
Primary ID: Not reported
Official City: MASHPEE
Notification: 05/01/2005
Category: TWO HR
Status Date: 08/30/2005
Phase: Not reported
Response Action Outcome: A1 - A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.
Oil / Haz Material Type: Oil

Click here to access the MA DEP site for this facility:

4
NNE
1/2-1
0.567 mi.
2993 ft.

INTERSECTION
RTE 28 AND QUINAQUISSET AVE
MASHPEE, MA 02649

SHWS RELEASE

S106617677
N/A

Relative:
Lower

Actual:
23 ft.

SHWS:

Release Tracking Number/Current Status:	4-0018583 / RAO
Release Town:	MASHPEE
Notification Date:	08/02/2004
Category:	TWO HR
Associated ID:	Not reported
Current Status:	**Response Action Outcome**
Status Date:	06/15/2005
Phase:	Not reported
Response Action Outcome:	A2 - A permanent solution has been achieved. Contamination has not been reduced to background.
Oil Or Haz Material:	Oil
Location Type:	ROADWAY
Source:	VEHICLE

Click here to access the MA DEP site for this facility:

Chemicals:

Chemical:	DIESEL FUEL
Quantity:	75 gallons

Actions:

Action Type:	RNF
Action Status:	Reportable Release under MGL 21E
Action Date:	10/4/2004
Response Action Outcome:	A permanent solution has been achieved. Contamination has not been reduced to background.
Action Type:	Immediate Response Action
Action Status:	Written Plan Received
Action Date:	10/8/2004
Response Action Outcome:	A permanent solution has been achieved. Contamination has not been reduced to background.
Action Type:	Immediate Response Action
Action Status:	Level I - Technical Screen Audit
Action Date:	12/14/2004
Response Action Outcome:	A permanent solution has been achieved. Contamination has not been reduced to background.
Action Type:	Immediate Response Action
Action Status:	Status or Interim Report Received
Action Date:	12/9/2004
Response Action Outcome:	A permanent solution has been achieved. Contamination has not been reduced to background.
Action Type:	Immediate Response Action
Action Status:	Completion Statement Received
Action Date:	6/15/2005
Response Action Outcome:	A permanent solution has been achieved. Contamination has not been reduced to background.

INTERSECTION (Continued) **S106617677**

Action Type: Response Action Outcome - RAO
Action Status: RAO Statement Received
Action Date: 6/15/2005
Response Action Outcome: A permanent solution has been achieved. Contamination has not been reduced to background.

Action Type: Response Action Outcome - RAO
Action Status: Fee Received - FMCRA Use Only
Action Date: 6/17/2005
Response Action Outcome: A permanent solution has been achieved. Contamination has not been reduced to background.

Action Type: Response Action Outcome - RAO
Action Status: Level I - Technical Screen Audit
Action Date: 6/23/2005
Response Action Outcome: A permanent solution has been achieved. Contamination has not been reduced to background.

Action Type: A Notice sent to a Potentially Responsible Party (PRP)
Action Status: A MassDEP piece of correspondence was issued (approvals, NORs, etc.
Action Date: 8/18/2004
Response Action Outcome: A permanent solution has been achieved. Contamination has not been reduced to background.

Action Type: Immediate Response Action
Action Status: Oral Approval of Plan or Action
Action Date: 8/2/2004
Response Action Outcome: A permanent solution has been achieved. Contamination has not been reduced to background.

Action Type: Release Disposition
Action Status: Reportable Release under MGL 21E
Action Date: 8/2/2004
Response Action Outcome: A permanent solution has been achieved. Contamination has not been reduced to background.

Action Type: A Notice sent to a Potentially Responsible Party (PRP)
Action Status: FLDISS
Action Date: 8/2/2004
Response Action Outcome: A permanent solution has been achieved. Contamination has not been reduced to background.

Action Type: RLFA
Action Status: FLDD1A
Action Date: 8/2/2004
Response Action Outcome: A permanent solution has been achieved. Contamination has not been reduced to background.

Action Type: RLFA
Action Status: FOLOFF
Action Date: 8/3/2004
Response Action Outcome: A permanent solution has been achieved. Contamination has not been reduced to background.

Release:
Release Tracking Number/Current Status: 4-0018583 / RAO

INTERSECTION (Continued) **S106617677**

Primary ID:	Not reported
Official City:	MASHPEE
Notification:	08/02/2004
Category:	TWO HR
Status Date:	06/15/2005
Phase:	Not reported
Response Action Outcome:	A2 - A permanent solution has been achieved. Contamination has not been reduced to background.
Oil / Haz Material Type:	Oil

Click here to access the MA DEP site for this facility:

---

5 **MASHPEE DPW** **SHWS** **S105735821**
NNE **350 MEETING HOUSE RD** **RELEASE** **N/A**
1/2-1 **MASHPEE, MA 02649**
0.928 mi.
4899 ft.

Relative:
Lower

Actual:
50 ft.

SHWS:

Release Tracking Number/Current Status:	4-0017468 / RAO
Release Town:	MASHPEE
Notification Date:	11/12/2002
Category:	TWO HR
Associated ID:	Not reported
Current Status:	**Response Action Outcome**
Status Date:	01/24/2003
Phase:	Not reported
Response Action Outcome:	A1 - A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.
Oil Or Haz Material:	Not reported
Location Type:	MUNICIPAL
Source:	VEHICLE
Source:	PIPE

Click here to access the MA DEP site for this facility:

Chemicals:

Chemical:	HYDRAULIC OIL
Quantity:	40 gallons

Actions:

Action Type:	RNF
Action Status:	Reportable Release under MGL 21E
Action Date:	1/2/2003
Response Action Outcome:	A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.
Action Type:	Response Action Outcome - RAO
Action Status:	RAO Statement Received
Action Date:	1/24/2003
Response Action Outcome:	A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.
Action Type:	Immediate Response Action
Action Status:	Completion Statement Received
Action Date:	1/24/2003

MASHPEE DPW (Continued) **S105735821**

Response Action Outcome: A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.

Action Type: Response Action Outcome - RAO
Action Status: Level I - Technical Screen Audit
Action Date: 1/31/2003
Response Action Outcome: A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.

Action Type: Release Disposition
Action Status: Reportable Release under MGL 21E
Action Date: 11/12/2002
Response Action Outcome: A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.

Action Type: Immediate Response Action
Action Status: Oral Approval of Plan or Action
Action Date: 11/12/2002
Response Action Outcome: A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.

Action Type: RLFA
Action Status: FOLOFF
Action Date: 11/12/2002
Response Action Outcome: A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.

Action Type: A Notice sent to a Potentially Responsible Party (PRP)
Action Status: A MassDEP piece of correspondence was issued (approvals, NORs, etc.
Action Date: 11/22/2002
Response Action Outcome: A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.

Action Type: Immediate Response Action
Action Status: Oral Approval of Plan or Action
Action Date: 12/19/2002
Response Action Outcome: A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.

Release:
Release Tracking Number/Current Status: 4-0017468 / RAO
Primary ID: Not reported
Official City: MASHPEE
Notification: 11/12/2002
Category: TWO HR
Status Date: 01/24/2003
Phase: Not reported
Response Action Outcome: A1 - A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.
Oil / Haz Material Type: Not reported

Click here to access the MA DEP site for this facility:

Count: 1 records. ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
MASHPEE	S106617648	AIRCRAFT RAMP	ECHO EAST ROW	02649	SHWS, RELEASE

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

To maintain currency of the following federal and state databases, EDR contacts the appropriate governmental agency on a monthly or quarterly basis, as required.

Number of Days to Update: Provides confirmation that EDR is reporting records that have been updated within 90 days from the date the government agency made the information available to the public.

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL: National Priority List

National Priorities List (Superfund). The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program. NPL sites may encompass relatively large areas. As such, EDR provides polygon coverage for over 1,000 NPL site boundaries produced by EPA's Environmental Photographic Interpretation Center (EPIC) and regional EPA offices.

Date of Government Version: 03/26/2015
Date Data Arrived at EDR: 04/08/2015
Date Made Active in Reports: 06/22/2015
Number of Days to Update: 75

Source: EPA
Telephone: N/A
Last EDR Contact: 04/08/2015
Next Scheduled EDR Contact: 07/20/2015
Data Release Frequency: Quarterly

NPL Site Boundaries

Sources:

EPA's Environmental Photographic Interpretation Center (EPIC)
Telephone: 202-564-7333

EPA Region 1
Telephone 617-918-1143

EPA Region 6
Telephone: 214-655-6659

EPA Region 3
Telephone 215-814-5418

EPA Region 7
Telephone: 913-551-7247

EPA Region 4
Telephone 404-562-8033

EPA Region 8
Telephone: 303-312-6774

EPA Region 5
Telephone 312-886-6686

EPA Region 9
Telephone: 415-947-4246

EPA Region 10
Telephone 206-553-8665

Proposed NPL: Proposed National Priority List Sites

A site that has been proposed for listing on the National Priorities List through the issuance of a proposed rule in the Federal Register. EPA then accepts public comments on the site, responds to the comments, and places on the NPL those sites that continue to meet the requirements for listing.

Date of Government Version: 03/26/2015
Date Data Arrived at EDR: 04/08/2015
Date Made Active in Reports: 06/22/2015
Number of Days to Update: 75

Source: EPA
Telephone: N/A
Last EDR Contact: 04/08/2015
Next Scheduled EDR Contact: 07/20/2015
Data Release Frequency: Quarterly

NPL LIENS: Federal Superfund Liens

Federal Superfund Liens. Under the authority granted the USEPA by CERCLA of 1980, the USEPA has the authority to file liens against real property in order to recover remedial action expenditures or when the property owner received notification of potential liability. USEPA compiles a listing of filed notices of Superfund Liens.

Date of Government Version: 10/15/1991
Date Data Arrived at EDR: 02/02/1994
Date Made Active in Reports: 03/30/1994
Number of Days to Update: 56

Source: EPA
Telephone: 202-564-4267
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: No Update Planned

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Federal Delisted NPL site list

Delisted NPL: National Priority List Deletions

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the NPL where no further response is appropriate.

Date of Government Version: 03/26/2015
Date Data Arrived at EDR: 04/08/2015
Date Made Active in Reports: 06/22/2015
Number of Days to Update: 75

Source: EPA
Telephone: N/A
Last EDR Contact: 04/08/2015
Next Scheduled EDR Contact: 07/20/2015
Data Release Frequency: Quarterly

Federal CERCLIS list

CERCLIS: Comprehensive Environmental Response, Compensation, and Liability Information System

CERCLIS contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLIS contains sites which are either proposed to or on the National Priorities List (NPL) and sites which are in the screening and assessment phase for possible inclusion on the NPL.

Date of Government Version: 10/25/2013
Date Data Arrived at EDR: 11/11/2013
Date Made Active in Reports: 02/13/2014
Number of Days to Update: 94

Source: EPA
Telephone: 703-412-9810
Last EDR Contact: 05/29/2015
Next Scheduled EDR Contact: 09/07/2015
Data Release Frequency: Quarterly

FEDERAL FACILITY: Federal Facility Site Information listing

A listing of National Priority List (NPL) and Base Realignment and Closure (BRAC) sites found in the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Database where EPA Federal Facilities Restoration and Reuse Office is involved in cleanup activities.

Date of Government Version: 03/26/2015
Date Data Arrived at EDR: 04/08/2015
Date Made Active in Reports: 06/11/2015
Number of Days to Update: 64

Source: Environmental Protection Agency
Telephone: 703-603-8704
Last EDR Contact: 04/08/2015
Next Scheduled EDR Contact: 07/20/2015
Data Release Frequency: Varies

Federal CERCLIS NFRAP site List

CERCLIS-NFRAP: CERCLIS No Further Remedial Action Planned

Archived sites are sites that have been removed and archived from the inventory of CERCLIS sites. Archived status indicates that, to the best of EPA's knowledge, assessment at a site has been completed and that EPA has determined no further steps will be taken to list this site on the National Priorities List (NPL), unless information indicates this decision was not appropriate or other considerations require a recommendation for listing at a later time. This decision does not necessarily mean that there is no hazard associated with a given site; it only means that, based upon available information, the location is not judged to be a potential NPL site.

Date of Government Version: 10/25/2013
Date Data Arrived at EDR: 11/11/2013
Date Made Active in Reports: 02/13/2014
Number of Days to Update: 94

Source: EPA
Telephone: 703-412-9810
Last EDR Contact: 05/29/2015
Next Scheduled EDR Contact: 09/07/2015
Data Release Frequency: Quarterly

Federal RCRA CORRACTS facilities list

CORRACTS: Corrective Action Report

CORRACTS identifies hazardous waste handlers with RCRA corrective action activity.

Date of Government Version: 03/10/2015
Date Data Arrived at EDR: 03/31/2015
Date Made Active in Reports: 06/11/2015
Number of Days to Update: 72

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 06/26/2015
Next Scheduled EDR Contact: 10/12/2015
Data Release Frequency: Quarterly

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF: RCRA - Treatment, Storage and Disposal

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Transporters are individuals or entities that move hazardous waste from the generator offsite to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste.

Date of Government Version: 03/10/2015
Date Data Arrived at EDR: 03/31/2015
Date Made Active in Reports: 06/11/2015
Number of Days to Update: 72

Source: Environmental Protection Agency
Telephone: (888) 372-7341
Last EDR Contact: 06/26/2015
Next Scheduled EDR Contact: 10/12/2015
Data Release Frequency: Quarterly

Federal RCRA generators list

RCRA-LQG: RCRA - Large Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Large quantity generators (LQGs) generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month.

Date of Government Version: 03/10/2015
Date Data Arrived at EDR: 03/31/2015
Date Made Active in Reports: 06/11/2015
Number of Days to Update: 72

Source: Environmental Protection Agency
Telephone: (888) 372-7341
Last EDR Contact: 06/26/2015
Next Scheduled EDR Contact: 10/12/2015
Data Release Frequency: Quarterly

RCRA-SQG: RCRA - Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month.

Date of Government Version: 03/10/2015
Date Data Arrived at EDR: 03/31/2015
Date Made Active in Reports: 06/11/2015
Number of Days to Update: 72

Source: Environmental Protection Agency
Telephone: (888) 372-7341
Last EDR Contact: 06/26/2015
Next Scheduled EDR Contact: 10/12/2015
Data Release Frequency: Quarterly

RCRA-CESQG: RCRA - Conditionally Exempt Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month.

Date of Government Version: 03/10/2015
Date Data Arrived at EDR: 03/31/2015
Date Made Active in Reports: 06/11/2015
Number of Days to Update: 72

Source: Environmental Protection Agency
Telephone: (888) 372-7341
Last EDR Contact: 06/26/2015
Next Scheduled EDR Contact: 10/12/2015
Data Release Frequency: Varies

Federal institutional controls / engineering controls registries

US ENG CONTROLS: Engineering Controls Sites List

A listing of sites with engineering controls in place. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or effect human health.

Date of Government Version: 03/16/2015
Date Data Arrived at EDR: 03/17/2015
Date Made Active in Reports: 06/02/2015
Number of Days to Update: 77

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 06/01/2015
Next Scheduled EDR Contact: 09/14/2015
Data Release Frequency: Varies

US INST CONTROL: Sites with Institutional Controls

A listing of sites with institutional controls in place. Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls.

Date of Government Version: 03/16/2015
Date Data Arrived at EDR: 03/17/2015
Date Made Active in Reports: 06/02/2015
Number of Days to Update: 77

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 06/01/2015
Next Scheduled EDR Contact: 09/14/2015
Data Release Frequency: Varies

LUCIS: Land Use Control Information System

LUCIS contains records of land use control information pertaining to the former Navy Base Realignment and Closure properties.

Date of Government Version: 05/28/2015
Date Data Arrived at EDR: 05/29/2015
Date Made Active in Reports: 06/11/2015
Number of Days to Update: 13

Source: Department of the Navy
Telephone: 843-820-7326
Last EDR Contact: 05/18/2015
Next Scheduled EDR Contact: 08/31/2015
Data Release Frequency: Varies

Federal ERNS list

ERNS: Emergency Response Notification System

Emergency Response Notification System. ERNS records and stores information on reported releases of oil and hazardous substances.

Date of Government Version: 03/30/2015
Date Data Arrived at EDR: 03/31/2015
Date Made Active in Reports: 06/02/2015
Number of Days to Update: 63

Source: National Response Center, United States Coast Guard
Telephone: 202-267-2180
Last EDR Contact: 06/26/2015
Next Scheduled EDR Contact: 10/12/2015
Data Release Frequency: Annually

State- and tribal - equivalent CERCLIS

SHWS: Site Transition List

Contains information on releases of oil and hazardous materials that have been reported to DEP.

Date of Government Version: 04/10/2015
Date Data Arrived at EDR: 04/16/2015
Date Made Active in Reports: 04/30/2015
Number of Days to Update: 14

Source: Department of Environmental Protection
Telephone: 617-292-5990
Last EDR Contact: 04/16/2015
Next Scheduled EDR Contact: 07/27/2015
Data Release Frequency: Quarterly

State and tribal landfill and/or solid waste disposal site lists

LF PROFILES: Landfill Profiles Listing

This spreadsheet describes landfills that have actively accepted waste or have closed under MassDEP Solid Waste Regulations first adopted in 1971 (310 CMR 16.00 and 310 CMR 19.00). The list does not include landfills that closed before 1971 (and which never had a MassDEP permit or approval), or for which agency data is incomplete.

Date of Government Version: 06/26/2012
Date Data Arrived at EDR: 11/21/2014
Date Made Active in Reports: 12/17/2014
Number of Days to Update: 26

Source: Department of Environmental Protection
Telephone: 617-292-5868
Last EDR Contact: 04/10/2015
Next Scheduled EDR Contact: 07/20/2015
Data Release Frequency: Varies

SWF/LF: Solid Waste Facility Database/Transfer Stations

Solid Waste Facilities/Landfill Sites. SWF/LF type records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. Depending on the state, these may be active or inactive facilities or open dumps that failed to meet RCRA Subtitle D Section 4004 criteria for solid waste landfills or disposal sites.

Date of Government Version: 01/29/2015
Date Data Arrived at EDR: 04/09/2015
Date Made Active in Reports: 04/21/2015
Number of Days to Update: 12

Source: Department of Environmental Protection
Telephone: 617-292-5989
Last EDR Contact: 04/09/2015
Next Scheduled EDR Contact: 07/20/2015
Data Release Frequency: Quarterly

State and tribal leaking storage tank lists

LUST: Leaking Underground Storage Tank Listing

Sites within the Leaking Underground Storage Tank Listing that have a UST listed as its source.

Date of Government Version: 04/10/2015
Date Data Arrived at EDR: 04/16/2015
Date Made Active in Reports: 04/30/2015
Number of Days to Update: 14

Source: Department of Environmental Protection
Telephone: 617-292-5990
Last EDR Contact: 04/16/2015
Next Scheduled EDR Contact: 07/27/2015
Data Release Frequency: Quarterly

LAST: Leaking Aboveground Storage Tank Sites

Sites within the Releases Database that have a AST listed as its source.

Date of Government Version: 04/10/2015
Date Data Arrived at EDR: 04/16/2015
Date Made Active in Reports: 04/30/2015
Number of Days to Update: 14

Source: Department of Environmental Protection
Telephone: 617-292-5500
Last EDR Contact: 04/16/2015
Next Scheduled EDR Contact: 07/27/2015
Data Release Frequency: Quarterly

INDIAN LUST R5: Leaking Underground Storage Tanks on Indian Land

Leaking underground storage tanks located on Indian Land in Michigan, Minnesota and Wisconsin.

Date of Government Version: 04/30/2015
Date Data Arrived at EDR: 05/29/2015
Date Made Active in Reports: 06/22/2015
Number of Days to Update: 24

Source: EPA, Region 5
Telephone: 312-886-7439
Last EDR Contact: 04/27/2015
Next Scheduled EDR Contact: 08/10/2015
Data Release Frequency: Varies

INDIAN LUST R7: Leaking Underground Storage Tanks on Indian Land

LUSTs on Indian land in Iowa, Kansas, and Nebraska

Date of Government Version: 03/30/2015
Date Data Arrived at EDR: 04/28/2015
Date Made Active in Reports: 06/22/2015
Number of Days to Update: 55

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 04/27/2015
Next Scheduled EDR Contact: 08/10/2015
Data Release Frequency: Varies

INDIAN LUST R10: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Alaska, Idaho, Oregon and Washington.

Date of Government Version: 02/03/2015
Date Data Arrived at EDR: 02/12/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 29
Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 04/27/2015
Next Scheduled EDR Contact: 08/10/2015
Data Release Frequency: Quarterly

INDIAN LUST R9: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Arizona, California, New Mexico and Nevada

Date of Government Version: 01/08/2015
Date Data Arrived at EDR: 01/08/2015
Date Made Active in Reports: 02/09/2015
Number of Days to Update: 32
Source: Environmental Protection Agency
Telephone: 415-972-3372
Last EDR Contact: 01/08/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Quarterly

INDIAN LUST R8: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming.

Date of Government Version: 04/30/2015
Date Data Arrived at EDR: 05/05/2015
Date Made Active in Reports: 06/22/2015
Number of Days to Update: 48
Source: EPA Region 8
Telephone: 303-312-6271
Last EDR Contact: 04/27/2015
Next Scheduled EDR Contact: 08/10/2015
Data Release Frequency: Quarterly

INDIAN LUST R6: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in New Mexico and Oklahoma.

Date of Government Version: 03/17/2015
Date Data Arrived at EDR: 05/01/2015
Date Made Active in Reports: 06/22/2015
Number of Days to Update: 52
Source: EPA Region 6
Telephone: 214-665-6597
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Varies

INDIAN LUST R4: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Florida, Mississippi and North Carolina.

Date of Government Version: 09/30/2014
Date Data Arrived at EDR: 03/03/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 10
Source: EPA Region 4
Telephone: 404-562-8677
Last EDR Contact: 04/27/2015
Next Scheduled EDR Contact: 08/10/2015
Data Release Frequency: Semi-Annually

INDIAN LUST R1: Leaking Underground Storage Tanks on Indian Land
A listing of leaking underground storage tank locations on Indian Land.

Date of Government Version: 02/03/2015
Date Data Arrived at EDR: 04/30/2015
Date Made Active in Reports: 06/22/2015
Number of Days to Update: 53
Source: EPA Region 1
Telephone: 617-918-1313
Last EDR Contact: 04/03/2015
Next Scheduled EDR Contact: 08/10/2015
Data Release Frequency: Varies

State and tribal registered storage tank lists

UST: Summary Listing of all the Tanks Registered in the State of Massachusetts
Registered Underground Storage Tanks. UST's are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA) and must be registered with the state department responsible for administering the UST program. Available information varies by state program.

Date of Government Version: 04/17/2015
Date Data Arrived at EDR: 04/20/2015
Date Made Active in Reports: 04/30/2015
Number of Days to Update: 10

Source: Department of Fire Services, Office of the Public Safety
Telephone: 617-556-1035
Last EDR Contact: 04/20/2015
Next Scheduled EDR Contact: 08/03/2015
Data Release Frequency: Quarterly

AST: Aboveground Storage Tank Database
Registered Aboveground Storage Tanks.

Date of Government Version: 10/22/2009
Date Data Arrived at EDR: 10/28/2009
Date Made Active in Reports: 11/06/2009
Number of Days to Update: 9

Source: Department of Public Safety
Telephone: 617-556-1035
Last EDR Contact: 04/16/2015
Next Scheduled EDR Contact: 08/03/2015
Data Release Frequency: Quarterly

INDIAN UST R10: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 10 (Alaska, Idaho, Oregon, Washington, and Tribal Nations).

Date of Government Version: 05/06/2015
Date Data Arrived at EDR: 05/19/2015
Date Made Active in Reports: 06/22/2015
Number of Days to Update: 34

Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 04/27/2015
Next Scheduled EDR Contact: 08/10/2015
Data Release Frequency: Quarterly

INDIAN UST R7: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 7 (Iowa, Kansas, Missouri, Nebraska, and 9 Tribal Nations).

Date of Government Version: 09/23/2014
Date Data Arrived at EDR: 11/25/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 65

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 04/27/2015
Next Scheduled EDR Contact: 08/10/2015
Data Release Frequency: Varies

INDIAN UST R5: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 5 (Michigan, Minnesota and Wisconsin and Tribal Nations).

Date of Government Version: 04/30/2015
Date Data Arrived at EDR: 05/26/2015
Date Made Active in Reports: 06/22/2015
Number of Days to Update: 27

Source: EPA Region 5
Telephone: 312-886-6136
Last EDR Contact: 04/27/2015
Next Scheduled EDR Contact: 08/10/2015
Data Release Frequency: Varies

INDIAN UST R4: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 4 (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee and Tribal Nations)

Date of Government Version: 09/30/2014
Date Data Arrived at EDR: 03/03/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 10

Source: EPA Region 4
Telephone: 404-562-9424
Last EDR Contact: 04/27/2015
Next Scheduled EDR Contact: 08/10/2015
Data Release Frequency: Semi-Annually

INDIAN UST R1: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 1 (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont and ten Tribal Nations).

Date of Government Version: 02/03/2015
Date Data Arrived at EDR: 04/30/2015
Date Made Active in Reports: 06/22/2015
Number of Days to Update: 53

Source: EPA, Region 1
Telephone: 617-918-1313
Last EDR Contact: 04/28/2015
Next Scheduled EDR Contact: 08/10/2015
Data Release Frequency: Varies

INDIAN UST R6: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 6 (Louisiana, Arkansas, Oklahoma, New Mexico, Texas and 65 Tribes).

Date of Government Version: 03/17/2015
Date Data Arrived at EDR: 05/01/2015
Date Made Active in Reports: 06/22/2015
Number of Days to Update: 52

Source: EPA Region 6
Telephone: 214-665-7591
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Semi-Annually

INDIAN UST R9: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 9 (Arizona, California, Hawaii, Nevada, the Pacific Islands, and Tribal Nations).

Date of Government Version: 12/14/2014
Date Data Arrived at EDR: 02/13/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 28

Source: EPA Region 9
Telephone: 415-972-3368
Last EDR Contact: 01/26/2015
Next Scheduled EDR Contact: 05/11/2015
Data Release Frequency: Quarterly

INDIAN UST R8: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 8 (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming and 27 Tribal Nations).

Date of Government Version: 04/30/2015
Date Data Arrived at EDR: 05/05/2015
Date Made Active in Reports: 06/22/2015
Number of Days to Update: 48

Source: EPA Region 8
Telephone: 303-312-6137
Last EDR Contact: 04/27/2015
Next Scheduled EDR Contact: 08/10/2015
Data Release Frequency: Quarterly

FEMA UST: Underground Storage Tank Listing

A listing of all FEMA owned underground storage tanks.

Date of Government Version: 01/01/2010
Date Data Arrived at EDR: 02/16/2010
Date Made Active in Reports: 04/12/2010
Number of Days to Update: 55

Source: FEMA
Telephone: 202-646-5797
Last EDR Contact: 04/13/2015
Next Scheduled EDR Contact: 07/27/2015
Data Release Frequency: Varies

State and tribal institutional control / engineering control registries

INST CONTROL: Sites With Activity and Use Limitation

Activity and Use Limitations establish limits and conditions on the future use of contaminated property, and therefore allow cleanups to be tailored to these uses.

Date of Government Version: 04/10/2015
Date Data Arrived at EDR: 04/16/2015
Date Made Active in Reports: 04/30/2015
Number of Days to Update: 14

Source: Department of Environmental Protection
Telephone: 617-292-5990
Last EDR Contact: 04/16/2015
Next Scheduled EDR Contact: 07/27/2015
Data Release Frequency: Quarterly

State and tribal voluntary cleanup sites

INDIAN VCP R1: Voluntary Cleanup Priority Listing
A listing of voluntary cleanup priority sites located on Indian Land located in Region 1.

Date of Government Version: 09/29/2014
Date Data Arrived at EDR: 10/01/2014
Date Made Active in Reports: 11/06/2014
Number of Days to Update: 36
Source: EPA, Region 1
Telephone: 617-918-1102
Last EDR Contact: 06/26/2015
Next Scheduled EDR Contact: 10/12/2015
Data Release Frequency: Varies

INDIAN VCP R7: Voluntary Cleanup Priority Lisitng
A listing of voluntary cleanup priority sites located on Indian Land located in Region 7.

Date of Government Version: 03/20/2008
Date Data Arrived at EDR: 04/22/2008
Date Made Active in Reports: 05/19/2008
Number of Days to Update: 27
Source: EPA, Region 7
Telephone: 913-551-7365
Last EDR Contact: 04/20/2009
Next Scheduled EDR Contact: 07/20/2009
Data Release Frequency: Varies

State and tribal Brownfields sites

BROWNFIELDS 2: Potential Brownfields Listing
A listing of potential brownfields site locations in the state.

Date of Government Version: 12/17/2014
Date Data Arrived at EDR: 05/06/2015
Date Made Active in Reports: 05/11/2015
Number of Days to Update: 5
Source: Department of Environmental Protection
Telephone: 617-556-1007
Last EDR Contact: 05/06/2015
Next Scheduled EDR Contact: 08/17/2015
Data Release Frequency: Varies

BROWNFIELDS: Completed Brownfields Covenants Listing
Under Massachusetts law, M.G.L. c. 21E is the statute that governs the cleanup of releases of oil and/or hazardous material to the environment. The Brownfields Act of 1998 amended M.G.L. c. 21E by establishing significant liability relief and financial incentives to spur the redevelopment of brownfields, while ensuring that the Commonwealth's environmental standards are met. Most brownfields are redeveloped with the benefit of liability protections that operate automatically under M.G.L. c. 21E.

Date of Government Version: 11/01/2014
Date Data Arrived at EDR: 11/06/2014
Date Made Active in Reports: 11/10/2014
Number of Days to Update: 4
Source: Office of the Attorney General
Telephone: 617-963-2423
Last EDR Contact: 05/08/2015
Next Scheduled EDR Contact: 08/17/2015
Data Release Frequency: Annually

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS: A Listing of Brownfields Sites
Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties takes development pressures off of undeveloped, open land, and both improves and protects the environment. Assessment, Cleanup and Redevelopment Exchange System (ACRES) stores information reported by EPA Brownfields grant recipients on brownfields properties assessed or cleaned up with grant funding as well as information on Targeted Brownfields Assessments performed by EPA Regions. A listing of ACRES Brownfield sites is obtained from Cleanups in My Community. Cleanups in My Community provides information on Brownfields properties for which information is reported back to EPA, as well as areas served by Brownfields grant programs.

Date of Government Version: 03/23/2015
Date Data Arrived at EDR: 03/24/2015
Date Made Active in Reports: 06/02/2015
Number of Days to Update: 70
Source: Environmental Protection Agency
Telephone: 202-566-2777
Last EDR Contact: 06/24/2015
Next Scheduled EDR Contact: 10/05/2015
Data Release Frequency: Semi-Annually

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Local Lists of Landfill / Solid Waste Disposal Sites

DEBRIS REGION 9: Torres Martinez Reservation Illegal Dump Site Locations
A listing of illegal dump sites location on the Torres Martinez Indian Reservation located in eastern Riverside County and northern Imperial County, California.

Date of Government Version: 01/12/2009
Date Data Arrived at EDR: 05/07/2009
Date Made Active in Reports: 09/21/2009
Number of Days to Update: 137
Source: EPA, Region 9
Telephone: 415-947-4219
Last EDR Contact: 04/23/2015
Next Scheduled EDR Contact: 08/10/2015
Data Release Frequency: No Update Planned

ODI: Open Dump Inventory
An open dump is defined as a disposal facility that does not comply with one or more of the Part 257 or Part 258 Subtitle D Criteria.

Date of Government Version: 06/30/1985
Date Data Arrived at EDR: 08/09/2004
Date Made Active in Reports: 09/17/2004
Number of Days to Update: 39
Source: Environmental Protection Agency
Telephone: 800-424-9346
Last EDR Contact: 06/09/2004
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

INDIAN ODI: Report on the Status of Open Dumps on Indian Lands
Location of open dumps on Indian land.

Date of Government Version: 12/31/1998
Date Data Arrived at EDR: 12/03/2007
Date Made Active in Reports: 01/24/2008
Number of Days to Update: 52
Source: Environmental Protection Agency
Telephone: 703-308-8245
Last EDR Contact: 05/01/2015
Next Scheduled EDR Contact: 08/17/2015
Data Release Frequency: Varies

Local Lists of Hazardous waste / Contaminated Sites

US CDL: Clandestine Drug Labs
A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 02/25/2015
Date Data Arrived at EDR: 03/10/2015
Date Made Active in Reports: 03/25/2015
Number of Days to Update: 15
Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 05/29/2015
Next Scheduled EDR Contact: 09/14/2015
Data Release Frequency: Quarterly

US HIST CDL: National Clandestine Laboratory Register
A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 02/25/2015
Date Data Arrived at EDR: 03/10/2015
Date Made Active in Reports: 03/25/2015
Number of Days to Update: 15
Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 05/29/2015
Next Scheduled EDR Contact: 09/14/2015
Data Release Frequency: No Update Planned

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Local Land Records

LIENS 2: CERCLA Lien Information

A Federal CERCLA ('Superfund') lien can exist by operation of law at any site or property at which EPA has spent Superfund monies. These monies are spent to investigate and address releases and threatened releases of contamination. CERCLIS provides information as to the identity of these sites and properties.

Date of Government Version: 02/18/2014
Date Data Arrived at EDR: 03/18/2014
Date Made Active in Reports: 04/24/2014
Number of Days to Update: 37

Source: Environmental Protection Agency
Telephone: 202-564-6023
Last EDR Contact: 04/27/2015
Next Scheduled EDR Contact: 08/10/2015
Data Release Frequency: Varies

LIENS: Liens Information Listing

A listing of environmental liens.

Date of Government Version: 02/24/2014
Date Data Arrived at EDR: 02/27/2014
Date Made Active in Reports: 03/14/2014
Number of Days to Update: 15

Source: Department of Environmental Protection
Telephone: 617-292-5628
Last EDR Contact: 05/22/2015
Next Scheduled EDR Contact: 09/07/2015
Data Release Frequency: Varies

Records of Emergency Release Reports

HMIRS: Hazardous Materials Information Reporting System

Hazardous Materials Incident Report System. HMIRS contains hazardous material spill incidents reported to DOT.

Date of Government Version: 03/30/2015
Date Data Arrived at EDR: 03/31/2015
Date Made Active in Reports: 06/11/2015
Number of Days to Update: 72

Source: U.S. Department of Transportation
Telephone: 202-366-4555
Last EDR Contact: 06/26/2015
Next Scheduled EDR Contact: 10/12/2015
Data Release Frequency: Annually

MA SPILLS: Historical Spill List

The Spills Database was the release notification tracking system for spills that occurred prior to October 1, 1993. This information should be considered to be primarily of historical interest since all of the listed spills have either been cleaned up or assigned new tracking numbers and moved to the Reportable Releases or Sites Transition List databases.

Date of Government Version: 09/30/1993
Date Data Arrived at EDR: 12/03/2003
Date Made Active in Reports: 12/31/2003
Number of Days to Update: 28

Source: Department of Environmental Protection
Telephone: 617-292-5720
Last EDR Contact: 12/03/2003
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

RELEASE: Reportable Releases

Contains information on all releases of oil and hazardous materials that have been reported to DEP

Date of Government Version: 04/10/2015
Date Data Arrived at EDR: 04/16/2015
Date Made Active in Reports: 04/30/2015
Number of Days to Update: 14

Source: Department of Environmental Protection
Telephone: 617-292-5990
Last EDR Contact: 04/16/2015
Next Scheduled EDR Contact: 07/27/2015
Data Release Frequency: Quarterly

SPILLS 80: SPILLS80 data from FirstSearch

Spills 80 includes those spill and release records available from FirstSearch databases prior to 1990. Typically, they may include chemical, oil and/or hazardous substance spills recorded before 1990. Duplicate records that are already included in EDR incident and release records are not included in Spills 80.

Date of Government Version: 03/10/1998
Date Data Arrived at EDR: 01/03/2013
Date Made Active in Reports: 03/05/2013
Number of Days to Update: 61

Source: FirstSearch
Telephone: N/A
Last EDR Contact: 01/03/2013
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

SPILLS 90: SPILLS90 data from FirstSearch

Spills 90 includes those spill and release records available exclusively from FirstSearch databases. Typically, they may include chemical, oil and/or hazardous substance spills recorded after 1990. Duplicate records that are already included in EDR incident and release records are not included in Spills 90.

Date of Government Version: 12/11/2012
Date Data Arrived at EDR: 01/03/2013
Date Made Active in Reports: 02/08/2013
Number of Days to Update: 36

Source: FirstSearch
Telephone: N/A
Last EDR Contact: 01/03/2013
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

Other Ascertainable Records

RCRA NonGen / NLR: RCRA - Non Generators / No Longer Regulated

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Non-Generators do not presently generate hazardous waste.

Date of Government Version: 03/10/2015
Date Data Arrived at EDR: 03/31/2015
Date Made Active in Reports: 06/11/2015
Number of Days to Update: 72

Source: Environmental Protection Agency
Telephone: (888) 372-7341
Last EDR Contact: 06/26/2015
Next Scheduled EDR Contact: 10/12/2015
Data Release Frequency: Varies

DOT OPS: Incident and Accident Data

Department of Transporation, Office of Pipeline Safety Incident and Accident data.

Date of Government Version: 07/31/2012
Date Data Arrived at EDR: 08/07/2012
Date Made Active in Reports: 09/18/2012
Number of Days to Update: 42

Source: Department of Transporation, Office of Pipeline Safety
Telephone: 202-366-4595
Last EDR Contact: 05/05/2015
Next Scheduled EDR Contact: 08/17/2015
Data Release Frequency: Varies

DOD: Department of Defense Sites

This data set consists of federally owned or administered lands, administered by the Department of Defense, that have any area equal to or greater than 640 acres of the United States, Puerto Rico, and the U.S. Virgin Islands.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 11/10/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 62

Source: USGS
Telephone: 888-275-8747
Last EDR Contact: 04/14/2015
Next Scheduled EDR Contact: 07/27/2015
Data Release Frequency: Semi-Annually

FUDS: Formerly Used Defense Sites

The listing includes locations of Formerly Used Defense Sites properties where the US Army Corps of Engineers is actively working or will take necessary cleanup actions.

Date of Government Version: 06/06/2014
Date Data Arrived at EDR: 09/10/2014
Date Made Active in Reports: 09/18/2014
Number of Days to Update: 8

Source: U.S. Army Corps of Engineers
Telephone: 202-528-4285
Last EDR Contact: 06/12/2015
Next Scheduled EDR Contact: 09/21/2015
Data Release Frequency: Varies

CONSENT: Superfund (CERCLA) Consent Decrees

Major legal settlements that establish responsibility and standards for cleanup at NPL (Superfund) sites. Released periodically by United States District Courts after settlement by parties to litigation matters.

Date of Government Version: 12/31/2014
Date Data Arrived at EDR: 04/17/2015
Date Made Active in Reports: 06/02/2015
Number of Days to Update: 46

Source: Department of Justice, Consent Decree Library
Telephone: Varies
Last EDR Contact: 06/22/2015
Next Scheduled EDR Contact: 10/12/2015
Data Release Frequency: Varies

ROD: Records Of Decision

Record of Decision. ROD documents mandate a permanent remedy at an NPL (Superfund) site containing technical and health information to aid in the cleanup.

Date of Government Version: 11/25/2013
Date Data Arrived at EDR: 12/12/2013
Date Made Active in Reports: 02/24/2014
Number of Days to Update: 74

Source: EPA
Telephone: 703-416-0223
Last EDR Contact: 06/12/2015
Next Scheduled EDR Contact: 09/21/2015
Data Release Frequency: Annually

UMTRA: Uranium Mill Tailings Sites

Uranium ore was mined by private companies for federal government use in national defense programs. When the mills shut down, large piles of the sand-like material (mill tailings) remain after uranium has been extracted from the ore. Levels of human exposure to radioactive materials from the piles are low; however, in some cases tailings were used as construction materials before the potential health hazards of the tailings were recognized.

Date of Government Version: 09/14/2010
Date Data Arrived at EDR: 10/07/2011
Date Made Active in Reports: 03/01/2012
Number of Days to Update: 146

Source: Department of Energy
Telephone: 505-845-0011
Last EDR Contact: 05/26/2015
Next Scheduled EDR Contact: 09/07/2015
Data Release Frequency: Varies

US MINES: Mines Master Index File

Contains all mine identification numbers issued for mines active or opened since 1971. The data also includes violation information.

Date of Government Version: 12/30/2014
Date Data Arrived at EDR: 12/31/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 29

Source: Department of Labor, Mine Safety and Health Administration
Telephone: 303-231-5959
Last EDR Contact: 06/03/2015
Next Scheduled EDR Contact: 09/14/2015
Data Release Frequency: Semi-Annually

TRIS: Toxic Chemical Release Inventory System

Toxic Release Inventory System. TRIS identifies facilities which release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313.

Date of Government Version: 12/31/2013
Date Data Arrived at EDR: 02/12/2015
Date Made Active in Reports: 06/02/2015
Number of Days to Update: 110

Source: EPA
Telephone: 202-566-0250
Last EDR Contact: 01/29/2015
Next Scheduled EDR Contact: 06/08/2015
Data Release Frequency: Annually

TSCA: Toxic Substances Control Act

Toxic Substances Control Act. TSCA identifies manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory list. It includes data on the production volume of these substances by plant site.

Date of Government Version: 12/31/2012
Date Data Arrived at EDR: 01/15/2015
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 14

Source: EPA
Telephone: 202-260-5521
Last EDR Contact: 06/25/2015
Next Scheduled EDR Contact: 10/05/2015
Data Release Frequency: Every 4 Years

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

FTTS: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
FTTS tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA (Emergency Planning and Community Right-to-Know Act). To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25

Source: EPA/Office of Prevention, Pesticides and Toxic Substances
Telephone: 202-566-1667
Last EDR Contact: 05/20/2015
Next Scheduled EDR Contact: 09/07/2015
Data Release Frequency: Quarterly

FTTS INSP: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
A listing of FIFRA/TSCA Tracking System (FTTS) inspections and enforcements.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25

Source: EPA
Telephone: 202-566-1667
Last EDR Contact: 05/20/2015
Next Scheduled EDR Contact: 09/07/2015
Data Release Frequency: Quarterly

HIST FTTS: FIFRA/TSCA Tracking System Administrative Case Listing
A complete administrative case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2007
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

HIST FTTS INSP: FIFRA/TSCA Tracking System Inspection & Enforcement Case Listing
A complete inspection and enforcement case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2008
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

SSTS: Section 7 Tracking Systems
Section 7 of the Federal Insecticide, Fungicide and Rodenticide Act, as amended (92 Stat. 829) requires all registered pesticide-producing establishments to submit a report to the Environmental Protection Agency by March 1st each year. Each establishment must report the types and amounts of pesticides, active ingredients and devices being produced, and those having been produced and sold or distributed in the past year.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 12/10/2010
Date Made Active in Reports: 02/25/2011
Number of Days to Update: 77

Source: EPA
Telephone: 202-564-4203
Last EDR Contact: 04/10/2015
Next Scheduled EDR Contact: 08/10/2015
Data Release Frequency: Annually

ICIS: Integrated Compliance Information System

The Integrated Compliance Information System (ICIS) supports the information needs of the national enforcement and compliance program as well as the unique needs of the National Pollutant Discharge Elimination System (NPDES) program.

Date of Government Version: 01/23/2015
Date Data Arrived at EDR: 02/06/2015
Date Made Active in Reports: 03/09/2015
Number of Days to Update: 31

Source: Environmental Protection Agency
Telephone: 202-564-5088
Last EDR Contact: 04/09/2015
Next Scheduled EDR Contact: 07/27/2015
Data Release Frequency: Quarterly

PADS: PCB Activity Database System

PCB Activity Database. PADS Identifies generators, transporters, commercial storers and/or brokers and disposers of PCB's who are required to notify the EPA of such activities.

Date of Government Version: 07/01/2014
Date Data Arrived at EDR: 10/15/2014
Date Made Active in Reports: 11/17/2014
Number of Days to Update: 33

Source: EPA
Telephone: 202-566-0500
Last EDR Contact: 04/17/2015
Next Scheduled EDR Contact: 07/27/2015
Data Release Frequency: Annually

MLTS: Material Licensing Tracking System

MLTS is maintained by the Nuclear Regulatory Commission and contains a list of approximately 8,100 sites which possess or use radioactive materials and which are subject to NRC licensing requirements. To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 03/31/2015
Date Data Arrived at EDR: 04/09/2015
Date Made Active in Reports: 06/11/2015
Number of Days to Update: 63

Source: Nuclear Regulatory Commission
Telephone: 301-415-7169
Last EDR Contact: 06/04/2015
Next Scheduled EDR Contact: 09/21/2015
Data Release Frequency: Quarterly

RADINFO: Radiation Information Database

The Radiation Information Database (RADINFO) contains information about facilities that are regulated by U.S. Environmental Protection Agency (EPA) regulations for radiation and radioactivity.

Date of Government Version: 04/07/2015
Date Data Arrived at EDR: 04/09/2015
Date Made Active in Reports: 06/11/2015
Number of Days to Update: 63

Source: Environmental Protection Agency
Telephone: 202-343-9775
Last EDR Contact: 04/09/2015
Next Scheduled EDR Contact: 07/20/2015
Data Release Frequency: Quarterly

FINDS: Facility Index System/Facility Registry System

Facility Index System. FINDS contains both facility information and 'pointers' to other sources that contain more detail. EDR includes the following FINDS databases in this report: PCS (Permit Compliance System), AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (State Environmental Laws and Statutes), and PADS (PCB Activity Data System).

Date of Government Version: 01/18/2015
Date Data Arrived at EDR: 02/27/2015
Date Made Active in Reports: 03/25/2015
Number of Days to Update: 26

Source: EPA
Telephone: (617) 918-1111
Last EDR Contact: 06/10/2015
Next Scheduled EDR Contact: 09/21/2015
Data Release Frequency: Quarterly

RAATS: RCRA Administrative Action Tracking System

RCRA Administration Action Tracking System. RAATS contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. For administration actions after September 30, 1995, data entry in the RAATS database was discontinued. EPA will retain a copy of the database for historical records. It was necessary to terminate RAATS because a decrease in agency resources made it impossible to continue to update the information contained in the database.

Date of Government Version: 04/17/1995
Date Data Arrived at EDR: 07/03/1995
Date Made Active in Reports: 08/07/1995
Number of Days to Update: 35

Source: EPA
Telephone: 202-564-4104
Last EDR Contact: 06/02/2008
Next Scheduled EDR Contact: 09/01/2008
Data Release Frequency: No Update Planned

RMP: Risk Management Plans

When Congress passed the Clean Air Act Amendments of 1990, it required EPA to publish regulations and guidance for chemical accident prevention at facilities using extremely hazardous substances. The Risk Management Program Rule (RMP Rule) was written to implement Section 112(r) of these amendments. The rule, which built upon existing industry codes and standards, requires companies of all sizes that use certain flammable and toxic substances to develop a Risk Management Program, which includes a(n): Hazard assessment that details the potential effects of an accidental release, an accident history of the last five years, and an evaluation of worst-case and alternative accidental releases; Prevention program that includes safety precautions and maintenance, monitoring, and employee training measures; and Emergency response program that spells out emergency health care, employee training measures and procedures for informing the public and response agencies (e.g the fire department) should an accident occur.

Date of Government Version: 02/01/2015
Date Data Arrived at EDR: 02/13/2015
Date Made Active in Reports: 03/25/2015
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-8600
Last EDR Contact: 04/27/2015
Next Scheduled EDR Contact: 08/10/2015
Data Release Frequency: Varies

BRS: Biennial Reporting System

The Biennial Reporting System is a national system administered by the EPA that collects data on the generation and management of hazardous waste. BRS captures detailed data from two groups: Large Quantity Generators (LQG) and Treatment, Storage, and Disposal Facilities.

Date of Government Version: 12/31/2011
Date Data Arrived at EDR: 02/26/2013
Date Made Active in Reports: 04/19/2013
Number of Days to Update: 52

Source: EPA/NTIS
Telephone: 800-424-9346
Last EDR Contact: 05/29/2015
Next Scheduled EDR Contact: 09/07/2015
Data Release Frequency: Biennially

NPDES: NPDES Permit Listing

Listing of treatment plants in Massachusetts that hold permits to discharge to groundwater.

Date of Government Version: 01/01/2015
Date Data Arrived at EDR: 02/17/2015
Date Made Active in Reports: 03/05/2015
Number of Days to Update: 16

Source: Department of Environmental Protection
Telephone: 508-767-2781
Last EDR Contact: 05/22/2015
Next Scheduled EDR Contact: 08/31/2015
Data Release Frequency: Varies

DRYCLEANERS: Regulated Drycleaning Facilities

A listing of Department of Environmental Protection regulated drycleaning facilities that use perchloroethylene under the Environmental Results Program.

Date of Government Version: 04/21/2015
Date Data Arrived at EDR: 04/23/2015
Date Made Active in Reports: 04/30/2015
Number of Days to Update: 7

Source: Department of Environmental Protection
Telephone: 617-292-5633
Last EDR Contact: 04/16/2015
Next Scheduled EDR Contact: 08/03/2015
Data Release Frequency: Varies

ENFORCEMENT: Enforcement Action Cases

A listing of enforcement action cases tracked by Department of Environmental Protection programs, including Solid Waste and Hazardous Waste.

Date of Government Version: 05/04/2015
Date Data Arrived at EDR: 05/12/2015
Date Made Active in Reports: 06/05/2015
Number of Days to Update: 24

Source: Department of Environmental Quality
Telephone: 617-292-5979
Last EDR Contact: 05/04/2015
Next Scheduled EDR Contact: 08/17/2015
Data Release Frequency: Varies

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

AIRS: Permitted Facilities Listing
A listing of Air Quality permit applications.

Date of Government Version: 01/26/2015
Date Data Arrived at EDR: 01/27/2015
Date Made Active in Reports: 02/10/2015
Number of Days to Update: 14

Source: Department of Environmental Protection
Telephone: 617-292-5789
Last EDR Contact: 04/16/2015
Next Scheduled EDR Contact: 08/03/2015
Data Release Frequency: Varies

TIER 2: Tier 2 Information Listing
A listing of facilities which store or manufacture hazardous materials and submit a chemical inventory report

Date of Government Version: 12/31/2013
Date Data Arrived at EDR: 11/06/2014
Date Made Active in Reports: 12/04/2014
Number of Days to Update: 28

Source: Massachusetts Emergency Management Agency
Telephone: 508-820-2019
Last EDR Contact: 04/16/2015
Next Scheduled EDR Contact: 08/03/2015
Data Release Frequency: Annually

LEAD: Lead Inspection Database
The Massachusetts Childhood Lead Poisoning Prevention Program data of lead inspection for the state.

Date of Government Version: 04/06/2015
Date Data Arrived at EDR: 04/10/2015
Date Made Active in Reports: 04/21/2015
Number of Days to Update: 11

Source: Department of Health & Human Services, Childhood Lead Poisoning Prevention Progr
Telephone: 617-624-5757
Last EDR Contact: 07/06/2015
Next Scheduled EDR Contact: 10/19/2015
Data Release Frequency: Varies

INDIAN RESERV: Indian Reservations
This map layer portrays Indian administered lands of the United States that have any area equal to or greater than 640 acres.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 12/08/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 34

Source: USGS
Telephone: 202-208-3710
Last EDR Contact: 04/14/2015
Next Scheduled EDR Contact: 07/27/2015
Data Release Frequency: Semi-Annually

SCRD DRYCLEANERS: State Coalition for Remediation of Drycleaners Listing
The State Coalition for Remediation of Drycleaners was established in 1998, with support from the U.S. EPA Office of Superfund Remediation and Technology Innovation. It is comprised of representatives of states with established drycleaner remediation programs. Currently the member states are Alabama, Connecticut, Florida, Illinois, Kansas, Minnesota, Missouri, North Carolina, Oregon, South Carolina, Tennessee, Texas, and Wisconsin.

Date of Government Version: 03/07/2011
Date Data Arrived at EDR: 03/09/2011
Date Made Active in Reports: 05/02/2011
Number of Days to Update: 54

Source: Environmental Protection Agency
Telephone: 615-532-8599
Last EDR Contact: 05/21/2015
Next Scheduled EDR Contact: 08/31/2015
Data Release Frequency: Varies

PCB TRANSFORMER: PCB Transformer Registration Database
The database of PCB transformer registrations that includes all PCB registration submittals.

Date of Government Version: 02/01/2011
Date Data Arrived at EDR: 10/19/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 83

Source: Environmental Protection Agency
Telephone: 202-566-0517
Last EDR Contact: 05/01/2015
Next Scheduled EDR Contact: 08/10/2015
Data Release Frequency: Varies

Financial Assurance 1: Financial Assurance Information Listing
Information for hazardous waste facilities. Financial assurance is intended to ensure that resources are available to pay for the cost of closure, post-closure care, and corrective measures if the owner or operator of a regulated facility is unable or unwilling to pay.

Date of Government Version: 12/01/2010
Date Data Arrived at EDR: 12/23/2010
Date Made Active in Reports: 02/03/2011
Number of Days to Update: 42

Source: Department of Environmental Protection
Telephone: 617-292-5970
Last EDR Contact: 06/11/2015
Next Scheduled EDR Contact: 09/28/2015
Data Release Frequency: Varies

Financial Assurance 2: Financial Assurance Information Listing

A listing of financial assurance information for underground storage tanks. Financial assurance is intended to ensure that resources are available to pay for the cost of closure, post-closure care, and corrective measures if the owner or operator of a regulated facility is unable or unwilling to pay.

Date of Government Version: 10/21/2011
Date Data Arrived at EDR: 10/25/2011
Date Made Active in Reports: 11/18/2011
Number of Days to Update: 24

Source: Office of State Fire Marshal
Telephone: 978-567-3100
Last EDR Contact: 04/16/2015
Next Scheduled EDR Contact: 08/03/2015
Data Release Frequency: Quarterly

COAL ASH EPA: Coal Combustion Residues Surface Impoundments List

A listing of coal combustion residues surface impoundments with high hazard potential ratings.

Date of Government Version: 07/01/2014
Date Data Arrived at EDR: 09/10/2014
Date Made Active in Reports: 10/20/2014
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: N/A
Last EDR Contact: 06/12/2015
Next Scheduled EDR Contact: 09/21/2015
Data Release Frequency: Varies

FEDLAND: Federal and Indian Lands

Federally and Indian administrated lands of the United States. Lands included are administrated by: Army Corps of Engineers, Bureau of Reclamation, National Wild and Scenic River, National Wildlife Refuge, Public Domain Land, Wilderness, Wilderness Study Area, Wildlife Management Area, Bureau of Indian Affairs, Bureau of Land Management, Department of Justice, Forest Service, Fish and Wildlife Service, National Park Service.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 02/06/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 339

Source: U.S. Geological Survey
Telephone: 888-275-8747
Last EDR Contact: 04/14/2015
Next Scheduled EDR Contact: 07/27/2015
Data Release Frequency: N/A

MERCURY: Mercury Product Recyling Drop-Off Locations Listing

A listing of locations, collecting and recycling for mercury-added products. Mercury is toxic to the human nervous system, as well as fish and animals. Mercury can enter the body either through skin absorption or through inhalation of mercury vapors. At room temperature, small beads of mercury will vaporize.

Date of Government Version: 07/02/2014
Date Data Arrived at EDR: 08/27/2014
Date Made Active in Reports: 08/29/2014
Number of Days to Update: 2

Source: Department of Environmental Protection
Telephone: 617-292-5632
Last EDR Contact: 05/26/2015
Next Scheduled EDR Contact: 09/07/2015
Data Release Frequency: Varies

LEAD SMELTER 2: Lead Smelter Sites

A list of several hundred sites in the U.S. where secondary lead smelting was done from 1931and 1964. These sites may pose a threat to public health through ingestion or inhalation of contaminated soil or dust

Date of Government Version: 04/05/2001
Date Data Arrived at EDR: 10/27/2010
Date Made Active in Reports: 12/02/2010
Number of Days to Update: 36

Source: American Journal of Public Health
Telephone: 703-305-6451
Last EDR Contact: 12/02/2009
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

LEAD SMELTER 1: Lead Smelter Sites
A listing of former lead smelter site locations.

Date of Government Version: 11/25/2014
Date Data Arrived at EDR: 11/26/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 64
Source: Environmental Protection Agency
Telephone: 703-603-8787
Last EDR Contact: 07/07/2015
Next Scheduled EDR Contact: 10/19/2015
Data Release Frequency: Varies

HW GEN: List of Massachusetts Hazardous Waste Generators
Permanent generator identification numbers for all Massachusetts generators of hazardous waste and waste oil that have registered with or notified MassDEP of their hazardous waste activities.

Date of Government Version: 03/23/2015
Date Data Arrived at EDR: 03/31/2015
Date Made Active in Reports: 04/08/2015
Number of Days to Update: 8
Source: Department of Environmental Protection
Telephone: 617-292-5500
Last EDR Contact: 06/26/2015
Next Scheduled EDR Contact: 10/12/2015
Data Release Frequency: Semi-Annually

2020 COR ACTION: 2020 Corrective Action Program List
The EPA has set ambitious goals for the RCRA Corrective Action program by creating the 2020 Corrective Action Universe. This RCRA cleanup baseline includes facilities expected to need corrective action. The 2020 universe contains a wide variety of sites. Some properties are heavily contaminated while others were contaminated but have since been cleaned up. Still others have not been fully investigated yet, and may require little or no remediation. Inclusion in the 2020 Universe does not necessarily imply failure on the part of a facility to meet its RCRA obligations.

Date of Government Version: 04/22/2013
Date Data Arrived at EDR: 03/03/2015
Date Made Active in Reports: 03/09/2015
Number of Days to Update: 6
Source: Environmental Protection Agency
Telephone: 703-308-4044
Last EDR Contact: 05/14/2015
Next Scheduled EDR Contact: 08/24/2015
Data Release Frequency: Varies

TSD: TSD Facility
List of Licensed Hazardous Waste Treatment, Storage Disposal Facilities (TSDFs) in Massachusetts.

Date of Government Version: 11/01/2009
Date Data Arrived at EDR: 06/04/2013
Date Made Active in Reports: 07/18/2013
Number of Days to Update: 44
Source: Department of Environmental Protection
Telephone: 617-292-5580
Last EDR Contact: 06/24/2015
Next Scheduled EDR Contact: 10/12/2015
Data Release Frequency: Varies

PRP: Potentially Responsible Parties
A listing of verified Potentially Responsible Parties

Date of Government Version: 10/25/2013
Date Data Arrived at EDR: 10/17/2014
Date Made Active in Reports: 10/20/2014
Number of Days to Update: 3
Source: EPA
Telephone: 202-564-6023
Last EDR Contact: 05/14/2015
Next Scheduled EDR Contact: 08/24/2015
Data Release Frequency: Quarterly

GWDP: Ground Water Discharge Permits
The Ground Water Discharge Permits datalayer (formerly known as Groundwater Discharge Points) is a statewide point dataset containing approximate locations of permitted discharges to groundwater.

Date of Government Version: 09/01/2011
Date Data Arrived at EDR: 11/08/2011
Date Made Active in Reports: 12/05/2011
Number of Days to Update: 27
Source: MassGIS
Telephone: 617-556-1150
Last EDR Contact: 05/08/2015
Next Scheduled EDR Contact: 08/17/2015
Data Release Frequency: Varies

Financial Assurance 3: Financial Assurance Information listing

Information for solid waste facilities. Financial assurance is intended to ensure that resources are available to pay for the cost of closure, post-closure care, and corrective measures if the owner or operator of a regulated facility is unable or unwilling to pay

Date of Government Version: 10/01/2014
Date Data Arrived at EDR: 10/30/2014
Date Made Active in Reports: 11/10/2014
Number of Days to Update: 11

Source: Department of Environmental Protection
Telephone: 617-292-5970
Last EDR Contact: 04/13/2015
Next Scheduled EDR Contact: 07/27/2015
Data Release Frequency: Varies

COAL ASH DOE: Steam-Electric Plant Operation Data

A listing of power plants that store ash in surface ponds.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 08/07/2009
Date Made Active in Reports: 10/22/2009
Number of Days to Update: 76

Source: Department of Energy
Telephone: 202-586-8719
Last EDR Contact: 04/15/2015
Next Scheduled EDR Contact: 07/27/2015
Data Release Frequency: Varies

US FIN ASSUR: Financial Assurance Information

All owners and operators of facilities that treat, store, or dispose of hazardous waste are required to provide proof that they will have sufficient funds to pay for the clean up, closure, and post-closure care of their facilities.

Date of Government Version: 03/09/2015
Date Data Arrived at EDR: 03/10/2015
Date Made Active in Reports: 03/25/2015
Number of Days to Update: 15

Source: Environmental Protection Agency
Telephone: 202-566-1917
Last EDR Contact: 05/14/2015
Next Scheduled EDR Contact: 08/31/2015
Data Release Frequency: Quarterly

US AIRS (AFS): Aerometric Information Retrieval System Facility Subsystem (AFS)

The database is a sub-system of Aerometric Information Retrieval System (AIRS). AFS contains compliance data on air pollution point sources regulated by the U.S. EPA and/or state and local air regulatory agencies. This information comes from source reports by various stationary sources of air pollution, such as electric power plants, steel mills, factories, and universities, and provides information about the air pollutants they produce. Action, air program, air program pollutant, and general level plant data. It is used to track emissions and compliance data from industrial plants.

Date of Government Version: 10/16/2014
Date Data Arrived at EDR: 10/31/2014
Date Made Active in Reports: 11/17/2014
Number of Days to Update: 17

Source: EPA
Telephone: 202-564-2496
Last EDR Contact: 06/22/2015
Next Scheduled EDR Contact: 10/05/2015
Data Release Frequency: Annually

US AIRS MINOR: Air Facility System Data

A listing of minor source facilities.

Date of Government Version: 10/16/2014
Date Data Arrived at EDR: 10/31/2014
Date Made Active in Reports: 11/17/2014
Number of Days to Update: 17

Source: EPA
Telephone: 202-564-2496
Last EDR Contact: 06/22/2015
Next Scheduled EDR Contact: 10/22/2015
Data Release Frequency: Annually

EPA WATCH LIST: EPA WATCH LIST

EPA maintains a "Watch List" to facilitate dialogue between EPA, state and local environmental agencies on enforcement matters relating to facilities with alleged violations identified as either significant or high priority. Being on the Watch List does not mean that the facility has actually violated the law only that an investigation by EPA or a state or local environmental agency has led those organizations to allege that an unproven violation has in fact occurred. Being on the Watch List does not represent a higher level of concern regarding the alleged violations that were detected, but instead indicates cases requiring additional dialogue between EPA, state and local agencies - primarily because of the length of time the alleged violation has gone unaddressed or unresolved.

Date of Government Version: 08/30/2013
Date Data Arrived at EDR: 03/21/2014
Date Made Active in Reports: 06/17/2014
Number of Days to Update: 88

Source: Environmental Protection Agency
Telephone: 617-520-3000
Last EDR Contact: 05/07/2015
Next Scheduled EDR Contact: 08/24/2015
Data Release Frequency: Quarterly

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP: EDR Proprietary Manufactured Gas Plants

The EDR Proprietary Manufactured Gas Plant Database includes records of coal gas plants (manufactured gas plants) compiled by EDR's researchers. Manufactured gas sites were used in the United States from the 1800's to 1950's to produce a gas that could be distributed and used as fuel. These plants used whale oil, rosin, coal, or a mixture of coal, oil, and water that also produced a significant amount of waste. Many of the byproducts of the gas production, such as coal tar (oily waste containing volatile and non-volatile chemicals), sludges, oils and other compounds are potentially hazardous to human health and the environment. The byproduct from this process was frequently disposed of directly at the plant site and can remain or spread slowly, serving as a continuous source of soil and groundwater contamination.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

EDR US Hist Auto Stat: EDR Exclusive Historic Gas Stations

EDR has searched selected national collections of business directories and has collected listings of potential gas station/filling station/service station sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include gas station/filling station/service station establishments. The categories reviewed included, but were not limited to gas, gas station, gasoline station, filling station, auto, automobile repair, auto service station, service station, etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

EDR US Hist Cleaners: EDR Exclusive Historic Dry Cleaners

EDR has searched selected national collections of business directories and has collected listings of potential dry cleaner sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include dry cleaning establishments. The categories reviewed included, but were not limited to dry cleaners, cleaners, laundry, laundromat, cleaning/laundry, wash & dry etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

EDR RECOVERED GOVERNMENT ARCHIVES

Exclusive Recovered Govt. Archives

RGA HWS: Recovered Government Archive State Hazardous Waste Facilities List

The EDR Recovered Government Archive State Hazardous Waste database provides a list of SHWS incidents derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Environmental Protection in Massachusetts.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 12/24/2013
Number of Days to Update: 176

Source: Department of Environmental Protection
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

RGA LUST: Recovered Government Archive Leaking Underground Storage Tank

The EDR Recovered Government Archive Leaking Underground Storage Tank database provides a list of LUST incidents derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Environmental Protection in Massachusetts.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 12/24/2013
Number of Days to Update: 176

Source: Department of Environmental Protection
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

OTHER DATABASE(S)

Depending on the geographic area covered by this report, the data provided in these specialty databases may or may not be complete. For example, the existence of wetlands information data in a specific report does not mean that all wetlands in the area covered by the report are included. Moreover, the absence of any reported wetlands information does not necessarily mean that wetlands do not exist in the area covered by the report.

Oil/Gas Pipelines

Source: PennWell Corporation
Telephone: 281-546-1505
Petroleum Bundle (Crude Oil, Refined Products, Petrochemicals, Gas Liquids (LPG/NGL), and Specialty Gases (Miscellaneous)) N = Natural Gas Bundle (Natural Gas, Gas Liquids (LPG/NGL), and Specialty Gases (Miscellaneous)). This map includes information copyrighted by PennWell Corporation. This information is provided on a best effort basis and PennWell Corporation does not guarantee its accuracy nor warrant its fitness for any particular purpose. Such information has been reprinted with the permission of PennWell.

Electric Power Transmission Line Data

Source: PennWell Corporation
Telephone: 800-823-6277
This map includes information copyrighted by PennWell Corporation. This information is provided on a best effort basis and PennWell Corporation does not guarantee its accuracy nor warrant its fitness for any particular purpose. Such information has been reprinted with the permission of PennWell.

Sensitive Receptors: There are individuals deemed sensitive receptors due to their fragile immune systems and special sensitivity to environmental discharges. These sensitive receptors typically include the elderly, the sick, and children. While the location of all sensitive receptors cannot be determined, EDR indicates those buildings and facilities - schools, daycares, hospitals, medical centers, and nursing homes - where individuals who are sensitive receptors are likely to be located.

AHA Hospitals:

Source: American Hospital Association, Inc.
Telephone: 312-280-5991
The database includes a listing of hospitals based on the American Hospital Association's annual survey of hospitals.

Medical Centers: Provider of Services Listing

Source: Centers for Medicare & Medicaid Services
Telephone: 410-786-3000
A listing of hospitals with Medicare provider number, produced by Centers of Medicare & Medicaid Services, a federal agency within the U.S. Department of Health and Human Services.

Nursing Homes

Source: National Institutes of Health
Telephone: 301-594-6248
Information on Medicare and Medicaid certified nursing homes in the United States.

Public Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on elementary and secondary public education in the United States. It is a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts, which contains data that are comparable across all states.

Private Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on private school locations in the United States.

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 2003 & 2011 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002, 2005 and 2010 from the U.S. Fish and Wildlife Service.

Scanned Digital USGS 7.5' Topographic Map (DRG)
Source: United States Geologic Survey
A digital raster graphic (DRG) is a scanned image of a U.S. Geological Survey topographic map. The map images are made by scanning published paper maps on high-resolution scanners. The raster image is georeferenced and fit to the Universal Transverse Mercator (UTM) projection.

STREET AND ADDRESS INFORMATION

© 2010 Tele Atlas North America, Inc. All rights reserved. This material is proprietary and the subject of copyright protection and other intellectual property rights owned by or licensed to Tele Atlas North America, Inc. The use of this material is subject to the terms of a license agreement. You will be held liable for any unauthorized copying or disclosure of this material.

GEOCHECK ®- PHYSICAL SETTING SOURCE ADDENDUM

TARGET PROPERTY ADDRESS

TROUT POND LOTS 3 AND 4
68 GREAT NECK ROAD SOUTH
MASHPEE, MA 02649

TARGET PROPERTY COORDINATES

Latitude (North):	41.6149 - 41° 36' 53.64''
Longitude (West):	70.4857 - 70° 29' 8.52''
Universal Tranverse Mercator:	Zone 19
UTM X (Meters):	376213.8
UTM Y (Meters):	4607873.5
Elevation:	61 ft. above sea level

USGS TOPOGRAPHIC MAP

Target Property Map:	41070-E4 COTUIT (DIGITAL), MA
Most Recent Revision:	1974
North Map:	41070-F4 SANDWICH (DIGITAL), MA
Most Recent Revision:	1972
West Map:	41070-E5 FALMOUTH, MA
Most Recent Revision:	1979

EDR's GeoCheck Physical Setting Source Addendum is provided to assist the environmental professional in forming an opinion about the impact of potential contaminant migration.

Assessment of the impact of contaminant migration generally has two principal investigative components:

1. Groundwater flow direction, and
2. Groundwater flow velocity.

Groundwater flow direction may be impacted by surface topography, hydrology, hydrogeology, characteristics of the soil, and nearby wells. Groundwater flow velocity is generally impacted by the nature of the geologic strata.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW DIRECTION INFORMATION

Groundwater flow direction for a particular site is best determined by a qualified environmental professional using site-specific well data. If such data is not reasonably ascertainable, it may be necessary to rely on other sources of information, such as surface topographic information, hydrologic information, hydrogeologic data collected on nearby properties, and regional groundwater flow information (from deep aquifers).

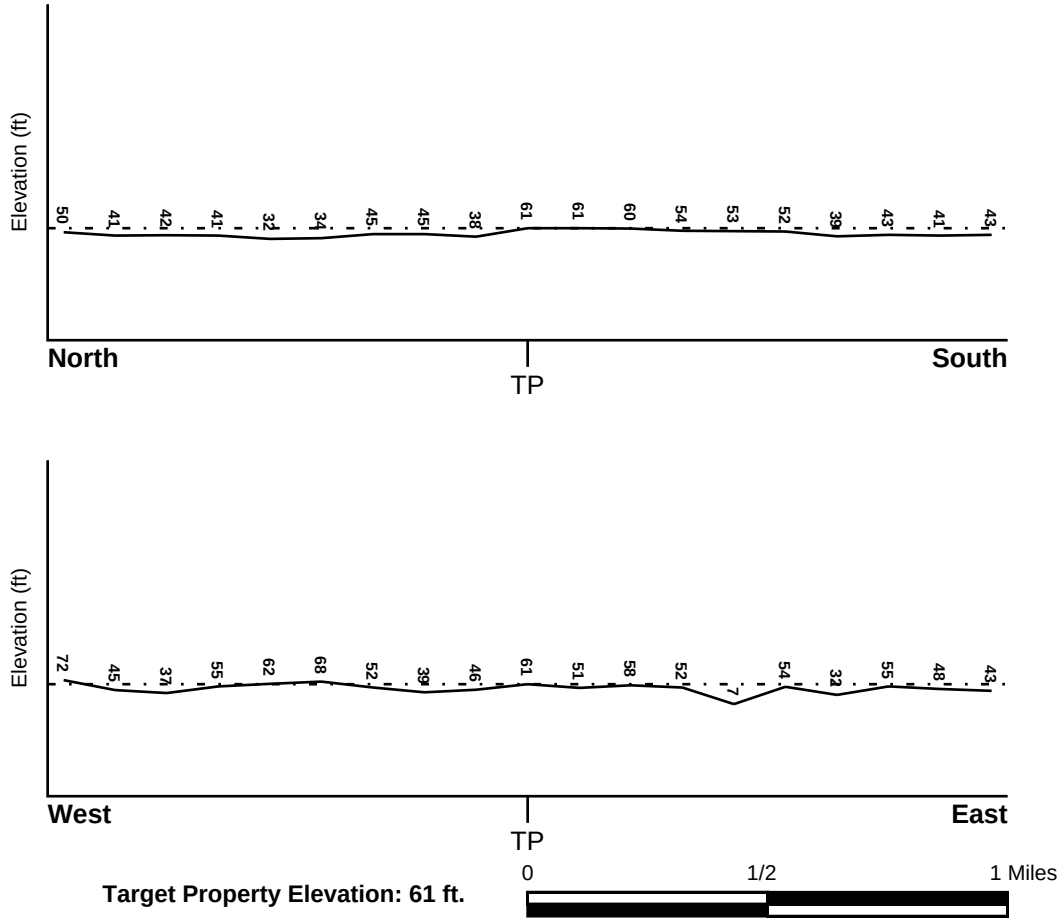
TOPOGRAPHIC INFORMATION

Surface topography may be indicative of the direction of surficial groundwater flow. This information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

TARGET PROPERTY TOPOGRAPHY

General Topographic Gradient: General NW

SURROUNDING TOPOGRAPHY: ELEVATION PROFILES



Target Property Elevation: 61 ft.

Source: Topography has been determined from the USGS 7.5' Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

HYDROLOGIC INFORMATION

Surface water can act as a hydrologic barrier to groundwater flow. Such hydrologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Refer to the Physical Setting Source Map following this summary for hydrologic information (major waterways and bodies of water).

FEMA FLOOD ZONE

Target Property County	FEMA Flood Electronic Data
BARNSTABLE, MA	YES - refer to the Overview Map and Detail Map

Flood Plain Panel at Target Property: 2500090007F - FEMA Q3 Flood data

Additional Panels in search area: 2500090005A - FEMA Q3 Flood data
2500090006E - FEMA Q3 Flood data

NATIONAL WETLAND INVENTORY

NWI Quad at Target Property	NWI Electronic Data Coverage
COTUIT	YES - refer to the Overview Map and Detail Map

HYDROGEOLOGIC INFORMATION

Hydrogeologic information obtained by installation of wells on a specific site can often be an indicator of groundwater flow direction in the immediate area. Such hydrogeologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

AQUIFLOW®

Search Radius: 1.000 Mile.

EDR has developed the AQUIFLOW Information System to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted by environmental professionals to regulatory authorities at select sites and has extracted the date of the report, groundwater flow direction as determined hydrogeologically, and the depth to water table.

MAP ID	LOCATION FROM TP	GENERAL DIRECTION GROUNDWATER FLOW
Not Reported		

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW VELOCITY INFORMATION

Groundwater flow velocity information for a particular site is best determined by a qualified environmental professional using site specific geologic and soil strata data. If such data are not reasonably ascertainable, it may be necessary to rely on other sources of information, including geologic age identification, rock stratigraphic unit and soil characteristics data collected on nearby properties and regional soil information. In general, contaminant plumes move more quickly through sandy-gravelly types of soils than silty-clayey types of soils.

GEOLOGIC INFORMATION IN GENERAL AREA OF TARGET PROPERTY

Geologic information can be used by the environmental professional in forming an opinion about the relative speed at which contaminant migration may be occurring.

ROCK STRATIGRAPHIC UNIT

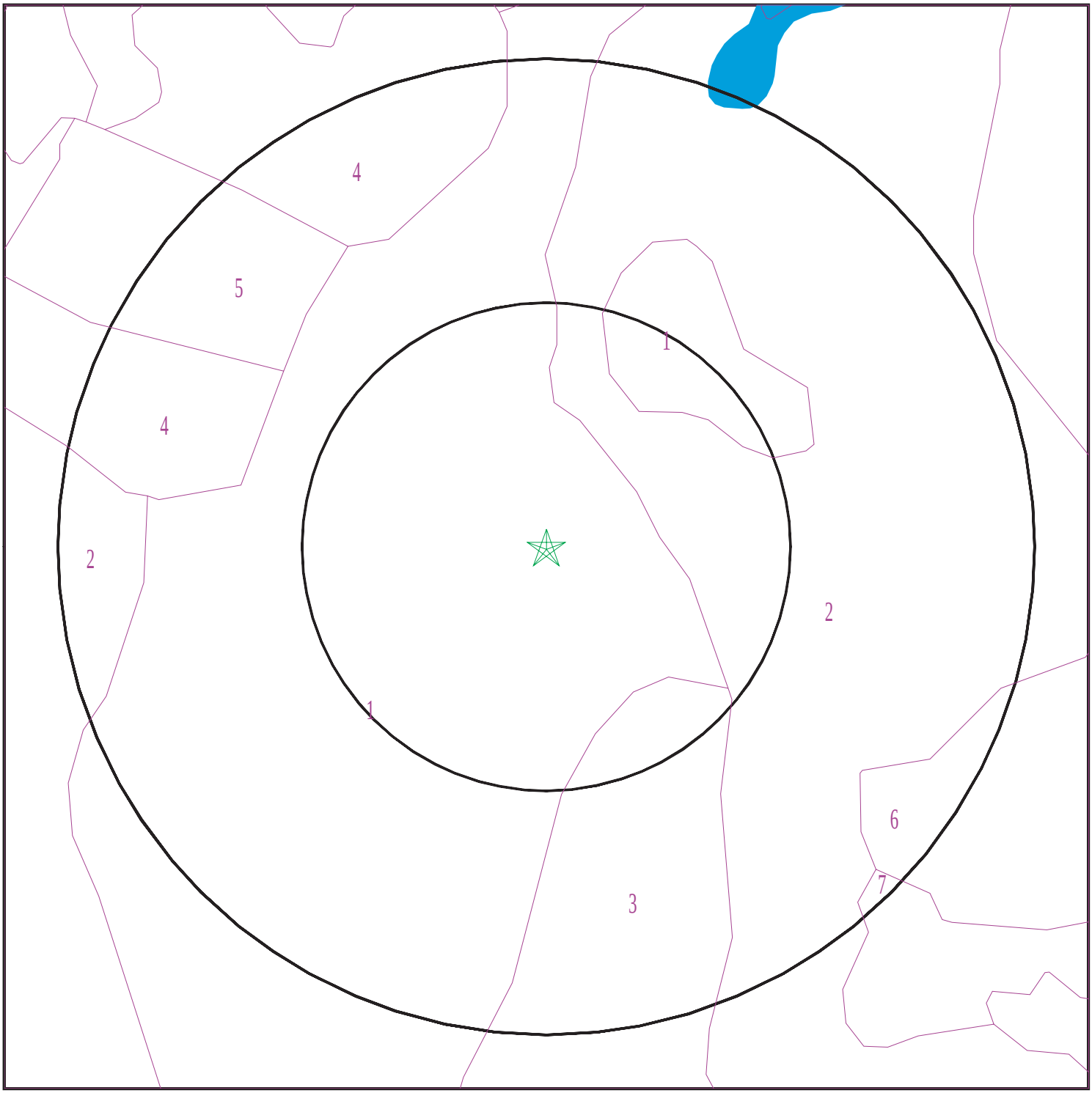
Era:	Cenozoic
System:	Quaternary
Series:	Pleistocene
Code:	Qp *(decoded above as Era, System & Series)*

GEOLOGIC AGE IDENTIFICATION

Category: Stratifed Sequence

Geologic Age and Rock Stratigraphic Unit Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - a digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

SSURGO SOIL MAP - 4349508.2s



Target Property
SSURGO Soil
Water

0 1/16 1/8 1/4 Miles

N

SITE NAME:	Trout Pond Lots 3 and 4	CLIENT:	The Isosceles Group
ADDRESS:	68 Great Neck Road South Mashpee MA 02649	CONTACT:	M Margret Hanley
LAT/LONG:	41.6149 / 70.4857	INQUIRY #:	4349508.2s
		DATE:	July 09, 2015 1:56 pm

Copyright © 2015 EDR, Inc. © 2010 Tele Atlas Rel. 07/2009.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

DOMINANT SOIL COMPOSITION IN GENERAL AREA OF TARGET PROPERTY

The U.S. Department of Agriculture's (USDA) Soil Conservation Service (SCS) leads the National Cooperative Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. The following information is based on Soil Conservation Service SSURGO data.

Soil Map ID: 1

Soil Component Name: Carver

Soil Surface Texture: loamy coarse sand

Hydrologic Group: Class A - High infiltration rates. Soils are deep, well drained to excessively drained sands and gravels.

Soil Drainage Class: Excessively drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: Low

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	7 inches	loamy coarse sand	Not reported	Not reported	Max: 705 Min: 141.14	Max: 6 Min: 3.6
2	7 inches	16 inches	coarse sand	Not reported	Not reported	Max: 705 Min: 141.14	Max: 5.5 Min: 3.6
3	16 inches	64 inches	coarse sand	Not reported	Not reported	Max: 705 Min: 141.14	Max: 5.5 Min: 3.6

Soil Map ID: 2

Soil Component Name: Carver

Soil Surface Texture: coarse sand

Hydrologic Group: Class A - High infiltration rates. Soils are deep, well drained to excessively drained sands and gravels.

Soil Drainage Class: Excessively drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: Low

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	7 inches	coarse sand	Not reported	Not reported	Max: 705 Min: 141.14	Max: 6 Min: 3.6
2	7 inches	16 inches	coarse sand	Not reported	Not reported	Max: 705 Min: 141.14	Max: 5.5 Min: 3.6
3	16 inches	64 inches	coarse sand	Not reported	Not reported	Max: 705 Min: 141.14	Max: 5.5 Min: 3.6

Soil Map ID: 3

Soil Component Name: Merrimac

Soil Surface Texture: sandy loam

Hydrologic Group: Class A - High infiltration rates. Soils are deep, well drained to excessively drained sands and gravels.

Soil Drainage Class: Somewhat excessively drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: Low

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	3 inches	sandy loam	Not reported	Not reported	Max: 42.34 Min: 14.11	Max: 6 Min: 3.6
2	3 inches	24 inches	sandy loam	Not reported	Not reported	Max: 42.34 Min: 14.11	Max: 6 Min: 3.6

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
3	24 inches	64 inches	stratified very gravelly coarse sand to sand	Not reported	Not reported	Max: 141.14 Min: 42.34	Max: 6 Min: 3.6

Soil Map ID: 4

Soil Component Name: Udipsamments

Soil Surface Texture: sandy loam

Hydrologic Group: Class A - High infiltration rates. Soils are deep, well drained to excessively drained sands and gravels.

Soil Drainage Class:
Hydric Status: Unknown

Corrosion Potential - Uncoated Steel: Not Reported

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

No Layer Information available.

Soil Map ID: 5

Soil Component Name: Urban land

Soil Surface Texture: sandy loam

Hydrologic Group: Class A - High infiltration rates. Soils are deep, well drained to excessively drained sands and gravels.

Soil Drainage Class:
Hydric Status: Unknown

Corrosion Potential - Uncoated Steel: Not Reported

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

No Layer Information available.

Soil Map ID: 6

Soil Component Name: Carver

Soil Surface Texture: coarse sand

Hydrologic Group: Class A - High infiltration rates. Soils are deep, well drained to excessively drained sands and gravels.

Soil Drainage Class: Excessively drained

Hydric Status: Partially hydric

Corrosion Potential - Uncoated Steel: Low

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	7 inches	coarse sand	Not reported	Not reported	Max: 705 Min: 141.14	Max: 6 Min: 3.6
2	7 inches	16 inches	coarse sand	Not reported	Not reported	Max: 705 Min: 141.14	Max: 5.5 Min: 3.6
3	16 inches	64 inches	coarse sand	Not reported	Not reported	Max: 705 Min: 141.14	Max: 5.5 Min: 3.6

Soil Map ID: 7

Soil Component Name: Freetown

Soil Surface Texture: muck

Hydrologic Group: Class D - Very slow infiltration rates. Soils are clayey, have a high water table, or are shallow to an impervious layer.

Soil Drainage Class: Very poorly drained

Hydric Status: All hydric

Corrosion Potential - Uncoated Steel: High

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	5 inches	muck	Not reported	Not reported	Max: 141.14 Min: 42.34	Max: Min:
2	5 inches	64 inches	muck	Not reported	Not reported	Max: 42.34 Min: 4.23	Max: Min:

LOCAL / REGIONAL WATER AGENCY RECORDS

EDR Local/Regional Water Agency records provide water well information to assist the environmental professional in assessing sources that may impact ground water flow direction, and in forming an opinion about the impact of contaminant migration on nearby drinking water wells.

WELL SEARCH DISTANCE INFORMATION

DATABASE	SEARCH DISTANCE (miles)
Federal USGS	1.000
Federal FRDS PWS	Nearest PWS within 1 mile
State Database	1.000

FEDERAL USGS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
1	USGS40000454500	0 - 1/8 Mile SSE
2	USGS40000454555	1/8 - 1/4 Mile ENE
A3	USGS40000454573	1/8 - 1/4 Mile WNW
A4	USGS40000454574	1/8 - 1/4 Mile WNW
5	USGS40000454624	1/4 - 1/2 Mile NE
C8	USGS40000454438	1/4 - 1/2 Mile SE
C9	USGS40000454411	1/4 - 1/2 Mile SE
10	USGS40000454304	1/2 - 1 Mile SW
11	USGS40000454814	1/2 - 1 Mile NNE
12	USGS40000454314	1/2 - 1 Mile SW
14	USGS40000454235	1/2 - 1 Mile SW
D15	USGS40000454848	1/2 - 1 Mile NNE
D16	USGS40000454853	1/2 - 1 Mile NNE
17	USGS40000454625	1/2 - 1 Mile WNW
18	USGS40000454904	1/2 - 1 Mile North
E19	USGS40000454897	1/2 - 1 Mile NNE
E20	USGS40000454903	1/2 - 1 Mile NNE
21	USGS40000454311	1/2 - 1 Mile WSW
22	USGS40000454412	1/2 - 1 Mile WSW

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

FEDERAL USGS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
24	USGS40000454357	1/2 - 1 Mile WSW

FEDERAL FRDS PUBLIC WATER SUPPLY SYSTEM INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
13	MA4172039	1/2 - 1 Mile NNE

Note: PWS System location is not always the same as well location.

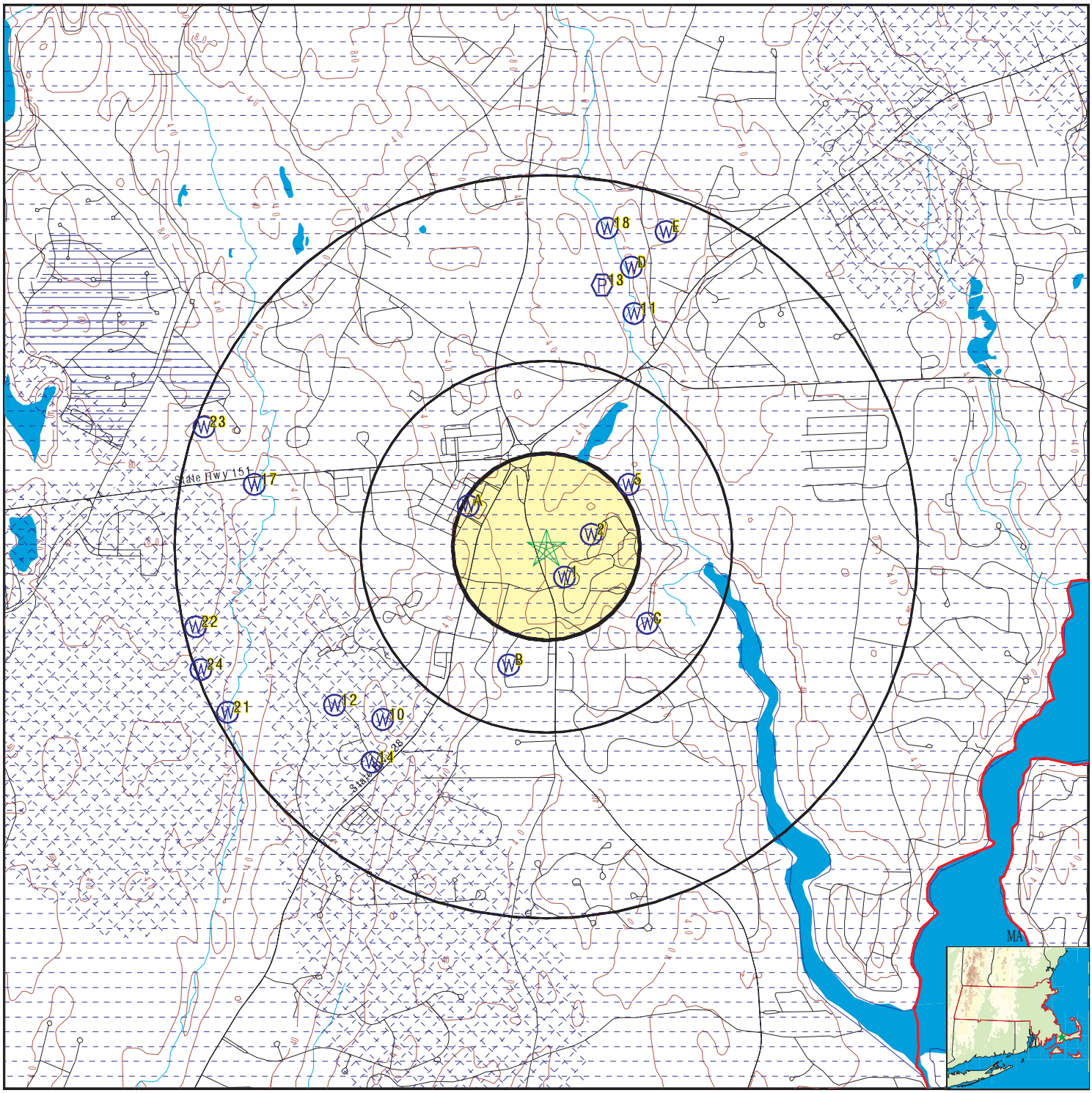
STATE DATABASE WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
B6	MA8000000002760	1/4 - 1/2 Mile SSW
B7	MA8000000004254	1/4 - 1/2 Mile SSW
23	MA8000000002659	1/2 - 1 Mile WNW

OTHER STATE DATABASE INFORMATION

ACEC ID	AREA NAME
4	WAQUOIT BAY

PHYSICAL SETTING SOURCE MAP - 4349508.2s



- County Boundary
- Major Roads
- Contour Lines
- Earthquake epicenter, Richter 5 or greater
- Water Wells
- Public Water Supply Wells
- Cluster of Multiple Icons

- Groundwater Flow Direction
- GI Indeterminate Groundwater Flow at Location
- GV Groundwater Flow Varies at Location

- Potentially Productive Aquifers
- Not Potentially Productive Aquifers
- DEP Approved Zone IIs
- EPA Designated Sole Src. Aq.

SITE NAME:	Trout Pond Lots 3 and 4	CLIENT:	The Isosceles Group
ADDRESS:	68 Great Neck Road South Mashpee MA 02649	CONTACT:	M Margret Hanley
LAT/LONG:	41.6149 / 70.4857	INQUIRY #:	4349508.2s
		DATE:	July 09, 2015 1:56 pm

Copyright © 2015 EDR, Inc. © 2010 Tele Atlas Rel. 07/2009.

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID
Direction
Distance
Elevation | Database | EDR ID Number

1
SSE **FED USGS** **USGS40000454500**
0 - 1/8 Mile
Higher

Org. Identifier:	USGS-MA		
Formal name:	USGS Massachusetts Water Science Center		
Monloc Identifier:	USGS-413649070290701		
Monloc name:	MA-MIW 117-0060		
Monloc type:	Well		
Monloc desc:	Not Reported		
Huc code:	01090002	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	41.6137205
Longitude:	-70.4847496	Sourcemap scale:	25000
Horiz Acc measure:	1	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	58.3
Vert measure units:	feet	Vertacc measure val:	0.5
Vert accmeasure units:	feet		
Vertcollection method:	Level or other surveying method		
Vert coord refsys:	NGVD29	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		
Aquifer type:	Unconfined single aquifer		
Construction date:	19850514	Welldepth:	59
Welldepth units:	ft	Wellholedepth:	60
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 2

Date	Feet below Surface	Feet to Sealevel	Date	Feet below Surface	Feet to Sealevel
1993-03-24	44.02		1990-05-10	44.64	

2
ENE **FED USGS** **USGS40000454555**
1/8 - 1/4 Mile
Lower

Org. Identifier:	USGS-MA		
Formal name:	USGS Massachusetts Water Science Center		
Monloc Identifier:	USGS-413655070290201		
Monloc name:	MA-MIW 114-0060		
Monloc type:	Well		
Monloc desc:	Not Reported		
Huc code:	01090002	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	41.6153872
Longitude:	-70.4833606	Sourcemap scale:	25000
Horiz Acc measure:	1	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	63.6
Vert measure units:	feet	Vertacc measure val:	0.5
Vert accmeasure units:	feet		
Vertcollection method:	Level or other surveying method		
Vert coord refsys:	NGVD29	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		

Aquifer type:	Unconfined single aquifer		
Construction date:	19850508	Welldepth:	60
Welldepth units:	ft	Wellholedepth:	60
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 2

Date	Feet below Surface	Feet to Sealevel	Date	Feet below Surface	Feet to Sealevel
1993-03-24	51.74		1990-05-10	52.27	

A3
WNW **FED USGS** **USGS40000454573**
1/8 - 1/4 Mile
Lower

Org. Identifier:	USGS-MA		
Formal name:	USGS Massachusetts Water Science Center		
Monloc Identifier:	USGS-413659070292501		
Monloc name:	MA-MIW 36		
Monloc type:	Well		
Monloc desc:	Not Reported		
Huc code:	01090002	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	41.6164982
Longitude:	-70.4897497	Sourcemap scale:	24000
Horiz Acc measure:	5	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	45.00
Vert measure units:	feet	Vertacc measure val:	5
Vert accmeasure units:	feet		
Vertcollection method:	Interpolated from topographic map		
Vert coord refsys:	NGVD29	Countrycode:	US
Aquifername:	Sand and gravel aquifers (glaciated regions)		
Formation type:	Not Reported		
Aquifer type:	Not Reported		
Construction date:	19680424	Welldepth:	81.6
Welldepth units:	ft	Wellholedepth:	81.6
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1968-04-24	24.30	

A4
WNW **FED USGS** **USGS40000454574**
1/8 - 1/4 Mile
Lower

Org. Identifier:	USGS-MA		
Formal name:	USGS Massachusetts Water Science Center		
Monloc Identifier:	USGS-413659070292502		
Monloc name:	MA-MIW 38		
Monloc type:	Well		
Monloc desc:	Not Reported		
Huc code:	01090002	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	41.6164982
Longitude:	-70.4897497	Sourcemap scale:	24000

Horiz Acc measure:	5	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	45.00
Vert measure units:	feet	Vertacc measure val:	5
Vert accmeasure units:	feet		
Vertcollection method:	Interpolated from topographic map		
Vert coord refsys:	NGVD29	Countrycode:	US
Aquifername:	Sand and gravel aquifers (glaciated regions)		
Formation type:	Not Reported		
Aquifer type:	Not Reported		
Construction date:	19651005	Welldepth:	60
Welldepth units:	ft	Wellholedepth:	81
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1965-10-05	20.20	

5
NE
1/4 - 1/2 Mile
Lower

FED USGS **USGS40000454624**

Org. Identifier:	USGS-MA		
Formal name:	USGS Massachusetts Water Science Center		
Monloc Identifier:	USGS-413702070285501		
Monloc name:	MA-MIW 113-0020		
Monloc type:	Well		
Monloc desc:	Not Reported		
Huc code:	01090002	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	41.6173316
Longitude:	-70.4814161	Sourcemap scale:	25000
Horiz Acc measure:	1	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	17.1
Vert measure units:	feet	Vertacc measure val:	.05
Vert accmeasure units:	feet		
Vertcollection method:	Level or other surveying method		
Vert coord refsys:	NGVD29	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		
Aquifer type:	Unconfined single aquifer		
Construction date:	19850507	Welldepth:	19
Welldepth units:	ft	Wellholedepth:	20
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 2

Date	Feet below Surface	Feet to Sealevel	Date	Feet below Surface	Feet to Sealevel
1993-03-24	9.09		1990-05-10	9.47	

B6
SSW
1/4 - 1/2 Mile
Lower

MA WELLS **MA8000000002760**

Fid:	2759	Fac name:	Not Reported
Address:	Not Reported	Town:	MASHPEE
Region:	Southeast	Rtn:	Not Reported
Hw id:	Not Reported	Sw id:	Not Reported
Sseis id:	0	Npdes id:	Not Reported
Air:	Not Reported	Gwd:	Not Reported
Hwr:	Not Reported	Lqg ma:	Not Reported
Lqg rcra:	Not Reported	Lqtu:	Not Reported
Tsdf:	Not Reported	Swd:	Not Reported
Fac id:	0	Source id:	4172043-02G
Site name:	SEA MIST RESORT		
Latitude:	41.61030936		
Longitude:	-70.48756427		
Type:	Transient Non-Community	Zii num:	0
Pws id:	4172043	Site id:	MA8000000002760

Objectid:	952	Source id:	4172043-02G
L base:	NA	L acc est:	100
L type:	GW	L meth:	GP_6
L src 1:	SV	L src 2:	Not Reported
L src 3:	Not Reported		

Objectid:	2649	Source id:	4172043-02G
Pws name:	SEA MIST RESORT	S name:	WELL 2
Pws status:	Active	S status:	A
Pws class:	Transient Non Community	S availabi:	ACTIVE

B7
SSW **MA WELLS** **MA8000000004254**
1/4 - 1/2 Mile
Lower

Fid:	4253	Fac name:	Not Reported
Address:	Not Reported	Town:	MASHPEE
Region:	Southeast	Rtn:	Not Reported
Hw id:	Not Reported	Sw id:	Not Reported
Sseis id:	0	Npdes id:	Not Reported
Air:	Not Reported	Gwd:	Not Reported
Hwr:	Not Reported	Lqg ma:	Not Reported
Lqg rcra:	Not Reported	Lqtu:	Not Reported
Tsdf:	Not Reported	Swd:	Not Reported
Fac id:	0	Source id:	4172043-01G
Site name:	SEA MIST RESORT		
Latitude:	41.61026745		
Longitude:	-70.48772427		
Type:	Transient Non-Community	Zii num:	0
Pws id:	4172043	Site id:	MA8000000004254

Objectid:	573	Source id:	4172043-01G
L base:	NA	L acc est:	100
L type:	GW	L meth:	GP_6
L src 1:	SV	L src 2:	Not Reported
L src 3:	Not Reported		

Objectid:	2648	Source id:	4172043-01G
Pws name:	SEA MIST RESORT	S name:	WELL 1
Pws status:	Active	S status:	A
Pws class:	Transient Non Community	S availabi:	ACTIVE

C8
SE **FED USGS** **USGS40000454438**
1/4 - 1/2 Mile
Lower

Org. Identifier:	USGS-MA		
Formal name:	USGS Massachusetts Water Science Center		
Monloc Identifier:	USGS-413643070285101		
Monloc name:	MA-MIW 116-0015		
Monloc type:	Well		
Monloc desc:	Not Reported		
Huc code:	01090002	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	41.6120539
Longitude:	-70.480305	Sourcemap scale:	25000
Horiz Acc measure:	1	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	11.4
Vert measure units:	feet	Vertacc measure val:	0.5
Vert accmeasure units:	feet		
Vertcollection method:	Level or other surveying method		
Vert coord refsys:	NGVD29	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		
Aquifer type:	Unconfined single aquifer		
Construction date:	19850513	Welldepth:	14
Welldepth units:	ft	Wellholedepth:	15
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 2

Date	Feet below Surface	Feet to Sealevel	Date	Feet below Surface	Feet to Sealevel
1993-03-24	2.77		1990-05-10	2.69	

C9
SE **FED USGS** **USGS40000454411**
1/4 - 1/2 Mile
Lower

Org. Identifier:	USGS-MA		
Formal name:	USGS Massachusetts Water Science Center		
Monloc Identifier:	USGS-413642070285201		
Monloc name:	MA-MIW 115-0069		
Monloc type:	Well		
Monloc desc:	Not Reported		
Huc code:	01090002	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	41.6117762
Longitude:	-70.4805828	Sourcemap scale:	25000

Horiz Acc measure:	1	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	14.0
Vert measure units:	feet	Vertacc measure val:	0.1
Vert accmeasure units:	feet		
Vertcollection method:	Level or other surveying method		
Vert coord refsys:	NGVD29	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		
Aquifer type:	Unconfined single aquifer		
Construction date:	19850513	Welldepth:	69
Welldepth units:	ft	Wellholedepth:	71
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1990-05-10	6.10	

10
SW
1/2 - 1 Mile
Lower

FED USGS **USGS40000454304**

Org. Identifier:	USGS-MA		
Formal name:	USGS Massachusetts Water Science Center		
Monloc Identifier:	USGS-413629070294101		
Monloc name:	MA-MIW 98-0030		
Monloc type:	Well		
Monloc desc:	Not Reported		
Huc code:	01090002	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	41.608165
Longitude:	-70.4941943	Sourcemap scale:	25000
Horiz Acc measure:	1	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	30.50
Vert measure units:	feet	Vertacc measure val:	.05
Vert accmeasure units:	feet		
Vertcollection method:	Level or other surveying method		
Vert coord refsys:	NGVD29	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		
Aquifer type:	Unconfined single aquifer		
Construction date:	19871123	Welldepth:	30
Welldepth units:	ft	Wellholedepth:	30.5
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1990-05-10	10.91	

11
NNE
1/2 - 1 Mile
Lower

FED USGS **USGS40000454814**

Org. Identifier:	USGS-MA		
Formal name:	USGS Massachusetts Water Science Center		
Monloc Identifier:	USGS-413726070285401		
Monloc name:	MA-MIW 63		
Monloc type:	Well		
Monloc desc:	Not Reported		
Huc code:	01090002	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	41.6239981
Longitude:	-70.4811383	Sourcemap scale:	24000
Horiz Acc measure:	1	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	10.23
Vert measure units:	feet	Vertacc measure val:	02
Vert accmeasure units:	feet		
Vertcollection method:	Level or other surveying method		
Vert coord refsys:	NGVD29	Countrycode:	US
Aquifername:	Sand and gravel aquifers (glaciated regions)		
Formation type:	Not Reported		
Aquifer type:	Not Reported		
Construction date:	19791107	Welldepth:	11
Welldepth units:	ft	Wellholedepth:	11
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1980-02-21	0.33	

12
SW
1/2 - 1 Mile
Lower

FED USGS **USGS40000454314**

Org. Identifier:	USGS-MA		
Formal name:	USGS Massachusetts Water Science Center		
Monloc Identifier:	USGS-413631070295001		
Monloc name:	MA-MIW 99-0050		
Monloc type:	Well		
Monloc desc:	Not Reported		
Huc code:	01090002	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	41.6087205
Longitude:	-70.4966944	Sourcemap scale:	25000
Horiz Acc measure:	1	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	61.94
Vert measure units:	feet	Vertacc measure val:	.05
Vert accmeasure units:	feet		
Vertcollection method:	Level or other surveying method		
Vert coord refsys:	NGVD29	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		

Aquifer type:	Unconfined single aquifer		
Construction date:	19871123	Welldepth:	50
Welldepth units:	ft	Wellholedepth:	50.5
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1990-05-10	44.59	

13
NNE
1/2 - 1 Mile
Lower

FRDS PWS **MA4172039**

Epa region:	01	State:	MA
Pwsid:	MA4172039		
Pwsname:	MASHPEE WATER DISTRICT		
City served:	Not Reported	State served:	MA
Zip served:	Not Reported	Fips county:	25001
Status:	Active	Pop srvd:	22445
Pwssvcconn:	9128	Source:	Purch_groundwater_under_infl_of_surface_water
Pws type:	CWS	Owner:	Local_Govt
Contact:	ANDREW G MARKS		
Contactor gname:	MASHPEE WATER DISTRICT		
Contact phone:	5084776767	Contact address1:	79 INDUSTRIAL DR
Contact address2:	Not Reported	Contact city:	MASHPEE
Contact state:	MA	Contact zip:	02649
Activity code:	A		

Facid:	10		
Facname:	ROCK LANDING 2		
Facility type:	Treatment_plant	Activity code:	A
Treatment obj:	corrosion control	Treatment process:	ph adjustment

Facid:	11		
Facname:	ROCK LANDING 3		
Facility type:	Treatment_plant	Activity code:	A
Treatment obj:	corrosion control	Treatment process:	ph adjustment

Facid:	12		
Facname:	QUAKER RUN 4 TREATMENT PLANT		
Facility type:	Treatment_plant	Activity code:	A
Treatment obj:	corrosion control	Treatment process:	ph adjustment
Treatment obj:	disinfection	Treatment process:	ultraviolet radiation
Treatment obj:	inorganics removal	Treatment process:	filtration, pressure sand

Facid:	13		
Facname:	MASHPEE VILLAGE WELL 6 TREATMENT PLANT		
Facility type:	Treatment_plant	Activity code:	A
Treatment obj:	corrosion control	Treatment process:	ph adjustment
Treatment obj:	disinfection	Treatment process:	ultraviolet radiation

Treatment obj:	inorganics removal	Treatment process:	filtration, pressure sand

Facid:	14		
Facname:	TURNER ROAD TREATMENT PLANT		
Facility type:	Treatment_plant	Activity code:	A
Treatment obj:	corrosion control	Treatment process:	ph adjustment

Facid:	17		
Facname:	BELCHER WELL 7 TREATMENT PLANT		
Facility type:	Treatment_plant	Activity code:	A
Treatment obj:	corrosion control	Treatment process:	ph adjustment

Facid:	25		
Facname:	UPPER CAPE REGIONAL COOPERATIVE		
Facility type:	Treatment_plant	Activity code:	A
Treatment obj:	corrosion control	Treatment process:	ph adjustment
Treatment obj:	disinfection	Treatment process:	ultraviolet radiation

Facid:	30		
Facname:	ROCK LANDING ROAD BOOSTER STATION		
Facility type:	Treatment_plant	Activity code:	A
Treatment obj:	corrosion control	Treatment process:	ph adjustment

Location Information:

Name:	MASHPEE WATER DISTRICT		
Pwstypcd:	CWS	Primsrccd:	GUP
Popserved:	22445		
Add1:	79 INDUSTRIAL DR		
Add2:	Not Reported		
City:	MASHPEE	State:	MA
Zip:	02649	Phone:	5084776767
Cityserv:	MASHPEE	Cntyserv:	Barnstable
Stateserv:	MA	Zipserv:	02649

PWS ID:	MA4172039		
Date Initiated:	Not Reported	Date Deactivated:	Not Reported
PWS Name:	MASHPEE WATER DISTRICT 10-B CAPE DRIVE MASHPEE, MA 026490000		

Addressee / Facility:	Mailing MASHPEE WATER DISTRICT P O BOX 1543 MASHPEE, MA 026490000		

Facility Latitude:	41 37 30.0000	Facility Longitude:	70 29 0.0000
City Served:	MASHPEE		
Treatment Class:	Mixed (treated and untreated)	Population:	29500

Violations information not reported.

ENFORCEMENT INFORMATION:

System Name:	MASHPEE WATER DISTRICT		
Violation Type:	MCL, Monthly (TCR)		
Contaminant:	COLIFORM (TCR)		
Compliance Period:	1994-10-01 - 1994-10-31		
Violation ID:	9500001V		
Enforcement Date:	1994-12-12	Enf. Action:	State Compliance Achieved

Map ID
Direction
Distance
Elevation | Database | EDR ID Number

14
SW
1/2 - 1 Mile
Lower | **FED USGS** | **USGS40000454235**

Org. Identifier:	USGS-MA		
Formal name:	USGS Massachusetts Water Science Center		
Monloc Identifier:	USGS-413623070294301		
Monloc name:	MA-MIW 101-0050		
Monloc type:	Well		
Monloc desc:	Not Reported		
Huc code:	01090002	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	41.6064983
Longitude:	-70.4947499	Sourcemap scale:	25000
Horiz Acc measure:	1	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	55.77
Vert measure units:	feet	Vertacc measure val:	.05
Vert accmeasure units:	feet		
Vertcollection method:	Level or other surveying method		
Vert coord refsys:	NGVD29	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		
Aquifer type:	Unconfined single aquifer		
Construction date:	19871124	Welldepth:	50
Welldepth units:	ft	Wellholedepth:	50.5
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 2

Date	Feet below Surface	Feet to Sealevel	Date	Feet below Surface	Feet to Sealevel
1993-03-24	39.41		1990-05-10	40.08	

D15
NNE
1/2 - 1 Mile
Lower | **FED USGS** | **USGS40000454848**

Org. Identifier:	USGS-MA		
Formal name:	USGS Massachusetts Water Science Center		
Monloc Identifier:	USGS-413732070285401		
Monloc name:	MA-MIW 64		
Monloc type:	Well		
Monloc desc:	Not Reported		
Huc code:	01090002	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	41.6256648
Longitude:	-70.4811383	Sourcemap scale:	24000
Horiz Acc measure:	1	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	13.03
Vert measure units:	feet	Vertacc measure val:	02
Vert accmeasure units:	feet		
Vertcollection method:	Level or other surveying method		
Vert coord refsys:	NGVD29	Countrycode:	US
Aquifername:	Sand and gravel aquifers (glaciated regions)		
Formation type:	Not Reported		

Aquifer type:	Not Reported		
Construction date:	19791107	Welldepth:	10
Welldepth units:	ft	Wellholedepth:	10
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1980-02-21	0.93	

D16
NNE **FED USGS** **USGS40000454853**
1/2 - 1 Mile
Lower

Org. Identifier:	USGS-MA		
Formal name:	USGS Massachusetts Water Science Center		
Monloc Identifier:	USGS-413733070285501		
Monloc name:	MA-MIW 62		
Monloc type:	Well		
Monloc desc:	Not Reported		
Huc code:	01090002	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	41.6259425
Longitude:	-70.4814161	Sourcemap scale:	24000
Horiz Acc measure:	1	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	33.84
Vert measure units:	feet	Vertacc measure val:	02
Vert accmeasure units:	feet		
Vertcollection method:	Level or other surveying method		
Vert coord refsys:	NGVD29	Countrycode:	US
Aquifername:	Sand and gravel aquifers (glaciated regions)		
Formation type:	Not Reported		
Aquifer type:	Not Reported		
Construction date:	19791115	Welldepth:	34
Welldepth units:	ft	Wellholedepth:	77
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1980-02-21	19.04	

17
WNW **FED USGS** **USGS40000454625**
1/2 - 1 Mile
Lower

Org. Identifier:	USGS-MA		
Formal name:	USGS Massachusetts Water Science Center		
Monloc Identifier:	USGS-413702070300501		
Monloc name:	QUASHNET RIVER AT RT. 151		
Monloc type:	Well		
Monloc desc:	Streambed sampler		
Huc code:	01090002	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	41.6173314
Longitude:	-70.5008612	Sourcemap scale:	25000

Horiz Acc measure:	1	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	Not Reported
Vert measure units:	Not Reported	Vertacc measure val:	Not Reported
Vert accmeasure units:	Not Reported		
Vertcollection method:	Not Reported		
Vert coord refsys:	Not Reported	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		
Aquifer type:	Not Reported		
Construction date:	Not Reported	Welldepth:	Not Reported
Welldepth units:	Not Reported	Wellholedepth:	Not Reported
Wellholedepth units:	Not Reported		

Ground-water levels, Number of Measurements: 0

18
North
1/2 - 1 Mile
Lower

FED USGS **USGS40000454904**

Org. Identifier:	USGS-MA		
Formal name:	USGS Massachusetts Water Science Center		
Monloc Identifier:	USGS-413738070285901		
Monloc name:	MA-MIW 65		
Monloc type:	Well		
Monloc desc:	Not Reported		
Huc code:	01090002	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	41.6273314
Longitude:	-70.4825273	Sourcemap scale:	24000
Horiz Acc measure:	1	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	16.02
Vert measure units:	feet	Vertacc measure val:	02
Vert accmeasure units:	feet		
Vertcollection method:	Level or other surveying method		
Vert coord refsys:	NGVD29	Countrycode:	US
Aquifername:	Sand and gravel aquifers (glaciated regions)		
Formation type:	Not Reported		
Aquifer type:	Not Reported		
Construction date:	19791108	Welldepth:	10
Welldepth units:	ft	Wellholedepth:	10
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1980-02-21	2.22	

E19
NNE
1/2 - 1 Mile
Lower

FED USGS **USGS40000454897**

Org. Identifier:	USGS-MA		
Formal name:	USGS Massachusetts Water Science Center		
Monloc Identifier:	USGS-413737070284902		
Monloc name:	MA-MIW 91		
Monloc type:	Well		
Monloc desc:	Not Reported		
Huc code:	01090002	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	41.6270537
Longitude:	-70.4797494	Sourcemap scale:	25000
Horiz Acc measure:	1	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	63.78
Vert measure units:	feet	Vertacc measure val:	.05
Vert accmeasure units:	feet		
Vertcollection method:	Level or other surveying method		
Vert coord refsys:	NGVD29	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		
Aquifer type:	Unconfined single aquifer		
Construction date:	19791106	Welldepth:	Not Reported
Welldepth units:	Not Reported	Wellholedepth:	122
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1990-05-10	42.03	

E20
NNE
1/2 - 1 Mile
Lower

FED USGS **USGS40000454903**

Org. Identifier:	USGS-MA		
Formal name:	USGS Massachusetts Water Science Center		
Monloc Identifier:	USGS-413738070284701		
Monloc name:	MA-MIW 61		
Monloc type:	Well		
Monloc desc:	Not Reported		
Huc code:	01090002	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	41.6273314
Longitude:	-70.4791938	Sourcemap scale:	24000
Horiz Acc measure:	1	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	61.78
Vert measure units:	feet	Vertacc measure val:	02
Vert accmeasure units:	feet		
Vertcollection method:	Level or other surveying method		
Vert coord refsys:	NGVD29	Countrycode:	US
Aquifername:	Sand and gravel aquifers (glaciated regions)		
Formation type:	Not Reported		

Aquifer type:	Not Reported		
Construction date:	19791106	Welldepth:	54
Welldepth units:	ft	Wellholedepth:	122
Wellholedepth units:	ft		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1980-02-21	40.68	

21
WSW **FED USGS** **USGS40000454311**
1/2 - 1 Mile
Lower

Org. Identifier:	USGS-MA		
Formal name:	USGS Massachusetts Water Science Center		
Monloc Identifier:	USGS-413630070301001		
Monloc name:	QUASHNET RIVER AT FISH LADDER		
Monloc type:	Well		
Monloc desc:	streambeddsampler		
Huc code:	01090002	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	41.6084426
Longitude:	-70.5022501	Sourcemap scale:	25000
Horiz Acc measure:	1	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	Not Reported
Vert measure units:	Not Reported	Vertacc measure val:	Not Reported
Vert accmeasure units:	Not Reported		
Vertcollection method:	Not Reported		
Vert coord refsys:	Not Reported	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		
Aquifer type:	Not Reported		
Construction date:	Not Reported	Welldepth:	Not Reported
Welldepth units:	Not Reported	Wellholedepth:	Not Reported
Wellholedepth units:	Not Reported		

Ground-water levels, Number of Measurements: 0

22
WSW **FED USGS** **USGS40000454412**
1/2 - 1 Mile
Higher

Org. Identifier:	USGS-MA		
Formal name:	USGS Massachusetts Water Science Center		
Monloc Identifier:	USGS-413642070301601		
Monloc name:	MA-MIW 127-0074		
Monloc type:	Well		
Monloc desc:	Not Reported		
Huc code:	01090002	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	41.6117759
Longitude:	-70.5039168	Sourcemap scale:	25000

Horiz Acc measure:	1	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	61.45
Vert measure units:	feet	Vertacc measure val:	.05
Vert accmeasure units:	feet		
Vertcollection method:	Level or other surveying method		
Vert coord refsys:	NGVD29	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		
Aquifer type:	Not Reported		
Construction date:	Not Reported	Welldepth:	Not Reported
Welldepth units:	Not Reported	Wellholedepth:	Not Reported
Wellholedepth units:	Not Reported		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1990-05-10	40.88	

23
WNW **MA WELLS** **MA8000000002659**
1/2 - 1 Mile
Lower

Fid:	2658	Fac name:	Not Reported
Address:	Not Reported	Town:	MASHPEE
Region:	Southeast	Rtn:	Not Reported
Hw id:	Not Reported	Sw id:	Not Reported
Sseis id:	0	Npdes id:	Not Reported
Air:	Not Reported	Gwd:	Not Reported
Hwr:	Not Reported	Lqg ma:	Not Reported
Lqg rcra:	Not Reported	Lqtu:	Not Reported
Tsdf:	Not Reported	Swd:	Not Reported
Fac id:	0	Source id:	4172039-06G
Site name:	MASHPEE VILLAGE WELL 6		
Latitude:	41.61957064		
Longitude:	-70.5034785		
Type:	Community groundwater well	Zii num:	633
Pws id:	4172039	Site id:	MA8000000002659

Objectid:	1076	Source id:	4172039-06G
L base:	DOQ	L acc est:	16
L type:	GW	L meth:	GP_2
L src 1:	SV	L src 2:	AP_DOQ
L src 3:	Not Reported		

Objectid:	2643	Source id:	4172039-06G
Pws name:	MASHPEE WATER DISTRICT	S name:	MASHPEE VILLAGE WELL 6
Pws status:	Active	S status:	A
Pws class:	Community surface and groundwater sources	Sa status:	ACTIVE

Objectid:	925	Town:	MASHPEE
Wellname:	MASHPEE VILLAGE WELL #2		
Source typ:	WELL		
Purveyor:	MASHPEE WATER DIST.	Basin:	CAPE COD
Region:	Southeast	Method:	ANALYTICAL/UNIFORM FL
Aquifer:	UNCONFINED	Prg:	TA
Sub date:	11-AUG-05	App date:	11-AUG-05
Gpm:	500	Status:	Current
System:	Community	Whp cntrl:	Not Reported
Bylaw date:	Not Reported	Zii num:	633

Pwsid: 4172039 Source id: 4172039-06G

24
WSW **FED USGS** **USGS40000454357**
1/2 - 1 Mile
Lower

Org. Identifier:	USGS-MA		
Formal name:	USGS Massachusetts Water Science Center		
Monloc Identifier:	USGS-413636070301501		
Monloc name:	MA-MIW 121-0073		
Monloc type:	Well		
Monloc desc:	Not Reported		
Huc code:	01090002	Drainagearea value:	Not Reported
Drainagearea Units:	Not Reported	Contrib drainagearea:	Not Reported
Contrib drainagearea units:	Not Reported	Latitude:	41.6101092
Longitude:	-70.503639	Sourcemap scale:	25000
Horiz Acc measure:	1	Horiz Acc measure units:	seconds
Horiz Collection method:	Interpolated from map		
Horiz coord refsys:	NAD83	Vert measure val:	47.85
Vert measure units:	feet	Vertacc measure val:	.05
Vert accmeasure units:	feet		
Vertcollection method:	Level or other surveying method		
Vert coord refsys:	NGVD29	Countrycode:	US
Aquifername:	Not Reported		
Formation type:	Not Reported		
Aquifer type:	Not Reported		
Construction date:	Not Reported	Welldepth:	Not Reported
Welldepth units:	Not Reported	Wellholedepth:	Not Reported
Wellholedepth units:	Not Reported		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1990-05-10	27.59	

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID
Direction
Distance

Database EDR ID Number

MA_ACECS_ID 4

ACEC ID:	4	Area Name:	WAQUOIT BAY
Responsible Agency:	CZM	Polygon Acreage:	1,129.1
Designation Date:	11/26/79	Secretary who signed:	JOHN A. BEWICK
CZM Compliance Date:	3/26/80	Region:	COASTAL

ACEC ID:	4	Area Name:	WAQUOIT BAY
Responsible Agency:	CZM	Polygon Acreage:	573.6
Designation Date:	11/26/79	Secretary who signed:	JOHN A. BEWICK
CZM Compliance Date:	3/26/80	Region:	COASTAL

ACEC ID:	4	Area Name:	WAQUOIT BAY
Responsible Agency:	CZM	Polygon Acreage:	32.8
Designation Date:	11/26/79	Secretary who signed:	JOHN A. BEWICK
CZM Compliance Date:	3/26/80	Region:	COASTAL

ACEC ID:	4	Area Name:	WAQUOIT BAY
Responsible Agency:	CZM	Polygon Acreage:	808.9
Designation Date:	11/26/79	Secretary who signed:	JOHN A. BEWICK
CZM Compliance Date:	3/26/80	Region:	COASTAL

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS
RADON

AREA RADON INFORMATION

State Database: MA Radon

Radon Test Results

County	% of sites>4 pCi/L	Median
BARNSTABLE	15	1.6

Federal EPA Radon Zone for BARNSTABLE County: 2

Note: Zone 1 indoor average level > 4 pCi/L.
: Zone 2 indoor average level >= 2 pCi/L and <= 4 pCi/L.
: Zone 3 indoor average level < 2 pCi/L.

Federal Area Radon Information for Zip Code: 02649

Number of sites tested: 1

Area	Average Activity	% <4 pCi/L	% 4-20 pCi/L	% >20 pCi/L
Living Area - 1st Floor	0.600 pCi/L	100%	0%	0%
Living Area - 2nd Floor	Not Reported	Not Reported	Not Reported	Not Reported
Basement	1.600 pCi/L	100%	0%	0%

PHYSICAL SETTING SOURCE RECORDS SEARCHED

TOPOGRAPHIC INFORMATION

USGS 7.5' Digital Elevation Model (DEM)
Source: United States Geologic Survey
EDR acquired the USGS 7.5' Digital Elevation Model in 2002 and updated it in 2006. The 7.5 minute DEM corresponds to the USGS 1:24,000- and 1:25,000-scale topographic quadrangle maps. The DEM provides elevation data with consistent elevation units and projection.

Scanned Digital USGS 7.5' Topographic Map (DRG)
Source: United States Geologic Survey
A digital raster graphic (DRG) is a scanned image of a U.S. Geological Survey topographic map. The map images are made by scanning published paper maps on high-resolution scanners. The raster image is georeferenced and fit to the Universal Transverse Mercator (UTM) projection.

HYDROLOGIC INFORMATION

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 2003 & 2011 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002, 2005 and 2010 from the U.S. Fish and Wildlife Service.

HYDROGEOLOGIC INFORMATION

AQUIFLOW^{R} Information System
Source: EDR proprietary database of groundwater flow information
EDR has developed the AQUIFLOW Information System (AIS) to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted to regulatory authorities at select sites and has extracted the date of the report, hydrogeologically determined groundwater flow direction and depth to water table information.

GEOLOGIC INFORMATION

Geologic Age and Rock Stratigraphic Unit
Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - A digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

STATSGO: State Soil Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Services
The U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) leads the national Conservation Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. Soil maps for STATSGO are compiled by generalizing more detailed (SSURGO) soil survey maps.

SSURGO: Soil Survey Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Services (NRCS)
Telephone: 800-672-5559
SSURGO is the most detailed level of mapping done by the Natural Resources Conservation Services, mapping scales generally range from 1:12,000 to 1:63,360. Field mapping methods using national standards are used to construct the soil maps in the Soil Survey Geographic (SSURGO) database. SSURGO digitizing duplicates the original soil survey maps. This level of mapping is designed for use by landowners, townships and county natural resource planning and management.

PHYSICAL SETTING SOURCE RECORDS SEARCHED

LOCAL / REGIONAL WATER AGENCY RECORDS

FEDERAL WATER WELLS

PWS: Public Water Systems
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Public Water System data from the Federal Reporting Data System. A PWS is any water system which provides water to at least 25 people for at least 60 days annually. PWSs provide water from wells, rivers and other sources.

PWS ENF: Public Water Systems Violation and Enforcement Data
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Violation and Enforcement data for Public Water Systems from the Safe Drinking Water Information System (SDWIS) after August 1995. Prior to August 1995, the data came from the Federal Reporting Data System (FRDS).

USGS Water Wells: USGS National Water Inventory System (NWIS)
This database contains descriptive information on sites where the USGS collects or has collected data on surface water and/or groundwater. The groundwater data includes information on wells, springs, and other sources of groundwater.

STATE RECORDS

Massachusetts Geographic Information System (MassGIS) Datalayers
Source: Executive Office of Environmental Affairs

Public Water Supply Database: The Public Water Supply datalayer contains the locations of public community surface and groundwater supply sources and public non-community supply sources as defined in 310 CMR 22.00.

OTHER STATE DATABASE INFORMATION

Areas of Critical Environmental Concern Datalayer: The Areas of Critical Environmental Concern (ACEC) datalayer shows the location of areas that have been designated ACECs by the Secretary of Environmental Affairs. ACEC designation requires greater environmental review of certain kinds of proposed development under state jurisdiction within the ACEC boundaries. The ACEC Program is administered by the Department of Environmental Management (DEM) on behalf of the Secretary of Environmental Affairs. The Massachusetts Coastal Zone Management (MCZM) Office managed the original Coastal ACEC Program from 1978 to 1993, and continues to play a key role in monitoring coastal ACECs. Procedures for ACEC designation and the general policies governing the effects of designation are contained in the ACEC regulations (301 CMR 12.00). The ACEC datalayer has been compiled by MCZM and DEM and includes both coastal and inland areas.

EPA Designated Sole Source Aquifers Datalayer: The Sole Source Aquifer datalayer was compiled by the Department of Environmental Protection (DEP) Division of Water Supply (DWS). Seven Sole Source Aquifers have been designated by the US Environmental Protection Agency (EPA) for Massachusetts. A Sole Source Aquifer (SSA) is an aquifer designated by US EPA as the sole or principal source of drinking water for a given aquifer service area; that is, an aquifer which is needed to supply 50% or more of the drinking water for that area and for which there are no reasonably available alternative sources should that aquifer become contaminated. The aquifers were defined by a EPA hydrogeologist.

Aquifers Datalayer: MassGIS produced an aquifer datalayer composed of 20 individual panels, generally based on the boundaries of the major drainage basins. Areas of high and medium yield were mapped. This datalayer includes polygon attribute coding to help in the identification of areas in which cleanup of hazardous waste sites must meet drinking water standards, as defined in the Massachusetts Contingency Plan (MCP) (310 CMR 40.00000).

Non-Potential Drinking Water Source Areas: Non-Potential Drinking Water Source Areas (NPDWSA) are regulatory in nature, representing one of many considerations used in determining the standards to which ground water must be cleaned in the event of a release of oil or hazardous material. NPDWSAs are not based on existing water quality and do not indicate poor ambient conditions.

PHYSICAL SETTING SOURCE RECORDS SEARCHED

DEP Approved Zone IIs Datalayer: The Department of Environmental Protection (DEP) approved Zone IIs datalayer was compiled by the DEP Division of Water Supply (DWS). The database contains 281 approved Zone IIs statewide. As stated in 310 CMR 22.02, a Zone II is "that area of an aquifer which contributes water to a well under the most severe pumping and recharge conditions that can be realistically anticipated (180 days of pumping at safe yield, with no recharge from precipitation.) It is bounded by the groundwater divides which result from pumping the well and by the contact of the aquifer with less permeable materials such as till or bedrock. In some cases, streams or lakes may act as recharge boundaries. In all cases, Zone IIs shall extend up gradient to its point of intersection with prevailing hydrogeologic boundaries (a groundwater flow divide, a contact with till or bedrock, or a recharge boundary)." These data are used in association with the Public Water Supplies datalayer. The following describes certain unique features of this association.

- Any proposed new well which will pump at least 100,000 gallons per day must have a Zone II delineation completed and approved by DEP prior to the well coming on line.
- Additionally, a new source may not be on-line yet, but other, older wells may fall within its Zone II boundary.
- Further, existing wells must have a Zone II delineated as a condition of receiving a water withdrawal permit under the Water Management Act.

RADON

State Database: MA Radon
Source: Department of Health
Telephone: 413-586-7525
Radon Test Results

Area Radon Information
Source: USGS
Telephone: 703-356-4020
The National Radon Database has been developed by the U.S. Environmental Protection Agency (USEPA) and is a compilation of the EPA/State Residential Radon Survey and the National Residential Radon Survey. The study covers the years 1986 - 1992. Where necessary data has been supplemented by information collected at private sources such as universities and research institutions.

EPA Radon Zones
Source: EPA
Telephone: 703-356-4020
Sections 307 & 309 of IRAA directed EPA to list and identify areas of U.S. with the potential for elevated indoor radon levels.

OTHER

Airport Landing Facilities: Private and public use landing facilities
Source: Federal Aviation Administration, 800-457-6656

Epicenters: World earthquake epicenters, Richter 5 or greater
Source: Department of Commerce, National Oceanic and Atmospheric Administration

Earthquake Fault Lines: The fault lines displayed on EDR's Topographic map are digitized quaternary faultlines, prepared in 1975 by the United State Geological Survey

STREET AND ADDRESS INFORMATION

© 2010 Tele Atlas North America, Inc. All rights reserved. This material is proprietary and the subject of copyright protection and other intellectual property rights owned by or licensed to Tele Atlas North America, Inc. The use of this material is subject to the terms of a license agreement. You will be held liable for any unauthorized copying or disclosure of this material.

Menu

United States Environmental Protection Agency

Log In Contact Us

Facility Search Results

This page updates dynamically based on your search criteria and selections within the page.

New Jersey Clean Water Act data and some Clean Air Act data are frozen. Read More... (#CaaCwaCaveatPopup)

Show Map (#)Hide Table (#) Hide Summary (#) Modify Search (#)

Report Violation (http://epa.gov/tips/) Help (https://echo.epa.gov/help/facility-search/facility-search-results-help)

Customize

Columns (#columns) Download

Data (#)

Results Guide (https://echo.epa.gov/help/facility-search/all-data-search-results-help#results) Reports Legend (https://echo.epa.gov/help/facility-search/search-results-reports-legend)

Facility Name (#)	**Mapped** (#)	**Street Address** (#)	**City** (#)	**State** (#)	**FRS ID** (#)	**Reports** (#)	**Current Significant Violations** (#)	**Quarters Non Comp (3 yrs)** (#)	**Inspections (5 yrs)** (#)	**Formal Enforcement Actions (5 yrs)** (#)
CAPE COD QUICK LUBE LLC (../../detailed-facility-report?fid=110003500881)	(../../facilities/facility-search/results)	60 FALMOUTH RD	MASHPEE	MA	110003500881	C (../../detailed-facility-report?fid=110003500881)	N	0	0	(#overBoxBlue)
CORMIERS AUTO SERVICE (../../detailed-facility-report?fid=110008413993)	(../../facilities/facility-search/results)	80 ALGONQUIN AVE	MASHPEE	MA	110008413993	C (../../detailed-facility-report?fid=110008413993)	N	0	0	(#overBoxBlue)
CAPE COD COFFEE CO (../../detailed-facility-report?fid=110010426191)	(../../facilities/facility-search/results)	ROUTE 130	MASHPEE	MA	110010426191	C (../../detailed-facility-report?fid=110010426191) A (../../air-pollutant-report?fid=110010426191)	N	0	0	(#overBoxBlue)
MOBIL 2730 (../../detailed-facility-report?fid=110024374997)	(../../facilities/facility-search/results)	548 FALMOUTH RD	MASHPEE	MA	110024374997	C (../../detailed-facility-report?fid=110024374997)	N	0	0	(#overBoxBlue)
ANN TAYLOR (../../detailed-facility-report?fid=110037394432)	(../../facilities/facility-search/results)	34 STEEPLE ST	MASHPEE	MA	110037394432	C (../../detailed-facility-report?fid=110037394432)	N	0	0	(#overBoxBlue)
JOHNNYS TUNE & LUBE MASHPEE LLC (../../detailed-facility-report?fid=110043855147)	(../../facilities/facility-search/results)	723 FALMOUTH RD	MASHPEE	MA	110043855147	C (../../detailed-facility-report?fid=110043855147)	N	0	0	(#overBoxBlue)
CVS 1253 (../../detailed-facility-report?fid=110043922379)	(../../facilities/facility-search/results)	38 NATHAN ELLIS HWY	MASHPEE	MA	110043922379	C (../../detailed-facility-report?fid=110043922379)	N	0	0	(#overBoxBlue)
BOSUNS MARINE INC (../../detailed-facility-report?fid=110046470886)	(../../facilities/facility-search/results)	100 FALMOUTH RD	MASHPEE	MA	110046470886	C (../../detailed-facility-report?fid=110046470886)	N	0	0	(#overBoxBlue)
WALGREENS 13135 (../../detailed-facility-report?fid=110057130233)	(../../facilities/facility-search/results)	21 SOUTH ST	MASHPEE	MA	110057130233	C (../../detailed-facility-report?fid=110057130233)	N	0	0	(#overBoxBlue)

Facility Name (#)	Mapped (#)	Street Address (#)	City (#)	State (#)	FRS ID (#)	Reports (#)	Current Significant Violations (#)	Quarters Non Comp (3 yrs) (#)	Inspections (5 yrs) (#)	Formal Enforcement Actions (5 yrs) (#)
BOTELLO LUMBER CO (../../detailed-facility-report?fid=110058242352)	(../../facilities/facility-search/results)	26 BOWDOIN RD	MASHPEE	MA	110058242352	(../../detailed-facility-report?fid=110058242352)	N	0	0	(#overBoxBlue)

Search Statistics(#)

10 Search Results

0	Facilities with a Current Violation/s
0	Facilities with Violations in the Last Three Years
0	Facilities with Formal Enforcement Actions in the Last Five Years
1	CAA Sources
0	Facilities with CWA Permits
9	Facilities with RCRA IDs
0	Facilities with TRI Releases

Facility Summary(#)

Search Criteria(#)

City, State, and/or ZIP Code: Mashpee MA
Active/Operating=Yes
Modify Search

Date Last Updated (https://echo.epa.gov/resources/echo-data/about-the-data#sources)

Last updated October 7, 2014

Reportable Release Lookup

The search returned 35 results | Search Keywords >> 'MASHPEE' | Data last updated: 06/30/2015

Page:1 of 1 | Sorted by: Notification Date | GIS | Previous | Next

Select	RTN	City/ Town	Release Address	Site Name Location Aid	Reporting Category	Notification Date	Compliance Status	Date	Phase	RAO Class	Chemical Type	Files	GIS
☐	4-0024432	MASHPEE	36 LOWELL ROAD	RESIDENCE	TWO HR	2013-02-22	RAO	2013-12-24		A2	Oil	Files	MAP
☐	4-0023624	MASHPEE	17 CUTLASS LANE	RESIDENCE	TWO HR	2011-10-17	RAO	2012-02-14		A1	Oil	Files	MAP
☐	4-0022667	MASHPEE	60 FALMOUTH ROAD (RT-28)	MASHPEE JIFFY LUBE	TWO HR	2010-06-10	RAO	2010-08-03		A2	Oil	Files	MAP
☐	4-0021741	MASHPEE	300 NATHAN ELLIS HWY	LAKESIDE TRAILER PARK	TWO HR	2009-01-18	RAO	2009-04-10		A1	Oil	Files	MAP
☐	4-0020714	MASHPEE	414 NATHAN ELLIS HWY	SUNOCO STATION	120 DY	2007-08-30	RAO	2008-08-28		B1	Hazardous Material	Files	MAP
☐	4-0020612	MASHPEE	93 LAKE EST	LAKESIDE TRAILER PARK	TWO HR	2007-06-28	RAO	2007-08-28		A1	Oil	Files	MAP
☐	4-0020580	MASHPEE	RT 151 / NATHAN ELLIS HWY	INFRONT OF 401 RT 151	TWO HR	2007-06-14	RAO	2007-08-14		A2	Oil	Files	MAP
☐	4-0019317	MASHPEE	324A GREAT NECK RD	NO LOCATION AID	120 DY	2005-09-12	RAO	2006-09-20		A2	Oil	Files	MAP
☐	4-0019056	MASHPEE	681 FALMOUTH RD	DEER CROSSING	TWO HR	2005-05-01	RAO	2005-08-30		A1	Oil	Files	MAP
☐	4-0019030	MASHPEE	548 FALMOUTH RD	MASHPEE ROTARY	TWO HR	2005-04-16	RAO	2005-06-13		A1	Oil	Files	MAP
☐	4-0018973	MASHPEE	FLIGHT RAMP	D-8	TWO HR	2005-03-22	RAO	2005-05-05		A1	Oil	Files	MAP
☐	4-0018583	MASHPEE	RTE 28 AND QUINAQUISSET AVE	INTERSECTION	TWO HR	2004-08-02	RAO	2005-06-15		A2	Oil	Files	MAP
☐	4-0018515	MASHPEE	PARKING LOT 3C	OTIS ANGB	TWO HR	2004-06-28	RAO	2004-08-26		A1	Oil	Files	MAP
☐	4-0018405	MASHPEE	ECHO EAST ROW	AIRCRAFT RAMP	TWO HR	2004-05-01	RAO	2004-06-30		A1	Oil	Files	MAP
☐	4-0017754	MASHPEE	OTIS AIR FORCE BASE	ABLE-4 PARKING APRON	TWO HR	2003-04-09	RAO	2003-05-30		A1	Oil	Files	MAP
☐	4-0017468	MASHPEE	350 MEETING HOUSE RD	MASHPEE DPW	TWO HR	2002-11-12	RAO	2003-01-24		A1		Files	MAP

Select	RTN	City/ Town	Release Address	Site Name Location Aid	Reporting Category	Notification Date	Compliance Status	Date	Phase	RAO Class	Chemical Type	Files	GIS
☐	4-0017308	MASHPEE	53 BOWDOIN RD	AUTO TRUCK REPAIR SPECIALIST	120 DY	2002-08-21	RAO	2004-06-04	PHASE II	A2		Files	MAP
☐	4-0015432	MASHPEE	KITTRIDGE RD	OTIS WWTP	TWO HR	2000-04-20	RAO	2000-07-14		A1	Oil	Files	MAP
☐	4-0015383	MASHPEE	525 GREAT NECK RD	BELL ATLANTIC VEHICLE	TWO HR	2000-03-27	RAO	2000-06-01		A1	Oil	Files	MAP
☐	4-0015381	MASHPEE	133 FALMOUTH SANDWICH RD	OTIS ANG EASEMENT	TWO HR	2000-03-24	RAO	2000-12-26		A1	Hazardous Material	Files	MAP
☐	4-0015083	MASHPEE	21 FROG POND CLOSE	HALFTIDE MARINA	TWO HR	1999-10-22	RAO	1999-12-20		A2	Oil	Files	MAP
☐	4-0014853	MASHPEE	135 DANIELS ISLAND RD	NEW SEABURY MARINA	TWO HR	1999-07-13	RAO	1999-09-14		A1	Oil	Files	MAP
☐	4-0014627	MASHPEE	21 FROG POND CLOSE	HALF TIDE MARINA	72 HR	1999-03-26	RAO	1999-05-21		A2	Oil	Files	MAP
☐	4-0014587	MASHPEE	SHORE DR	NO LOCATION AID	72 HR	1999-03-11	RAO	1999-06-17		A2	Oil	Files	MAP
☐	4-0014286	MASHPEE	135 MAIN ST	NO LOCATION AID	72 HR	1998-10-26	RAO	2009-12-21	PHASE IV	C1	Oil	Files	MAP
☐	4-0012943	MASHPEE	15 RIVERSIDE RD	LITTLE RIVER BOATYARD	72 HR	1997-04-07	RAO	2004-04-29	PHASE II	A2	Oil	Files	MAP
☐	4-0012221	MASHPEE	106 FALMOUTH RD	83 SAMPSON MILL RD	TWO HR	1996-05-15	RTN CLOSED	2012-01-03	PHASE IV		Hazardous Material	Files	MAP
☐	4-0011904	MASHPEE	106 FALMOUTH RD	AUGAT INC	72 HR	1996-01-20	TIER 2	2012-01-03	PHASE IV		Hazardous Material	Files	MAP
☐	4-0011738	MASHPEE	15 RIVERSIDE RD	LITLE RIVER BOAT YARD	TWO HR	1995-10-25	RAO	1996-10-30		A1	Oil and Hazardous Material	Files	
☐	4-0011080	MASHPEE	548 FALMOUTH RD	MASHPEE EXXON @ ROTARY	72 HR	1995-01-19	RAO	1995-05-19		B1	Oil	Files	MAP
☐	4-0010661	MASHPEE	22 MEADOW HAVEN DR	OFF RTE 130	TWO HR	1994-08-09	RAO	1994-11-23		A1	Oil	Files	MAP
☐	4-0010048	MASHPEE	76 CLOVER LN	NO LOCATION AID	TWO HR	1993-10-23	RAO	1994-09-08		A2	Oil	Files	MAP
☐	4-0001076	MASHPEE	RTE 151	MASHPEE SHELL STATION	NONE	1991-07-15	TIERI	2008-09-24	PHASE V		Oil	Files	MAP
☐	4-0000377	MASHPEE	ASHERS PATH	MASHPEE LANDFILL	NONE	1987-01-15	RAO	1995-10-18	PHASE III	A2	Hazardous Material	Files	
☐	4-0000211	MASHPEE	GREAT NECK RD QUASHNET RD	PROPERTY	NONE	1986-09-03	DEPNFA	1993-07-23				Files	

Page:1 of 1 Previous Next

Appendix E

Aerial Photographs

Trout Pond Lots 3 & 4
47-30 GREAT NECK RD S
Mashpee, MA 02649

Inquiry Number: 3591217.5
April 30, 2013

EDR® Environmental Data Resources Inc

440 Wheelers Farms Road
Milford, CT 06461
800.352.0050
www.edrnet.com

EDR Aerial Photo Decade Package

Environmental Data Resources, Inc. (EDR) Aerial Photo Decade Package is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDR's professional researchers provide digitally reproduced historical aerial photographs, and when available, provide one photo per decade.

When delivered electronically by EDR, the aerial photo images included with this report are for ONE TIME USE ONLY. Further reproduction of these aerial photo images is prohibited without permission from EDR. For more information contact your EDR Account Executive.

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

Disclaimer - Copyright and Trademark Notice

This Report contains certain information obtained from a variety of public and other sources reasonably available to Environmental Data Resources, Inc. It cannot be concluded from this Report that coverage information for the target and surrounding properties does not exist from other sources. **NO WARRANTY EXPRESSED OR IMPLIED, IS MADE WHATSOEVER IN CONNECTION WITH THIS REPORT. ENVIRONMENTAL DATA RESOURCES, INC. SPECIFICALLY DISCLAIMS THE MAKING OF ANY SUCH WARRANTIES, INCLUDING WITHOUT LIMITATION, MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE OR PURPOSE. ALL RISK IS ASSUMED BY THE USER. IN NO EVENT SHALL ENVIRONMENTAL DATA RESOURCES, INC. BE LIABLE TO ANYONE, WHETHER ARISING OUT OF ERRORS OR OMISSIONS, NEGLIGENCE, ACCIDENT OR ANY OTHER CAUSE, FOR ANY LOSS OF DAMAGE, INCLUDING, WITHOUT LIMITATION, SPECIAL, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES. ANY LIABILITY ON THE PART OF ENVIRONMENTAL DATA RESOURCES, INC. IS STRICTLY LIMITED TO A REFUND OF THE AMOUNT PAID FOR THIS REPORT.** Purchaser accepts this Report AS IS. Any analyses, estimates, ratings, environmental risk levels or risk codes provided in this Report are provided for illustrative purposes only, and are not intended to provide, nor should they be interpreted as providing any facts regarding, or prediction or forecast of, any environmental risk for any property. Only a Phase I Environmental Site Assessment performed by an environmental professional can provide information regarding the environmental risk for any property. Additionally, the information provided in this Report is not to be construed as legal advice.

Copyright 2013 by Environmental Data Resources, Inc. All rights reserved. Reproduction in any media or format, in whole or in part, of any report or map of Environmental Data Resources, Inc., or its affiliates, is prohibited without prior written permission.

EDR and its logos (including Sanborn and Sanborn Map) are trademarks of Environmental Data Resources, Inc. or its affiliates. All other trademarks used herein are the property of their respective owners.

Date EDR Searched Historical Sources:

Aerial Photography April 30, 2013

Target Property:

47-30 GREAT NECK RD S

Mashpee, MA 02649

Year	***Scale***	***Details***	***Source***
1938	Aerial Photograph. Scale: 1"=500'	Panel #: 41070-E4, Cotuit (digital), MA;/Flight Date: November 21, 1938	EDR
1971	Aerial Photograph. Scale: 1"=500'	Panel #: 41070-E4, Cotuit (digital), MA;/Flight Date: May 14, 1971	EDR
1973	Aerial Photograph. Scale: 1"=500'	Panel #: 41070-E4, Cotuit (digital), MA;/Flight Date: March 01, 1973	EDR
1986	Aerial Photograph. Scale: 1"=1000'	Panel #: 41070-E4, Cotuit (digital), MA;/Flight Date: July 22, 1986	EDR
1991	Aerial Photograph. Scale: 1"=750'	Panel #: 41070-E4, Cotuit (digital), MA;/Flight Date: April 04, 1991	EDR
1995	Aerial Photograph. Scale: 1"=500'	Panel #: 41070-E4, Cotuit (digital), MA;/DOQQ - acquisition dates: March 10, 1995	EDR
2006	Aerial Photograph. Scale: 1"=500'	Panel #: 41070-E4, Cotuit (digital), MA;/Flight Year: 2006	EDR
2008	Aerial Photograph. Scale: 1"=500'	Panel #: 41070-E4, Cotuit (digital), MA;/Flight Year: 2008	EDR
2010	Aerial Photograph. Scale: 1"=500'	Panel #: 41070-E4, Cotuit (digital), MA;/Flight Year: 2010	EDR
2012	Aerial Photograph. Scale: 1"=500'	Panel #: 41070-E4, Cotuit (digital), MA;/Flight Year: 2012	EDR


INQUIRY #: 3591217.5
YEAR: 1938
= 500'
N


INQUIRY #: 3591217.5
YEAR: 1971
= 500'
N


INQUIRY #: 3591217.5
YEAR: 1973
= 500'
N


INQUIRY #: 3591217.5
YEAR: 1986
= 1000'
N


INQUIRY #: 3591217.5
YEAR: 1991
= 750'
N


INQUIRY #: 3591217.5
YEAR: 1995
= 500'
N


INQUIRY #: 3591217.5
YEAR: 2006
= 500'
N


INQUIRY #: 3591217.5
YEAR: 2008
= 500'
N


INQUIRY #: 3591217.5
YEAR: 2010
= 500'
N


INQUIRY #: 3591217.5
YEAR: 2012
= 500'
N

Appendix F

Photographs of Property

Appendix F
Photographs of Property taken May 8, 2013 and July 15, 2015
Phase I Environmental Site Assessment
Trout Pond Lots 3 and 4
Great Neck Road South
Mashpee, MA

Photographs Taken May 8, 2013

1. View of western boundary of Property, along Great Neck Road South, looking north.

2. View of Property, looking northeast.

3. Gravel road that provides access to WWTP at Property, looking northeast.

Appendix F
Photographs of Property taken May 8, 2013 and July 15, 2015
Phase I Environmental Site Assessment
Trout Pond Lots 3 and 4
Great Neck Road South
Mashpee, MA

4. View of gravel road gate at Property, looking northeast.

5. View of piles of gravel along access road at Property.

6. Gravel road that provides access to WWTP at Property, looking southwest.

Appendix F
Photographs of Property taken May 8, 2013 and July 15, 2015
Phase I Environmental Site Assessment
Trout Pond Lots 3 and 4
Great Neck Road South
Mashpee, MA

7. View of electric easement at eastern boundary of Property, looking northeast.

8. View of electric easement at eastern boundary of Property, looking southwest.

9. View of Property, looking northeast.

Appendix F
Photographs of Property taken May 8, 2013 and July 15, 2015
Phase I Environmental Site Assessment
Trout Pond Lots 3 and 4
Great Neck Road South
Mashpee, MA

10. View of Property, looking northwest.

11. View of Property, looking south.

12. View of dead vegetation under power lines at southern boundary of Property.

Appendix F
Photographs of Property taken May 8, 2013 and July 15, 2015
Phase I Environmental Site Assessment
Trout Pond Lots 3 and 4
Great Neck Road South
Mashpee, MA

13. View of dead vegetation under power lines on southern boundary of Property.

14. View of piles of gravel on southern boundary of Property.

15. Semi circle gravel road on abutting parcel to north of Property.

Appendix F
Photographs of Property taken May 8, 2013 and July 15, 2015
Phase I Environmental Site Assessment
Trout Pond Lots 3 and 4
Great Neck Road South
Mashpee, MA

16. Brush piles and wood chip piles on abutting parcel to north of Property.

17. Brush piles and wood chip piles on abutting parcel to north of Property.

18. Land to west of Great Neck Road South.

19. View of Windchime Condominiums to south of Property.

20. View of WWTP building to east of Property.

21. View of piles of lime to west of WWTP.

Appendix F
Photographs of Property taken May 8, 2013 and July 15, 2015
Phase I Environmental Site Assessment
Trout Pond Lots 3 and 4
Great Neck Road South
Mashpee, MA

22. View of sand beds to east of WWTP building.

Appendix F
Photographs of Property taken May 8, 2013 and July 15, 2015
Phase I Environmental Site Assessment
Trout Pond Lots 3 and 4
Great Neck Road South
Mashpee, MA

Photographs Taken July 15, 2015

23. View Along Power Lines

24. Power Line Easement

25. Power Line Easement

Appendix F
Photographs of Property taken May 8, 2013 and July 15, 2015
Phase I Environmental Site Assessment
Trout Pond Lots 3 and 4
Great Neck Road South
Mashpee, MA

26. Power Line Easement

27. Power Line Easement

28. Power Line Easement

Appendix F
Photographs of Property taken May 8, 2013 and July 15, 2015
Phase I Environmental Site Assessment
Trout Pond Lots 3 and 4
Great Neck Road South
Mashpee, MA

29. View South of Power Line Easement

30. Power Line Easement

31. Vegetated Area (typical)

Appendix F
Photographs of Property taken May 8, 2013 and July 15, 2015
Phase I Environmental Site Assessment
Trout Pond Lots 3 and 4
Great Neck Road South
Mashpee, MA

32. Access Road to Wastewater Treatment Plan

33. Signage along Access Road

34. Vegetation (typical)

Appendix F
Photographs of Property taken May 8, 2013 and July 15, 2015
Phase I Environmental Site Assessment
Trout Pond Lots 3 and 4
Great Neck Road South
Mashpee, MA

45. Vegetation at Property (typical)

46. Vegetation (typical)

47, Vegetation (typical)

Appendix F
Photographs of Property taken May 8, 2013 and July 15, 2015
Phase I Environmental Site Assessment
Trout Pond Lots 3 and 4
Great Neck Road South
Mashpee, MA

48. Ground surface

49. Vegetation and Ground Surface

50. Ground Surface

Appendix F
Photographs of Property taken May 8, 2013 and July 15, 2015
Phase I Environmental Site Assessment
Trout Pond Lots 3 and 4
Great Neck Road South
Mashpee, MA

51. Access Road

52. Vegetation

53. Vegetation, Ground Surface

54. Semi circle gravel road on abutting parcel to north of Property.

55. Brush piles and wood chip piles on abutting parcel to north of Property.

56. Brush piles and wood chip piles on abutting parcel to north of Property.

57. Brush piles and wood chip piles on abutting parcel to north of Property.

58. Brush piles and wood chip piles on abutting parcel to north of Property.

59. Brush piles and wood chip piles on abutting parcel to north of Property.

Appendix F
Photographs of Property taken May 8, 2013 and July 15, 2015
Phase I Environmental Site Assessment
Trout Pond Lots 3 and 4
Great Neck Road South
Mashpee, MA

60. View of piles of gravel on southern boundary of Property.

61. Vegetation

1. 62. View of western boundary of Property, along Great Neck Road South, looking south.

Appendix F
Photographs of Property taken May 8, 2013 and July 15, 2015
Phase I Environmental Site Assessment
Trout Pond Lots 3 and 4
Great Neck Road South
Mashpee, MA

63. Vegetation

64. View of western boundary of Property, along Great Neck Road South, looking north.

65. View of Property, looking east.

Appendix F
Photographs of Property taken May 8, 2013 and July 15, 2015
Phase I Environmental Site Assessment
Trout Pond Lots 3 and 4
Great Neck Road South
Mashpee, MA

66. View of Property, looking east.

67. View of WWTP building to east of Property.

68. View of area to the south of WWTP

Appendix F
Photographs of Property taken May 8, 2013 and July 15, 2015
Phase I Environmental Site Assessment
Trout Pond Lots 3 and 4
Great Neck Road South
Mashpee, MA

69. View of sand beds to east of WWTP building.

70. View of area to the south of WWTP

71. View of new confined space entry signs and sand beds to the northeast of WWTP building.

Appendix F
Photographs of Property taken May 8, 2013 and July 15, 2015
Phase I Environmental Site Assessment
Trout Pond Lots 3 and 4
Great Neck Road South
Mashpee, MA

72. View of confined space entry sign to the south of WWTP


73. View of area to the south of WWTP


74. View of area to the south of WWTP

75. View of one of manholes to the south of WWTP

76. View of area to the south of WWTP

77. View of area to the south of WWTP, looking southwest

78. View of area to the south of WWTP, looking southwest

79. View of area to the south of WWTP, looking west

80. View of area to the south of WWTP, looking southwest

Appendix F
Photographs of Property taken May 8, 2013 and July 15, 2015
Phase I Environmental Site Assessment
Trout Pond Lots 3 and 4
Great Neck Road South
Mashpee, MA

81. Building material to the south of WWTP

82. Empty drums to the south of WWTP

83. Empty drums to the south of WWTP

Appendix F
Photographs of Property taken May 8, 2013 and July 15, 2015
Phase I Environmental Site Assessment
Trout Pond Lots 3 and 4
Great Neck Road South
Mashpee, MA

84. View of storage trailers to the south of WWTP

Appendix G

Historical Topographic Maps

Trout Pond Lots 3 & 4
47-30 GREAT NECK RD S
Mashpee, MA 02649

Inquiry Number: 3591217.4
April 30, 2013

EDR® Environmental Data Resources Inc

440 Wheelers Farms Road
Milford, CT 06461
800.352.0050
www.edrnet.com

EDR Historical Topographic Map Report

Environmental Data Resources, Inc.s (EDR) Historical Topographic Map Report is designed to assist professionals in evaluating potential liability on a target property resulting from past activities. EDRs Historical Topographic Map Report includes a search of a collection of public and private color historical topographic maps, dating back to the early 1900s.

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

Disclaimer - Copyright and Trademark Notice

This Report contains certain information obtained from a variety of public and other sources reasonably available to Environmental Data Resources, Inc. It cannot be concluded from this Report that coverage information for the target and surrounding properties does not exist from other sources. **NO WARRANTY EXPRESSED OR IMPLIED, IS MADE WHATSOEVER IN CONNECTION WITH THIS REPORT. ENVIRONMENTAL DATA RESOURCES, INC. SPECIFICALLY DISCLAIMS THE MAKING OF ANY SUCH WARRANTIES, INCLUDING WITHOUT LIMITATION, MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE OR PURPOSE. ALL RISK IS ASSUMED BY THE USER. IN NO EVENT SHALL ENVIRONMENTAL DATA RESOURCES, INC. BE LIABLE TO ANYONE, WHETHER ARISING OUT OF ERRORS OR OMISSIONS, NEGLIGENCE, ACCIDENT OR ANY OTHER CAUSE, FOR ANY LOSS OF DAMAGE, INCLUDING, WITHOUT LIMITATION, SPECIAL, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES. ANY LIABILITY ON THE PART OF ENVIRONMENTAL DATA RESOURCES, INC. IS STRICTLY LIMITED TO A REFUND OF THE AMOUNT PAID FOR THIS REPORT.** Purchaser accepts this Report AS IS. Any analyses, estimates, ratings, environmental risk levels or risk codes provided in this Report are provided for illustrative purposes only, and are not intended to provide, nor should they be interpreted as providing any facts regarding, or prediction or forecast of, any environmental risk for any property. Only a Phase I Environmental Site Assessment performed by an environmental professional can provide information regarding the environmental risk for any property. Additionally, the information provided in this Report is not to be construed as legal advice.

Copyright 2013 by Environmental Data Resources, Inc. All rights reserved. Reproduction in any media or format, in whole or in part, of any report or map of Environmental Data Resources, Inc., or its affiliates, is prohibited without prior written permission.

EDR and its logos (including Sanborn and Sanborn Map) are trademarks of Environmental Data Resources, Inc. or its affiliates. All other trademarks used herein are the property of their respective owners.

Historical Topographic Map

N	TARGET QUAD NAME: BARNSTABLE MAP YEAR: 1893 SERIES: 15 SCALE: 1:62500	SITE NAME: Trout Pond Lots 3 & 4 ADDRESS: 47-30 GREAT NECK RD S Mashpee, MA 02649 LAT/LONG: 41.6149 / -70.4856	CLIENT: The Isosceles Group CONTACT: M Margret Hanley INQUIRY#: 3591217.4 RESEARCH DATE: 04/30/2013

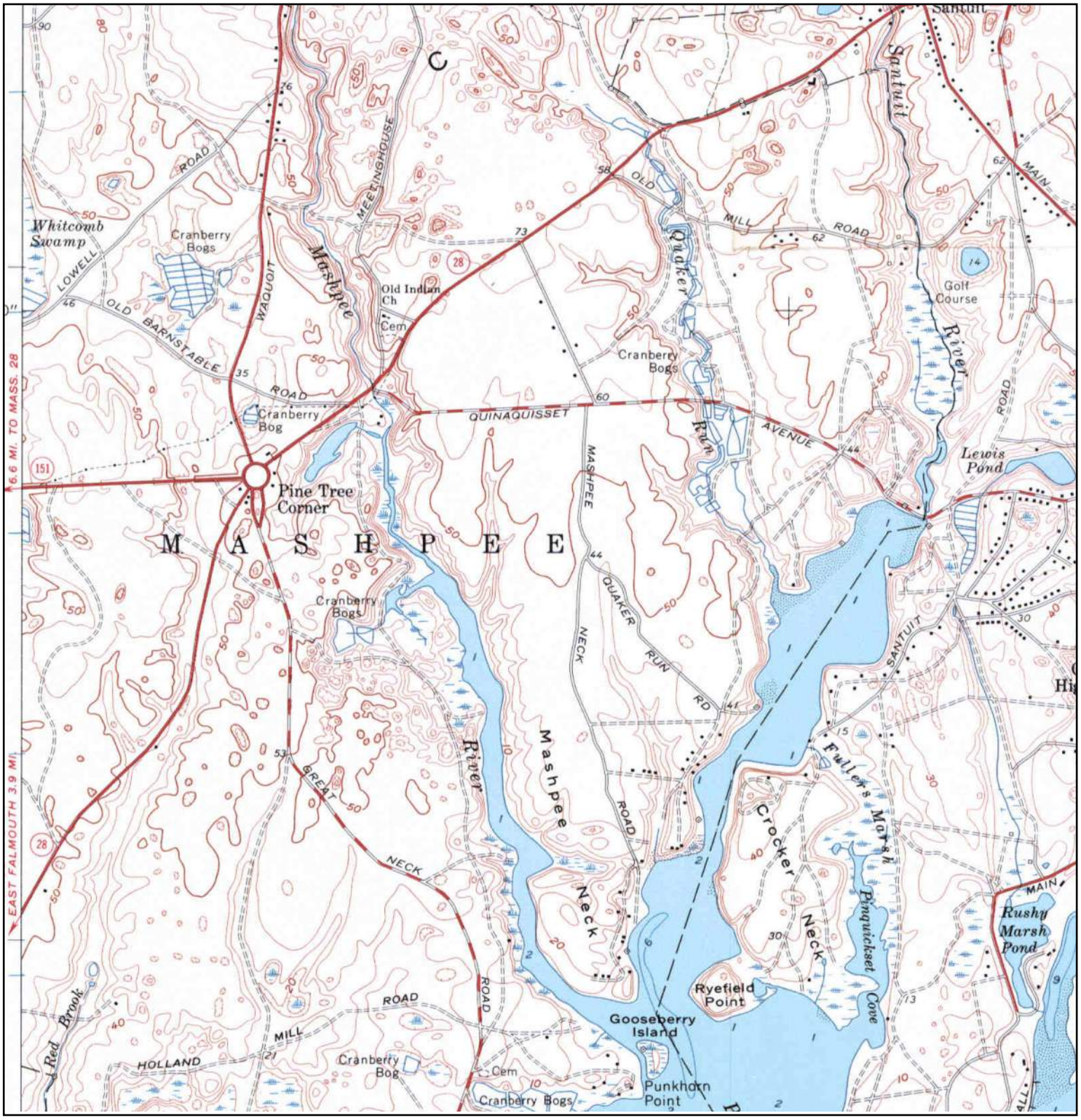
Historical Topographic Map

N	TARGET QUAD NAME: COTUIT MAP YEAR: 1942 SERIES: 7.5 SCALE: 1:25000	SITE NAME: Trout Pond Lots 3 & 4 ADDRESS: 47-30 GREAT NECK RD S Mashpee, MA 02649 LAT/LONG: 41.6149 / -70.4856	CLIENT: The Isosceles Group CONTACT: M Margret Hanley INQUIRY#: 3591217.4 RESEARCH DATE: 04/30/2013

Historical Topographic Map

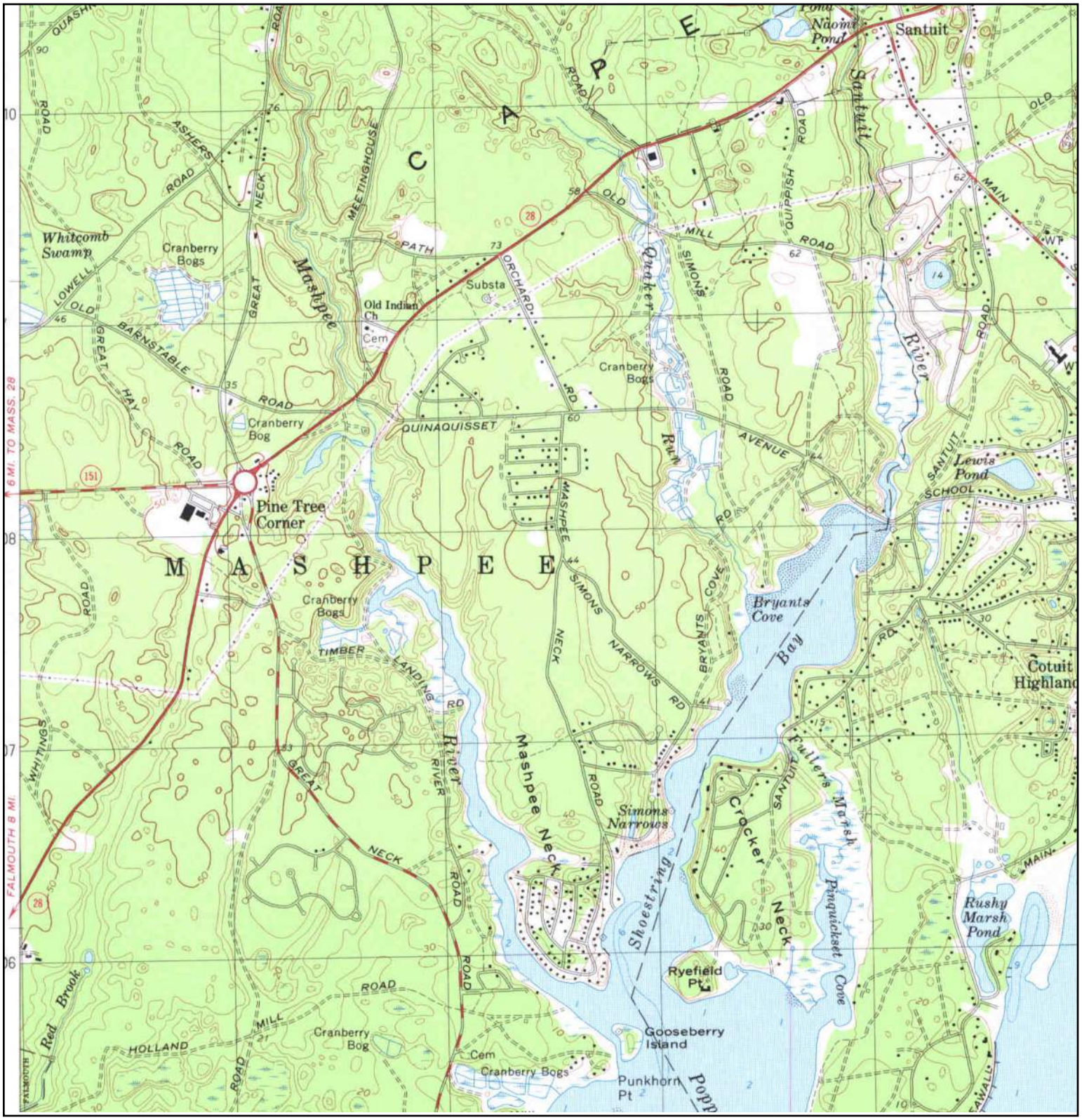
N	TARGET QUAD NAME: COTUIT MAP YEAR: 1949 SERIES: 7.5 SCALE: 1:24000	SITE NAME: Trout Pond Lots 3 & 4 ADDRESS: 47-30 GREAT NECK RD S Mashpee, MA 02649 LAT/LONG: 41.6149 / -70.4856	CLIENT: The Isosceles Group CONTACT: M Margret Hanley INQUIRY#: 3591217.4 RESEARCH DATE: 04/30/2013

Historical Topographic Map



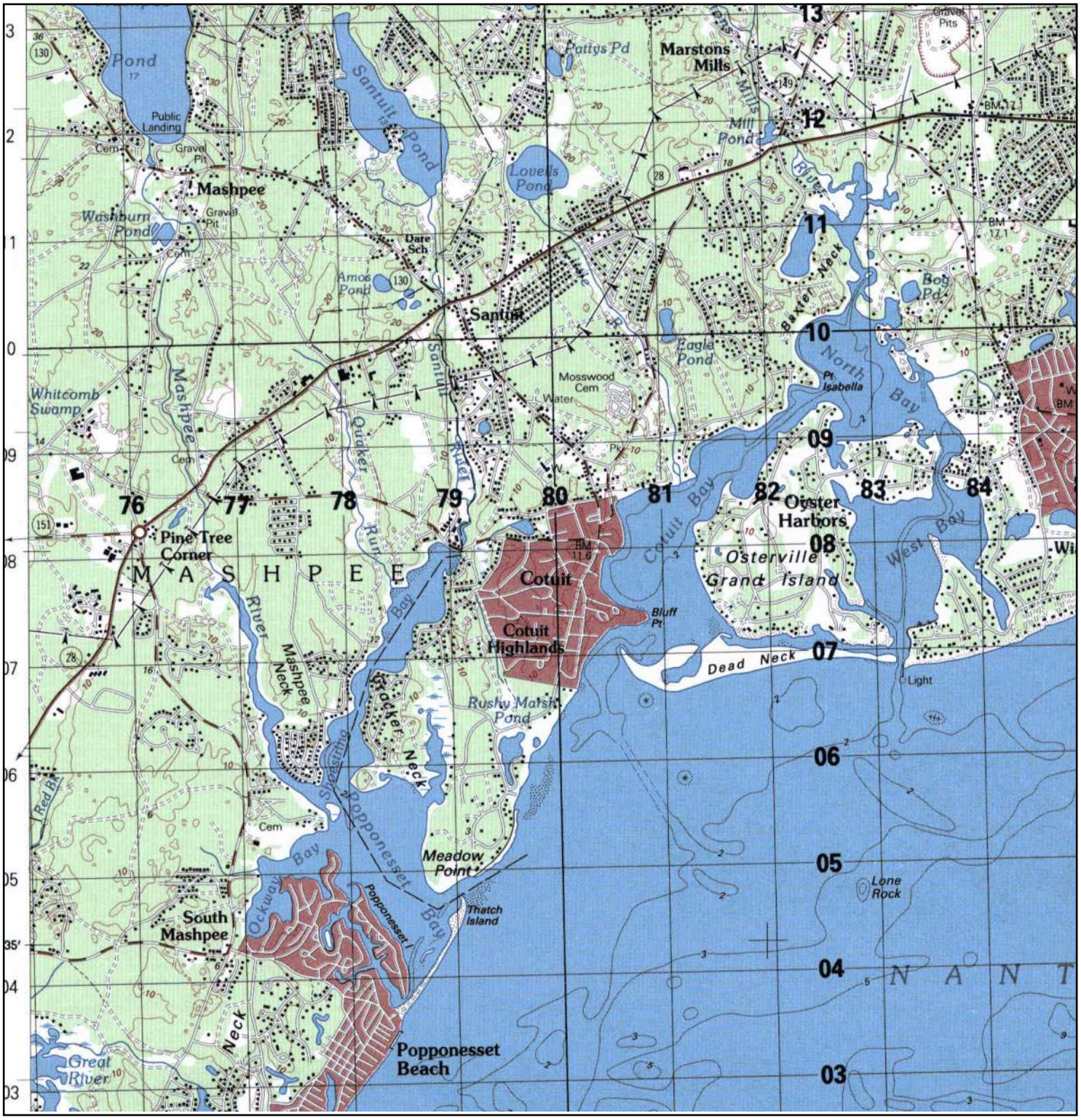
N	TARGET QUAD NAME: COTUIT MAP YEAR: 1961 SERIES: 7.5 SCALE: 1:24000	SITE NAME: Trout Pond Lots 3 & 4 ADDRESS: 47-30 GREAT NECK RD S Mashpee, MA 02649 LAT/LONG: 41.6149 / -70.4856	CLIENT: The Isosceles Group CONTACT: M Margret Hanley INQUIRY#: 3591217.4 RESEARCH DATE: 04/30/2013

Historical Topographic Map



N	TARGET QUAD NAME: COTUIT MAP YEAR: 1974 SERIES: 7.5 SCALE: 1:25000	SITE NAME: Trout Pond Lots 3 & 4 ADDRESS: 47-30 GREAT NECK RD S Mashpee, MA 02649 LAT/LONG: 41.6149 / -70.4856	CLIENT: The Isosceles Group CONTACT: M Margret Hanley INQUIRY#: 3591217.4 RESEARCH DATE: 04/30/2013

Historical Topographic Map



N	TARGET QUAD NAME: HYANNIS MAP YEAR: 1985 SERIES: 15 SCALE: 1:50000	SITE NAME: Trout Pond Lots 3 & 4 ADDRESS: 47-30 GREAT NECK RD S Mashpee, MA 02649 LAT/LONG: 41.6149 / -70.4856	CLIENT: The Isosceles Group CONTACT: M Margret Hanley INQUIRY#: 3591217.4 RESEARCH DATE: 04/30/2013

Appendix G

Qualifications of Environmental Professional

The Isosceles Group
50 Congress Street | Boston, MA 02109
Tel: 617.330.2800 | Fax: 617.330.2801

M. MARGRET HANLEY, LSP

Principal

BACKGROUND

Margret Hanley is a co-founder of The Isosceles Group (Isosceles) and is an expert in the management of environmental issues affecting the development and use of real estate. Ms. Hanley has over 28 years of experience in the integration of environmental management programs and the sale, redevelopment, and use of industrial properties, and leads Isosceles' **Due Diligence Evaluation and Asset Management Services.**

At Isosceles, Ms. Hanley provides strategic environmental management services, including Due Diligence Assessments in the US and internationally, the identification and remediation of legacy issues, and the development of environmental response costs and schedules for property valuation, SEC reporting, the negotiation with State and Federal Agencies.

Ms. Hanley is currently retained to address environmental issues during the acquisition, management and sale of real estate assets for several investment funds. She has extensive experience on litigation-sensitive projects, and been invited to speak on issues related to the impact of environmental regulation on real estate development and risk management.

Ms. Hanley was previously Corporate Vice President of a nationally recognized consulting and engineering firm specializing in Environmental and Geotechnical Engineering and Water Resources, where she managed division, branch, and corporate programs from offices located in Chicago, Illinois and Boston, Massachusetts, and served on the Board of Directors. She is a Licensed Site Professional (LSP) in Massachusetts.

AREAS OF EXPERTISE

- Hazardous Material / Waste Management under State and Federal (US) Regulations
- Waste Site Classification, Investigation, and Remedial Action under Federal and State Regulations, including RCRA, TSCA, and CERCLA.
- Licensed Site Professional (LSP) Services in Massachusetts
- Environmental Due Diligence and Risk Characterization in support of Commercial and Industrial Property Acquisition, Development, and Sale.
- Redevelopment of Former Industrial (Brownfield) Properties
- Expert Testimony
- Public Communications Related to Environmental Matters

REPRESENTATIVE PROJECTS

DUE DILIGENCE/ASSET MANAGEMENT

- **Strategic Planning and Environmental Management, Northwest Park, Burlington, MA.** Project Manager and LSP providing technical oversight and litigation support services to owners and potentially responsible parties, for a multi-source ground water contamination site affecting the municipal water supply of Burlington, Massachusetts. Site consists of a 180 acre, 40+building technology park, developed in the 1960s and 70s. Responsible for the planning and management of comprehensive environmental response actions, including performance of a pump test at the municipal wells and modeling of the impact of pumping on

water quality at the wells, the development and implementation of long-term remediation strategies, and management of a Public Participation Program. Responsible for managing communications with local health officials, PRPs, tenants, and numerous lenders and financial interests involved in the development. Currently working with management team to obtain permits for a comprehensive redevelopment plan, which includes the preparation of a Comprehensive Environmental Management Plan to address existing conditions and on-going remedial action during redevelopment.

- **Strategic Planning and Environmental Management Consulting Services, Property Acquisition and Development Services, New Boston Fund, Inc.** Provides continuing services related to the evaluation, acquisition and/or development of industrial and commercial properties. Responsible for Due Diligence, screening, estimation of remedial response action costs, risk evaluation, procurement of environmental insurance, and compliance monitoring at key facilities. Locations include properties in Massachusetts, Pennsylvania, Maryland, Connecticut, District of Columbia, and Florida.
- **Environmental Assessment, Acquisition Support, Former Sun Microsystems Property, Burlington, MA.** Expedited environmental review and risk assessment, of 156 acre property, as part of a unique acquisition process. Land was formerly occupied by Lockheed Martin, GE Aerospace, and others. Soil and groundwater at the Property was remediated prior to 2005, and is currently subject to multiple Response Action Outcome Statements.
- **MCP/Solid Waste Closure at Future Development Site, Bethlehem Steel Corp.** Project Manager and LSP of Record for MCP Response Actions and Closure of former off-site disposal facility for solid waste and asbestos containing debris generated at the Quincy Shipyard, and other sources. Site was located within the limits of a proposed High School Development. Closure required consideration of applicable requirements of TSCA, Massachusetts Solid Waste and Hazardous Waste regulations, and various state and federal asbestos regulations, as well as the planned future use of the site. Responsible for the identification of Potential Imminent Hazard Conditions, and implementation of Immediate Response Actions and management and implementation of a Public Involvement Plan (PIP).
- **Due Diligence, Papa Gino's Corp.** Program Manager for fast track due diligence of 76 restaurant locations owned or operated by Papa Gino's Corp. Program was implemented over a six-week period and included development of audit standards and protocols, hazard ranking, data management, and regulatory compliance planning in anticipation of real estate transactions.

AUDITING AND FACILITY DEVELOPMENT PROTOCOLS (AUDIT)

- **Environmental Protocol Development, Various Countries.** Responsible for the identification of environmental regulations that apply to various industrial operations and the preparation of EH&S Protocols for foreign countries. Clients include US-based Fortune 500 companies with oversees facilities.

PROJECT MANAGEMENT

- **Licensed Site Professional (LSP) of Record for the Former Olin Corporation, Tier IA Site, Wilmington, MA.** Responsible for oversight of all environmental assessment, remediation, and regulatory permitting activities of major disposal site, containing six

operable units, affecting over 200 acres of land, and including portions of a watershed that services five public water supply wells. Responsible for developing regulatory strategy, including the development of Groundwater Management Plans and the procurement of Down Gradient Property Status for numerous affected properties, and the development of a Contingency Plan for an affected municipal water supply. Responsible for obtaining State and Local approvals for the redevelopment of the former facility area in accordance with the construction policy under the MCP, WPA, MEPA, ACOE, and other regulations. Responsible for the oversight of Remedial Action necessary to achieve a regulatory closure under state law, and management of extensive, on-going Public Involvement Program. Work completed included oversight of major Construction Related Release Abatement Measure, and implementation and management of three separate Immediate Response Actions (IRAs).

- **Facility Decommissioning/Site Assessment/Litigation Support, Philips Lighting Co. (PLC).** Project Director and LSP for site assessment and remedial actions at a former PLC fluorescent and incandescent lamp manufacturing facility. Services included the acquisition of a Waiver of Approvals from state regulatory agencies, development of cleanup goals for commercial use, assessment, technical support of a damage claim and subsequent financial settlement against a previous owner, and the design and construction of a product recovery system and soil removal beneath portions of the facility buildings. Project also included the planning and oversight of the decontamination of over 500,000 square feet of Hg and Pb contaminated manufacturing space, and subsequent risk characterization. Assisted in the negotiation of purchase terms with prospective buyer, and development of appropriate land use restrictions.
- **Environmental Consulting, Massachusetts Turnpike Authority.** Project Director for a term consultant contract, to provide environmental services at MTA maintenance facilities and service areas, including the Callahan and Sumner Tunnels. GEI developed a 5-year strategic plan for moving MTA sites through the MCP process, and provided ongoing litigation and land taking support services.
- **Evaluation of Proposed of Re-Use Options for Former Manufacturing Facility, Joliet, Illinois.** Consultant responsible for evaluation of environmental and market constraints for multi-use development of 1100 acre manufacturing facility, bordering the Des Plaines River. Included evaluation of environmental conditions at Property, regulatory status, and permitting and zoning requirements associated with the various re-use scenarios.
- **Preliminary Environmental Assessment, Former Wisconsin Steel Works Site, Chicago, IL.** Project Manager responsible for evaluation of remediation and re-use scenarios of the former Wisconsin Steel Works site in Chicago. Work included review of USEPA, IEPA and EDA documents related to historical use of the site, remedial action performed to date, and the regulatory status. Information developed was used to evaluate the feasibility of future development of the site as an inter-modal facility.
- **Comprehensive Investigation/Remediation and Development Support, Armstrong World Industries, Braintree, MA.** Project Manager, LSP, and regulatory liaison for all environmental work performed at Armstrong World Industries' Braintree facility. Ms. Hanley's responsibilities include assisting Armstrong personnel in developing Long-Term Environmental Compliance programs, permitting, OSHA Training, and the identification and characterization of potential environmental contamination problems at the site. GEI performed a Remedial Investigation/Feasibility Study at the site and limited removal actions, including buried drum removal, necessary to permit the commercial redevelopment of the facility.

- **Remedial Investigation/Strategic Planning, Bostik Corp.** Program Manager and LSP for remedial investigation and response actions at the Bostik Middleton, Massachusetts facility, between 1992 and 1996. Supervised the assessment of 12 Solid Waste Management Units (SWMUs), preparation of environmental and human health risk assessment reports, and development of strategic plans for compliance with state regulations. Response actions at the site include ground water recovery and treatment, vapor extraction, limited soil removal and drum removal. Plant expansion and remedial actions were integrated. Management support services included cost estimating for SEC reporting requirements, cost-recovery negotiations with previous property owners, and expert testimony during litigation with insurance carrier.
- **Remedial (Phase II/III) Investigation, Amesbury, MA.** Project Manager for the comprehensive site assessment and evaluation of remedial actions at Brazonics Corp., which is situated adjacent to a Priority Disposal facility and CERCLAIS site, where DNAPL is present in rock. Based on work performed by GEI, an estimate of the relative contribution of ground water contamination to the adjacent disposal site, and a determination of No Significant Risk (NSR) was made for the Brazonics site.
- **Litigation Support, Bedford, MA.** Project Manager of litigation support services to the town of Bedford, Massachusetts. Responsibilities include data assessment and case development for litigation against parties potentially responsible for the contamination of the Town of Bedford water supply wells.
- **Litigation Support Services, Associated Aviation Insurance Company.** Provided expert opinion leading to settlement, regarding environmental claims made by the managing authority of a major international airport. Opinions related to the regulatory requirements and associated costs for environmental assessment under state regulations.
- **Remedial Response Actions, MCP, Textron Financial Corp.** Project Manager and LSP for preliminary investigations, Immediate Response Actions (IRAs) and Release Abatement Measures (RAMs) at former rope manufacturing facility in Plymouth, Massachusetts. Responsible for supporting real estate sale and/or development of selected parcels.
- **Remedial Investigation/Solvents Recovery Services of New England and Former Municipal Landfill, Southington, CT.** Project Geohydrologist for evaluation of a solvent disposal area and landfill for the U.S. Department of Justice and USEPA. Evaluation included historical assessment, site inspection and field investigation.
- **Expert Witness, Whittaker Corporation.** Retained to provide litigation support services, including testimony, in a damage claim associated with the sale of a former plastics manufacturing facility. Responsible for the evaluation of the current extent and impact of vinyl chloride, TCE and phthalate oil (NAPL) at the site, analysis of current and historical regulatory status and likely response-action costs. Assisted in settlement negotiations with the plaintiff.
- **Remedial Action, NPL Site, Plymouth, MA.** Quality Assurance Officer/ Program Manager for soil removal action at Cannons Engineering Corporation Superfund site in Plymouth for Responsible Parties, under consent agreement with the United States Environmental Protection Agency. Based on submittals prepared by GEI, this site was delisted as an NPL site in 1992.
- **Litigation Support/Settlement Negotiations, Honeywell, Corp.** Ms Hanley was retained as an expert to assist in the defense of a claim by an entity that acquired a property formerly

owned and occupied by Honeywell, Corp. in Waltham, Massachusetts. Services provided included the analysis of chemical fate and transport in ground water, modeling of releases of volatile organic compounds from hypothetical sources, the assessment of the existing ground water recovery and treatment system, and the likelihood of achieving regulatory closure, evaluation of other possible contributors, and development of alternative regulatory scenarios and related cost estimates.

- **Remedial Response Actions, Compo Industries, Inc./ Ausimont, USA.** Project Director and LSP for remedial Response Actions and Immediate Response Actions (IRAs) at Tier IA Site in Mansfield and Lowell, Massachusetts. IRAs include assessment of VOC contamination and installation of Air Sparging/Vapor Extraction system in location of former tank farm, and evaluation of NAPL in soil in former on-site landfill. Also prepared USEPA Site Inspection Report and managed public participation program.
- **Remedial Investigation/Feasibility Study (RI/FS) at the Kearsarge Metallurgical Corporation Site in Conway, NH, an abandoned metal casting facility.** Responsible for the negotiating and implementing of the scope of work for the RI/FS, at the Kearsarge Site, which was listed on the U.S. EPA National Priorities List (NPL). The Kearsarge Metallurgical Corporation Remedial Investigation was performed for the responsible parties, under consent agreement with the state of New Hampshire.
- **Remedial Investigation, Industrial Site, Cambridge, MA.** Site Assessment, Remedial Investigation and Feasibility Study at former metal plating facility. Contaminants of concern include metals and PCBs. Included negotiation of scope of work for field investigation with state agencies.
- **Hazard Ranking, USEPA Region I.** Member of QA/QC Team responsible for review and verification of supporting data for Hazard Ranking of sites, prior to listing on USEPA National Priority List (NPL) 1981-1982. Also responsible for collection of data and Hazard Ranking of numerous sites in Region I.
- **Preliminary Assessment, Numerous Sites, Naugatuck and Beacon Falls, CT.** Project Manager for preliminary site assessment of seven potential uncontrolled waste sites in Naugatuck, Connecticut, including the Laurel Park Landfill.
- **Litigation Support Services, BP Oil, Saugus, MA.** Project Manager of litigation support services to a major petroleum distributor in Saugus, Massachusetts. Work performed included preparation of interrogatories, reviewing depositions, discovery actions, and case development planning for third party suit. Ms. Hanley was identified as an expert witness for litigation in this case.
- **Litigation Support Services, Dracut, MA.** Project Manager of litigation support services to attorneys representing potentially responsible party and insurance carriers at a ground water-contaminated site in Dracut, Massachusetts.
- **Preliminary Assessment, Saco Tannery Disposal Site, Saco, ME.** Project Manager for preliminary assessment and site inspection of a municipal landfill and tannery waste disposal area in Saco, Maine.

PROFESSIONAL EXPERIENCE

The Isosceles Group (former Sleeman Hanley & DiNitto, Inc.) Boston, Massachusetts

- Principal, September 2000-Present

-

Greenfield International LLC, Cambridge, Massachusetts

- Senior Associate, November 1999-August 2000

GEI Consultants Inc., Winchester, Massachusetts (formerly Geotechnical Engineers, Inc.)

- Board of Directors, May 1997-April 2000
- Corporate Vice President/Commercial and Manufacturing Program Manager, January 1998-November 1999
- Corporate Vice President, Environmental Programs/Acting Manager of Chicago Branch Office, February 1996-July 1998
- Vice President, Environmental Division Manager, 1990-1996
- Group Leader, 1987-1990
- Project Manager, 1985-87
- Project Geologist, December 1983-1984

Yankee Environmental Engineering and Research Services, Woburn, Massachusetts

- Project Geologist, January 1982-December 1993

Ecology and Environment, Inc., Woburn, Massachusetts

- Geologist, member of USEPA Field Investigation Team (FIT) May 1980-December 1981

ACADEMIC AND PROFESSIONAL QUALIFICATIONS

- B.S., Geology and Geophysics, Boston College ('79)

PUBLICATIONS

- M.M. Hanley, et al., (1995). Massachusetts Continuing Legal Education, Inc. **Chapter 21E and the Revised MCP** (95-09.08).
- M.M. Hanley, et al., Massachusetts Continuing Legal Education, Inc. (1995). **G.L. Chapter 21E Basics** (96-09.01).
- M.M. Hanley, et al., Massachusetts Continuing Legal Education, Inc. (1992). **Pitfalls for Real Estate Professionals** (92-19.14).
- DiNitto, R.G.; Norman, W.R.; and Hanley, M.M., "**An Approach to Investigating Groundwater Contaminant Movement in Bedrock Aquifers: Case Histories**," Presented at the Third National Conference and Exhibition on Management of Uncontrolled Hazardous Waste Sites, December 1, 1982, Washington, D.C.
- M.M. Hanley LSP (2009) . Massachusetts Continuing Legal Education, Inc. **The Evaluation of Environmental Conditions During Eminent Domain Proceedings.**

SELECTED PRESENTATIONS

- Massachusetts Continuing Legal Education (MCLE), Seminar; Pitfalls for Real Estate Professionals *Environmental Assessments for Real Estate Transactions*, 1992.
- MCLE Seminar: Chapter 21E and the Revised MCP, *Recurrent Problems for LSPs,* September 1995.
- MCLE Seminar: Environmental Law for the General Practitioner: *Contaminated Property: Navigating Cleanups and Cost Recovery.* December 1995.
- NAEM'S EHS Management Forum: *EHS Role in Anticipating and Managing Environmental Due Diligence Requirements and Impacts*. October 8, 2004.

PROFESSIONAL AFFILIATIONS

- Boston Bar Association (BNA), Associate Member. Member of MCP Re-write Subcommittee 1990-1993. (Former Member)
- American Consulting Engineers Council (ACEC) of New England. Chair of Hazardous Waste Committee 1995-1996.(Former Member)
- Licensed Site Professional Association (LSPA). Full Member. (Current)

CONTINUING EDUCATION

- Ground Water Hydrology Seminar, American Society of Civil Engineers Continuing Education Program, Boston, Massachusetts. 1982.
- Hazardous Waste Site Investigations Training Course, U.S. Environmental Protection Agency, Chicago, Illinois. 1980.
- Supervisors Hazardous Waste Operations & Emergency Response Course, Darell Bevis Assoc. Inc.1980.
- Institute for Professional Practice, *Fundamentals of Professional Practice,* Washington, D.C. 1994.
- Licensed Site Professional Association, *Short Course in Statistics for LSPs and Risk Characterization under the MCP*. March 4-11, 1997.
- Licensed Site Professional Association and the Massachusetts Department of Environmental Protection, *Beyond TPH-Understanding and Using the new VPH/EPH Approach*. May 13, 1997.
- Massachusetts Department of Environmental Protection (MADEP), *Understanding Subparts I and J of the MCP*. November 29, 1994.
- Massachusetts Department of Environmental Protection, *Remediation Waste and Remedial Wastewater Management*. December 13, 1996.
- Massachusetts Department of Environmental Protection, *MCP Environmental Risk Characterization*. November 26, 1996.
- Licensed Site Professional Association and Massachusetts Department of Environmental Protection, *Understanding and Using AULs and Public Involvement Requirements of the MCP.* June 2, 1998.
- Licensed Site Professional Association and Environmental Professionals' Organization of Connecticut, *Professionalism and Professional Ethics for LSPs and LEPs.* October 6, 1998.

- Environmental Business Institute, *Capping and Containment*. March 2000.
- Environmental Business Institute, *Role of LSP, I & II.* September 12, 2001
- Sitelab Corp., *Field Screening Petroleum Hydrocarbons Using Ultraviolet Fluorescence Technology*, March 25, 2002
- EnviroBusiness, *Recycling & Beneficial Uses of Petroleum Contaminated Soils,* April 1, 1999
- New Environmental Horizons, *Quality of Environmental Measurements,* November 3, 2001
- Regenisis, *Accelerated Natural Attenuation in Bedrock and Formation with Reduced Permeability*, November 11, 2001
- MADEP, *Addressing Indoor Air Contamination: Measurements and Models*, October 30, 2001
- MADEP, Analytical Data Enhancement Program, June 13, 2002
- LSP Association, *Monitored Natural Attenuation*, February 25, 2003
- LSP Association, *Risk Assessment and Remediation of Sediment and Surface Water*, April 17, 2003
- LSP Association, Hydrogeology of Massachusetts, September 25, 2003
- LSP Association, Principles and Field Techniques for Characterizing Contaminant Migration in Fractured Rock, November 13, 2003
- LSP Association, Vapor Intrusion Seminar, December 1, 2004
- MADEP, MCP Audit and Regulatory Training, December 8, 2004
- LSP Association, Techniques to Generate Data for Environmental Risk Characterization, may 25, 2005
- LSP Association, Demystifying the Activity and Use Limitation, June 1, 2005
- LSP Association, 2006 MCP Revisions, April 26, 2006
- LSP Association, Groundwater Flow in Fractured Bedrock, September 12, 2006
- LSP Association, Use of the CSM Process to Support MCP Deliverables, September 26, 2006
- LSP Association, Integrating Expedited Site Assessment into 310 CMR 40.0800, January 25, 2007
- MADEP, A Different Path Through the MCP, 2007, May 16, 2007
- LSP Association, Environmental Law for LSP's, November 15, 2007
- MADEP, MCP Representativeness Evaluation & Data Usability, February 22, 2008
- MADEP, The MCP Audit 2007-A Case Study Approach, April 23, 2008
- LSP Association, Basic Principals of Groundwater Flow and Contamination Migration, June 4, 2008
- LSP Association, Site Assessment and Remediation Concepts, June 4, 2008

The Isosceles Group

Summary of Qualifications

Environmental Management

and Health & Safety Services

The Isosceles Group
A Sleeman Hanley & DiNitto Company
50 Congress Street | Boston, MA 02109
Tel: 617.330.2800 | Fax: 617.330.2801

The Isosceles Group, a Sleeman Hanley & DiNitto, Inc. company (Isosceles), provides Environmental Management and Occupational Health and Safety Services to commercial clients, industry and government in the United States, and internationally. Founded in 1999, our mission is to develop and optimize Environmental Health & Safety systems and to provide time-critical support in key compliance areas on an as-needed basis, in a cost-effective manner.

Isosceles develops, implements and maintains Occupational Health and Safety (OHS) and Environmental Management Systems (EMS) at client facilities, and manages environmental issues that affect the acquisition, operation, expansion and closure of Industrial and Commercial Real Estate. Isosceles conducts Environmental Due Diligence and Corporate Social Responsibility (CSA) Assessments worldwide, and has developed Auditing and Facility Development Protocols for the efficient assessment of OHS and EMS requirements for industry in 40 countries, including China, India and Mexico, and countries within the European Union (EU).

Isosceles also provides environmental support services to its clients during Product Development and deployment, including feasibility assessment, pilot testing, permitting and registration.

Isosceles principals each have over 30 years of experience in Occupational Health and Safety, Chemistry, Environmental Science, and Regulatory Compliance, and are retained by public and private clients to provide Project Management Services, including policy development and litigation support services.

Key Facts about The Isosceles Group

- Founded in 1999
- Small Business
- 50% of Staff Located in Client Facilities
- Work Performed in 40 Countries
- Regulatory Compliance Assistance/Research for Industry
- In-Facility Management and Technical Support Services
- Project Management Services
- Project Management Services for National Priority List (NPL) Sites in USA
- Environmental Due Diligence/AAI Services Worldwide
- Technical and Regulatory Translation Services
- Corporate Social Responsibility (CSR) Programs

Representative Clients

- AEW Capital Management
- American International Group, Inc. (AIG)
- Alpha Laboratories
- American Power Conversion
- American Seafoods
- Atlas Die LLC
- Bio Tabs
- Cabot Corporation
- Diversified Auto
- ESPN
- Gaia Tech, inc.
- Greenberg Traurig
- Honeywell
- Inland Properties
- Marsh
- Northbridge Companies
- NBC Universal
- New Boston Fund, Inc.
- Nordblom Company
- Ocean Organics
- Olin Corporation
- ORC Worldwide
- Pfizer, Inc.
- Philips Analytical
- Profiles, Inc.
- Sanofi-Aventis
- S.C. Johnson
- Sensata
- Specialty Hospitals of America
- SpeedFam-IPEC Corporation
- Sterling Corporation
- The McLaughlin Group
- Texas Instruments
- United Technologies
- United States Environmental Protection Agency
- U.S. Steel
- Verizon
- Weston Solutions, Inc.

The Isosceles Group

Contact Information

Corporate Offices:
50 Congress Street, Suite 615
Boston, MA 02109
Tel. 617.330.2800
Fax. 617.330.2801
www.theisogroup.com

Contacts for Key Service Areas:
For specific information regarding our capabilities, please contact the following individuals:

Environmental Management and Occupational Health and Safety:
Stuart Sleeman
Tel: 617.330.2806
E-mail: ssleeman@theisogroup.com

International Compliance:
Richard G. DiNitto
Tel: 617.330.2807
E-mail: rdinitto@theisogroup.com

Environmental Assessment, Due Diligence, Asset Management, Social Responsibility, Permitting Support:
Margret Hanley, LSP
Tel: 617.330.2803
E-mail: mhanley@theisogroup.com

Project Management, Quality Assurance, Study Design and Data Analysis:
Richard A. McGrath
Tel: 978.779.6578
Email: rmcgrath@theisogroup.com

The Isosceles Group

Environmental Management and Occupational Health and Safety

The Isosceles Group (Isosceles) is retained to develop, implement and maintain Occupational Health and Safety (OH&S) and Environmental Management Systems (EMS) at client facilities, and to manage environmental issues that affect the operation and expansion of facilities. Isosceles has managed assessment programs for a number of US-based Fortune 500 firms, and has completed audits of operations in 55 countries utilizing both US based and in-country personnel. Isosceles has developed and implemented a web-based evaluation and knowledge transfer program that covers 22 OHS and EMS disciplines which is currently used in over 1,500 international facilities.

Isosceles is experienced in time critical crisis management at industrial facilities, and has extensive experience in risk management and process safety program development.

Key Facts about Isosceles Group Environmental Management and Occupational Health & Safety Services

Environmental Management Services (EMS)

- Environmental Permitting
- EIS/EIA
- Air Quality Management
- Waste Management (Solid and Hazardous)
- Chemical & Hazardous Substance Management
- REACH/WEEE/RoHS Compliance Monitoring
- Radiation and Radioactive Waste Management
- Wastewater Treatment & Discharge Management
- Noise Management
- Due Diligence & Site Remediation
- Product Transportation
- Emergency Planning
- Recordkeeping

Occupational Health and Safety Services (OHS)

- Permitting
- Training
- Accident Prevention & Investigation
- Fire Safety & Prevention
- Industrial Hygiene
- Worker Right-To-Know
- Electrical Safety
- Work Environment Controls (ventilation, temperature, signage, work-at-heights, Housekeeping, etc.)
- Machinery & Equipment Management (tag-out/lock-out, etc., cranes, lifts, power Trucks, safe tool use, training, etc.)
- Ergonomic

Corporate Social Responsibility Services (CSR)

- Security
- Social Insurance (worker's compensation, etc.)
- Employee Demographics & Compensation Management
- Product Safety Issues
- Energy Management
- Carbon-Emissions Reduction Strategies and Management
- Resource Conservation
- Public Communications
- Crisis Management

Representative Projects:

- **Environmental Health and Safety (EH&S) Support (including on-site staffing) for the international operations of Sensata Technologies.** The Isosceles Group (Isosceles) (as SHD) has global responsibility for the strategic development and implementation of corporate safety, industrial hygiene and workers' compensation programs; development and oversight of Sensata's global EH&S audit program; and development and implementation of EH&S training initiatives. As part of this program, Isosceles designed and implemented a worldwide EH&S EMS; coordinated roll-out of an EH&S EMS program with international counterparts; developed procedures, practices and technical standards to assist in the implementation of a corporate EH&S policy and management system; and established numerical goals and objectives as well as methods, to acquire data and track performance against goals. Isosceles also directed the development and implementation of a worldwide multi-media audit program to assess implementation of the EH&S management system, and led corporate-wide EH&S training initiatives ranging from needs assessment to assessing program effectiveness. Isosceles provides continued management direction to all international facilities and provides for on-site staffing in domestic locations. International locations addressed in the program include facilities in The Netherlands, China, Brazil, Malaysia, Japan, Hungary, Dominican Republic, Korea and Mexico. Facility ESH Support, Regulatory Compliance Auditing and Risk Planning, American Seafood International. Isosceles was retained to provide EH&S support to the East Coast Operations of American Companies.

- **Seafood International of Seattle, Washington.** EH&S support included the preparation of written programs required to meet regulatory compliance under both OSHA and EPA. The first phase of this project involved a review and evaluation of the manufacturing facility's current EH&S compliance programs. This review included: a review of manufacturing operations and management practices; comparing existing EH&S policies and procedures against facility business plans and expectations; and the identification of EH&S issues at the facility and appropriate response actions. Based on the results of the initial assessment program, Isosceles (as SHD) identified operations that could be improved, and recommended management systems that could be implemented to reduce cost and improve compliance. Isosceles also assisted the company's counsel in addressing the items raised by the US EPA regarding the sites current Risk Management Plan (RMP). Isosceles reviewed the current RMP and updated its content to reflect operating conditions and risks. Isosceles developed response actions to alleviate concerns raised by the US EPA. Finally, Isosceles directed a monitoring and assistance program designed to support the facility in the implementation of an effective EH&S program.

- **Worldwide Facility Evaluation Program, Texas Instruments (TI).** The Isosceles Group (as SHD) was selected as project manager for TI's facility evaluation program. In this role, Isosceles provided detailed assessments of EHS performance at 8 facilities located in the USA and Asia. Isosceles outlined areas for improvement and oversaw technical assistance to these facilities through the development of strategy for the provision of a uniform standard for EH&S awareness and training to all international employees. Isosceles provided in-country personnel for translation services, and the training of in-country facility personnel in Europe and Asia.

- **Facility EHS Support, American Power Company (APC).** The Isosceles Group (Isosceles) (as SHD) provided in-facility management and support services for APC's EH&S Program in West Warwick RI. Isosceles developed and implemented daily EHS protocols, and provided

evaluations of policies and procedures for the APC Safety Department. Isosceles conduct EHS training, and Hazard Risk Assessments (including Job Safety and Job Hazard Analysis) for multiple manufacturing and warehouse functions. Isosceles coordinated Environmental Management Systems and ISO 14000 Protocol with corporate and international facilities, and acted as the corporate liaison for employee and management health and safety concerns. Isosceles worked with the facility management staff in the prioritization and remediation of EHS concerns, and developed procedures for EHS documentation and chemical inventory.

- **Development of a Web-Based International EH&S Management System, Pfizer Corporation**. On behalf of Pfizer, The Isosceles Group (Isosceles) (as SHD) developed a web-based EH&S management system for more than 750 worldwide distribution, office, and sales and support facilities in more than 60 countries, on all continents to evaluate risks that were not previously addressed by the Facility and EH&S management structure. Isosceles developed a series of questionnaires to which facilities could respond via a web-based portal, to gain an understanding of each facility's basic operations, systems, potential risks, staffing, level of training, and staff competency with handling of various risks. These surveys, supported with selected physical in-facility audits to confirm the web-based survey results, allowed for the development of new programs for sustainable risk management systems to be implemented across the globe. As part of this program Isosceles implemented a fast-tracked knowledge-transfer program to improve EHS performance at international facilities. By utilizing a combination of web-based tools and focused audits, Isosceles was able to quickly transfer corporate requirements and model programs from other international facilities to on-site staff.

- **Development of Lead -Dust Abatement Standards, New Boston Fund, Inc.** On behalf of the property owner, The Isosceles Group (Isosceles) (as SHD) developed Lead Dust Abatement standards for a manufacturing facility formerly occupied by an energy technologies company that produces programmable power electronic converters and high temperature superconductor wires. Isosceles (as SHD) developed cleanup standards based on both Federal and Industry standards, that were suitable for unrestricted use, and worked with consultants retained by the tenant to develop acceptable confirmatory testing protocols. Isosceles worked with the former tenant in the development and implementation of a clearance testing program.

The Isosceles Group

International Compliance Services

The Isosceles Group's International Compliance Services include assessment, auditing, compliance management, and regulatory tracking of a broad range of environmental and occupational health and safety categories.

The Isosceles Group (Isosceles) currently operates in more than 25 countries through its network of in-country associates, where we manage the day to day workplace labor, safety, and environmental issues at 21 facilities. Isosceles has also performed Due Diligence Assignments in Asia, Europe and the Middle East, and our staff has audited operations in more than 35 countries.

Isosceles tracks the environmental and workplace safety regulations of 57 countries and the status of numerous global initiatives on a quarterly basis to identify new or emerging compliance and Corporate Social Responsibility related issues that could affect the operation and expansion of facilities. Isosceles has published individual Country Regulatory Compliance and Audit Protocols for use by our clients for 41 countries or provinces. Isosceles also conducts research of specific regulatory requirements in several languages, including Chinese (Mandarin), Spanish and German.

The Isosceles Group's International Compliance Services include assessment, auditing, compliance management, and regulatory tracking of a broad range of environmental and occupational health and safety categories.

The Isosceles Group (Isosceles) currently operates in more than 25 countries through its network of in-country associates, where we manage the day to day workplace labor, safety, and environmental issues at 21 facilities. Isosceles has also performed Due Diligence Assignments in Asia, Europe and the Middle East, and our staff has audited operations in more than 35 countries.

Isosceles tracks the environmental and workplace safety regulations of 57 countries and the status of numerous global initiatives on a quarterly basis to identify new or emerging compliance and Corporate Social Responsibility related issues that could affect the operation and expansion of facilities. Isosceles has published individual Country Regulatory Compliance and Audit Protocols for use by our clients for 41 countries or provinces. Isosceles also conducts research of specific regulatory requirements in several languages, including Chinese (Mandarin), Spanish and German.

Key Facts about Isosceles Group
Country Profile & Protocols
and Translation & Research Services

Compliance Protocols are available for purchase and/or update

Country Profile and Protocol Content:

- General Overview of Country/Province
- Country Approach to EH&S Issues
- Legislative and Legal Process
- Regulatory Agencies
- Key Laws and Regulations
- Air Quality /Emissions
- Wastewater Discharges
- Water Resources
- Hazardous Waste Management
- Solid Waste Management
- Environmental Liability
- Radioactive Materials Handling & Disposal
- Hazardous Substance Compliance Programs
- Environmental Noise
- Storage Tank Management
- Remediation
- Property Transactions
- Emergency Planning
- Occupational Health and Safety

Translation and Research Services:

Chinese (Mandarin), French, German, Polish, Portuguese, Spanish, Russian

Country Experience:

- Argentina
- Australia
- Austria
- Belgium
- Brazil
- Bulgaria
- Canada
- Chile
- China
- Colombia
- Costa Rica
- Cyprus
- Czech Republic
- Denmark
- Dominican Republic
- Egypt
- Estonia
- Finland
- France
- Germany
- Greece
- Guatemala
- Hungary
- India
- Indonesia
- Ireland
- Israel
- Italy
- Japan
- Kuwait
- Latvia
- Lithuania
- Malaysia
- Mexico
- Netherlands
- New Zealand
- Norway
- Panama
- Peru
- Philippines
- Poland
- Portugal
- Romania
- Russia
- Saudi Arabia
- Singapore
- Slovakia
- South Africa
- South Korea
- Spain
- Sweden
- Taiwan
- Turkey
- Ukraine
- United Kingdom
- Venezuela
- Vietnam

Representative Isosceles Projects:

- **International Regulatory Protocol Development, Various Countries, for Organization Resources Counselors, Inc. (ORC).** The Isosceles Group (Isosceles) (as SHD) provides ORC and its membership firms with regulatory summaries for environmental and occupational health and safety laws and regulations for more than 40 countries in Europe, Asia, Africa, the Middle East and the Americas. These summaries of local laws and regulations, and an auditing checklist, are being used by several Fortune 500 US-based multi-national firms with operations in many of these countries. Isosceles also provides ORC and its membership with a regulatory alert update service that details new and emerging issues in the fields of environmental stewardship, sustainability, corporate social responsibility, and climate- change legislation, in addition to the more traditional environmental and health and safety laws and regulations.

- **Regulatory Compliance Auditing and Litigation Support, Australian Meat Employees Union.** The Isosceles Group (Isosceles) (as SHD) was retained to provide Health & Safety (H&S) support to a poultry processing and meat packing facilities located in Australia and New Zealand. The project initially involved a comprehensive review of applicable global EH&S standards both within Australia and New Zealand, as well as other first world countries with similar facilities. This review included a detailed evaluation of the existing written H&S Policies and Procedures for each of approximately 10 individual corporations that owned the poultry processing and meat packing facilities. The review focused on injury and illness data, and the correlation of this data with existing programs designed to mitigate identified risks. Following the initial review, over a 12-month period, Isosceles systematically evaluated each individual facility for compliance with in-country H&S regulatory requirements, conducted an analysis of the program management system developed by each facility to meet expected H&S goals and objectives, and produced a detailed report to each facility.

- **International Environmental, Health & Safety Protocol Development and Auditing Support, United Technologies Corporation (UTC).** The Isosceles Group (Isosceles) (as SHD) was retained to develop regulatory compliance protocols for environmental, health and safety regulations for manufacturing facilities in Europe (Sweden, Denmark, Norway, Hungary, Ukraine, Finland and Italy) and in Southeast Asia (Vietnam and Taiwan). Isosceles provided UTC with a detailed summary of each country's existing EH&S laws and regulations relating to manufacturing operations, and developed an auditing checklist for compliance verification. Isosceles also participated in performing audits of UTC's international operations, as well as conducting an assessment of selected process lines with high accident rates to understand the root cause of the incidents, and to help UTC develop a method to prevent future accidents. Isosceles was directly responsible for evaluation of all Asian facilities, through the provision of both US-based and in-country personnel. This included involvement in fatality reviews for Chinese operations at the request of the company CEO. Our success in the Asian region led to the expansion of services to include all international and domestic operations.

- **Development of a Web-Based International EH&S Management System, Pfizer Corporation**. On behalf of Pfizer, The Isosceles Group (Isosceles) (as SHD) developed a web-based EH&S management system for more than 750 worldwide distribution, office, and sales and support facilities in more than 60 countries, on all continents to evaluate risks that were not previously addressed by the Facility and EH&S management structure. Isosceles developed a series of questionnaires to which facilities could respond via a web-based portal, to gain an understanding of each facility's basic operations, systems, potential risks, staffing, level of training, and staff competency with handling of various risks. These surveys,

supported with selected physical in-facility audits to confirm the web-based survey results, allowed for the development of new programs for sustainable risk management systems to be implemented across the globe. As part of this program Isosceles implemented a fast-tracked knowledge-transfer program to improve EHS performance at international facilities. By utilizing a combination of web-based tools and focused audits, Isosceles was able to quickly transfer corporate requirements and model programs from other international facilities to on-site staff.

- **Environmental Health and Safety (EH&S) Support (including On-Site Staffing) for Sensata Technologies.** The Isosceles Group (Isosceles) (as SHD) is responsible for the strategic development and implementation of corporate safety, industrial hygiene and workers' compensation programs; the development and oversight of EH&S audit program; and development and implementation of EH&S training initiatives, globally. As part of this program, Isosceles designed and implemented a worldwide EH&S EMS; coordinated roll-out of an EH&S EMS program with international counterparts; developed procedures, practices and technical standards to assist in the implementation of a corporate EH&S policy and management system; and established numerical goals and objectives as well as methods, to acquire data and track performance against goals. Isosceles also directed development and implementation of worldwide multi-media audit program to assess implementation of the EH&S management system, and led corporate-wide EH&S training initiatives ranging from needs assessment to assessing program effectiveness. Isosceles provides continued management direction to all international facilities and provides for on-site staffing in domestic locations. International locations addressed in the program include facilities in The Netherlands, China, Brazil, Malaysia, Japan, Hungary, Dominican Republic, Korea and Mexico.

- **Worldwide Facility Evaluation Program, Texas Instruments (TI).** The Isosceles Group (as SHD) was selected as project manager for TI's facility evaluation program. In this role Isosceles provided detailed assessments of EHS performance at 8 facilities located in the USA and Asia. Isosceles identified areas for improvement and provided technical assistance to these facilities through the development of a uniform standard for EH&S awareness, and training to all international employees. Isosceles provided in-country personnel for translation services, and the training of in-country facility personnel in Europe and Asia.

- **Development of a uniform standard for EH&S awareness and training, Novellus Systems Inc.** The Isosceles Group (as SHD) developed EHS awareness training programs in the local languages for 8 countries and then provided in-country personnel and training of all personnel in their Europe and Asia facilities.

The Isosceles Group

Corporate Social Responsibility

The Isosceles Group (Isosceles) tracks the environmental and work place regulations of 50 countries on a quarterly basis to identify new or emerging CSR issues that could affect the operation and expansion of client facilities worldwide. These issues include workplace safety, employee compensation, labor demographics, resource conservation, product safety issues (cleanliness of work spaces and process lines, raw product management and storage in the facility, etc.), packaging, product transportation, energy management, and carbon emissions reduction strategies.

Isosceles develops and implements cost-effective auditing programs and reporting systems, based on the evaluation of corporate risk and priorities, and the use of web-based tools to obtain and report information for each facility. Isosceles can assist its clients remotely, or on-site, in the deployment of auditing and compliance systems.

Key Facts about Isosceles Group
Corporate Social Responsibility Services

CSR Issues Addressed by Isosceles:

- REACH/WEEE/RoHS Compliance Monitoring
- Product Transportation
- Emergency Planning
- Workplace Safety
- Worker Right-To-Know
- Security
- Social Insurance (workman's comp., etc.)
- Employee Demographics & Compensation
- Product Safety Issues
- Energy management and Conservation
- Carbon-emissions Reduction Strategies
- Resource Conservation
- Public Communication

Representative Projects:

- **Carbon Footprint Analysis and Energy Minimization Programs, Various Clients.** The Isosceles Group (Isosceles) (as SHD) is currently providing assessments to clients of their energy consumption and carbon footprint, and assisting them with development of alternative equipment and operating strategies to reduce energy usage and carbon emissions. In addition, Isosceles has developed, in conjunction with a partner firm, a "Green IT" methodology for assessing and reducing a business operations energy usage and carbon footprint associated with information technology equipment and operations.

- **Environmental Stewardship Program Development, Nortel, North America.** The Isosceles Group (Isosceles) (as SHD) staff members were retained as the Program Manager and the Technical Director for the identification, development, and implementation of a "World Class" EH&S Program model for the telecommunications industry, to be implemented at Nortel's US facilities in California, Texas and the Carolinas. This work included benchmarking the 10 largest telecommunications companies in the world to identify management drivers, focus the program to meet corporate objectives, and support the design and implementation of EH&S programs for both manufacturing and non-manufacturing operations. Nortel subsequently outsourced their EHS management program and staffing to the Isosceles staff and implementation of the program reduced operating costs by over 25% at subject facilities.

- **Development of Lead Dust Abatement Standards, New Boston Fund, Inc.** On behalf of the property owner, The Isosceles Group (as SHD) developed lead dust abatement standards for a manufacturing facility formerly occupied by an energy technologies company that produces programmable power electronic converters and high temperature superconductor wires. Isosceles developed cleanup standards based on both Federal and Industry standards that were suitable for unrestricted use, and worked with consultants retained by the former tenant to develop acceptable confirmatory testing protocols.

The Isosceles Group

Project Management and Litigation Support

The Isosceles Group (Isosceles) has extensive experience and qualifications in the management of environmental projects and litigation support services. Isosceles has been retained to perform environmental investigations and remedial actions under state and federal law, and to manage and coordinate investigations and response actions by multiples contractors on behalf of government and industry at locations throughout the United States. Isosceles has been retained as technical experts and fact witnesses in litigation related to environmental matters, including land taking, insurance claims, and, and cost recovery.

Key Facts about Isosceles Group
Project Management Services

Project Management Service Areas:

- Facility Decommissioning
- Pre-Demolition Surveys
- Environmental Remediation
- Brownfields Redevelopment
- Waste Site Cleanup/LSP Services
- Eminent Domain Projects
- CERCLA (Superfund Investigation)
- RCRA Permitting and Assessment
- Asset Management Systems
- Product Development and Permitting
- Laboratory Quality Assurance Programs
- Data Validation Programs
- Waste Management
- Public Communications

Representative Projects:

- **Environmental Management Services, Former Olin Corporation Site, Wilmington, MA.** The Isosceles Group (Isosceles) (as SHD) was responsible for the oversight of environmental assessment, remediation, and regulatory permitting activities at a former chemical manufacturing facility which contained six operable units, affected over 200 acres of land, and included portions of a watershed that services five public water supply wells. Isosceles was responsible for developing the regulatory strategy under State and Federal Law, including the development of groundwater management plans and the procurement of Down Gradient Property Status for numerous affected properties, and the development of a contingency plan for the affected municipal water supply. Isosceles was responsible for obtaining State and Local approvals for the redevelopment of the former facility area in accordance with the construction policy under the MCP, WPA, MEPA, ACOE, and other state and federal regulations. Isosceles also assisted a prospective purchaser in preparing submittals to the Surface Transportation Board (STB) for the permitting and use of a portion of the facility as a rail facility. Isosceles managed the oversight of remedial action necessary to achieve regulatory closure under state law, and the management of extensive, on-going Public Involvement Program. Work completed included oversight of major Construction Related Release Abatement Measure, and implementation and management of three separate Immediate Response Actions (IRAs).

- **Litigation Support Service, US Department of Justice (DOJ), US EPA Region I.** The Isosceles Group (Isosceles) (as SHD) provided expert and technical witness services to the US EPA DOJ. In this capacity, Isosceles staff was were responsible for developing environmental data sets and position statements in support of agency claims regarding the source and extent of PCBs and other contaminants at a Superfund Site in New Hampshire. Based on personal knowledge and previously prepared data sets, Isosceles rendered opinions regarding the nature of contamination, and industry standards for chemical management and use at the time of the release, and conditions which lead to a release.

- **Assessment/Expert Services Related to Municipal Land Takings, Metropolitan Boston Area, MA, Various Law Firms.** The Isosceles Group (Isosceles) (as SHD) is retained by landowners and representing counsel to assess the impact of environmental conditions, on the anticipated highest and best use of property that has been taken by state and municipal agencies. Properties include land taken by the Massachusetts Highway Department, and various municipal redevelopment authorities, for infrastructure and economic redevelopment. Isosceles has provided opinions and testimony on the applicability of the Massachusetts Contingency Plan (MCP) and remediation requirements established for the Central Artery A/T project, on the redevelopment of contaminated properties.

- **Strategic Planning and Environmental Management, Northwest Park, Burlington, MA.** The Isosceles Group (Isosceles) (as SHD) provides Environmental Management Services to the owner and operator of a 180 acre commercial office and technology park which is the historical source of ground water contamination affecting the municipal water supply of Burlington, Massachusetts. The Park consists of over 40 buildings which were developed in the 1960s and '70s. Isosceles staff have been responsible for the planning and management of comprehensive environmental response actions, including performance of a pump test at the municipal wells and modeling of the impact of pumping on water quality at the wells; the development and implementation of long-term remediation strategies; and the management of a Public Participation Program. Isosceles is currently working with a multiform management team to obtain permits for a comprehensive redevelopment plan, which includes the preparation of an Environmental Management Plan to address existing conditions

and on-going remedial action during redevelopment. Isosceles is responsible for managing communications regarding environmental matters with local health officials, and financial interests involved in the proposed redevelopment of the Park.

- **Technical Direction and Project Management Support Services, GE/Housatonic River Site, Pittsfield, MA.** The Isosceles Group (Isosceles) (as SHD). Senior Staff are currently supporting EPA's assessment and remediation of the GE/Housatonic River Superfund Site, one of the largest and most controversial PCB-contaminated sites in North America, and one of the largest and most complex environmental remediation projects ever conducted. Isosceles has comprehensive responsibility for technical direction of the investigation of the riverine portion of the site, spanning approximately 135 miles of river in western Massachusetts and Connecticut. Isosceles has managed and directed aspects of the study design, technical management, and site assessment, and provides technical direction for programs in numerical fate and transport modeling, human health risk assessment, and ecological risk assessment, in addition to various other technical areas. Isosceles is responsible to EPA for development and monitoring of the overall project schedule and provides services to expedite scheduled completion of project tasks. Isosceles also provides final review and technical editing of major reports, press releases, fact sheets, and similar documents, and conducts presentations on behalf of EPA at public meetings and technical conferences. Isosceles staff attend meetings between EPA and the PRP and provide assistance in negotiation and strategic planning.

- **Strategic Planning and Environmental Management Consulting Services, Property Acquisition and Development Services, New Boston Fund, Inc.** The Isosceles Group (Isosceles) (as SHD) provides continuing services related to the management of environmental issues evaluation, acquisition and/or development of industrial and commercial properties. Isosceles staff have provided environmental consulting services to NBF and related entities since 1996. Since the founding of Isosceles in 2000, we have performed work for NBF and its affiliates at 71 locations, in 11 states. This work includes Due Diligence Assessment in accordance with ASTM, HUD, and FREDDIE MAC guidelines and standards, risk screening, estimation of remedial response action costs, management of abatement and rehabilitation services, procurement of environmental insurance, and compliance monitoring. Isosceles is currently assisting NBF in the management of environmental compliance requirements at a multi-asset industrial portfolio in Connecticut, and the abatement of Lead dust at a NBF property prior to the termination of a long-term lease.

- **MCP/Solid Waste Closure at Future Development Site, Bethlehem Steel Corp.** The Isosceles Group (Isosceles) (as SHD) staff provided Project Management Services for required environmental response actions and closure of a former off-site disposal facility for solid waste and asbestos containing debris that was generated at the Quincy Shipyard, and other sources. The site was located within the limits of a proposed high school development. Closure required the consideration of applicable requirements of TSCA, Massachusetts Solid Waste and Hazardous Waste regulations, and various state and federal asbestos regulations, as well as the planned future use of the site. Isosceles was responsible for the identification of Potential Imminent Hazard Conditions, and the implementation of Immediate Response Actions and management and implementation of a Public Involvement Plan (PIP).

- **Development of a Web-Based International EH&S Management System, Pfizer Corporation**. On behalf of Pfizer, The Isosceles Group (Isosceles) (as SHD) developed a web-based EH&S management system for more than 750 worldwide distribution, office, and sales and

- support facilities in more than 60 countries on all continents to evaluate risks that were not previously addressed by the Facility and EH&S management structure. Isosceles developed a series of questionnaires to which facilities could respond via a web-based portal, to gain an understanding of each facility's basic operations, systems, potential risks, staffing, level of training, and staff competency with handling of various risks. These surveys, supported with selected physical in-facility audits to confirm the web-based survey results, allowed for the development of new programs to allow for sustainable risk management systems to be implemented across the globe. As part of this program Isosceles implemented a fast-tracked knowledge-transfer program to improve EHS performance at international facilities. By utilizing a combination of web-based tools and focused audits, Isosceles was able to quickly transfer corporate requirements and model programs from other international facilities to on-site staff.

- **Evaluation of Vapor Intrusion Condition, Commercial Property, Boston, Massachusetts**. Isosceles recently facilitated the acquisition of a commercial office building in Boston Massachusetts where the potential for a vapor intrusion condition was identified by a regulatory agency during a post-closure audit. The substance of concern, tetrachloroethylene (PCE), was historically present in groundwater at the property, and due to a recent change in regulatory standards, the conditions at the property, and the historical basis for regulatory closure was challenged. Ms Hanley of the Isosceles Group worked with the new and previous property owner, existing tenants, and the regulating agency, to demonstrate the absence of a significant risk, and the demonstrate compliance with the current regulations. This project included the implementation of an indoor air sampling program, evaluation of the operating standard and conditions of the heating, ventilation and air conditioning systems, re-evaluation and validation of historical testing data (for soil and groundwater), preparation of a human health risk characterization report, and negotiations with regulators, regarding the requirements for closure under the applicable regulations in Massachusetts, and preparation of an LSP Opinion regarding the regulatory status of the Property.

- **Documentation of Indoor Air Quality for Prospective Tenant, Burlington, MA.** On behalf of a prospective tenant of a commercial office building, where chlorinated solvents are known to be present at elevated concentrations in groundwater, Isosceles developed and implemented an indoor air sampling program to verify the absence of a significant risk in the building, as defined by the Massachusetts Contingency Plan. This work included the implementation of an indoor air sampling program, documentation of the operating conditions of the HVAC system in the building, and a screening level risk evaluation of indoor air sampling data, in accordance with standards of the MCP.

- **Evaluation of Vapor Intrusion Risks, Commercial Office Building, Charlotte, NC.** Isosceles is currently assisting a property investment company in the evaluation of the potential risks associated with vapor intrusion conditions at a commercial office park that is transected by a gas and petroleum products pipeline, in Charlotte, NC. This project includes an evaluation of the historical operation of the pipeline, a detailed record of historical releases of petroleum hydrocarbons within the pipeline easement, and an assessment of the HVAC systems, and foundation plans of each building. Isosceles is responsible for determining the potential risk for future assessment, and mitigation in each building as a result of known or potential conditions, and /or changes in regulatory standards that related to vapor intrusion conditions.

The Isosceles Group

Due Diligence and Asset Management

The Isosceles Group (Isosceles) provides Environmental Due Diligence Assessment and Consulting Services and has developed Facility Development Protocols which delineate the requirements for facility acquisition and development in 40 countries, including China, India and Mexico, and countries within the European Union (EU).

Isosceles staff has managed the environmental assessment of hundreds of commercial properties, including properties located overseas, to support acquisition, management, sale, and asset valuation. Our work is performed in compliance with the industry standards that are required to demonstrate All Appropriate Inquiry (AAI), as defined by the applicable local regulatory agencies (such as United States Environmental Protection Agency (USEPA).

Isosceles specializes in the documentation of environmental conditions and risk at large industrial properties with historical releases of oil and hazardous materials and complex compliance histories, to address the concerns of investors, support financing and the procurement of environmental insurance, and to reduce environmental liabilities.

Key Facts about Isosceles Group
Due Diligence and Asset Management Services

Due Diligence Services

- Historical Land Use Research
- Facility Reconnaissance and Inspection Services
- Phase I and II Investigations
- International Due Diligence
- Report Preparation (ASTM, All Appropriate Inquiry Standards)
- Document Management
- Risk Based Cleanup
- EH&S and Remediation Cost Estimates
- Third Party Review of Due Diligence Reports

Asset Management Services

- Permitting
- Compliance Monitoring
- Pre- and Post-Occupancy Surveys
- Hazardous Activity Evaluations
- Environmental Insurance Evaluations
- SEC/Sarbanes-Oxley Reporting
- Remediation System Management
- Dust and Interior Contamination Abatement
- Pre-Demolition Support Services

Representative Projects:

- **Due Diligence of Former Sun Microsystems Inc. Property, Burlington and Bedford, MA.** The Isosceles Group (Isosceles) (as SHD) conducted a Phase I ESA of a 158 acre property owned and developed by Sun Microsystems Inc. (Sun). The property was formerly owned, and /or occupied by manufacturing divisions of several major electronics firms, and extensive investigation and remedial actions were performed prior to development by Sun. As part of the Phase I ESA, The Isosceles Group independently evaluated the adequacy of previous response actions, and identified continuing obligations for soil, groundwater and surface water management at the property, and subsequently assisted the new owner of the property in the subdivision, sale of and permitting of undeveloped portions of the property.

- **Due Diligence of Former Thomson Electronics Facility, Dunmore, PA.** The Isosceles Group (Isosceles) (as SHD) evaluated the historical use, decommissioning, and rehabilitation of a manufacturing facility formerly utilized by RCA and Thompson Electronics. This 41 acre facility was used for the manufacturing of cathode ray tubes between the early 1960s and the 1990s/, which resulted in the presence of significant requirements for dust abatement, and environmental assessment and remedial action, prior to re-use. Isosceles assembled and reviewed hundreds of archived documents regarding the use and management of hazardous materials at the facility, evaluated site-specific risks to adjacent properties and land users; independently evaluated the adequacy of previous actions to meet regulatory requirements; and audited the performance of Phase I and II investigations by subcontractors retained by the prospective purchaser.

- **Due Diligence of Former Department of Public Works (DPW) Facility, Reading MA.** The Isosceles Group (Isosceles) (as SHD) was retained to evaluate the environmental conditions of a former municipal DPW facility that was developed for office use in the 1980s, and the impact of historical conditions on future redevelopment. Isosceles assembled and reviewed hundreds of documents that summarized former investigations and remedial actions, conducted additional Phase I and II Investigations to verify current conditions; performed a risk evaluation of conditions under current regulations; and documented and managed in-situ conditions during subdivision, permitting and redevelopment. Isosceles prepared documents used by prospective purchasers in the sale and financing of the subdivided parcels.

- **Due Diligence of Former Caterpillar Manufacturing Facility, York, PA.** The Isosceles Group (Isosceles) (as SHD) valuated the conditions of a former Caterpillar facility where oils and other petroleum products, degreasing solvents, and metals such as cadmium, chromium, lead, zinc and Polychlorinated Biphenyls (PCBs) were released at the Property, and were remediated under the Pennsylvania (PA) Land Recycling and Environmental Remediation Standards Act (Act 2). Matters evaluated by Isosceles included the conditions of various closure agreements with the PA Department of Environmental Protection, the status of ongoing response actions, and potential effects of existing conditions on future redevelopment. Isosceles evaluated the requirements for maintaining liability protections under Act 2, soil management requirements under future use scenarios, compliance on an on-property water treatment facility, and the management of debris during rehabilitation of the facility. Isosceles assisted the new owner in the procurement of environmental insurance.

- **Due Diligence of Hospital and Health Care Facilities, Washington DC, and Odessa, Texas.** The Isosceles Group (Isosceles) (as SHD) performed Phase I ESA and Facility condition surveys at three hospitals and health care facilities. Isosceles's work included review of former environmental investigations, procurement of documentation regarding compliance with

environmental regulations and policies from governmental agencies, and coordination of asbestos surveys. Isosceles identified requirements and prepared cost estimates for future compliance during the redevelopment and use of these facilities.

- **Review of Environmental Conditions and Liabilities, Urban Redevelopment Site, Winooski, VT.** The Isosceles Group (Isosceles) (as SHD) evaluated the historical use history, and subsurface data for multiple parcels of land in a former industrial area of Winooski, VT, and identified future regulatory requirements and uncertainties that could affect the acquisition and redevelopment of the property. Conditions of concern at the development site included petroleum contamination associated with the former use of USTs, mercury contamination in portions of an existing mill building, and the requirements for environmental insurance.

- **Review of Environmental Conditions and Liabilities, Urban Redevelopment Site, Wyomissing, PA.** The Isosceles Group (Isosceles) (as SHD) reviewed the historical use history, geologic setting, and subsurface soil and groundwater conditions developed by previous investigators at a Brownfield development site to establish the regulatory status of the Site under the applicable state regulations, the availability of liability protections under state regulations, and the identification of potentially significant costs associated with remedial action and waste abatement during redevelopment. Isosceles identified regulatory requirements that could affect prospective owners, investors and tenants, and provided recommendations for additional work and documentation to support the acquisition and sale of the Property. Conditions of concern at the Property included the presence of groundwater contamination, and Vapor Intrusion Condition (VIC), and outstanding requirements under PA regulations.

- **Phase I and II Investigations and Redevelopment Support, Cambridge, MA.** The Isosceles Group (Isosceles) (as SHD) conducted Phase I and II Investigations, of two contiguous industrial properties, to support of acquisition, financing, and redevelopment planning. Isosceles performed subsurface investigations at both properties to estimate costs associated with soil excavation and disposal during redevelopment. Soil at one of these properties are typical of urban fill in Cambridge, and required release notification, investigation, and the filing of a Response Action Outcome (RAO) with the Massachusetts Department of Environmental Protection (MA DEP).

- **International Due Diligence.** The Isosceles Group (Isosceles) has managed the completion of environmental due diligence, using relevant ASTM standards at facilities located overseas. This work has been performed by SHD staff and its consultants at multiple locations, including China, Dominican Republic, India, Israel, Japan, Korea, Mexico, Poland and Russia. These reviews have been designed to: identify the sources of potential or actual contamination; identify the possible and likely pathways of contaminant migration; and identify any environmental receptors and the potential degree of likely impairment from any identified or potential contamination. In addition, Isosceles has been tasked to assess the existing and proposed processes and operations, to determine if they are protective of human health and the environment and in compliance with applicable environmental law. This assessment typically included: identification of appropriate remedial alternatives and likely prevention initiatives and their approximate costs; a review and assessment of existing and potential workers' compensation issues; and the performance of an initial review and assessment of health and safety inherent risks pertaining to operations, processes, equipment, chemicals and materials used, physical condition of facility, etc., and the evaluation of the adequacy of existing systems to address them.

- **International Regulatory Protocols - Addressing Due Diligence.** The Isosceles Group (Isosceles) has also been retained by various multi-national corporations and organizations to develop protocols which delineate the requirements for permitting, development, and operation of manufacturing facilities worldwide. These protocols establish a formal procedure to ensure that the essential components of due diligence are incorporated into the acquisition divestiture, joint venture or lease. These protocols include provisions for EH&S and other functional line management accountability, responsibility and approvals for the various types and levels of transactions.

Principal Staff at The Isosceles Group

Mr. Stuart Sleeman
Principal
Tel: 617.330.2806
E-mail: ssleeman@theisogroup.com

Mr. Sleeman is a co-founder of The Isosceles Group and has over 25 years of experience in the development, implementation and evaluation of Environmental Health & Safety (EH&S) programs for multinational private sector clients in the US and in more than two dozen countries in Asia, Europe and the Americas. Mr. Sleeman has a broad range of experience in hazard and risk assessment, employee safety programs, workers' compensation management, industrial hygiene, training, regulatory analysis, and litigation support. Mr. Sleeman is currently responsible for Isosceles's Environmental Safety and Health Outsourcing and International Auditing Services.

Mr. Sleeman currently serves as Worldwide Safety & Health Manager for a large US-based multinational company and has global responsibility for the strategic development and implementation of corporate safety, industrial hygiene and workers' compensation programs; development and oversight of the corporation's global EH&S audit program; and development and implementation of EH&S training initiatives. These responsibilities extend to the oversight of 22 manufacturing and distribution facilities in 12 countries. The Environmental Safety and Health Outsourcing Services group has also successfully used benchmarking to identify management drivers and designed implementation processes for both manufacturing and non-manufacturing operations. The implementation of an outsourced facility EHS management program has resulted in an over 25% reduction in operating costs and focused the program to better meet corporate objectives.

Mr. Sleeman manages The Isosceles Group's International Auditing Services and has completed audits of operations in 55 countries utilizing both US-based and in-country personnel. He directed the implementation of a web-based EHS evaluation and knowledge transfer program covering 22 EHS disciplines and affecting over 1,500 international facilities.

Mr. Sleeman co-patented a unique technique for certification of businesses for international EHS standards and protocols, and was the Executive Vice President of an international energy products firm focused on low-carbon emission technology and the re-cycling of coal mining waste. In this position, Mr. Sleeman co-managed the acquisition of $25 million of working capital for this venture, and was also responsible for technology development that led to over a half dozen patents. He has a Bachelor of Engineering and a Master of Science in Safety from the University of New South Wales, Australia.

Mr. Richard G. DiNitto
Principal
Tel: 617.330.2807
E-mail: rdinitto@theisogroup.com

Mr. DiNitto is a co-founder of The Isosceles Group, and has over 30 years of environmental consulting and business operations experience with an emphasis on the design and implementation of environmental management systems for business and government. He currently manages the design and preparation of Auditing and Development Protocols, and is managing several technical projects.

Mr. DiNitto's business experience includes facility operation, Product Development, and the design and implementation of environmentally friendly process-improvement systems. Mr. DiNitto was formerly the CEO and COO of an international publicly-traded energy services firm, and held executive and senior positions at several other environmental consulting firms. He has successfully managed operations with multiple US and international facilities with annual revenues of up to $50 million.

Mr. DiNitto has performed and managed nearly 1000 individual site assessments and property evaluations, developed more than 30 international environmental regulatory compliance protocols, and has managed and technically directed more than two dozen multi-million dollar environmental site investigation and remediation projects. He has technical expertise in the fate and transport of Polychlorinated Biphenyl Compounds (PCBs) in the environment.

Mr. DiNitto has a Bachelor and a Masters of Science in Geology and Geophysics from Boston College, Boston, Massachusetts.

Ms. Margret Hanley LSP
Principal
Tel: 617.330.2803
E-mail: mhanley@theisogroup.com

Margret Hanley is a co-founder of The Isosceles Group and is an expert in the management of environmental issues affecting the development and use of real estate. Ms. Hanley has over 28 years of experience in the integration of environmental management programs and the sale, redevelopment, and use of industrial properties, and leads Isosceles's Due Diligence Evaluation and Asset Management Services.

Ms. Hanley provides strategic environmental management services, including Due Diligence Assessments in the US and internationally, the identification and remediation of legacy issues, and the development of environmental response costs and schedules for property valuation, SEC reporting, and negotiation with State and Federal Agencies.

Ms. Hanley is currently retained to address environmental issues during the acquisition, management and sale of real estate assets for several investment funds headquartered in Boston, Massachusetts. She has extensive experience in litigation-sensitive projects, and been invited to speak on issues related to the impact of environmental regulation on real estate development and risk management. Ms. Hanley has been involved with the management of Vapor Intrusion Conditions at existing properties and proposed developments located in Boston and Burlington, Massachusetts, and Charlotte, North Carolina.

Ms. Hanley was previously Corporate Vice President of a nationally recognized consulting and engineering firm specializing in Environmental and Geotechnical Engineering and Water Resources, where she managed division, branch, and corporate programs from offices located in Chicago, Illinois; and Boston, Massachusetts, and served on the Board of Directors. She is a Licensed Site Professional (LSP) in Massachusetts, and has a Bachelor of Science in Geology and Geophysics from Boston College in Boston, Massachusetts.

Mr. Richard McGrath
Principal
Tel: 978.779.6578
E-mail: mcgrath@theisogroup.com

Mr. McGrath joined The Isosceles Group as a Principal in 2003, and has over 35 years of broad-based experience in the management of multidisciplinary teams conducting projects in the environmental, health and safety fields. Mr. McGrath has extensive experience in large program management, with technical expertise in EH&S management systems, strategic environmental management, compliance planning and auditing, hazardous waste remediation, coastal ecology, environmental impact assessment, ecological risk assessment, biostatistics, and the management of contaminated sediments.

Mr. McGrath's training and experience include the technical and financial management of federal and private sector projects. He also has comprehensive knowledge and understanding of environmental legislation and regulations with particular expertise in the assessment and remediation of PCB-contaminated sediments. Mr. McGrath's experience in the management of projects to evaluate the impact of human activity on terrestrial and marine resources spans many years, and involves projects and programs on all three coasts and in other countries.

In the areas of environmental management and sustainability consulting, Mr. McGrath was responsible for the environmental management department of a major international corporation conducting EHS auditing, management systems consulting, and related multidisciplinary programs at facilities of multinational clients around the globe. He has worked directly as a consultant to the petrochemical and forest products industries in a variety of technical areas, including environmental management and contaminated sediments assessment/remediation.

Mr. McGrath has a B.A. Biology (Honors), Northeastern University, Boston, Massachusetts; was a National Science Foundation Fellow in 1971 at the University of Washington, Seattle; and has completed Graduate Study in Zoology at the University of New Hampshire, Durham.

Ms. Sandra Tiah
Senior Regulatory Analyst/Translator
Tel: 617.330.2802
E-mail: stiah@theisogroup.com

Ms. Tiah is Vice President of The Isosceles Group, and manages the production of Auditing and Facility Development Protocols for use at client facilities in 40 countries. This work entails detailed research on environmental and occupational, health and safety regulatory requirements, and coordination with international governmental and non-governmental contacts, as well as the management of Translation Services for foreign regulations and guidelines in languages such as Polish, Portuguese and Mandarin, among others.

Ms. Tiah joined the company as the Operations Manager in 2002, and was responsible for the implementation and management of administrative and financial systems. Prior to joining The Isosceles Group, Ms. Tiah held the position of Broker Recruitment Manager for the UK Division of an international insurance company, where she served as primary liaison between clients and consultants. Ms. Tiah has lived in several countries, has traveled extensively throughout Europe and Asia-Pacific, and is fluent in Spanish and French. Ms. Tiah holds a B.A. (Hons.) Degree in Spanish and Mathematics from the University of Dublin, Ireland (Trinity College).

Ms. Susan Ascheuer-Funke
Senior Regulatory Analyst
Tel: 781.534.2900
E-mail: saf@theisogroup.com

Susan Ascheuer-Funke joined Isosceles in October 2009 as a Senior Regulatory Analyst and translator.

Ms. Ascheuer-Funke has a legal background and is experienced in the management of international events, German contract law, and legal research.

At Isosceles, Ms. Ascheuer-Funke performs research on environmental and occupational, health and safety regulatory requirements, and coordinates contacts with international governments and non-governmental organizations. Ms. Ascheuer-Funke has participated in the preparation of international Auditing and Facility Development Protocols and regulatory tracking documents, and also provides translation services for foreign regulations and law in German.

Prior to joining Isosceles, Ms. Ascheuer-Funke was a Manager, and General Manger of Columbia Artists Management International, Ltd in Switzerland, where she managed the business operations and tours of orchestras and artists throughout Europe and Asia. She has a Degree in Law from Cologne University in Germany and is fluent in German and English, and competent in French.

Ms. Sharon Rose
Director of Management Systems
Tel: 570.407.1031
E-mail: srose@theisogroup.com

Sharon Rose joined Isosceles in March 2009 as the Director of Management Systems and Biologics, and currently develops and manages ISO and OHSAS management systems for clients in the Pharmaceutical Industry.

Prior to joining Isosceles, Sharon held numerous management positions at Sanofi Pasteur in Swiftwater PA, including Director of Safety, Director of Clinical Manufacturing and Biosafety, and Director of Clinical Supplies.

Ms Rose is a Registered Biosafety Professional with the American Biological Safety Association (ABSA), an expert in Manufacturing Management Systems, is Six Sigma Certified, and is a Certified Quality Auditor.

Sharon's background includes laboratory management at Merck, and the University of Scranton, where she was responsible for the management of all facility, personnel, and compliance issues. She also served as an adjunct professor at Lackawanna College, where she designed an Associate degree program in Biotechnology, which included the construction of laboratories, and the design and instruction of introductory courses. Ms. Rose has a Master of Science in Biotechnology Management from the University of Maryland, College Park, MD, and a Bachelor of Science in Biology (Magna Cum Laude) from Misericordia University, Dallas, PA.

Mr. Andrew Beliveau
Senior Associate
Tel: 617.696.4567
E-mail: abeliveau@theisogroup.com

Andrew Beliveau is an analytical chemist with over 40 years of experience in industry and government.

At Polaroid Corporation, Mr. Beliveau spent 18 years conducting analytical method development, and between 1984 and 1995, worked as a manager of a full service environmental analytical laboratory. In 1995, Mr. Beliveau joined EPA Region 1 as a Team Leader in the Quality Assurance Unit, where he reviewed and developed quality assurance project plans, and developed analytical methods for EPA Region 1 Superfund, RCRA, TOSCA, Tribal programs, and the Office of Ecosystem Protection. Mr. Beliveau has extensive laboratory auditing experience.

Mr. Beliveau is an expert in the identification and quantification of PCBs in environmental media; during his tenure at EPA, Mr. Beliveau was involved in many PCB investigations and remediation projects including the New Bedford Harbor, GE Housatonic River, Hudson River, Fletcher's Paint and Ototti and Goss Superfund sites, and the Hamilton Standard RCRA site. He was involved in several national work groups including the National PCB Risk Work Group, SW-846 Methods Work Group, and the National Regional Science Council as well as several other EPA/ORD work groups responsible for the development of new methods for the field analysis of PCBs and Dioxins. Mr. Beliveau was an original author and contributor to the National PCB Risk Guidance, was co-author of USEPA's guidance on Immunoassay analysis, sediment sampling and analysis, and has published numerous papers on PCB analytical methods.

After leaving EPA, Mr. Beliveau joined The Isosceles Group as a Senior Associate, and has provided services on a variety of environmental PCB projects such as the development of the "Applied Characterization Methods on PCBs in Groundwater and Subsurface Soil, Including Conceptual Model Scenarios, Analytical Techniques, and Data Use", and supporting and editing work with the Superfund Office of Science policy on the "Guidance for Assessing Human Health Risks from PCBs at Waste Sites."

Mr. Beliveau has recently provided expert services on behalf of USEPA, and has developed technical papers to support the US Department of Justice's case against proposed Responsible Parties. He is currently retained by independent laboratories to provide training and technical support. In addition to providing technical assistance to The Isosceles Group staff performing assessments and remediation of hazardous waste sites, he is involved in the evaluation of an environmentally friendly treatment technology for industrial and municipal waste streams.
Mr. Beliveau has a B.S. in Chemistry from Boston University, Boston, Massachusetts.

STORMWATER REPORT

NORTHBRIDGE MASHPEE COMMONS
58 GREAT NECK ROAD, SOUTH
MASHPEE, MASSACHUSETTS

SEPTEMBER 10, 2015

Prepared For:

The Northbridge Companies
71 Third Avenue
Burlington, MA 01803

BSC Job Number: 2-3216.00

Prepared by:

BSC GROUP

349 Route 28, Unit D
W. Yarmouth, Massachusetts
02673

TABLE OF CONTENTS

SECTION 1.0

PROJECT NARRATIVE

1.1 PROJECT DESCRIPTION

The Applicant is proposing to develop an assisted-living facility on a 3.65± acre undeveloped parcel of land in the Town of Mashpee. The project site is bounded by commercial land to the north and west, a wastewater treatment plant to the north, power lines to the south and east, and Great Neck Road South to the west. The site is completely wooded with the exception of an existing gravel access road, which provides access to the wastewater treatment plant. A sewer force main is buried beneath the access road, as well as a natural gas service.

The proposed project entails the construction of an assisted-living facility, paved access drive, parking areas, utilities and landscaping. Other site features include outdoor patios, two courtyards, walkways, and a service area.

1.2 PRE-DEVELOPMENT DRAINAGE CONDITIONS

The site topography consists of moderately sloping land, draining generally east to west across the property. A smaller portion of land drains from south to north. Steeper slopes exist in the northern and western portions of the site, while the southern and easterly areas are more gently sloping. A small portion of land in the western portion of the site drains to Great Neck Road South.

The NRCS Web Soil Survey has classified the soils underlying the project site as Carver coarse sand, belonging to Hydraulic Soil Group A. BSC conducted onsite soil testing on September 24, 2014. The soil testing confirmed the NRCS soil classification. Given that the site is undeveloped, and the nature of the underlying soils, stormwater runoff from the site is minimal.

1.3 POST-DEVELOPMENT DRAINAGE CONDITIONS

The project site has been designed to reduce the peak rate and volume of stormwater runoff in the post-development condition. Utilizing the MassDEP Stormwater Management Guidelines, BSC has designed drainage facilities that provide water quality treatment, groundwater recharge, and peak rate attenuation, and meet or exceed the requirements of the MassDEP Stormwater Management Standards and the Town of Mashpee Zoning Bylaws.

Stormwater runoff from all impervious areas of the site will be collected and pre-treated by the use of deep sump and hooded catch basins, storm drains, drain manholes, bioretention areas (raingardens), and proprietary treebox filter (Filterra® Bioretention Systems) units. Four (4) subsurface leaching chamber systems located throughout the site will groundwater recharge for pretreated stormwater. These systems have been designed utilizing StormTech MC-3500 polypropylene leaching chambers installed within a bed of crushed, angular stone.

Stormwater runoff collected from the building roof areas will be collected and routed through a total of four (4) roof drains to the bioretenion areas located around the site. Three (3) of the bioretention areas are equipped with area drains with a grate inlet raised 6 inches above the ground surface to capture stormwater overflows. Each raingarden will convey the overflow to one of the subsurface leaching systems described above for groundwater recharge. The largest of the bioretention areas is located in the northern portion of the site. In addition to attenuating and recharging roof water, this area will also accommodate stormwater from a small portion of the access drive and parking area located at the northeast corner of the building.

Specifics of the proposed stormwater management plan for the site are as follows:

Standard 1 - New Stormwater Conveyances

Per Massachusetts Stormwater Management Standard #1, no new outfalls may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth. There are no new stormwater conveyances proposed for this project.

Standard 2 - Stormwater Runoff Rates

The stormwater management system has been designed such that the post-development conditions result in a decrease in the peak runoff rates for the entire site. The reduction in peak runoff rates is achieved with the underground stormwater infiltration/detention proposed as part of the site development;

Table 1.1 – Peak Flow Rates Summary

	Existing Flows (cfs)	Proposed Flows (cfs)	Peak Runoff Decrease (cfs)
2-Year Storm	0	0	0
10-Year Storm	0.03	0.02	0.01
25-Year Storm	0.12	0.05	0.07
100-Year Storm	0.49	0.16	0.33

Standard 3 – Groundwater Recharge

In accordance with Massachusetts Stormwater Management Standard #3, the groundwater recharge requirements for a site are determined, as follows:

$R_v = F \times$ *Impervious Area*

R_v = *Required Recharge Volume* (ft^3)
F = Target Depth Factor (0.1 inches for hydrologic soil group D)
Impervious Area = Pavement and rooftop area on site

Table 1.2 – Recharge Target Depth by Hydrologic Soil Group

NRCS HYDROLOGIC SOIL TYPE	APPROX. SOIL TEXTURE	TARGET DEPTH FACTOR (F)
A	sand	0.6-inch
B	loam	0.35-inch
C	silty loam	0.25-inch
D	clay	0.1-inch

The Natural Resources Conservation Service (NRCS) classified the soils underlying the project site as Carver coarse sand (252C) and Carver loamy coarse sand (259B). Both of these soil types are classified as belonging to Hydrologic Soil Group A.

A Certified MassDEP Soil Evaluator performed six deep-hole test pits in September 2014. As shown in the soil logs in the Soil Evaluation Forms (see Appendix), the parent material, Glacial Till, is defined as a glacial surface deposit of loose, permeable, somewhat stratified, sandy, and stony till overlying denser till, is consistent with the NRCS Soil Survey Report findings, in addition to the limitations associated with the site and the soils. Based on the test pit soil classification, which confirmed the NRCS soil classification, Hydrologic Soil Group A (sand) has been used in the drainage calculations for the entire site.

Based on the above, the following table summarizes the prescribed stormwater runoff volume required to be recharged to the groundwater for this project.

Hydrologic Group	Proposed Impervious Area	Inches of Recharge Required	Total Prescribed Stormwater Runoff Volume to Recharge
A	2.22 acres	0.60	0.111 acre-feet
B	0	0.35	0
C	0	0.25	0
D	0	0.1	0
Totals	**2.22 acres**	**-**	**0.111 acre-feet (4,836 cubic feet)**

To meet the prescribed stormwater runoff volume to be recharged to the groundwater, the Project proposes the construction of several infiltration systems throughout the site. Compliance with this Standard has been determined in accordance with the *Static* Method as outlined in the Massachusetts Stormwater Handbook.

Infiltration System #1

	Elevation	Surface Area	Void Ratio	Volume
Top of Stone Bedding	50.75	2,532 ft^2		
			0.40	759 ft^3
Bottom of Stone Bedding	50.00	2,532 ft^2		

Infiltration System #2

	Elevation	Surface Area	Void Ratio	Volume
Top of Stone Bedding	52.25	1,459 ft^2		
			0.40	437 ft^3
Bottom of Stone Bedding	51.50	1,459 ft^2		

Infiltration System #3				
	Elevation	Surface Area	Void Ratio	Volume
Top of Stone Bedding	53.25	457 ft^2		
			0.40	137 ft^3
Bottom of Stone Bedding	52.50	457 ft^2		

Infiltration System #4				
	Elevation	Surface Area	Void Ratio	Volume
Top of Stone Bedding	50.75	983 ft^2		
			0.40	294 ft^3
Bottom of Stone Bedding	50.00	983 ft^2		

Drawdown Time

The following formula must be used to demonstrate that each proposed infiltration BMP will drain within 72 hours:

$$Time_{drawdown} = \frac{R_v}{(K)(Bottom\ Area)}$$

R_v = Storage Volume (Required Recharge Volume)
K = Saturated Hydraulic Conductivity For "Static" and "Simple Dynamic" Methods, use Rawls Rate
Bottom Area = Bottom Area of Recharge Structure

$$Time_{drawdown} = \frac{4{,}836\ ft^3}{(8.27\ in/hr)(1\ ft/12\ in)(5{,}431\ ft^2)}$$

$$Time_{drawdown} = 1.29\ hours$$

Standard 4 – Water Quality

The stormwater management systems have been designed to provide treatment for stormwater runoff from all proposed impervious surfaces. Sizing calculations for the Filterra® systems are included in the Additional Drainage Calculations section of this report.

$$V_{WQ} = (D_{WQ}/12\ inches/foot) \times (A_{imp} \times 43{,}560\ ft^2/acre)$$

V_{WQ} = *Required Water Quality Volume (ft^3)*
D_{WQ} = *Water Quality Depth (1 inch)*
A_{imp} = *Impervious Area (acres)*

Bioretention Area #1

V_{WQ} = *(1.0 inches/12 inches/ft) x (19,088 ft^2)*
V_{WQ} = *1,591 ft^3*

Bioretention Area #2

V_{WQ} = *(1.0 inches/12 inches/ft) x (19,340 ft^2)*
V_{WQ} = *1,612 ft^3*

Bioretention Area #3

V_{WQ} = *(1.0 inches/12 inches/ft) x (8,991 ft^2)*
V_{WQ} = *750 ft^3*

Bioretention Area #4

V_{WQ} = *(1.0 inches/12 inches/ft) x (36,155 ft^2)*
V_{WQ} = *3,013 ft^3*

The proposed stormwater management systems have been designed to meet Standard #4 for the removal of a minimum of 80% Total Suspended Solids (TSS). This is achieved through implementation of the following Best Management Practices (BMPs):

- Deep sump & hooded catch basins
- Bioretention areas
- Tree box filters
- Subsurface leaching systems

Standard 5 – Land Uses With Higher Potential Pollutant Loads (LUHPPL)

The project entails the development of an assisted-living facility, and is not a land use with higher potential pollutant loads.

Standard 6 – Stormwater Discharges to a Critical Area

The project is not subject to Standard 6. There are no discharges to any Critical Area, as defined by the Massachusetts Stormwater Handbook.

Standard 7 – Redevelopment Projects

This project entails new construction and is not considered to be a redevelopment project.

Standard 8 – Erosion and Sedimentation Control Plan

An Erosion and Sedimentation Control Plan is included within the plan set along with a narrative in Section 4.0 of this Report.

Standard 9 – Long Term Operation and Maintenance Plan

A long-term operation and maintenance plan is included in Section 3.0 of this Report.

Standard 10 – Illicit Discharges to the Stormwater Management System are Prohibited

There will be no illicit discharges to any of the proposed stormwater management systems onsite.

CONCLUSIONS

The project has been designed to meet, and in some cases exceed, the requirements of the MassDEP Stormwater Management Standards and the Town of Mashpee Zoning Bylaws. Through the incorporation of the BMPs described above, the project will provide an overall reduction in the peak rates of runoff, a minimum 80% TSS removal and groundwater recharge. The proposed stormwater management systems have been designed for the 2-year, 10-year, 25-year and 100-year storm events. Each design scenario was modeled utilizing HydroCAD® Version 10.0 modeling software.

SECTION 2.0

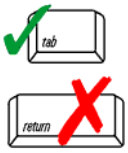
MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION CHECKLIST FOR STORMWATER REPORT

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

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

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

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

---

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

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

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

Signature and Date 9/10/15

Checklist

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

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☒ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☒ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

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

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☒ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☒ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☒ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

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

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☒ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

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

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

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

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

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

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

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ An Illicit Discharge Compliance Statement is attached;

☒ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

SECTION 3.0

LONG-TERM POLLUTION PREVENTION PLAN & OPERATION AND MAINTENANCE PLAN

3.0 LONG-TERM POLLUTION PREVENTION & OPERATION AND MAINTENANCE PLAN

As required by Standard 4 and Standard 9 of the Massachusetts Stormwater Handbook, this Long-Term Pollution Prevention Plan has been developed for source control and pollution prevention at the site after construction.

MAINTENANCE RESPONSIBILITY

The enforcement of the Long-Term Operation and Maintenance Plan will be the responsibility of the owner of the property.

GOOD HOUSEKEEPING PRACTICES

The site is to be kept clean of trash and debris at all times. Trash, junk, etc. is not to be left outside and will be subject to removal at the owner's expense.

REQUIREMENTS FOR ROUTINE INSPECTIONS AND MAINTENANCE OF STORMWATER BEST MANAGEMENT PRACTICES

All stormwater Best Management Practices (BMPs) are to be inspected and maintained as follows:

FILTERRA® BIORETENTION SYSTEMS

Maintenance of the bioretention systems should be done a minimum of twice annually. The procedure consists of the following steps:

1. Visually inspect the tree box and surrounding area to ensure that there is no standing water or damage to the box structure or grate, and that the bypass is clear of debris or other obstructions.

2. Remove the cast iron grate and erosion control stones for access. Dig out any silt and/or mulch and remove trash and other foreign items.

3. After removal of mulch and debris, measure distance from the top of the Filterra® engineered media soil to the bottom of the top slab. If this distance is greater than 12 inches, add Filterra® media until the distance to the bottom of the top slab is 9 inches.

4. Add mulch (see manufacturer specifications) evenly across the entire unit to a depth of 3 inches. Replace erosion control stones by the inlet to allow for entry of trash during a storm event. Replace grates correctly, taking care not to damage the plant.

5. Examine the plant's health and replace if dead or diseased. Prune as necessary to encourage growth in the desired directions.

6. Clean area around unit and remove dispose of all refuse appropriately.

DEEP SUMP & HOODED CATCH BASINS

Regular maintenance is essential. Deep sump catch basins remain effective at removing pollutants only if they are cleaned out frequently. Inspect or clean deep sump basins at least four times per year and at the end of the foliage and snow removal seasons. Sediment must also be removed four (4) times per year or whenever the depth of the deposits in the catch basin sump is greater than or equal to one (1) foot from the bottom of the basin.

STORMTECH® INFILTRATION SYSTEMS

Maintenance is required for the proper operation of the subsurface infiltration systems. Infiltration systems are prone to failure due to clogging if the upstream stormwater pretreatment BMP is not maintained. The proper use and maintenance of pretreatment BMPs will minimize failure and maintenance requirements.

Following construction, the infiltration systems should be inspected after every major storm for the first few months to ensure proper stabilization and function. Water levels in the access ports should be recorded over several days to ensure the drainage of the systems. It is recommended that a log book be maintained showing the depth of water in the infiltration system at each observation port in order to determine the rate at which the system dewaters after runoff producing storm events. Once the performance characteristics of the infiltration system have been verified, the monitoring schedule can be reduced to an annual basis, unless the performance data suggests that a more frequent schedule is required.

Preventive maintenance on the infiltration systems should be performed at least twice a year, and sediment should be removed from any and all pretreatment and collection structures. Sediment should be removed when deposits approach within six inches of the invert heights of connecting pipes between unit rows, or in the sump of any inlet structure. Removal of sediment should be performed by a vacuum truck.

BIORETENTION AREAS (RAIN GARDENS)

Raingardens should be watered often in the first two years and especially during hot and dry spells to ensure plant growth and survival. Once vegetation has been adequately established, watering may only be necessary during prolonged periods without rainfall. In the first few months following construction, the raingarden should be inspected after rainfall events. Add or replace vegetation in any eroded areas.

The following steps should be performed monthly:

- Prune and weed;
- Remove accumulated trash and debris;
- Replace mulch as needed.

The following steps should be performed semi-annually during the first year and may be reduced to annually thereafter:

- Inspect inflow area for sediment accumulation. Remove as necessary;
- Add or replace vegetation in any eroded areas;
- Inspect raingarden for dead or dying vegetation and replace as needed;
- Test planting bed for pH. If the pH is below 5.2, limestone should be applied. If the pH is above 8.0, iron sulfate and sulfur should be applied;
- Remove and replace mulch every 2 to 3 years.

PIPE OUTLET PROTECTION

The outlet protection should be checked at least annually and after every major storm. If the riprap has been displaced, undermined or damaged, it should be repaired immediately. The channel immediately below the outlet should be checked to see that erosion is not occurring. The downstream channel should be kept clear of obstructions such as fallen trees, debris, and sediment that could change flow patterns and/or tailwater depths on the pipes. Repairs must be carried out immediately to avoid additional damage to the outlet protection apron.

LEVEL SPREADERS / STONE APRONS

Level Spreaders, like any other Best Management Practice (BMP) do require regular maintenance. Maintenance concerns include cleaning debris that may accumulate immediately up sloe of the level spreader. This prevents long term clogging. Debris can also gather immediately down slope of the level spreader causing localized damming, forcing the level spreader to have concentrated flow. These outlets should be checked and cleared of debris a minimum of two times per year. In addition, level spreaders must be occasionally checked to make sure they are still level. This can often be done with a simple visual inspection, immediately after a large precipitation event, to ensure the flow is evenly spread.

PROVISIONS FOR MAINTENANCE OF LAWNS, GARDENS AND OTHER LANDSCAPE AREAS

1.0 Level of Maintenance Required

All site areas are to be well maintained at all times. The most visible landscape areas require the highest level of landscape maintenance and should receive constant attention. The less visible and/or less formal areas of the site require a slightly lower level of landscape maintenance.

The areas requiring slightly lower landscape maintenance are not to acquire an un-kept appearance. They need to be kept neat and well maintained. The lower required maintenance level simply means that the maintenance of these areas is less labor intensive due to the type of plant materials, the informal planting concept, the level of visibility, and/or the environmental conditions.

2.0 Maintenance Operations & Schedules

More specific information regarding the Maintenance Operations is organized by landscape feature. There is a section for Trees & Shrubs; Planting Beds; Turf Areas; Rain Gardens, Vegetated Filter Strips, and Groundcovers / Annuals & Perennials. These sections explain the Landscape Maintenance Operation for the specific landscape features throughout all the Landscape Maintenance Zones.

3.0 Qualifications of the Landscape Maintenance Contractor

The Landscape Maintenance Contractor shall be experienced in all aspects of landscape installation and maintenance. A minimum of five years' experience in Landscape Maintenance is required. The Landscape Maintenance Contractor shall furnish the names of at least five current or previous Landscape Maintenance Clients along with a description of the size of the site and the nature and duration of the services provided.

The Landscape Maintenance Contractor shall have on staff or list current qualified sub consultants (sub consultant shall be a person or firm the contractor has worked with within the last five years, sub consultant references must be supplied) in the following fields: a licensed Arborist, a Turf Specialist, and a Pesticide Applicator.

All applicable licenses required for the performance of the maintenance activities shall be current. All Landscape Maintenance personnel shall be qualified and able to perform to the standards stated in this guideline.

4.0 Performance Standards

A Landscape Maintenance Supervisor with overall responsibility for all daily operations shall be designated. This Supervisor shall be on site at all times during Landscape Maintenance operations and shall remain on site until all Landscape Maintenance crews have left the site. The Supervisor is responsible for any necessary coordination with the University. The University shall be immediately informed if a new Landscape Maintenance Supervisor is designated on a permanent or temporary basis.

All work outlined in this Guideline shall be performed under the appropriate environmental conditions for the specific work task.

Work requiring a license shall be directly supervised or actually performed by the individual holding the applicable license.

The contractor shall perform any incidental work which constitutes good Landscape Maintenance (example: planting of replacement plant material) that will contribute to the health and appearance of the landscape. This work is to be included even if not specifically stated in these guidelines.

Plant material inspections shall be performed monthly by the Landscape Maintenance Contractor. In particular an inspection shall be performed immediately following severe wind, rain, or ice conditions. Plant materials severely damaged in a winter storm shall be scheduled for spring replacement.

5.0 Safety Issues

Safety of people and protection of property is critical. The landscape maintenance work shall be performed in such a manner as to not jeopardize either.

At no time shall the landscape maintenance activities obstruct entry to any building. Maintenance activities near building entrances shall be coordinated with appropriate site manager.

When applying pesticides other safety measures may be required (respirators, special clothing, etc.) Providing the proper safety measures, for the landscape maintenance crews, will be the responsibility of the Landscape Maintenance Contractor.

6.0 Maintenance Operations

A. Trees and Shrubs

Disease and Pest Management - Prevention of disease or infestation is the first step of pest management. A plant that is in overall good health is far less susceptible to disease. Good general landscape maintenance can reduce problems from disease.

Inspections of plant materials for signs of disease or infestation are to be performed monthly by the Landscape Maintenance Contractor's Certified Arborist. This is a critical step for early diagnosis. Trees and shrubs that have been diagnosed to have a plant disease or an infestation of insect pests are to be treated promptly with an appropriate material by a licensed applicator.

Fertilization - Trees and shrubs live outside their natural environment and should be given proper care to maintain health and vigor. Fertilizing trees and shrubs provides the plants with nutrients needed to resist insect attack, to resist drought and to grow thicker foliage. Fertilizing of new and old trees may be done in one of three ways, in either the early spring or the late fall.

- Systemic Injection of new and existing trees on trees 2-inches or greater in diameter. You must be licensed to apply this method.

- Soil Injection – a liquid fertilizer with a product such as Arbor Green or Rapid Grow injected into the soil under the drip zone of a tree or shrub. Material must be used according to manufacturers' specifications to be effective. Outside contracting is recommended.

- Punch Bar Method – a dry fertilizer such as 10-10-10, may be used by punched holes in the drip zone of the tree 12 to 18-inches deep, two feet apart around the circumference, to the edge of the drip line. Three pounds of fertilizer should be used per diameter inch for trees with trunks six inches or more in diameter.
- Fertilizer of shrubs – use a fertilizer such as 10-10-10, broadcast over the planting area according to the manufacturers' rate and water in.

- All fertilization must be noted on daily maintenance log.

Watering - Trees and shrubs will need supplemental watering to remain in vigorous health. All new plants need to be watered once a week in cool weather, twice a week during warm weather, and up to three times in a week during periods of extreme heat and drought. Trees and shrubs should be watered in such a manner as to totally saturate the soil in the root zone area. Over-watering or constant saturation of the soil must be avoided as this could lead to root rot and other disease problems. The use of a soil moisture meter can help you monitor the soil's water intake.

Plant Replacement - Unhealthy plants that may cause widespread infestation of other nearby plants shall be immediately removed from the site. Any vegetation removed from the site must be

recorded and submitted with the daily maintenance log. The area shall be treated to prevent further infestation. The plant shall then be replaced with a healthy specimen of the same species and size. A spring inspection of all plant materials shall be performed to identify those plant materials that are not in vigorously healthy condition. Unhealthy plant materials shall be evaluated. If the problem is determined to be minor the plant material shall be given appropriate restorative care in accordance with this maintenance guideline until it is restored to a vigorously healthy condition. Unhealthy plant materials that do not respond to restorative care or are determined to be beyond saving shall be replaced with a healthy specimen of the same species and size. In the case of the necessity of replacing extremely large plant materials the Landscape Architect and the University shall determine the size of the replacement plant.

Pruning - Proper pruning is the selective removal of branches without changing the plant's natural appearance, or habit of growth. All tree pruning is to be performed by a licensed Arborist. All branches that are dead, broken, scared or crossing should be removed. All cuts should be made at the collar and not cut flush with the base. Pruning shall be done for the following purposes;

- To maintain or reduce the size of a tree or shrub
- To remove dead, diseased or damaged branches
- To rejuvenate old shrubs and encourage new growth
- To stimulate future flower and fruit development
- To maximize the visibility of twig color
- To prevent damage and reduce hazards to people and properties
  All shrubs are to be pruned on an annual basis to prevent the shrub from becoming overgrown and eliminate the need for drastic pruning. There are several types of pruning for deciduous shrubs. Hand snips should be used to maintain a more natural look or hand shears can be used for a more formal appearance.

Winter Protection - All trees and shrubs are to be watered, fertilized, and mulched before the first frost. All stakes should be checked and ties adjusted. Damaged branches should be pruned.

Broadleaf and Coniferous Evergreen plant materials are to be sprayed with an anti-desiccant product to prevent winter burn. The application shall be repeated during a suitable mid-winter thaw.
Shrubs located in areas likely to be piled with snow during snow removal (but not designated as Snow Storage Areas) shall be marked by six-foot high poles with bright green banner flags. These areas are to be reviewed with the University. Stockpiles of snow are not to be located in these areas due to potential damage to the plant materials from both the weight of the snow and the snow melting chemicals.

Seasonal Clean Up - A thorough spring cleanup is to be performed. This includes the removal and replacement of dead or unhealthy plant materials and the cleanup of plant debris and any general debris that has accumulated over the winter season.
Mulch is to be lightly raked to clean debris from the surface without removing any mulch. Twigs and debris are to be removed from the planting beds throughout the growing season.

Mulching - Planting beds shall be mulched with treated shredded hardwood mulch free from dirt, debris, and insects. A sample of this mulch shall be given to the University for approval prior to installation.

Maintain a 2 to 3-inches maximum depth and keep free of weeds either by hand weeding or by the use of a pre-emergent weed control such as Treflan or Serfian. Seasonal re-mulching shall occur as necessary in the spring and the fall to maintain this minimum depth. When new mulch is added to the planting bed it shall be spread to create a total depth of no more than three inches. Edges should be maintained in a cleanly edged fashion.
Mulch shall not be placed directly against the trunk of any tree or shrub.

B. Groundcover and Perennials

Disease and Pest Management – Pesticides and herbicides should be applied only as problems occur, with the proper chemical applied only by a trained professional or in the case of pesticide, a Certified Pesticide Applicator. Plants should be monitored weekly and treated accordingly.

Fertilizer – The health of the plants can be maintained or improved, and their growth encouraged by an application of complete fertilizer. Apply a fertilizer such as 4-12-4 as growth becomes apparent and before mulching. Apply to all groundcover and perennial planting areas by hand and avoid letting the fertilizer come in contact with the foliage, or use a liquid fertilizer and apply by soaking the soil. Apply according to the manufacturers' specifications. Fertilization shall stop at the end of July.

Water – Groundcovers and Perennials will need supplemental watering in order to become established, healthy plants. All new plants need to be watered once a week in cool weather, twice a week during warm weather, and up to three times in a week during periods of extreme heat and drought. Until established, groundcovers and perennials should be watered in such a manner as to totally saturate the soil in the root zone area, to a depth of 6-inches. Once established, perennials shall continue to be watered as necessary to maintain them in a vigorous healthy condition. Over-watering or constant saturation of the soil must be avoided as this could lead to root rot and other disease problems. The use of a soil moisture meter can help you monitor the soil's water intake.
On-site water shall be furnished by the University. Hose and other watering equipment shall be furnished by the Landscape Maintenance Contractor.

Replacement – Any unhealthy plant/s that may cause widespread infestation of other nearby plants shall be immediately removed from the site. Any vegetation removed from the site must be recorded and submitted with the landscape maintenance log. The area shall be treated to prevent further infestation. The plant/s shall then be replaced with healthy specimen/s of the same species and size.

Deadheading – Perennials shall be checked on a weekly basis and dead-headed once flowers have faded or as necessary based on plant type and duration of flower. Spent flowers can be pinched off with the thumb and forefinger. Continue to remove all faded flowers until Fall. All associated debris shall be removed from site daily.

Staking – Upright-growing perennials need support especially when in flower. Use of bamboo stakes, galvanized wire hoops or mesh may be necessary for their support. Supports should be put in place before they have become too difficult to handle. The supports should not be taller than the mature height of the perennial plant.

Division of Perennials – Two or three year-old perennials are easily divided in the spring if more plants are needed. To divide, cut out the entire section of plant to be divided, including roots. The larger divisions (those with three or more shoots) can be set out immediately in their permanent location, where they can be expected to bloom the same season. Smaller divisions are best planted in an out-of-the-way planting bed until the following autumn or spring, when they can be moved to their permanent location.

Weeding – All planting beds should be kept weed-free. Weed either by hand or with a pre-emergent herbicide such as Treflan used according to manufacturers' specifications. Manual weeding is to be used in combination with the use of spot applications of herbicides. Both live and dead weeds are to be pulled and removed from the site.
All herbicide applications shall be documented in the Landscape Maintenance Log. The actual product label or the manufacturers product specification sheet for the specific product shall also be included in the Log.
Only personnel with appropriate applicator licenses shall supervise and/or perform the application of pesticide products requiring a license.

Winterizing – Perennial gardens should be cleaned-up when growth ceases in the fall. Remove foliage of plants that normally die down to the ground. Divide and replant over-grown clumps.

C. Lawn Areas – Turf Systems

Mowing – Proper mowing is an integral part of any good turf maintenance program. Without it, fertilization, watering and other vital maintenance practices would be completely ineffective. Proper mowing will help control dicot weeds; help the turf survive during periods of extreme heat, and gain strength and vigor to resist disease and other infestations.

1. Mowing height – The proper mowing height will vary somewhat according to the type of grass. The most common type of seed & sod lawns contain a mixture of bluegrass, fine fescue and perennial rye, which should be mowed at 2 to 3-inches.

2. Mowing frequency – The basic rule of thumb for mowing frequency is to never remove more than 1/3 of the grass blade in one mowing. Example: if you want to mow your turf at 2-inches, you should cut it when it reaches 3-inches. Removing more than ½ of the grass plant at a time can put the plant into shock, thus making it more susceptible to stress, disease and weed infestation.

Mowing frequency will vary with the growing season and should be set by the plant height and not a set date. It will often be necessary to mow twice a week during periods of surge growth to help maintain plant health and color. Mowing should be cut back during periods of stress.

Grass clippings should be removed whenever they are thick enough to layer the turf. The return of clippings to the soil actually adds nutrients and helps retain moisture. Heavily clumped grass clippings are a sign of infrequent moving, calling for an adjustment in the mowing schedule.

When mowing any area, try to alternate mowing patterns. This tends to keep grass blades more erect and assures an even cut. A dull mower will cause color loss due to tearing of the turf plant,

and since mowing will ultimately determine the appearance of any turf area there is an absolute necessity for a clean sharp cut.

Weed & Pest Control and Fertilizing- In order to maintain turf grass health, vigor and color, nutrients, by way of fertilizer, must be added to the soil. Recommendations for fertilization of lawn areas are as follows; fertilize at the rate of one (1) pound of nitrogen per thousand square feet, per year is optimum. Fertilizer should be a balanced slow release, sulfur coated type fertilizer.

- **Weed Control** - All turf areas will require some weed control, for both weed grasses and dicot weeds. Weeds should be treated at the appropriate time and with a material labeled for the target weed. Please refer to the fertilizer weed and pest schedule for timing.

- **Pest Control** - All turf areas will require some pest control. Pests should be treated at the appropriate time with a material labeled for the target pest. Please refer to the fertilizer, weed and pest schedule for timing.

- **Lime -** A common cause for an unhealthy lawn is acidic soil. When the PH is below the neutral range (between 6-7) vital plant nutrients become fixed in the soil and cannot be absorbed by the grass plant. Lime corrects an acid soil condition, supplies calcium for plant growth and improves air and water circulation. Limestone applied at the rate of 50 lbs. per thousand square feet will adjust the soil PH one point over a period of 6-9 months.

D. Maintenance Schedules

Fertilizer, Weed & Pest Control Schedule – Turf Systems

Spring (April)	Fertilize one (1) pound of nitrogen per 1,000 square feet Pre-emergent weed grass control Broadleaf weed control
Late Spring (June)	Fertilize one (1) pound of nitrogen per 1,000 square feet Pre-emergent weed grass control Broadleaf weed control Insect Control (if needed)
Summer* (August)	Fertilize one (1) pound of nitrogen per 1,000 square feet Broadleaf weed control (if needed) Insect Control (if needed)
Fall (September)	Fertilize one (1) pound of nitrogen per 1,000 square feet

* Omit if area is not to be irrigated

Lawn Maintenance Task Schedule

MARCH (Weather permitting)

- Clean up winter debris, sand, leaves, trash etc.
- Re-edge mulch beds, maintain at 2-3" maximum.
- Fertilize plants
- Aerate and thatch turf (conditions permitting)

APRIL

- Reseed or sod all areas needing attention.
- Fertilize and weed control
- Lime
- Start mowing when grass reaches 2-1/2", mow to 2"

MAY

- Mow turf to 2-2-1/2"
- Weed as necessary.
- Check for disease and pest problems in both turf and plants.

JUNE

- Mow turf to 2-1/2" – 3"
- Fertilize and weed control.
- Weed
- Check for disease and pest problems in both turf and plants, treat as necessary.

SNOW DISPOSAL AND PLOWING

The purpose of the snow and snowmelt management plan is to provide guidelines regarding snow disposal site selection, site preparation and maintenance that are acceptable to the Department of Environmental Protection, Bureau of Resource Protection.

For the areas that require snow removal, snow storage onsite will largely be accomplished by using pervious upland areas away from paved areas for smaller storms. There are adequate snow storage areas located within parking lot islands and edges of paved areas away from the wetland resource areas for small, more frequent snowfall events. For larger snowfall events or for additional snow storage space, snowfall will be required to be hauled offsite to a snow stockpile area meeting DEP requirements.

The key to selecting effective snow disposal sites is to locate them adjacent to or on pervious surfaces in upland areas away from water resources. At these locations, the snow melt water can filter in to the soil, leaving behind sand and debris, which can be removed in the springtime. The following areas should be avoided:

- Avoid dumping of snow into any water body, including rivers, ponds, or wetlands. In addition to water quality impacts and flooding, snow disposed of in open water can cause navigational hazards when it freezes into ice blocks.

- Avoid disposing of snow on top of storm drain catch basins or in stormwater drainage swales or ditches. Snow combined with sand and debris may block a storm drainage system, causing localized flooding. A high volume of sand, sediment, and litter released from melting snow also may be quickly transported through the system into surface water.

WINTER ROAD SALT AND/OR SAND USE AND STORAGE RESTRICTIONS

Road salt and sand is prohibited from being stored onsite.

STREET SWEEPING SCHEDULES

Effective sweeping requires access to the areas to be swept. It is essential that applicants or those responsible for stormwater maintenance have the ability to impose parking regulations to facilitate proper sweeping, particularly in densely populated or heavily traveled areas, so that sweepers can get as close to curbs as possible. Tenants are to be notified prior to street sweeping operations so that paved areas can be clear of vehicles and any other items.

There are three types of sweepers: Mechanical, Regenerative Air, and Vacuum Filter. Each has a different ability to remove TSS.

1. Mechanical: Mechanical sweepers use brooms or rotary brushes to scour the pavement. Although most of the sweepers currently in use in Massachusetts are mechanical sweepers, they are not effective at removing TSS (from 0% to 20% removal). Mechanical sweepers are especially ineffective at picking up fine particles ("fines") (less than 100 microns).

2. Regenerative Air: These sweepers blow air onto the road or parking lot surface, causing fines to rise where they are vacuumed. Regenerative air sweepers may blow fines off the vacuumed portion of the roadway or parking lot, where they contaminate stormwater when it rains.

3. Vacuum filter: These sweepers remove fines along roads. Two general types of vacuum filter sweepers are available - wet and dry. The dry type uses a broom in combination with the vacuum. The wet type uses water for dust suppression. Research indicates vacuum sweepers are highly effective in removing TSS.

Regardless of the type chosen, the efficiency of street sweeping is increased when sweepers are operated in tandem. The following table summarizes the frequency of the site street sweeping based on the type of sweeper used.

High Efficiency Vacuum Sweeper	Regenerative Air Sweeper	Mechanical Sweeper (Rotary Broom)
Quarterly average, with sweeping scheduled primarily in Spring and Fall	Quarterly average, with sweeping scheduled primarily in Spring and Fall	Monthly average, with sweeping scheduled primarily in Spring and Fall

REUSE AND DISPOSAL OF STREET SWEEPINGS

Once removed from paved surfaces, the sweepings must be handled and disposed of properly. Mass DEP's Bureau of Waste Prevention has issued a written policy regarding the reuse and disposal of street sweepings. These sweepings are regulated as a solid waste, and can be used in three ways:

- In one of the ways already approved by MassDEP (e.g., daily cover in a landfill, additive to compost, fill in a public way)
- If approved under a Beneficial Use Determination
- Disposed in a landfill

TRAINING OF STAFF OR PERSONNEL INVOLVED WITH IMPLEMENTING LONG-TERM POLLUTION PREVENTION PLAN

The Long-Term Pollution Prevention Plan is to be implemented by property owner of the site. Trained and, if required, licensed Professionals are to be hired by the owner as applicable to implement the Long-Term Pollution Prevention Plan.

LIST OF EMERGENCY CONTACTS FOR IMPLEMENTING LONG-TERM POLLUTION PREVENTION PLAN

The Owner will be required to maintain an updated list of Emergency Contacts for the site.

POST CONSTRUCTION PHASE INSPECTION SCHEDULE AND EVALUATION CHECKLIST

BMP	Inspection Schedule	Inspection Performed Date:	By:	Method	Notes / Remarks
Catch Basins	March			Visually inspect quarterly. Clean when sediment exceeds 50% of the depth using clam shell or vacuum sump.	
	June				
	September				
	December				
Filterra® Bioretention Systems	March			Inspect quarterly during initial year following installation. Reduce to semi-annual inspections after first year. Remove sediment by hand or vacuum sump.	
	June				
	September				
	December				
StormTech® Infiltration Systems	March			Monitor water level in the access ports for the first three (3) months after construction. Inspect inlets semi-annually. Remove debris that may clog the system.	
	September				
Bioretention Areas (Raingardens)	June			Inspect to ensure that the vegetation is adequate. Inspect side slopes for rills or gulleys for three (3) months after construction and planting. Remove trash, sediment & dead vegetation as necessary, prune & replace vegetation as needed. Mow wet swale annually, if needed.	
	September				

1. Refer to the Massachusetts Stormwater Handbook Volume Two: Stormwater Technical Handbook (February 2008) for recommendations regarding frequency for inspections and maintenance of specific BMP's
2. Inspections to be conducted by a qualified professional such as an environmental scientist or civil engineer.
3. The use of sodium chloride salts, fertilizers or pesticides is prohibited on this site.

Other Notes: (Include deviations from Conservation Commission Orders of Conditions, Planning Board Approvals and Approved Plans)

SECTION 4.0

CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL PLAN (STORM WATER POLLUTION PREVENTION PLAN - SWPPP)

4.0 CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL PLAN (STORM WATER POLLUTION PREVENTION PLAN)

This Section specifies requirements and suggestions for implementation of a Storm Water Pollution Prevention Plan (SWPPP) for the development of the **Northbridge Mashpee Commons** facility on Great Neck Road South in Mashpee, Massachusetts. The SWPPP shall be provided and maintained on-site by the Contractor(s) during all construction activities. The SWPPP shall be updated as required to reflect changes to construction activity.

The storm water pollution prevention measures contained in the SWPPP shall be at least the minimum required by Local Regulations. The Contractor shall provide additional measures to prevent pollution from stormwater discharges in compliance with the National Pollution Discharge Elimination System (NPDES) Phase II permit requirements and all other local, state and federal requirements.

The SWPPP shall include provisions for, but not be limited to, the following:

1. Construction Trailers
2. Lay-down Areas
3. Equipment Storage Areas
4. Stockpile Areas
5. Disturbed Areas

The Contractor shall NOT begin construction without submitting evidence that a NPDES Notice of Intent (NOI) governing the discharge of storm water from the construction site for the entire construction period has been filed at least seven days prior to construction. It is the Contractor's responsibility to complete and file the NOI.

The cost of any fines, construction delays and remedial actions resulting from the Contractor's failure to comply with all provisions of local regulations and Federal NPDES permit requirements shall be paid for by the Contractor at no additional cost to the Owner.

As a requirement of the EPA's NPDES permitting program, each Contractor and Subcontractor responsible for implementing and maintaining stormwater Best Management Practices shall execute a Contractor's Certification form.

4.1 EROSION AND SEDIMENTATION CONTROL

The Contractor shall be solely responsible for erosion and sedimentation control at the site. The Contractor shall utilize a system of operations and all necessary erosion and sedimentation control measures, even if not specified herein or elsewhere, to minimize erosion damage at the site to prevent the migration of sediment into environmentally sensitive areas. Environmentally sensitive areas include all wetland resource areas within, and downstream of, the site, and those areas of the site that are not being altered.

Erosion and sedimentation control shall be in accordance with this Section, the design drawings, and the following:

- "Storm Water Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices" (EPA 832-R92-005, Sept. 1992).

- "Storm Water Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices – Summary Guidance" (EPA 833-R92-001, Oct. 1992).

- Massachusetts Stormwater Management Policy Handbook (Volume I) and Technical Handbook (Volume II) issued by the Massachusetts Department of Environmental Protection, March 1997.

- Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas, A Guide for Planners, Designers and Municipal Officials, March 1997.

The BMPs presented herein should be used as a guide for erosion and sedimentation control and are not intended to be considered specifications for construction. The most important BMP is maintaining a rapid construction process, resulting in prompt stabilization of surfaces, thereby reducing erosion potential. Given the primacy of rapid construction, these guidelines have been designed to allow construction to progress with essentially no hindrance by the erosion control methods prescribed. These guidelines have also been designed with sufficient flexibility to allow the contractor to modify the suggested methods as required to suit seasonal, atmospheric, and site-specific physical constraints.

Another important BMP is the prevention of concentrated water flow. Sheet flow does not have the erosive potential of a concentrated rivulet. These guidelines recommend construction methods that allow localized erosion control and a system of construction, which inhibits the development of shallow concentrated flow. These BMPs shall be maintained throughout the construction process.

4.2 CONTACT INFORMATION AND RESPONSIBLE PARTIES

The following is a list of all project-associated parties:

Owner/Applicant
The Northbridge Companies
71 Third Avenue
Burlington, MA 01803

Contact: Ray Mitrano
Phone: (617) 875-2501
Email: raymitrano@waypointkla.com

Contractor
To Be Determined

Environmental Consultant
BSC Group, Inc.
349 Route 28, Unit D
West Yarmouth, MA 02673

Contact: Brian G. Yergatian, P.E., LEED AP
Phone: (617) 896-4590
Email: byergatian@bscgroup.com

4.3 PROCEDURAL CONDITIONS OF THE CONSTRUCTION GENERAL PERMIT (CGP)

The following list outlines the Stormwater responsibilities for all construction operators working on the Project. The operators below agree through a cooperative agreement to abide by the following conditions throughout the duration of the construction project, effective the date of signature of the required SWPPP. These conditions apply to all operators on the project site.

The project is subject to EPA's NPDES General Permit through the CGP. The goal of this permit is to prevent the discharge of pollutants associated with construction activity from entering the existing and proposed storm drain system or surface waters.

All contractors/operators involved in clearing, grading and excavation construction activities must sign the appropriate certification statement required, which will remain with the SWPPP. The owner must also sign a certification, which is to remain with the SWPPP in accordance with the signatory requirements of the SWPPP.

Once the SWPPP is finalized, a signed copy, plus supporting documents, must be held at the project site during construction. A copy must remain available to EPA, State and Local agencies, and other interested parties during normal business hours.

The following items associated with this SWPPP must be posted in a prominent place at the construction site until final stabilization has been achieved:

- The completed/submitted NOI form
- Location where the public can view the SWPPP during normal business hours
- A copy of the signed/submitted NOI, permit number issued by the EPA and a copy of the current CGP.

Project specific SWPPP documents are not submitted to the USEPA unless the agency specifically requests a copy for review. SWPPP documents requested by a permitting authority, the permittee(s) will submit it in a timely manner.

EPA inspectors will be allowed free and unrestricted access to the project site and all related documentation and records kept under the conditions of the permit.

The permitee is expected to keep all BMPs and stormwater controls operating correctly and maintained regularly.

In all circumstances, you must immediately take all reasonable steps to minimize or prevent the discharge of pollutants until a permanent solution is installed and made operational, including cleaning up any contaminated surfaces so that the material will not discharge in subsequent storm events.

In this context, the term "immediately" requires construction operators to, on the same day a condition requiring corrective action is found, take all reasonable steps to minimize or prevent the discharge of pollutants until a permanent solution is installed and made operational. However, if the problem is identified at a time in the work day when it is too late to initiative corrective action, the initiation of corrective action must begin on the following work day.

If you become aware that the stormwater controls you have installed and are maintaining are not effective enough for the discharge to meet applicable water quality standards or applicable requirements in Part 3.1. In this case, you must notify your EPA Regional Office by the end of the next work day. You are required to submit your notification through EPA's electronic NOI system, or "eNOI", at www.epa.gov/npdes/cgpenoi.

Within 24 hours of discovering the occurrence of one of the triggering conditions in Part 5.2.1 at your site, you must complete a report of the following:

5.4.1.1 Which condition was identified at your site;
5.4.1.2 The nature of the condition identified; and
5.4.1.3 The date and time of the condition identified and how it was identified.

Within 7 calendar days of discovering the occurrence of one of the triggering conditions in Part 5.2.1 at your site, you must complete a report of the following:

5.4.2.1 Any follow-up actions taken to review the design, installation, and maintenance of stormwater controls, including the dates such actions occurred;
5.4.2.2 A summary of stormwater control modifications taken or to be taken, including a schedule of activities necessary to implement changes, and the date the modifications are completed or expected to be completed; and
5.4.2.3 Notice of whether SWPPP modifications are required as a result of the condition identified or corrective action.

Please note that some of the items above are direct quotations from the February 16, 2012 National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges from Construction Activities (CGP).

It also needs to be noted that this SWPPP document shall be updated by the General Contractor before the start of construction.

In maintaining the SWPPP, all records and supporting documents will be compiled together in an orderly fashion. Inspection reports and amendments to the SWPPP must remain with the document. Federal regulations require permitee(s) to keep their Project Specific SWPPP and all reports and documents for at least three years after the project is complete.

4.4 PROJECT DESCRIPTION AND INTENDED CONSTRUCTION SEQUENCE

The applicant is planning to redevelop the site. The site is currently comprised of soon to be vacant buildings, associated parking lots and driveways and walkways. The redevelopment activities will include the following major components:

- Construction of the building and parking improvements
- The construction of stormwater management systems
- Landscaping associated with utilities and grading

Soil disturbing activities will include site demolition, installing stabilized construction exits, installation of erosion and sedimentation controls, grading, storm drain inlets, utilities, building foundations,

construction of roadways and parking lots and preparation for final seeding, mulching and landscaping. Please refer to Table 1 for the projects anticipated construction timetable. A description of BMP's associated with project timetable and construction-phasing elements are provided in Section 4.2 of this SWPPP.

Table 4.1 – Anticipated Construction Timetable

Construction Phasing Activity	Anticipated Timetable
Demolition, Grubbing and Stripping of Limits of Construction Phase	To be determined
Rough Site Grading and Site Utilities	To be determined
Building Foundation and Shell	To be determined
Parking	To be determined
Landscaping	To be determined
Final Clean-up	To be determined

4.5 POTENTIAL SOURCES OF POLLUTION

Any project site activities that have the potential to add pollutants to runoff are subject to the requirements of this sample SWPPP. Listed below are a description of potential sources of pollution from both sedimentation to Storm Water runoff, and pollutants from sources other than sedimentation.

Table 4.2 – Potential Sources of Sediment to Storm Water Runoff

Potential Source	Activities/Comments
Construction Site Entrance and Site Vehicles	Vehicles leaving the site can track soils onto public roadways. Site Vehicles can readily transport exposed soils throughout the site and off-site areas.
Grading Operations	Exposed soils have the potential for erosion and discharge of sediment to off-site areas. Stockpiling of materials during excavation and relocation of soils can contribute to erosion and sedimentation. In addition fugitive dust from stockpiled material, vehicle transport and site grading can be deposited in wetlands and waterway.
Landscaping Operations	Landscaping operations specifically associated with exposed soils can contribute to erosion and sedimentation. Hydroseeding if not properly applied can runoff to adjacent wetlands and waterways.

Table 4.3 – Potential Pollutants and Sources, Other Than Sediment to Storm Water Runoff

Potential Source	Activities/Comments
Staging Areas and Construction Vehicles	Vehicle refueling, minor equipment maintenance, sanitary facilities and hazardous waste storage
Materials Storage Area	General building materials, solvents, adhesives, paving materials, paints, aggregates, trash, etc.
Construction Activities	Construction, paving, curb/gutter installation, concrete pouring/mortar/stucco

4.6 EROSION AND SEDIMENTATION CONTROL BEST MANAGEMENT PRACTICES

The project site is characterized by primarily impervious surface. All construction activities will implement Best Management Practices (BMPs) in order to minimize overall site disturbance and impacts to the sites natural features. Please refer to the following sections for a detailed description of site specific BMPs. In addition, an Erosion and Sedimentation Control Plan is provided in the Site Plans.

4.7 TIMETABLE AND CONSTRUCTION PHASING

This section provides the Owner and Contractor with a suggested order of construction that shall minimize erosion and the transport of sediments. The individual objectives of the construction techniques described herein shall be considered an integral component of the project design intent of each project phase. The construction sequence is not intended to prescribe definitive construction methods and should not be interpreted as a construction specification document. However, the Contractor shall follow the general construction phase principles provided below:

- Protect and maintain existing vegetation wherever possible.
- Minimize the area of disturbance.
- To the extent possible, route unpolluted flows around disturbed areas.
- Install mitigation devices as early as possible.
- Minimize the time disturbed areas are left unstabilized.
- Maintain siltation control devices in proper condition.
- The contractor should use the suggested sequence and techniques as a general guide and modify the suggested methods and procedures as required to best suit seasonal, atmospheric, and site specific physical constraints for the purpose of minimizing the environmental impact of construction.

<u>Demolition, Grubbing and Stripping of Limits of Construction Phase</u>

- Install TEC devices as required to prevent sediment transport into resource areas.
- Place a ring of silt socks and/or hay bales around stockpiles.
- Stabilize all exposed surfaces that will not be under immediate construction.
- Store and/or dispose all pavement and building demolition debris as indicated in accordance with all applicable local, state, and federal regulations.

Parking Areas Sub-base Construction

- Install temporary culverts and diversion ditches and additional TEC devices as required by individual construction area constraints to direct potential runoff toward detention areas designated for the current construction phase.
- Compact gravel as work progresses to control erosion potential.
- Apply water to control air suspension of dust.
- Avoid creating an erosive condition due to over-watering.
- Install piped utility systems as required as work progresses, keeping all inlets sealed until all downstream drainage system components are functional.

Binder Construction

- Fine grade gravel base and install processed gravel to the design grades.
- Compact pavement base as work progresses.
- Install pavement binder coat starting from the downhill end of the site and work toward the top.

Finish Paving

- Repair and stabilize damaged side slopes.
- Clean inverts of drainage structures.
- Install final top coat of pavement.

Final Clean-up

- Clean inverts of culverts and catch basins.
- Remove sediment and debris from rip-rap outlet areas.
- Remove TEC devices only after permanent vegetation and erosion control has been fully established.

4.8 SITE STABILIZATION

Grubbing Stripping and Grading

- Erosion control devices shall be in place as shown on the design plans before grading commences.
- Stripping shall be done in a manner, which will not concentrate runoff. If precipitation is expected, earthen berms shall be constructed around the area being stripped, with a silt sock, silt fence or hay bale dike situated in an arc at the low point of the berm.
- If intense precipitation is anticipated, silt socks, hay bales, dikes and /or silt fences shall be used as required to prevent erosion and sediment transport. The materials required shall be stored on site at all time.
- If water is required for soil compaction, it shall be added in a uniform manner that does not allow excess water to flow off the area being compacted.
- Dust shall be held at a minimum by sprinkling exposed soil with an appropriate amount of water.

Maintenance of Disturbed Surfaces

- Runoff shall be diverted from disturbed side slopes in both cut and fill.
- Mulching may be used for temporary stabilization.
- Silt sock, hay bale or silt fences shall be set where required to trap products of erosion and shall be maintained on a continuing basis during the construction process.

Loaming and Seeding

- Loam shall not be placed unless it is to be seeded directly thereafter.
- All disturbed areas shall have a minimum of 4 inches of loam placed before seeded and mulched.
- Consideration shall be given to hydro-mulching, especially on slopes in excess of 3 to 1.
- Loamed and seeded slopes shall be protected from washout by mulching or other acceptable slope protection until vegetation begins to grow.

Storm Water Collection System Installation

- The Storm Water drainage system shall be installed from the downstream end up and in a manner which will not allow runoff from disturbed areas to enter pipes.
- Excavation for the drainage system shall not be left open when rainfall is expected overnight. If left open under other circumstances, pipe ends shall be closed by a staked board or by an equivalent method.
- All catch basin openings shall be covered by a silt bag between the grate and the frame or protected from sediment by silt fence surrounding the catch basin grate.
- The ADS detention system will remain off-line until all upgradient tributary areas have been fully stabilized.

Completion of Paved Areas

- During the placement of sub-base and pavement, the entrance to the Storm Water drainage systems shall be sealed when rain is expected. When these entrances are closed, consideration must be given to the direction of run-off and measures shall be undertaken to minimize erosion and to provide for the collection of sediment.
- In some situations it may be necessary to keep catch basins open.
- Appropriate arrangements shall be made downstream to remove all sediment deposition.

Stabilization of Surfaces

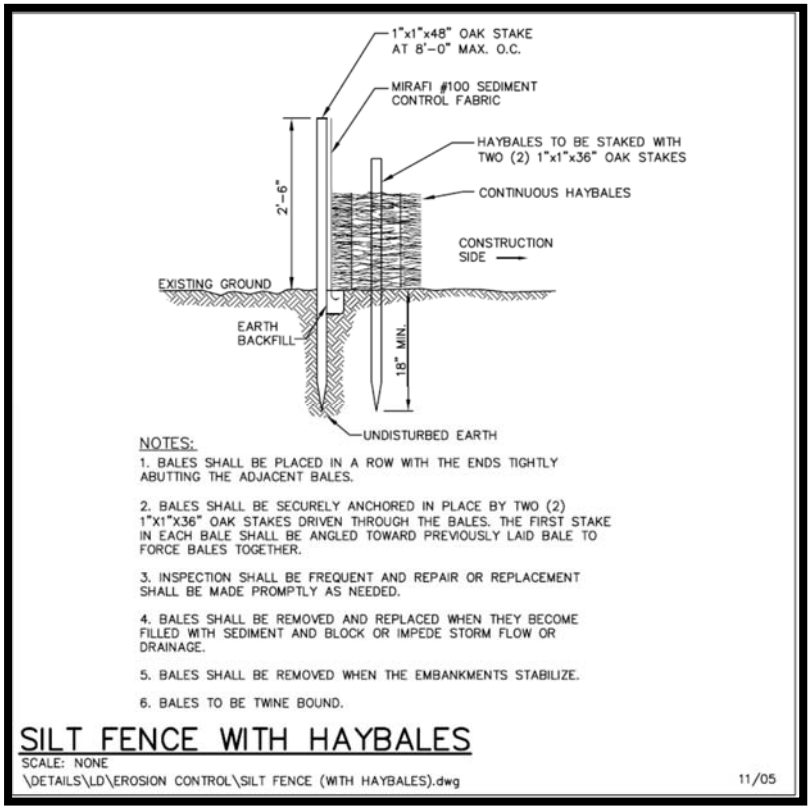
- Stabilization of surfaces includes the placement of pavement, rip-rap, wood bark mulch and the establishment of vegetated surfaces.
- Upon completion of construction, all surfaces shall be stabilized even though it is apparent that future construction efforts will cause their disturbance.
- Vegetated cover shall be established during the proper growing season and shall be enhanced by soil adjustment for proper pH, nutrients and moisture content.
- Surfaces that are disturbed by erosion processes or vandalism shall be stabilized as soon as possible.
- Areas where construction activities have permanently or temporarily ceased shall be stabilized within 7 days from the last construction activity, except when construction activity will resume within 21 days (e.g., the total time period that construction activity is temporarily ceased is less than 21 days).
- Hydro-mulching of grass surfaces is recommended, especially if seeding of the surfaces is required outside the normal growing season.
- Hay mulch is an effective method of temporarily stabilizing surfaces, but only if it is properly secured by branches, weighted snow fences or weighted chicken wire.

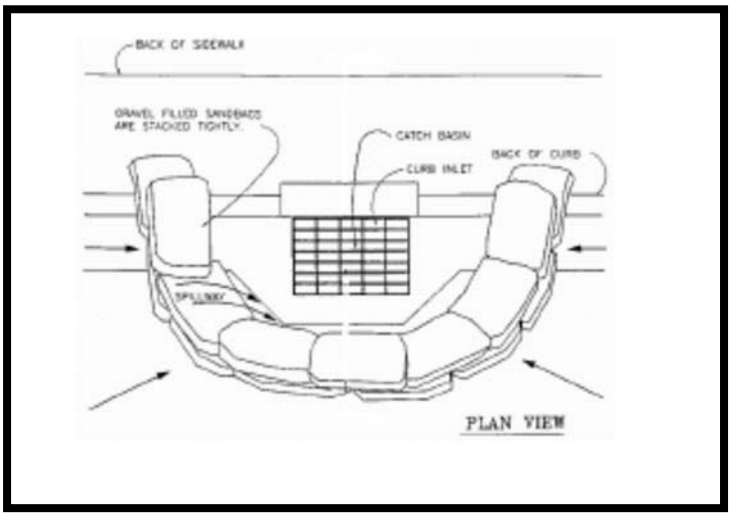
4.9 TEMPORARY STRUCTURAL EROSION CONTROL MEASURES

Temporary erosion control measures serve to minimize construction-associated impacts to wetland resource and undisturbed areas. Please refer to the following sections for a description of temporary erosion control measures implemented as part of the project and this sample SWPPP.

4.9.1 Silt Socks, Hay Bales, and Silt Fencing

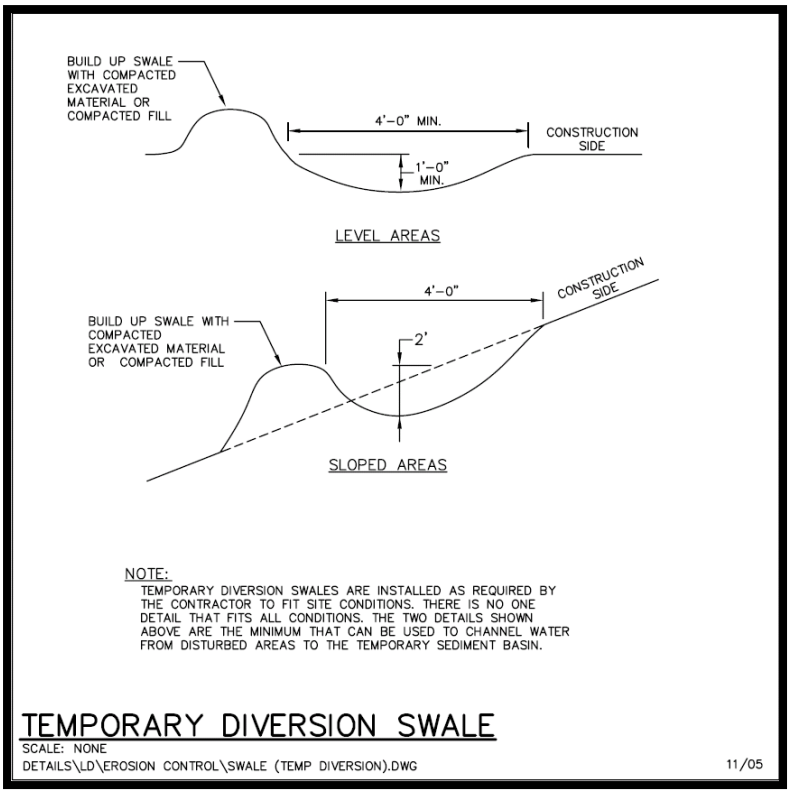
Siltation barriers composed of silt socks and staked hay bales and trenched silt fence will be installed within the 100-foot buffer zone along the upland side of delineated wetland resources. The siltation barriers will demarcate the limit of work, form a work envelope and provide additional assurance that construction equipment will not enter the adjacent wetlands or undisturbed portions of the site. All barriers will remain in place until disturbed areas are stabilized.





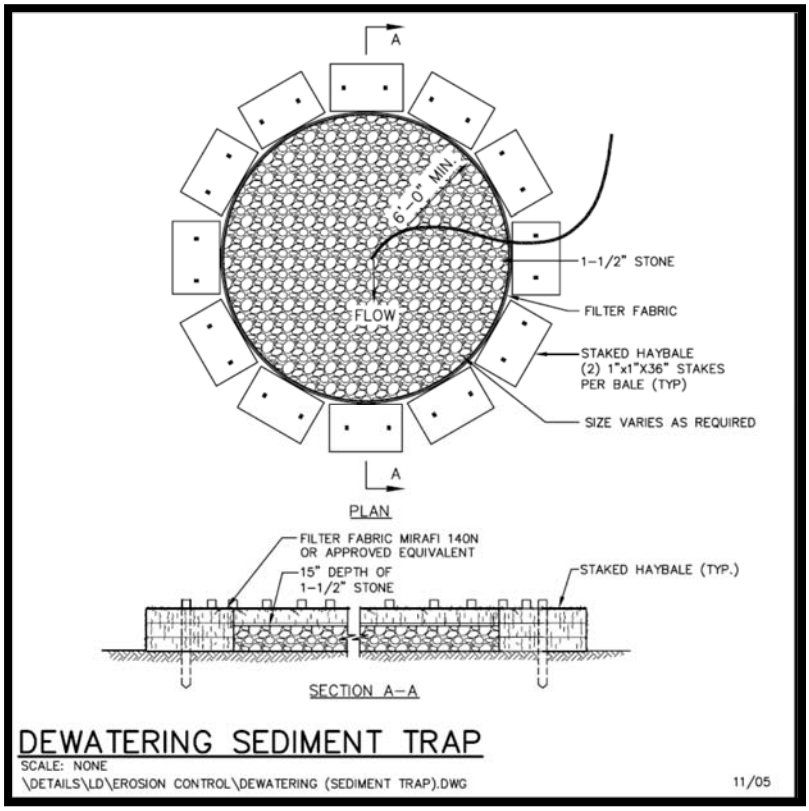
4.9.2 Temporary Storm Water Diversion Swale

A temporary diversion swale is an effective practice for temporarily diverting Storm Water flows and to reduce Storm Water runoff velocities during storm events. The swale channel can be installed before infrastructure construction begins at the site, or as needed throughout the construction process. The diversion swale should be routinely compacted or seeded to minimize the amount of exposed soil.



4.9.3 Dewatering Basins

Dewatering may be required during Storm Water system, foundation construction and utility installation. Should the need for dewatering arise, groundwater will be pumped directly into a temporary settling basin, which will act as a sediment trap during construction. All temporary settling basins will be located within close proximity of daily work activities. Prior to discharge, all groundwater will be treated by means of the settling basin or acceptable substitute. Discharges from sediment basins will be free of visible floating, suspended and settleable solids that would impair the functions of a wetland or degrade the chemical composition of the wetland resource area receiving ground or surface water flows and will be to the combined system.



4.9.4 Material Stockpiling Locations

There will be no storage of soil, gravel or construction debris within the 100-foot buffer zone to wetland resource areas. It is anticipated that all excavated material will be placed in a dump truck and stockpiled outside the 100-foot buffer zone during construction activities. Piping and trench excavate associated with the subsurface utility work will be contained with a single row of silt socks and/or hay bales.

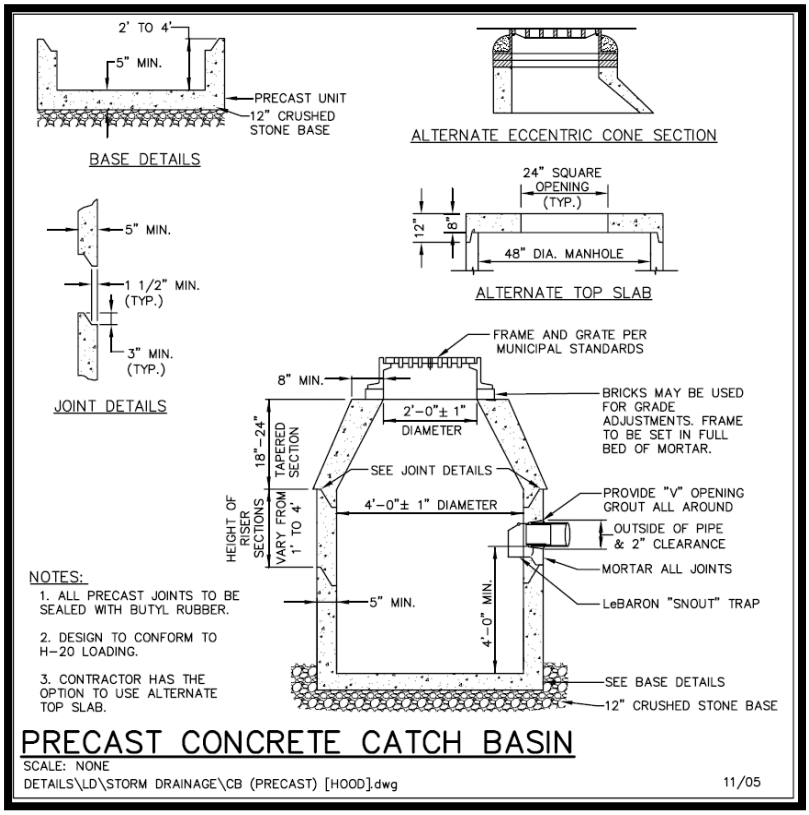
4.10 PERMANENT STRUCTURAL EROSION CONTROL MEASURES

Permanent erosion control measures serve to minimize post-construction impacts to wetland resource areas and undisturbed areas. Please refer to the following sections for a description of permanent erosion control measures implemented as part of the project and this SWPPP.

4.10.1 Catch Basins with Deep Sumps and Hooded Traps

Parking lots will be curbed and provided with catch basins to collect runoff. The entire drainage system for each respective project phase will be installed during the initial phases of construction. The collection system will be installed from the downstream end up, and in a manner which will not allow runoff from disturbed areas to enter the pipes.

The catch basins will be inspected and cleaned as necessary (sediment depth of 12 inches) at least four (4) times per year. The optimum time for cleaning is during the period just after the snowmelt of late winter and prior to the onset of heavy spring precipitation. All sediments and hydrocarbons will be properly handled and disposed of in accordance with local state and federal guidelines and regulations.



4.10.2 GOOD HOUSEKEEPING BEST MANAGEMENT PRACTICES

Material Handling and Waste Management

Solid waste generation during the construction period will be primarily construction debris. The debris will include scrap lumber (used forming and shoring pallets and other shipping containers), waste packaging materials (plastic sheeting and cardboard), scrap cable and wire, roll-off containers (or dumpsters) and will be removed by a contract hauler to a properly licensed landfill. The roll-off containers will be covered with a properly secured tarp before the hauler exists the site. In addition to construction debris, the construction work force will generate some amount of household-type wastes (food packing, soft drink containers, and other paper). Trash containers for these wastes will be located around the site and will be emptied regularly so as to prevent wind-blown litter. This waste will also be removed by a contract hauler.

All hazardous waste material such as oil filters, petroleum products, paint and equipment maintenance fluids will be stored in structurally sound and sealed shipping containers in the hazardous-materials storage area and segregated from other non-waste materials. Secondary containment will be provided for all materials in the hazardous materials storage area and will consist of commercially available spill pallets. Additionally, all hazardous materials will be disposed of in accordance with federal, state and municipal regulations.

Two temporary sanitary facilities (portable toilets) will be provided at the site in the combined staging area. The toilets will be away from a concentrated flow path and traffic flow and will have collection pans underneath as secondary treatment. All sanitary waste will be collected from an approved party at a minimum of three times per week.

Building Material Staging Areas

Construction equipment and maintenance materials will be stored at the combined staging area and materials storage areas. Silt fence will be installed around the perimeter to designate the staging and materials storage area. A watertight shipping container will be used to store hand tools, small parts and other construction materials.

Non-hazardous building materials such as packaging material (wood, plastic and glass) and construction scrap material (brick, wood, steel, metal scraps, and pine cuttings) will be stored in a separate covered storage facility adjacent to other stored materials. All hazardous-waste materials such as oil filters, petroleum products, paint and equipment maintenance fluids will be stored in structurally sound and sealed containers under cover within the hazardous materials storage area.

Large items such as framing materials and stockpiled lumber will be stored in the open storage area. Such materials will be elevated on wood blocks to minimize contact with runoff.

The combined storage areas are expected to remain clean, well organized and equipped with ample cleaning supplies as appropriate for the materials being stored. Perimeter controls such as containment structures, covers and liners will be repaired or replaced as necessary to maintain proper function.

Designated Washout Areas

Designated temporary, below-ground concrete washout areas will be constructed, as required, to minimize the pollution potential associated with concrete, paint, stucco, mixers etc. Signs will, if required, be posted marking the location of the washout area to ensure that concrete equipment operators use the proper facility. Concrete pours will not be conducted during or before an

anticipated precipitation event. All excess concrete and concrete washout slurries from the concrete mixer trucks and chutes will be discharged to the washout area or hauled off-site for disposal.

Equipment/Vehicle Maintenance and Fueling Areas
Several types of vehicles and equipment will be used on-site throughout the project including graders, scrapers, excavators, loaders, paving equipment, rollers, trucks and trailers, backhoes and forklifts. All major equipment/vehicle fueling and maintenance will be performed off-site. A small, 20-gallon pickup bed fuel tank will be kept on-site in the combined staging area. When vehicle fueling must occur on-site, the fueling activity will occur in the staging area. Only minor equipment maintenance will occur on-site. All equipment fluids generated from maintenance activities will be disposed of into designated drums stored on spill pallets. Absorbent, spill-cleanup materials and spill kits will be available at the combined staging and materials storage area. Drip pans will be placed under all equipment receiving maintenance and vehicles and equipment parked overnight.

Equipment/Vehicle Wash down Area
All equipment and vehicle washing will be performed off-site.

Spill Prevention Plan
A spill containment kit will be kept on-site in the Contractor's trailer and/or the designated staging area throughout the duration of construction. Should there be an accidental release of petroleum product into a wetland (or within 100-feet of a wetland), the appropriate agencies will be immediately notified.

4.10.3 INSPECTIONS

Maintenance of existing and proposed BMP's to address Storm Water management facilities during construction is an on-going process. The purpose of the inspections is to observe all sources of Storm Water or non-Storm Water discharge as identified in the SWPPP as well as the status of the receiving waters and fulfill the requirements of the Order of Conditions. The following sections describe the appropriate inspection measures to adequately implement the project's SWPPP. A blank inspection form is provided at the end of this section. Completed inspection forms are to be maintained on site.

4.10.3.1 Inspection Personnel

The owner's appointed representative will be responsible for performing regular inspections of erosion controls and ordering repairs as necessary.

4.10.3.2 Inspection Frequency

Inspections will be performed by qualified personnel once every 7 days and/or within 24-hours after a storm event of greater than one-quarter inch, in accordance with the CGP and as required by the OOC. The inspections must be documented on the inspection form provided at the end of this section, and completed forms will be provided to the on-site supervisor and maintained at the Owner's office throughout the entire duration of construction.

4.10.3.3 Inspection Reporting

Each inspection report will summarize the scope of the inspection, name(s) and qualifications of personnel making the inspection, and major observations relating to the implementation of the SWPPP, including compliance and non-compliance items. Completed inspection reports will remain with the completed SWPPP on site.

4.10.4 AMENDMENT REQUIREMENTS

The final SWPPP is intended to be a working document that is utilized regularly on the construction site, and provides guidance to the Contractor. It must reflect changes made to the originally proposed plan and will be updated to include project specific activities and ensure that they are in compliance with the NPDES General Permit and state and local laws and regulations. It should be amended whenever there is a change in design, construction, operation or maintenance that affects discharge of pollutants. The following items should be addressed should an amendment to the SWPPP occur:

- Dates of certain construction activities such as major grading activities, clearing and initiation of and completion of stabilization measures should be recorded.

- Future amendments to the SWPPP will be recorded as required. As this SWPPP is amended, all amendments will be kept on site and made part of the SWPPP.

- Upon completion of site stabilization (completed as designed and/or 70% background vegetative cover), it can be documented and marked on the plans. Inspections are no longer required at this time.

- Inspections often identify areas not included in the original SWPPP, which will require the SWPPP to be amended. These updates should be made within seven days of being recognized by the inspector.

SWPPP INSPECTION AND MAINTENANCE REPORT

Northbridge Mashpee Commons
Mashpee, MA

TO BE COMPLETED AT LEAST EVERY 7 DAYS AND WITHIN 24 HOURS OF A STORM EVENT OF AT LEAST 0.5 INCHES. AFTER SITE STABILIZATION, TO BE COMPLETED AT LEAST ONCE PER MONTH FOR THREE YEARS OR UNTIL A NOTICE OF TERMINATION IS FILED.

INSPECTOR NAME /TITLE: _____ DATE: _____

START/END TIME: _____

Type of Inspection
☐ Regular ☐ Pre-storm event ☐ During storm event ☐ Post-storm event (____ inches)

Construction Activities: _____
_____
_____

Weather at Time of Inspection: _____

Has it rained since the last inspection?
☐Yes ☐No

If yes, provide:
Storm Start Date & Time: _____ Storm Duration (hrs): _____ Approximate Rainfall (in): _____

Do you suspect that discharges may have occurred since the last inspection?
☐Yes ☐No

Are there any discharges at the time of inspection?
☐Yes ☐No

BMP Description	In Conformance	Effective	Notes
Construction Entrance	☐Yes ☐ No ☐ NA	☐Yes ☐ No ☐ NA	
Haybales and/or Silt Fencing	☐Yes ☐ No ☐ NA	☐Yes ☐ No ☐ NA	
Storage/Disposal Areas	☐Yes ☐ No ☐ NA	☐Yes ☐ No ☐ NA	
Subsurface Infiltration System	☐Yes ☐ No ☐ NA	☐Yes ☐ No ☐ NA	
Catch Basins	☐Yes ☐ No ☐ NA	☐Yes ☐ No ☐ NA	
Other	☐Yes ☐ No ☐ NA	☐Yes ☐ No ☐ NA	

SITE STABILIZATION STATUS:

BMP/Activity	Implemented	Maintained	Status/Actions Required
All Slopes and disturbed areas not actively being worked properly stabilized?	☐Yes ☐ No	☐Yes ☐ No	
Are natural resource areas (e.g. stream, wetlands, mature trees, etc.) protected with barriers of similar BMP's?	☐Yes ☐ No	☐Yes ☐ No	
Are perimeter controls and sediment barriers adequately installed and maintained?	☐Yes ☐ No	☐Yes ☐ No	
Are discharge points and receiving waters free of sediment deposits?	☐Yes ☐ No	☐Yes ☐ No	
Are Storm drain inlets properly protected?	☐Yes ☐ No	☐Yes ☐ No	
Is there evidence of sediment being tracked into the street?	☐Yes ☐ No	☐Yes ☐ No	
Is trash/littler from work areas collected and placed in covered dumpsters?	☐Yes ☐ No	☐Yes ☐ No	
Are washout facilities available, clearly marked, and maintained?	☐Yes ☐ No	☐Yes ☐ No	
Are vehicle and equipment fueling, cleaning and maintenance areas free of spills, leaks or any other deleterious material?	☐Yes ☐ No	☐Yes ☐ No	
Are materials that are potential stormwater contaminants stored inside or under cover?	☐Yes ☐ No	☐Yes ☐ No	
Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	☐Yes ☐ No	☐Yes ☐ No	
Other - specify:	☐Yes ☐ No	☐Yes ☐ No	
Other - specify:	☐Yes ☐ No	☐Yes ☐ No	

Certification statement:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print name: _____

Signature: _____ Date: _____

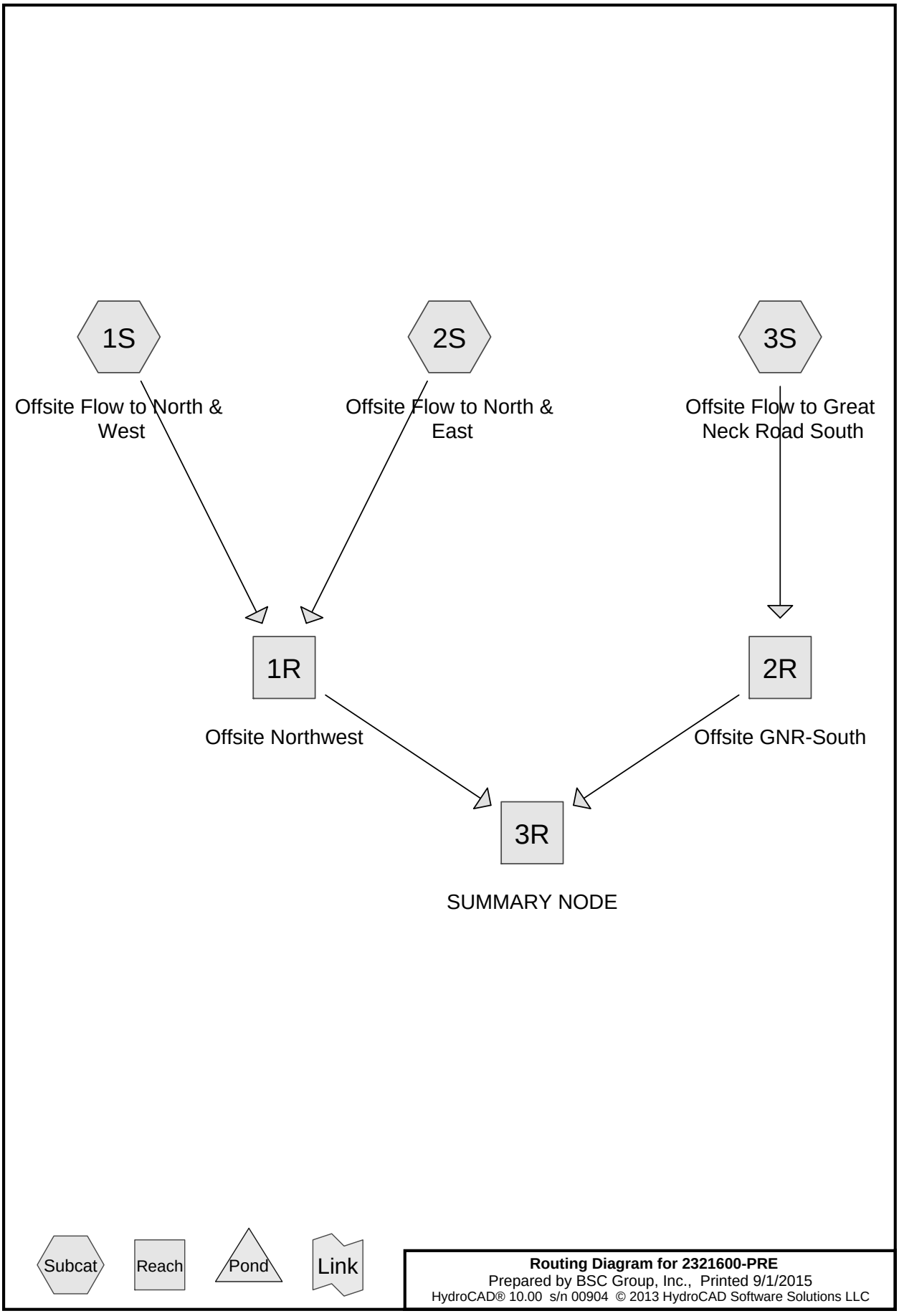
SECTION 5.0

DRAINAGE CALCULATIONS

5.1 EXISTING DRAINAGE CALCULATIONS AND WATERSHED PLAN

5.2 POST CONDITIONS DRAINAGE CALCULATIONS AND WATERSHED PLAN

5.1 EXISTING DRAINAGE CALCULATIONS AND WATERSHED PLAN



Routing Diagram for 2321600-PRE
Prepared by BSC Group, Inc., Printed 9/1/2015
HydroCAD® 10.00 s/n 00904 © 2013 HydroCAD Software Solutions LLC

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Offsite Flow to Runoff Area=101,679 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=381' Tc=13.2 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 2S: Offsite Flow to Runoff Area=44,503 sf 0.00% Impervious Runoff Depth=0.01"
Flow Length=518' Tc=15.0 min CN=39 Runoff=0.00 cfs 0.001 af

Subcatchment 3S: Offsite Flow to Runoff Area=23,367 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=416' Tc=16.8 min CN=35 Runoff=0.00 cfs 0.000 af

Reach 1R: Offsite Northwest Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Reach 2R: Offsite GNR-South Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach 3R: SUMMARY NODE Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Total Runoff Area = 3.892 ac Runoff Volume = 0.001 af Average Runoff Depth = 0.00"
100.00% Pervious = 3.892 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Offsite Flow to North & West

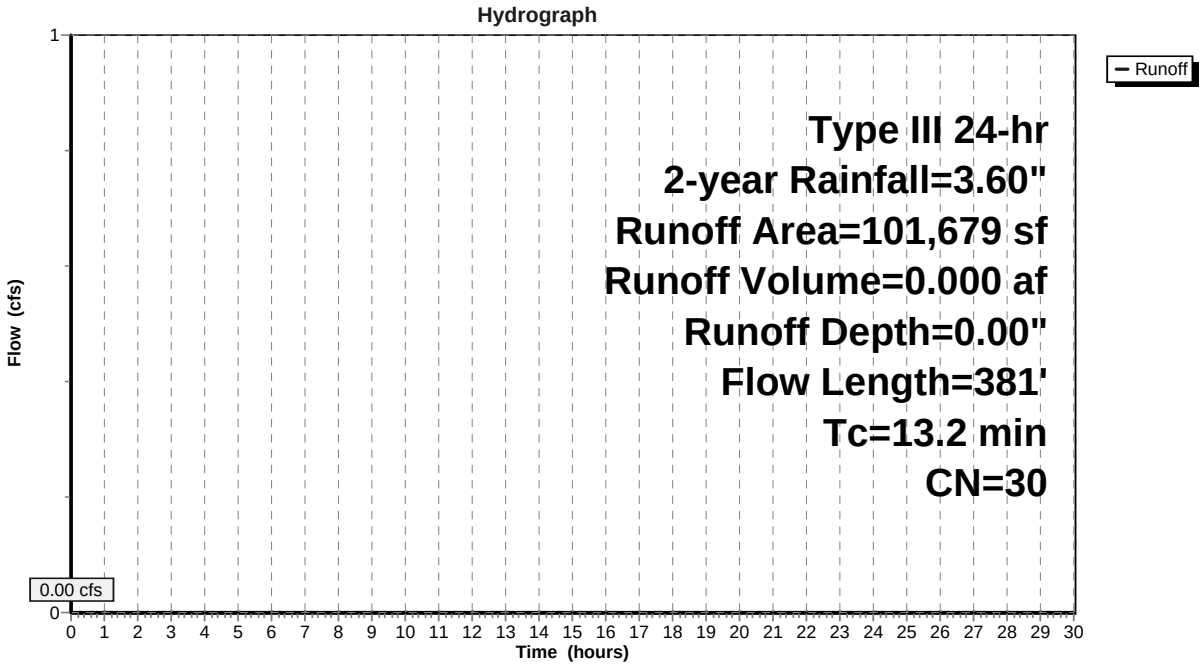
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.60"

Area (sf)	CN	Description
101,458	30	Woods, Good, HSG A
221	76	Gravel roads, HSG A
101,679	30	Weighted Average
101,679		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	50	0.0200	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
1.6	331	0.0440	3.38		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
13.2	381	Total			

Subcatchment 1S: Offsite Flow to North & West



Summary for Subcatchment 2S: Offsite Flow to North & East

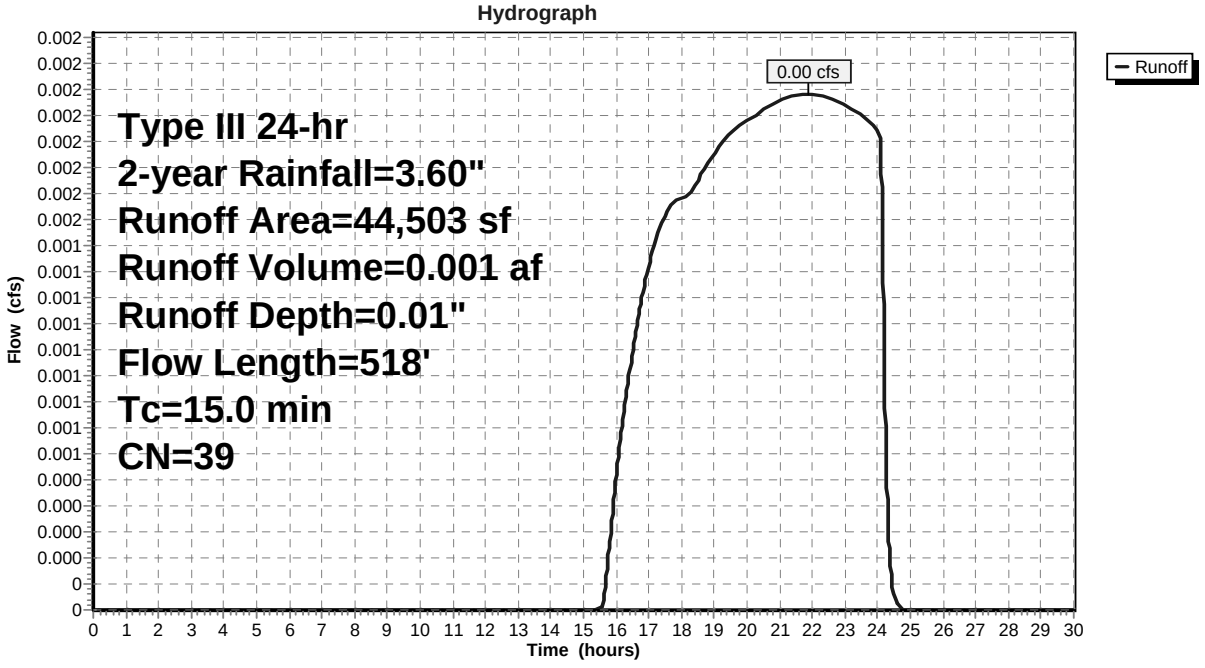
Runoff = 0.00 cfs @ 21.85 hrs, Volume= 0.001 af, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.60"

Area (sf)	CN	Description
38,758	30	Woods, Good, HSG A
5,745	96	Gravel surface, HSG A
44,503	39	Weighted Average
44,503		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0260	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
3.2	217	0.0050	1.14		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
1.3	251	0.0430	3.34		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
15.0	518	Total			

Subcatchment 2S: Offsite Flow to North & East



Summary for Subcatchment 3S: Offsite Flow to Great Neck Road South

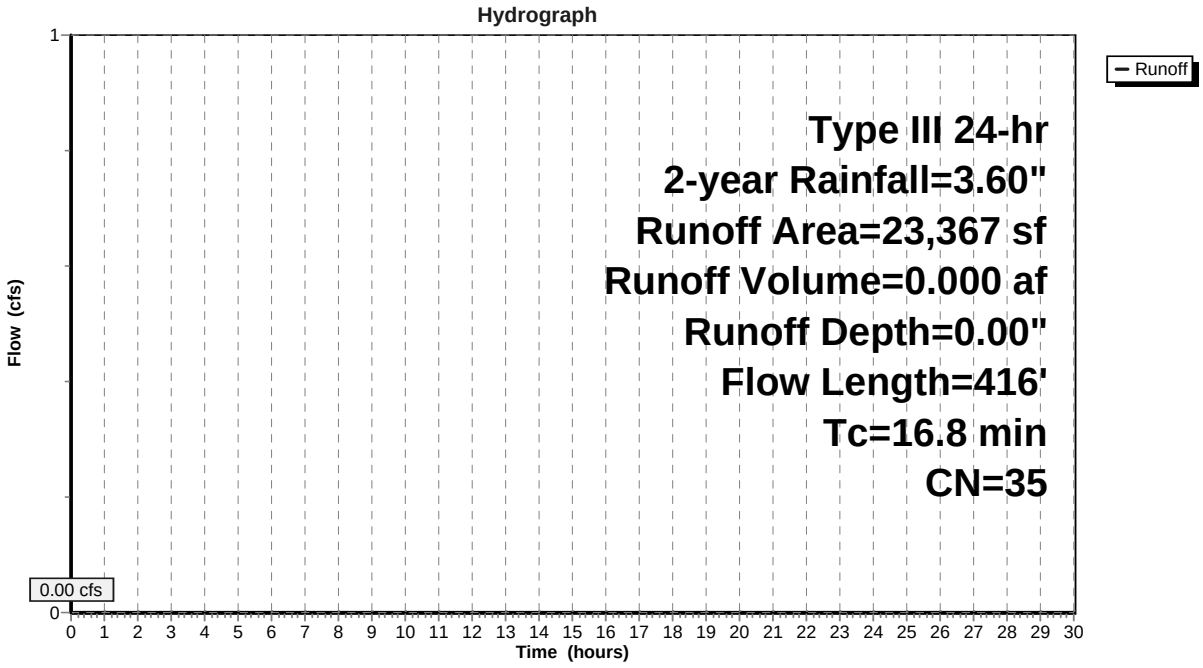
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.60"

Area (sf)	CN	Description
21,761	30	Woods, Good, HSG A
1,606	96	Gravel surface, HSG A
23,367	35	Weighted Average
23,367		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	50	0.0120	0.06		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
2.5	366	0.0230	2.44		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
16.8	416	Total			

Subcatchment 3S: Offsite Flow to Great Neck Road South

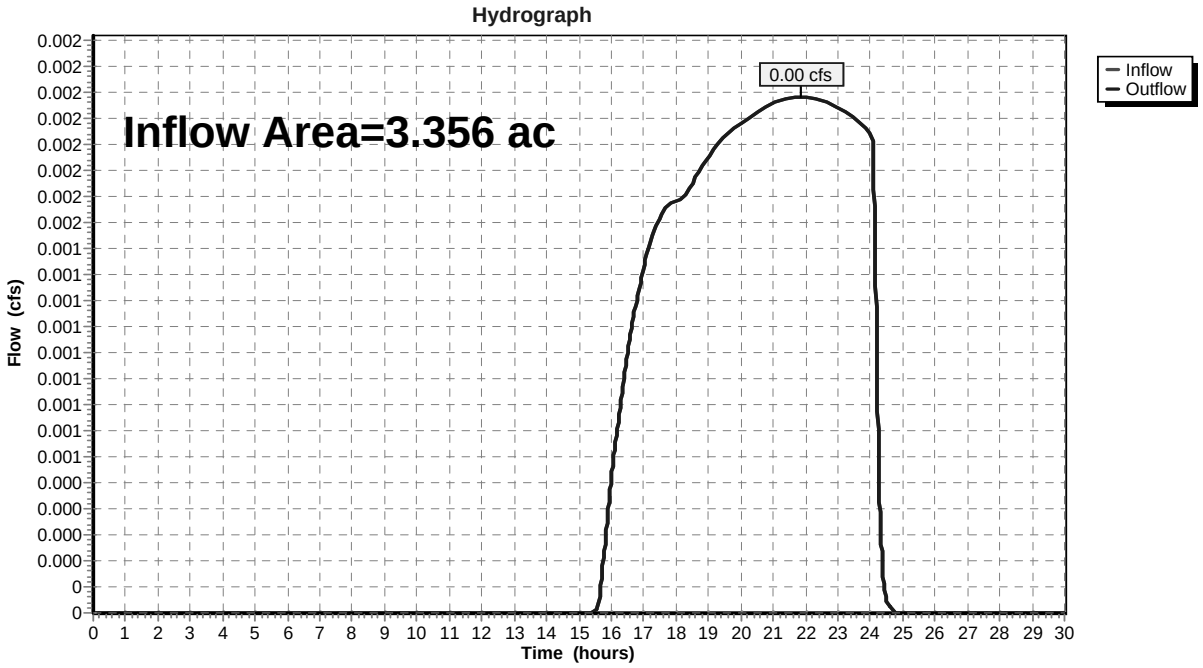


Summary for Reach 1R: Offsite Northwest

Inflow Area = 3.356 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-year event
Inflow = 0.00 cfs @ 21.85 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 21.85 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach 1R: Offsite Northwest

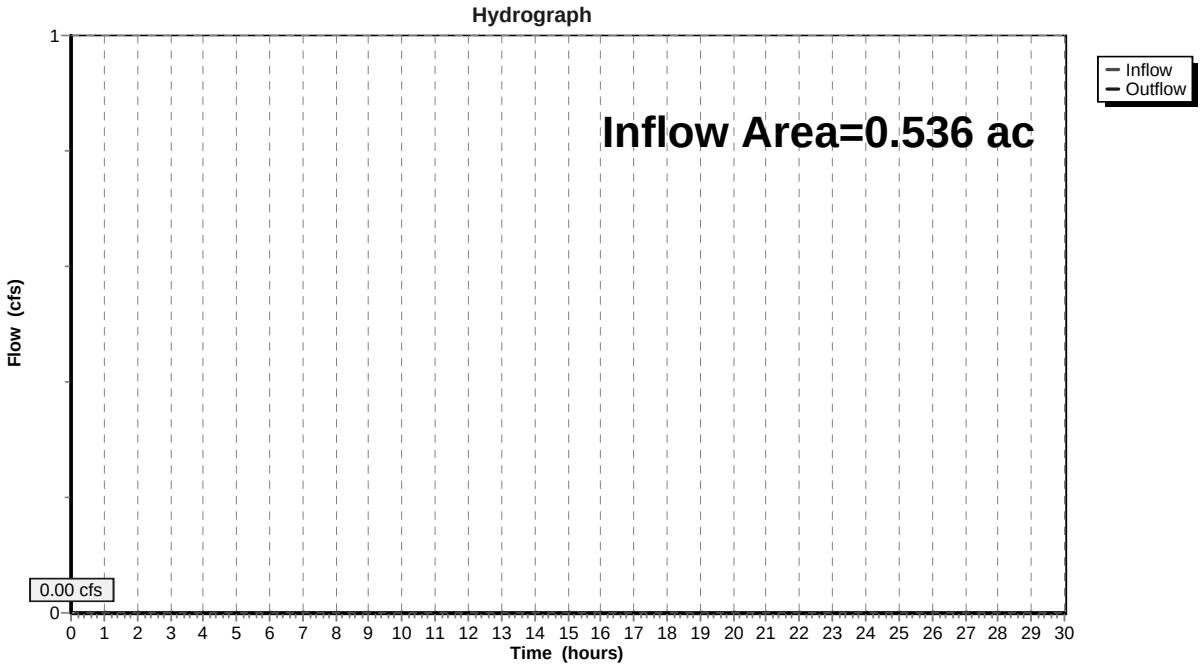


Summary for Reach 2R: Offsite GNR-South

Inflow Area = 0.536 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach 2R: Offsite GNR-South

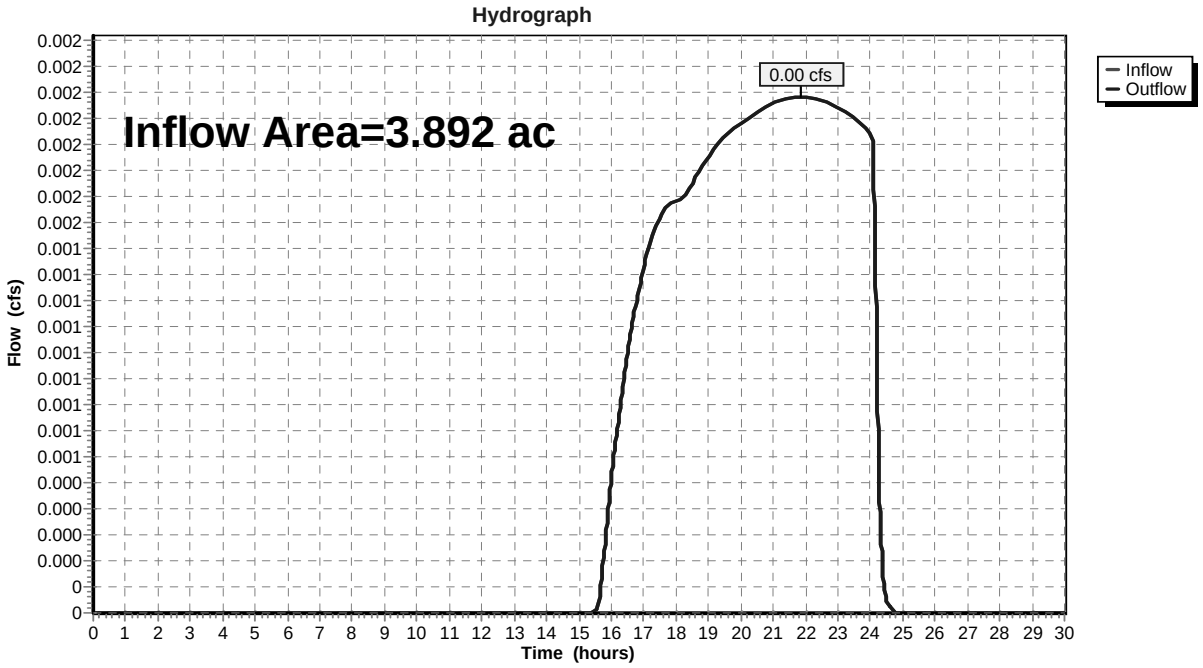


Summary for Reach 3R: SUMMARY NODE

Inflow Area = 3.892 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-year event
Inflow = 0.00 cfs @ 21.85 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 21.85 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach 3R: SUMMARY NODE



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Offsite Flow to Runoff Area=101,679 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=381' Tc=13.2 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 2S: Offsite Flow to Runoff Area=44,503 sf 0.00% Impervious Runoff Depth=0.16"
Flow Length=518' Tc=15.0 min CN=39 Runoff=0.02 cfs 0.014 af

Subcatchment 3S: Offsite Flow to Runoff Area=23,367 sf 0.00% Impervious Runoff Depth=0.06"
Flow Length=416' Tc=16.8 min CN=35 Runoff=0.00 cfs 0.003 af

Reach 1R: Offsite Northwest Inflow=0.02 cfs 0.014 af
Outflow=0.02 cfs 0.014 af

Reach 2R: Offsite GNR-South Inflow=0.00 cfs 0.003 af
Outflow=0.00 cfs 0.003 af

Reach 3R: SUMMARY NODE Inflow=0.03 cfs 0.017 af
Outflow=0.03 cfs 0.017 af

Total Runoff Area = 3.892 ac Runoff Volume = 0.017 af Average Runoff Depth = 0.05"
100.00% Pervious = 3.892 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Offsite Flow to North & West

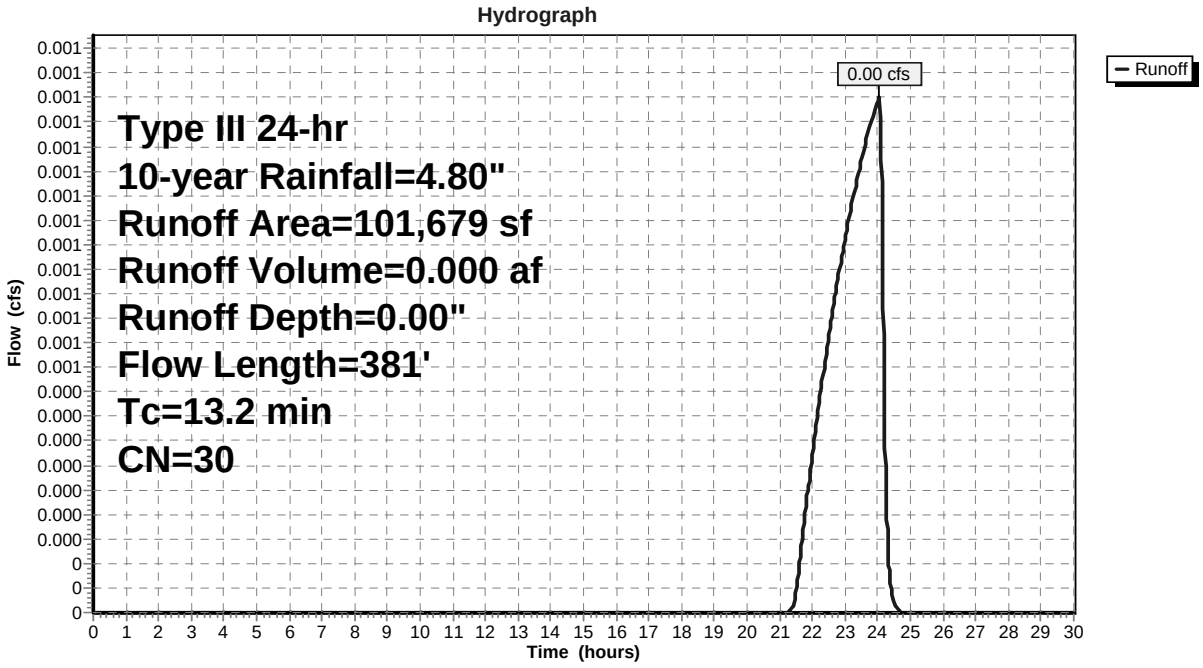
Runoff = 0.00 cfs @ 24.03 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
101,458	30	Woods, Good, HSG A
221	76	Gravel roads, HSG A
101,679	30	Weighted Average
101,679		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	50	0.0200	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
1.6	331	0.0440	3.38		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
13.2	381	Total			

Subcatchment 1S: Offsite Flow to North & West



Summary for Subcatchment 2S: Offsite Flow to North & East

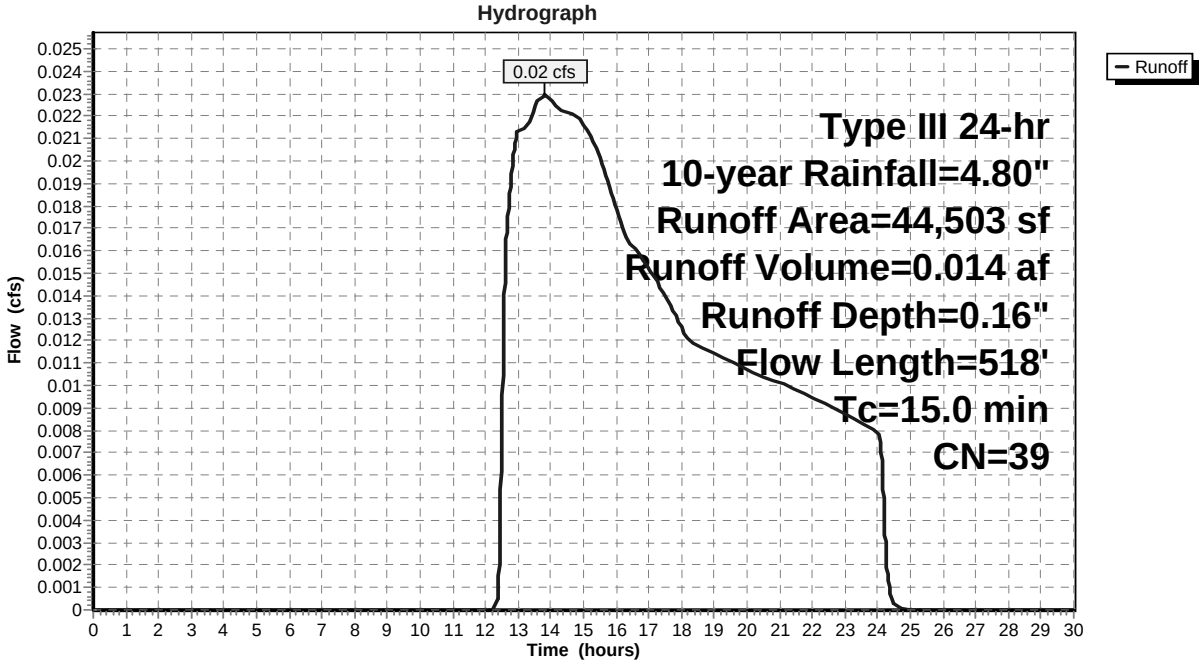
Runoff = 0.02 cfs @ 13.82 hrs, Volume= 0.014 af, Depth= 0.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
38,758	30	Woods, Good, HSG A
5,745	96	Gravel surface, HSG A
44,503	39	Weighted Average
44,503		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0260	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
3.2	217	0.0050	1.14		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
1.3	251	0.0430	3.34		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
15.0	518	Total			

Subcatchment 2S: Offsite Flow to North & East



Summary for Subcatchment 3S: Offsite Flow to Great Neck Road South

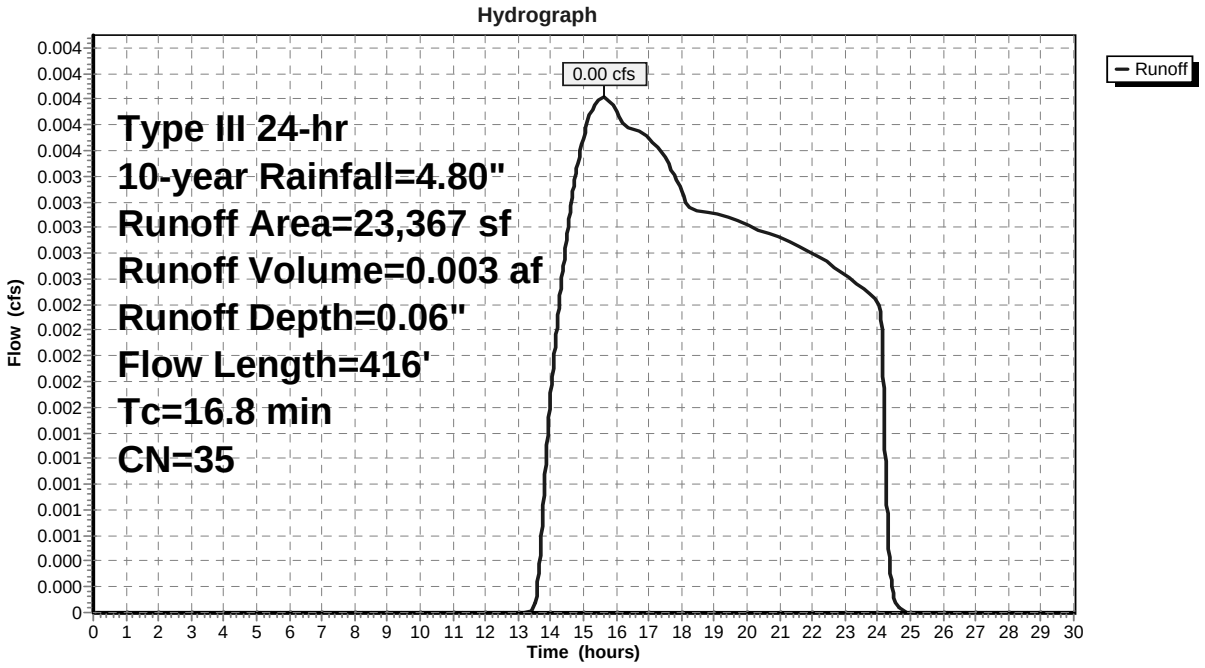
Runoff = 0.00 cfs @ 15.62 hrs, Volume= 0.003 af, Depth= 0.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
21,761	30	Woods, Good, HSG A
1,606	96	Gravel surface, HSG A
23,367	35	Weighted Average
23,367		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	50	0.0120	0.06		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
2.5	366	0.0230	2.44		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
16.8	416	Total			

Subcatchment 3S: Offsite Flow to Great Neck Road South

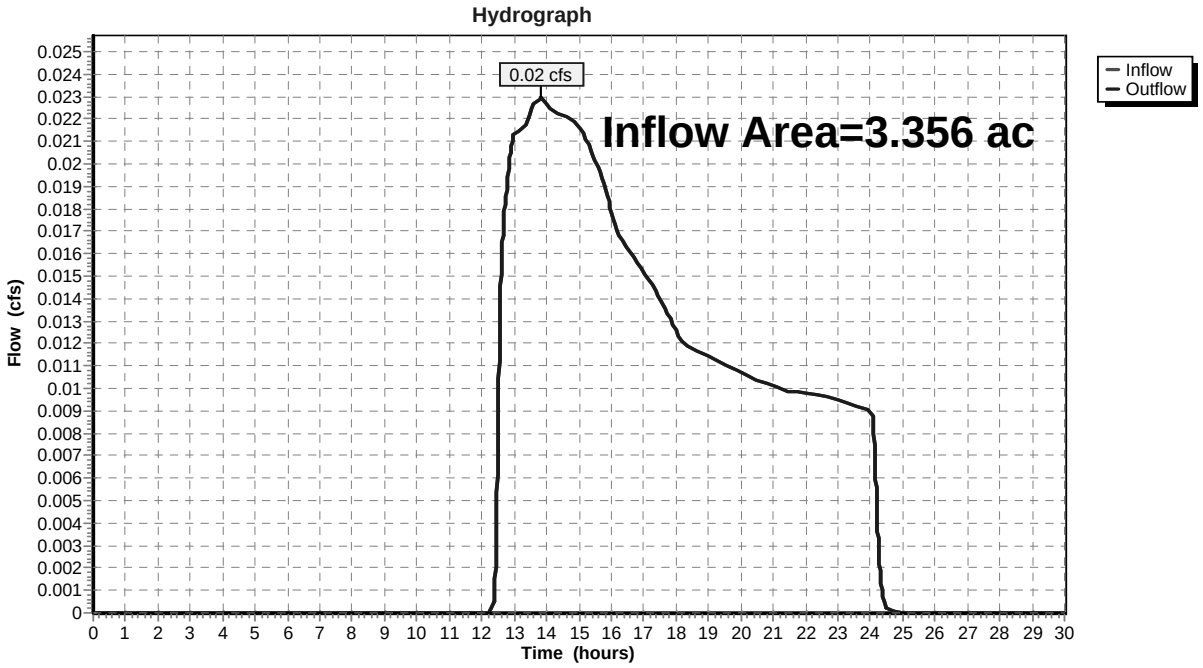


Summary for Reach 1R: Offsite Northwest

Inflow Area = 3.356 ac, 0.00% Impervious, Inflow Depth = 0.05" for 10-year event
Inflow = 0.02 cfs @ 13.82 hrs, Volume= 0.014 af
Outflow = 0.02 cfs @ 13.82 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach 1R: Offsite Northwest

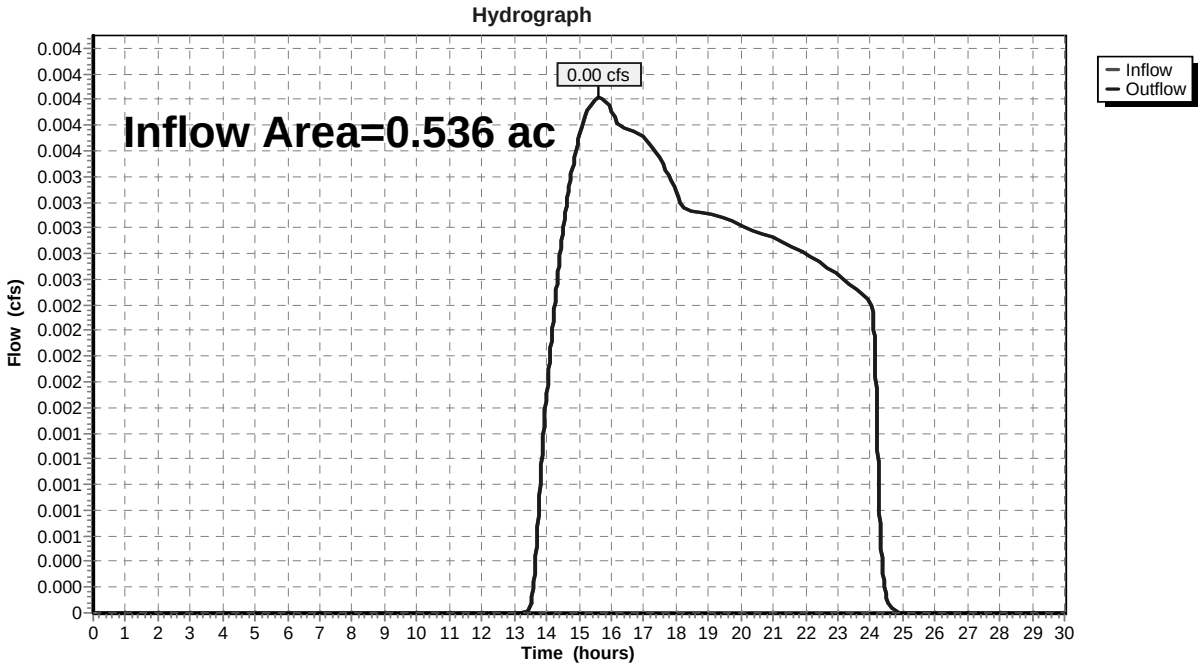


Summary for Reach 2R: Offsite GNR-South

Inflow Area = 0.536 ac, 0.00% Impervious, Inflow Depth = 0.06" for 10-year event
Inflow = 0.00 cfs @ 15.62 hrs, Volume= 0.003 af
Outflow = 0.00 cfs @ 15.62 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach 2R: Offsite GNR-South

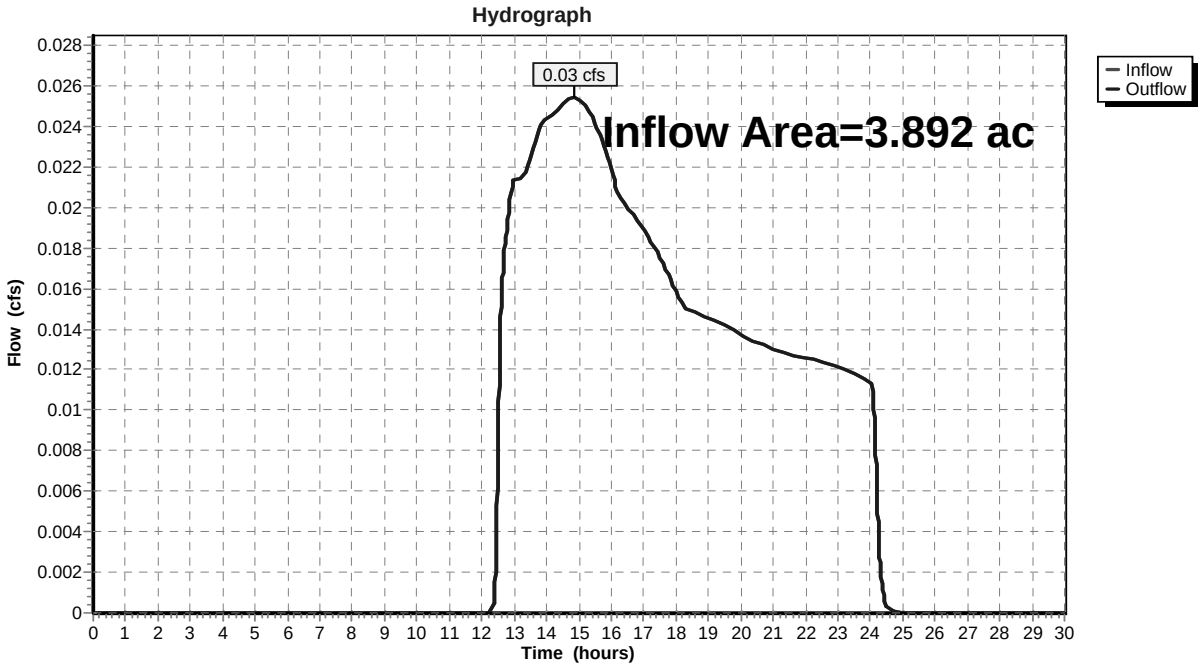


Summary for Reach 3R: SUMMARY NODE

Inflow Area = 3.892 ac, 0.00% Impervious, Inflow Depth = 0.05" for 10-year event
Inflow = 0.03 cfs @ 14.85 hrs, Volume= 0.017 af
Outflow = 0.03 cfs @ 14.85 hrs, Volume= 0.017 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach 3R: SUMMARY NODE



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Offsite Flow to Runoff Area=101,679 sf 0.00% Impervious Runoff Depth=0.04"
Flow Length=381' Tc=13.2 min CN=30 Runoff=0.01 cfs 0.009 af

Subcatchment 2S: Offsite Flow to Runoff Area=44,503 sf 0.00% Impervious Runoff Depth=0.36"
Flow Length=518' Tc=15.0 min CN=39 Runoff=0.12 cfs 0.031 af

Subcatchment 3S: Offsite Flow to Runoff Area=23,367 sf 0.00% Impervious Runoff Depth=0.19"
Flow Length=416' Tc=16.8 min CN=35 Runoff=0.01 cfs 0.009 af

Reach 1R: Offsite Northwest Inflow=0.12 cfs 0.039 af
Outflow=0.12 cfs 0.039 af

Reach 2R: Offsite GNR-South Inflow=0.01 cfs 0.009 af
Outflow=0.01 cfs 0.009 af

Reach 3R: SUMMARY NODE Inflow=0.12 cfs 0.048 af
Outflow=0.12 cfs 0.048 af

Total Runoff Area = 3.892 ac Runoff Volume = 0.048 af Average Runoff Depth = 0.15"
100.00% Pervious = 3.892 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Offsite Flow to North & West

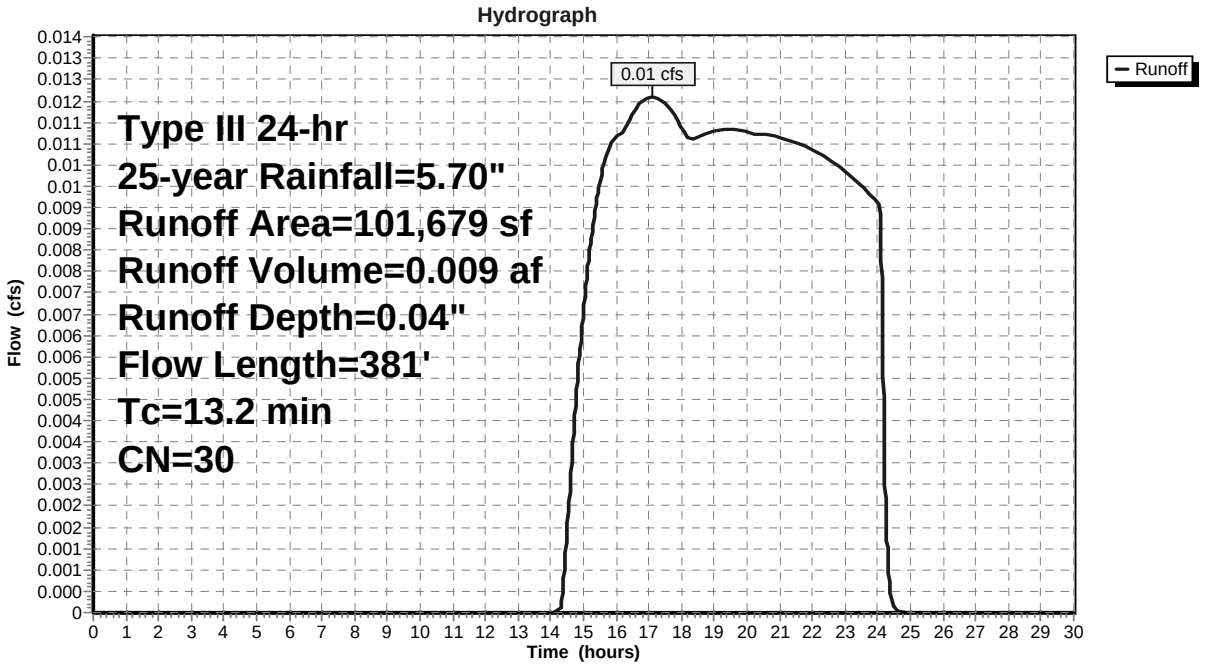
Runoff = 0.01 cfs @ 17.12 hrs, Volume= 0.009 af, Depth= 0.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.70"

Area (sf)	CN	Description
101,458	30	Woods, Good, HSG A
221	76	Gravel roads, HSG A
101,679	30	Weighted Average
101,679		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	50	0.0200	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
1.6	331	0.0440	3.38		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
13.2	381	Total			

Subcatchment 1S: Offsite Flow to North & West



Summary for Subcatchment 2S: Offsite Flow to North & East

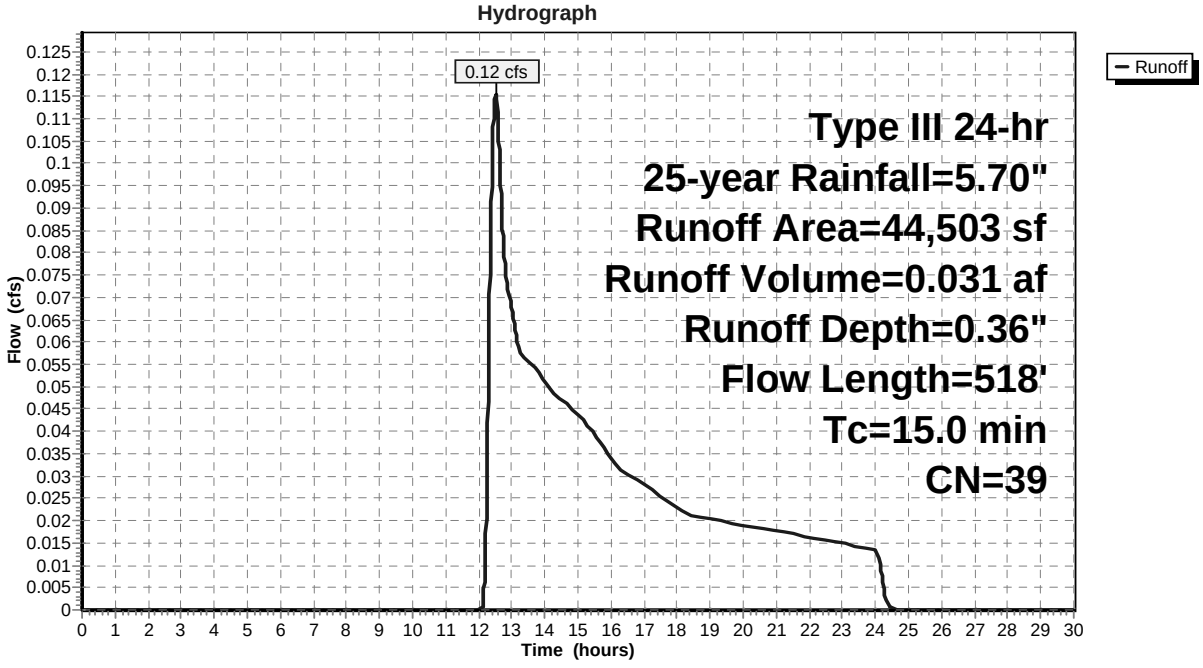
Runoff = 0.12 cfs @ 12.52 hrs, Volume= 0.031 af, Depth= 0.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.70"

Area (sf)	CN	Description
38,758	30	Woods, Good, HSG A
5,745	96	Gravel surface, HSG A
44,503	39	Weighted Average
44,503		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0260	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
3.2	217	0.0050	1.14		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
1.3	251	0.0430	3.34		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
15.0	518	Total			

Subcatchment 2S: Offsite Flow to North & East



Summary for Subcatchment 3S: Offsite Flow to Great Neck Road South

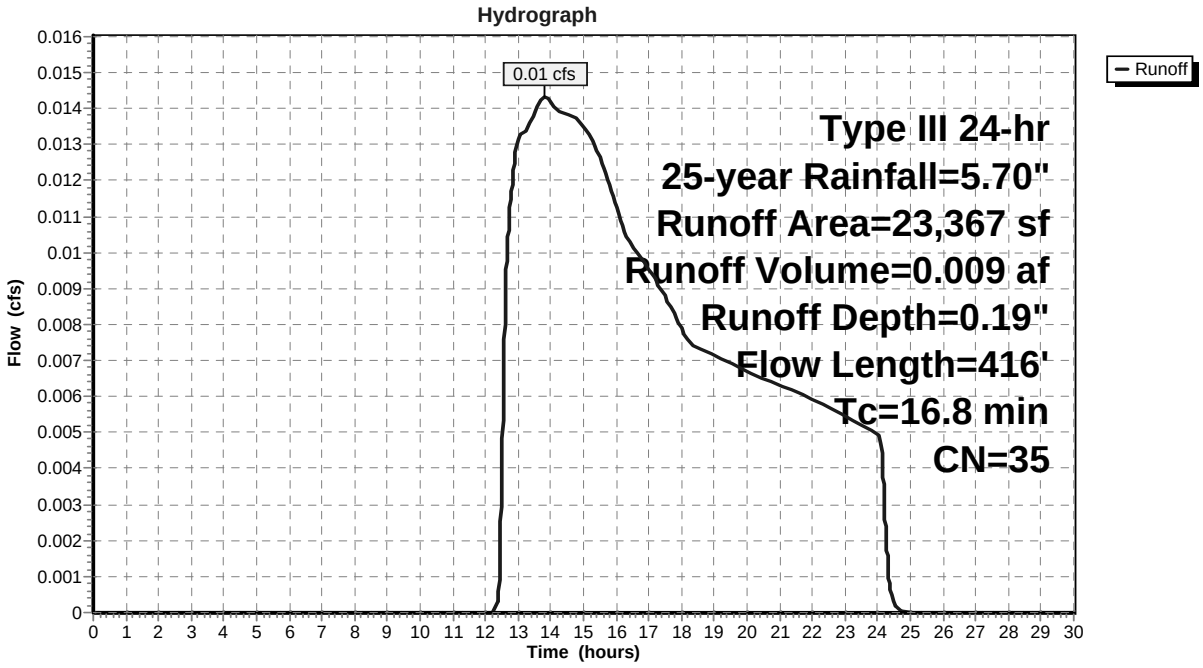
Runoff = 0.01 cfs @ 13.83 hrs, Volume= 0.009 af, Depth= 0.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.70"

Area (sf)	CN	Description
21,761	30	Woods, Good, HSG A
1,606	96	Gravel surface, HSG A
23,367	35	Weighted Average
23,367		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	50	0.0120	0.06		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
2.5	366	0.0230	2.44		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
16.8	416	Total			

Subcatchment 3S: Offsite Flow to Great Neck Road South

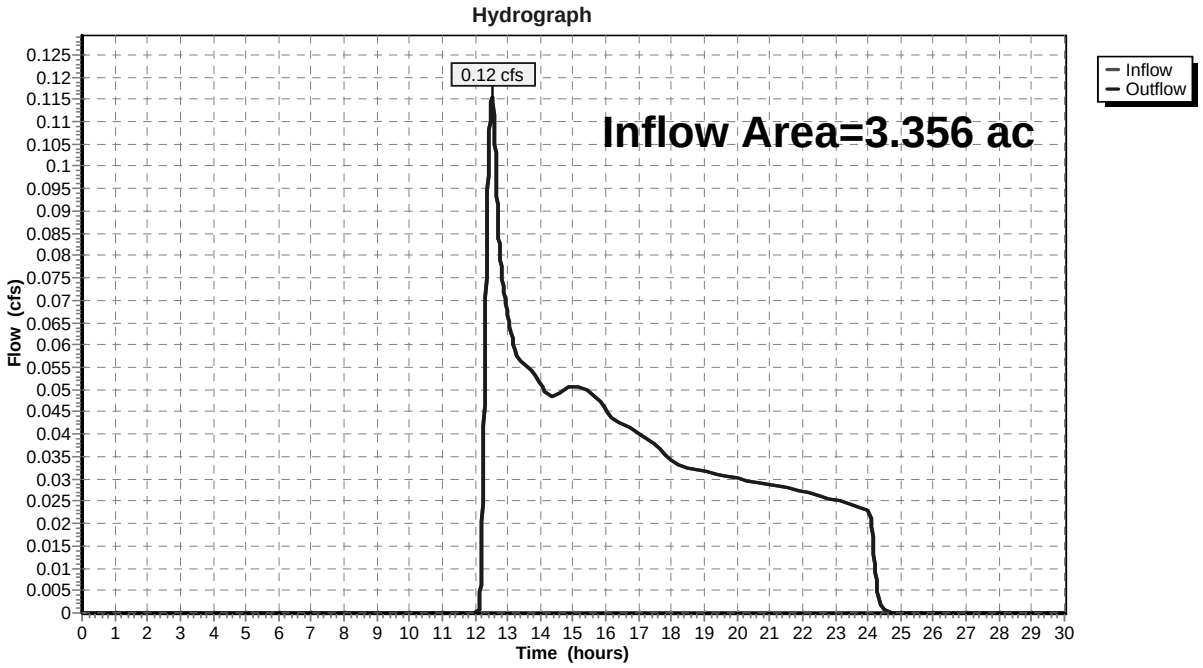


Summary for Reach 1R: Offsite Northwest

Inflow Area = 3.356 ac, 0.00% Impervious, Inflow Depth = 0.14" for 25-year event
Inflow = 0.12 cfs @ 12.52 hrs, Volume= 0.039 af
Outflow = 0.12 cfs @ 12.52 hrs, Volume= 0.039 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach 1R: Offsite Northwest

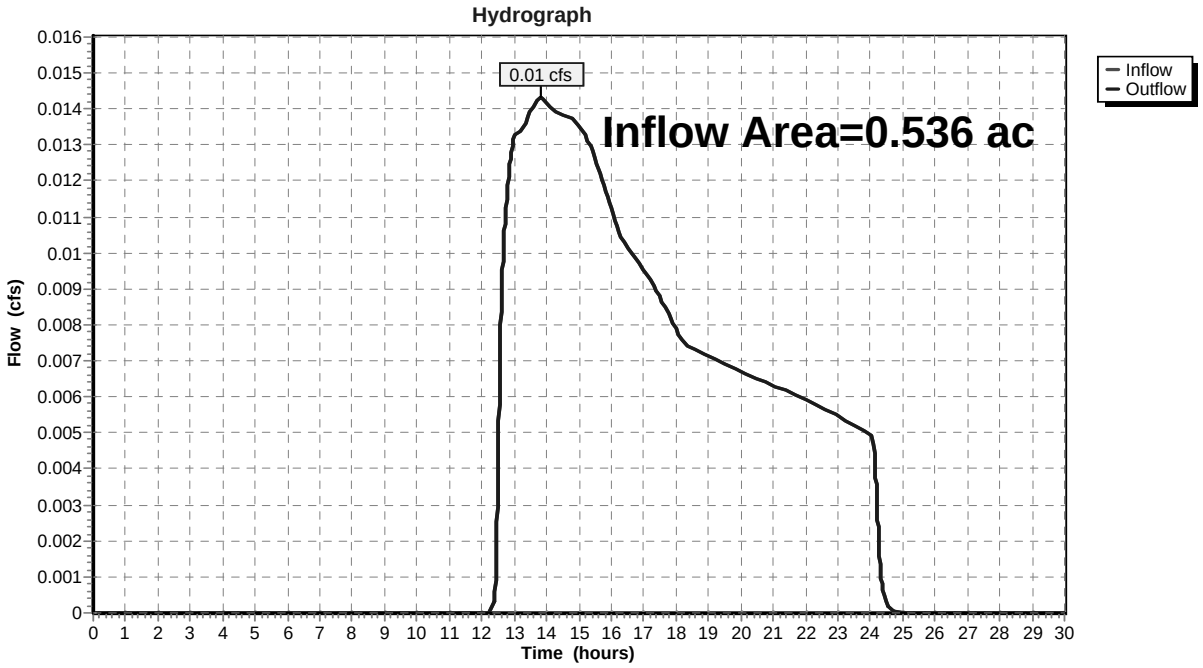


Summary for Reach 2R: Offsite GNR-South

Inflow Area = 0.536 ac, 0.00% Impervious, Inflow Depth = 0.19" for 25-year event
Inflow = 0.01 cfs @ 13.83 hrs, Volume= 0.009 af
Outflow = 0.01 cfs @ 13.83 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach 2R: Offsite GNR-South

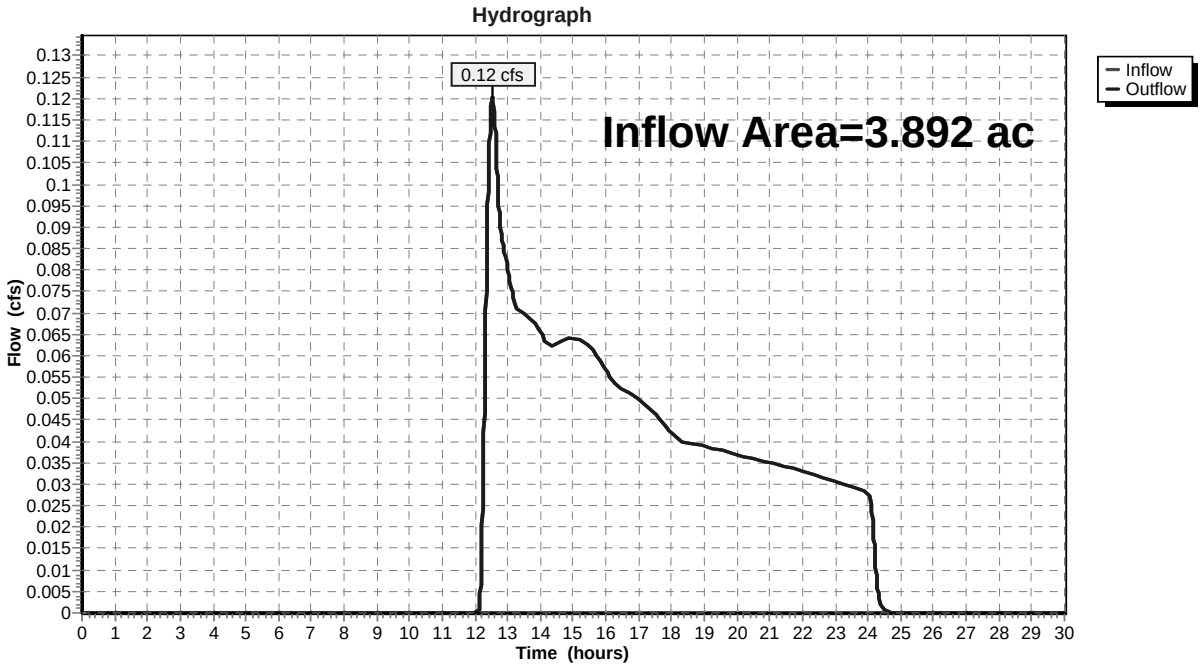


Summary for Reach 3R: SUMMARY NODE

Inflow Area = 3.892 ac, 0.00% Impervious, Inflow Depth = 0.15" for 25-year event
Inflow = 0.12 cfs @ 12.53 hrs, Volume= 0.048 af
Outflow = 0.12 cfs @ 12.53 hrs, Volume= 0.048 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach 3R: SUMMARY NODE



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Offsite Flow to Runoff Area=101,679 sf 0.00% Impervious Runoff Depth=0.23"
Flow Length=381' Tc=13.2 min CN=30 Runoff=0.07 cfs 0.045 af

Subcatchment 2S: Offsite Flow to Runoff Area=44,503 sf 0.00% Impervious Runoff Depth=0.80"
Flow Length=518' Tc=15.0 min CN=39 Runoff=0.40 cfs 0.068 af

Subcatchment 3S: Offsite Flow to Runoff Area=23,367 sf 0.00% Impervious Runoff Depth=0.52"
Flow Length=416' Tc=16.8 min CN=35 Runoff=0.10 cfs 0.023 af

Reach 1R: Offsite Northwest Inflow=0.40 cfs 0.113 af
Outflow=0.40 cfs 0.113 af

Reach 2R: Offsite GNR-South Inflow=0.10 cfs 0.023 af
Outflow=0.10 cfs 0.023 af

Reach 3R: SUMMARY NODE Inflow=0.49 cfs 0.137 af
Outflow=0.49 cfs 0.137 af

Total Runoff Area = 3.892 ac Runoff Volume = 0.137 af Average Runoff Depth = 0.42"
100.00% Pervious = 3.892 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Offsite Flow to North & West

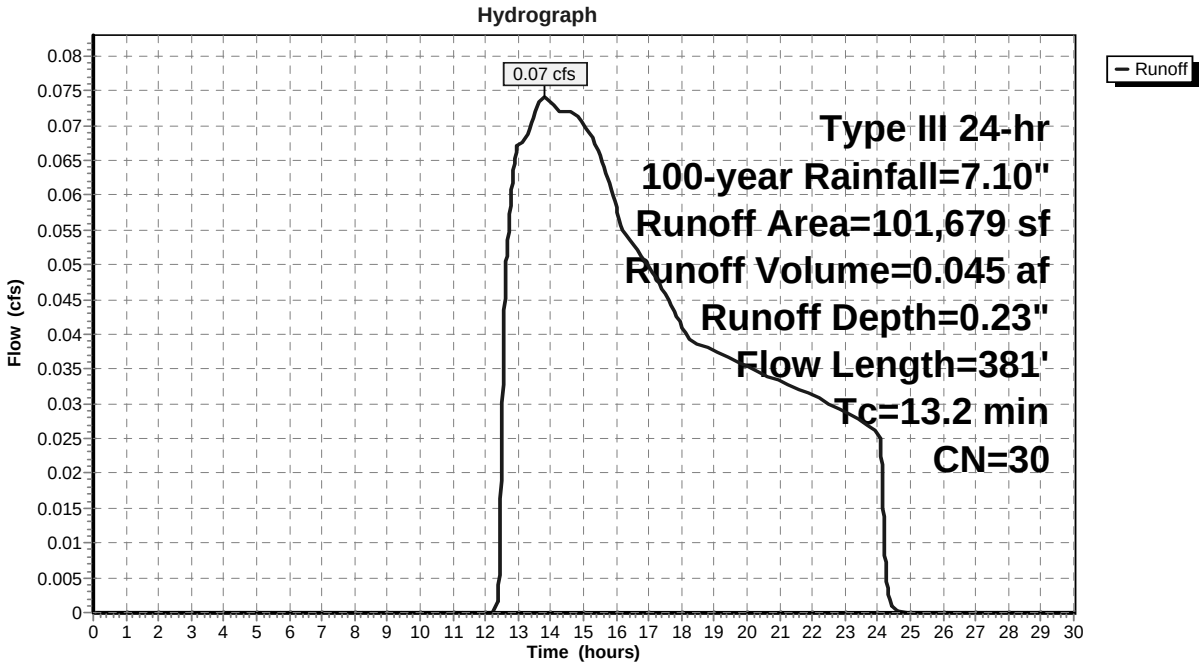
Runoff = 0.07 cfs @ 13.83 hrs, Volume= 0.045 af, Depth= 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (sf)	CN	Description
101,458	30	Woods, Good, HSG A
221	76	Gravel roads, HSG A
101,679	30	Weighted Average
101,679		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	50	0.0200	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
1.6	331	0.0440	3.38		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
13.2	381	Total			

Subcatchment 1S: Offsite Flow to North & West



Summary for Subcatchment 2S: Offsite Flow to North & East

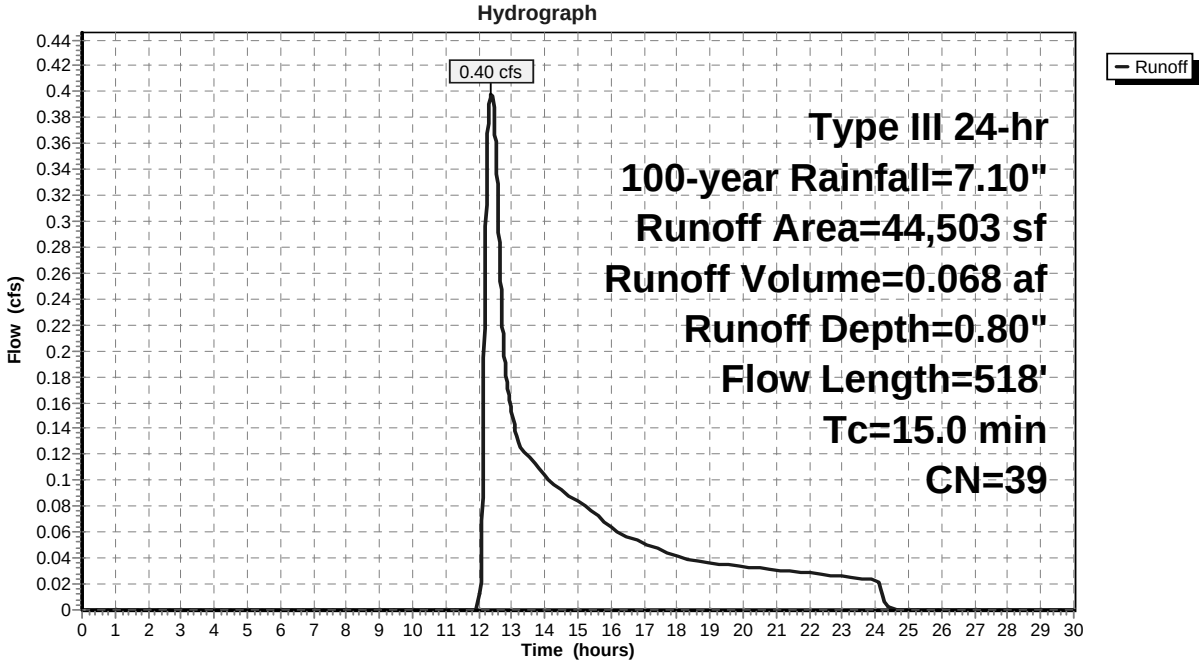
Runoff = 0.40 cfs @ 12.38 hrs, Volume= 0.068 af, Depth= 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (sf)	CN	Description
38,758	30	Woods, Good, HSG A
5,745	96	Gravel surface, HSG A
44,503	39	Weighted Average
44,503		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0260	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
3.2	217	0.0050	1.14		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
1.3	251	0.0430	3.34		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
15.0	518	Total			

Subcatchment 2S: Offsite Flow to North & East



Summary for Subcatchment 3S: Offsite Flow to Great Neck Road South

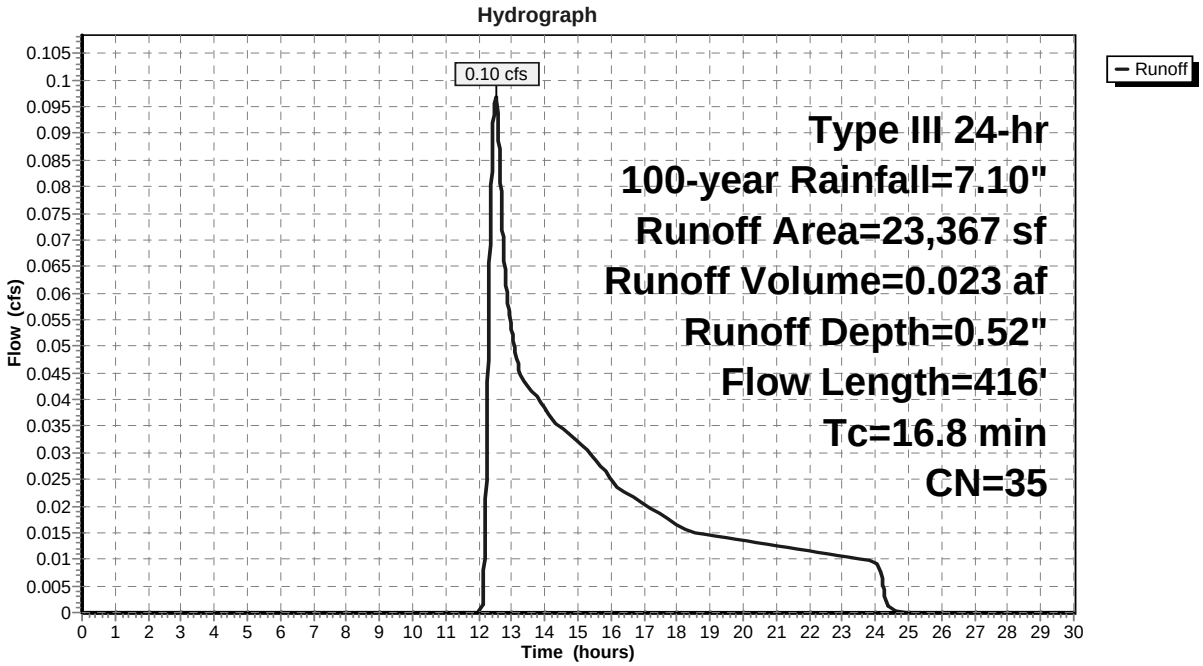
Runoff = 0.10 cfs @ 12.51 hrs, Volume= 0.023 af, Depth= 0.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (sf)	CN	Description
21,761	30	Woods, Good, HSG A
1,606	96	Gravel surface, HSG A
23,367	35	Weighted Average
23,367		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	50	0.0120	0.06		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
2.5	366	0.0230	2.44		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
16.8	416	Total			

Subcatchment 3S: Offsite Flow to Great Neck Road South

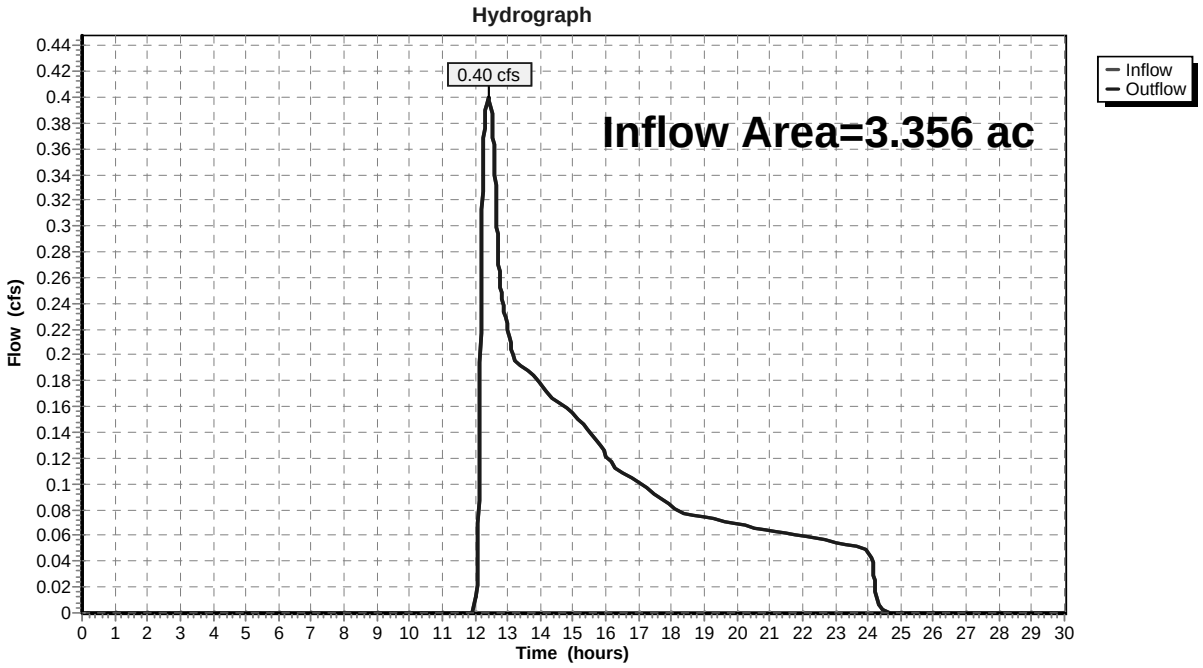


Summary for Reach 1R: Offsite Northwest

Inflow Area = 3.356 ac, 0.00% Impervious, Inflow Depth = 0.40" for 100-year event
Inflow = 0.40 cfs @ 12.42 hrs, Volume= 0.113 af
Outflow = 0.40 cfs @ 12.42 hrs, Volume= 0.113 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach 1R: Offsite Northwest

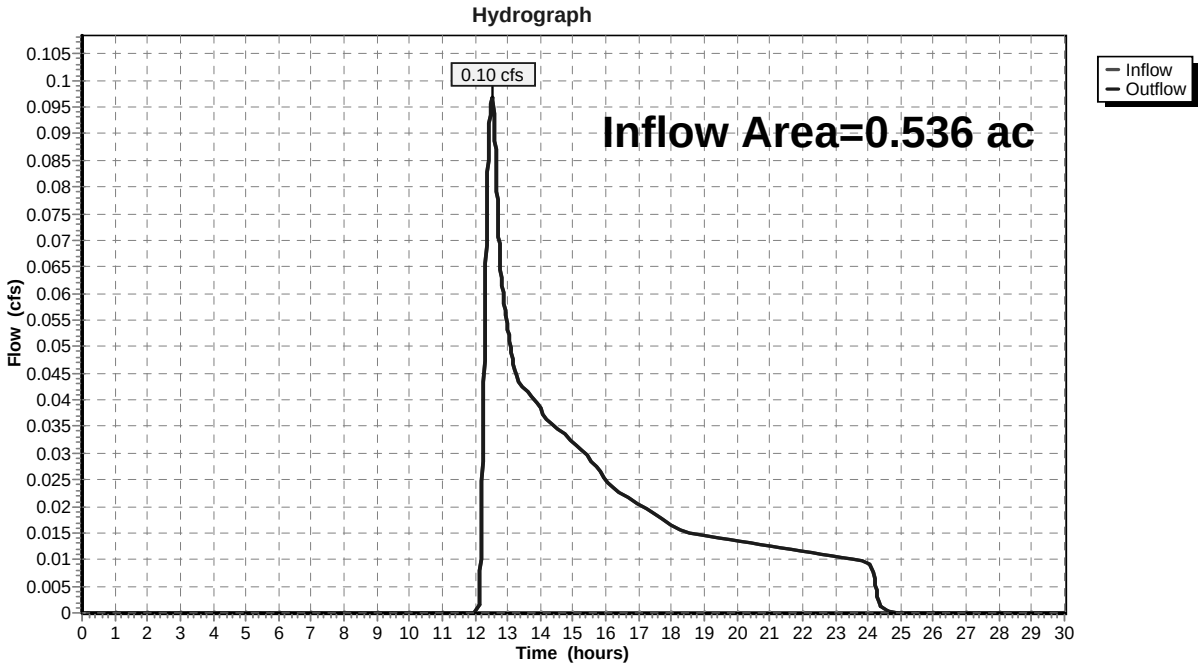


Summary for Reach 2R: Offsite GNR-South

Inflow Area = 0.536 ac, 0.00% Impervious, Inflow Depth = 0.52" for 100-year event
Inflow = 0.10 cfs @ 12.51 hrs, Volume= 0.023 af
Outflow = 0.10 cfs @ 12.51 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach 2R: Offsite GNR-South

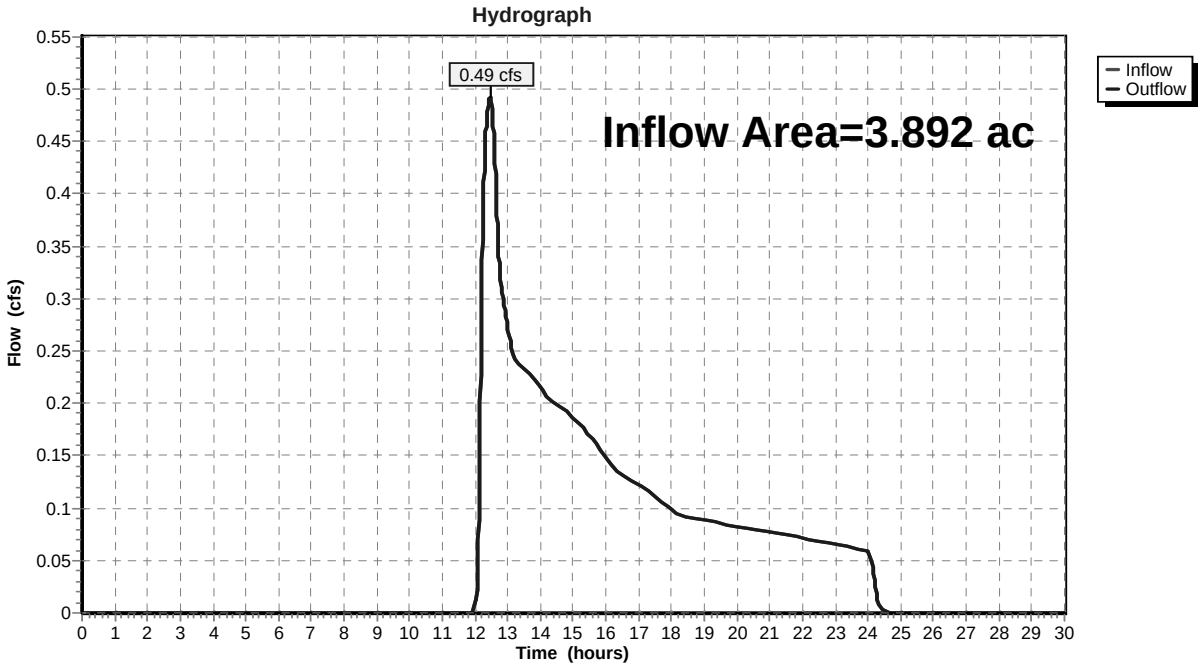


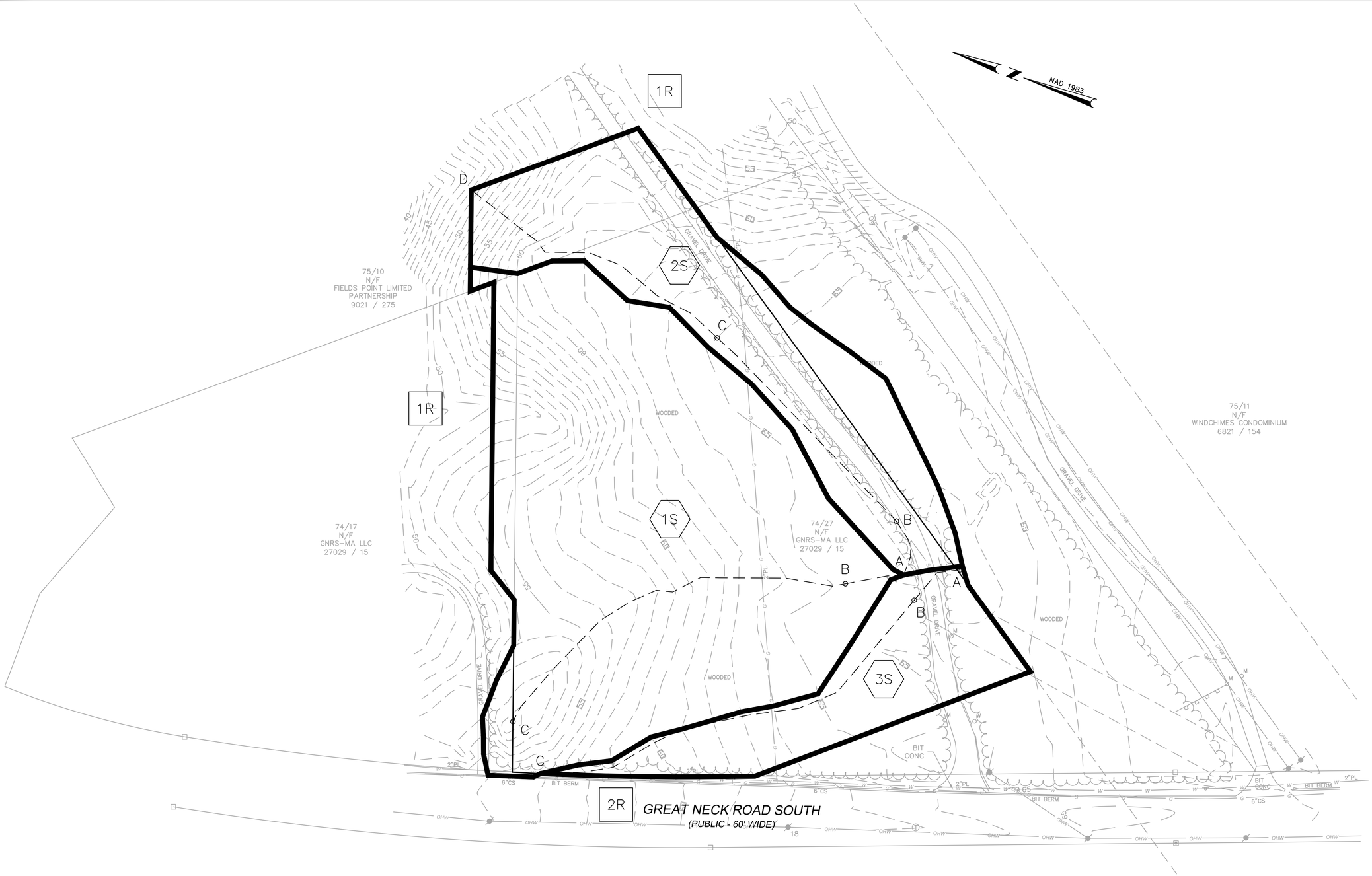
Summary for Reach 3R: SUMMARY NODE

Inflow Area = 3.892 ac, 0.00% Impervious, Inflow Depth = 0.42" for 100-year event
Inflow = 0.49 cfs @ 12.45 hrs, Volume= 0.137 af
Outflow = 0.49 cfs @ 12.45 hrs, Volume= 0.137 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach 3R: SUMMARY NODE





BRIAN G. YERGATIAN
PROFESSIONAL ENGINEER

DATE

NORTHBRIDGE MASHPEE COMMONS

GREAT NECK ROAD SOUTH

IN

MASHPEE
MASSACHUSETTS
(BARNSTABLE COUNTY)

PRE-DEVELOPMENT WATERSHED PLAN

SEPTEMBER 7, 2015

REVISIONS:

NO.	DATE	DESC.

PERMITTING PLANS
NOT FOR CONSTRUCTION

PREPARED FOR:

THE NORTHBRIDGE COMPANIES
71 THIRD AVENUE
BURLINGTON, MA 01803

BSC GROUP
349 Route 28, Unit D
W. Yarmouth, Massachusetts
02673
617 896 4300

© 2015 BSC Group, Inc.

SCALE: 1" = 40'

0 20 40 80 FEET

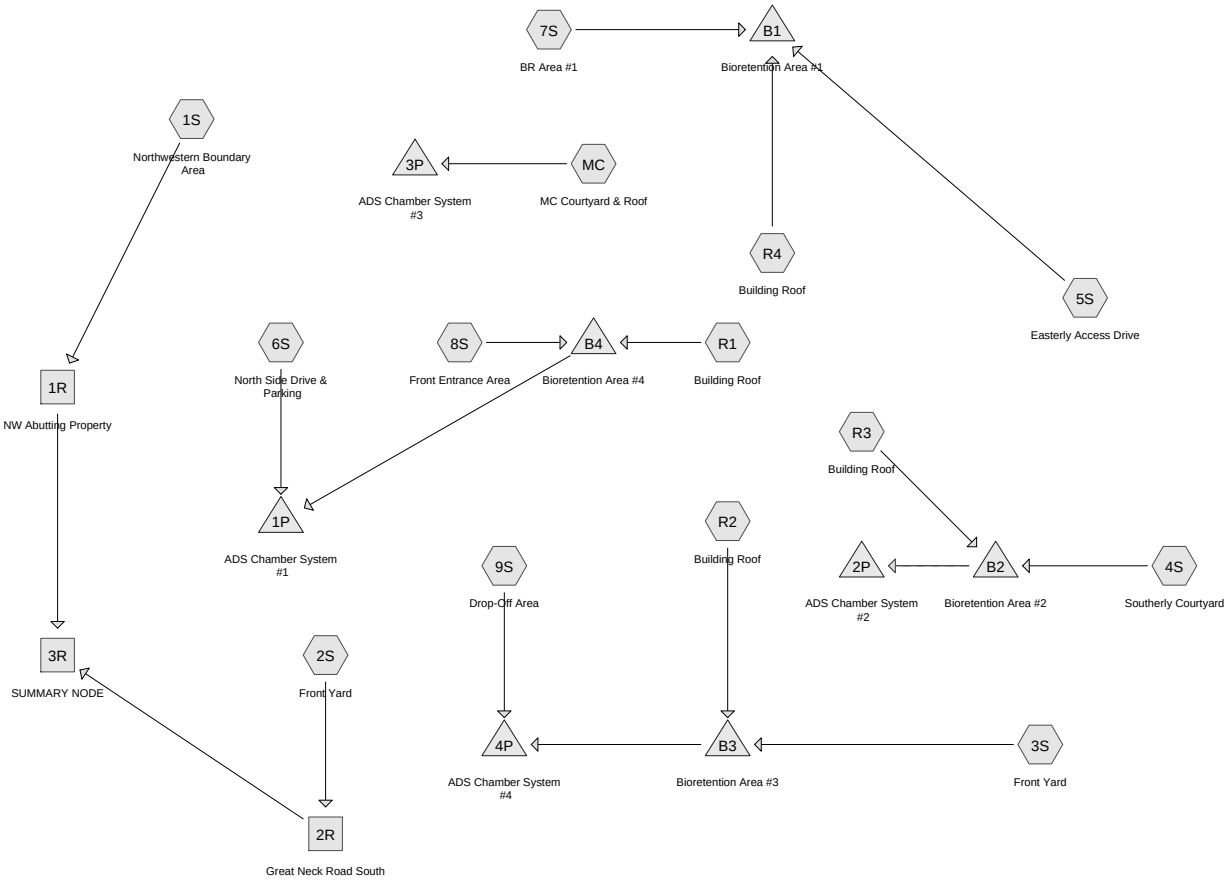
FILE: \\bscbos\bos\2321600\Civil\Drawings\...

DWG. NO:

JOB. NO: 23216.00

SHEET

5.2 PROPOSED DRAINAGE CALCULATIONS AND WATERSHED PLAN



Subcat Reach Pond Link

Routing Diagram for 2321600-POST
Prepared by BSC Group, Inc., Printed 9/1/2015
HydroCAD® 10.00 s/n 00904 © 2013 HydroCAD Software Solutions LLC

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1S: Northwestern Runoff Area=16,859 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=33 Runoff=0.00 cfs 0.000 af

Subcatchment 2S: Front Yard Runoff Area=8,602 sf 15.40% Impervious Runoff Depth=0.05"
Tc=6.0 min CN=42 Runoff=0.00 cfs 0.001 af

Subcatchment 3S: Front Yard Runoff Area=7,305 sf 27.47% Impervious Runoff Depth=0.22"
Tc=6.0 min UI Adjusted CN=50 Runoff=0.01 cfs 0.003 af

Subcatchment 4S: Southerly Runoff Area=24,964 sf 29.67% Impervious Runoff Depth=0.31"
Tc=6.0 min UI Adjusted CN=53 Runoff=0.08 cfs 0.015 af

Subcatchment 5S: Easterly Access Runoff Area=13,653 sf 47.25% Impervious Runoff Depth=0.76"
Tc=6.0 min CN=64 Runoff=0.23 cfs 0.020 af

Subcatchment 6S: North Side Drive Runoff Area=30,907 sf 79.72% Impervious Runoff Depth=2.19"
Tc=6.0 min CN=86 Runoff=1.82 cfs 0.129 af

Subcatchment 7S: BR Area #1 Runoff Area=13,211 sf 42.99% Impervious Runoff Depth=1.07"
Tc=6.0 min CN=70 Runoff=0.35 cfs 0.027 af

Subcatchment 8S: Front Entrance Runoff Area=4,770 sf 51.89% Impervious Runoff Depth=1.07"
Tc=6.0 min CN=70 Runoff=0.13 cfs 0.010 af

Subcatchment 9S: Drop-Off Area Runoff Area=6,767 sf 78.45% Impervious Runoff Depth=2.10"
Tc=6.0 min CN=85 Runoff=0.38 cfs 0.027 af

Subcatchment MC: MC Courtyard & Runoff Area=7,595 sf 86.33% Impervious Runoff Depth=2.54"
Tc=6.0 min CN=90 Runoff=0.51 cfs 0.037 af

Subcatchment R1: Building Roof Runoff Area=9,040 sf 100.00% Impervious Runoff Depth=3.37"
Tc=6.0 min CN=98 Runoff=0.73 cfs 0.058 af

Subcatchment R2: Building Roof Runoff Area=6,984 sf 100.00% Impervious Runoff Depth=3.37"
Tc=6.0 min CN=98 Runoff=0.56 cfs 0.045 af

Subcatchment R3: Building Roof Runoff Area=11,933 sf 100.00% Impervious Runoff Depth=3.37"
Tc=6.0 min CN=98 Runoff=0.96 cfs 0.077 af

Subcatchment R4: Building Roof Runoff Area=6,958 sf 100.00% Impervious Runoff Depth=3.37"
Tc=6.0 min CN=98 Runoff=0.56 cfs 0.045 af

Reach 1R: NW Abutting Property Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach 2R: Great Neck Road South Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Reach 3R: SUMMARY NODE Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Pond 1P: ADS Chamber System #1 Peak Elev=51.36' Storage=2,055 cf Inflow=2.65 cfs 0.169 af
Outflow=0.58 cfs 0.169 af

Pond 2P: ADS Chamber System #2 Peak Elev=52.37' Storage=584 cf Inflow=0.98 cfs 0.071 af
Outflow=0.31 cfs 0.071 af

Pond 3P: ADS Chamber System #3 Peak Elev=54.07' Storage=424 cf Inflow=0.51 cfs 0.037 af
Outflow=0.10 cfs 0.037 af

Pond 4P: ADS Chamber System #4 Peak Elev=51.23' Storage=685 cf Inflow=0.92 cfs 0.056 af
Outflow=0.22 cfs 0.056 af

Pond B1: Bioretention Area #1 Peak Elev=56.01' Storage=1,854 cf Inflow=1.14 cfs 0.092 af
Outflow=0.07 cfs 0.090 af

Pond B2: Bioretention Area #2 Peak Elev=58.53' Storage=164 cf Inflow=0.99 cfs 0.092 af
Discarded=0.01 cfs 0.020 af Primary=0.98 cfs 0.071 af Outflow=0.99 cfs 0.092 af

Pond B3: Bioretention Area #3 Peak Elev=59.59' Storage=209 cf Inflow=0.56 cfs 0.048 af
Discarded=0.01 cfs 0.019 af Primary=0.54 cfs 0.029 af Outflow=0.55 cfs 0.048 af

Pond B4: Bioretention Area #4 Peak Elev=59.54' Storage=297 cf Inflow=0.85 cfs 0.068 af
Discarded=0.02 cfs 0.029 af Primary=0.83 cfs 0.039 af Outflow=0.85 cfs 0.068 af

Total Runoff Area = 3.892 ac Runoff Volume = 0.494 af Average Runoff Depth = 1.52"
42.93% Pervious = 1.671 ac 57.07% Impervious = 2.221 ac

Summary for Subcatchment 1S: Northwestern Boundary Area

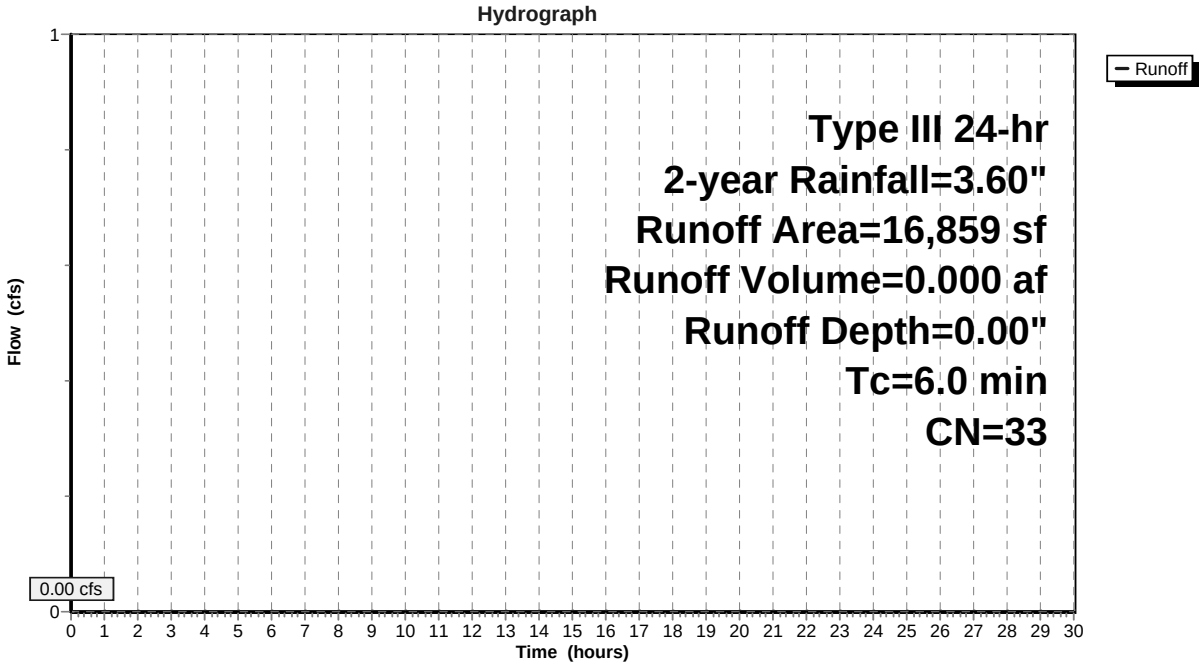
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.60"

Area (sf)	CN	Description
16,470	32	Woods/grass comb., Good, HSG A
389	76	Gravel roads, HSG A
16,859	33	Weighted Average
16,859		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 1S: Northwestern Boundary Area



Summary for Subcatchment 2S: Front Yard

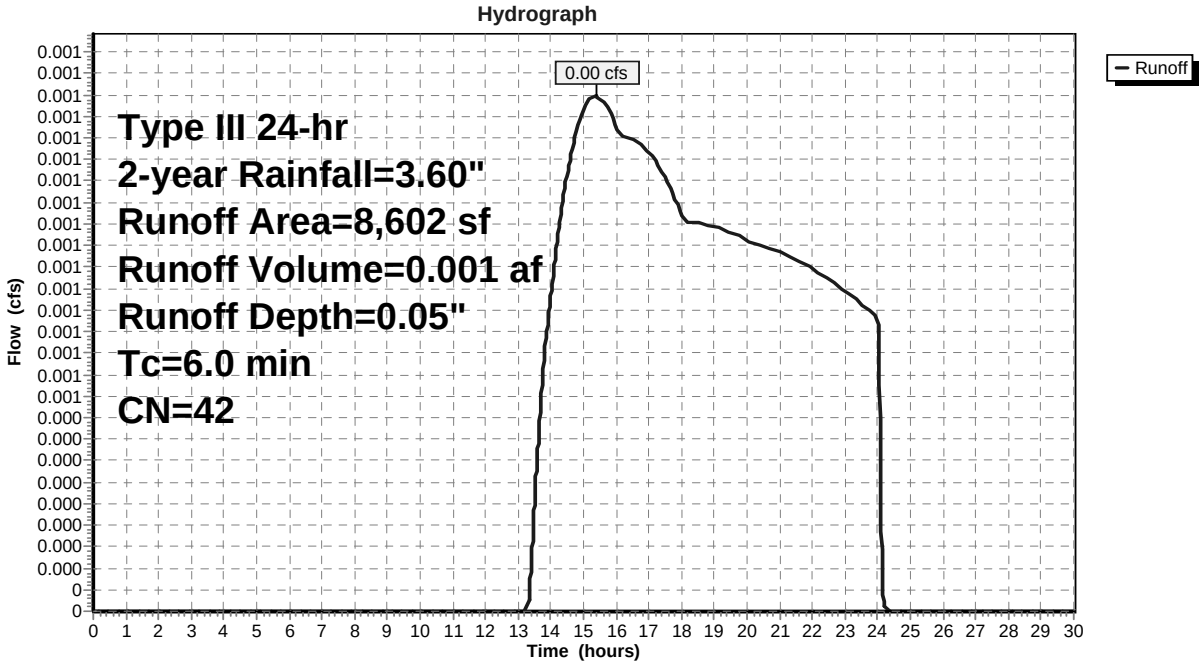
Runoff = 0.00 cfs @ 15.38 hrs, Volume= 0.001 af, Depth= 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.60"

Area (sf)	CN	Description
1,660	39	>75% Grass cover, Good, HSG A
1,325	98	Paved parking, HSG A
5,617	30	Woods, Good, HSG A
8,602	42	Weighted Average
7,277		84.60% Pervious Area
1,325		15.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 2S: Front Yard



Summary for Subcatchment 3S: Front Yard

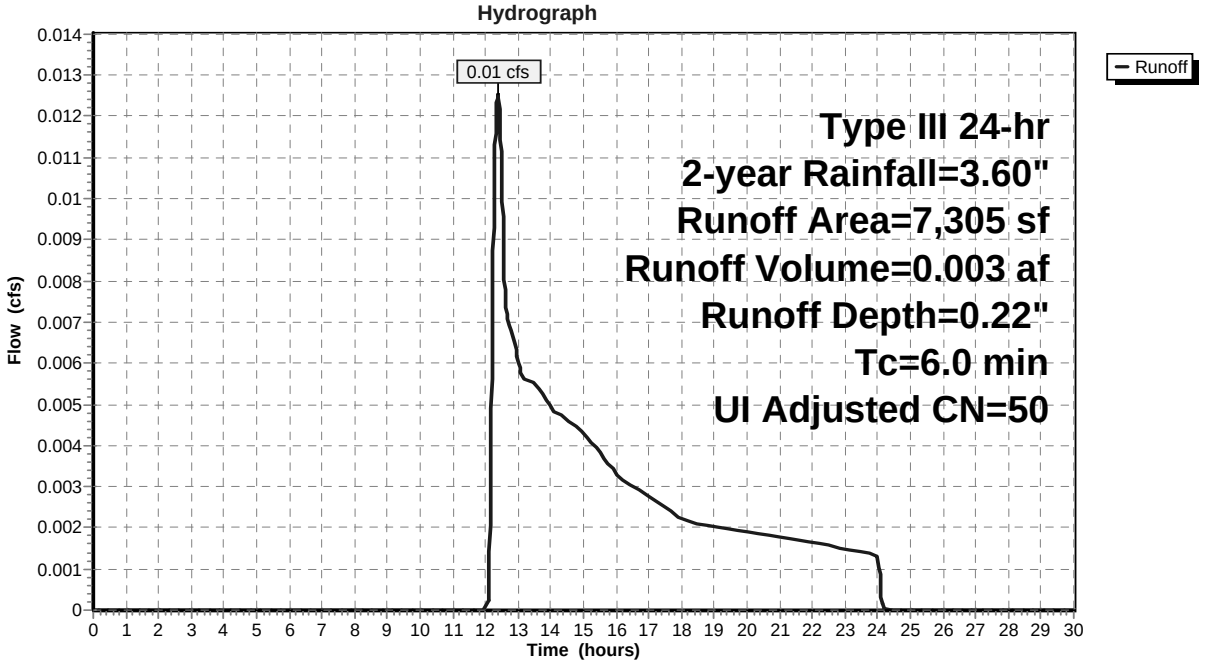
Runoff = 0.01 cfs @ 12.38 hrs, Volume= 0.003 af, Depth= 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.60"

	Area (sf)	CN	Adj	Description
	5,298	39		>75% Grass cover, Good, HSG A
*	1,346	98		Unconnected pvmnt & porch roofs, HSG A
	661	98		Water Surface, HSG A
	7,305	55	50	Weighted Average, UI Adjusted
	5,298			72.53% Pervious Area
	2,007			27.47% Impervious Area
	1,346			67.07% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 3S: Front Yard



Summary for Subcatchment 4S: Southerly Courtyard

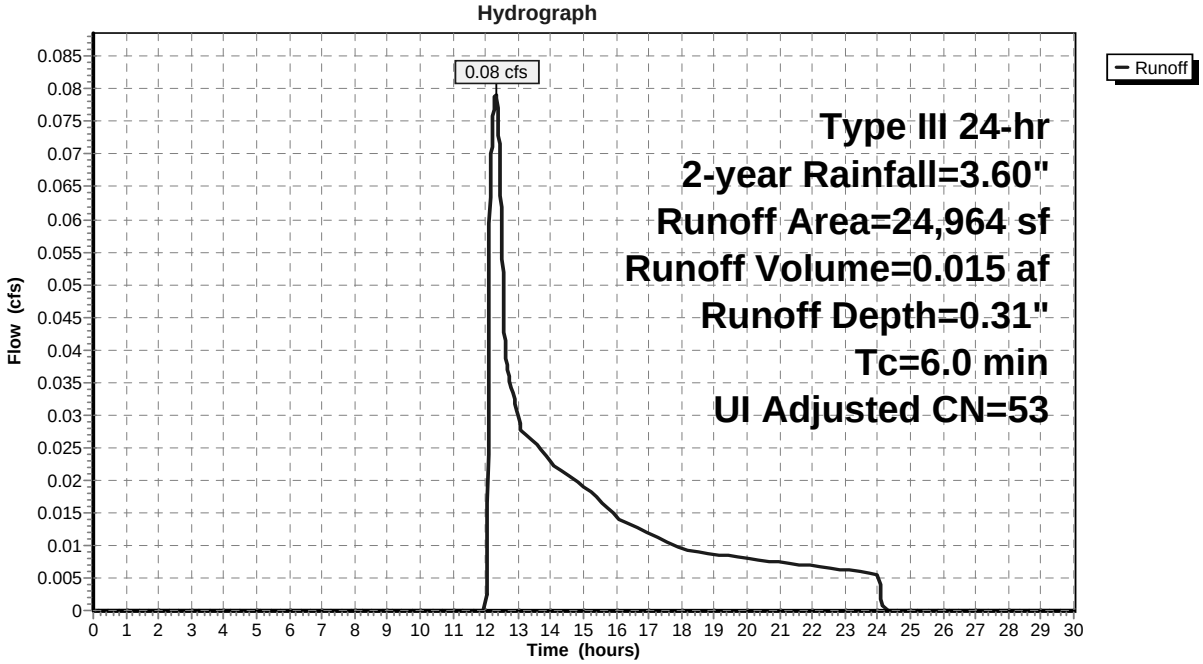
Runoff = 0.08 cfs @ 12.31 hrs, Volume= 0.015 af, Depth= 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.60"

	Area (sf)	CN	Adj	Description
	3,660	76		Gravel roads, HSG A
*	5,842	98		Unconnected pvmnt & porch roofs, HSG A
	1,565	98		Water Surface, HSG A
	5,984	30		Woods, Good, HSG A
	7,913	39		>75% Grass cover, Good, HSG A
	24,964	60	53	Weighted Average, UI Adjusted
	17,557			70.33% Pervious Area
	7,407			29.67% Impervious Area
	5,842			78.87% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 4S: Southerly Courtyard



Summary for Subcatchment 5S: Easterly Access Drive

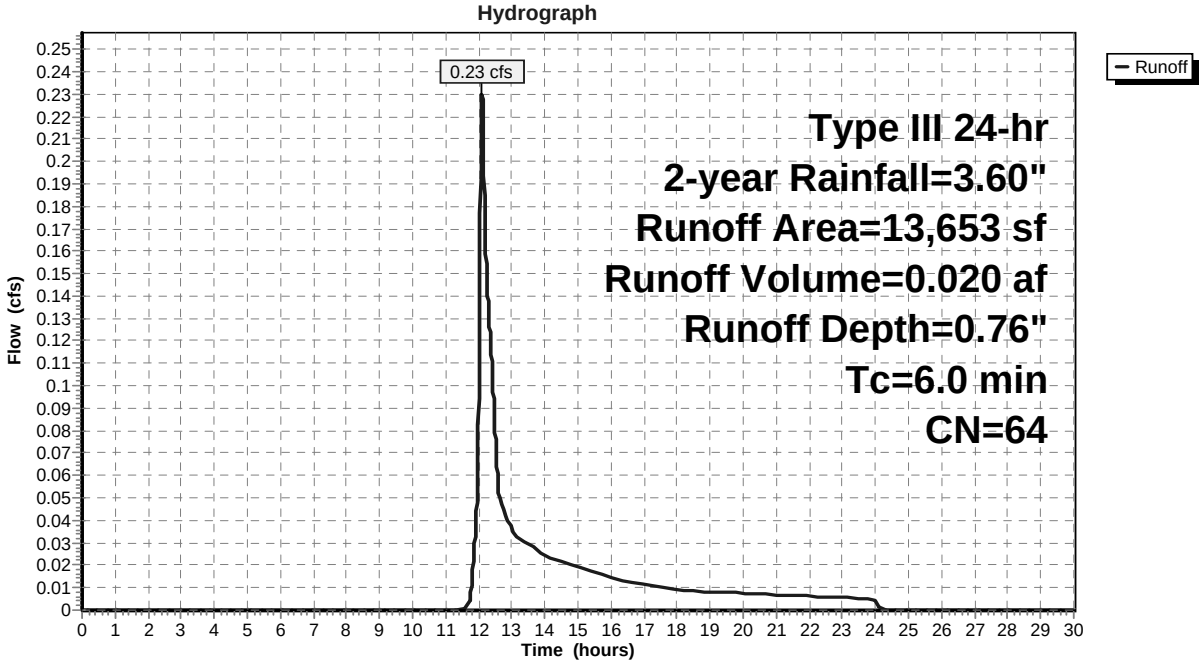
Runoff = 0.23 cfs @ 12.10 hrs, Volume= 0.020 af, Depth= 0.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.60"

Area (sf)	CN	Description
5,400	30	Woods, Good, HSG A
1,503	39	>75% Grass cover, Good, HSG A
6,451	98	Paved parking, HSG A
299	76	Gravel roads, HSG A
13,653	64	Weighted Average
7,202		52.75% Pervious Area
6,451		47.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 5S: Easterly Access Drive



Summary for Subcatchment 6S: North Side Drive & Parking

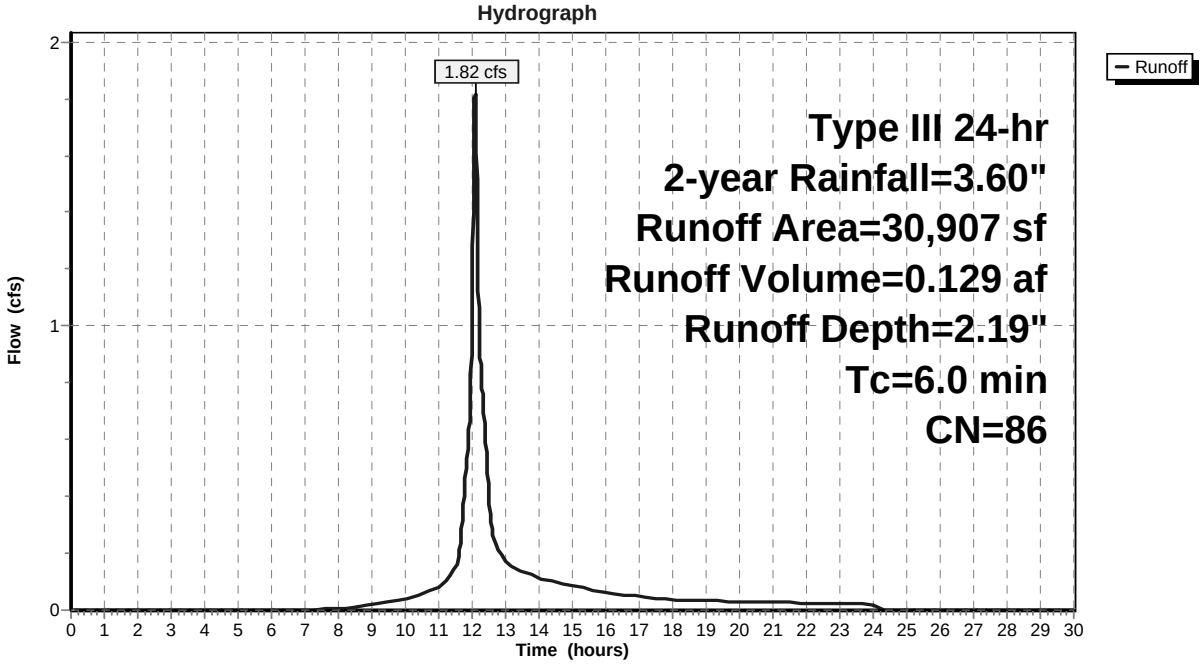
Runoff = 1.82 cfs @ 12.09 hrs, Volume= 0.129 af, Depth= 2.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.60"

Area (sf)	CN	Description
24,640	98	Paved parking, HSG A
4,625	39	>75% Grass cover, Good, HSG A
1,092	30	Woods, Good, HSG A
550	76	Gravel roads, HSG A
30,907	86	Weighted Average
6,267		20.28% Pervious Area
24,640		79.72% Impervious Area

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

Subcatchment 6S: North Side Drive & Parking



Summary for Subcatchment 7S: BR Area #1

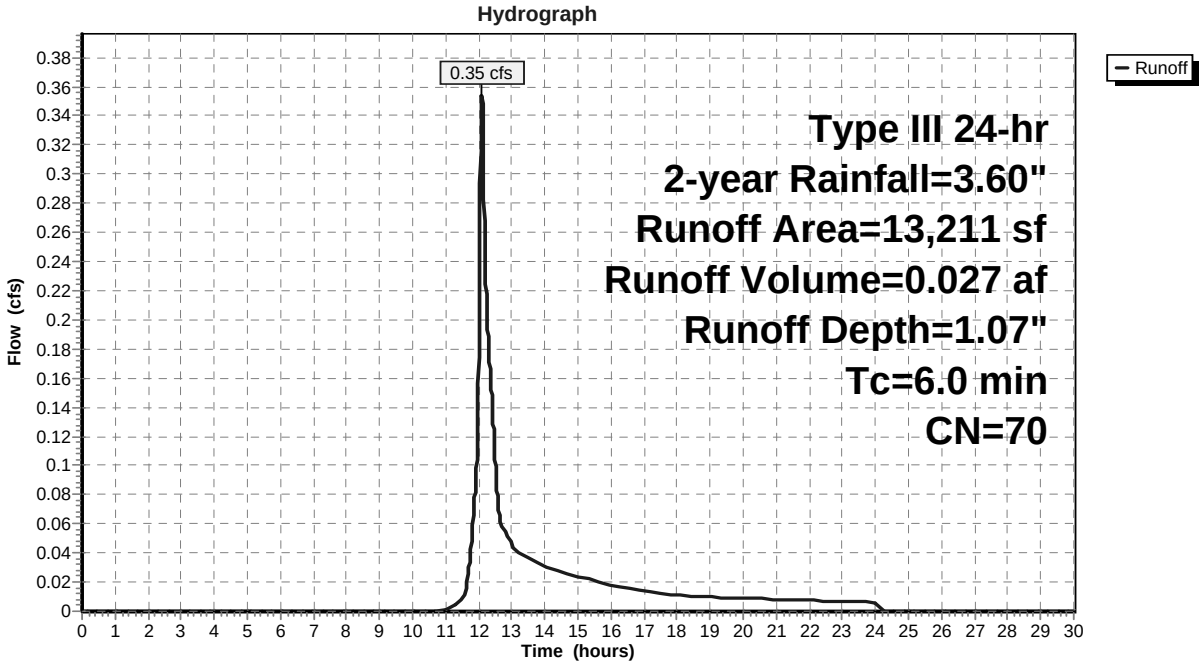
Runoff = 0.35 cfs @ 12.10 hrs, Volume= 0.027 af, Depth= 1.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.60"

Area (sf)	CN	Description
5,630	39	>75% Grass cover, Good, HSG A
1,902	76	Gravel roads, HSG A
5,679	98	Water Surface, HSG A
13,211	70	Weighted Average
7,532		57.01% Pervious Area
5,679		42.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 7S: BR Area #1



Summary for Subcatchment 8S: Front Entrance Area

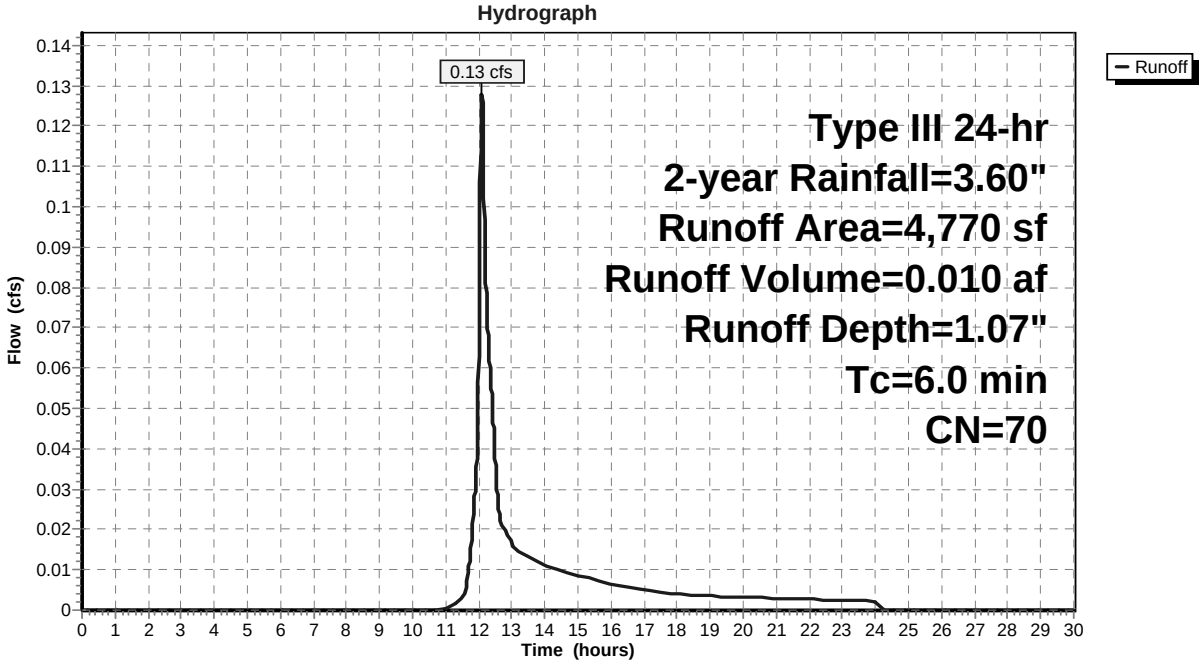
Runoff = 0.13 cfs @ 12.10 hrs, Volume= 0.010 af, Depth= 1.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.60"

	Area (sf)	CN	Description
	2,295	39	>75% Grass cover, Good, HSG A
*	1,279	98	Unconnected pvmnt & porch roofs, HSG A
	1,196	98	Water Surface, HSG A
	4,770	70	Weighted Average
	2,295		48.11% Pervious Area
	2,475		51.89% Impervious Area
	1,279		51.68% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 8S: Front Entrance Area



Summary for Subcatchment 9S: Drop-Off Area

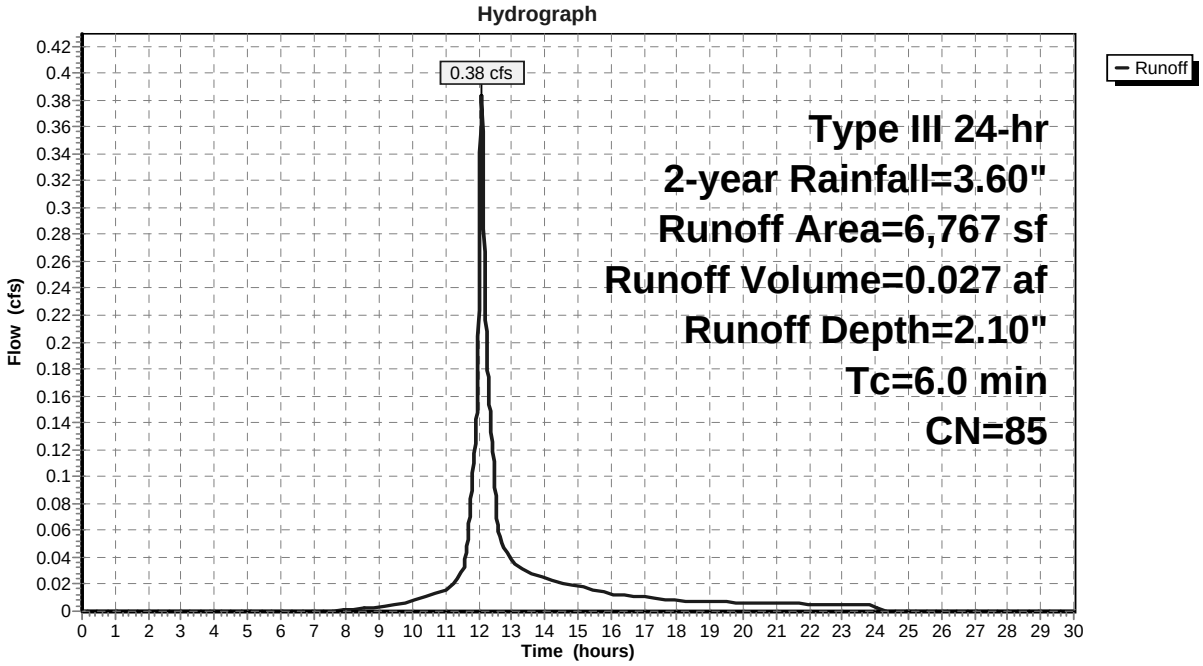
Runoff = 0.38 cfs @ 12.09 hrs, Volume= 0.027 af, Depth= 2.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.60"

	Area (sf)	CN	Description
	1,458	39	>75% Grass cover, Good, HSG A
*	5,309	98	Unconnected pvmnt & porch roofs, HSG A
	6,767	85	Weighted Average
	1,458		21.55% Pervious Area
	5,309		78.45% Impervious Area
	5,309		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 9S: Drop-Off Area



Summary for Subcatchment MC: MC Courtyard & Roof

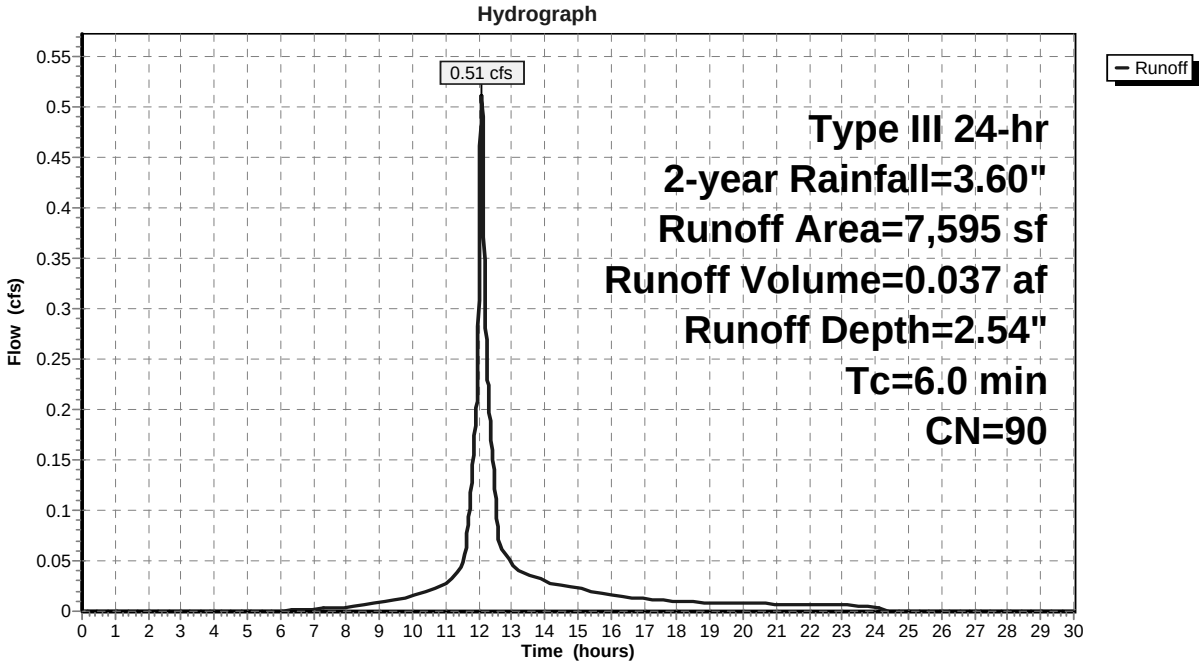
Runoff = 0.51 cfs @ 12.09 hrs, Volume= 0.037 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.60"

Area (sf)	CN	Description
1,038	39	>75% Grass cover, Good, HSG A
6,557	98	Unconnected roofs, HSG A
7,595	90	Weighted Average
1,038		13.67% Pervious Area
6,557		86.33% Impervious Area
6,557		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment MC: MC Courtyard & Roof



Summary for Subcatchment R1: Building Roof

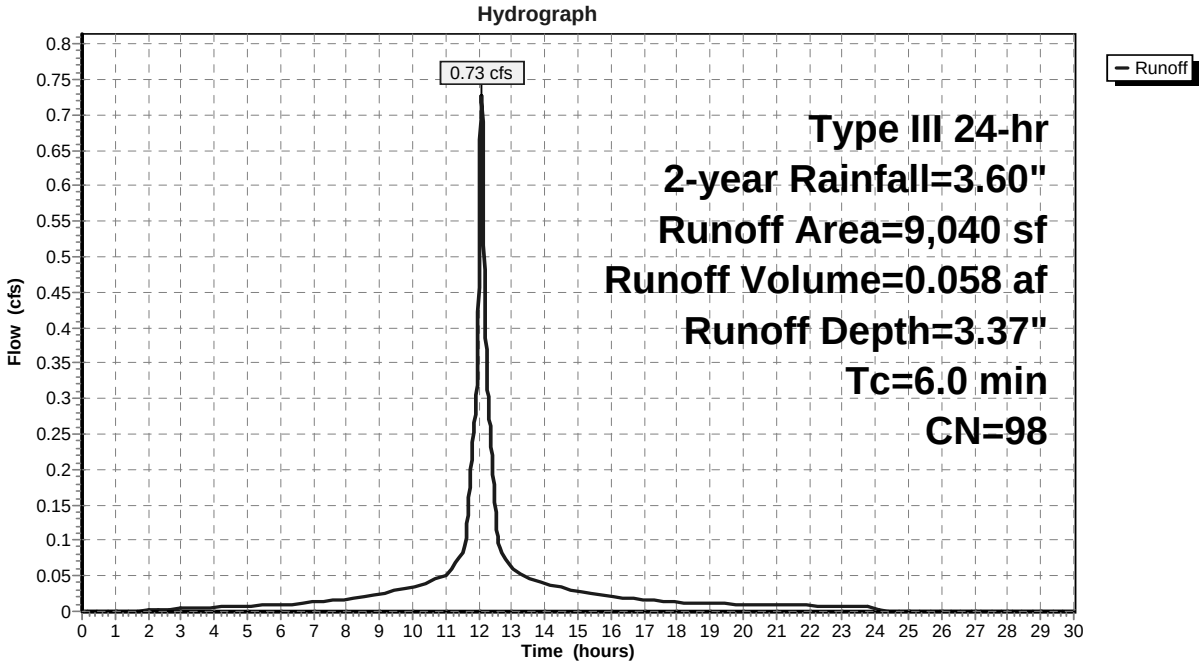
Runoff = 0.73 cfs @ 12.08 hrs, Volume= 0.058 af, Depth= 3.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.60"

Area (sf)	CN	Description
9,040	98	Roofs, HSG A
9,040		100.00% Impervious Area

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

Subcatchment R1: Building Roof



Summary for Subcatchment R2: Building Roof

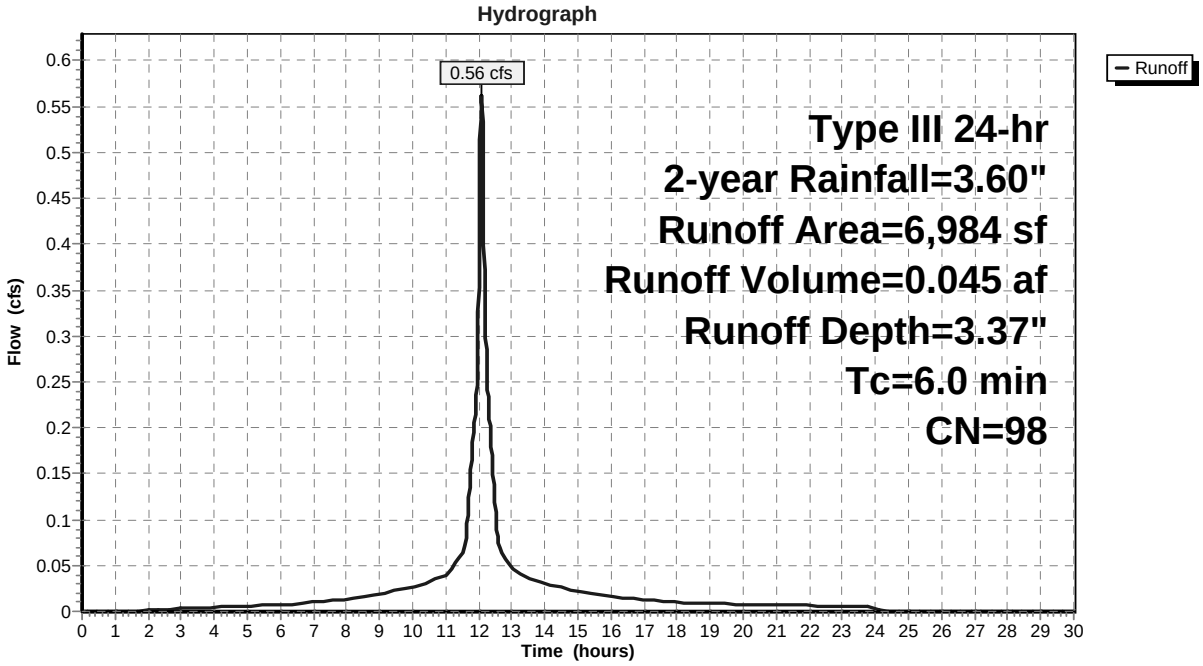
Runoff = 0.56 cfs @ 12.08 hrs, Volume= 0.045 af, Depth= 3.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.60"

Area (sf)	CN	Description
6,984	98	Roofs, HSG A
6,984		100.00% Impervious Area

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

Subcatchment R2: Building Roof



Summary for Subcatchment R3: Building Roof

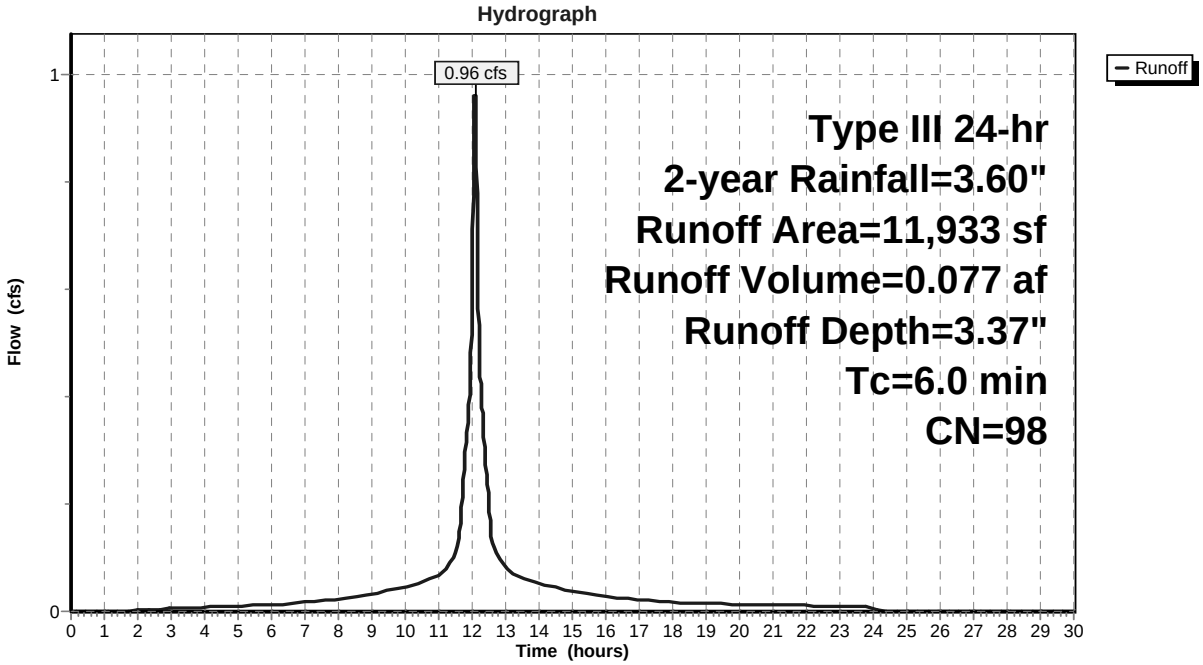
Runoff = 0.96 cfs @ 12.08 hrs, Volume= 0.077 af, Depth= 3.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.60"

Area (sf)	CN	Description
11,933	98	Roofs, HSG A
11,933		100.00% Impervious Area

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

Subcatchment R3: Building Roof



Summary for Subcatchment R4: Building Roof

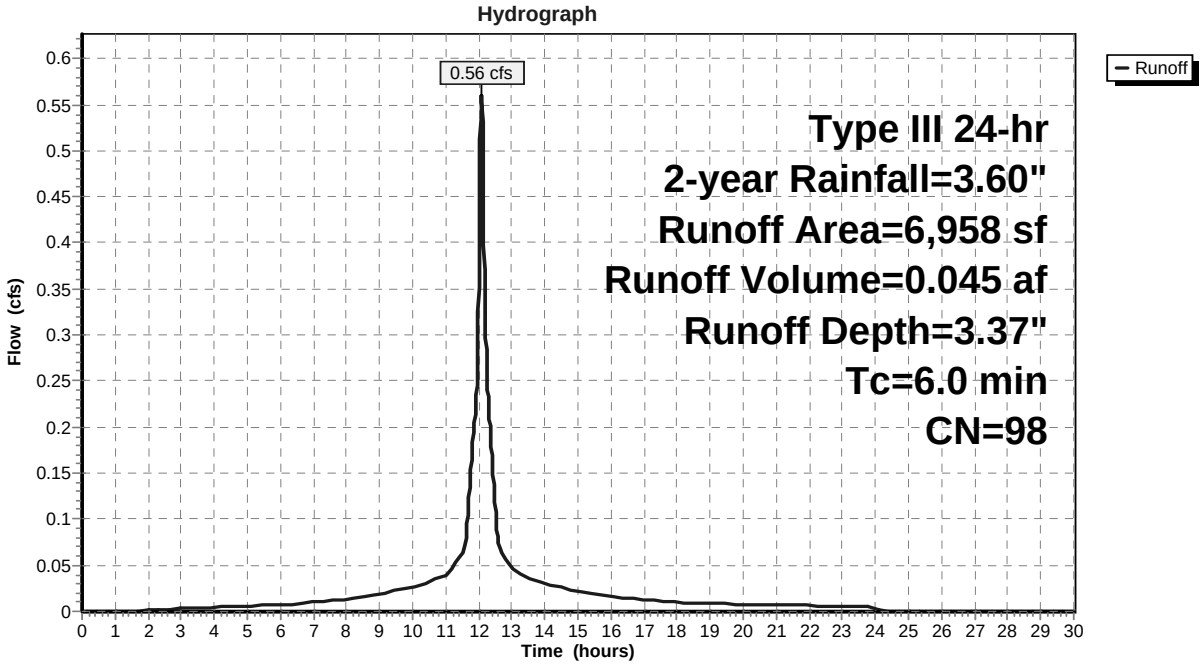
Runoff = 0.56 cfs @ 12.08 hrs, Volume= 0.045 af, Depth= 3.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.60"

Area (sf)	CN	Description
6,958	98	Roofs, HSG A
6,958		100.00% Impervious Area

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

Subcatchment R4: Building Roof

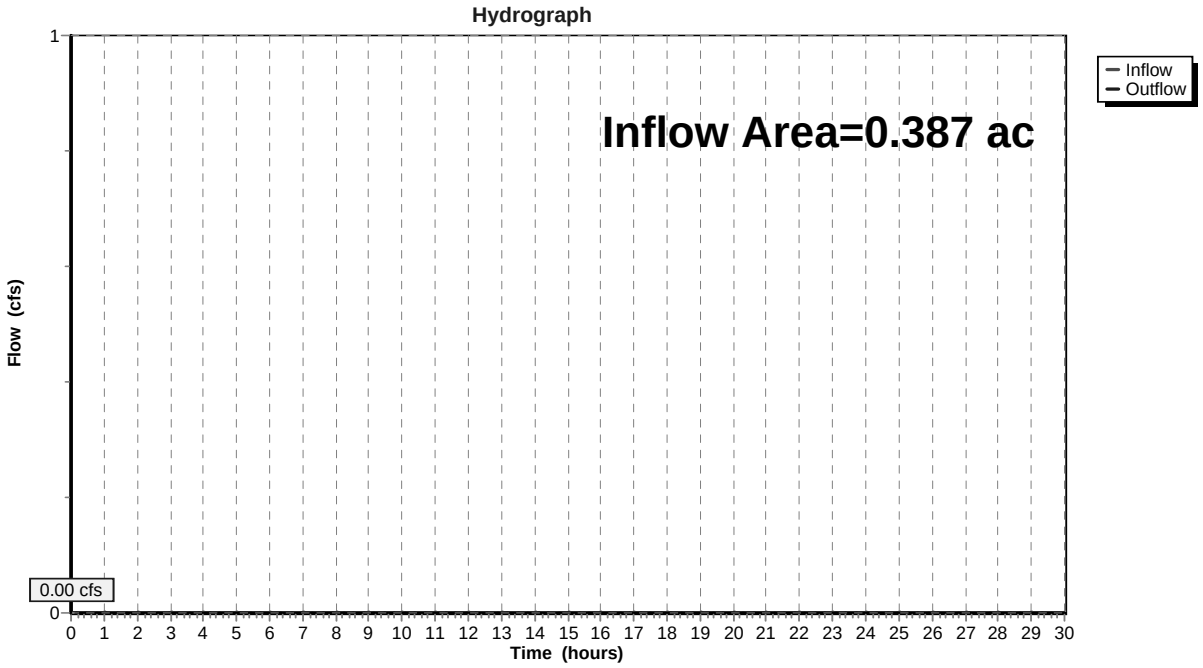


Summary for Reach 1R: NW Abutting Property

Inflow Area = 0.387 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach 1R: NW Abutting Property

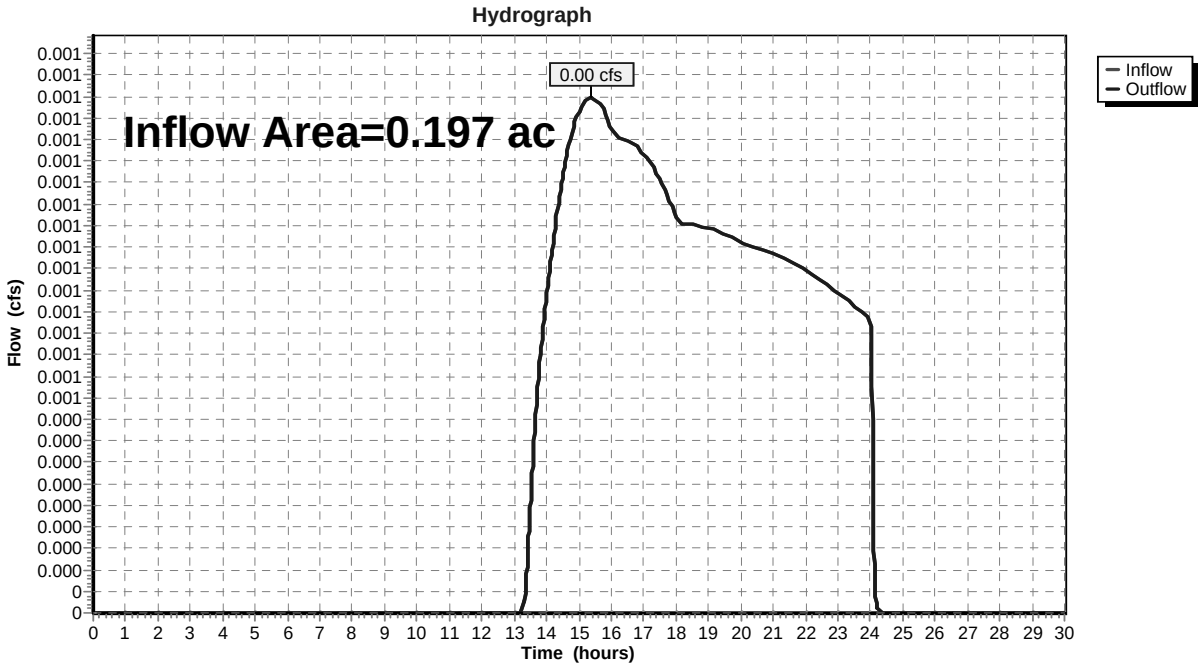


Summary for Reach 2R: Great Neck Road South

Inflow Area = 0.197 ac, 15.40% Impervious, Inflow Depth = 0.05" for 2-year event
Inflow = 0.00 cfs @ 15.38 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 15.38 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach 2R: Great Neck Road South

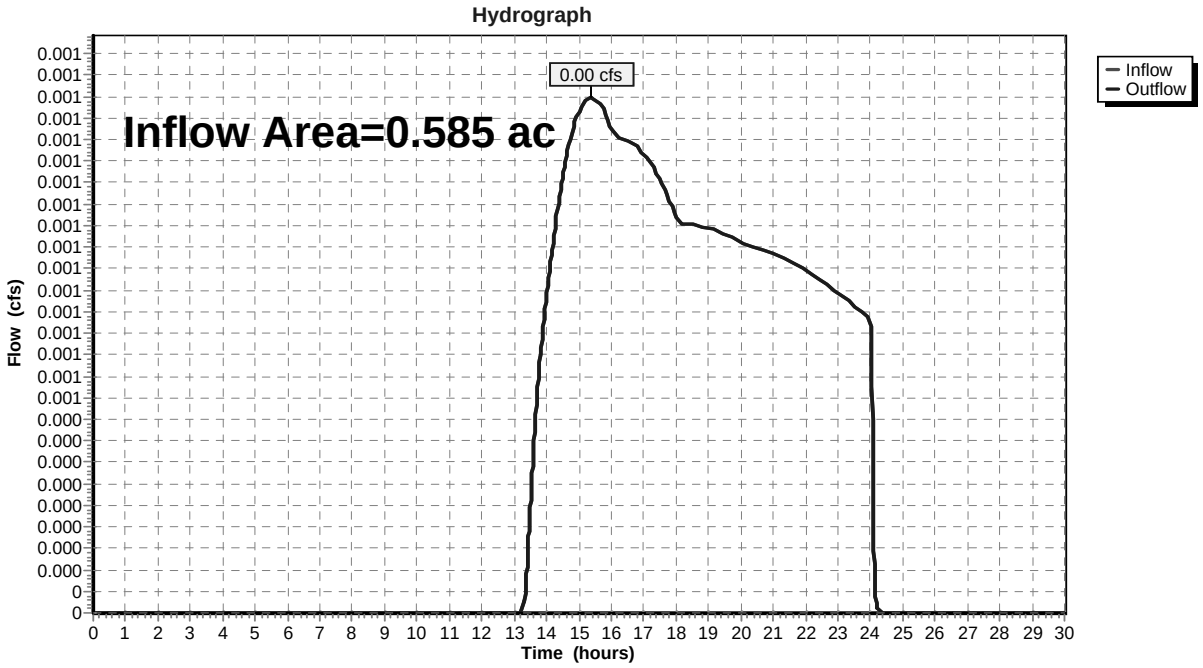


Summary for Reach 3R: SUMMARY NODE

Inflow Area = 0.585 ac, 5.20% Impervious, Inflow Depth = 0.02" for 2-year event
Inflow = 0.00 cfs @ 15.38 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 15.38 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach 3R: SUMMARY NODE



Summary for Pond 1P: ADS Chamber System #1

Inflow Area = 1.027 ac, 80.85% Impervious, Inflow Depth = 1.97" for 2-year event
Inflow = 2.65 cfs @ 12.09 hrs, Volume= 0.169 af
Outflow = 0.58 cfs @ 12.51 hrs, Volume= 0.169 af, Atten= 78%, Lag= 25.1 min
Discarded = 0.58 cfs @ 12.51 hrs, Volume= 0.169 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 51.36' @ 12.51 hrs Surf.Area= 2,532 sf Storage= 2,055 cf

Plug-Flow detention time= 23.3 min calculated for 0.169 af (100% of inflow)
Center-of-Mass det. time= 23.3 min (825.9 - 802.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	50.00'	3,585 cf	**29.92'W x 84.64'L x 5.50'H Field A** 13,926 cf Overall - 4,963 cf Embedded = 8,964 cf x 40.0% Voids
#2A	50.75'	4,963 cf	**ADS_StormTech MC-3500 c +Cap** x 44 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 4 rows = 124.8 cf
		8,548 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	50.00'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.58 cfs @ 12.51 hrs HW=51.36' (Free Discharge)
↑**1=Exfiltration** (Controls 0.58 cfs)

Pond 1P: ADS Chamber System #1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 c +Cap (ADS StormTech® MC-3500 c rev 05/12 with Cap storage)
Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +15.6 cf x 2 x 4 rows = 124.8 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

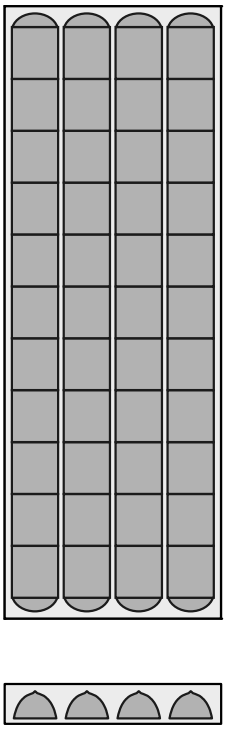
11 Chambers/Row x 7.17' Long +1.88' Cap Length x 2 = 82.64' Row Length +12.0" End Stone x 2 = 84.64' Base Length
4 Rows x 77.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 29.92' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

44 Chambers x 110.0 cf + 15.6 cf Cap Volume x 2 x 4 Rows = 4,962.7 cf Chamber Storage

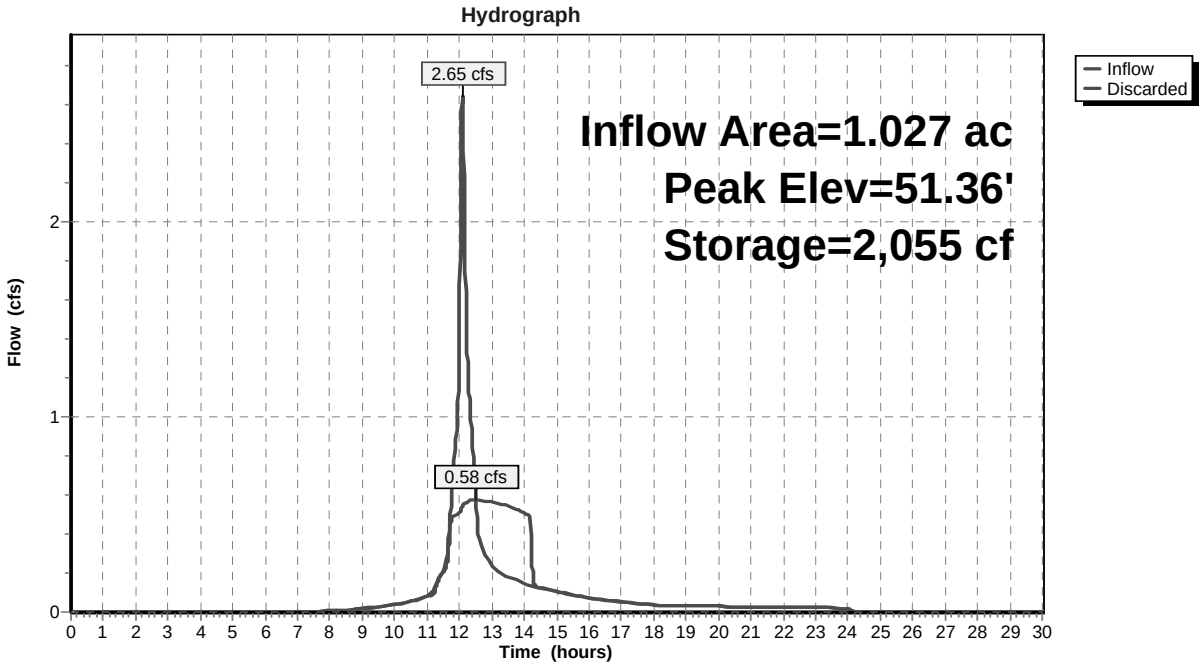
13,926.3 cf Field - 4,962.7 cf Chambers = 8,963.6 cf Stone x 40.0% Voids = 3,585.4 cf Stone Storage

Chamber Storage + Stone Storage = 8,548.1 cf = 0.196 af
Overall Storage Efficiency = 61.4%

44 Chambers
515.8 cy Field
332.0 cy Stone



Pond 1P: ADS Chamber System #1



Summary for Pond 2P: ADS Chamber System #2

Inflow Area = 0.847 ac, 52.42% Impervious, Inflow Depth = 1.01" for 2-year event
Inflow = 0.98 cfs @ 12.09 hrs, Volume= 0.071 af
Outflow = 0.31 cfs @ 12.45 hrs, Volume= 0.071 af, Atten= 68%, Lag= 21.2 min
Discarded = 0.31 cfs @ 12.45 hrs, Volume= 0.071 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 52.37' @ 12.45 hrs Surf.Area= 1,460 sf Storage= 584 cf

Plug-Flow detention time= 10.8 min calculated for 0.071 af (100% of inflow)
Center-of-Mass det. time= 10.8 min (797.1 - 786.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	51.50'	2,106 cf	**29.92'W x 48.79'L x 5.50'H Field A** 8,027 cf Overall - 2,764 cf Embedded = 5,264 cf x 40.0% Voids
#2A	52.25'	2,764 cf	**ADS_StormTech MC-3500 c +Cap** x 24 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 4 rows = 124.8 cf
		4,869 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	51.50'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.31 cfs @ 12.45 hrs HW=52.37' (Free Discharge)
1=Exfiltration (Controls 0.31 cfs)

Pond 2P: ADS Chamber System #2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 c +Cap (ADS StormTech® MC-3500 c rev 05/12 with Cap storage)
Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +15.6 cf x 2 x 4 rows = 124.8 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

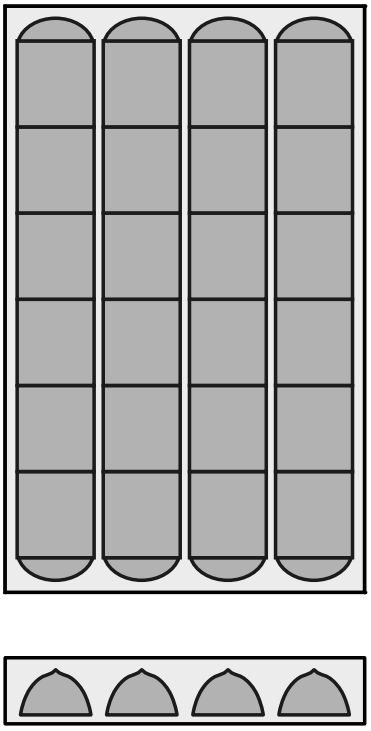
6 Chambers/Row x 7.17' Long +1.88' Cap Length x 2 = 46.79' Row Length +12.0" End Stone x 2 = 48.79' Base Length
4 Rows x 77.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 29.92' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

24 Chambers x 110.0 cf + 15.6 cf Cap Volume x 2 x 4 Rows = 2,763.6 cf Chamber Storage

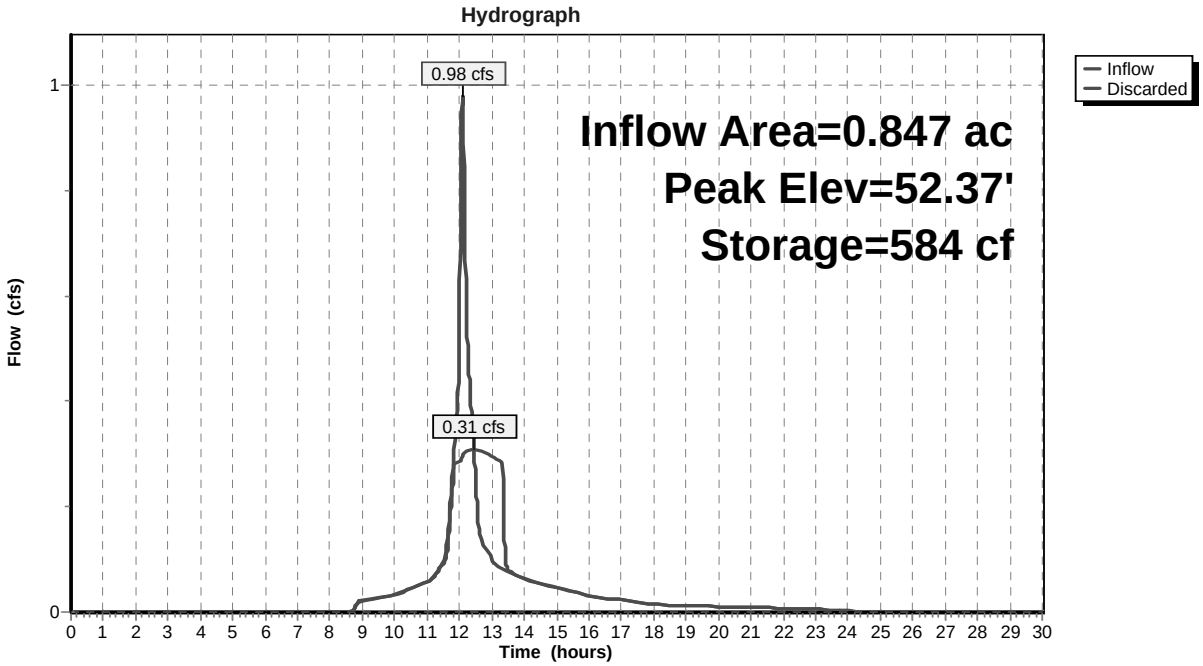
8,027.4 cf Field - 2,763.6 cf Chambers = 5,263.8 cf Stone x 40.0% Voids = 2,105.5 cf Stone Storage

Chamber Storage + Stone Storage = 4,869.2 cf = 0.112 af
Overall Storage Efficiency = 60.7%

24 Chambers
297.3 cy Field
195.0 cy Stone



Pond 2P: ADS Chamber System #2



Summary for Pond 3P: ADS Chamber System #3

Inflow Area = 0.174 ac, 86.33% Impervious, Inflow Depth = 2.54" for 2-year event
Inflow = 0.51 cfs @ 12.09 hrs, Volume= 0.037 af
Outflow = 0.10 cfs @ 12.52 hrs, Volume= 0.037 af, Atten= 80%, Lag= 26.2 min
Discarded = 0.10 cfs @ 12.52 hrs, Volume= 0.037 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 54.07' @ 12.52 hrs Surf.Area= 457 sf Storage= 424 cf

Plug-Flow detention time= 25.4 min calculated for 0.037 af (100% of inflow)
Center-of-Mass det. time= 25.4 min (827.8 - 802.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	52.50'	705 cf	**22.75'W x 20.11'L x 5.50'H Field A** 2,516 cf Overall - 753 cf Embedded = 1,763 cf x 40.0% Voids
#2A	53.25'	753 cf	**ADS_StormTech MC-3500 c +Cap** x 6 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 3 rows = 93.6 cf
		1,458 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	52.50'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.10 cfs @ 12.52 hrs HW=54.07' (Free Discharge)
1=Exfiltration (Controls 0.10 cfs)

Pond 3P: ADS Chamber System #3 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 c +Cap (ADS StormTech® MC-3500 c rev 05/12 with Cap storage)
Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +15.6 cf x 2 x 3 rows = 93.6 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

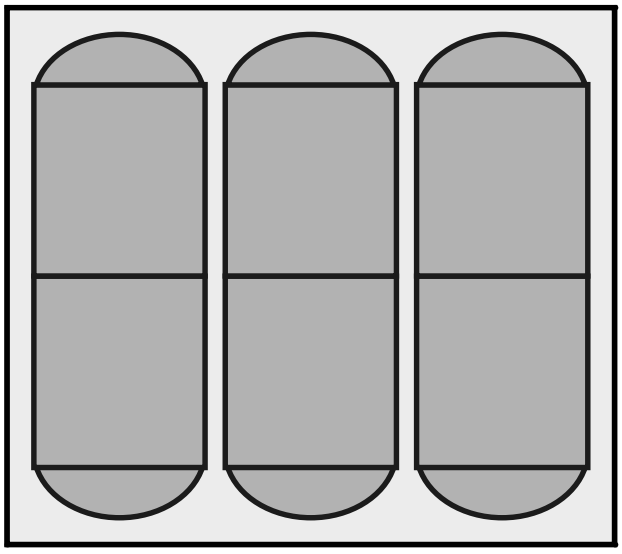
2 Chambers/Row x 7.17' Long +1.88' Cap Length x 2 = 18.11' Row Length +12.0" End Stone x 2 = 20.11' Base Length
3 Rows x 77.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 22.75' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

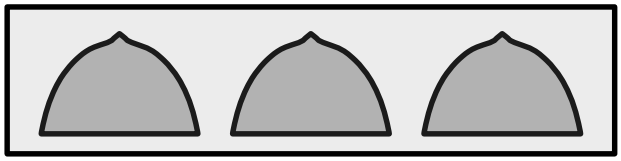
6 Chambers x 110.0 cf + 15.6 cf Cap Volume x 2 x 3 Rows = 753.3 cf Chamber Storage

2,515.8 cf Field - 753.3 cf Chambers = 1,762.5 cf Stone x 40.0% Voids = 705.0 cf Stone Storage

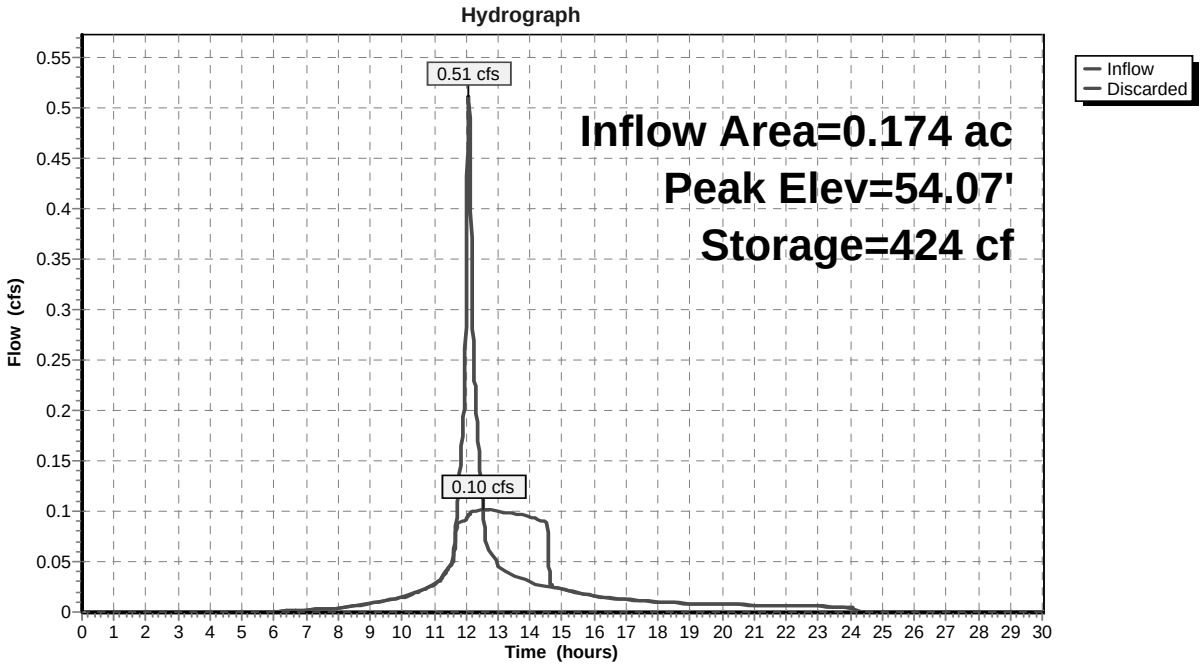
Chamber Storage + Stone Storage = 1,458.3 cf = 0.033 af
Overall Storage Efficiency = 58.0%

6 Chambers
93.2 cy Field
65.3 cy Stone





Pond 3P: ADS Chamber System #3



Summary for Pond 4P: ADS Chamber System #4

Inflow Area = 0.483 ac, 67.91% Impervious, Inflow Depth = 1.40" for 2-year event
Inflow = 0.92 cfs @ 12.09 hrs, Volume= 0.056 af
Outflow = 0.22 cfs @ 12.49 hrs, Volume= 0.056 af, Atten= 76%, Lag= 24.1 min
Discarded = 0.22 cfs @ 12.49 hrs, Volume= 0.056 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 51.23' @ 12.49 hrs Surf.Area= 984 sf Storage= 685 cf

Plug-Flow detention time= 20.8 min calculated for 0.056 af (100% of inflow)
Center-of-Mass det. time= 20.8 min (808.4 - 787.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	50.00'	1,436 cf	**15.58'W x 63.13'L x 5.50'H Field A** 5,410 cf Overall - 1,822 cf Embedded = 3,589 cf x 40.0% Voids
#2A	50.75'	1,822 cf	**ADS_StormTech MC-3500 c +Cap** x 16 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf
		3,257 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	50.00'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.22 cfs @ 12.49 hrs HW=51.23' (Free Discharge)
1=Exfiltration (Controls 0.22 cfs)

Pond 4P: ADS Chamber System #4 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 c +Cap (ADS StormTech® MC-3500 c rev 05/12 with Cap storage)
Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

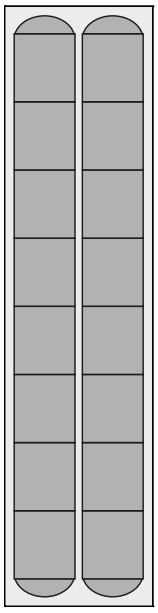
8 Chambers/Row x 7.17' Long +1.88' Cap Length x 2 = 61.13' Row Length +12.0" End Stone x 2 = 63.13' Base Length
2 Rows x 77.0" Wide + 9.0" Spacing x 1 + 12.0" Side Stone x 2 = 15.58' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

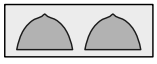
16 Chambers x 110.0 cf + 15.6 cf Cap Volume x 2 x 2 Rows = 1,821.6 cf Chamber Storage

5,410.5 cf Field - 1,821.6 cf Chambers = 3,588.9 cf Stone x 40.0% Voids = 1,435.5 cf Stone Storage

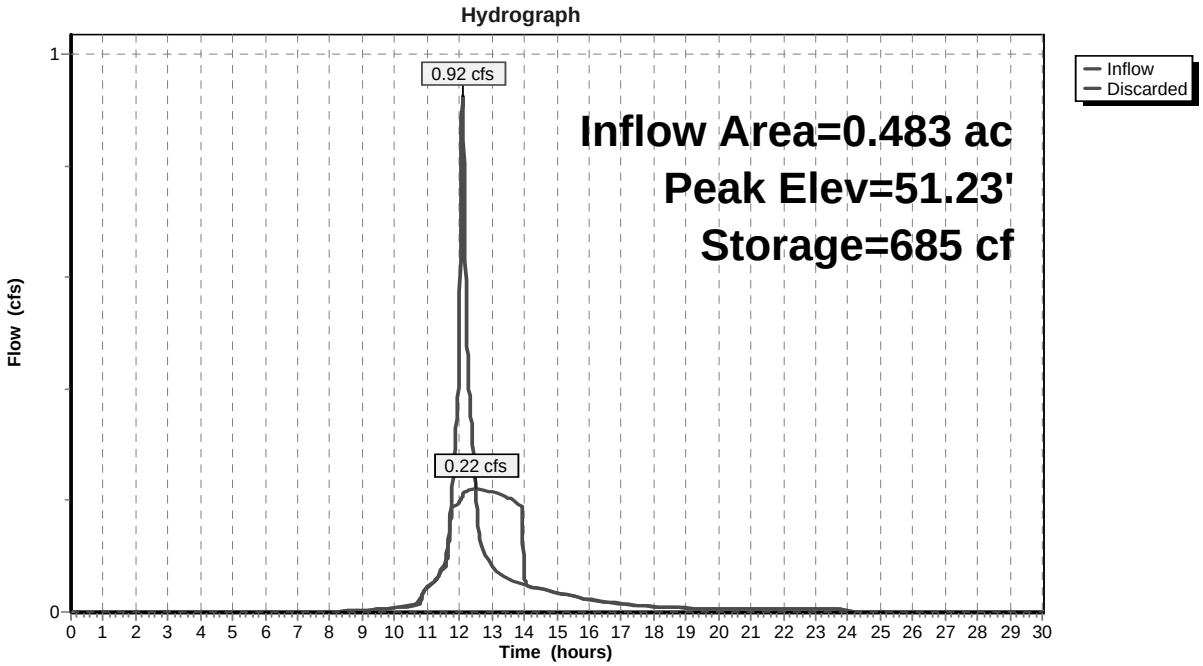
Chamber Storage + Stone Storage = 3,257.2 cf = 0.075 af
Overall Storage Efficiency = 60.2%

16 Chambers
200.4 cy Field
132.9 cy Stone





Pond 4P: ADS Chamber System #4



Summary for Pond B1: Bioretention Area #1

Inflow Area = 0.776 ac, 56.44% Impervious, Inflow Depth = 1.42" for 2-year event
Inflow = 1.14 cfs @ 12.09 hrs, Volume= 0.092 af
Outflow = 0.07 cfs @ 14.49 hrs, Volume= 0.090 af, Atten= 93%, Lag= 143.8 min
Discarded = 0.07 cfs @ 14.49 hrs, Volume= 0.090 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 56.01' @ 14.49 hrs Surf.Area= 3,017 sf Storage= 1,854 cf

Plug-Flow detention time= 294.9 min calculated for 0.090 af (99% of inflow)
Center-of-Mass det. time= 286.5 min (1,102.9 - 816.4)

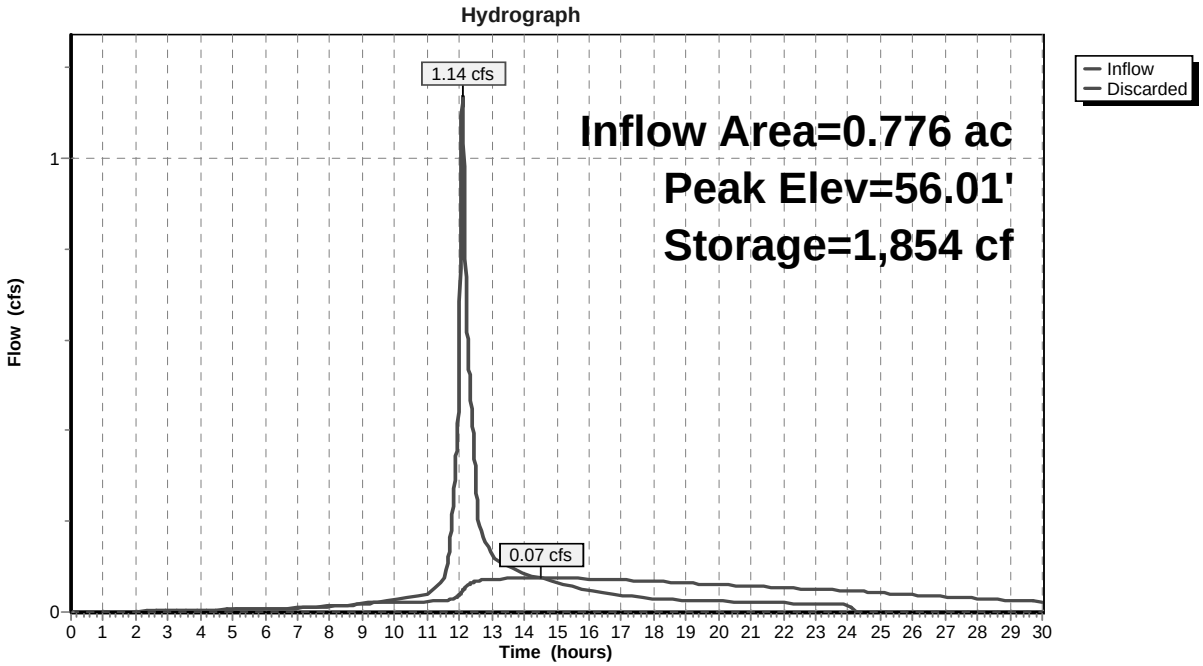
Volume	Invert	Avail.Storage	Storage Description
#1	55.00'	7,558 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
55.00	861	144.3	0	0	861
56.00	2,990	237.5	1,818	1,818	3,699
57.00	5,679	300.3	4,263	6,082	6,400
57.25	6,136	309.7	1,477	7,558	6,863

Device	Routing	Invert	Outlet Devices
#1	Discarded	55.00'	**1.020 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.07 cfs @ 14.49 hrs HW=56.01' (Free Discharge)
1=Exfiltration (Controls 0.07 cfs)

Pond B1: Bioretention Area #1



Summary for Pond B2: Bioretention Area #2

Inflow Area = 0.847 ac, 52.42% Impervious, Inflow Depth = 1.30" for 2-year event
Inflow = 0.99 cfs @ 12.09 hrs, Volume= 0.092 af
Outflow = 0.99 cfs @ 12.09 hrs, Volume= 0.092 af, Atten= 0%, Lag= 0.2 min
Discarded = 0.01 cfs @ 12.09 hrs, Volume= 0.020 af
Primary = 0.98 cfs @ 12.09 hrs, Volume= 0.071 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 58.53' @ 12.09 hrs Surf.Area= 461 sf Storage= 164 cf

Plug-Flow detention time= 44.6 min calculated for 0.092 af (100% of inflow)
Center-of-Mass det. time= 44.5 min (830.0 - 785.5)

Volume	Invert	Avail.Storage	Storage Description
#1	58.00'	1,632 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

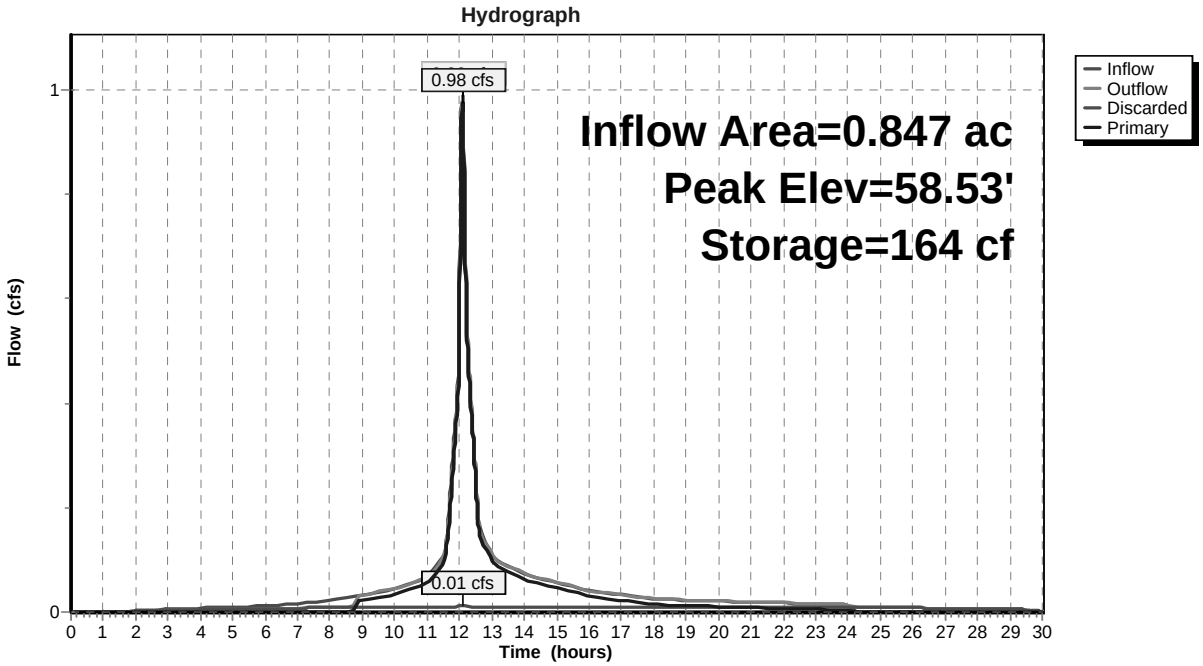
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
58.00	179	70.0	0	0	179
59.00	819	201.9	460	460	3,036
60.00	1,565	223.9	1,172	1,632	3,811

Device	Routing	Invert	Outlet Devices
#1	Primary	53.50'	**12.0" Round Culvert X 2.00** L= 51.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 53.50' / 52.75' S= 0.0146 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	58.50'	**2.0" x 2.0" Horiz. Orifice/Grate X 80.00** C= 0.600 Limited to weir flow at low heads
#3	Discarded	58.00'	**1.020 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.01 cfs @ 12.09 hrs HW=58.53' (Free Discharge)
└**3=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=0.94 cfs @ 12.09 hrs HW=58.53' (Free Discharge)
└**1=Culvert** (Passes 0.94 cfs of 15.61 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 0.94 cfs @ 0.57 fps)

Pond B2: Bioretention Area #2



Summary for Pond B3: Bioretention Area #3

Inflow Area = 0.328 ac, 62.92% Impervious, Inflow Depth = 1.76" for 2-year event
Inflow = 0.56 cfs @ 12.08 hrs, Volume= 0.048 af
Outflow = 0.55 cfs @ 12.10 hrs, Volume= 0.048 af, Atten= 2%, Lag= 0.8 min
Discarded = 0.01 cfs @ 12.10 hrs, Volume= 0.019 af
Primary = 0.54 cfs @ 12.10 hrs, Volume= 0.029 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 59.59' @ 12.10 hrs Surf.Area= 470 sf Storage= 209 cf

Plug-Flow detention time= 80.8 min calculated for 0.048 af (100% of inflow)
Center-of-Mass det. time= 80.8 min (848.9 - 768.2)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	442 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

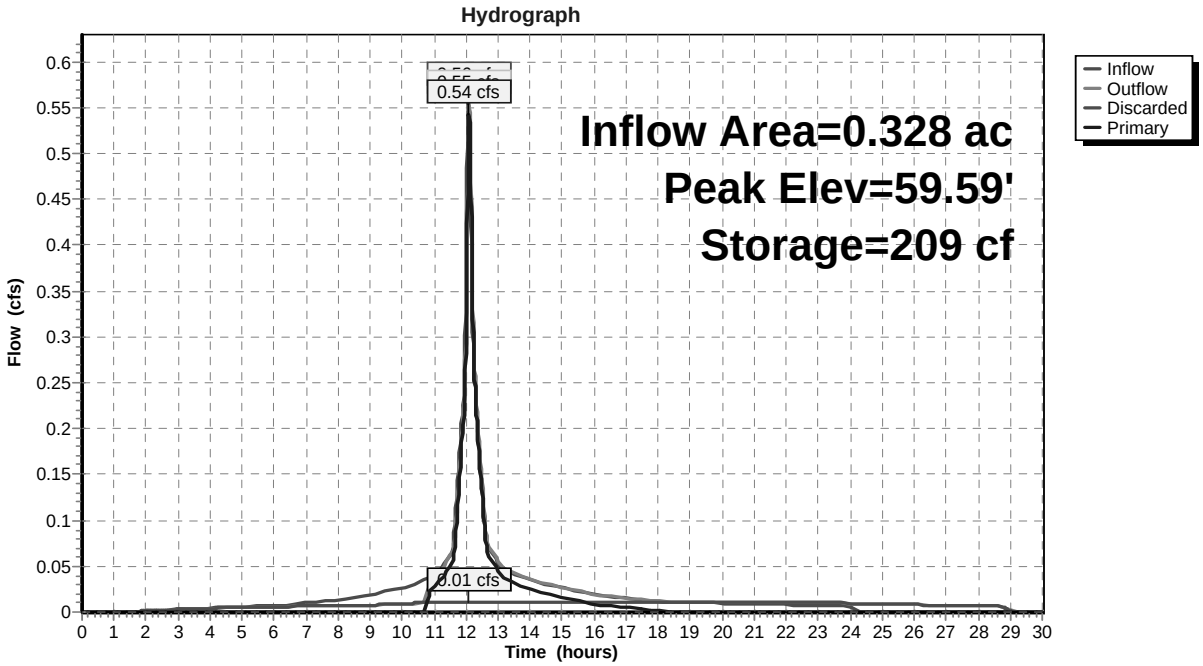
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
59.00	255	67.4	0	0	255
60.00	661	113.9	442	442	932

Device	Routing	Invert	Outlet Devices
#1	Primary	53.50'	**12.0" Round Culvert** L= 188.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 53.50' / 50.75' S= 0.0146 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	59.50'	**2.0" W x 2.0" H Vert. Orifice/Grate X 40.00** C= 0.600
#3	Discarded	59.00'	**1.020 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.01 cfs @ 12.10 hrs HW=59.59' (Free Discharge)
└**3=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=0.54 cfs @ 12.10 hrs HW=59.59' (Free Discharge)
└**1=Culvert** (Passes 0.54 cfs of 6.48 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 0.54 cfs @ 0.94 fps)

Pond B3: Bioretention Area #3



Summary for Pond B4: Bioretention Area #4

Inflow Area = 0.317 ac, 83.38% Impervious, Inflow Depth = 2.57" for 2-year event
Inflow = 0.85 cfs @ 12.09 hrs, Volume= 0.068 af
Outflow = 0.85 cfs @ 12.09 hrs, Volume= 0.068 af, Atten= 1%, Lag= 0.5 min
Discarded = 0.02 cfs @ 12.09 hrs, Volume= 0.029 af
Primary = 0.83 cfs @ 12.09 hrs, Volume= 0.039 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 59.54' @ 12.09 hrs Surf.Area= 758 sf Storage= 297 cf

Plug-Flow detention time= 79.4 min calculated for 0.068 af (100% of inflow)
Center-of-Mass det. time= 79.5 min (849.8 - 770.3)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	740 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

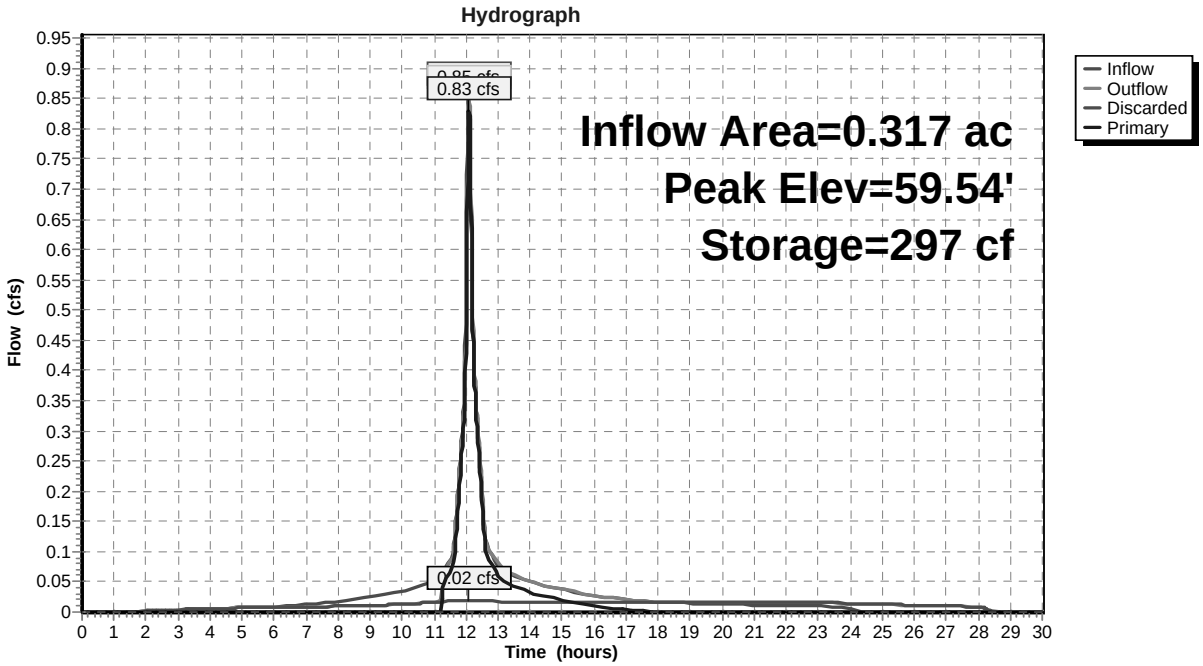
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
59.00	356	271.0	0	0	356
60.00	1,208	271.5	740	740	628

Device	Routing	Invert	Outlet Devices
#1	Primary	53.50'	**12.0" Round Culvert** L= 216.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 53.50' / 50.75' S= 0.0127 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	59.50'	**2.0" x 2.0" Horiz. Orifice/Grate X 40.00** C= 0.600 Limited to weir flow at low heads
#3	Discarded	59.00'	**1.020 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.02 cfs @ 12.09 hrs HW=59.54' (Free Discharge)
└**3=Exfiltration** (Controls 0.02 cfs)

Primary OutFlow Max=0.83 cfs @ 12.09 hrs HW=59.54' (Free Discharge)
└**1=Culvert** (Passes 0.83 cfs of 6.11 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 0.83 cfs @ 0.69 fps)

Pond B4: Bioretention Area #4



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1S: Northwestern Runoff Area=16,859 sf 0.00% Impervious Runoff Depth=0.03"
Tc=6.0 min CN=33 Runoff=0.00 cfs 0.001 af

Subcatchment 2S: Front Yard Runoff Area=8,602 sf 15.40% Impervious Runoff Depth=0.26"
Tc=6.0 min CN=42 Runoff=0.02 cfs 0.004 af

Subcatchment 3S: Front Yard Runoff Area=7,305 sf 27.47% Impervious Runoff Depth=0.61"
Tc=6.0 min UI Adjusted CN=50 Runoff=0.07 cfs 0.009 af

Subcatchment 4S: Southerly Runoff Area=24,964 sf 29.67% Impervious Runoff Depth=0.77"
Tc=6.0 min UI Adjusted CN=53 Runoff=0.37 cfs 0.037 af

Subcatchment 5S: Easterly Access Runoff Area=13,653 sf 47.25% Impervious Runoff Depth=1.45"
Tc=6.0 min CN=64 Runoff=0.50 cfs 0.038 af

Subcatchment 6S: North Side Drive Runoff Area=30,907 sf 79.72% Impervious Runoff Depth=3.28"
Tc=6.0 min CN=86 Runoff=2.70 cfs 0.194 af

Subcatchment 7S: BR Area #1 Runoff Area=13,211 sf 42.99% Impervious Runoff Depth=1.89"
Tc=6.0 min CN=70 Runoff=0.66 cfs 0.048 af

Subcatchment 8S: Front Entrance Runoff Area=4,770 sf 51.89% Impervious Runoff Depth=1.89"
Tc=6.0 min CN=70 Runoff=0.24 cfs 0.017 af

Subcatchment 9S: Drop-Off Area Runoff Area=6,767 sf 78.45% Impervious Runoff Depth=3.18"
Tc=6.0 min CN=85 Runoff=0.58 cfs 0.041 af

Subcatchment MC: MC Courtyard & Runoff Area=7,595 sf 86.33% Impervious Runoff Depth=3.68"
Tc=6.0 min CN=90 Runoff=0.73 cfs 0.054 af

Subcatchment R1: Building Roof Runoff Area=9,040 sf 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98 Runoff=0.97 cfs 0.079 af

Subcatchment R2: Building Roof Runoff Area=6,984 sf 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98 Runoff=0.75 cfs 0.061 af

Subcatchment R3: Building Roof Runoff Area=11,933 sf 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98 Runoff=1.29 cfs 0.104 af

Subcatchment R4: Building Roof Runoff Area=6,958 sf 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98 Runoff=0.75 cfs 0.061 af

Reach 1R: NW Abutting Property Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Reach 2R: Great Neck Road South Inflow=0.02 cfs 0.004 af
Outflow=0.02 cfs 0.004 af

Reach 3R: SUMMARY NODE Inflow=0.02 cfs 0.005 af
Outflow=0.02 cfs 0.005 af

Pond 1P: ADS Chamber System #1 Peak Elev=52.16' Storage=3,695 cf Inflow=3.88 cfs 0.258 af
Outflow=0.63 cfs 0.258 af

Pond 2P: ADS Chamber System #2 Peak Elev=53.00' Storage=1,340 cf Inflow=1.62 cfs 0.120 af
Outflow=0.33 cfs 0.120 af

Pond 3P: ADS Chamber System #3 Peak Elev=54.95' Storage=722 cf Inflow=0.73 cfs 0.054 af
Outflow=0.11 cfs 0.054 af

Pond 4P: ADS Chamber System #4 Peak Elev=51.97' Storage=1,263 cf Inflow=1.36 cfs 0.090 af
Outflow=0.24 cfs 0.090 af

Pond B1: Bioretention Area #1 Peak Elev=56.43' Storage=3,338 cf Inflow=1.90 cfs 0.146 af
Outflow=0.10 cfs 0.132 af

Pond B2: Bioretention Area #2 Peak Elev=58.54' Storage=170 cf Inflow=1.63 cfs 0.141 af
Discarded=0.01 cfs 0.021 af Primary=1.62 cfs 0.120 af Outflow=1.63 cfs 0.141 af

Pond B3: Bioretention Area #3 Peak Elev=59.61' Storage=221 cf Inflow=0.81 cfs 0.070 af
Discarded=0.01 cfs 0.021 af Primary=0.79 cfs 0.049 af Outflow=0.80 cfs 0.070 af

Pond B4: Bioretention Area #4 Peak Elev=59.56' Storage=306 cf Inflow=1.21 cfs 0.096 af
Discarded=0.02 cfs 0.032 af Primary=1.19 cfs 0.064 af Outflow=1.20 cfs 0.096 af

Total Runoff Area = 3.892 ac Runoff Volume = 0.747 af Average Runoff Depth = 2.30"
42.93% Pervious = 1.671 ac 57.07% Impervious = 2.221 ac

Summary for Subcatchment 1S: Northwestern Boundary Area

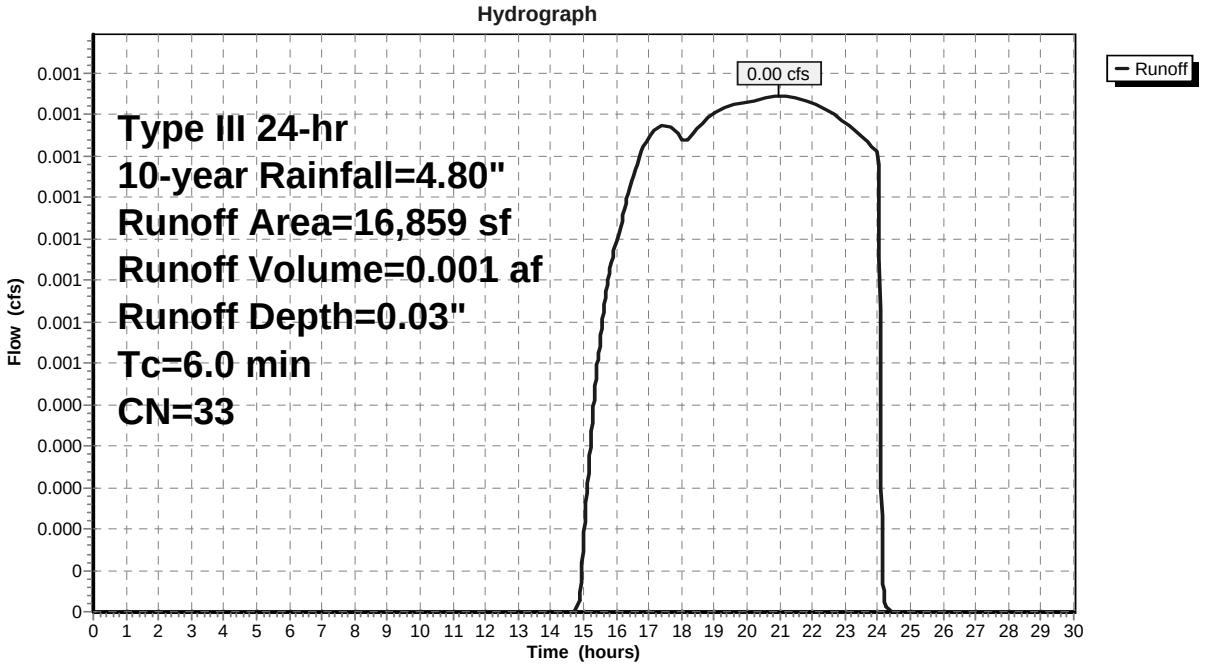
Runoff = 0.00 cfs @ 20.98 hrs, Volume= 0.001 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
16,470	32	Woods/grass comb., Good, HSG A
389	76	Gravel roads, HSG A
16,859	33	Weighted Average
16,859		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 1S: Northwestern Boundary Area



Summary for Subcatchment 2S: Front Yard

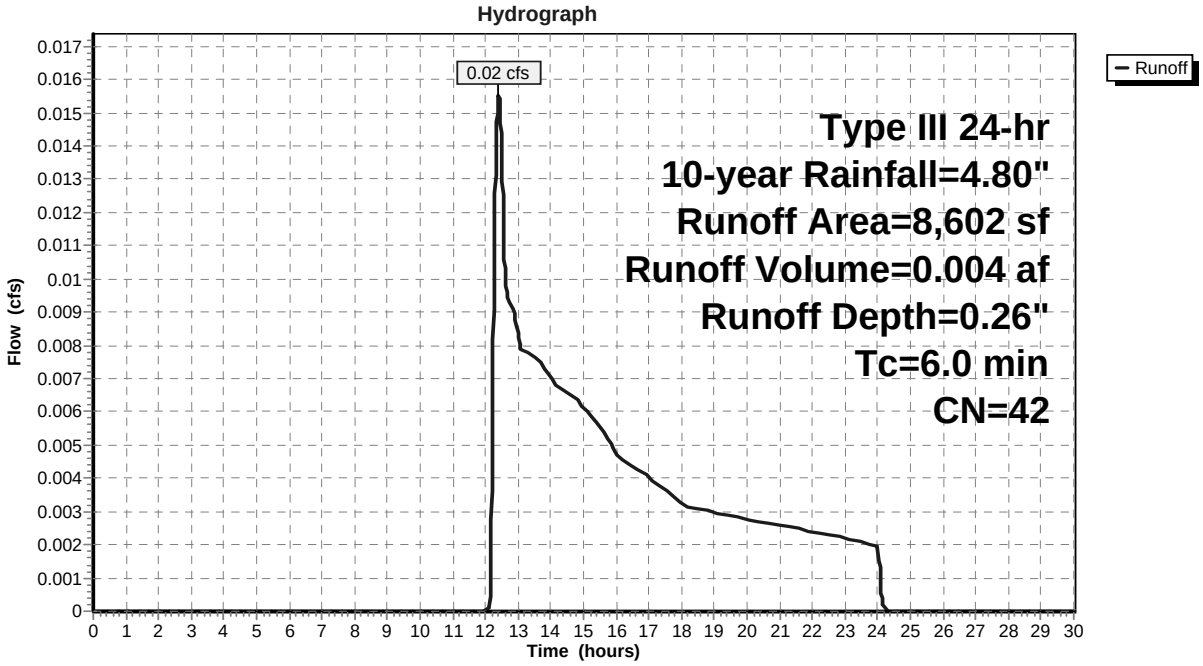
Runoff = 0.02 cfs @ 12.41 hrs, Volume= 0.004 af, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
1,660	39	>75% Grass cover, Good, HSG A
1,325	98	Paved parking, HSG A
5,617	30	Woods, Good, HSG A
8,602	42	Weighted Average
7,277		84.60% Pervious Area
1,325		15.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 2S: Front Yard



Summary for Subcatchment 3S: Front Yard

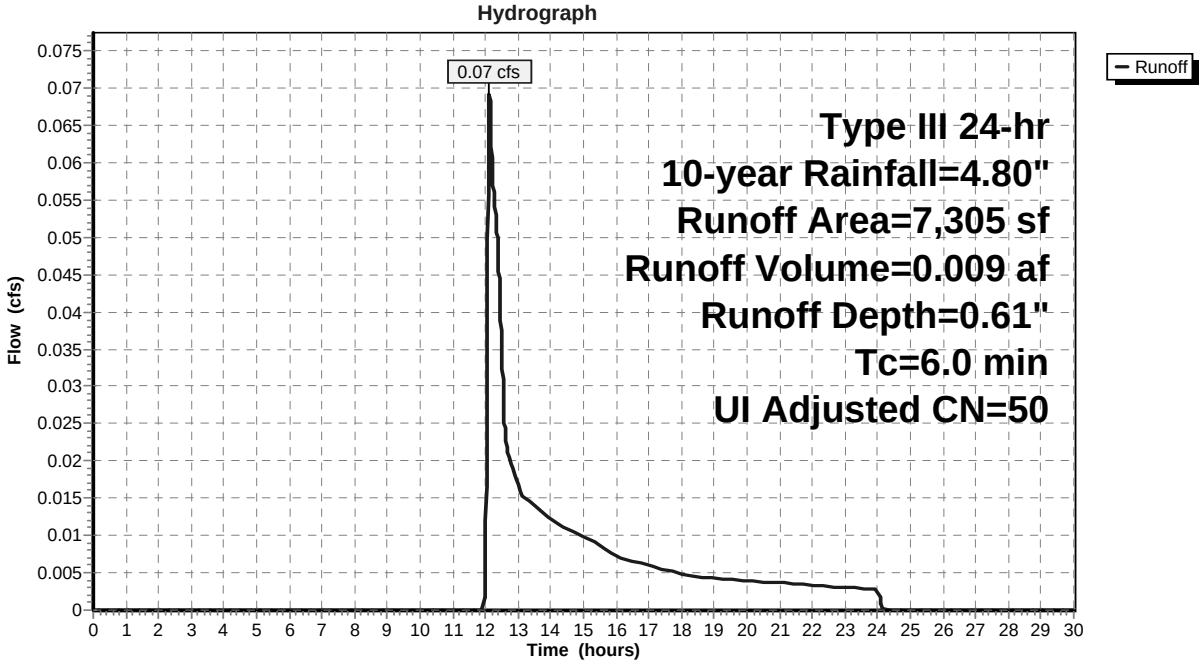
Runoff = 0.07 cfs @ 12.13 hrs, Volume= 0.009 af, Depth= 0.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

	Area (sf)	CN	Adj	Description
	5,298	39		>75% Grass cover, Good, HSG A
*	1,346	98		Unconnected pvmnt & porch roofs, HSG A
	661	98		Water Surface, HSG A
	7,305	55	50	Weighted Average, UI Adjusted
	5,298			72.53% Pervious Area
	2,007			27.47% Impervious Area
	1,346			67.07% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 3S: Front Yard



Summary for Subcatchment 4S: Southerly Courtyard

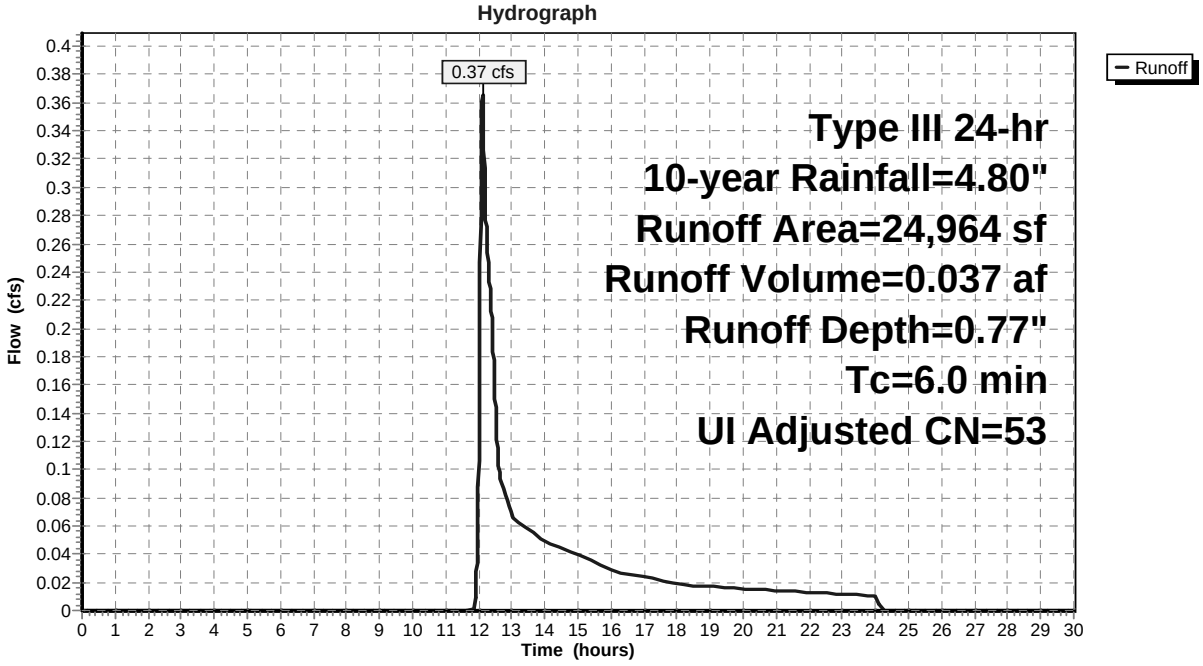
Runoff = 0.37 cfs @ 12.11 hrs, Volume= 0.037 af, Depth= 0.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

	Area (sf)	CN	Adj	Description
	3,660	76		Gravel roads, HSG A
*	5,842	98		Unconnected pvmnt & porch roofs, HSG A
	1,565	98		Water Surface, HSG A
	5,984	30		Woods, Good, HSG A
	7,913	39		>75% Grass cover, Good, HSG A
	24,964	60	53	Weighted Average, UI Adjusted
	17,557			70.33% Pervious Area
	7,407			29.67% Impervious Area
	5,842			78.87% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 4S: Southerly Courtyard



Summary for Subcatchment 5S: Easterly Access Drive

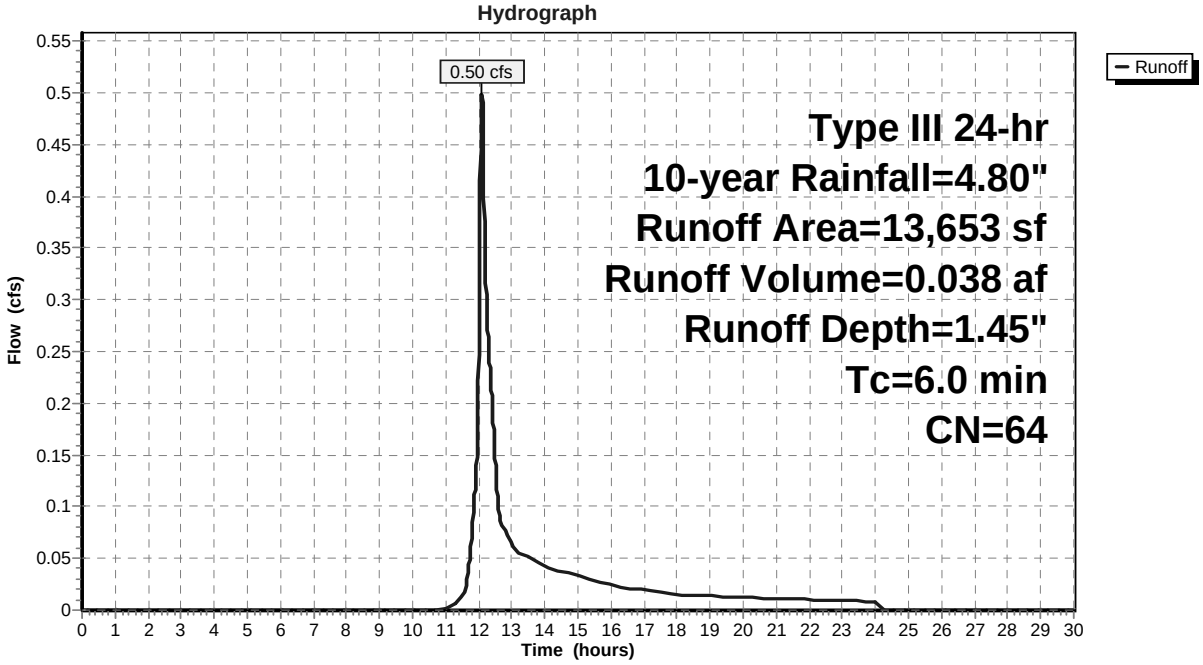
Runoff = 0.50 cfs @ 12.10 hrs, Volume= 0.038 af, Depth= 1.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
5,400	30	Woods, Good, HSG A
1,503	39	>75% Grass cover, Good, HSG A
6,451	98	Paved parking, HSG A
299	76	Gravel roads, HSG A
13,653	64	Weighted Average
7,202		52.75% Pervious Area
6,451		47.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 5S: Easterly Access Drive



Summary for Subcatchment 6S: North Side Drive & Parking

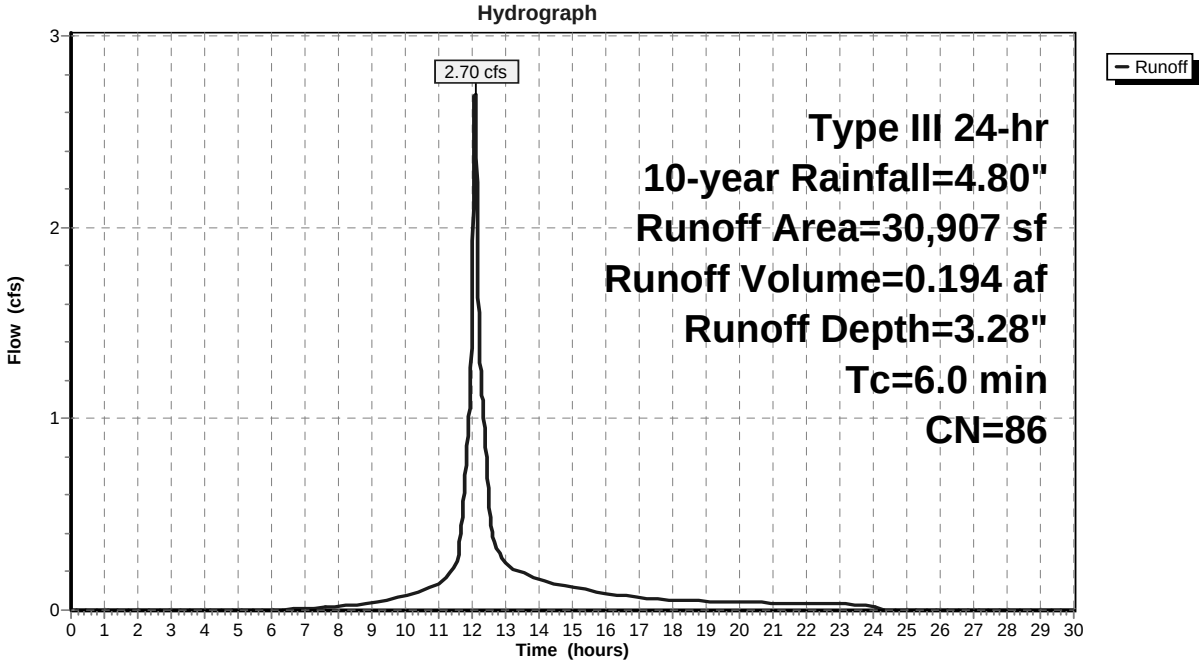
Runoff = 2.70 cfs @ 12.09 hrs, Volume= 0.194 af, Depth= 3.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
24,640	98	Paved parking, HSG A
4,625	39	>75% Grass cover, Good, HSG A
1,092	30	Woods, Good, HSG A
550	76	Gravel roads, HSG A
30,907	86	Weighted Average
6,267		20.28% Pervious Area
24,640		79.72% Impervious Area

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

Subcatchment 6S: North Side Drive & Parking



Summary for Subcatchment 7S: BR Area #1

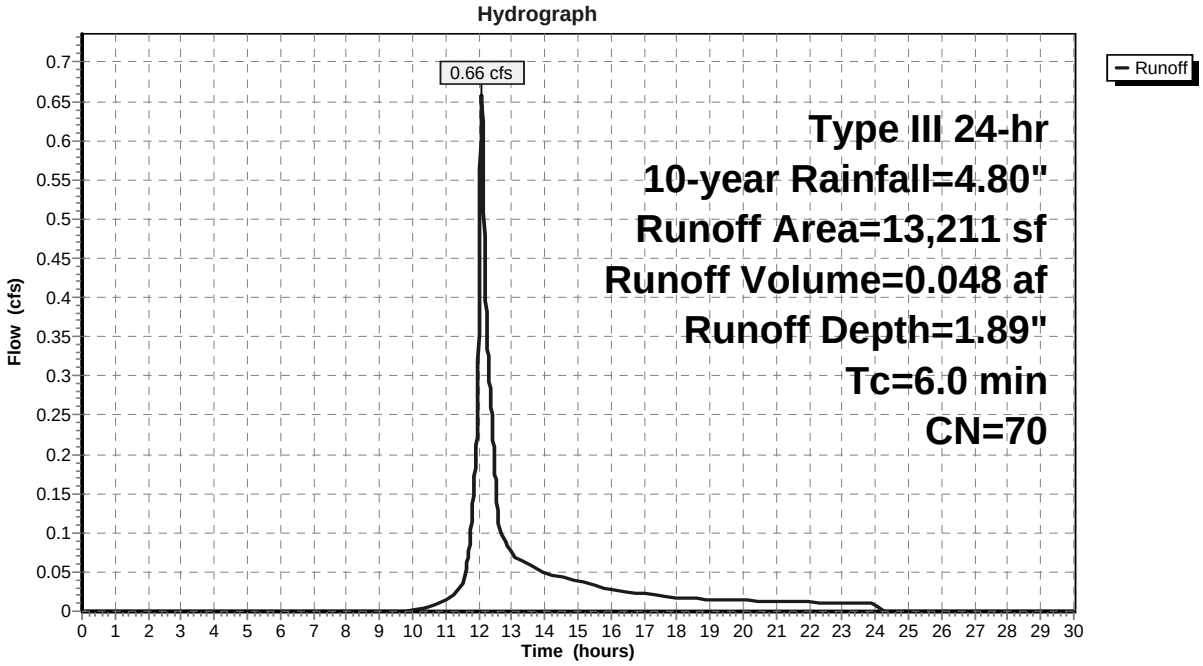
Runoff = 0.66 cfs @ 12.09 hrs, Volume= 0.048 af, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
5,630	39	>75% Grass cover, Good, HSG A
1,902	76	Gravel roads, HSG A
5,679	98	Water Surface, HSG A
13,211	70	Weighted Average
7,532		57.01% Pervious Area
5,679		42.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 7S: BR Area #1



Summary for Subcatchment 8S: Front Entrance Area

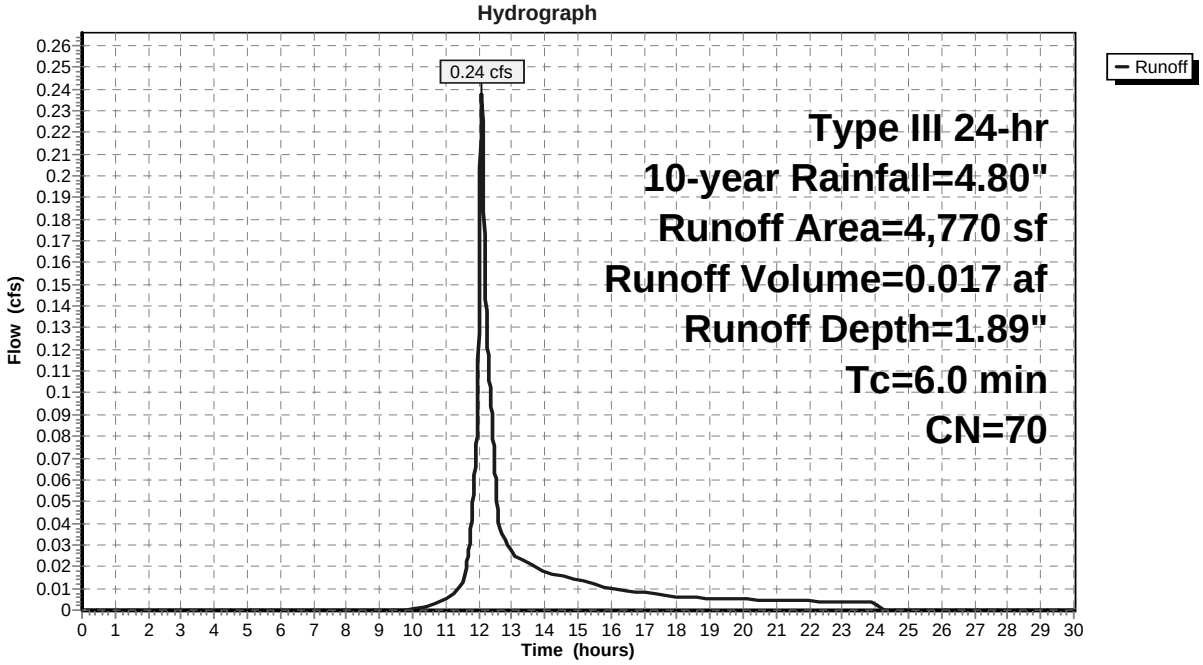
Runoff = 0.24 cfs @ 12.09 hrs, Volume= 0.017 af, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

	Area (sf)	CN	Description
	2,295	39	>75% Grass cover, Good, HSG A
*	1,279	98	Unconnected pvmnt & porch roofs, HSG A
	1,196	98	Water Surface, HSG A
	4,770	70	Weighted Average
	2,295		48.11% Pervious Area
	2,475		51.89% Impervious Area
	1,279		51.68% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 8S: Front Entrance Area



Summary for Subcatchment 9S: Drop-Off Area

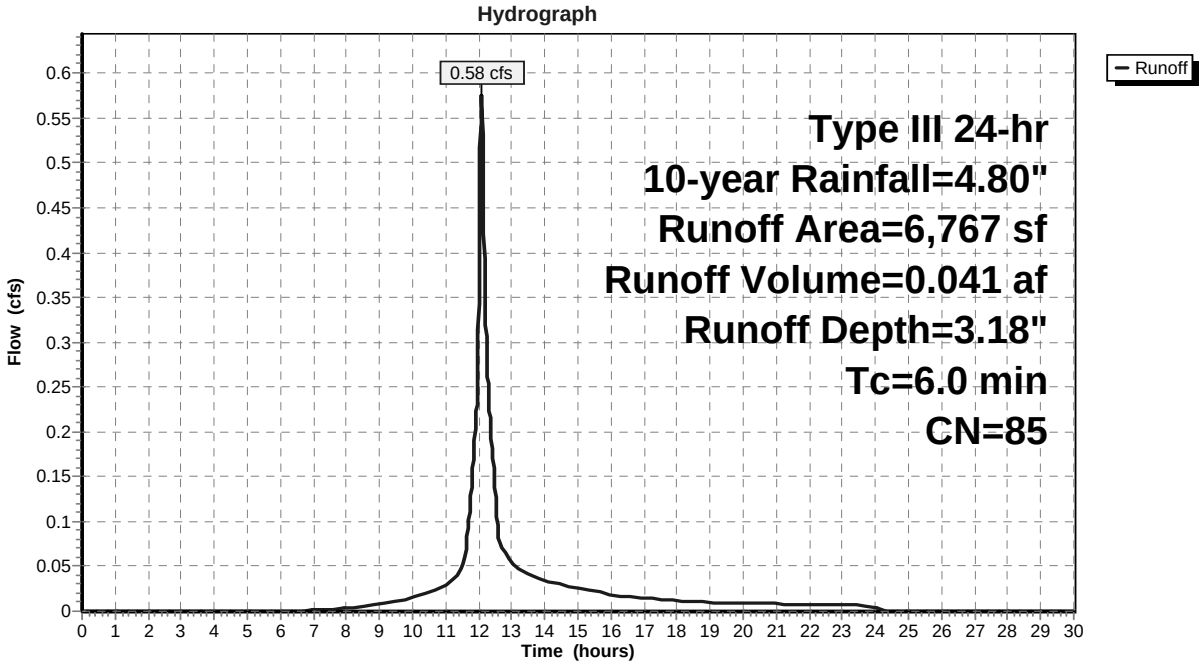
Runoff = 0.58 cfs @ 12.09 hrs, Volume= 0.041 af, Depth= 3.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

	Area (sf)	CN	Description
	1,458	39	>75% Grass cover, Good, HSG A
*	5,309	98	Unconnected pvmnt & porch roofs, HSG A
	6,767	85	Weighted Average
	1,458		21.55% Pervious Area
	5,309		78.45% Impervious Area
	5,309		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 9S: Drop-Off Area



Summary for Subcatchment MC: MC Courtyard & Roof

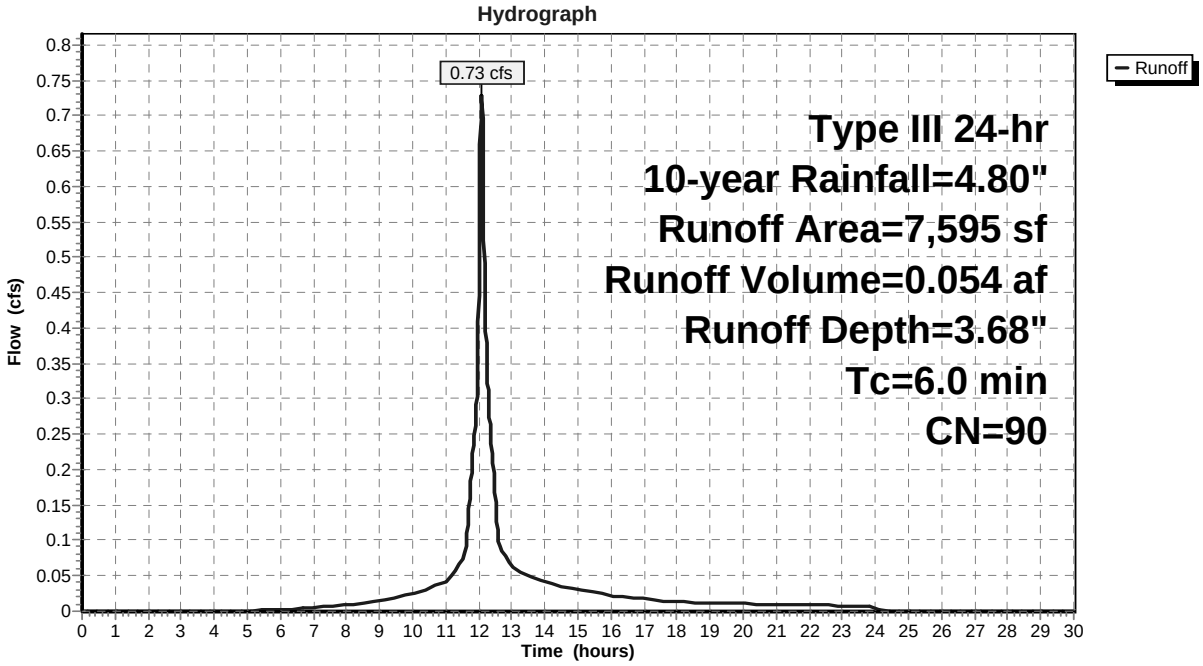
Runoff = 0.73 cfs @ 12.09 hrs, Volume= 0.054 af, Depth= 3.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
1,038	39	>75% Grass cover, Good, HSG A
6,557	98	Unconnected roofs, HSG A
7,595	90	Weighted Average
1,038		13.67% Pervious Area
6,557		86.33% Impervious Area
6,557		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment MC: MC Courtyard & Roof



Summary for Subcatchment R1: Building Roof

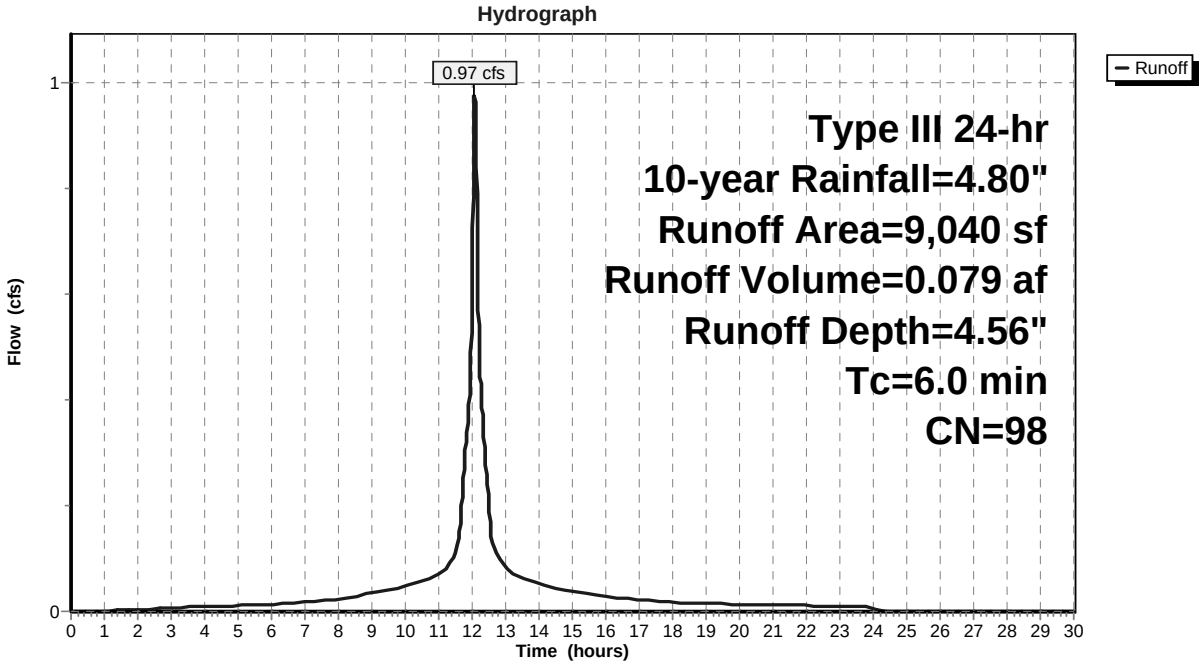
Runoff = 0.97 cfs @ 12.08 hrs, Volume= 0.079 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
9,040	98	Roofs, HSG A
9,040		100.00% Impervious Area

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

Subcatchment R1: Building Roof



Summary for Subcatchment R2: Building Roof

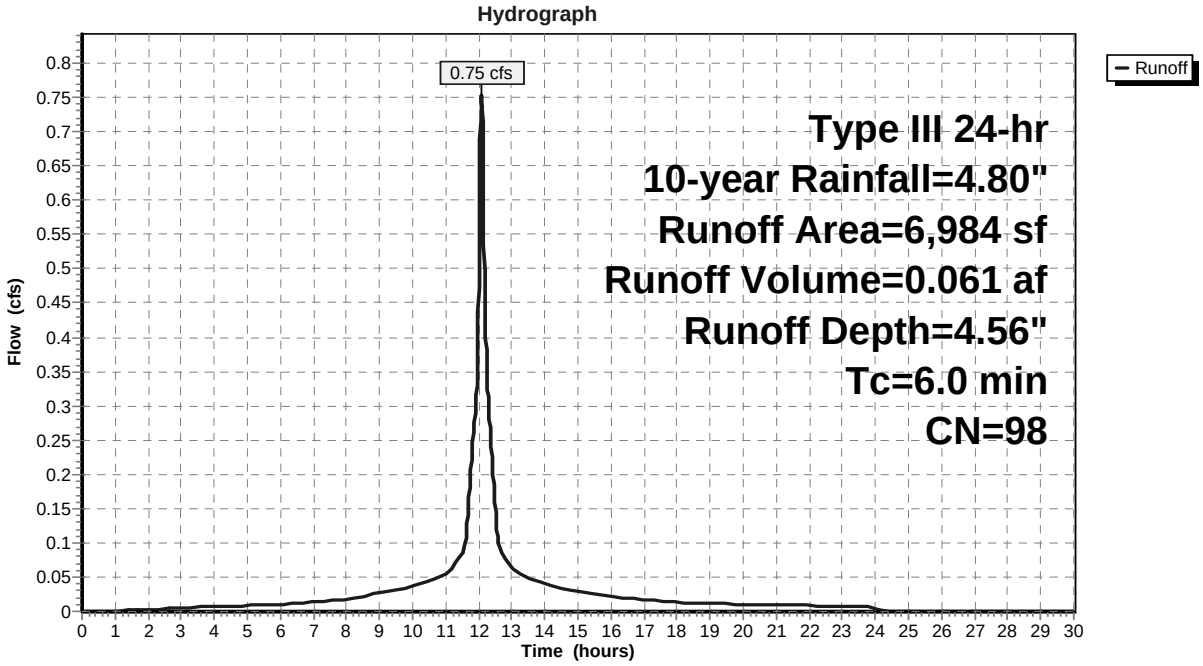
Runoff = 0.75 cfs @ 12.08 hrs, Volume= 0.061 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
6,984	98	Roofs, HSG A
6,984		100.00% Impervious Area

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

Subcatchment R2: Building Roof



Summary for Subcatchment R3: Building Roof

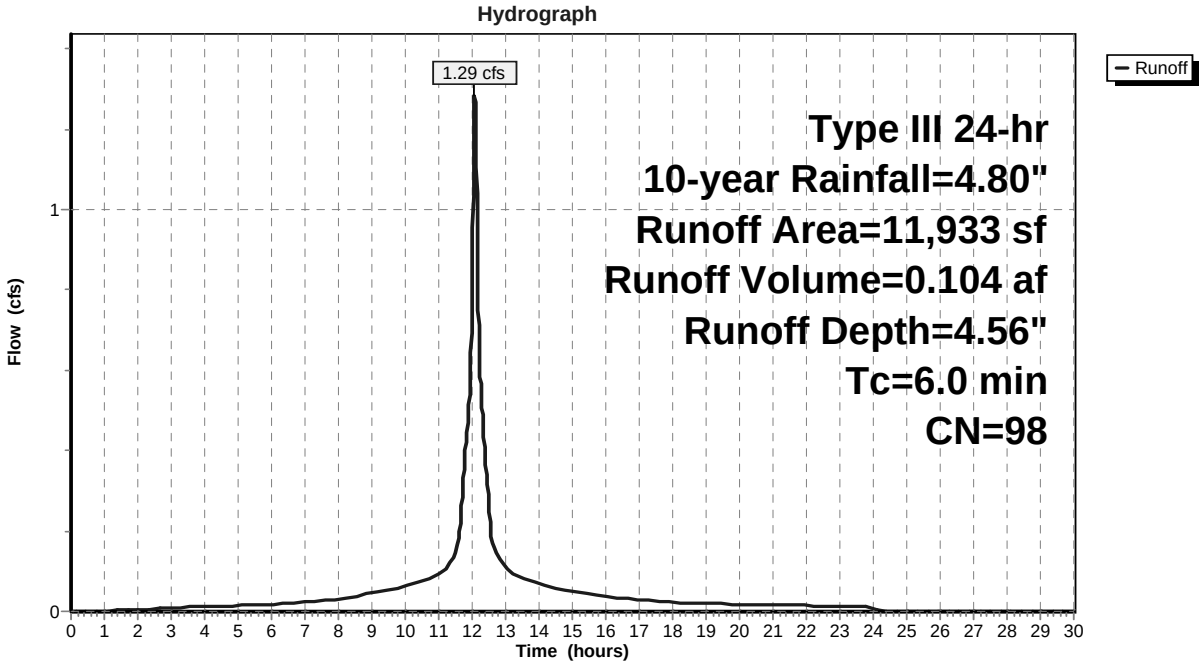
Runoff = 1.29 cfs @ 12.08 hrs, Volume= 0.104 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
11,933	98	Roofs, HSG A
11,933		100.00% Impervious Area

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

Subcatchment R3: Building Roof



Summary for Subcatchment R4: Building Roof

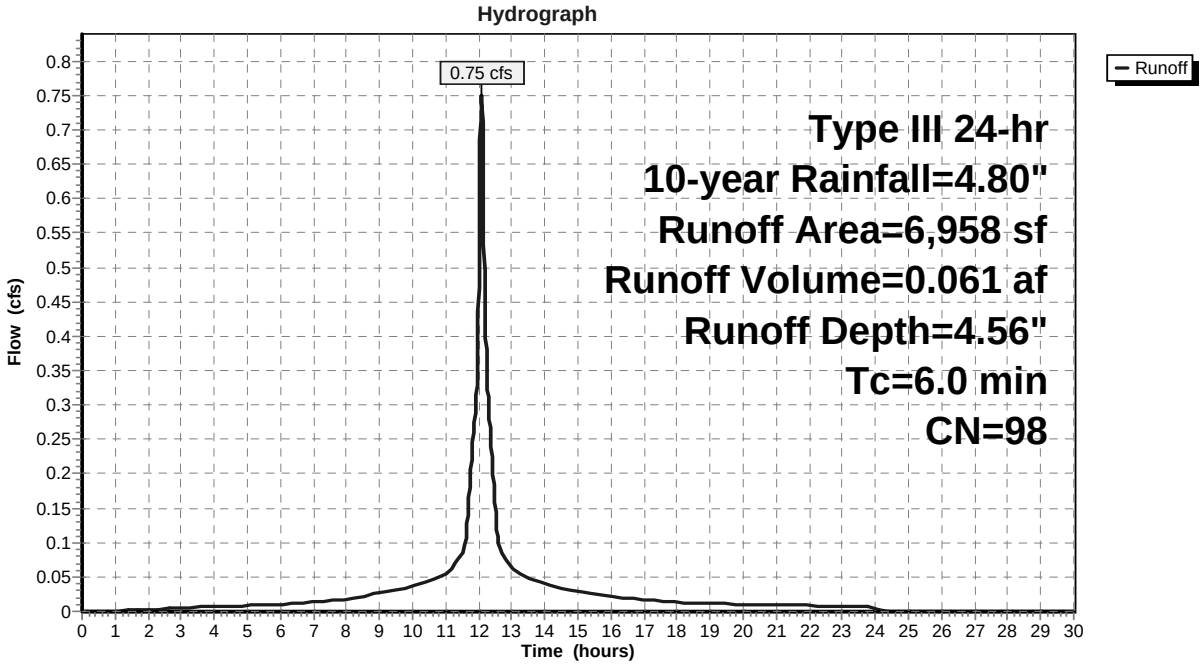
Runoff = 0.75 cfs @ 12.08 hrs, Volume= 0.061 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
6,958	98	Roofs, HSG A
6,958		100.00% Impervious Area

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

Subcatchment R4: Building Roof

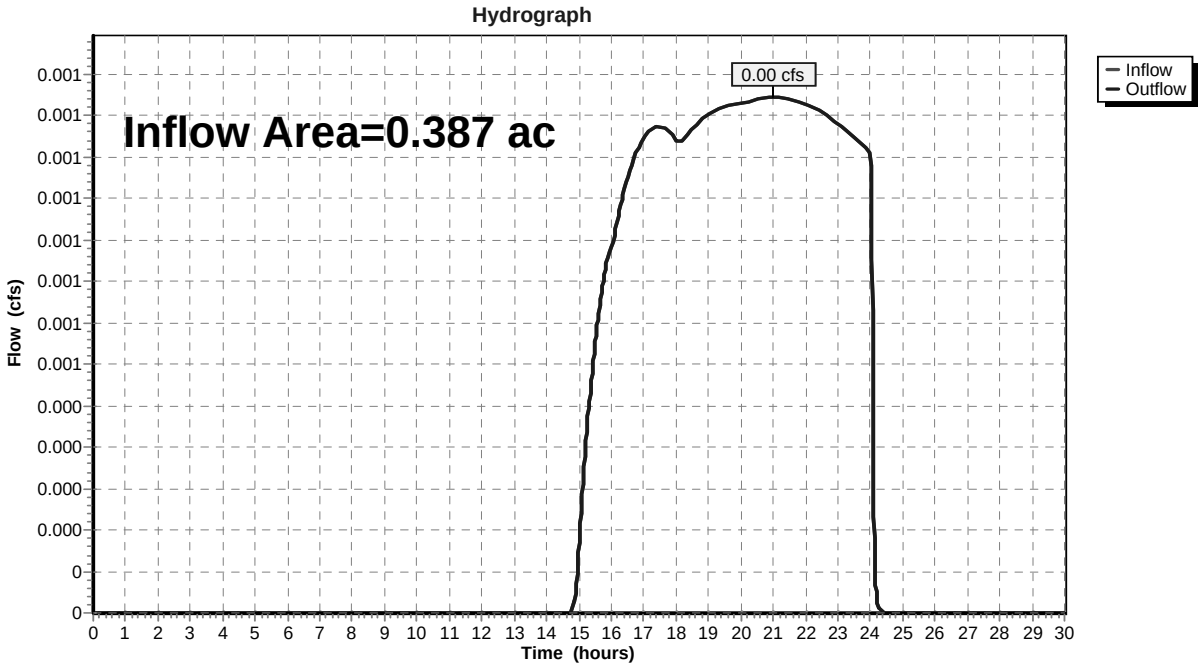


Summary for Reach 1R: NW Abutting Property

Inflow Area = 0.387 ac, 0.00% Impervious, Inflow Depth = 0.03" for 10-year event
Inflow = 0.00 cfs @ 20.98 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 20.98 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach 1R: NW Abutting Property

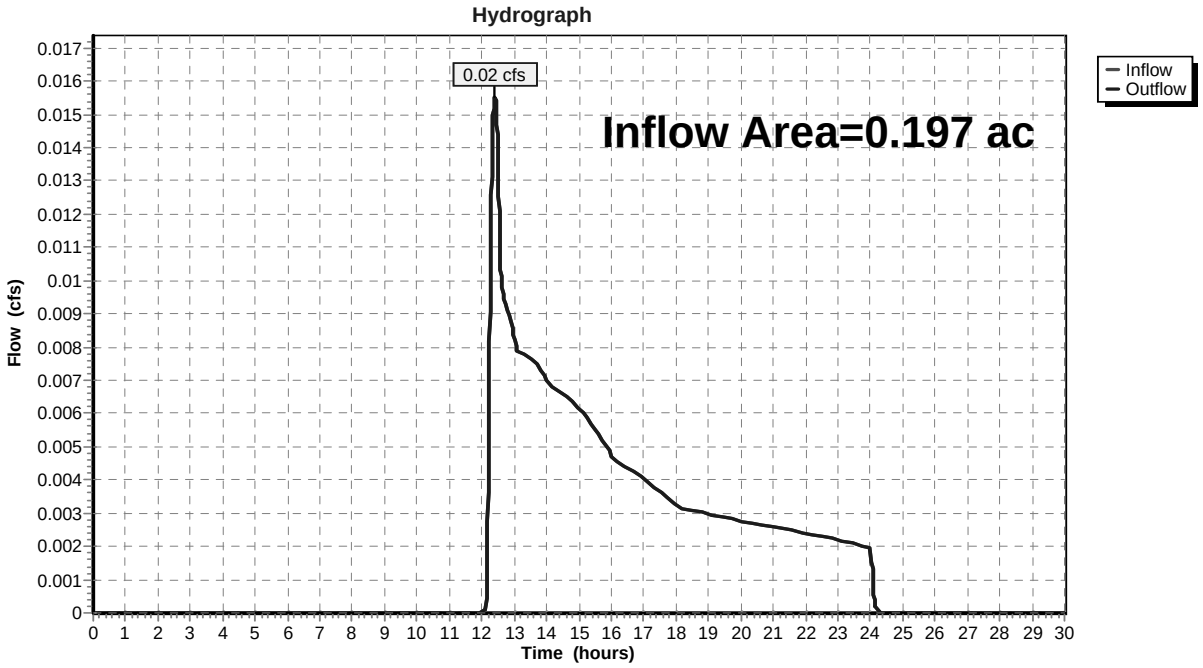


Summary for Reach 2R: Great Neck Road South

Inflow Area = 0.197 ac, 15.40% Impervious, Inflow Depth = 0.26" for 10-year event
Inflow = 0.02 cfs @ 12.41 hrs, Volume= 0.004 af
Outflow = 0.02 cfs @ 12.41 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach 2R: Great Neck Road South

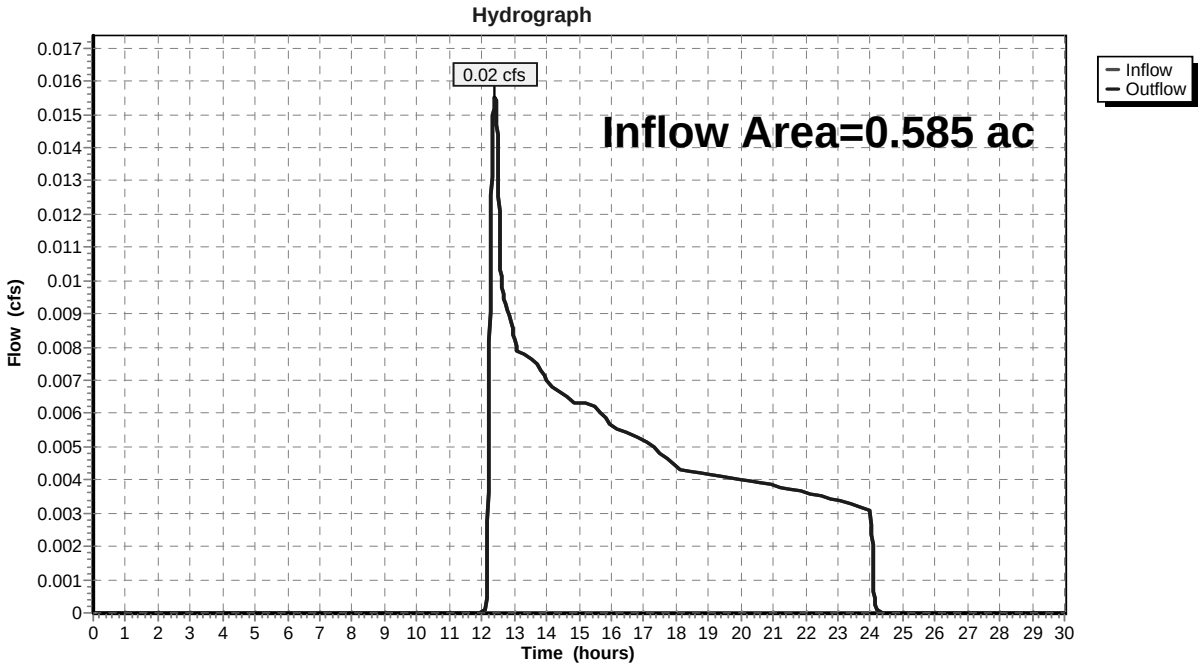


Summary for Reach 3R: SUMMARY NODE

Inflow Area = 0.585 ac, 5.20% Impervious, Inflow Depth = 0.11" for 10-year event
Inflow = 0.02 cfs @ 12.41 hrs, Volume= 0.005 af
Outflow = 0.02 cfs @ 12.41 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach 3R: SUMMARY NODE



Summary for Pond 1P: ADS Chamber System #1

Inflow Area = 1.027 ac, 80.85% Impervious, Inflow Depth = 3.02" for 10-year event
Inflow = 3.88 cfs @ 12.09 hrs, Volume= 0.258 af
Outflow = 0.63 cfs @ 12.56 hrs, Volume= 0.258 af, Atten= 84%, Lag= 28.6 min
Discarded = 0.63 cfs @ 12.56 hrs, Volume= 0.258 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 52.16' @ 12.56 hrs Surf.Area= 2,532 sf Storage= 3,695 cf

Plug-Flow detention time= 42.2 min calculated for 0.258 af (100% of inflow)
Center-of-Mass det. time= 42.2 min (836.0 - 793.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	50.00'	3,585 cf	**29.92'W x 84.64'L x 5.50'H Field A** 13,926 cf Overall - 4,963 cf Embedded = 8,964 cf x 40.0% Voids
#2A	50.75'	4,963 cf	**ADS_StormTech MC-3500 c +Cap** x 44 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 4 rows = 124.8 cf
		8,548 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	50.00'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.63 cfs @ 12.56 hrs HW=52.16' (Free Discharge)
1=Exfiltration (Controls 0.63 cfs)

Pond 1P: ADS Chamber System #1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 c +Cap (ADS StormTech® MC-3500 c rev 05/12 with Cap storage)
Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +15.6 cf x 2 x 4 rows = 124.8 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

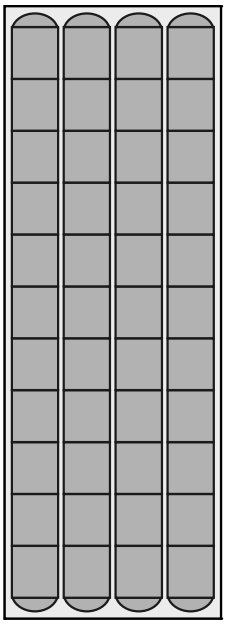
11 Chambers/Row x 7.17' Long +1.88' Cap Length x 2 = 82.64' Row Length +12.0" End Stone x 2 = 84.64' Base Length
4 Rows x 77.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 29.92' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

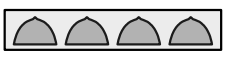
44 Chambers x 110.0 cf + 15.6 cf Cap Volume x 2 x 4 Rows = 4,962.7 cf Chamber Storage

13,926.3 cf Field - 4,962.7 cf Chambers = 8,963.6 cf Stone x 40.0% Voids = 3,585.4 cf Stone Storage

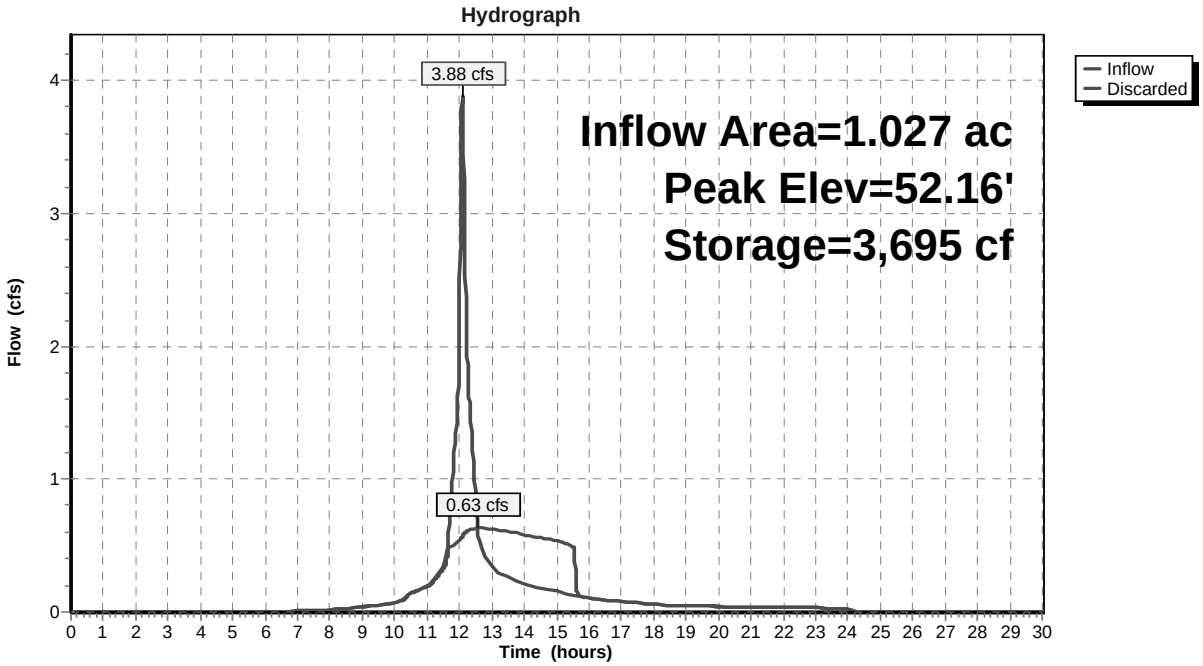
Chamber Storage + Stone Storage = 8,548.1 cf = 0.196 af
Overall Storage Efficiency = 61.4%

44 Chambers
515.8 cy Field
332.0 cy Stone





Pond 1P: ADS Chamber System #1



Summary for Pond 2P: ADS Chamber System #2

Inflow Area = 0.847 ac, 52.42% Impervious, Inflow Depth = 1.69" for 10-year event
Inflow = 1.62 cfs @ 12.09 hrs, Volume= 0.120 af
Outflow = 0.33 cfs @ 12.55 hrs, Volume= 0.120 af, Atten= 80%, Lag= 27.4 min
Discarded = 0.33 cfs @ 12.55 hrs, Volume= 0.120 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 53.00' @ 12.55 hrs Surf.Area= 1,460 sf Storage= 1,340 cf

Plug-Flow detention time= 25.5 min calculated for 0.120 af (100% of inflow)
Center-of-Mass det. time= 25.5 min (822.5 - 797.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	51.50'	2,106 cf	**29.92'W x 48.79'L x 5.50'H Field A** 8,027 cf Overall - 2,764 cf Embedded = 5,264 cf x 40.0% Voids
#2A	52.25'	2,764 cf	**ADS_StormTech MC-3500 c +Cap** x 24 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 4 rows = 124.8 cf
		4,869 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	51.50'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.33 cfs @ 12.55 hrs HW=53.00' (Free Discharge)
1=Exfiltration (Controls 0.33 cfs)

Pond 2P: ADS Chamber System #2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 c +Cap (ADS StormTech® MC-3500 c rev 05/12 with Cap storage)
Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +15.6 cf x 2 x 4 rows = 124.8 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

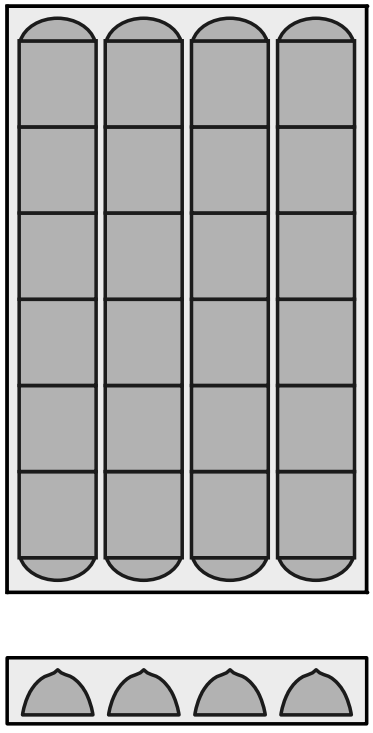
6 Chambers/Row x 7.17' Long +1.88' Cap Length x 2 = 46.79' Row Length +12.0" End Stone x 2 = 48.79' Base Length
4 Rows x 77.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 29.92' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

24 Chambers x 110.0 cf + 15.6 cf Cap Volume x 2 x 4 Rows = 2,763.6 cf Chamber Storage

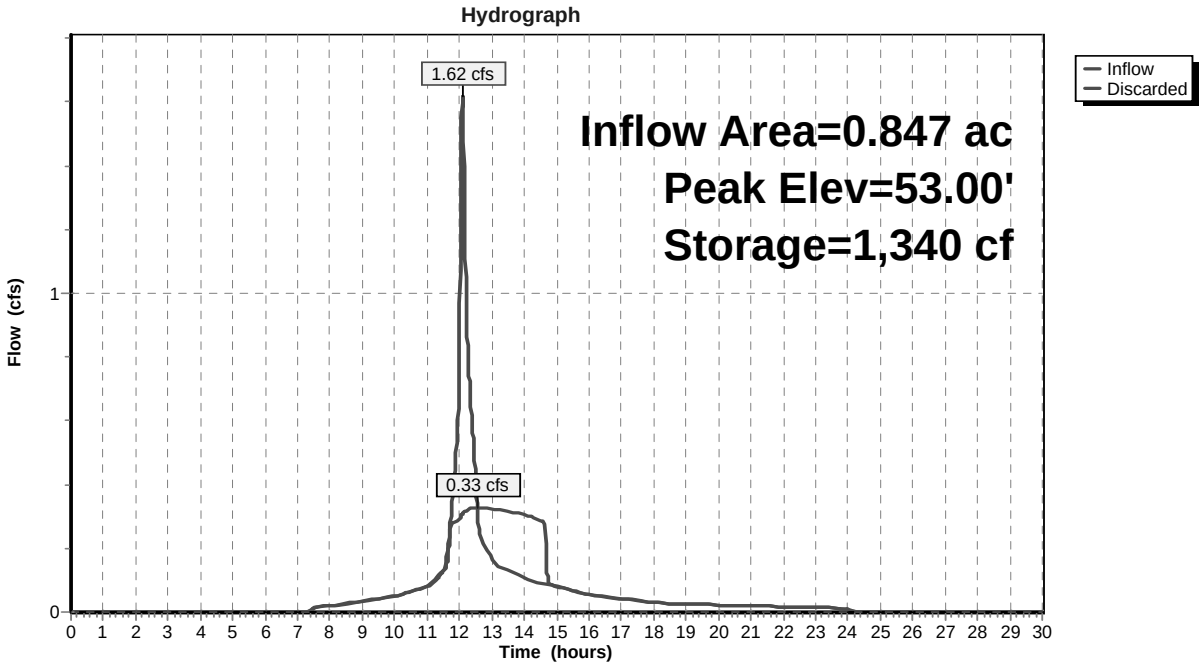
8,027.4 cf Field - 2,763.6 cf Chambers = 5,263.8 cf Stone x 40.0% Voids = 2,105.5 cf Stone Storage

Chamber Storage + Stone Storage = 4,869.2 cf = 0.112 af
Overall Storage Efficiency = 60.7%

24 Chambers
297.3 cy Field
195.0 cy Stone



Pond 2P: ADS Chamber System #2



Summary for Pond 3P: ADS Chamber System #3

Inflow Area = 0.174 ac, 86.33% Impervious, Inflow Depth = 3.68" for 10-year event
Inflow = 0.73 cfs @ 12.09 hrs, Volume= 0.054 af
Outflow = 0.11 cfs @ 12.58 hrs, Volume= 0.054 af, Atten= 85%, Lag= 29.5 min
Discarded = 0.11 cfs @ 12.58 hrs, Volume= 0.054 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 54.95' @ 12.58 hrs Surf.Area= 457 sf Storage= 722 cf

Plug-Flow detention time= 44.8 min calculated for 0.054 af (100% of inflow)
Center-of-Mass det. time= 44.8 min (836.9 - 792.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	52.50'	705 cf	**22.75'W x 20.11'L x 5.50'H Field A** 2,516 cf Overall - 753 cf Embedded = 1,763 cf x 40.0% Voids
#2A	53.25'	753 cf	**ADS_StormTech MC-3500 c +Cap** x 6 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 3 rows = 93.6 cf
		1,458 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	52.50'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.11 cfs @ 12.58 hrs HW=54.95' (Free Discharge)
↑**1=Exfiltration** (Controls 0.11 cfs)

Pond 3P: ADS Chamber System #3 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 c +Cap (ADS StormTech® MC-3500 c rev 05/12 with Cap storage)
Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +15.6 cf x 2 x 3 rows = 93.6 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

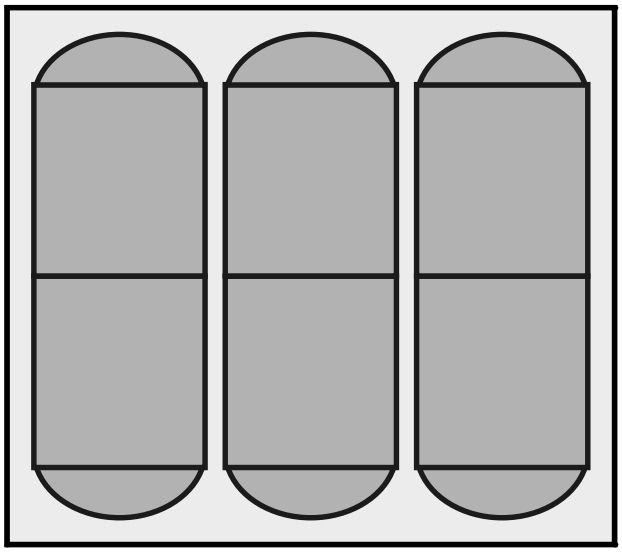
2 Chambers/Row x 7.17' Long +1.88' Cap Length x 2 = 18.11' Row Length +12.0" End Stone x 2 = 20.11' Base Length
3 Rows x 77.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 22.75' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

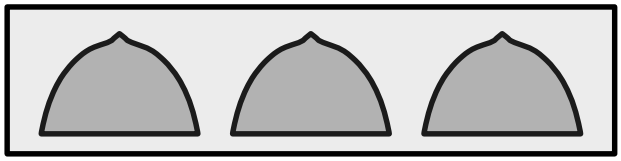
6 Chambers x 110.0 cf + 15.6 cf Cap Volume x 2 x 3 Rows = 753.3 cf Chamber Storage

2,515.8 cf Field - 753.3 cf Chambers = 1,762.5 cf Stone x 40.0% Voids = 705.0 cf Stone Storage

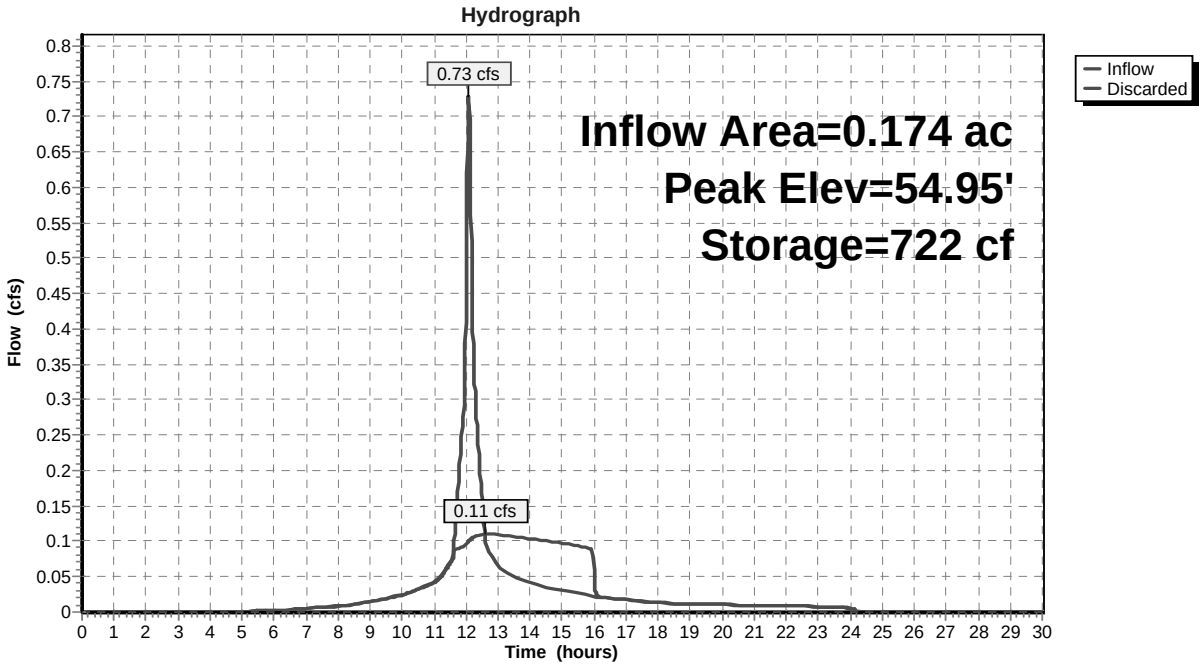
Chamber Storage + Stone Storage = 1,458.3 cf = 0.033 af
Overall Storage Efficiency = 58.0%

6 Chambers
93.2 cy Field
65.3 cy Stone





Pond 3P: ADS Chamber System #3



Summary for Pond 4P: ADS Chamber System #4

Inflow Area = 0.483 ac, 67.91% Impervious, Inflow Depth = 2.23" for 10-year event
Inflow = 1.36 cfs @ 12.09 hrs, Volume= 0.090 af
Outflow = 0.24 cfs @ 12.56 hrs, Volume= 0.090 af, Atten= 82%, Lag= 28.1 min
Discarded = 0.24 cfs @ 12.56 hrs, Volume= 0.090 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 51.97' @ 12.56 hrs Surf.Area= 984 sf Storage= 1,263 cf

Plug-Flow detention time= 37.7 min calculated for 0.090 af (100% of inflow)
Center-of-Mass det. time= 37.7 min (824.9 - 787.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	50.00'	1,436 cf	**15.58'W x 63.13'L x 5.50'H Field A** 5,410 cf Overall - 1,822 cf Embedded = 3,589 cf x 40.0% Voids
#2A	50.75'	1,822 cf	**ADS_StormTech MC-3500 c +Cap** x 16 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf
		3,257 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	50.00'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.24 cfs @ 12.56 hrs HW=51.97' (Free Discharge)
↑**1=Exfiltration** (Controls 0.24 cfs)

Pond 4P: ADS Chamber System #4 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 c +Cap (ADS StormTech® MC-3500 c rev 05/12 with Cap storage)
Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

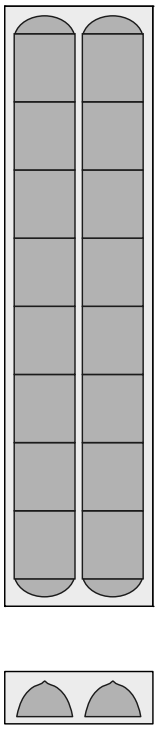
8 Chambers/Row x 7.17' Long +1.88' Cap Length x 2 = 61.13' Row Length +12.0" End Stone x 2 = 63.13' Base Length
2 Rows x 77.0" Wide + 9.0" Spacing x 1 + 12.0" Side Stone x 2 = 15.58' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

16 Chambers x 110.0 cf + 15.6 cf Cap Volume x 2 x 2 Rows = 1,821.6 cf Chamber Storage

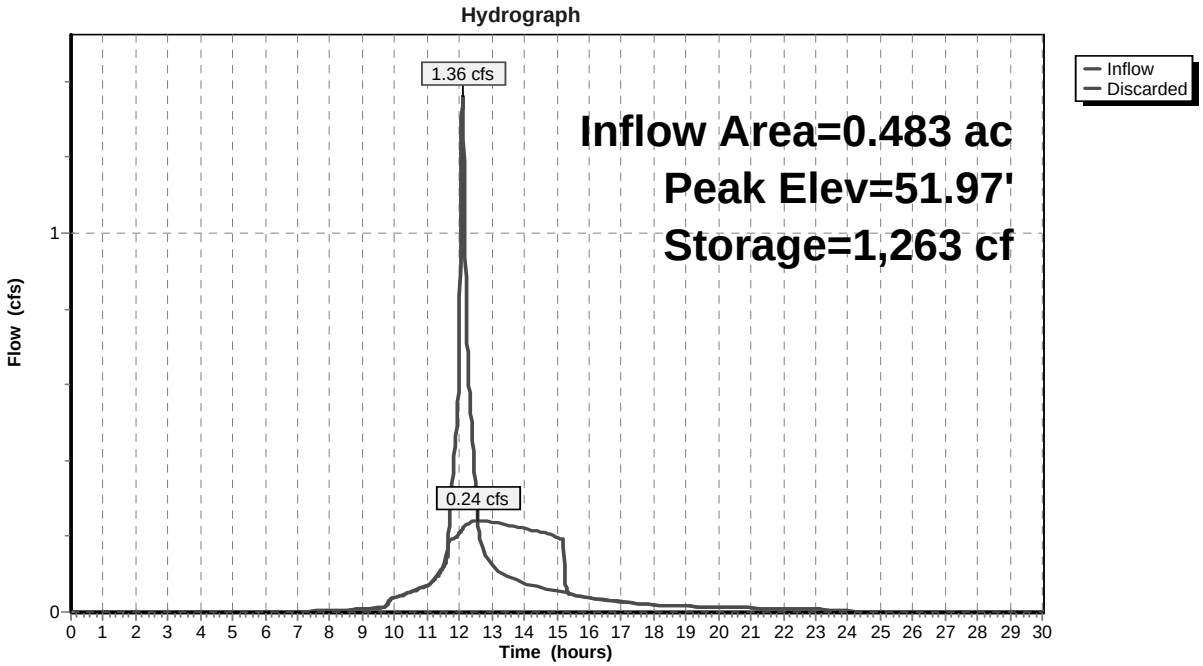
5,410.5 cf Field - 1,821.6 cf Chambers = 3,588.9 cf Stone x 40.0% Voids = 1,435.5 cf Stone Storage

Chamber Storage + Stone Storage = 3,257.2 cf = 0.075 af
Overall Storage Efficiency = 60.2%

16 Chambers
200.4 cy Field
132.9 cy Stone



Pond 4P: ADS Chamber System #4



Summary for Pond B1: Bioretention Area #1

Inflow Area = 0.776 ac, 56.44% Impervious, Inflow Depth = 2.26" for 10-year event
Inflow = 1.90 cfs @ 12.09 hrs, Volume= 0.146 af
Outflow = 0.10 cfs @ 14.98 hrs, Volume= 0.132 af, Atten= 95%, Lag= 173.2 min
Discarded = 0.10 cfs @ 14.98 hrs, Volume= 0.132 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 56.43' @ 14.98 hrs Surf.Area= 4,050 sf Storage= 3,338 cf

Plug-Flow detention time= 368.8 min calculated for 0.132 af (90% of inflow)
Center-of-Mass det. time= 319.4 min (1,131.5 - 812.2)

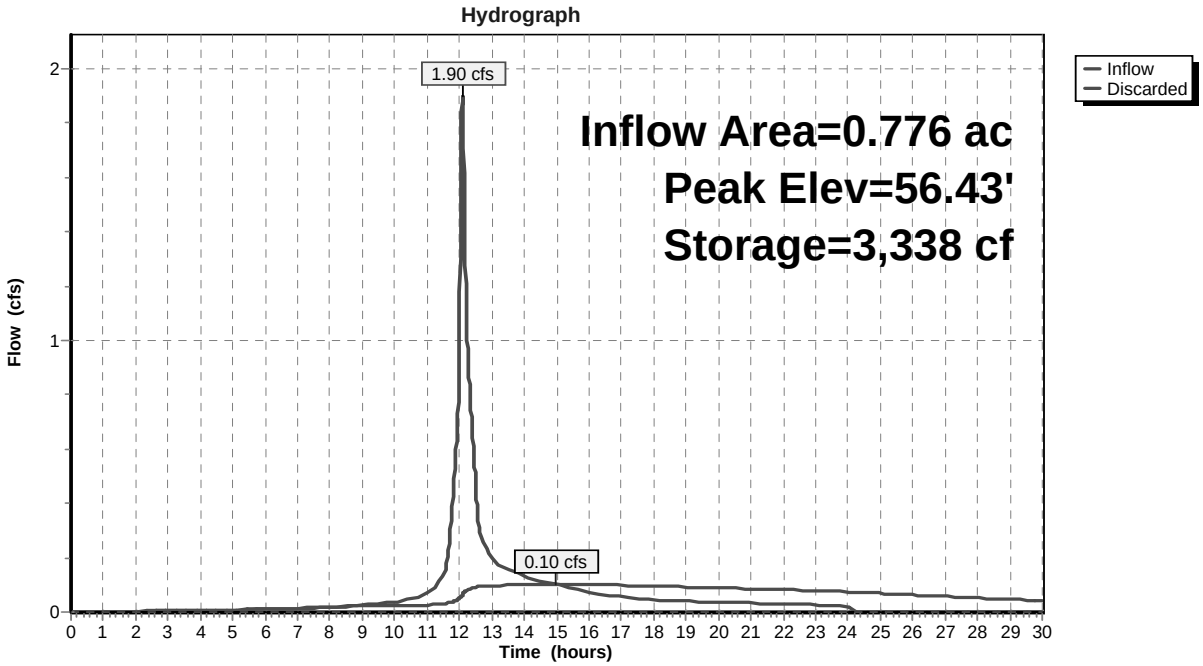
Volume	Invert	Avail.Storage	Storage Description
#1	55.00'	7,558 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
55.00	861	144.3	0	0	861
56.00	2,990	237.5	1,818	1,818	3,699
57.00	5,679	300.3	4,263	6,082	6,400
57.25	6,136	309.7	1,477	7,558	6,863

Device	Routing	Invert	Outlet Devices
#1	Discarded	55.00'	**1.020 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.10 cfs @ 14.98 hrs HW=56.43' (Free Discharge)
1=Exfiltration (Controls 0.10 cfs)

Pond B1: Bioretention Area #1



Summary for Pond B2: Bioretention Area #2

Inflow Area = 0.847 ac, 52.42% Impervious, Inflow Depth = 2.00" for 10-year event
Inflow = 1.63 cfs @ 12.09 hrs, Volume= 0.141 af
Outflow = 1.63 cfs @ 12.09 hrs, Volume= 0.141 af, Atten= 0%, Lag= 0.1 min
Discarded = 0.01 cfs @ 12.09 hrs, Volume= 0.021 af
Primary = 1.62 cfs @ 12.09 hrs, Volume= 0.120 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 58.54' @ 12.09 hrs Surf.Area= 469 sf Storage= 170 cf

Plug-Flow detention time= 31.1 min calculated for 0.141 af (100% of inflow)
Center-of-Mass det. time= 31.1 min (820.7 - 789.6)

Volume	Invert	Avail.Storage	Storage Description
#1	58.00'	1,632 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

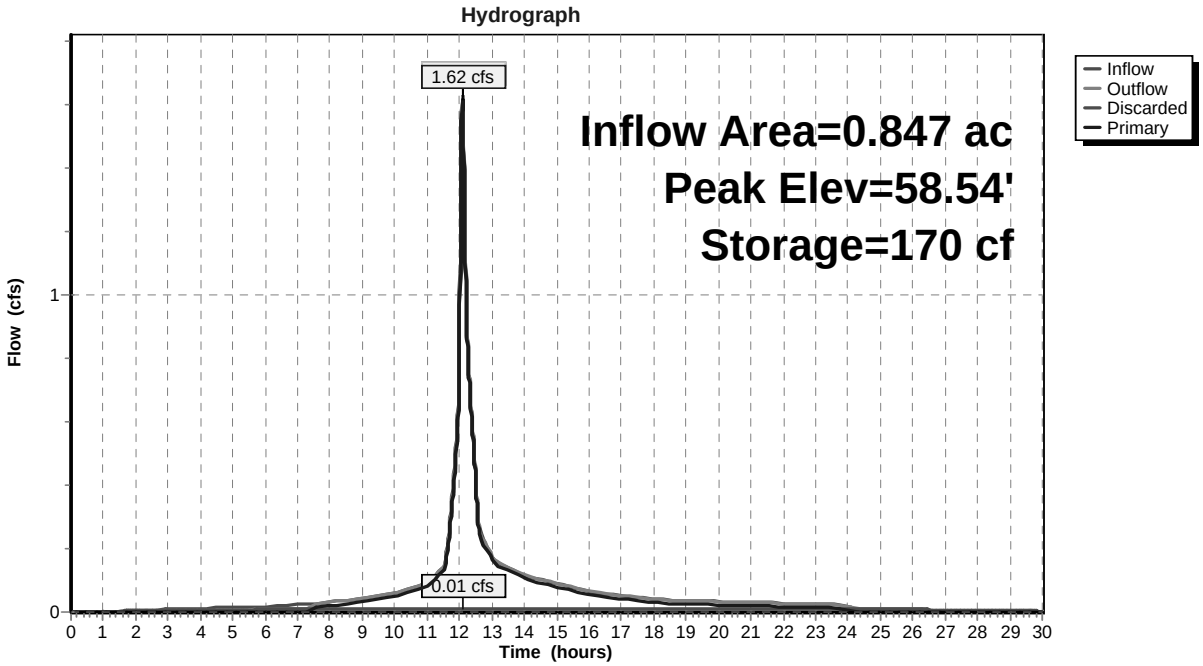
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
58.00	179	70.0	0	0	179
59.00	819	201.9	460	460	3,036
60.00	1,565	223.9	1,172	1,632	3,811

Device	Routing	Invert	Outlet Devices
#1	Primary	53.50'	**12.0" Round Culvert X 2.00** L= 51.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 53.50' / 52.75' S= 0.0146 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	58.50'	**2.0" x 2.0" Horiz. Orifice/Grate X 80.00** C= 0.600 Limited to weir flow at low heads
#3	Discarded	58.00'	**1.020 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.01 cfs @ 12.09 hrs HW=58.54' (Free Discharge)
└**3=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=1.60 cfs @ 12.09 hrs HW=58.54' (Free Discharge)
└**1=Culvert** (Passes 1.60 cfs of 15.63 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 1.60 cfs @ 0.68 fps)

Pond B2: Bioretention Area #2



Summary for Pond B3: Bioretention Area #3

Inflow Area = 0.328 ac, 62.92% Impervious, Inflow Depth = 2.54" for 10-year event
Inflow = 0.81 cfs @ 12.09 hrs, Volume= 0.070 af
Outflow = 0.80 cfs @ 12.10 hrs, Volume= 0.070 af, Atten= 1%, Lag= 0.8 min
Discarded = 0.01 cfs @ 12.10 hrs, Volume= 0.021 af
Primary = 0.79 cfs @ 12.10 hrs, Volume= 0.049 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 59.61' @ 12.10 hrs Surf.Area= 480 sf Storage= 221 cf

Plug-Flow detention time= 64.4 min calculated for 0.070 af (100% of inflow)
Center-of-Mass det. time= 64.4 min (834.2 - 769.8)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	442 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

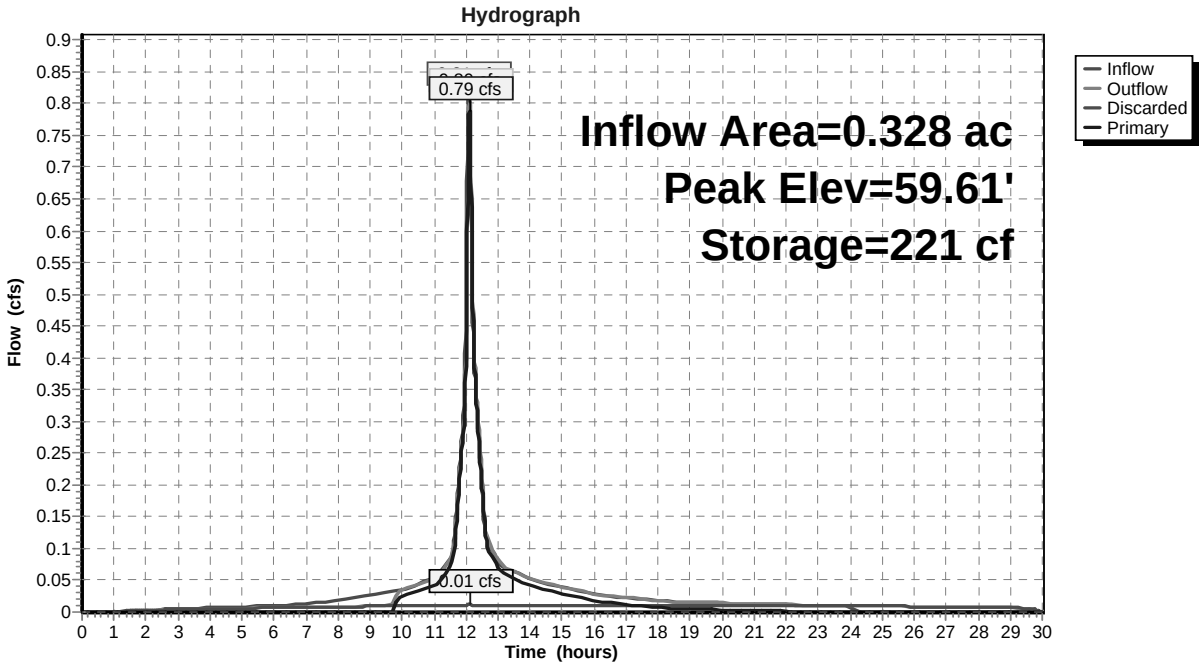
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
59.00	255	67.4	0	0	255
60.00	661	113.9	442	442	932

Device	Routing	Invert	Outlet Devices
#1	Primary	53.50'	**12.0" Round Culvert** L= 188.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 53.50' / 50.75' S= 0.0146 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	59.50'	**2.0" W x 2.0" H Vert. Orifice/Grate X 40.00** C= 0.600
#3	Discarded	59.00'	**1.020 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.01 cfs @ 12.10 hrs HW=59.61' (Free Discharge)
└**3=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=0.79 cfs @ 12.10 hrs HW=59.61' (Free Discharge)
└**1=Culvert** (Passes 0.79 cfs of 6.49 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 0.79 cfs @ 1.07 fps)

Pond B3: Bioretention Area #3



Summary for Pond B4: Bioretention Area #4

Inflow Area = 0.317 ac, 83.38% Impervious, Inflow Depth = 3.64" for 10-year event
Inflow = 1.21 cfs @ 12.09 hrs, Volume= 0.096 af
Outflow = 1.20 cfs @ 12.09 hrs, Volume= 0.096 af, Atten= 0%, Lag= 0.4 min
Discarded = 0.02 cfs @ 12.09 hrs, Volume= 0.032 af
Primary = 1.19 cfs @ 12.09 hrs, Volume= 0.064 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 59.56' @ 12.09 hrs Surf.Area= 768 sf Storage= 306 cf

Plug-Flow detention time= 66.7 min calculated for 0.096 af (100% of inflow)
Center-of-Mass det. time= 66.7 min (833.6 - 766.8)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	740 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

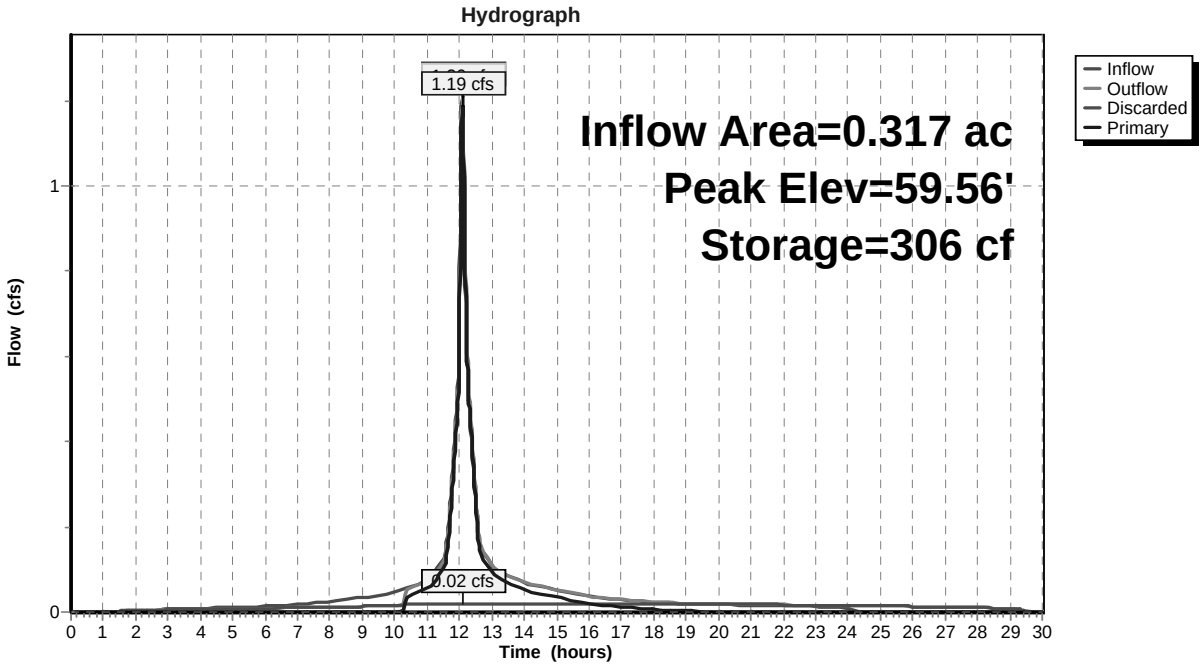
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
59.00	356	271.0	0	0	356
60.00	1,208	271.5	740	740	628

Device	Routing	Invert	Outlet Devices
#1	Primary	53.50'	**12.0" Round Culvert** L= 216.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 53.50' / 50.75' S= 0.0127 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	59.50'	**2.0" x 2.0" Horiz. Orifice/Grate X 40.00** C= 0.600 Limited to weir flow at low heads
#3	Discarded	59.00'	**1.020 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.02 cfs @ 12.09 hrs HW=59.56' (Free Discharge)
└**3=Exfiltration** (Controls 0.02 cfs)

Primary OutFlow Max=1.18 cfs @ 12.09 hrs HW=59.56' (Free Discharge)
└**1=Culvert** (Passes 1.18 cfs of 6.12 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 1.18 cfs @ 0.78 fps)

Pond B4: Bioretention Area #4



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1S: Northwestern Runoff Area=16,859 sf 0.00% Impervious Runoff Depth=0.12"
Tc=6.0 min CN=33 Runoff=0.01 cfs 0.004 af

Subcatchment 2S: Front Yard Runoff Area=8,602 sf 15.40% Impervious Runoff Depth=0.52"
Tc=6.0 min CN=42 Runoff=0.05 cfs 0.008 af

Subcatchment 3S: Front Yard Runoff Area=7,305 sf 27.47% Impervious Runoff Depth=1.00"
Tc=6.0 min UI Adjusted CN=50 Runoff=0.15 cfs 0.014 af

Subcatchment 4S: Southerly Runoff Area=24,964 sf 29.67% Impervious Runoff Depth=1.20"
Tc=6.0 min UI Adjusted CN=53 Runoff=0.67 cfs 0.058 af

Subcatchment 5S: Easterly Access Runoff Area=13,653 sf 47.25% Impervious Runoff Depth=2.05"
Tc=6.0 min CN=64 Runoff=0.73 cfs 0.054 af

Subcatchment 6S: North Side Drive Runoff Area=30,907 sf 79.72% Impervious Runoff Depth=4.12"
Tc=6.0 min CN=86 Runoff=3.36 cfs 0.244 af

Subcatchment 7S: BR Area #1 Runoff Area=13,211 sf 42.99% Impervious Runoff Depth=2.57"
Tc=6.0 min CN=70 Runoff=0.91 cfs 0.065 af

Subcatchment 8S: Front Entrance Runoff Area=4,770 sf 51.89% Impervious Runoff Depth=2.57"
Tc=6.0 min CN=70 Runoff=0.33 cfs 0.023 af

Subcatchment 9S: Drop-Off Area Runoff Area=6,767 sf 78.45% Impervious Runoff Depth=4.02"
Tc=6.0 min CN=85 Runoff=0.72 cfs 0.052 af

Subcatchment MC: MC Courtyard & Runoff Area=7,595 sf 86.33% Impervious Runoff Depth=4.55"
Tc=6.0 min CN=90 Runoff=0.89 cfs 0.066 af

Subcatchment R1: Building Roof Runoff Area=9,040 sf 100.00% Impervious Runoff Depth=5.46"
Tc=6.0 min CN=98 Runoff=1.16 cfs 0.094 af

Subcatchment R2: Building Roof Runoff Area=6,984 sf 100.00% Impervious Runoff Depth=5.46"
Tc=6.0 min CN=98 Runoff=0.90 cfs 0.073 af

Subcatchment R3: Building Roof Runoff Area=11,933 sf 100.00% Impervious Runoff Depth=5.46"
Tc=6.0 min CN=98 Runoff=1.53 cfs 0.125 af

Subcatchment R4: Building Roof Runoff Area=6,958 sf 100.00% Impervious Runoff Depth=5.46"
Tc=6.0 min CN=98 Runoff=0.89 cfs 0.073 af

Reach 1R: NW Abutting Property Inflow=0.01 cfs 0.004 af
Outflow=0.01 cfs 0.004 af

Reach 2R: Great Neck Road South Inflow=0.05 cfs 0.008 af
Outflow=0.05 cfs 0.008 af

Reach 3R: SUMMARY NODE Inflow=0.05 cfs 0.012 af
Outflow=0.05 cfs 0.012 af

Pond 1P: ADS Chamber System #1 Peak Elev=52.83' Storage=4,991 cf Inflow=4.79 cfs 0.328 af
Outflow=0.68 cfs 0.328 af

Pond 2P: ADS Chamber System #2 Peak Elev=53.63' Storage=2,068 cf Inflow=2.17 cfs 0.160 af
Outflow=0.35 cfs 0.160 af

Pond 3P: ADS Chamber System #3 Peak Elev=55.69' Storage=953 cf Inflow=0.89 cfs 0.066 af
Outflow=0.12 cfs 0.066 af

Pond 4P: ADS Chamber System #4 Peak Elev=52.63' Storage=1,753 cf Inflow=1.73 cfs 0.117 af
Outflow=0.26 cfs 0.117 af

Pond B1: Bioretention Area #1 Peak Elev=56.72' Storage=4,604 cf Inflow=2.52 cfs 0.191 af
Outflow=0.12 cfs 0.163 af

Pond B2: Bioretention Area #2 Peak Elev=58.55' Storage=175 cf Inflow=2.18 cfs 0.182 af
Discarded=0.01 cfs 0.022 af Primary=2.17 cfs 0.160 af Outflow=2.18 cfs 0.182 af

Pond B3: Bioretention Area #3 Peak Elev=59.63' Storage=231 cf Inflow=1.04 cfs 0.087 af
Discarded=0.01 cfs 0.021 af Primary=1.01 cfs 0.065 af Outflow=1.02 cfs 0.087 af

Pond B4: Bioretention Area #4 Peak Elev=59.57' Storage=318 cf Inflow=1.48 cfs 0.118 af
Discarded=0.02 cfs 0.034 af Primary=1.44 cfs 0.084 af Outflow=1.46 cfs 0.118 af

Total Runoff Area = 3.892 ac Runoff Volume = 0.953 af Average Runoff Depth = 2.94"
42.93% Pervious = 1.671 ac 57.07% Impervious = 2.221 ac

Summary for Subcatchment 1S: Northwestern Boundary Area

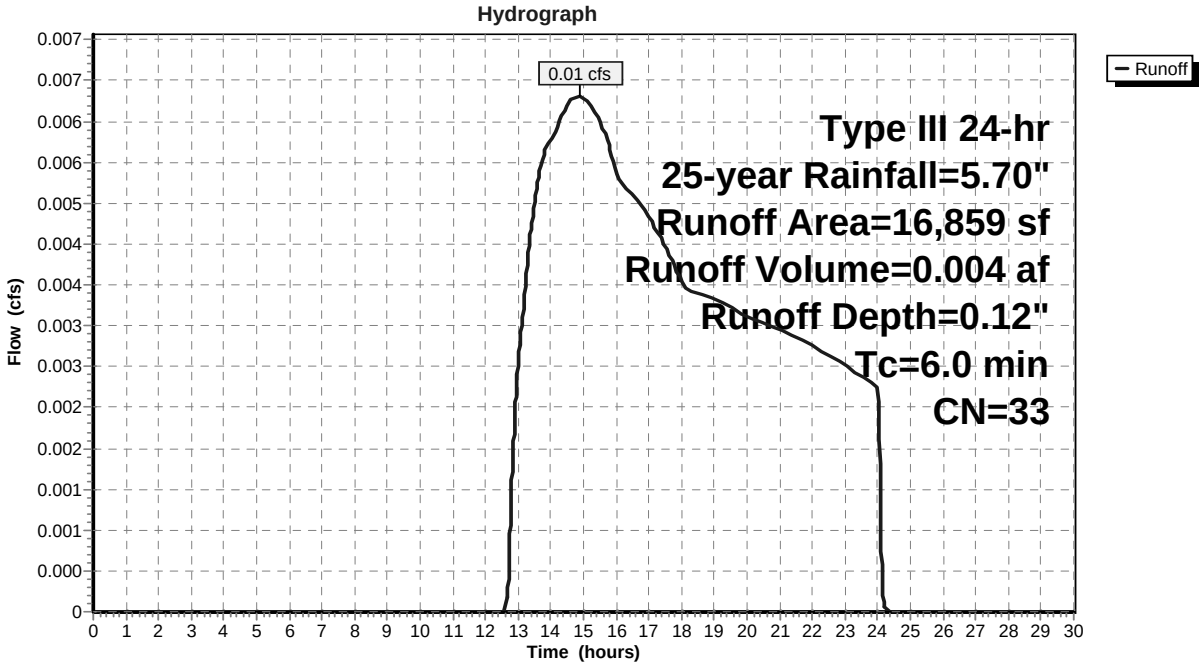
Runoff = 0.01 cfs @ 14.86 hrs, Volume= 0.004 af, Depth= 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.70"

Area (sf)	CN	Description
16,470	32	Woods/grass comb., Good, HSG A
389	76	Gravel roads, HSG A
16,859	33	Weighted Average
16,859		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 1S: Northwestern Boundary Area



Summary for Subcatchment 2S: Front Yard

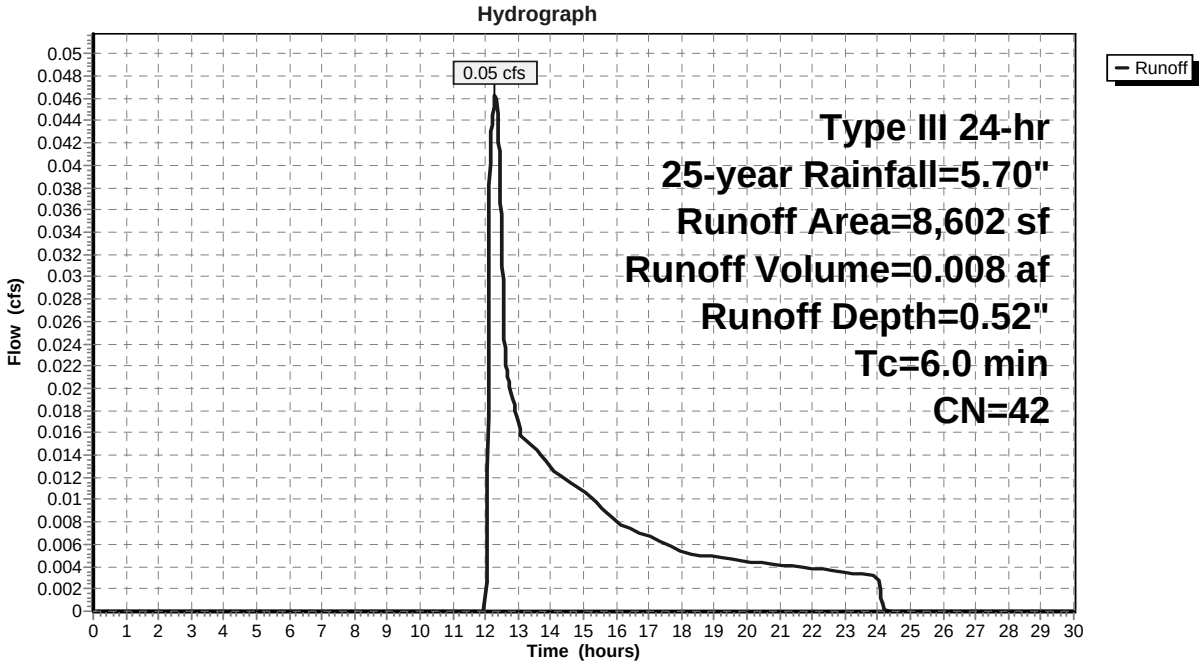
Runoff = 0.05 cfs @ 12.30 hrs, Volume= 0.008 af, Depth= 0.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.70"

Area (sf)	CN	Description
1,660	39	>75% Grass cover, Good, HSG A
1,325	98	Paved parking, HSG A
5,617	30	Woods, Good, HSG A
8,602	42	Weighted Average
7,277		84.60% Pervious Area
1,325		15.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 2S: Front Yard



Summary for Subcatchment 3S: Front Yard

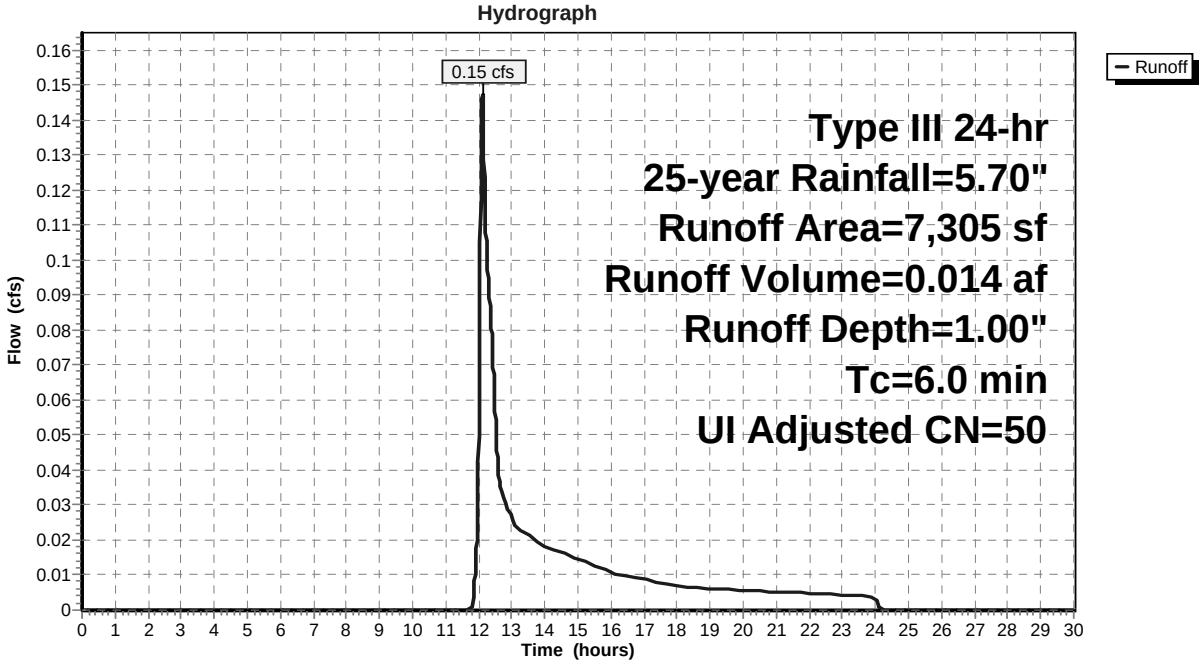
Runoff = 0.15 cfs @ 12.11 hrs, Volume= 0.014 af, Depth= 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.70"

	Area (sf)	CN	Adj	Description
	5,298	39		>75% Grass cover, Good, HSG A
*	1,346	98		Unconnected pvmnt & porch roofs, HSG A
	661	98		Water Surface, HSG A
	7,305	55	50	Weighted Average, UI Adjusted
	5,298			72.53% Pervious Area
	2,007			27.47% Impervious Area
	1,346			67.07% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 3S: Front Yard



Summary for Subcatchment 4S: Southerly Courtyard

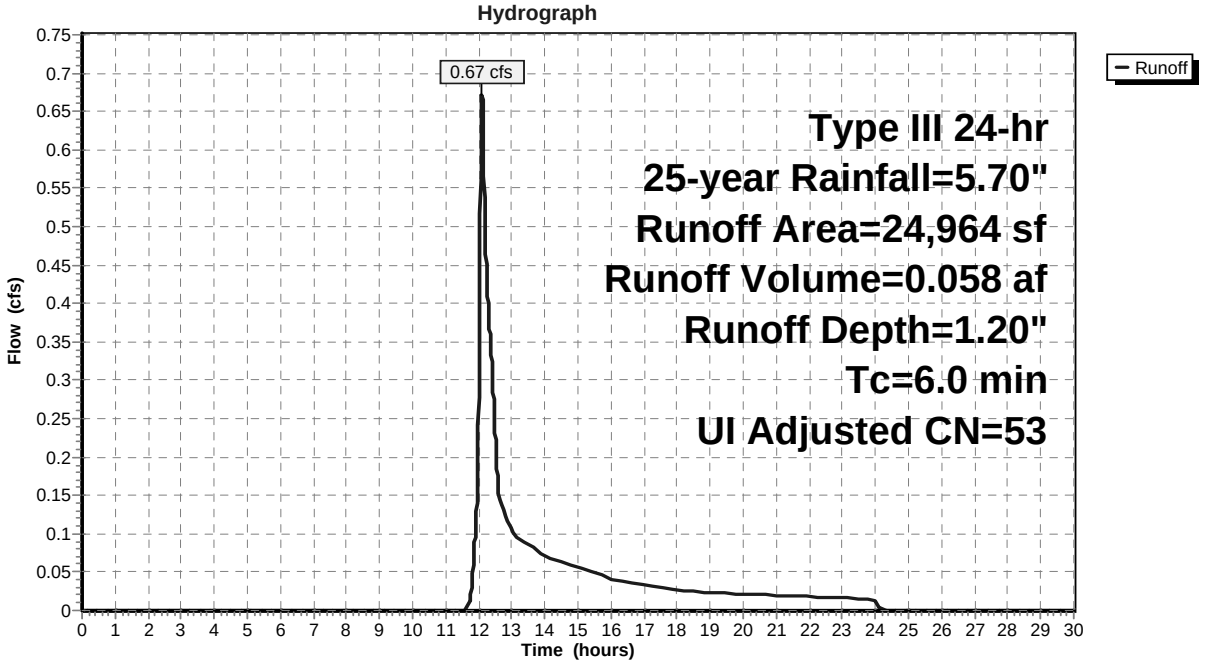
Runoff = 0.67 cfs @ 12.10 hrs, Volume= 0.058 af, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.70"

	Area (sf)	CN	Adj	Description
	3,660	76		Gravel roads, HSG A
*	5,842	98		Unconnected pvmnt & porch roofs, HSG A
	1,565	98		Water Surface, HSG A
	5,984	30		Woods, Good, HSG A
	7,913	39		>75% Grass cover, Good, HSG A
	24,964	60	53	Weighted Average, UI Adjusted
	17,557			70.33% Pervious Area
	7,407			29.67% Impervious Area
	5,842			78.87% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 4S: Southerly Courtyard



Summary for Subcatchment 5S: Easterly Access Drive

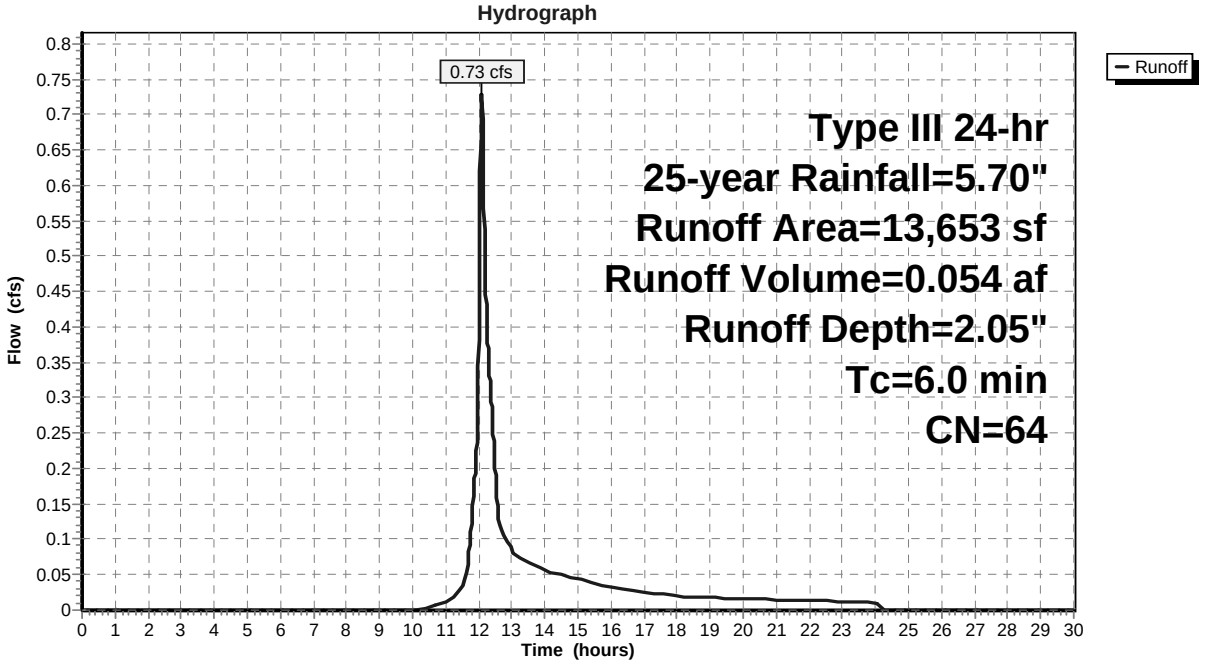
Runoff = 0.73 cfs @ 12.09 hrs, Volume= 0.054 af, Depth= 2.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.70"

Area (sf)	CN	Description
5,400	30	Woods, Good, HSG A
1,503	39	>75% Grass cover, Good, HSG A
6,451	98	Paved parking, HSG A
299	76	Gravel roads, HSG A
13,653	64	Weighted Average
7,202		52.75% Pervious Area
6,451		47.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 5S: Easterly Access Drive



Summary for Subcatchment 6S: North Side Drive & Parking

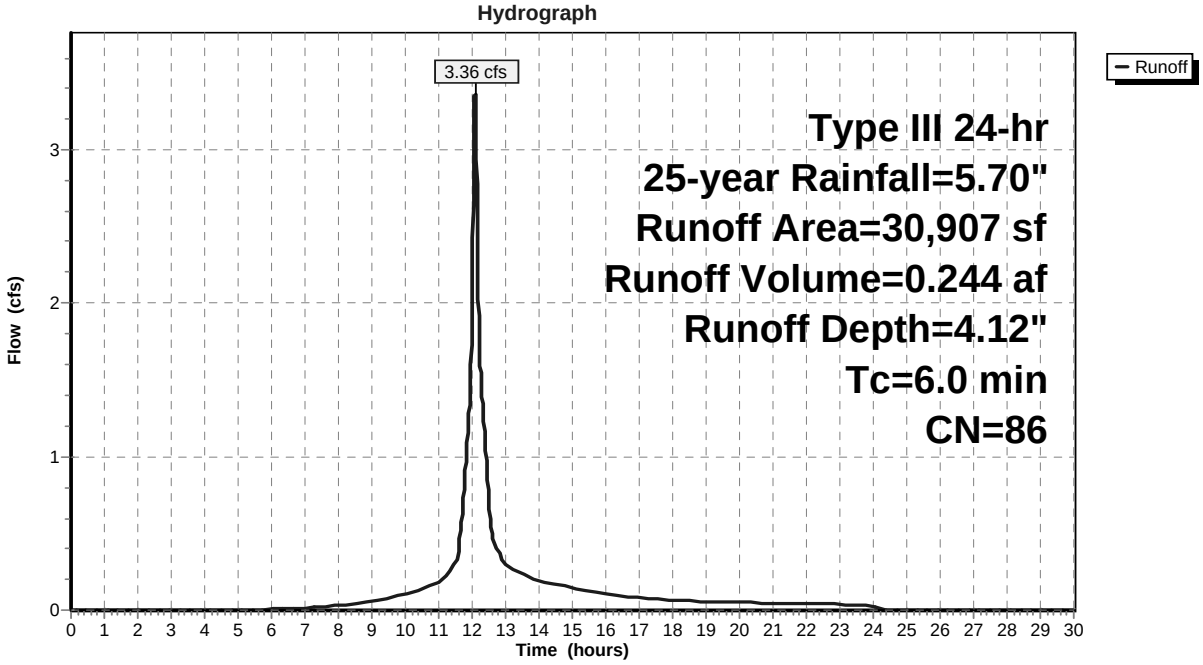
Runoff = 3.36 cfs @ 12.09 hrs, Volume= 0.244 af, Depth= 4.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.70"

Area (sf)	CN	Description
24,640	98	Paved parking, HSG A
4,625	39	>75% Grass cover, Good, HSG A
1,092	30	Woods, Good, HSG A
550	76	Gravel roads, HSG A
30,907	86	Weighted Average
6,267		20.28% Pervious Area
24,640		79.72% Impervious Area

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

Subcatchment 6S: North Side Drive & Parking



Summary for Subcatchment 7S: BR Area #1

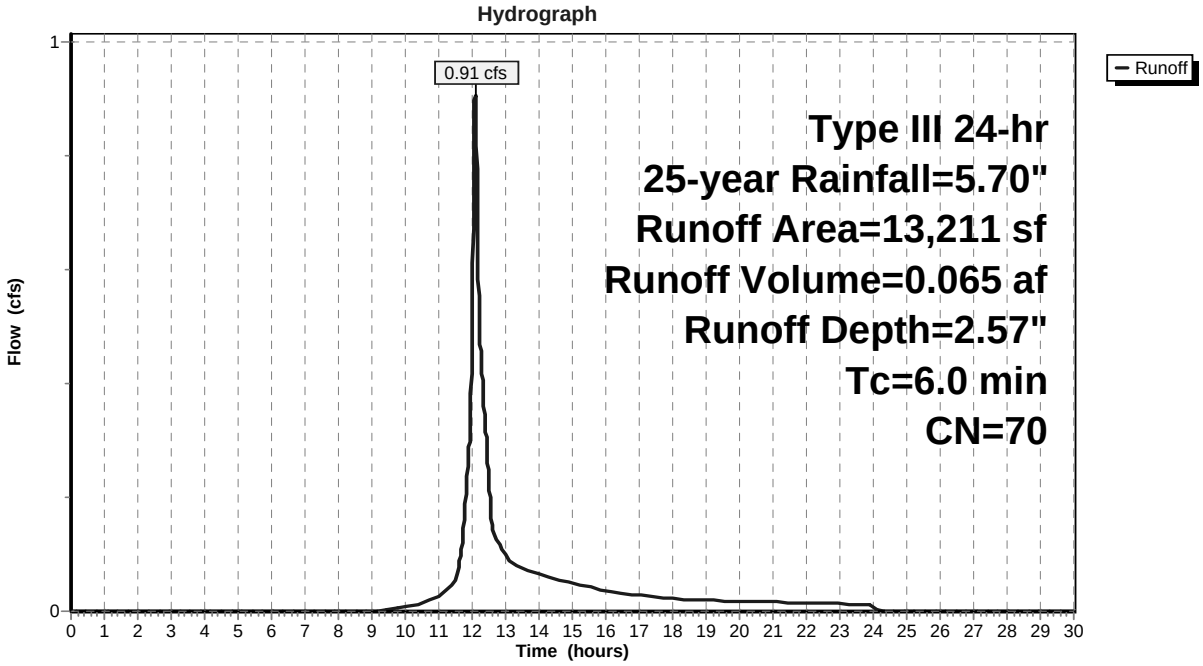
Runoff = 0.91 cfs @ 12.09 hrs, Volume= 0.065 af, Depth= 2.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.70"

Area (sf)	CN	Description
5,630	39	>75% Grass cover, Good, HSG A
1,902	76	Gravel roads, HSG A
5,679	98	Water Surface, HSG A
13,211	70	Weighted Average
7,532		57.01% Pervious Area
5,679		42.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 7S: BR Area #1



Summary for Subcatchment 8S: Front Entrance Area

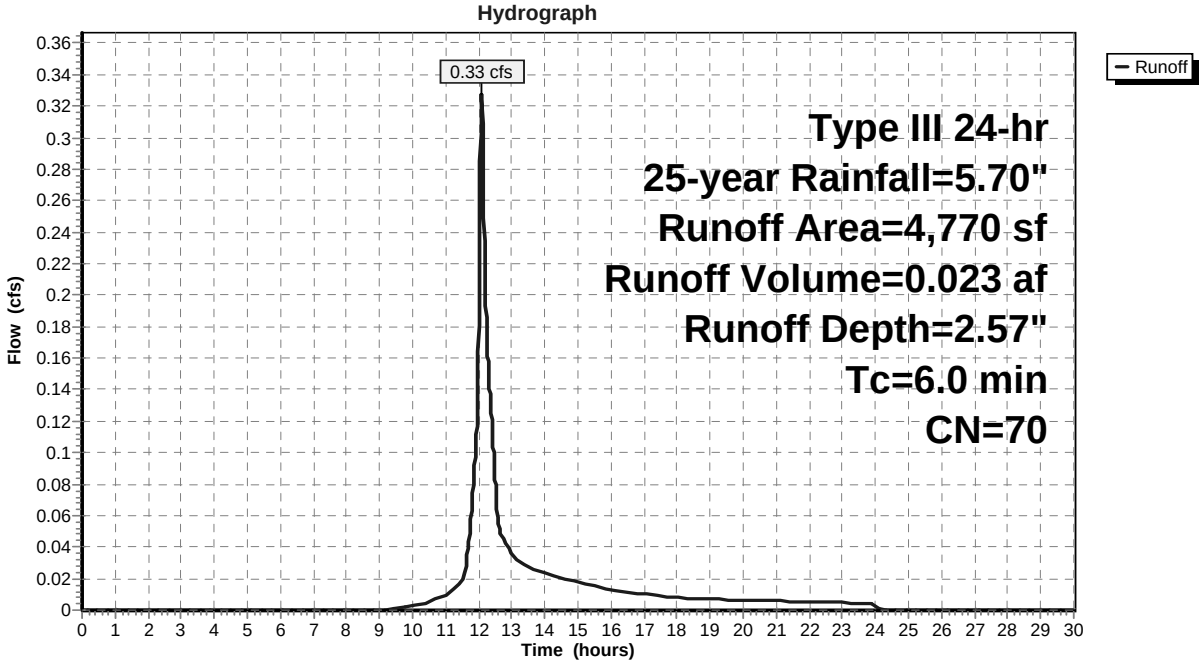
Runoff = 0.33 cfs @ 12.09 hrs, Volume= 0.023 af, Depth= 2.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.70"

	Area (sf)	CN	Description
	2,295	39	>75% Grass cover, Good, HSG A
*	1,279	98	Unconnected pvmnt & porch roofs, HSG A
	1,196	98	Water Surface, HSG A
	4,770	70	Weighted Average
	2,295		48.11% Pervious Area
	2,475		51.89% Impervious Area
	1,279		51.68% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 8S: Front Entrance Area



Summary for Subcatchment 9S: Drop-Off Area

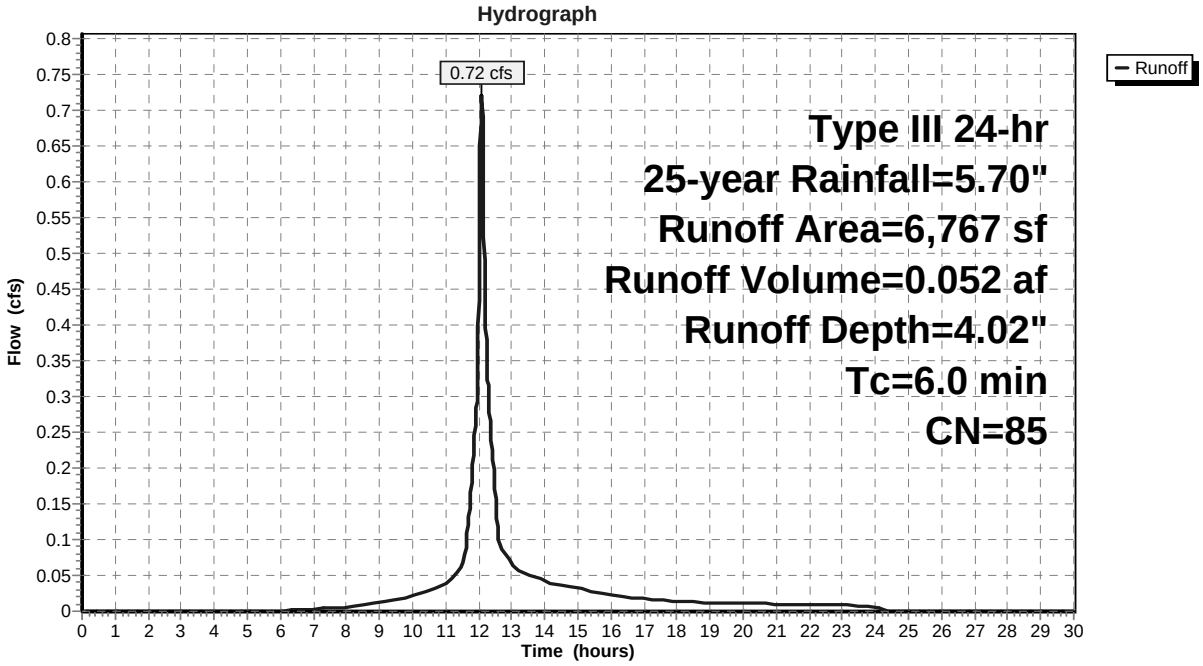
Runoff = 0.72 cfs @ 12.09 hrs, Volume= 0.052 af, Depth= 4.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.70"

	Area (sf)	CN	Description
	1,458	39	>75% Grass cover, Good, HSG A
*	5,309	98	Unconnected pvmnt & porch roofs, HSG A
	6,767	85	Weighted Average
	1,458		21.55% Pervious Area
	5,309		78.45% Impervious Area
	5,309		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 9S: Drop-Off Area



Summary for Subcatchment MC: MC Courtyard & Roof

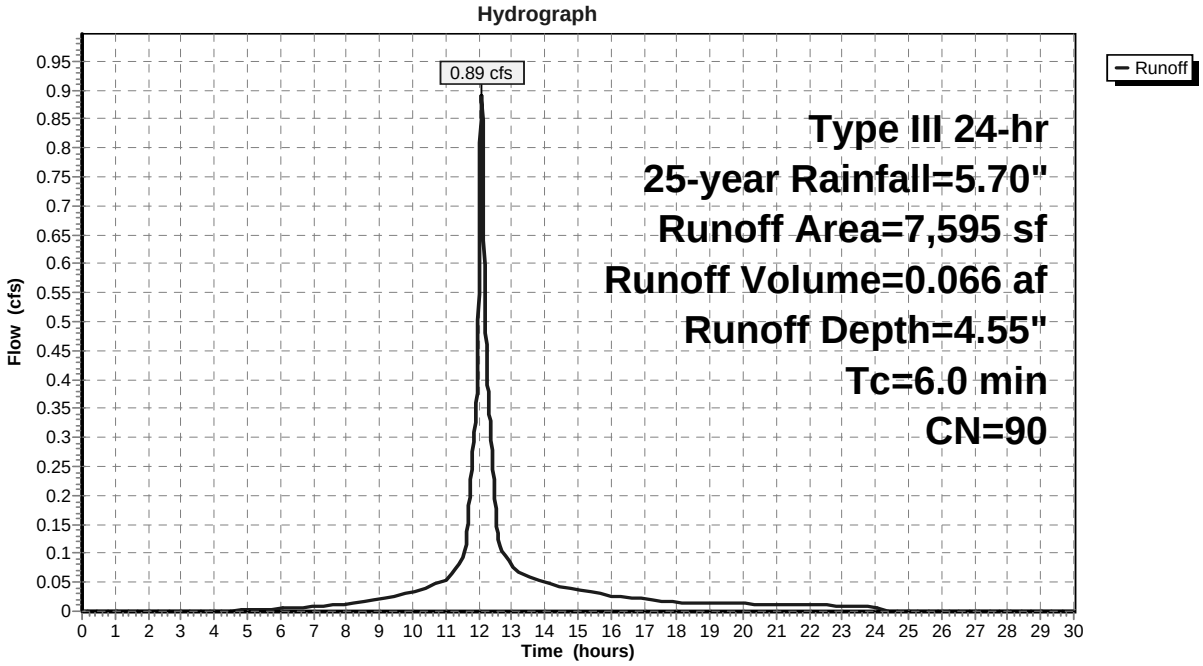
Runoff = 0.89 cfs @ 12.08 hrs, Volume= 0.066 af, Depth= 4.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.70"

Area (sf)	CN	Description
1,038	39	>75% Grass cover, Good, HSG A
6,557	98	Unconnected roofs, HSG A
7,595	90	Weighted Average
1,038		13.67% Pervious Area
6,557		86.33% Impervious Area
6,557		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment MC: MC Courtyard & Roof



Summary for Subcatchment R1: Building Roof

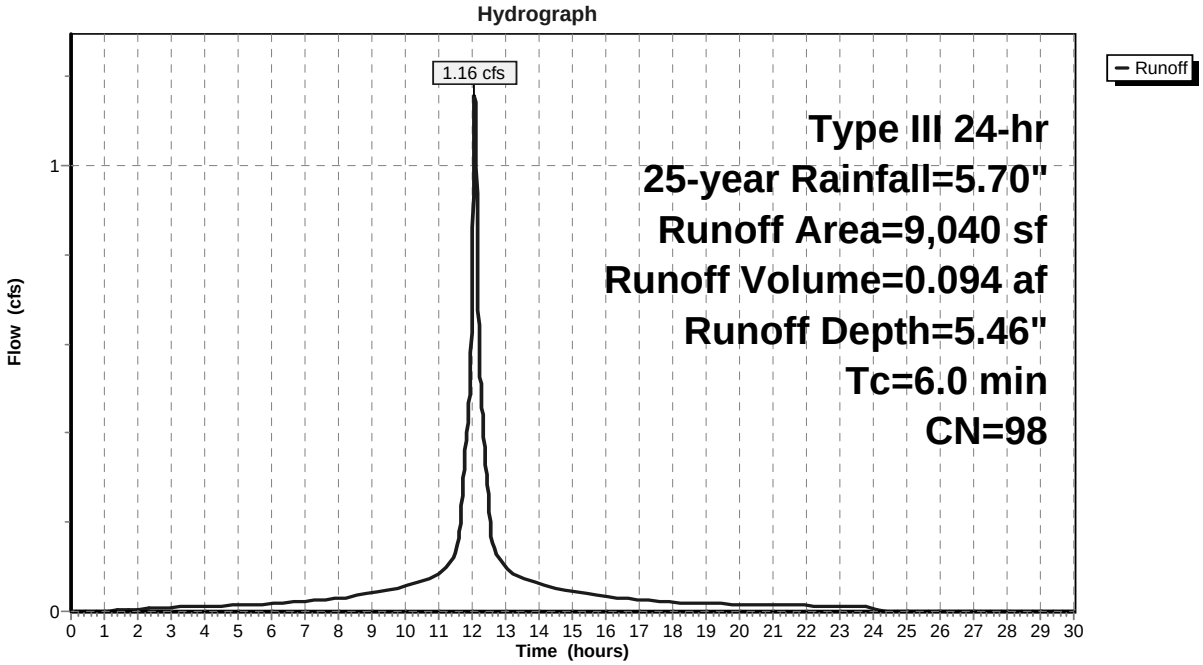
Runoff = 1.16 cfs @ 12.08 hrs, Volume= 0.094 af, Depth= 5.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.70"

Area (sf)	CN	Description
9,040	98	Roofs, HSG A
9,040		100.00% Impervious Area

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

Subcatchment R1: Building Roof



Summary for Subcatchment R2: Building Roof

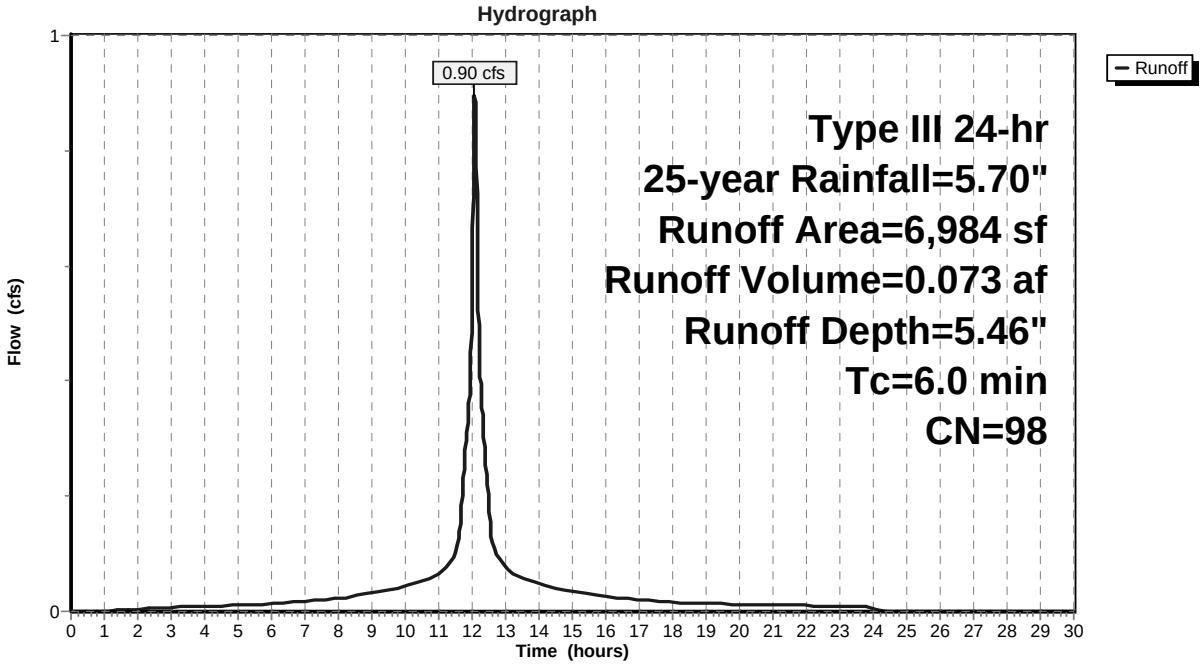
Runoff = 0.90 cfs @ 12.08 hrs, Volume= 0.073 af, Depth= 5.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.70"

Area (sf)	CN	Description
6,984	98	Roofs, HSG A
6,984		100.00% Impervious Area

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

Subcatchment R2: Building Roof



Summary for Subcatchment R3: Building Roof

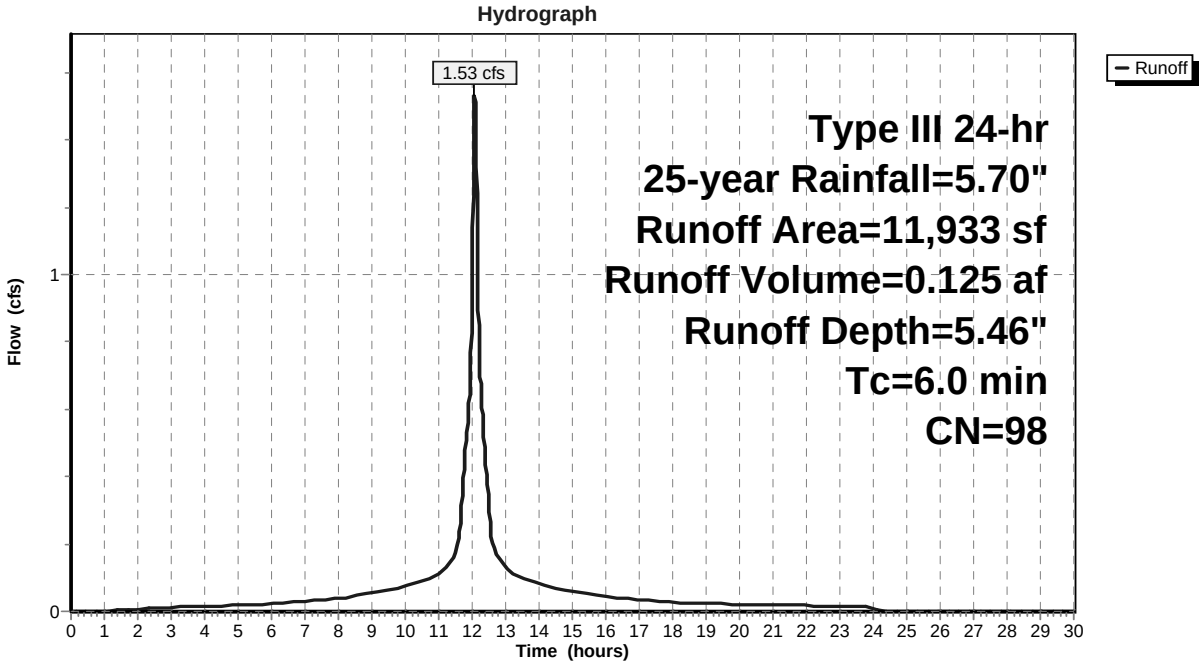
Runoff = 1.53 cfs @ 12.08 hrs, Volume= 0.125 af, Depth= 5.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.70"

Area (sf)	CN	Description
11,933	98	Roofs, HSG A
11,933		100.00% Impervious Area

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

Subcatchment R3: Building Roof



Summary for Subcatchment R4: Building Roof

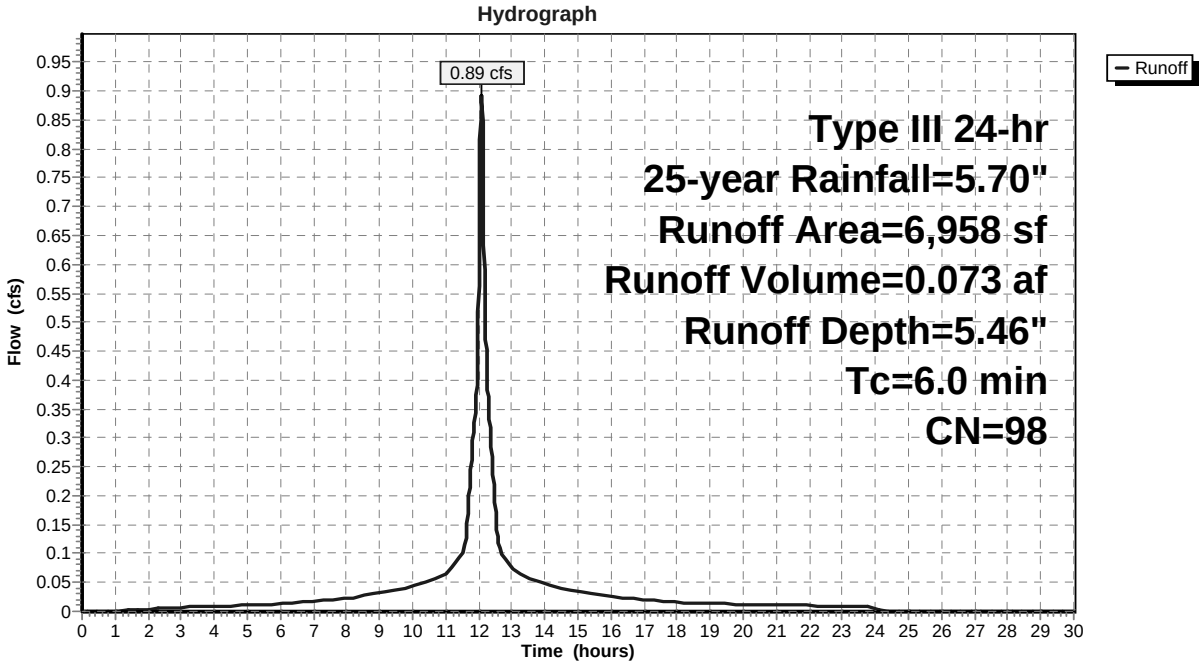
Runoff = 0.89 cfs @ 12.08 hrs, Volume= 0.073 af, Depth= 5.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.70"

Area (sf)	CN	Description
6,958	98	Roofs, HSG A
6,958		100.00% Impervious Area

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

Subcatchment R4: Building Roof

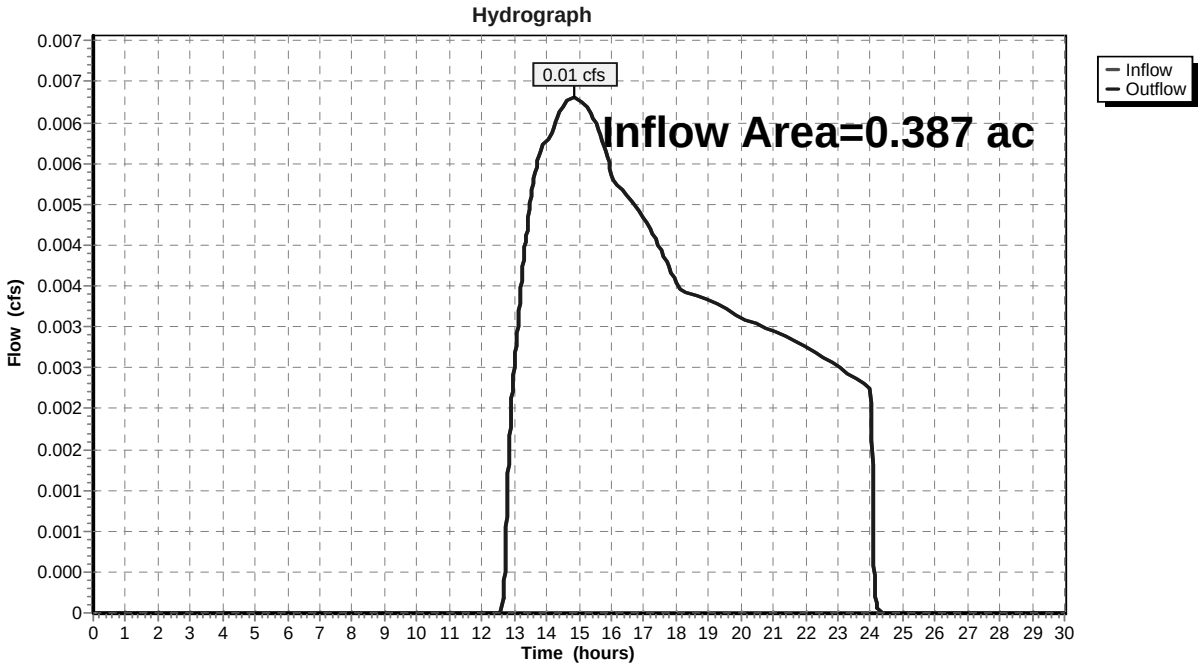


Summary for Reach 1R: NW Abutting Property

Inflow Area = 0.387 ac, 0.00% Impervious, Inflow Depth = 0.12" for 25-year event
Inflow = 0.01 cfs @ 14.86 hrs, Volume= 0.004 af
Outflow = 0.01 cfs @ 14.86 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach 1R: NW Abutting Property

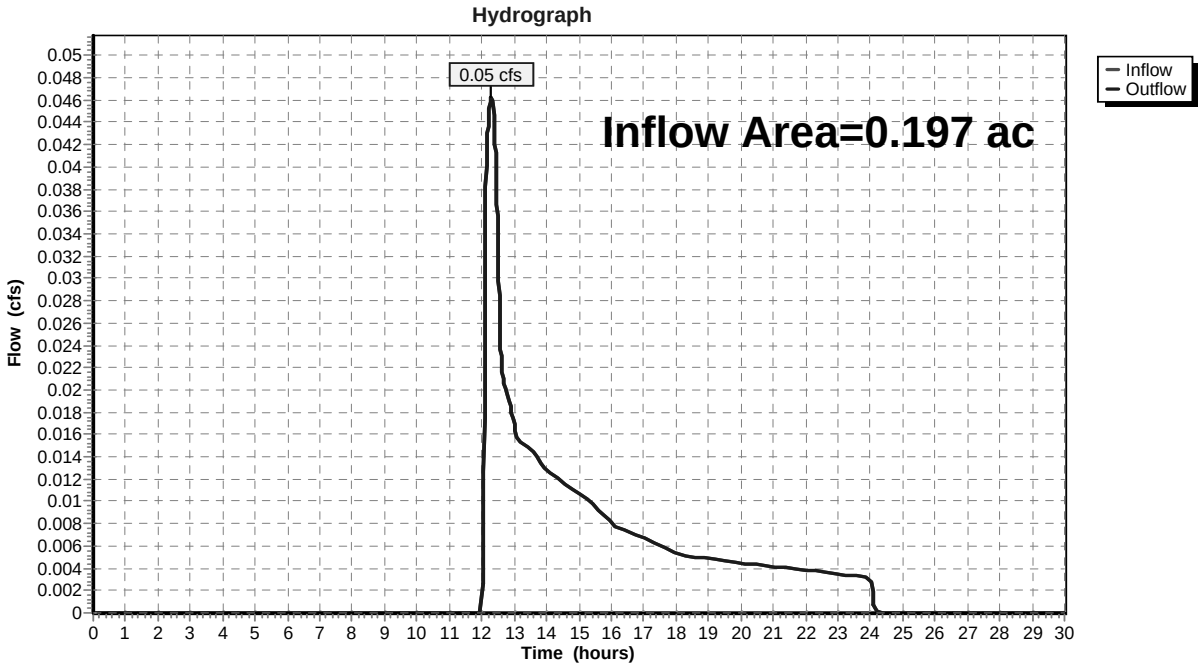


Summary for Reach 2R: Great Neck Road South

Inflow Area = 0.197 ac, 15.40% Impervious, Inflow Depth = 0.52" for 25-year event
Inflow = 0.05 cfs @ 12.30 hrs, Volume= 0.008 af
Outflow = 0.05 cfs @ 12.30 hrs, Volume= 0.008 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach 2R: Great Neck Road South

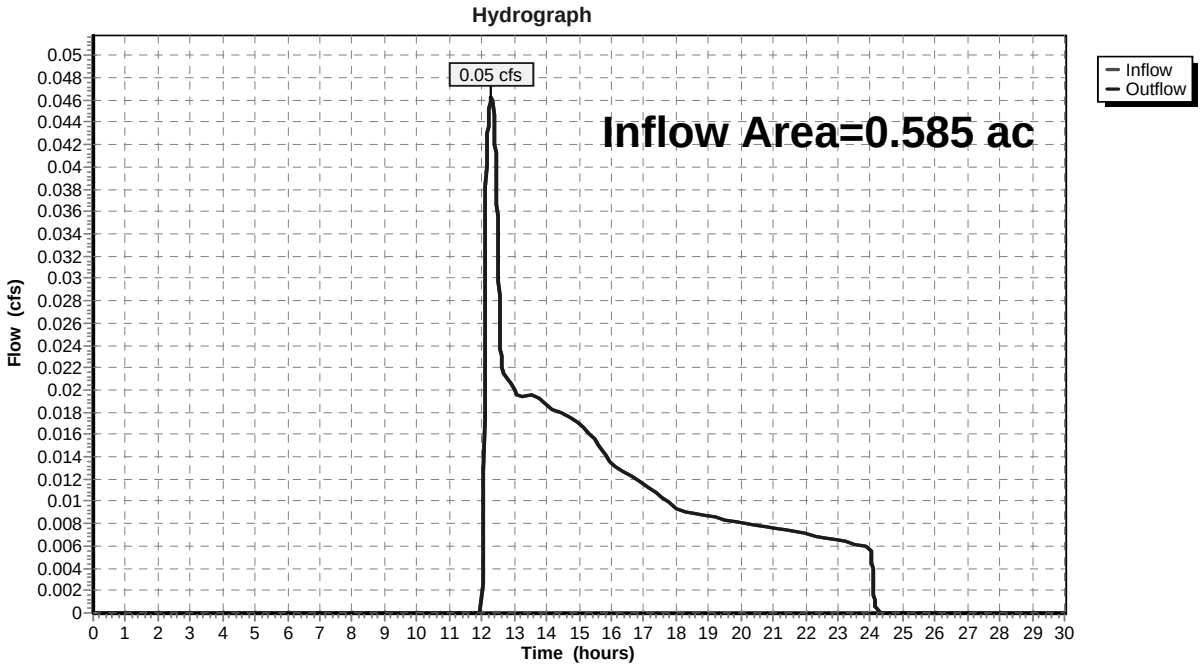


Summary for Reach 3R: SUMMARY NODE

Inflow Area = 0.585 ac, 5.20% Impervious, Inflow Depth = 0.26" for 25-year event
Inflow = 0.05 cfs @ 12.30 hrs, Volume= 0.012 af
Outflow = 0.05 cfs @ 12.30 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach 3R: SUMMARY NODE



Summary for Pond 1P: ADS Chamber System #1

Inflow Area = 1.027 ac, 80.85% Impervious, Inflow Depth = 3.84" for 25-year event
Inflow = 4.79 cfs @ 12.09 hrs, Volume= 0.328 af
Outflow = 0.68 cfs @ 12.60 hrs, Volume= 0.328 af, Atten= 86%, Lag= 30.6 min
Discarded = 0.68 cfs @ 12.60 hrs, Volume= 0.328 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 52.83' @ 12.60 hrs Surf.Area= 2,532 sf Storage= 4,991 cf

Plug-Flow detention time= 56.4 min calculated for 0.328 af (100% of inflow)
Center-of-Mass det. time= 56.4 min (845.9 - 789.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	50.00'	3,585 cf	**29.92'W x 84.64'L x 5.50'H Field A** 13,926 cf Overall - 4,963 cf Embedded = 8,964 cf x 40.0% Voids
#2A	50.75'	4,963 cf	**ADS_StormTech MC-3500 c +Cap** x 44 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 4 rows = 124.8 cf
		8,548 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	50.00'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.68 cfs @ 12.60 hrs HW=52.83' (Free Discharge)
↑**1=Exfiltration** (Controls 0.68 cfs)

Pond 1P: ADS Chamber System #1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 c +Cap (ADS StormTech® MC-3500 c rev 05/12 with Cap storage)
Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +15.6 cf x 2 x 4 rows = 124.8 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

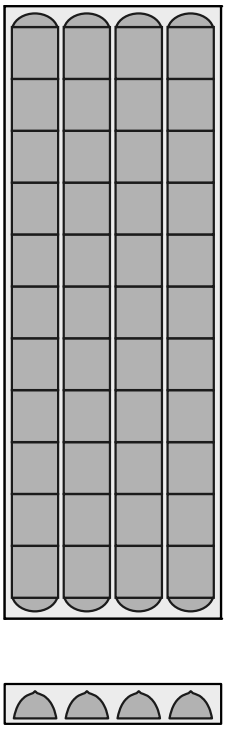
11 Chambers/Row x 7.17' Long +1.88' Cap Length x 2 = 82.64' Row Length +12.0" End Stone x 2 = 84.64' Base Length
4 Rows x 77.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 29.92' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

44 Chambers x 110.0 cf + 15.6 cf Cap Volume x 2 x 4 Rows = 4,962.7 cf Chamber Storage

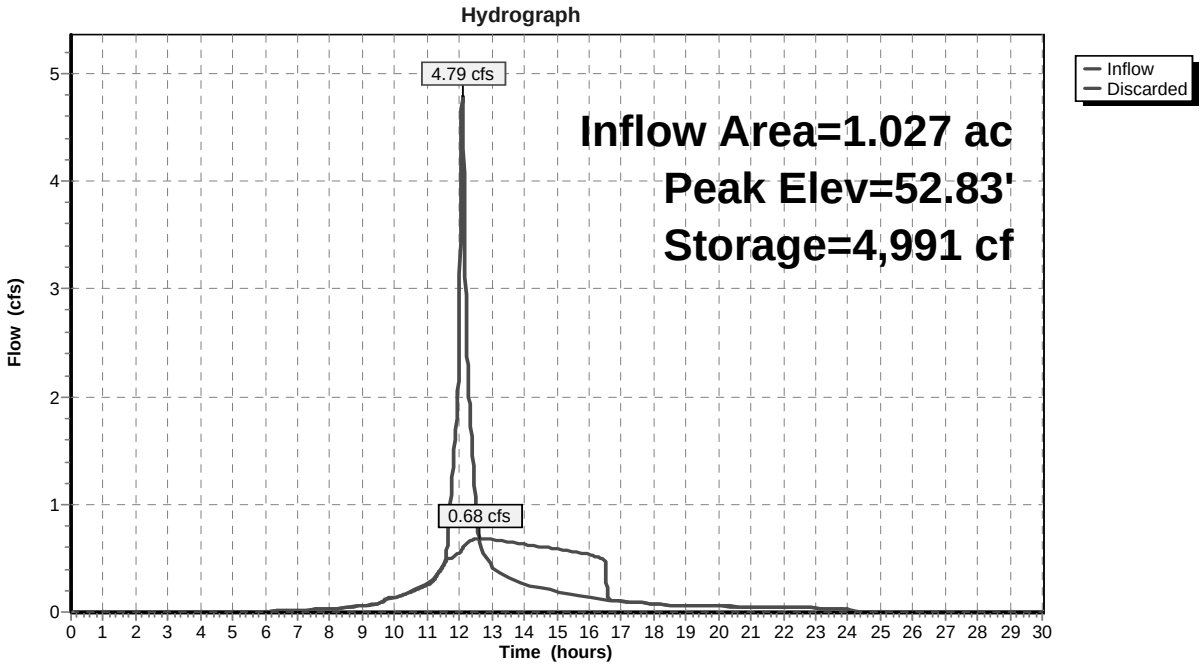
13,926.3 cf Field - 4,962.7 cf Chambers = 8,963.6 cf Stone x 40.0% Voids = 3,585.4 cf Stone Storage

Chamber Storage + Stone Storage = 8,548.1 cf = 0.196 af
Overall Storage Efficiency = 61.4%

44 Chambers
515.8 cy Field
332.0 cy Stone



Pond 1P: ADS Chamber System #1



Summary for Pond 2P: ADS Chamber System #2

Inflow Area = 0.847 ac, 52.42% Impervious, Inflow Depth = 2.27" for 25-year event
Inflow = 2.17 cfs @ 12.09 hrs, Volume= 0.160 af
Outflow = 0.35 cfs @ 12.60 hrs, Volume= 0.160 af, Atten= 84%, Lag= 30.6 min
Discarded = 0.35 cfs @ 12.60 hrs, Volume= 0.160 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 53.63' @ 12.60 hrs Surf.Area= 1,460 sf Storage= 2,068 cf

Plug-Flow detention time= 41.7 min calculated for 0.160 af (100% of inflow)
Center-of-Mass det. time= 41.7 min (840.9 - 799.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	51.50'	2,106 cf	**29.92'W x 48.79'L x 5.50'H Field A** 8,027 cf Overall - 2,764 cf Embedded = 5,264 cf x 40.0% Voids
#2A	52.25'	2,764 cf	**ADS_StormTech MC-3500 c +Cap** x 24 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 4 rows = 124.8 cf
		4,869 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	51.50'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.35 cfs @ 12.60 hrs HW=53.63' (Free Discharge)
↑**1=Exfiltration** (Controls 0.35 cfs)

Pond 2P: ADS Chamber System #2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 c +Cap (ADS StormTech® MC-3500 c rev 05/12 with Cap storage)
Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +15.6 cf x 2 x 4 rows = 124.8 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

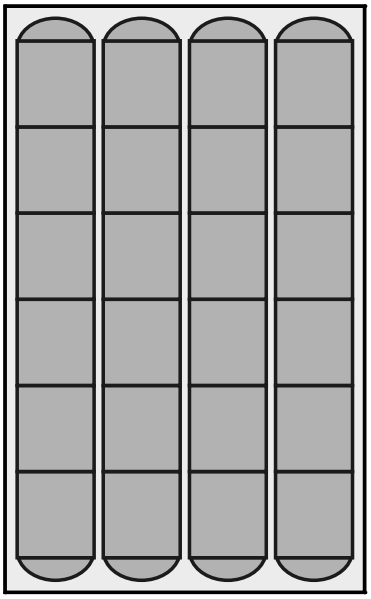
6 Chambers/Row x 7.17' Long +1.88' Cap Length x 2 = 46.79' Row Length +12.0" End Stone x 2 = 48.79' Base Length
4 Rows x 77.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 29.92' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

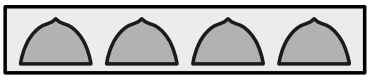
24 Chambers x 110.0 cf + 15.6 cf Cap Volume x 2 x 4 Rows = 2,763.6 cf Chamber Storage

8,027.4 cf Field - 2,763.6 cf Chambers = 5,263.8 cf Stone x 40.0% Voids = 2,105.5 cf Stone Storage

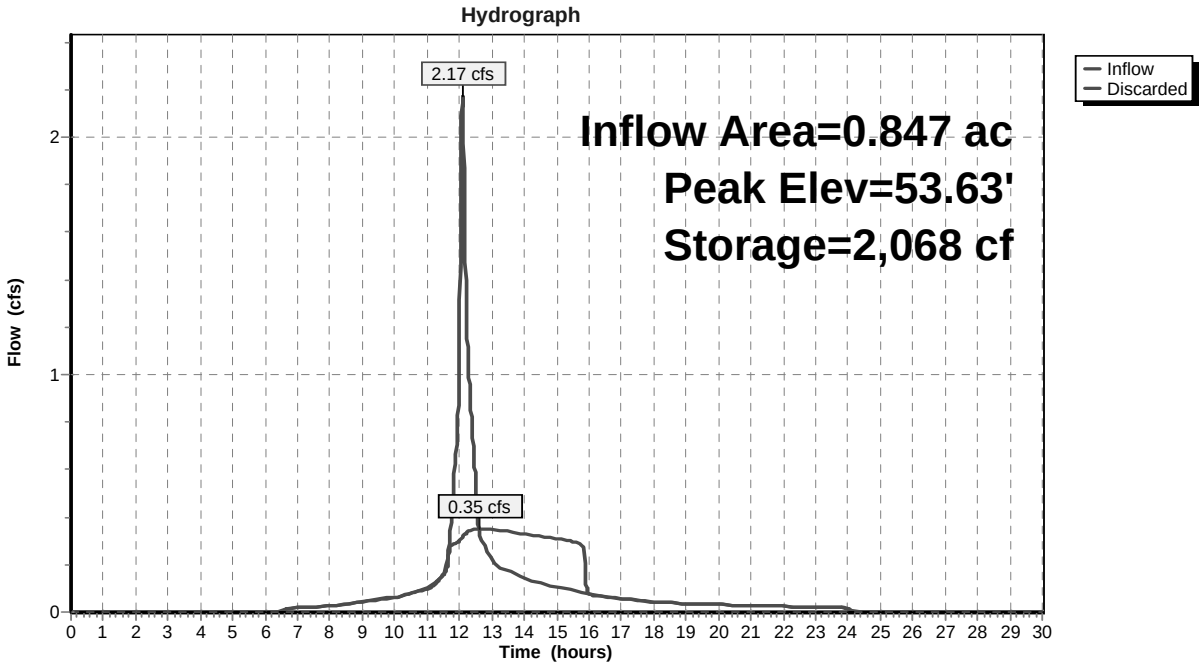
Chamber Storage + Stone Storage = 4,869.2 cf = 0.112 af
Overall Storage Efficiency = 60.7%

24 Chambers
297.3 cy Field
195.0 cy Stone





Pond 2P: ADS Chamber System #2



Summary for Pond 3P: ADS Chamber System #3

Inflow Area = 0.174 ac, 86.33% Impervious, Inflow Depth = 4.55" for 25-year event
Inflow = 0.89 cfs @ 12.08 hrs, Volume= 0.066 af
Outflow = 0.12 cfs @ 12.62 hrs, Volume= 0.066 af, Atten= 87%, Lag= 32.2 min
Discarded = 0.12 cfs @ 12.62 hrs, Volume= 0.066 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 55.69' @ 12.62 hrs Surf.Area= 457 sf Storage= 953 cf

Plug-Flow detention time= 59.4 min calculated for 0.066 af (100% of inflow)
Center-of-Mass det. time= 59.4 min (845.7 - 786.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	52.50'	705 cf	**22.75'W x 20.11'L x 5.50'H Field A** 2,516 cf Overall - 753 cf Embedded = 1,763 cf x 40.0% Voids
#2A	53.25'	753 cf	**ADS_StormTech MC-3500 c +Cap** x 6 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 3 rows = 93.6 cf
		1,458 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	52.50'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.12 cfs @ 12.62 hrs HW=55.69' (Free Discharge)
1=Exfiltration (Controls 0.12 cfs)

Pond 3P: ADS Chamber System #3 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 c +Cap (ADS StormTech® MC-3500 c rev 05/12 with Cap storage)
Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +15.6 cf x 2 x 3 rows = 93.6 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

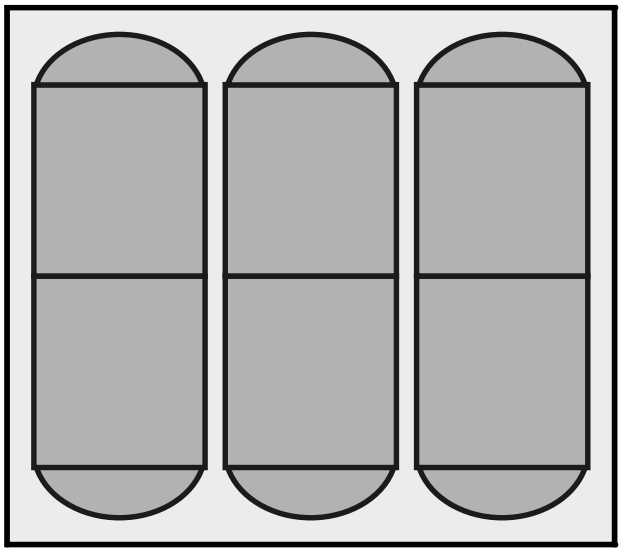
2 Chambers/Row x 7.17' Long +1.88' Cap Length x 2 = 18.11' Row Length +12.0" End Stone x 2 = 20.11' Base Length
3 Rows x 77.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 22.75' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

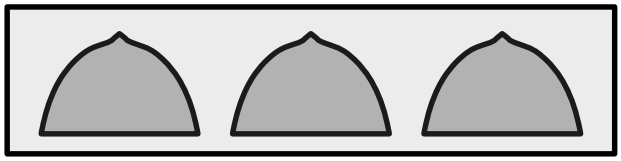
6 Chambers x 110.0 cf + 15.6 cf Cap Volume x 2 x 3 Rows = 753.3 cf Chamber Storage

2,515.8 cf Field - 753.3 cf Chambers = 1,762.5 cf Stone x 40.0% Voids = 705.0 cf Stone Storage

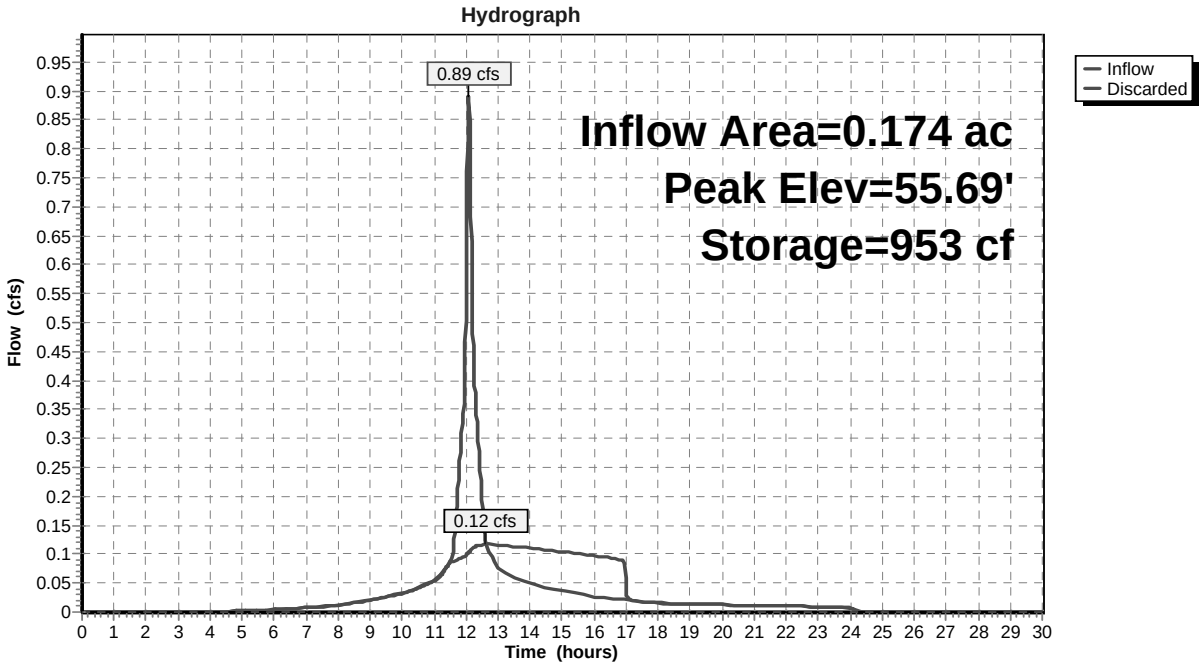
Chamber Storage + Stone Storage = 1,458.3 cf = 0.033 af
Overall Storage Efficiency = 58.0%

6 Chambers
93.2 cy Field
65.3 cy Stone





Pond 3P: ADS Chamber System #3



Summary for Pond 4P: ADS Chamber System #4

Inflow Area = 0.483 ac, 67.91% Impervious, Inflow Depth = 2.92" for 25-year event
Inflow = 1.73 cfs @ 12.09 hrs, Volume= 0.117 af
Outflow = 0.26 cfs @ 12.60 hrs, Volume= 0.117 af, Atten= 85%, Lag= 30.6 min
Discarded = 0.26 cfs @ 12.60 hrs, Volume= 0.117 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 52.63' @ 12.60 hrs Surf.Area= 984 sf Storage= 1,753 cf

Plug-Flow detention time= 51.8 min calculated for 0.117 af (100% of inflow)
Center-of-Mass det. time= 51.8 min (839.8 - 788.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	50.00'	1,436 cf	**15.58'W x 63.13'L x 5.50'H Field A** 5,410 cf Overall - 1,822 cf Embedded = 3,589 cf x 40.0% Voids
#2A	50.75'	1,822 cf	**ADS_StormTech MC-3500 c +Cap** x 16 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf
		3,257 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	50.00'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.26 cfs @ 12.60 hrs HW=52.63' (Free Discharge)
1=Exfiltration (Controls 0.26 cfs)

Pond 4P: ADS Chamber System #4 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 c +Cap (ADS StormTech® MC-3500 c rev 05/12 with Cap storage)
Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

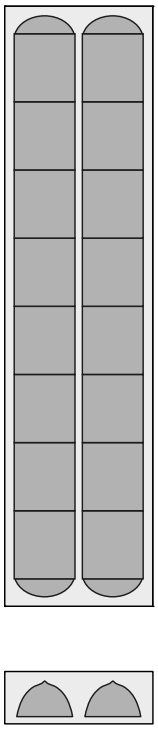
8 Chambers/Row x 7.17' Long +1.88' Cap Length x 2 = 61.13' Row Length +12.0" End Stone x 2 = 63.13' Base Length
2 Rows x 77.0" Wide + 9.0" Spacing x 1 + 12.0" Side Stone x 2 = 15.58' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

16 Chambers x 110.0 cf + 15.6 cf Cap Volume x 2 x 2 Rows = 1,821.6 cf Chamber Storage

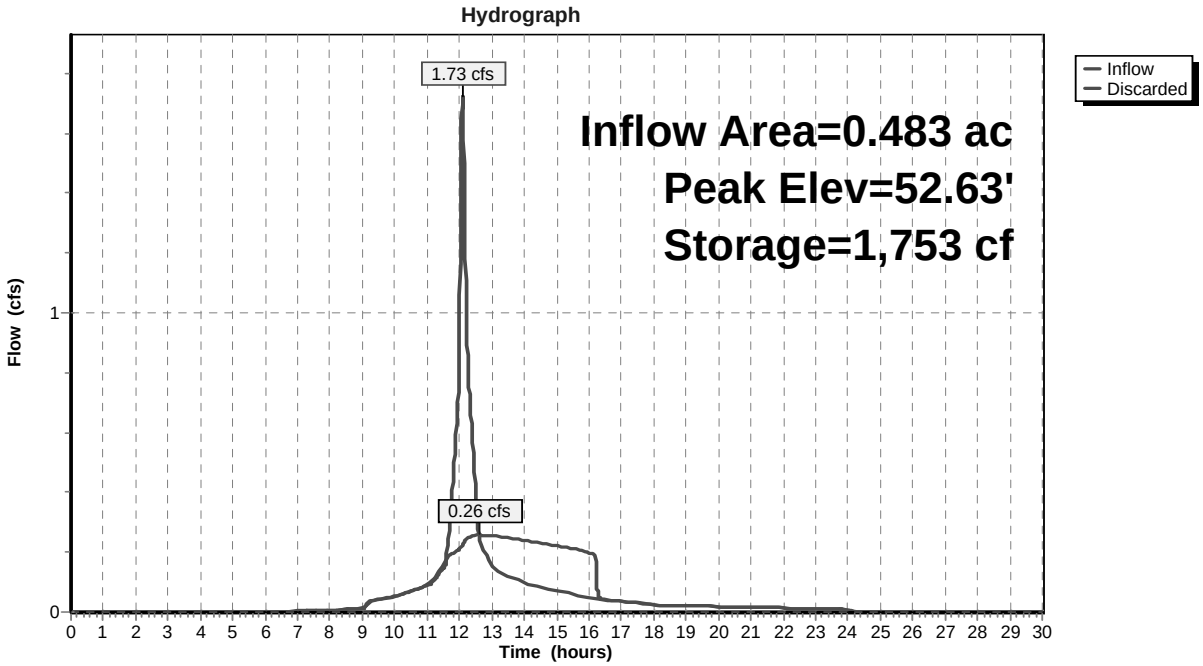
5,410.5 cf Field - 1,821.6 cf Chambers = 3,588.9 cf Stone x 40.0% Voids = 1,435.5 cf Stone Storage

Chamber Storage + Stone Storage = 3,257.2 cf = 0.075 af
Overall Storage Efficiency = 60.2%

16 Chambers
200.4 cy Field
132.9 cy Stone



Pond 4P: ADS Chamber System #4



Summary for Pond B1: Bioretention Area #1

Inflow Area = 0.776 ac, 56.44% Impervious, Inflow Depth = 2.96" for 25-year event
Inflow = 2.52 cfs @ 12.09 hrs, Volume= 0.191 af
Outflow = 0.12 cfs @ 15.16 hrs, Volume= 0.163 af, Atten= 95%, Lag= 184.5 min
Discarded = 0.12 cfs @ 15.16 hrs, Volume= 0.163 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 56.72' @ 15.16 hrs Surf.Area= 4,836 sf Storage= 4,604 cf

Plug-Flow detention time= 401.3 min calculated for 0.163 af (85% of inflow)
Center-of-Mass det. time= 335.1 min (1,144.0 - 808.9)

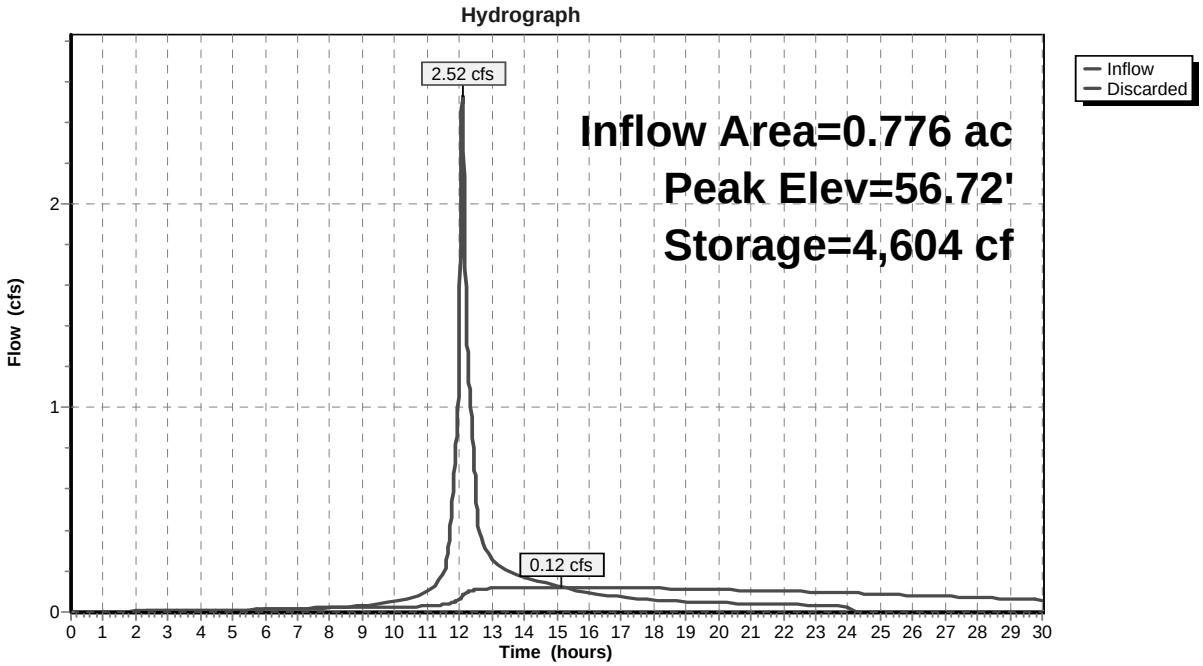
Volume	Invert	Avail.Storage	Storage Description
#1	55.00'	7,558 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
55.00	861	144.3	0	0	861
56.00	2,990	237.5	1,818	1,818	3,699
57.00	5,679	300.3	4,263	6,082	6,400
57.25	6,136	309.7	1,477	7,558	6,863

Device	Routing	Invert	Outlet Devices
#1	Discarded	55.00'	**1.020 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.12 cfs @ 15.16 hrs HW=56.72' (Free Discharge)
1=Exfiltration (Controls 0.12 cfs)

Pond B1: Bioretention Area #1



Summary for Pond B2: Bioretention Area #2

Inflow Area = 0.847 ac, 52.42% Impervious, Inflow Depth = 2.58" for 25-year event
Inflow = 2.18 cfs @ 12.09 hrs, Volume= 0.182 af
Outflow = 2.18 cfs @ 12.09 hrs, Volume= 0.182 af, Atten= 0%, Lag= 0.1 min
Discarded = 0.01 cfs @ 12.09 hrs, Volume= 0.022 af
Primary = 2.17 cfs @ 12.09 hrs, Volume= 0.160 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 58.55' @ 12.09 hrs Surf.Area= 476 sf Storage= 175 cf

Plug-Flow detention time= 25.0 min calculated for 0.182 af (100% of inflow)
Center-of-Mass det. time= 25.0 min (815.8 - 790.8)

Volume	Invert	Avail.Storage	Storage Description
#1	58.00'	1,632 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

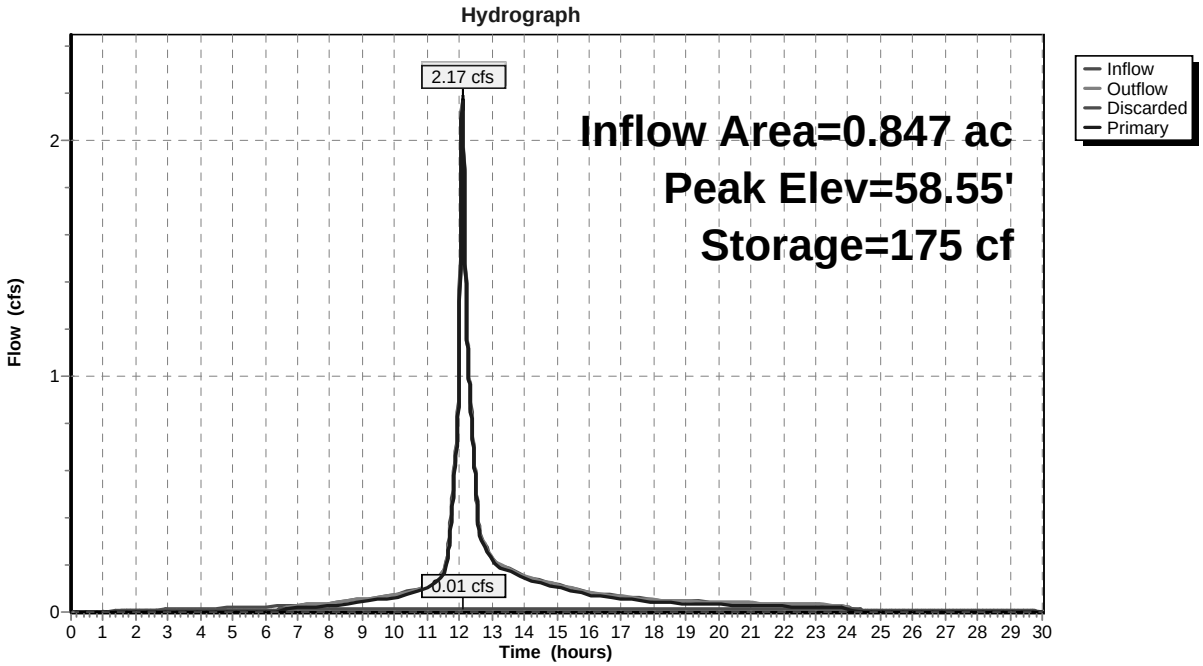
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
58.00	179	70.0	0	0	179
59.00	819	201.9	460	460	3,036
60.00	1,565	223.9	1,172	1,632	3,811

Device	Routing	Invert	Outlet Devices
#1	Primary	53.50'	**12.0" Round Culvert X 2.00** L= 51.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 53.50' / 52.75' S= 0.0146 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	58.50'	**2.0" x 2.0" Horiz. Orifice/Grate X 80.00** C= 0.600 Limited to weir flow at low heads
#3	Discarded	58.00'	**1.020 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.01 cfs @ 12.09 hrs HW=58.55' (Free Discharge)
↑**3=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=2.14 cfs @ 12.09 hrs HW=58.55' (Free Discharge)
↑**1=Culvert** (Passes 2.14 cfs of 15.65 cfs potential flow)
↑**2=Orifice/Grate** (Weir Controls 2.14 cfs @ 0.75 fps)

Pond B2: Bioretention Area #2



Summary for Pond B3: Bioretention Area #3

Inflow Area = 0.328 ac, 62.92% Impervious, Inflow Depth = 3.18" for 25-year event
Inflow = 1.04 cfs @ 12.09 hrs, Volume= 0.087 af
Outflow = 1.02 cfs @ 12.10 hrs, Volume= 0.087 af, Atten= 1%, Lag= 0.7 min
Discarded = 0.01 cfs @ 12.10 hrs, Volume= 0.021 af
Primary = 1.01 cfs @ 12.10 hrs, Volume= 0.065 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 59.63' @ 12.10 hrs Surf.Area= 489 sf Storage= 231 cf

Plug-Flow detention time= 54.3 min calculated for 0.087 af (100% of inflow)
Center-of-Mass det. time= 54.2 min (824.8 - 770.6)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	442 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

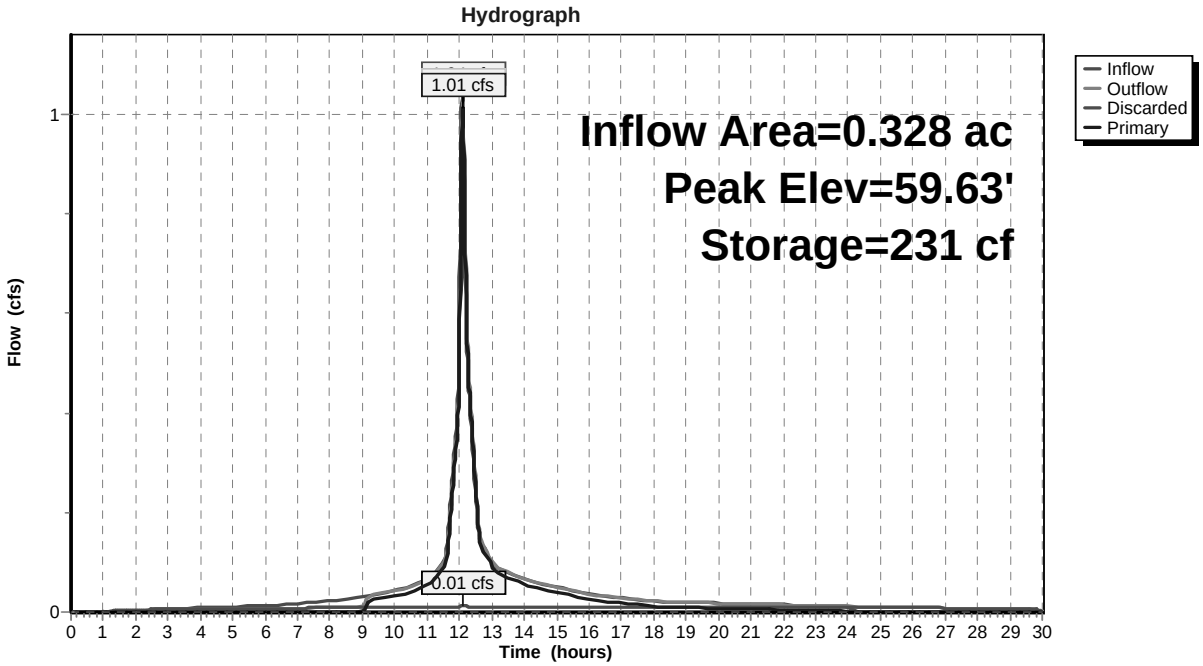
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
59.00	255	67.4	0	0	255
60.00	661	113.9	442	442	932

Device	Routing	Invert	Outlet Devices
#1	Primary	53.50'	**12.0" Round Culvert** L= 188.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 53.50' / 50.75' S= 0.0146 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	59.50'	**2.0" W x 2.0" H Vert. Orifice/Grate X 40.00** C= 0.600
#3	Discarded	59.00'	**1.020 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.01 cfs @ 12.10 hrs HW=59.63' (Free Discharge)
└**3=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=1.01 cfs @ 12.10 hrs HW=59.63' (Free Discharge)
└**1=Culvert** (Passes 1.01 cfs of 6.50 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 1.01 cfs @ 1.16 fps)

Pond B3: Bioretention Area #3



Summary for Pond B4: Bioretention Area #4

Inflow Area = 0.317 ac, 83.38% Impervious, Inflow Depth = 4.46" for 25-year event
Inflow = 1.48 cfs @ 12.09 hrs, Volume= 0.118 af
Outflow = 1.46 cfs @ 12.10 hrs, Volume= 0.118 af, Atten= 2%, Lag= 0.9 min
Discarded = 0.02 cfs @ 12.10 hrs, Volume= 0.034 af
Primary = 1.44 cfs @ 12.10 hrs, Volume= 0.084 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 59.57' @ 12.10 hrs Surf.Area= 782 sf Storage= 318 cf

Plug-Flow detention time= 58.5 min calculated for 0.118 af (100% of inflow)
Center-of-Mass det. time= 58.5 min (823.3 - 764.8)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	740 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

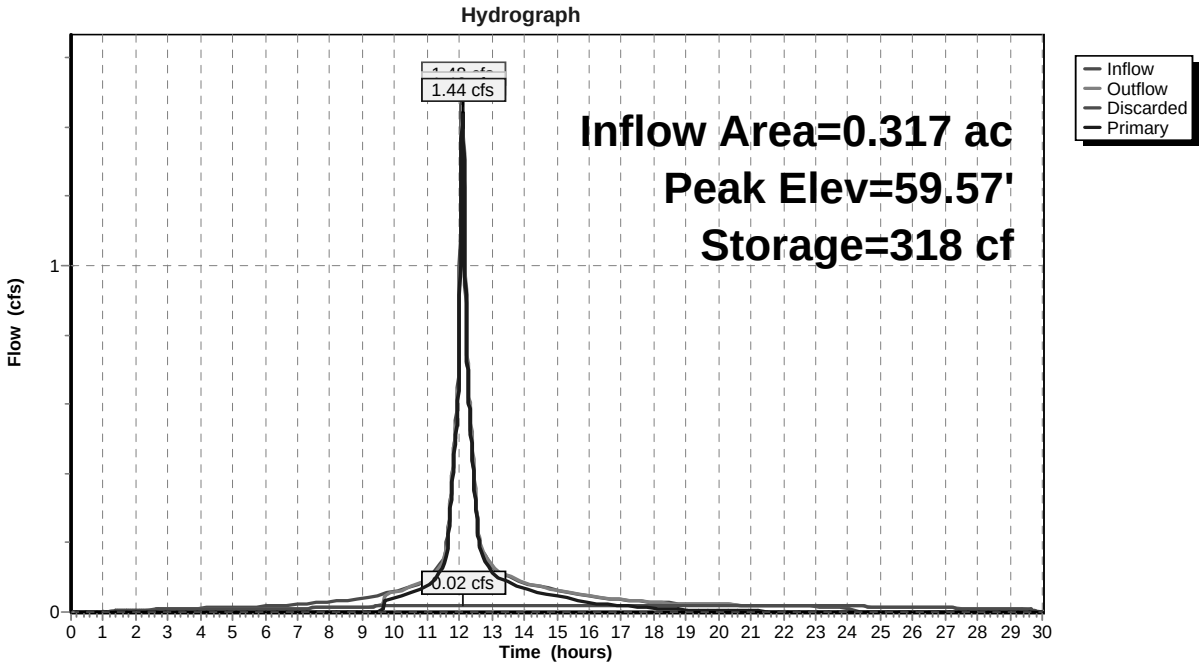
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
59.00	356	271.0	0	0	356
60.00	1,208	271.5	740	740	628

Device	Routing	Invert	Outlet Devices
#1	Primary	53.50'	**12.0" Round Culvert** L= 216.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 53.50' / 50.75' S= 0.0127 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	59.50'	**2.0" x 2.0" Horiz. Orifice/Grate X 40.00** C= 0.600 Limited to weir flow at low heads
#3	Discarded	59.00'	**1.020 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.02 cfs @ 12.10 hrs HW=59.57' (Free Discharge)
└**3=Exfiltration** (Controls 0.02 cfs)

Primary OutFlow Max=1.44 cfs @ 12.10 hrs HW=59.57' (Free Discharge)
└**1=Culvert** (Passes 1.44 cfs of 6.13 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 1.44 cfs @ 1.29 fps)

Pond B4: Bioretention Area #4



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1S: Northwestern Runoff Area=16,859 sf 0.00% Impervious Runoff Depth=0.40"
Tc=6.0 min CN=33 Runoff=0.05 cfs 0.013 af

Subcatchment 2S: Front Yard Runoff Area=8,602 sf 15.40% Impervious Runoff Depth=1.04"
Tc=6.0 min CN=42 Runoff=0.16 cfs 0.017 af

Subcatchment 3S: Front Yard Runoff Area=7,305 sf 27.47% Impervious Runoff Depth=1.72"
Tc=6.0 min UI Adjusted CN=50 Runoff=0.30 cfs 0.024 af

Subcatchment 4S: Southerly Runoff Area=24,964 sf 29.67% Impervious Runoff Depth=2.00"
Tc=6.0 min UI Adjusted CN=53 Runoff=1.23 cfs 0.095 af

Subcatchment 5S: Easterly Access Runoff Area=13,653 sf 47.25% Impervious Runoff Depth=3.08"
Tc=6.0 min CN=64 Runoff=1.12 cfs 0.080 af

Subcatchment 6S: North Side Drive Runoff Area=30,907 sf 79.72% Impervious Runoff Depth=5.46"
Tc=6.0 min CN=86 Runoff=4.39 cfs 0.323 af

Subcatchment 7S: BR Area #1 Runoff Area=13,211 sf 42.99% Impervious Runoff Depth=3.70"
Tc=6.0 min CN=70 Runoff=1.32 cfs 0.094 af

Subcatchment 8S: Front Entrance Runoff Area=4,770 sf 51.89% Impervious Runoff Depth=3.70"
Tc=6.0 min CN=70 Runoff=0.48 cfs 0.034 af

Subcatchment 9S: Drop-Off Area Runoff Area=6,767 sf 78.45% Impervious Runoff Depth=5.35"
Tc=6.0 min CN=85 Runoff=0.95 cfs 0.069 af

Subcatchment MC: MC Courtyard & Runoff Area=7,595 sf 86.33% Impervious Runoff Depth=5.92"
Tc=6.0 min CN=90 Runoff=1.14 cfs 0.086 af

Subcatchment R1: Building Roof Runoff Area=9,040 sf 100.00% Impervious Runoff Depth=6.86"
Tc=6.0 min CN=98 Runoff=1.45 cfs 0.119 af

Subcatchment R2: Building Roof Runoff Area=6,984 sf 100.00% Impervious Runoff Depth=6.86"
Tc=6.0 min CN=98 Runoff=1.12 cfs 0.092 af

Subcatchment R3: Building Roof Runoff Area=11,933 sf 100.00% Impervious Runoff Depth=6.86"
Tc=6.0 min CN=98 Runoff=1.91 cfs 0.157 af

Subcatchment R4: Building Roof Runoff Area=6,958 sf 100.00% Impervious Runoff Depth=6.86"
Tc=6.0 min CN=98 Runoff=1.11 cfs 0.091 af

Reach 1R: NW Abutting Property Inflow=0.05 cfs 0.013 af
Outflow=0.05 cfs 0.013 af

Reach 2R: Great Neck Road South Inflow=0.16 cfs 0.017 af
Outflow=0.16 cfs 0.017 af

Reach 3R: SUMMARY NODE Inflow=0.16 cfs 0.030 af
Outflow=0.16 cfs 0.030 af

Pond 1P: ADS Chamber System #1 Peak Elev=54.11' Storage=7,107 cf Inflow=6.18 cfs 0.440 af
Outflow=0.77 cfs 0.440 af

Pond 2P: ADS Chamber System #2 Peak Elev=54.87' Storage=3,389 cf Inflow=3.10 cfs 0.230 af
Outflow=0.39 cfs 0.230 af

Pond 3P: ADS Chamber System #3 Peak Elev=57.29' Storage=1,329 cf Inflow=1.14 cfs 0.086 af
Outflow=0.13 cfs 0.086 af

Pond 4P: ADS Chamber System #4 Peak Elev=53.91' Storage=2,589 cf Inflow=2.32 cfs 0.163 af
Outflow=0.29 cfs 0.163 af

Pond B1: Bioretention Area #1 Peak Elev=57.12' Storage=6,779 cf Inflow=3.54 cfs 0.265 af
Outflow=0.15 cfs 0.210 af

Pond B2: Bioretention Area #2 Peak Elev=58.58' Storage=190 cf Inflow=3.13 cfs 0.252 af
Discarded=0.01 cfs 0.023 af Primary=3.10 cfs 0.230 af Outflow=3.11 cfs 0.252 af

Pond B3: Bioretention Area #3 Peak Elev=59.66' Storage=246 cf Inflow=1.41 cfs 0.116 af
Discarded=0.01 cfs 0.022 af Primary=1.38 cfs 0.093 af Outflow=1.39 cfs 0.116 af

Pond B4: Bioretention Area #4 Peak Elev=59.62' Storage=353 cf Inflow=1.92 cfs 0.152 af
Discarded=0.02 cfs 0.035 af Primary=1.82 cfs 0.117 af Outflow=1.84 cfs 0.152 af

Total Runoff Area = 3.892 ac Runoff Volume = 1.294 af Average Runoff Depth = 3.99"
42.93% Pervious = 1.671 ac 57.07% Impervious = 2.221 ac

Summary for Subcatchment 1S: Northwestern Boundary Area

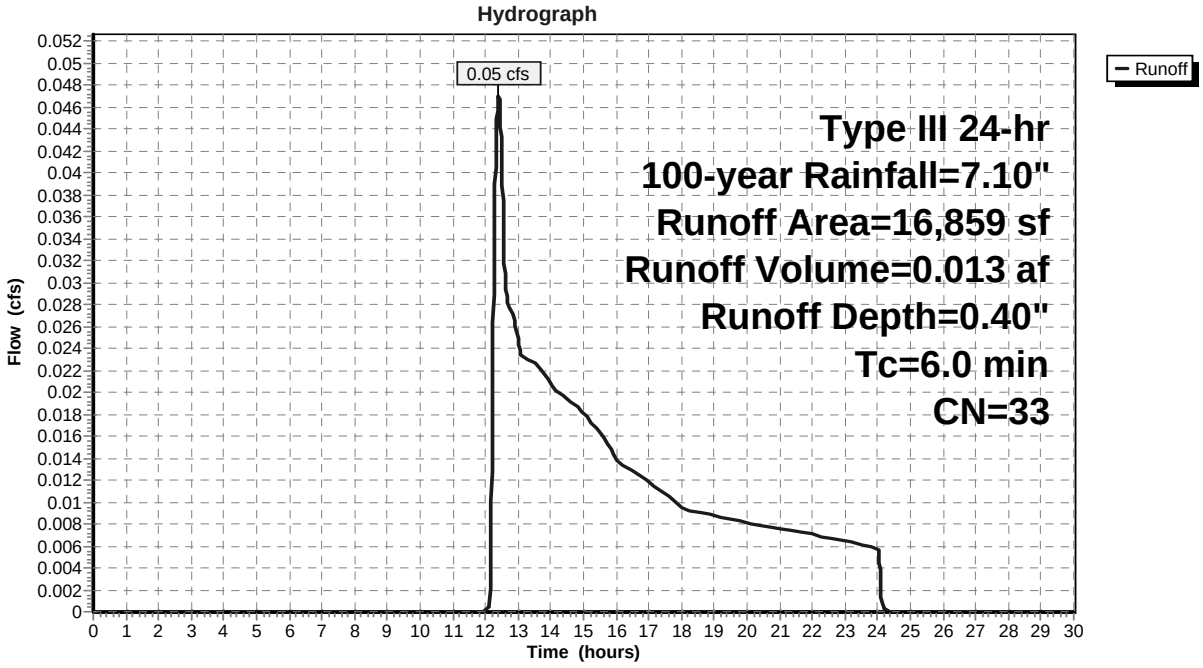
Runoff = 0.05 cfs @ 12.40 hrs, Volume= 0.013 af, Depth= 0.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (sf)	CN	Description
16,470	32	Woods/grass comb., Good, HSG A
389	76	Gravel roads, HSG A
16,859	33	Weighted Average
16,859		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 1S: Northwestern Boundary Area



Summary for Subcatchment 2S: Front Yard

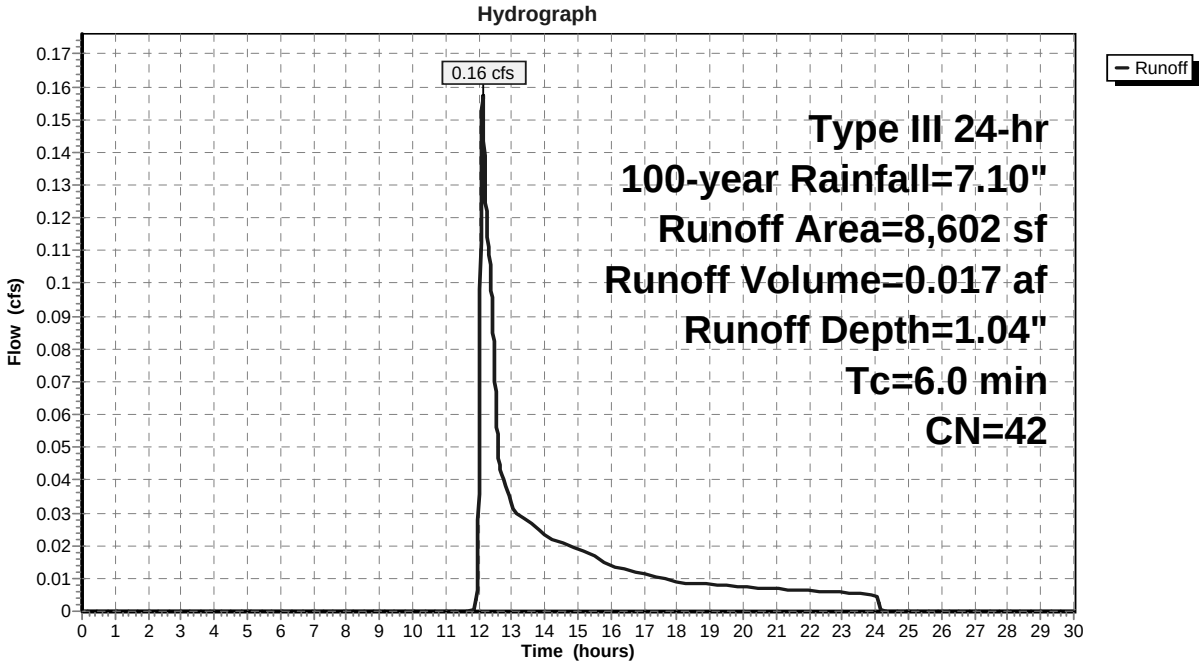
Runoff = 0.16 cfs @ 12.12 hrs, Volume= 0.017 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (sf)	CN	Description
1,660	39	>75% Grass cover, Good, HSG A
1,325	98	Paved parking, HSG A
5,617	30	Woods, Good, HSG A
8,602	42	Weighted Average
7,277		84.60% Pervious Area
1,325		15.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 2S: Front Yard



Summary for Subcatchment 3S: Front Yard

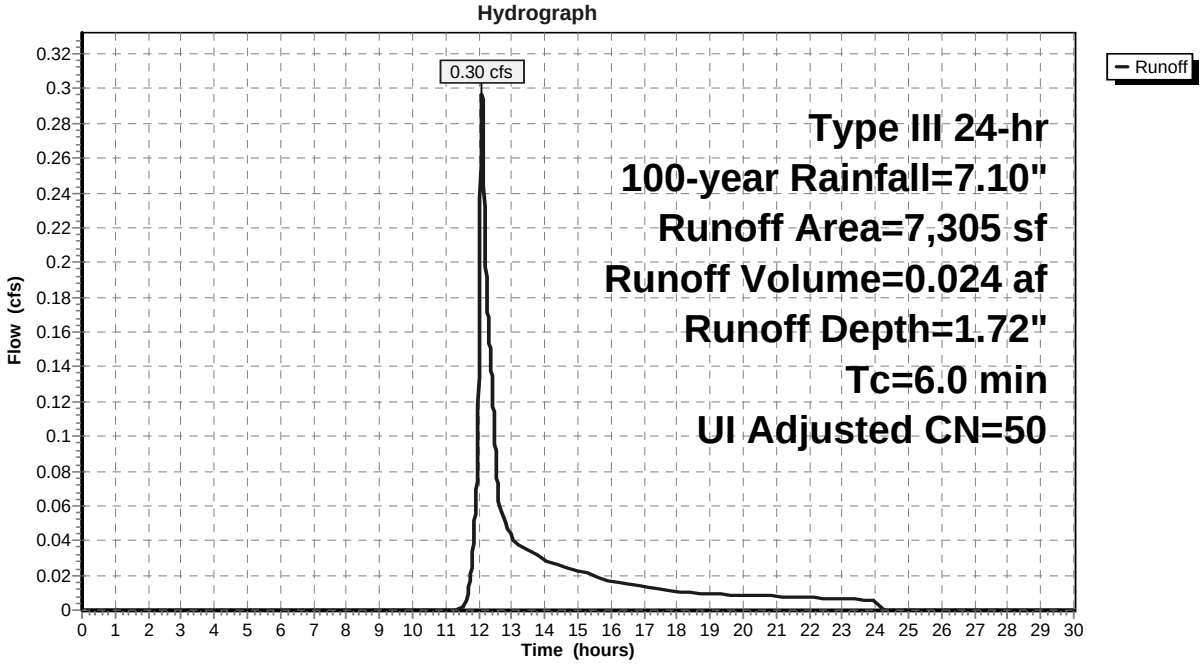
Runoff = 0.30 cfs @ 12.10 hrs, Volume= 0.024 af, Depth= 1.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

	Area (sf)	CN	Adj	Description
	5,298	39		>75% Grass cover, Good, HSG A
*	1,346	98		Unconnected pvmnt & porch roofs, HSG A
	661	98		Water Surface, HSG A
	7,305	55	50	Weighted Average, UI Adjusted
	5,298			72.53% Pervious Area
	2,007			27.47% Impervious Area
	1,346			67.07% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 3S: Front Yard



Summary for Subcatchment 4S: Southerly Courtyard

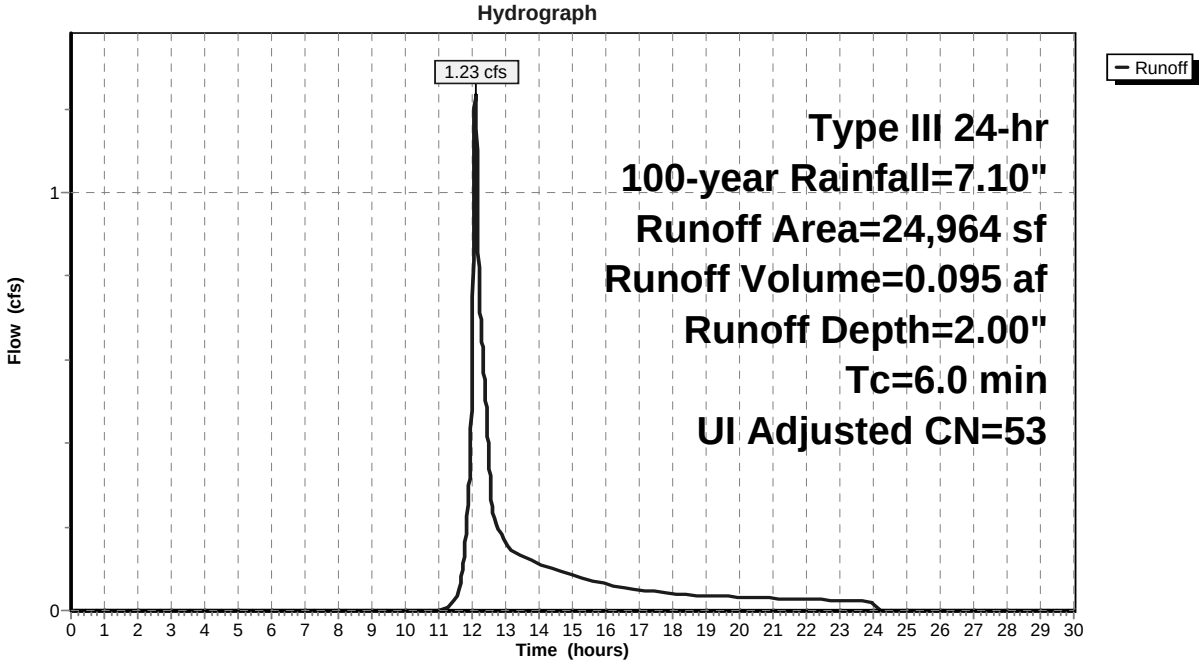
Runoff = 1.23 cfs @ 12.10 hrs, Volume= 0.095 af, Depth= 2.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

	Area (sf)	CN	Adj	Description
	3,660	76		Gravel roads, HSG A
*	5,842	98		Unconnected pvmnt & porch roofs, HSG A
	1,565	98		Water Surface, HSG A
	5,984	30		Woods, Good, HSG A
	7,913	39		>75% Grass cover, Good, HSG A
	24,964	60	53	Weighted Average, UI Adjusted
	17,557			70.33% Pervious Area
	7,407			29.67% Impervious Area
	5,842			78.87% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 4S: Southerly Courtyard



Summary for Subcatchment 5S: Easterly Access Drive

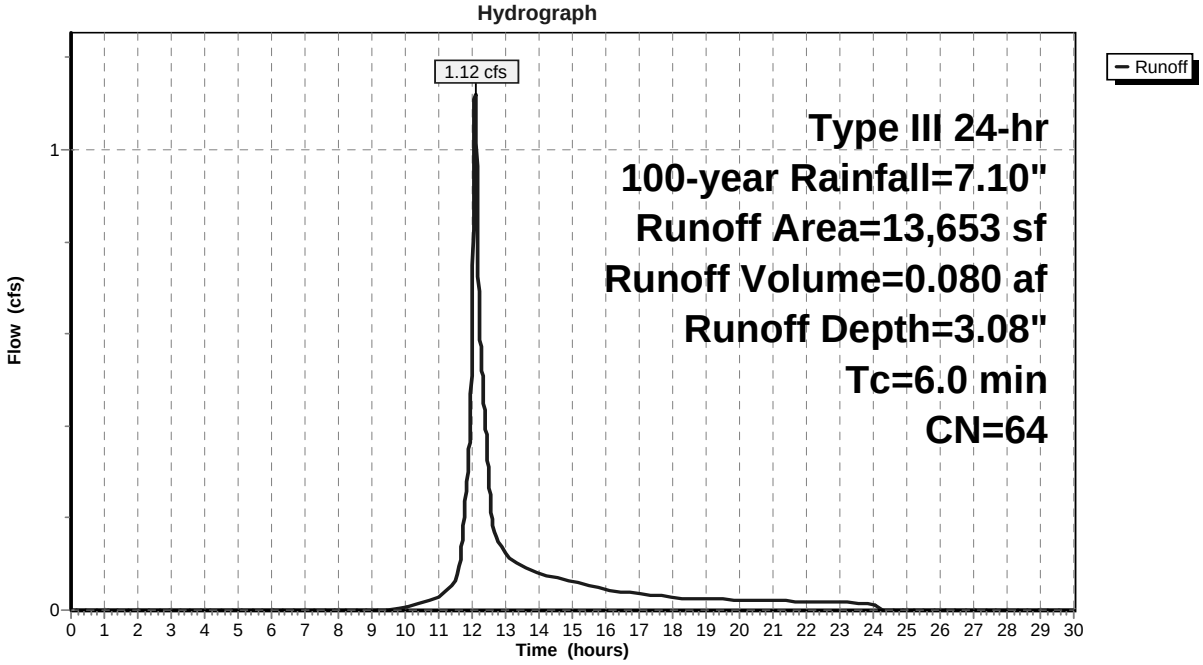
Runoff = 1.12 cfs @ 12.09 hrs, Volume= 0.080 af, Depth= 3.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (sf)	CN	Description
5,400	30	Woods, Good, HSG A
1,503	39	>75% Grass cover, Good, HSG A
6,451	98	Paved parking, HSG A
299	76	Gravel roads, HSG A
13,653	64	Weighted Average
7,202		52.75% Pervious Area
6,451		47.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 5S: Easterly Access Drive



Summary for Subcatchment 6S: North Side Drive & Parking

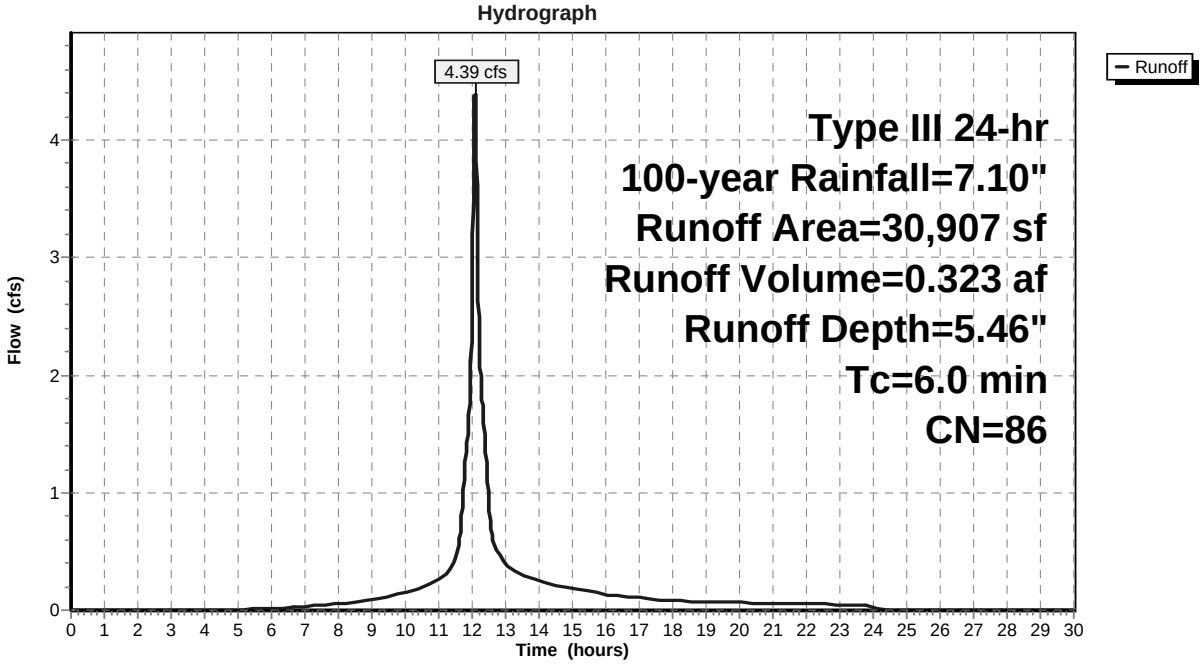
Runoff = 4.39 cfs @ 12.09 hrs, Volume= 0.323 af, Depth= 5.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (sf)	CN	Description
24,640	98	Paved parking, HSG A
4,625	39	>75% Grass cover, Good, HSG A
1,092	30	Woods, Good, HSG A
550	76	Gravel roads, HSG A
30,907	86	Weighted Average
6,267		20.28% Pervious Area
24,640		79.72% Impervious Area

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

Subcatchment 6S: North Side Drive & Parking



Summary for Subcatchment 7S: BR Area #1

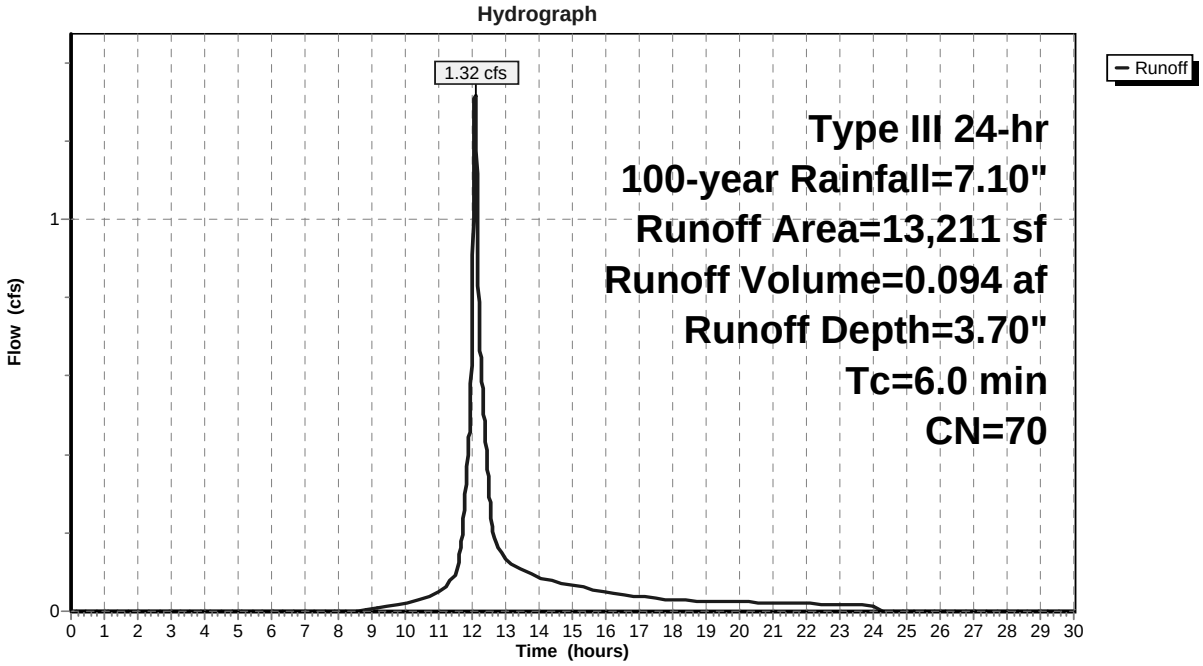
Runoff = 1.32 cfs @ 12.09 hrs, Volume= 0.094 af, Depth= 3.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (sf)	CN	Description
5,630	39	>75% Grass cover, Good, HSG A
1,902	76	Gravel roads, HSG A
5,679	98	Water Surface, HSG A
13,211	70	Weighted Average
7,532		57.01% Pervious Area
5,679		42.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 7S: BR Area #1



Summary for Subcatchment 8S: Front Entrance Area

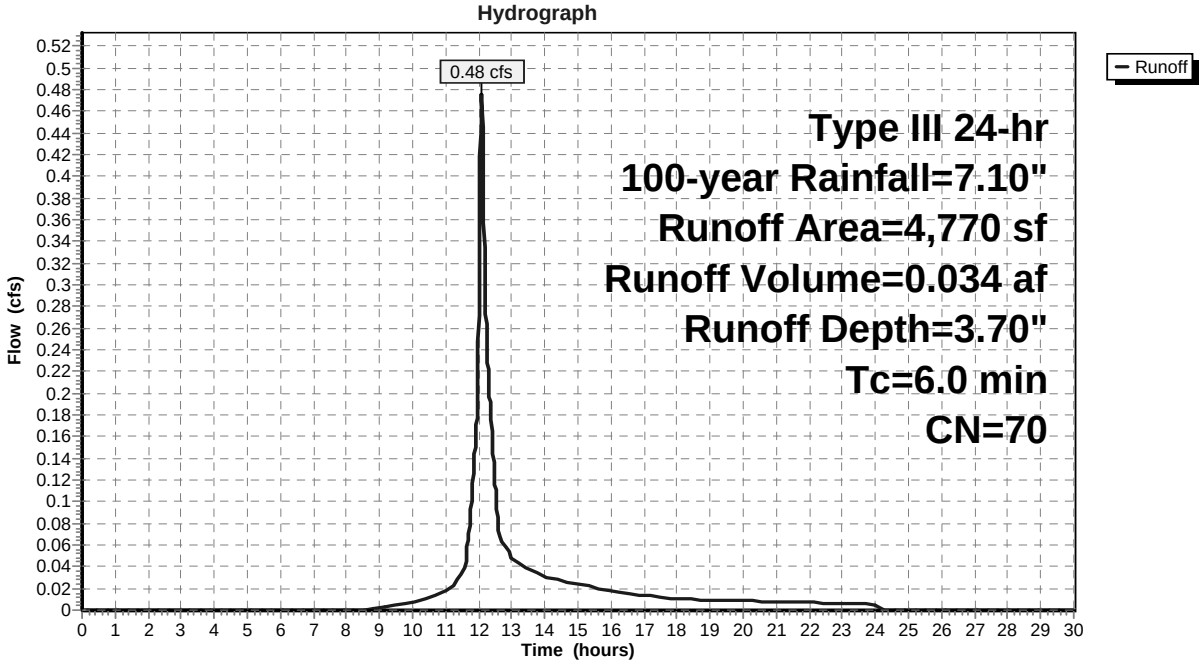
Runoff = 0.48 cfs @ 12.09 hrs, Volume= 0.034 af, Depth= 3.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

	Area (sf)	CN	Description
	2,295	39	>75% Grass cover, Good, HSG A
*	1,279	98	Unconnected pvmnt & porch roofs, HSG A
	1,196	98	Water Surface, HSG A
	4,770	70	Weighted Average
	2,295		48.11% Pervious Area
	2,475		51.89% Impervious Area
	1,279		51.68% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 8S: Front Entrance Area



Summary for Subcatchment 9S: Drop-Off Area

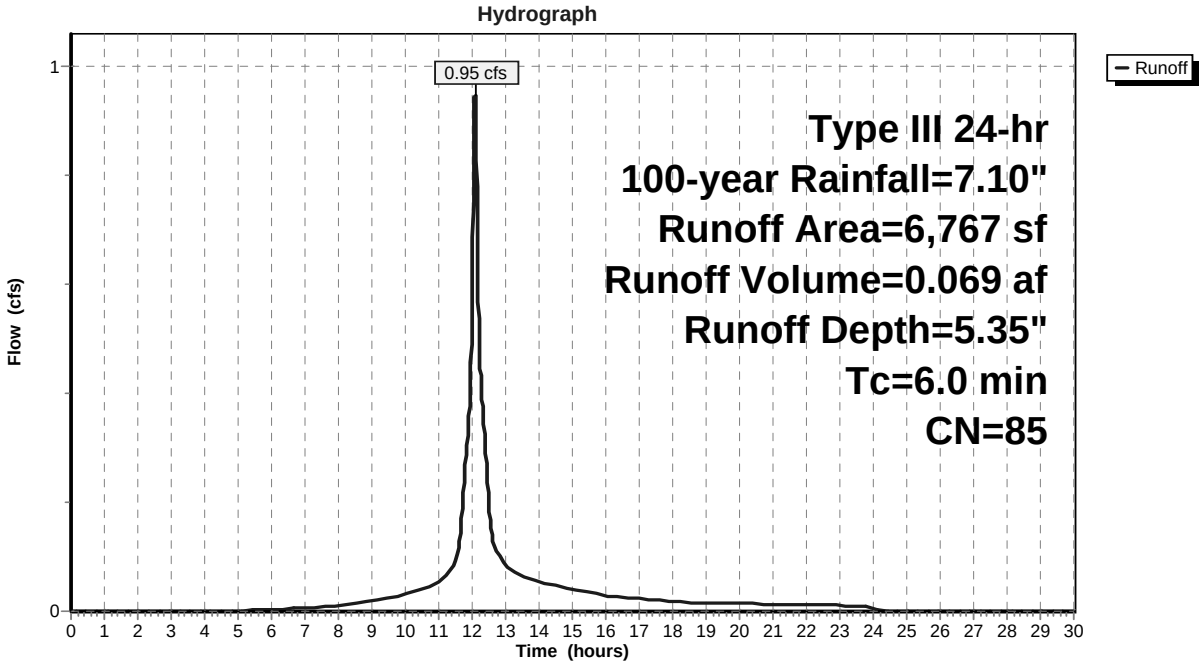
Runoff = 0.95 cfs @ 12.09 hrs, Volume= 0.069 af, Depth= 5.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

	Area (sf)	CN	Description
	1,458	39	>75% Grass cover, Good, HSG A
*	5,309	98	Unconnected pvmnt & porch roofs, HSG A
	6,767	85	Weighted Average
	1,458		21.55% Pervious Area
	5,309		78.45% Impervious Area
	5,309		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment 9S: Drop-Off Area



Summary for Subcatchment MC: MC Courtyard & Roof

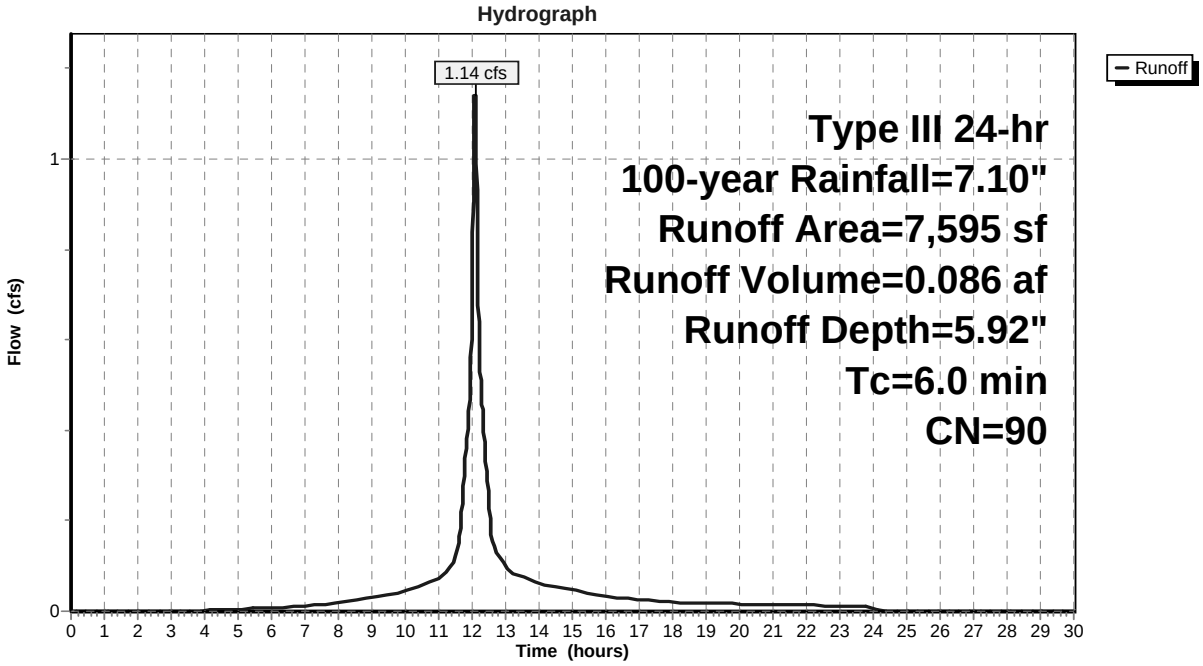
Runoff = 1.14 cfs @ 12.08 hrs, Volume= 0.086 af, Depth= 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (sf)	CN	Description
1,038	39	>75% Grass cover, Good, HSG A
6,557	98	Unconnected roofs, HSG A
7,595	90	Weighted Average
1,038		13.67% Pervious Area
6,557		86.33% Impervious Area
6,557		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, A-B**

Subcatchment MC: MC Courtyard & Roof



Summary for Subcatchment R1: Building Roof

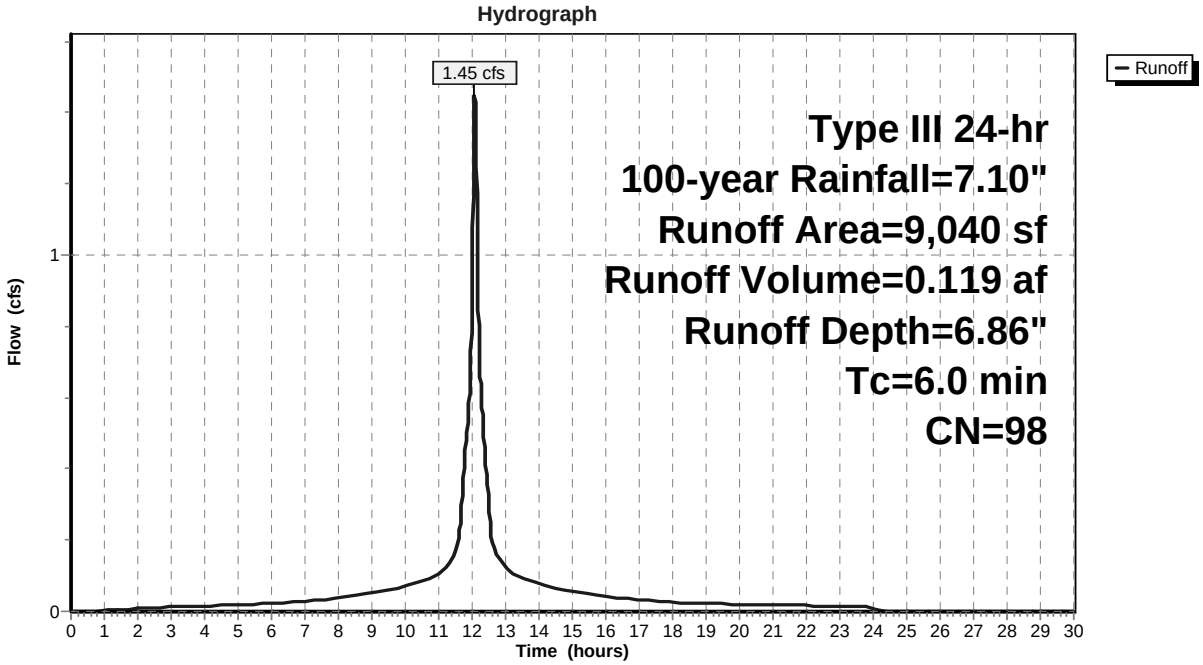
Runoff = 1.45 cfs @ 12.08 hrs, Volume= 0.119 af, Depth= 6.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (sf)	CN	Description
9,040	98	Roofs, HSG A
9,040		100.00% Impervious Area

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

Subcatchment R1: Building Roof



Summary for Subcatchment R2: Building Roof

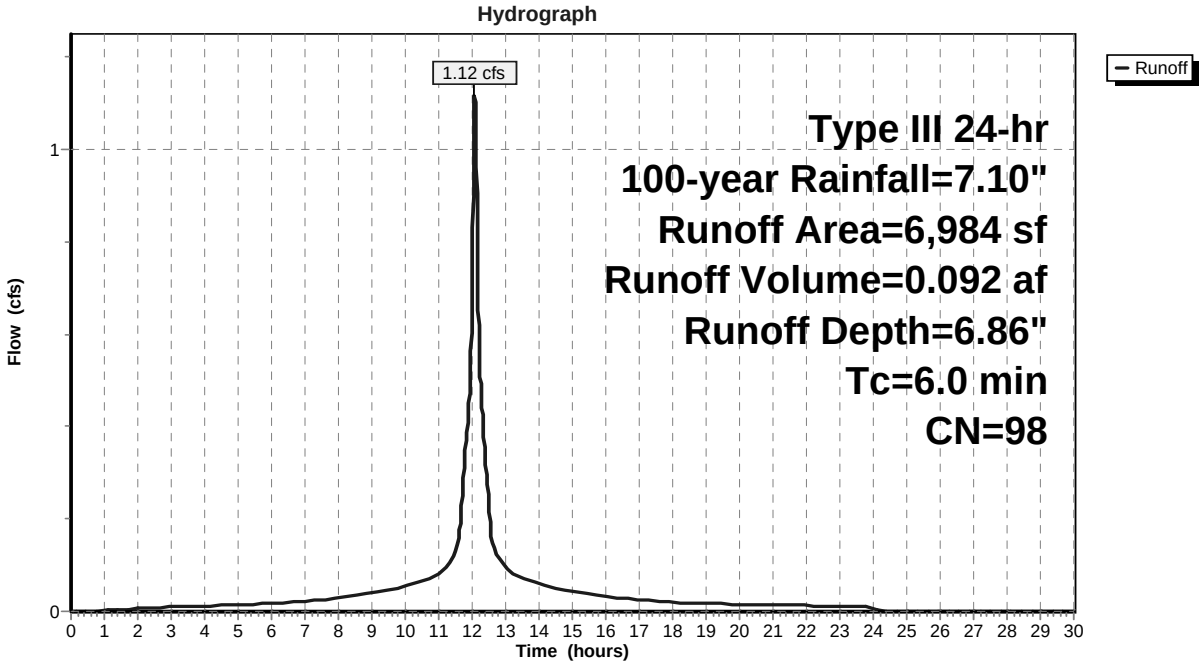
Runoff = 1.12 cfs @ 12.08 hrs, Volume= 0.092 af, Depth= 6.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (sf)	CN	Description
6,984	98	Roofs, HSG A
6,984		100.00% Impervious Area

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

Subcatchment R2: Building Roof



Summary for Subcatchment R3: Building Roof

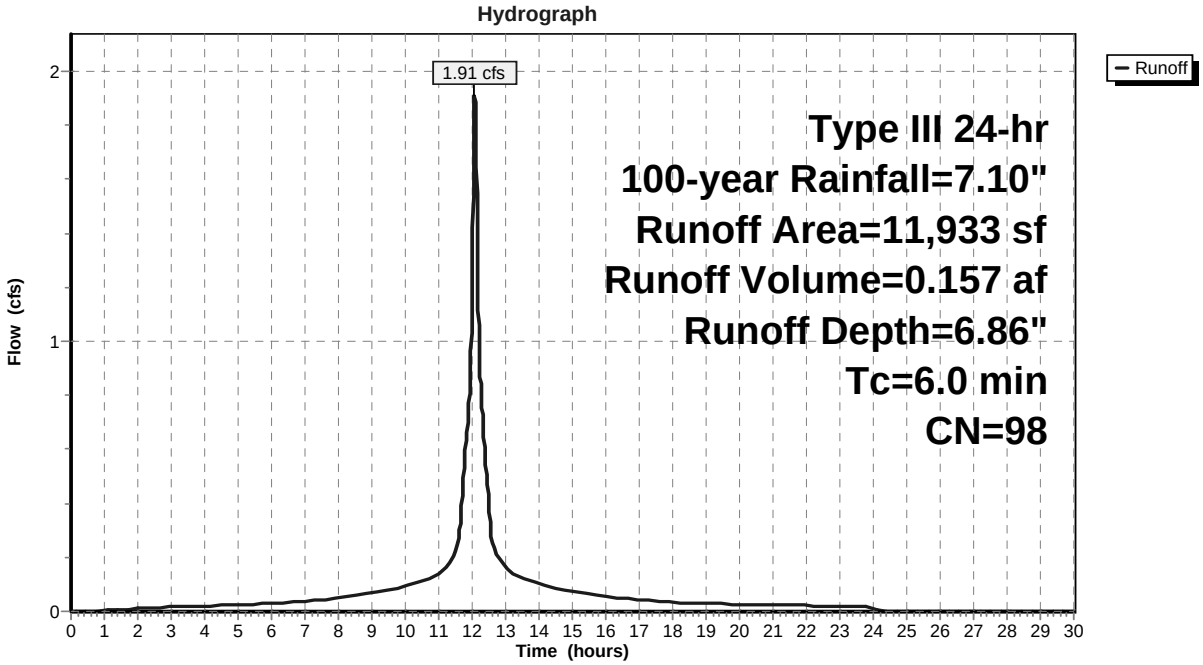
Runoff = 1.91 cfs @ 12.08 hrs, Volume= 0.157 af, Depth= 6.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (sf)	CN	Description
11,933	98	Roofs, HSG A
11,933		100.00% Impervious Area

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

Subcatchment R3: Building Roof



Summary for Subcatchment R4: Building Roof

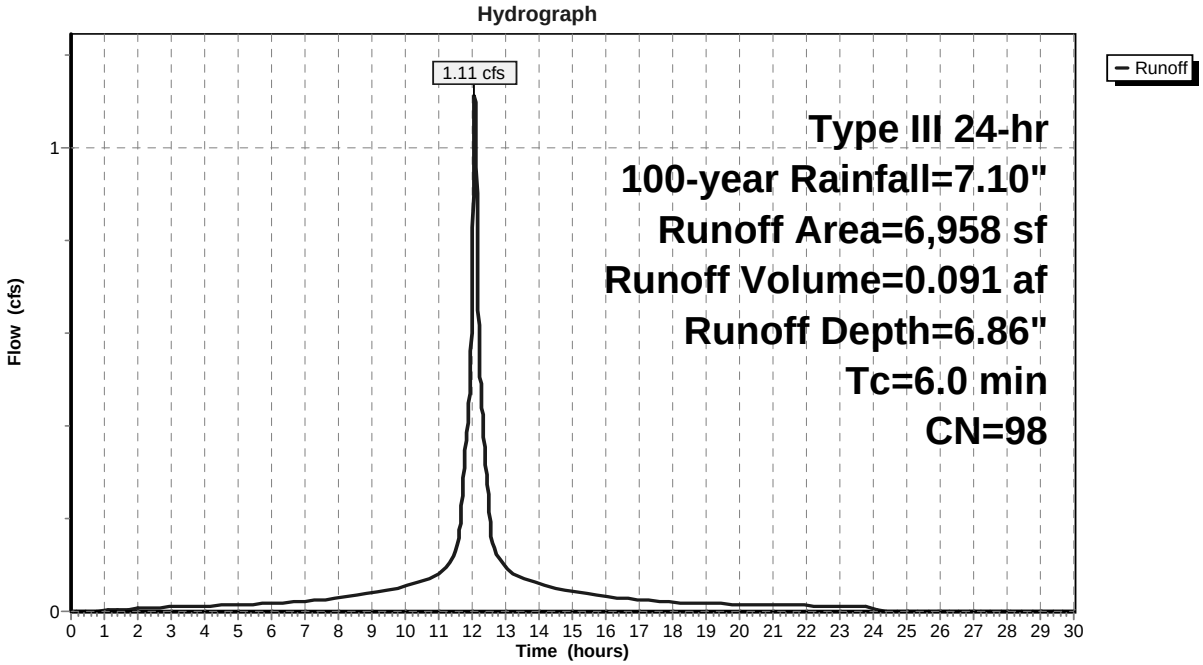
Runoff = 1.11 cfs @ 12.08 hrs, Volume= 0.091 af, Depth= 6.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.10"

Area (sf)	CN	Description
6,958	98	Roofs, HSG A
6,958		100.00% Impervious Area

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

Subcatchment R4: Building Roof

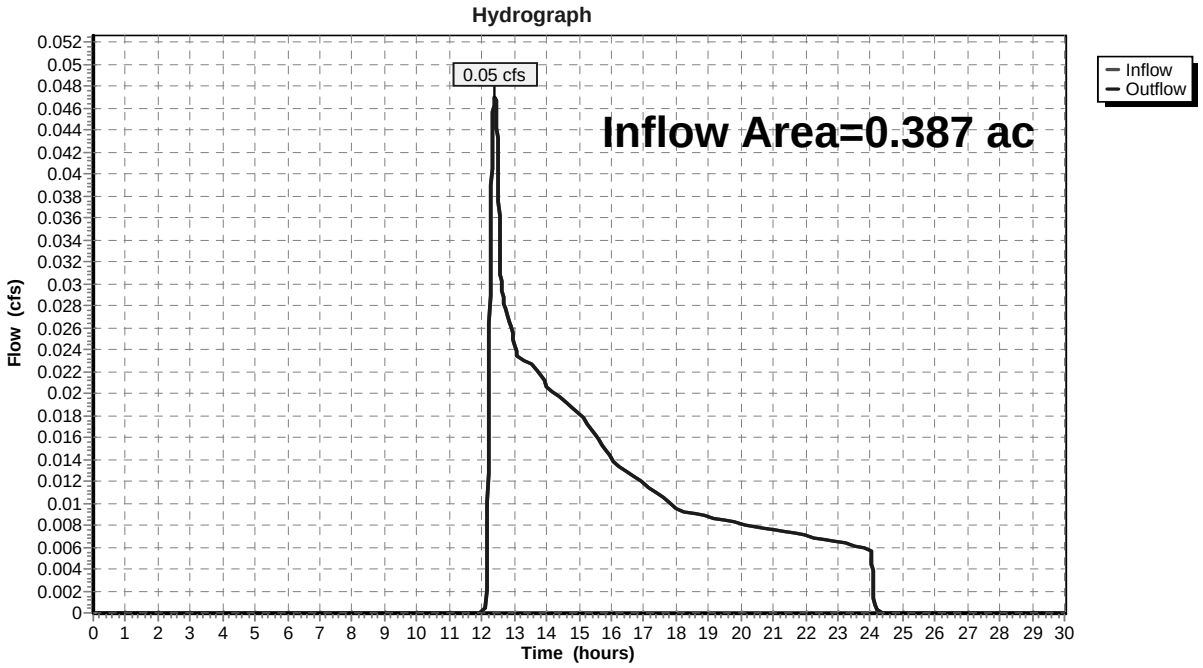


Summary for Reach 1R: NW Abutting Property

Inflow Area = 0.387 ac, 0.00% Impervious, Inflow Depth = 0.40" for 100-year event
Inflow = 0.05 cfs @ 12.40 hrs, Volume= 0.013 af
Outflow = 0.05 cfs @ 12.40 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach 1R: NW Abutting Property

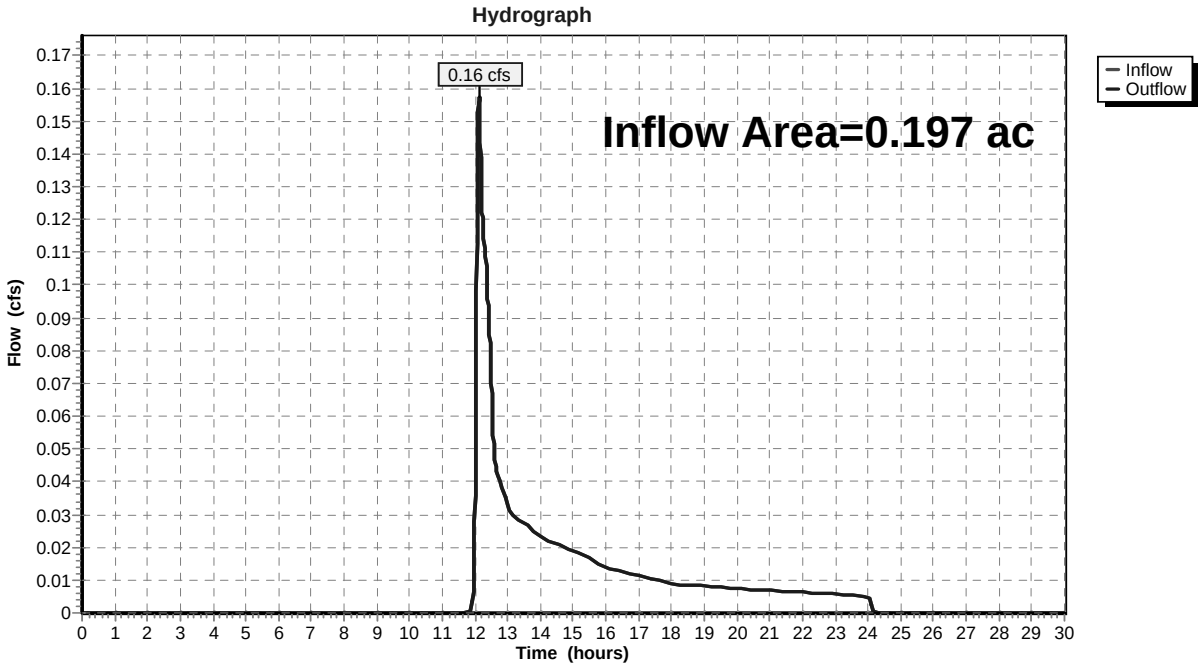


Summary for Reach 2R: Great Neck Road South

Inflow Area = 0.197 ac, 15.40% Impervious, Inflow Depth = 1.04" for 100-year event
Inflow = 0.16 cfs @ 12.12 hrs, Volume= 0.017 af
Outflow = 0.16 cfs @ 12.12 hrs, Volume= 0.017 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach 2R: Great Neck Road South

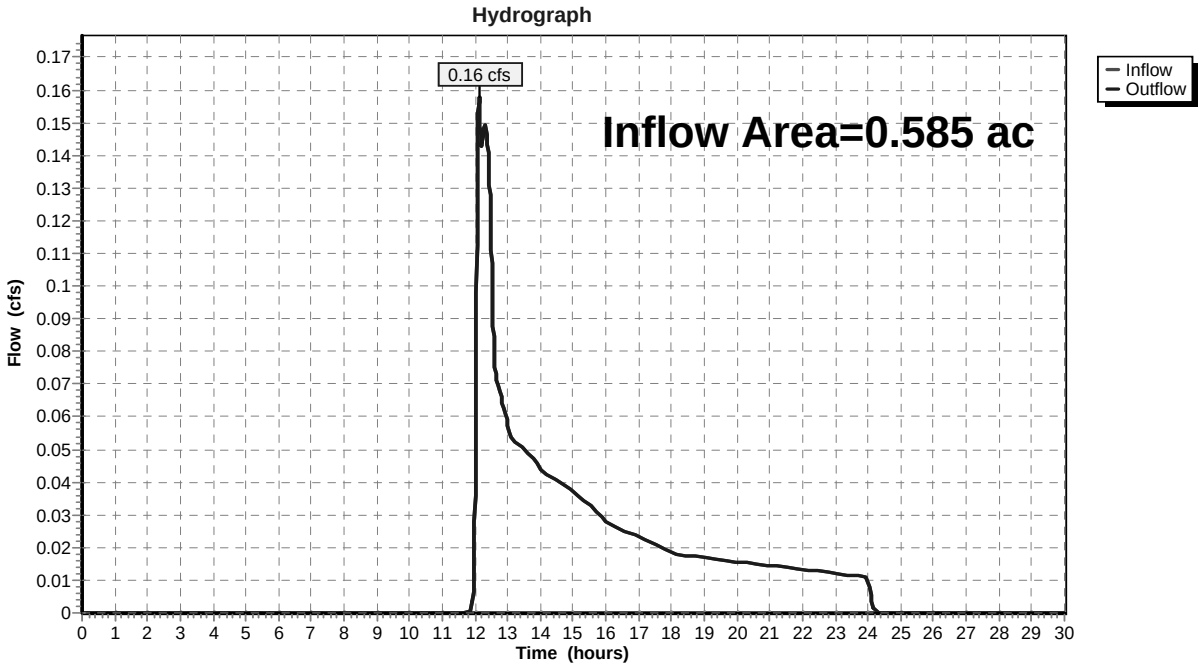


Summary for Reach 3R: SUMMARY NODE

Inflow Area = 0.585 ac, 5.20% Impervious, Inflow Depth = 0.61" for 100-year event
Inflow = 0.16 cfs @ 12.12 hrs, Volume= 0.030 af
Outflow = 0.16 cfs @ 12.12 hrs, Volume= 0.030 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach 3R: SUMMARY NODE



Summary for Pond 1P: ADS Chamber System #1

Inflow Area = 1.027 ac, 80.85% Impervious, Inflow Depth = 5.15" for 100-year event
Inflow = 6.18 cfs @ 12.09 hrs, Volume= 0.440 af
Outflow = 0.77 cfs @ 12.66 hrs, Volume= 0.440 af, Atten= 88%, Lag= 34.3 min
Discarded = 0.77 cfs @ 12.66 hrs, Volume= 0.440 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 54.11' @ 12.66 hrs Surf.Area= 2,532 sf Storage= 7,107 cf

Plug-Flow detention time= 76.8 min calculated for 0.440 af (100% of inflow)
Center-of-Mass det. time= 76.8 min (861.4 - 784.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	50.00'	3,585 cf	**29.92'W x 84.64'L x 5.50'H Field A** 13,926 cf Overall - 4,963 cf Embedded = 8,964 cf x 40.0% Voids
#2A	50.75'	4,963 cf	**ADS_StormTech MC-3500 c +Cap** x 44 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 4 rows = 124.8 cf
		8,548 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	50.00'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.77 cfs @ 12.66 hrs HW=54.11' (Free Discharge)
1=Exfiltration (Controls 0.77 cfs)

Pond 1P: ADS Chamber System #1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 c +Cap (ADS StormTech® MC-3500 c rev 05/12 with Cap storage)
Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +15.6 cf x 2 x 4 rows = 124.8 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

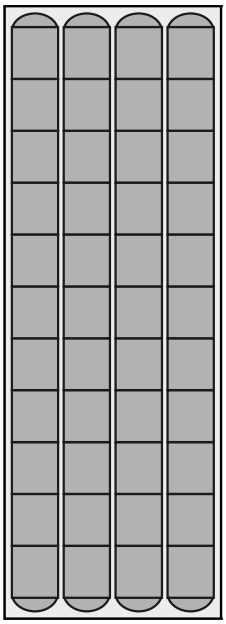
11 Chambers/Row x 7.17' Long +1.88' Cap Length x 2 = 82.64' Row Length +12.0" End Stone x 2 = 84.64' Base Length
4 Rows x 77.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 29.92' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

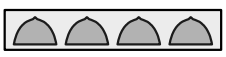
44 Chambers x 110.0 cf + 15.6 cf Cap Volume x 2 x 4 Rows = 4,962.7 cf Chamber Storage

13,926.3 cf Field - 4,962.7 cf Chambers = 8,963.6 cf Stone x 40.0% Voids = 3,585.4 cf Stone Storage

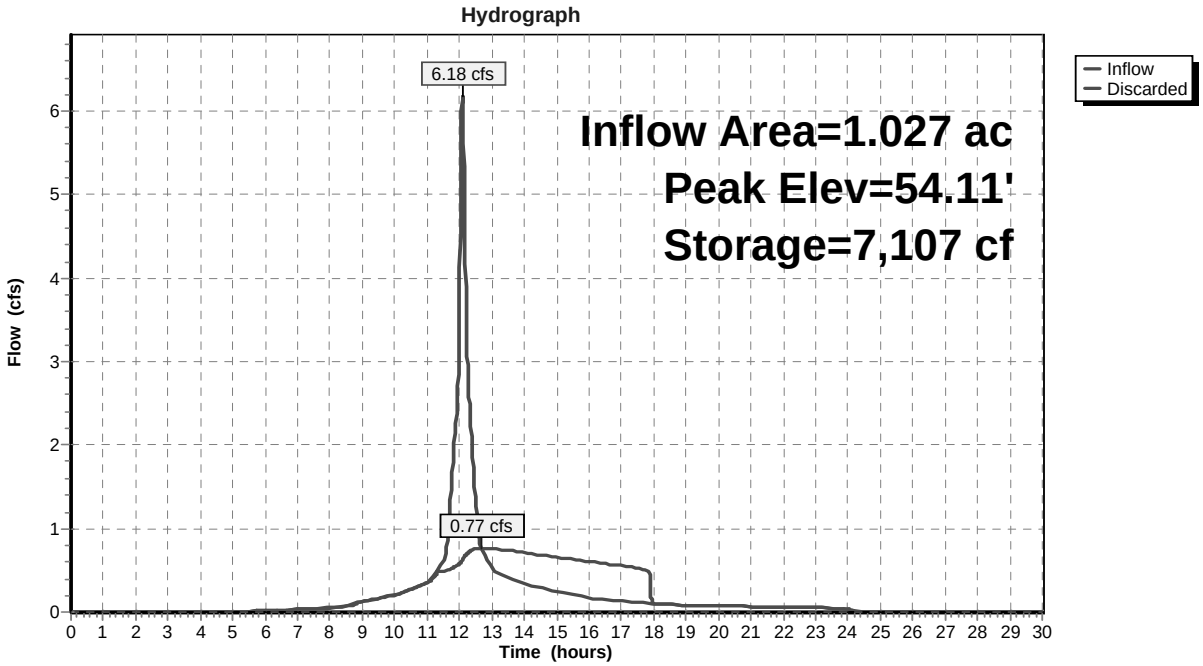
Chamber Storage + Stone Storage = 8,548.1 cf = 0.196 af
Overall Storage Efficiency = 61.4%

44 Chambers
515.8 cy Field
332.0 cy Stone





Pond 1P: ADS Chamber System #1



Summary for Pond 2P: ADS Chamber System #2

Inflow Area = 0.847 ac, 52.42% Impervious, Inflow Depth = 3.25" for 100-year event
Inflow = 3.10 cfs @ 12.10 hrs, Volume= 0.230 af
Outflow = 0.39 cfs @ 12.77 hrs, Volume= 0.230 af, Atten= 87%, Lag= 40.6 min
Discarded = 0.39 cfs @ 12.77 hrs, Volume= 0.230 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 54.87' @ 12.77 hrs Surf.Area= 1,460 sf Storage= 3,389 cf

Plug-Flow detention time= 70.5 min calculated for 0.229 af (100% of inflow)
Center-of-Mass det. time= 70.5 min (869.9 - 799.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	51.50'	2,106 cf	**29.92'W x 48.79'L x 5.50'H Field A** 8,027 cf Overall - 2,764 cf Embedded = 5,264 cf x 40.0% Voids
#2A	52.25'	2,764 cf	**ADS_StormTech MC-3500 c +Cap** x 24 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 4 rows = 124.8 cf
		4,869 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	51.50'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.39 cfs @ 12.77 hrs HW=54.87' (Free Discharge)
1=Exfiltration (Controls 0.39 cfs)

Pond 2P: ADS Chamber System #2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 c +Cap (ADS StormTech® MC-3500 c rev 05/12 with Cap storage)
Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +15.6 cf x 2 x 4 rows = 124.8 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

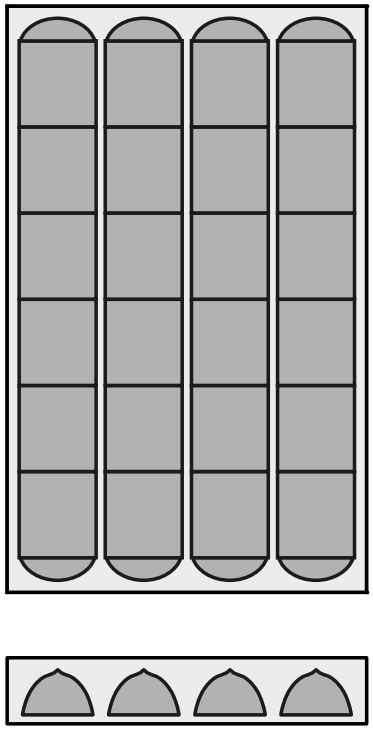
6 Chambers/Row x 7.17' Long +1.88' Cap Length x 2 = 46.79' Row Length +12.0" End Stone x 2 = 48.79' Base Length
4 Rows x 77.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 29.92' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

24 Chambers x 110.0 cf + 15.6 cf Cap Volume x 2 x 4 Rows = 2,763.6 cf Chamber Storage

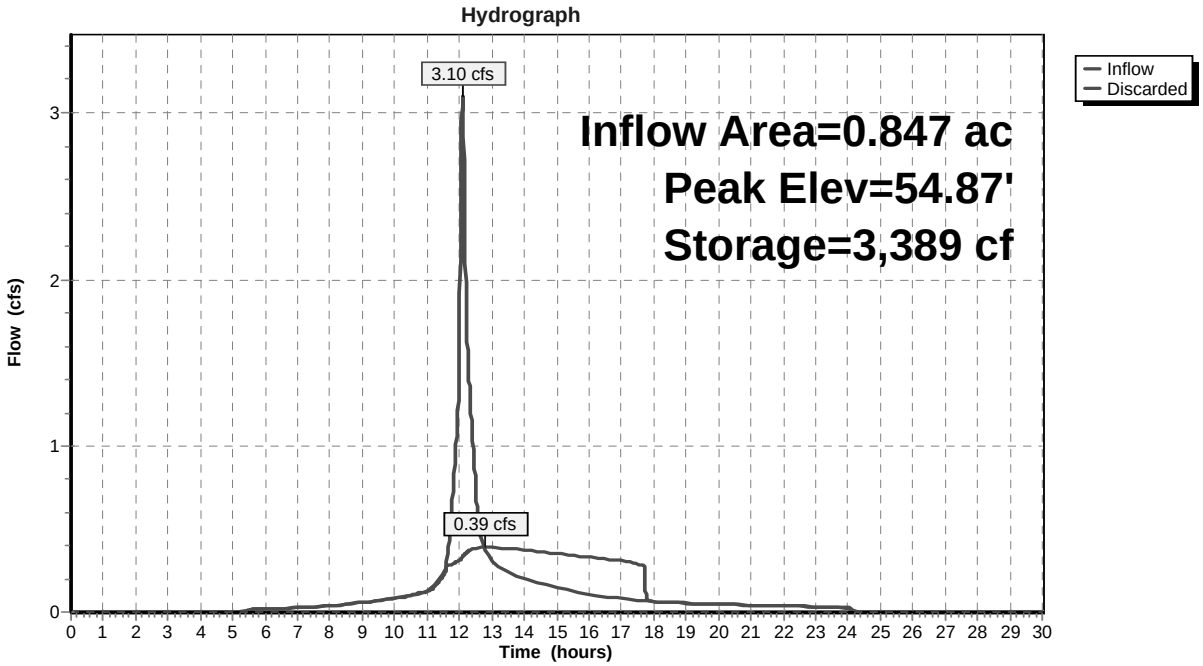
8,027.4 cf Field - 2,763.6 cf Chambers = 5,263.8 cf Stone x 40.0% Voids = 2,105.5 cf Stone Storage

Chamber Storage + Stone Storage = 4,869.2 cf = 0.112 af
Overall Storage Efficiency = 60.7%

24 Chambers
297.3 cy Field
195.0 cy Stone



Pond 2P: ADS Chamber System #2



Summary for Pond 3P: ADS Chamber System #3

Inflow Area = 0.174 ac, 86.33% Impervious, Inflow Depth = 5.92" for 100-year event
Inflow = 1.14 cfs @ 12.08 hrs, Volume= 0.086 af
Outflow = 0.13 cfs @ 12.71 hrs, Volume= 0.086 af, Atten= 88%, Lag= 37.3 min
Discarded = 0.13 cfs @ 12.71 hrs, Volume= 0.086 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 57.29' @ 12.71 hrs Surf.Area= 457 sf Storage= 1,329 cf

Plug-Flow detention time= 80.7 min calculated for 0.086 af (100% of inflow)
Center-of-Mass det. time= 80.6 min (860.1 - 779.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	52.50'	705 cf	**22.75'W x 20.11'L x 5.50'H Field A** 2,516 cf Overall - 753 cf Embedded = 1,763 cf x 40.0% Voids
#2A	53.25'	753 cf	**ADS_StormTech MC-3500 c +Cap** x 6 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 3 rows = 93.6 cf
		1,458 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	52.50'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.13 cfs @ 12.71 hrs HW=57.29' (Free Discharge)
1=Exfiltration (Controls 0.13 cfs)

Pond 3P: ADS Chamber System #3 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 c +Cap (ADS StormTech® MC-3500 c rev 05/12 with Cap storage)
Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +15.6 cf x 2 x 3 rows = 93.6 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

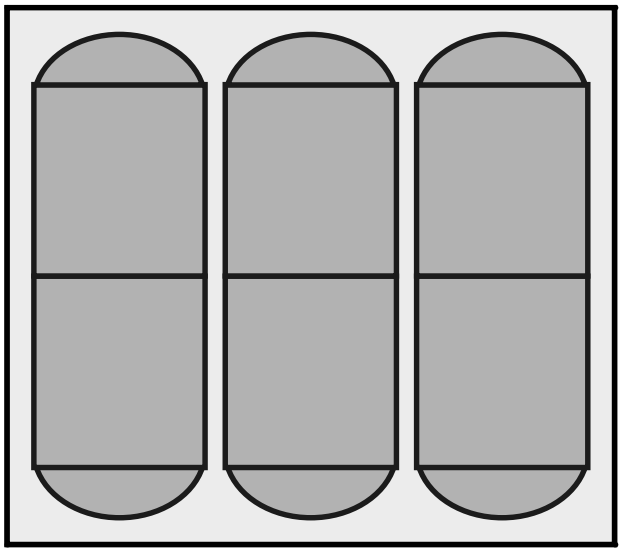
2 Chambers/Row x 7.17' Long +1.88' Cap Length x 2 = 18.11' Row Length +12.0" End Stone x 2 = 20.11' Base Length
3 Rows x 77.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 22.75' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

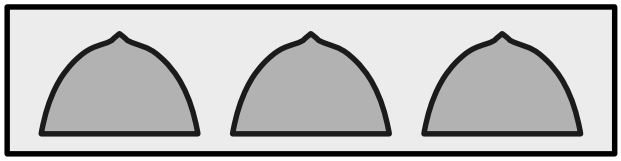
6 Chambers x 110.0 cf + 15.6 cf Cap Volume x 2 x 3 Rows = 753.3 cf Chamber Storage

2,515.8 cf Field - 753.3 cf Chambers = 1,762.5 cf Stone x 40.0% Voids = 705.0 cf Stone Storage

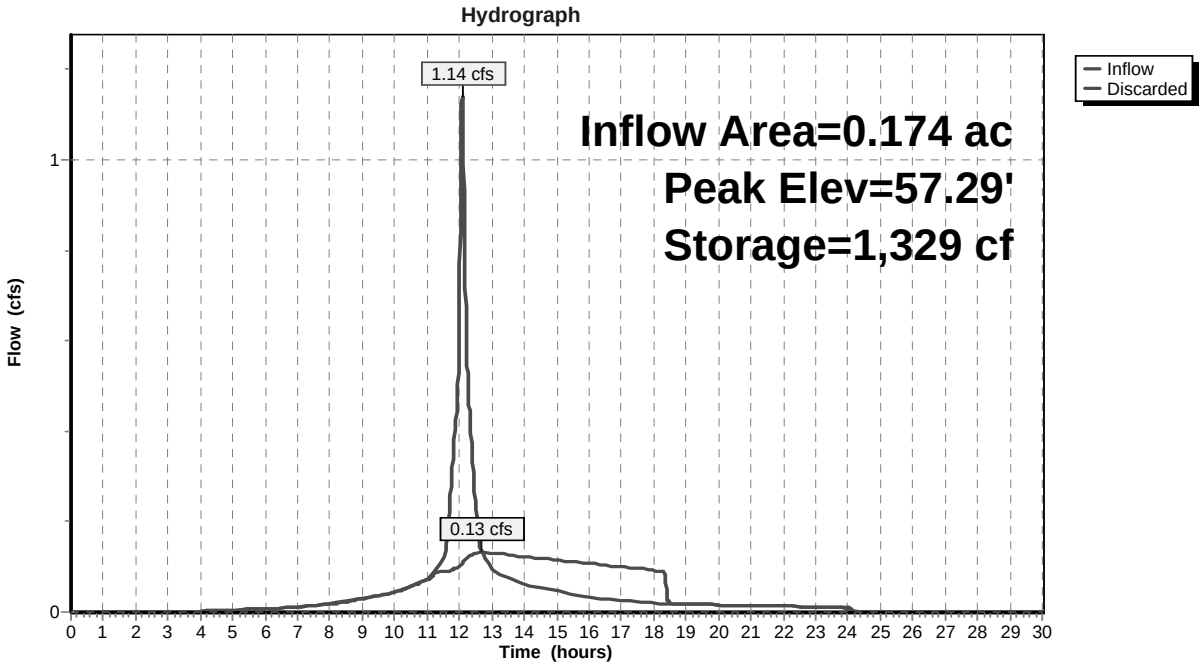
Chamber Storage + Stone Storage = 1,458.3 cf = 0.033 af
Overall Storage Efficiency = 58.0%

6 Chambers
93.2 cy Field
65.3 cy Stone





Pond 3P: ADS Chamber System #3



Summary for Pond 4P: ADS Chamber System #4

Inflow Area = 0.483 ac, 67.91% Impervious, Inflow Depth = 4.04" for 100-year event
Inflow = 2.32 cfs @ 12.09 hrs, Volume= 0.163 af
Outflow = 0.29 cfs @ 12.68 hrs, Volume= 0.163 af, Atten= 87%, Lag= 35.3 min
Discarded = 0.29 cfs @ 12.68 hrs, Volume= 0.163 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 53.91' @ 12.68 hrs Surf.Area= 984 sf Storage= 2,589 cf

Plug-Flow detention time= 73.6 min calculated for 0.163 af (100% of inflow)
Center-of-Mass det. time= 73.6 min (860.9 - 787.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	50.00'	1,436 cf	**15.58'W x 63.13'L x 5.50'H Field A** 5,410 cf Overall - 1,822 cf Embedded = 3,589 cf x 40.0% Voids
#2A	50.75'	1,822 cf	**ADS_StormTech MC-3500 c +Cap** x 16 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf
		3,257 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	50.00'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.29 cfs @ 12.68 hrs HW=53.91' (Free Discharge)
1=Exfiltration (Controls 0.29 cfs)

Pond 4P: ADS Chamber System #4 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 c +Cap (ADS StormTech® MC-3500 c rev 05/12 with Cap storage)
Effective Size= 70.4"W x 45.0"H => 15.34 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +15.6 cf x 2 x 2 rows = 62.4 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

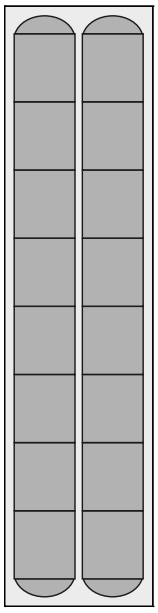
8 Chambers/Row x 7.17' Long +1.88' Cap Length x 2 = 61.13' Row Length +12.0" End Stone x 2 = 63.13' Base Length
2 Rows x 77.0" Wide + 9.0" Spacing x 1 + 12.0" Side Stone x 2 = 15.58' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

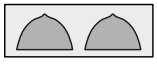
16 Chambers x 110.0 cf + 15.6 cf Cap Volume x 2 x 2 Rows = 1,821.6 cf Chamber Storage

5,410.5 cf Field - 1,821.6 cf Chambers = 3,588.9 cf Stone x 40.0% Voids = 1,435.5 cf Stone Storage

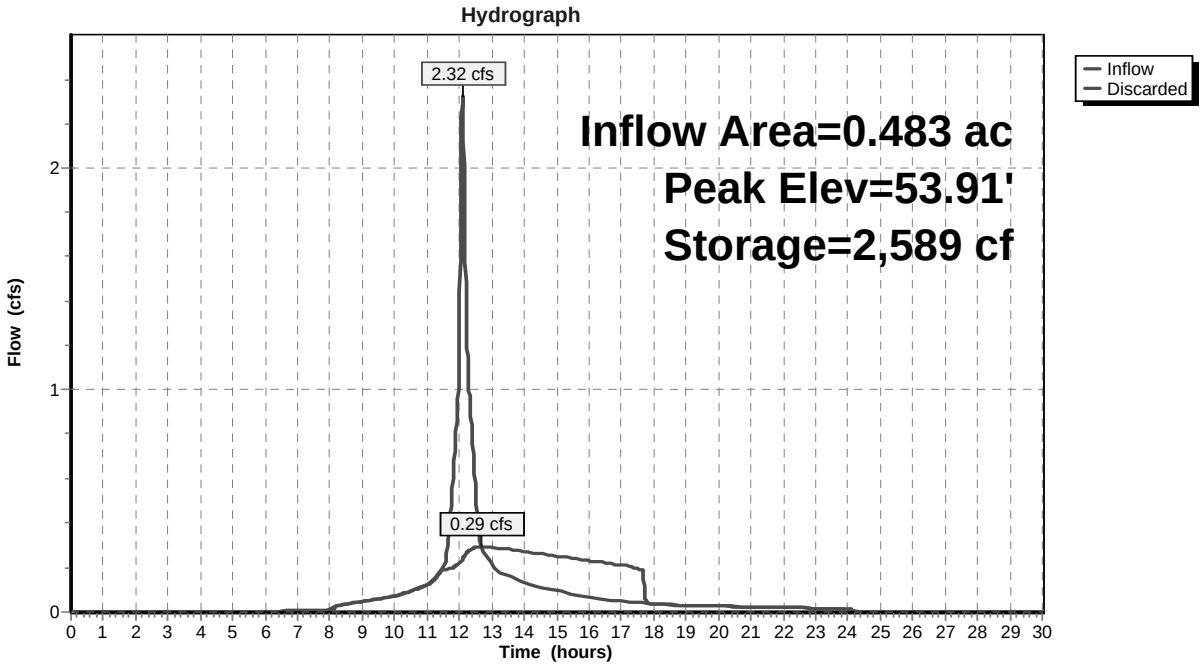
Chamber Storage + Stone Storage = 3,257.2 cf = 0.075 af
Overall Storage Efficiency = 60.2%

16 Chambers
200.4 cy Field
132.9 cy Stone





Pond 4P: ADS Chamber System #4



Summary for Pond B1: Bioretention Area #1

Inflow Area = 0.776 ac, 56.44% Impervious, Inflow Depth = 4.10" for 100-year event
Inflow = 3.54 cfs @ 12.09 hrs, Volume= 0.265 af
Outflow = 0.15 cfs @ 15.42 hrs, Volume= 0.210 af, Atten= 96%, Lag= 199.7 min
Discarded = 0.15 cfs @ 15.42 hrs, Volume= 0.210 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 57.12' @ 15.42 hrs Surf.Area= 5,897 sf Storage= 6,779 cf

Plug-Flow detention time= 433.1 min calculated for 0.210 af (79% of inflow)
Center-of-Mass det. time= 351.4 min (1,155.5 - 804.1)

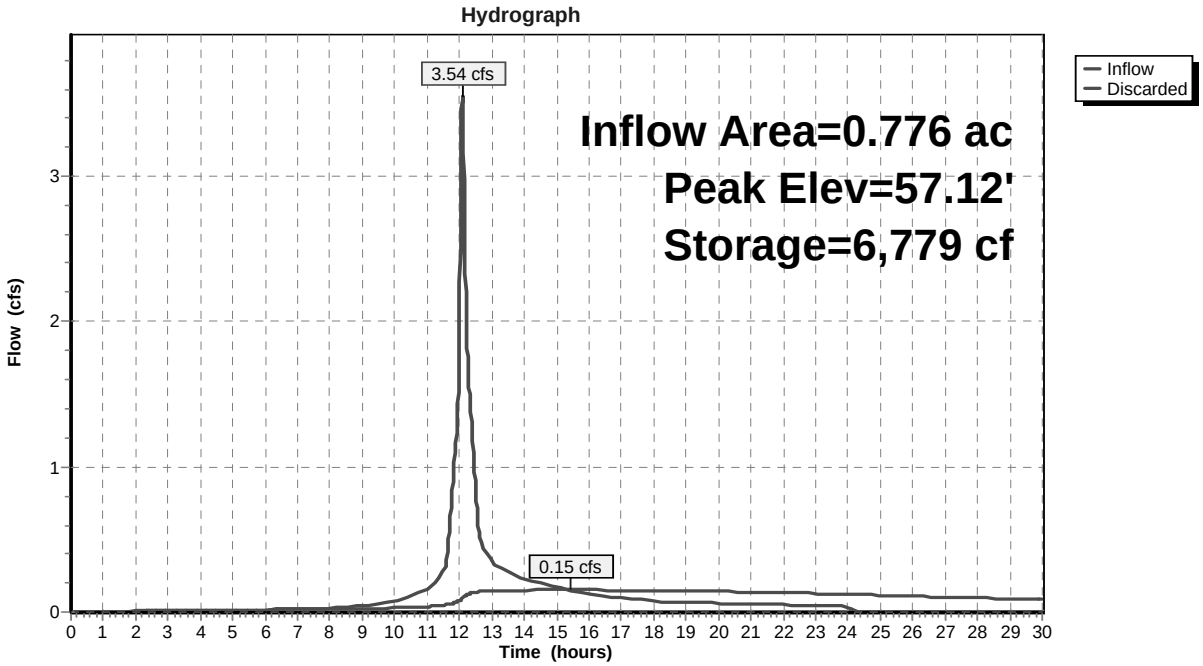
Volume	Invert	Avail.Storage	Storage Description
#1	55.00'	7,558 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
55.00	861	144.3	0	0	861
56.00	2,990	237.5	1,818	1,818	3,699
57.00	5,679	300.3	4,263	6,082	6,400
57.25	6,136	309.7	1,477	7,558	6,863

Device	Routing	Invert	Outlet Devices
#1	Discarded	55.00'	**1.020 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.15 cfs @ 15.42 hrs HW=57.12' (Free Discharge)
↑**1=Exfiltration** (Controls 0.15 cfs)

Pond B1: Bioretention Area #1



Summary for Pond B2: Bioretention Area #2

Inflow Area = 0.847 ac, 52.42% Impervious, Inflow Depth = 3.57" for 100-year event
Inflow = 3.13 cfs @ 12.09 hrs, Volume= 0.252 af
Outflow = 3.11 cfs @ 12.10 hrs, Volume= 0.252 af, Atten= 0%, Lag= 0.4 min
Discarded = 0.01 cfs @ 12.10 hrs, Volume= 0.023 af
Primary = 3.10 cfs @ 12.10 hrs, Volume= 0.230 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 58.58' @ 12.10 hrs Surf.Area= 496 sf Storage= 190 cf

Plug-Flow detention time= 18.9 min calculated for 0.252 af (100% of inflow)
Center-of-Mass det. time= 18.9 min (810.1 - 791.2)

Volume	Invert	Avail.Storage	Storage Description
#1	58.00'	1,632 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

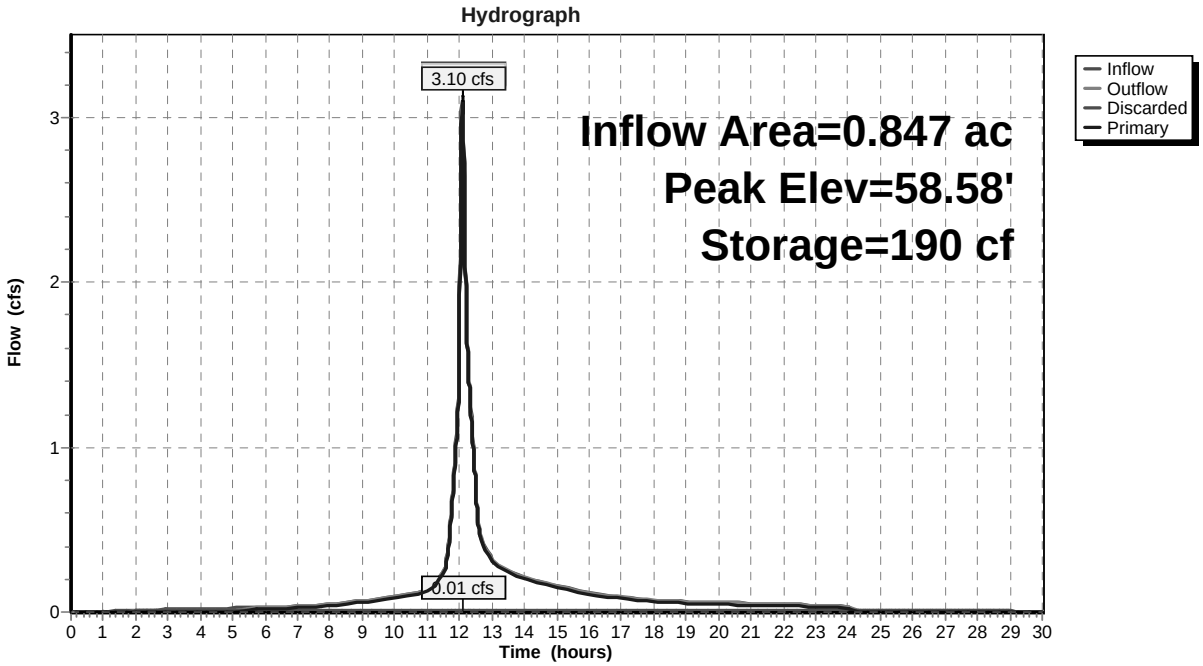
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
58.00	179	70.0	0	0	179
59.00	819	201.9	460	460	3,036
60.00	1,565	223.9	1,172	1,632	3,811

Device	Routing	Invert	Outlet Devices
#1	Primary	53.50'	**12.0" Round Culvert X 2.00** L= 51.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 53.50' / 52.75' S= 0.0146 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	58.50'	**2.0" x 2.0" Horiz. Orifice/Grate X 80.00** C= 0.600 Limited to weir flow at low heads
#3	Discarded	58.00'	**1.020 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.01 cfs @ 12.10 hrs HW=58.58' (Free Discharge)
└**3=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=3.10 cfs @ 12.10 hrs HW=58.58' (Free Discharge)
└**1=Culvert** (Passes 3.10 cfs of 15.70 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 3.10 cfs @ 1.40 fps)

Pond B2: Bioretention Area #2



Summary for Pond B3: Bioretention Area #3

Inflow Area = 0.328 ac, 62.92% Impervious, Inflow Depth = 4.23" for 100-year event
Inflow = 1.41 cfs @ 12.09 hrs, Volume= 0.116 af
Outflow = 1.39 cfs @ 12.10 hrs, Volume= 0.116 af, Atten= 1%, Lag= 0.7 min
Discarded = 0.01 cfs @ 12.10 hrs, Volume= 0.022 af
Primary = 1.38 cfs @ 12.10 hrs, Volume= 0.093 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 59.66' @ 12.10 hrs Surf.Area= 502 sf Storage= 246 cf

Plug-Flow detention time= 43.4 min calculated for 0.116 af (100% of inflow)
Center-of-Mass det. time= 43.4 min (814.7 - 771.2)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	442 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

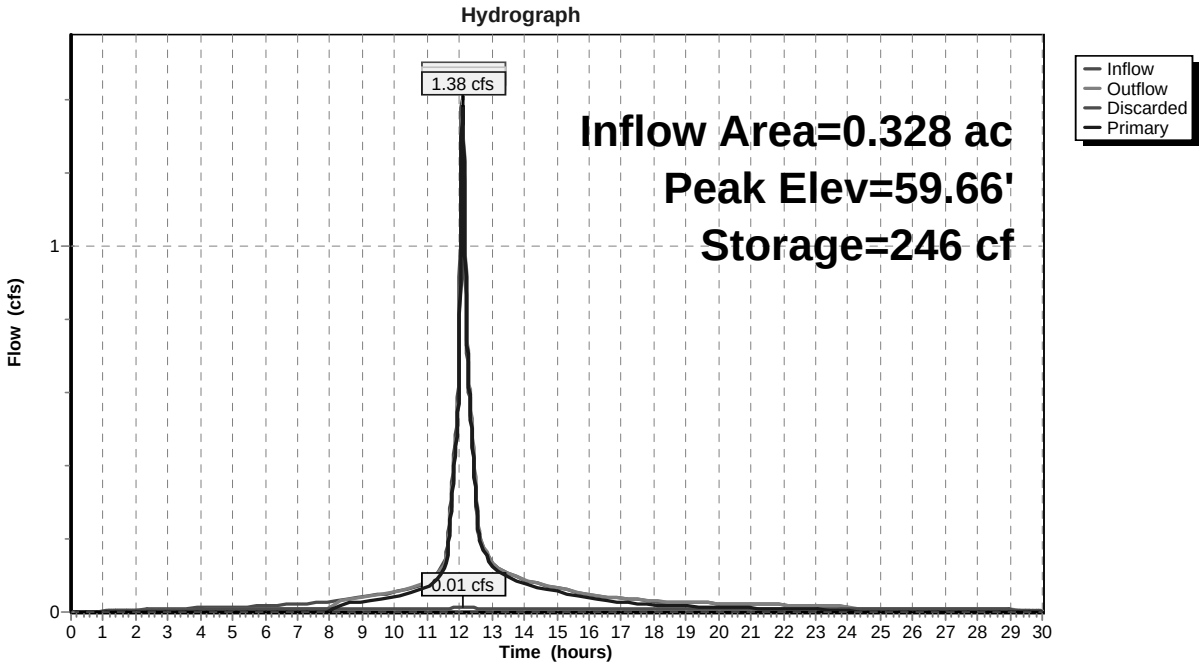
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
59.00	255	67.4	0	0	255
60.00	661	113.9	442	442	932

Device	Routing	Invert	Outlet Devices
#1	Primary	53.50'	**12.0" Round Culvert** L= 188.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 53.50' / 50.75' S= 0.0146 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	59.50'	**2.0" W x 2.0" H Vert. Orifice/Grate X 40.00** C= 0.600
#3	Discarded	59.00'	**1.020 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.01 cfs @ 12.10 hrs HW=59.66' (Free Discharge)
└**3=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=1.38 cfs @ 12.10 hrs HW=59.66' (Free Discharge)
└**1=Culvert** (Passes 1.38 cfs of 6.52 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 1.38 cfs @ 1.29 fps)

Pond B3: Bioretention Area #3



Summary for Pond B4: Bioretention Area #4

Inflow Area = 0.317 ac, 83.38% Impervious, Inflow Depth = 5.77" for 100-year event
Inflow = 1.92 cfs @ 12.08 hrs, Volume= 0.152 af
Outflow = 1.84 cfs @ 12.11 hrs, Volume= 0.152 af, Atten= 4%, Lag= 1.4 min
Discarded = 0.02 cfs @ 12.11 hrs, Volume= 0.035 af
Primary = 1.82 cfs @ 12.11 hrs, Volume= 0.117 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 59.62' @ 12.11 hrs Surf.Area= 821 sf Storage= 353 cf

Plug-Flow detention time= 48.4 min calculated for 0.152 af (100% of inflow)
Center-of-Mass det. time= 48.3 min (810.5 - 762.1)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	740 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

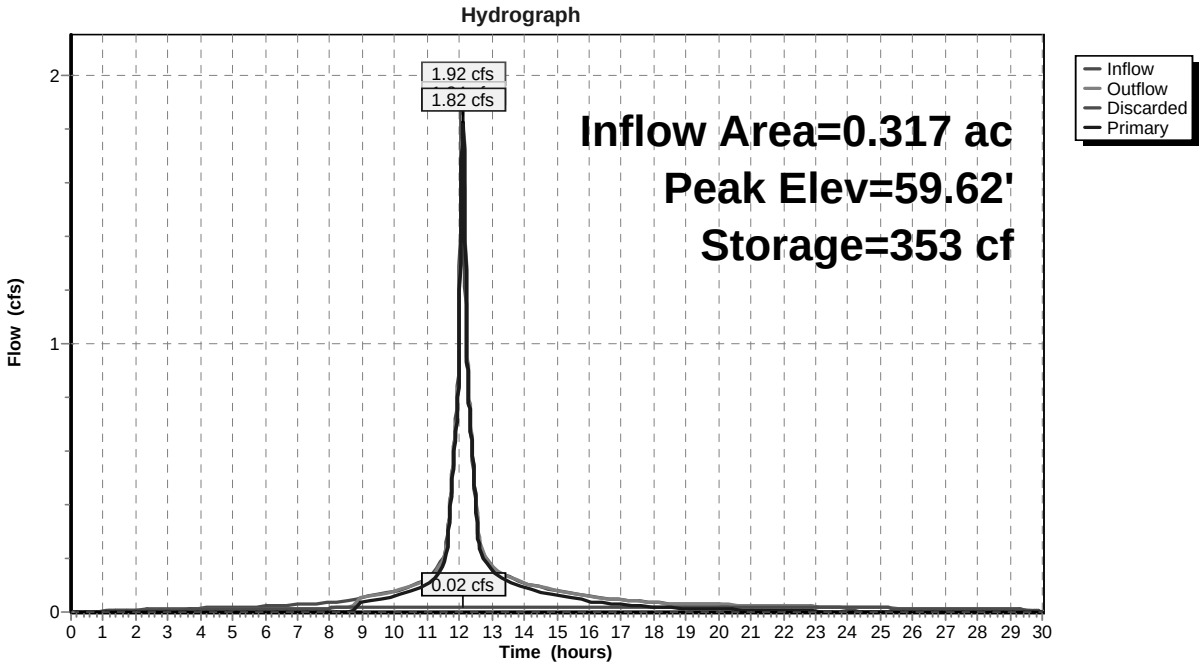
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
59.00	356	271.0	0	0	356
60.00	1,208	271.5	740	740	628

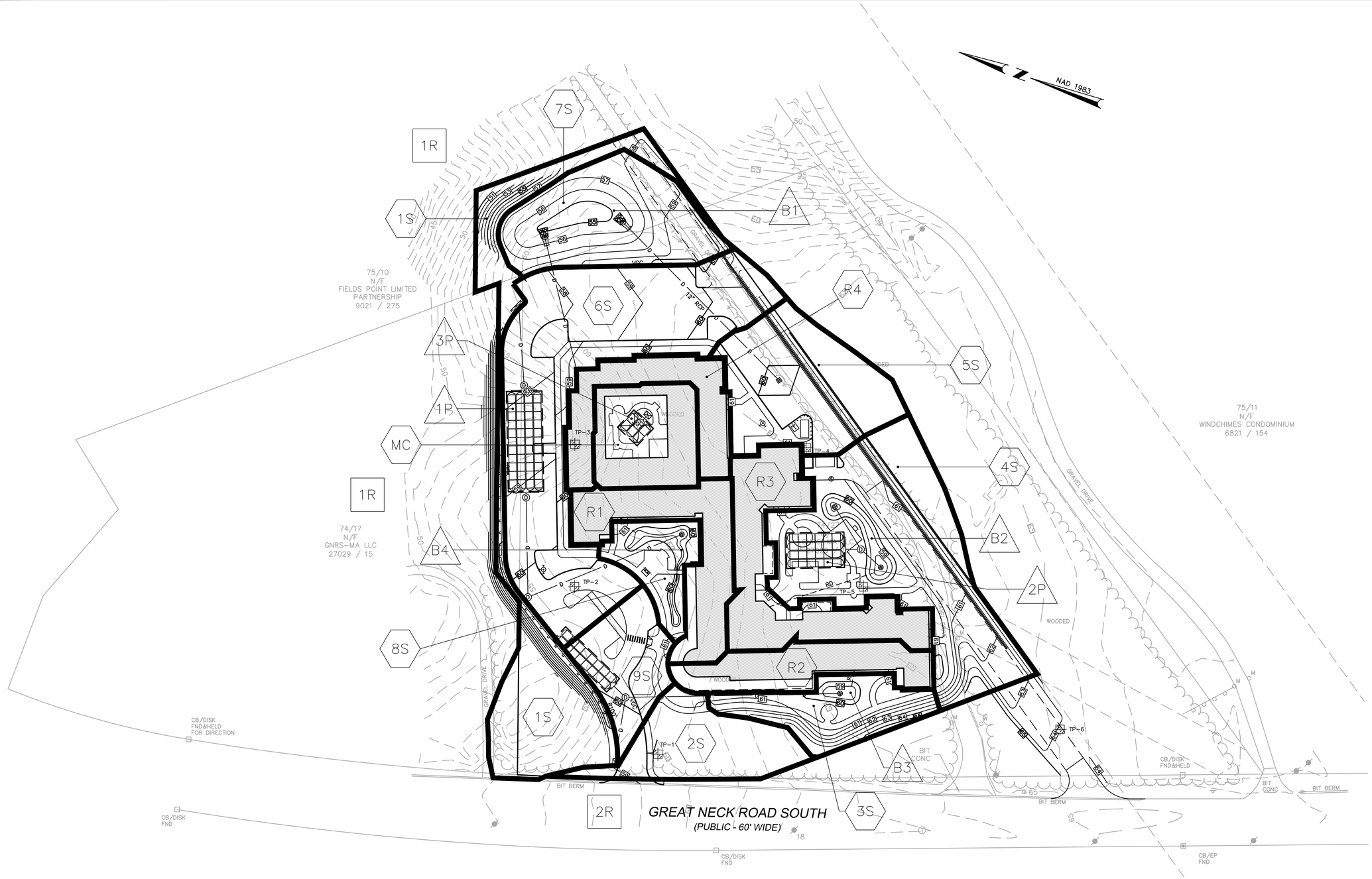
Device	Routing	Invert	Outlet Devices
#1	Primary	53.50'	**12.0" Round Culvert** L= 216.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 53.50' / 50.75' S= 0.0127 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	59.50'	**2.0" x 2.0" Horiz. Orifice/Grate X 40.00** C= 0.600 Limited to weir flow at low heads
#3	Discarded	59.00'	**1.020 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 43.00'

Discarded OutFlow Max=0.02 cfs @ 12.11 hrs HW=59.62' (Free Discharge)
└**3=Exfiltration** (Controls 0.02 cfs)

Primary OutFlow Max=1.82 cfs @ 12.11 hrs HW=59.62' (Free Discharge)
└**1=Culvert** (Passes 1.82 cfs of 6.14 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 1.82 cfs @ 1.64 fps)

Pond B4: Bioretention Area #4





COMMONWEALTH OF MASSACHUSETTS
BRIAN G. YERGATIAN
CIVIL
No. 46206
REGISTERED PROFESSIONAL ENGINEER

BRIAN G. YERGATIAN — DATE
PROFESSIONAL ENGINEER

NORTHBRIDGE MASHPEE COMMONS

GREAT NECK ROAD SOUTH
IN
MASHPEE
MASSACHUSETTS
(BARNSTABLE COUNTY)

POST-DEVELOPMENT WATERSHED PLAN

SEPTEMBER 7, 2015

REVISIONS:

NO.	DATE	DESC.

PERMITTING PLANS
NOT FOR CONSTRUCTION

PREPARED FOR:
THE NORTHBRIDGE COMPANIES
71 THIRD AVENUE
BURLINGTON, MA 01803

BSC GROUP
349 Route 28, Unit D
W. Yarmouth, Massachusetts
02673
617 896 4300

© 2015 BSC Group, Inc.

SCALE: 1" = 40'
0 20 40 80 FEET

FILE: \\bscbos\bos\2321600\Civil\Drawings\...
DWG. NO:
JOB. NO: 23216.00
SHEET

SECTION 6.0

ADDITIONAL DRAINAGE CALCULATIONS

6.1 TOTAL SUSPENDED SOLIDS REMOVAL (TSS)

6.2 FILTERRA® SIZING CALCULATIONS

6.1 TOTAL SUSPENDED SOLIDS REMOVAL (TSS)

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: Tributary to Bioretention Area #1

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Bioretention Area	**0.90**	**0.75**	**0.68**	**0.08**
	0.00	**0.08**	**0.00**	**0.08**
	0.00	**0.08**	**0.00**	**0.08**
	0.00	**0.08**	**0.00**	**0.08**

Total TSS Removal = **93%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Northbridge Mashpee Commons**

Prepared By: **Brian G. Yergatian, P.E.**

Date: **9/10/2015**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: Tributary to ADS Chamber Area #1

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Bioretention Area	**0.90**	**1.00**	**0.90**	**0.10**
Subsurface Infiltration Structure	**0.80**	**0.10**	**0.08**	**0.02**
	0.00	**0.02**	**0.00**	**0.02**
	0.00	**0.02**	**0.00**	**0.02**
	0.00	**0.02**	**0.00**	**0.02**

Total TSS Removal = **98%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Northbridge Mashpee Commons**

Prepared By: **Brian G. Yergatian, P.E.**

Date: **9/10/2015**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: Tributary to ADS Chamber Area #2

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Bioretention Area	**0.90**	**1.00**	**0.90**	**0.10**
Subsurface Infiltration Structure	**0.80**	**0.10**	**0.08**	**0.02**
	0.00	**0.02**	**0.00**	**0.02**
	0.00	**0.02**	**0.00**	**0.02**
	0.00	**0.02**	**0.00**	**0.02**

Total TSS Removal = **98%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Northbridge Mashpee Commons**

Prepared By: **Brian G. Yergatian, P.E.**

Date: **9/10/2015**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: Tributary to ADS Chamber Area #3

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Treebox Filter	**0.80**	**1.00**	**0.80**	**0.20**
Subsurface Infiltration Structure	**0.80**	**0.20**	**0.16**	**0.04**
	0.00	**0.04**	**0.00**	**0.04**
	0.00	**0.04**	**0.00**	**0.04**
	0.00	**0.04**	**0.00**	**0.04**

Total TSS Removal = **96%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Northbridge Mashpee Commons**

Prepared By: **Brian G. Yergatian, P.E.**

Date: **9/10/2015**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: Tributary to ADS Chamber Area #4

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Bioretention Area	**0.90**	**1.00**	**0.90**	**0.10**
Subsurface Infiltration Structure	**0.80**	**0.10**	**0.08**	**0.02**
	0.00	**0.02**	**0.00**	**0.02**
	0.00	**0.02**	**0.00**	**0.02**
	0.00	**0.02**	**0.00**	**0.02**

Total TSS Removal = **98%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Northbridge Mashpee Commons**

Prepared By: **Brian G. Yergatian, P.E.**

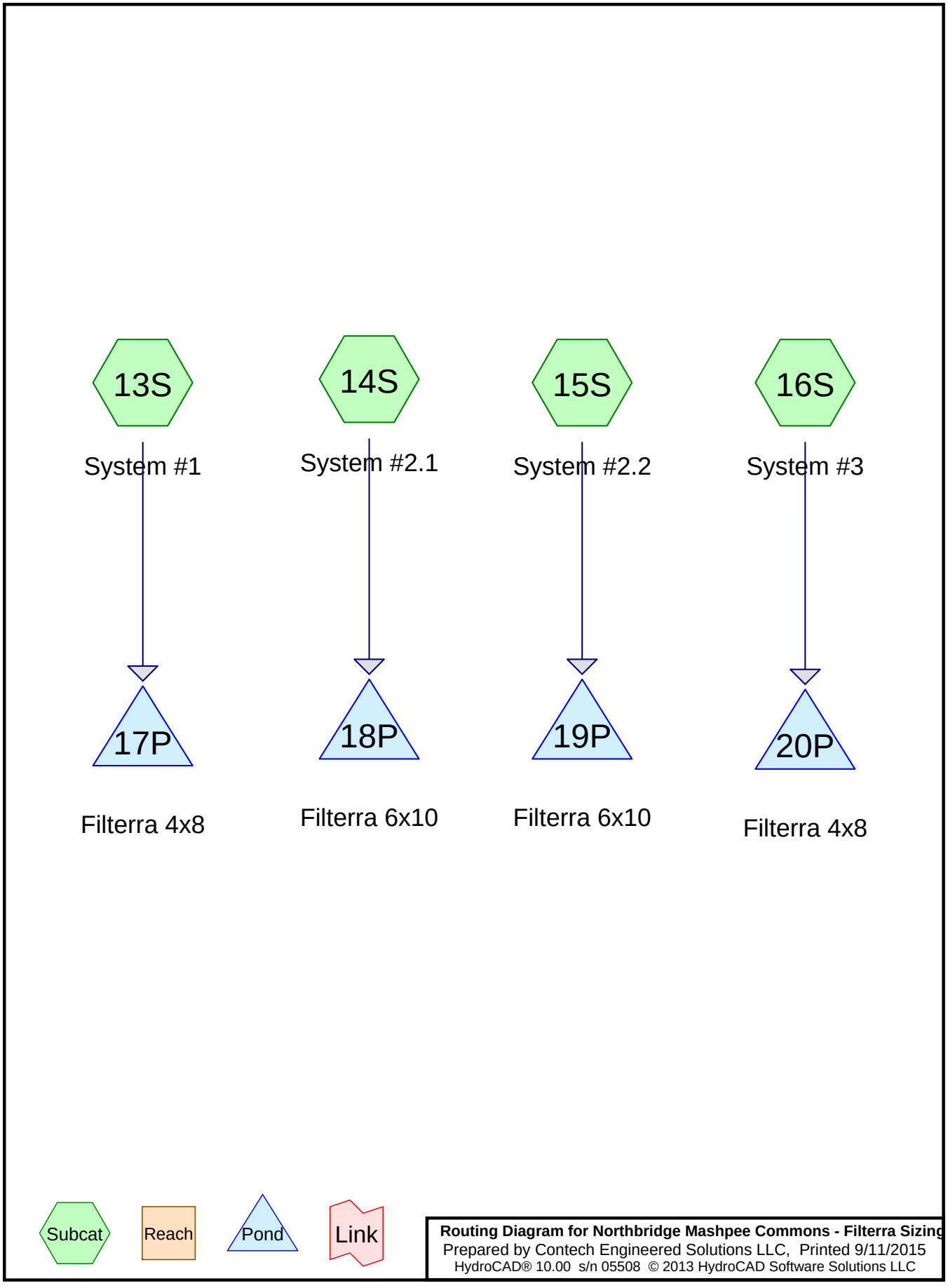
Date: **9/10/2015**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

6.2 FILTERRA® SIZING CALCULATIONS



Routing Diagram for Northbridge Mashpee Commons - Filterra Sizing
Prepared by Contech Engineered Solutions LLC, Printed 9/11/2015
HydroCAD® 10.00 s/n 05508 © 2013 HydroCAD Software Solutions LLC

Summary for Subcatchment 13S: System #1

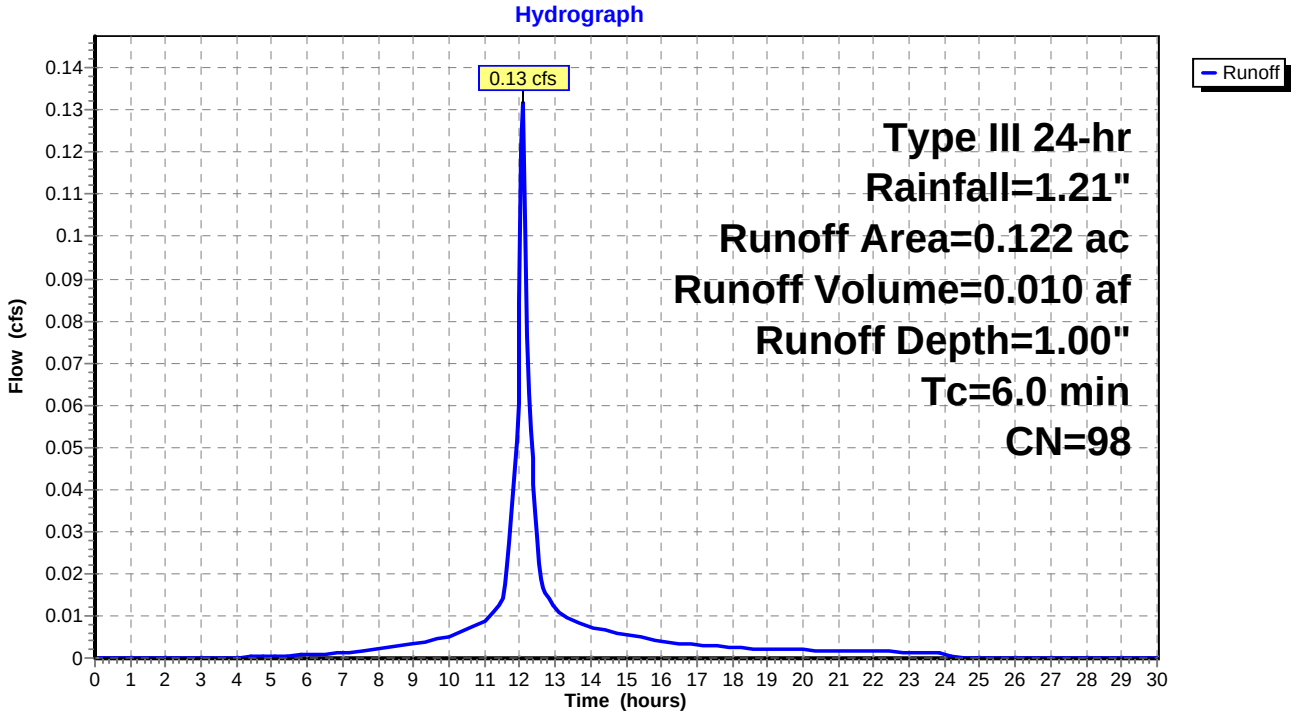
Runoff = 0.13 cfs @ 12.09 hrs, Volume= 0.010 af, Depth= 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=1.21"

	Area (ac)	CN	Description
*	0.122	98	
	0.122		100.00% Impervious Area

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

Subcatchment 13S: System #1



Summary for Subcatchment 14S: System #2.1

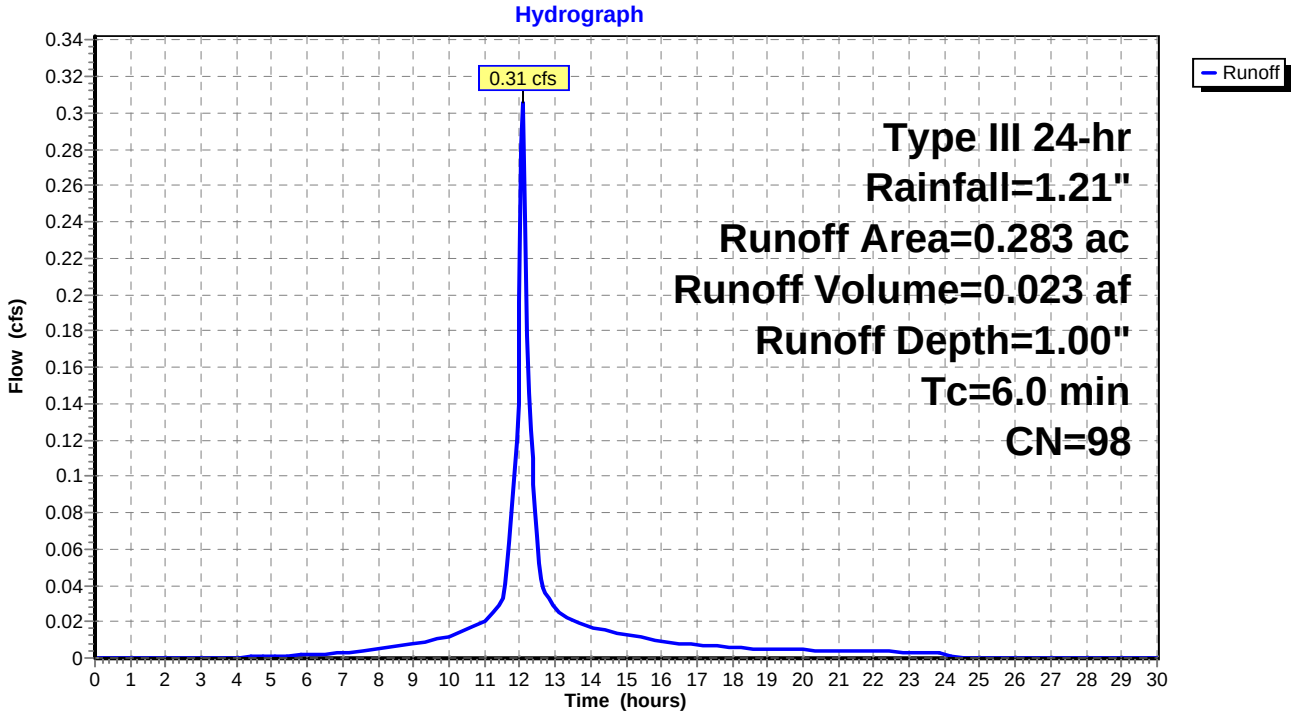
Runoff = 0.31 cfs @ 12.09 hrs, Volume= 0.023 af, Depth= 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=1.21"

	Area (ac)	CN	Description
*	0.283	98	
	0.283		100.00% Impervious Area

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

Subcatchment 14S: System #2.1



Summary for Subcatchment 15S: System #2.2

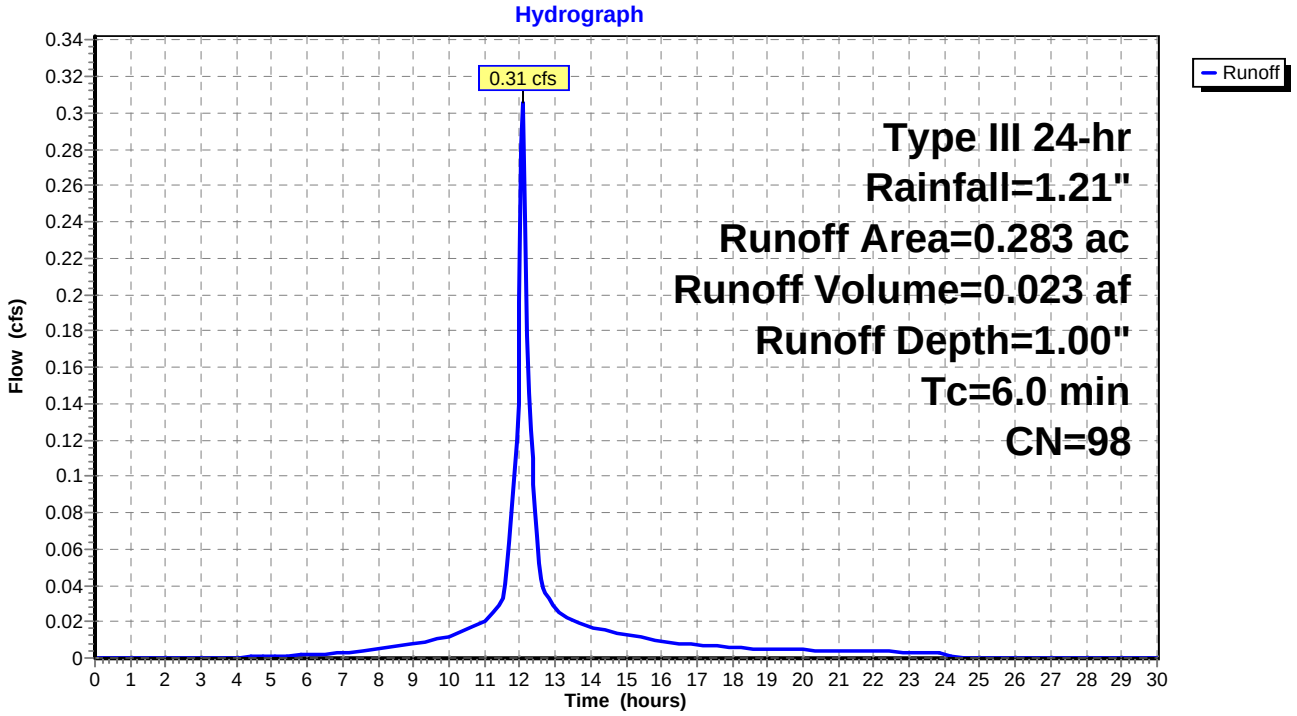
Runoff = 0.31 cfs @ 12.09 hrs, Volume= 0.023 af, Depth= 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=1.21"

	Area (ac)	CN	Description
*	0.283	98	
	0.283		100.00% Impervious Area

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

Subcatchment 15S: System #2.2



Summary for Subcatchment 16S: System #3

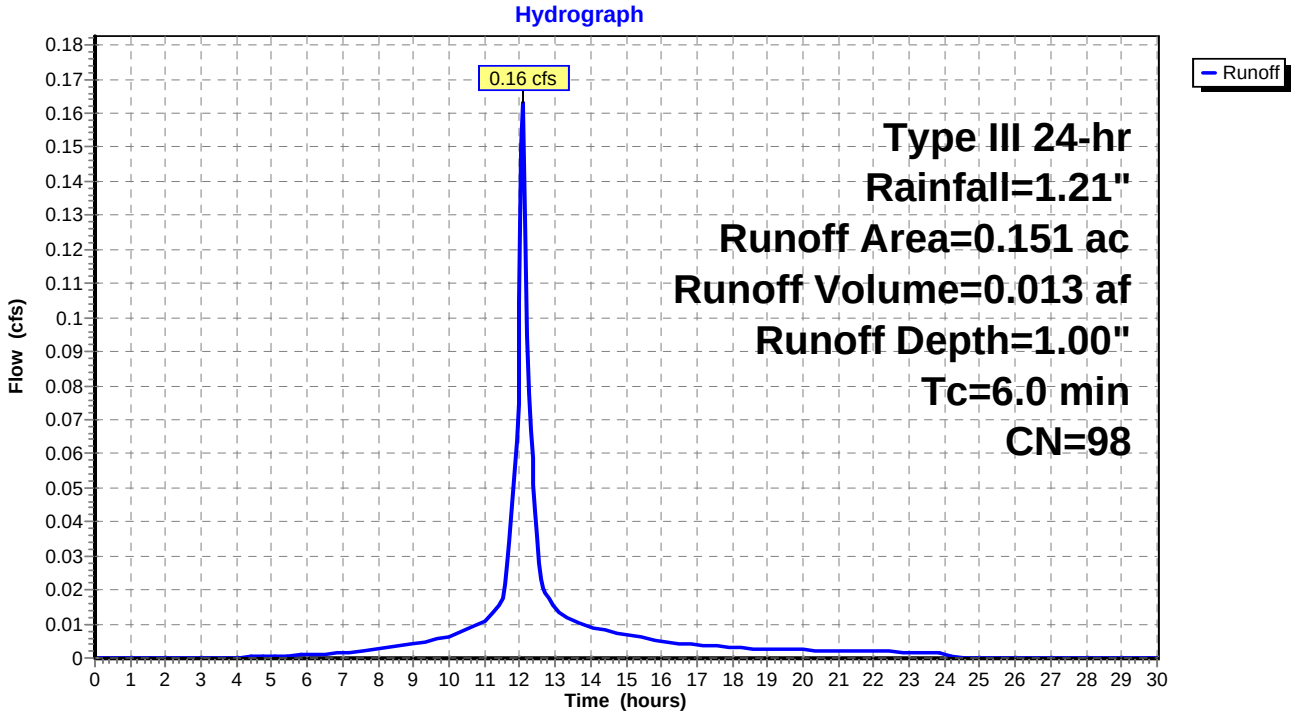
Runoff = 0.16 cfs @ 12.09 hrs, Volume= 0.013 af, Depth= 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=1.21"

	Area (ac)	CN	Description
*	0.151	98	
	0.151		100.00% Impervious Area

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

Subcatchment 16S: System #3



Summary for Pond 17P: Filterra 4x8

Inflow Area = 0.122 ac,100.00% Impervious, Inflow Depth = 1.00"
Inflow = 0.13 cfs @ 12.09 hrs, Volume= 0.010 af
Outflow = 0.10 cfs @ 12.05 hrs, Volume= 0.010 af, Atten= 21%, Lag= 0.0 min
Primary = 0.10 cfs @ 12.05 hrs, Volume= 0.010 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 2.49' @ 12.15 hrs Surf.Area= 0.001 ac Storage= 0.000 af

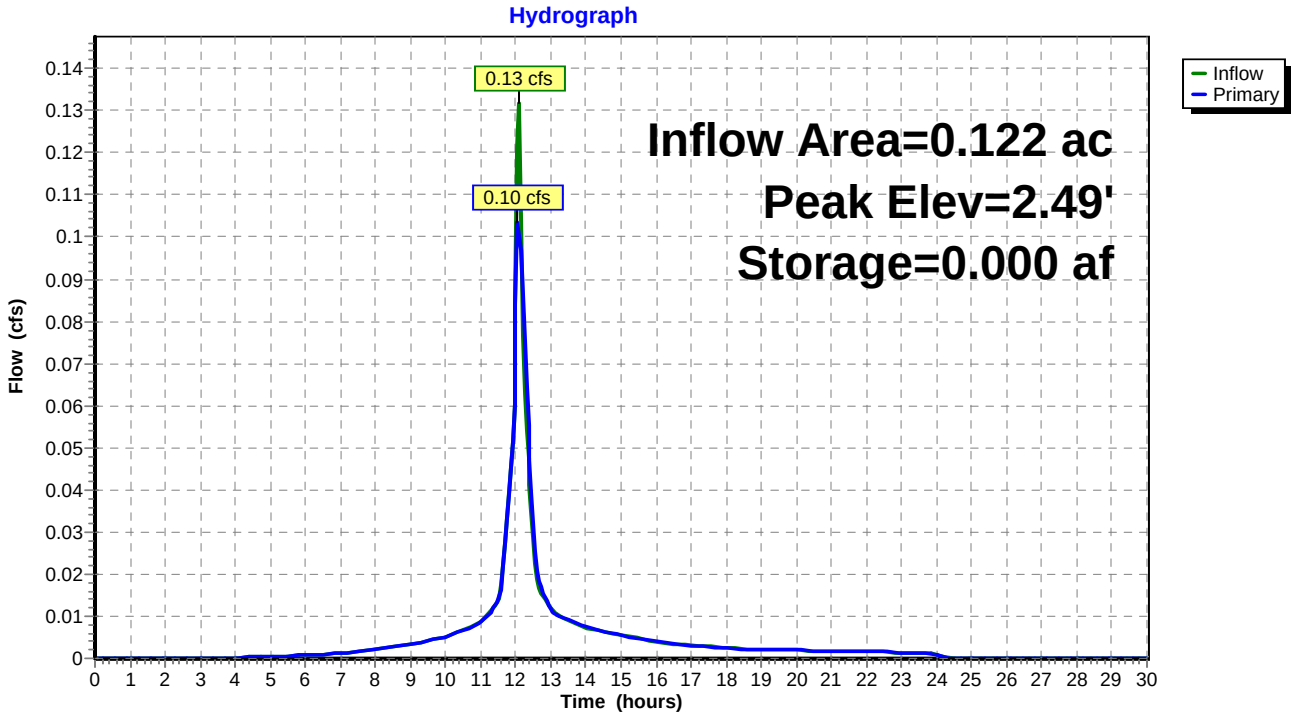
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	2.25'	0.001 af	**8.00'W x 4.00'L x 1.00'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	2.25'	**140.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.10 cfs @ 12.05 hrs HW=2.29' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.10 cfs)

Pond 17P: Filterra 4x8



Summary for Pond 18P: Filterra 6x10

Inflow Area = 0.283 ac,100.00% Impervious, Inflow Depth = 1.00"
Inflow = 0.31 cfs @ 12.09 hrs, Volume= 0.023 af
Outflow = 0.19 cfs @ 12.00 hrs, Volume= 0.023 af, Atten= 36%, Lag= 0.0 min
Primary = 0.19 cfs @ 12.00 hrs, Volume= 0.023 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 2.96' @ 12.19 hrs Surf.Area= 0.001 ac Storage= 0.001 af

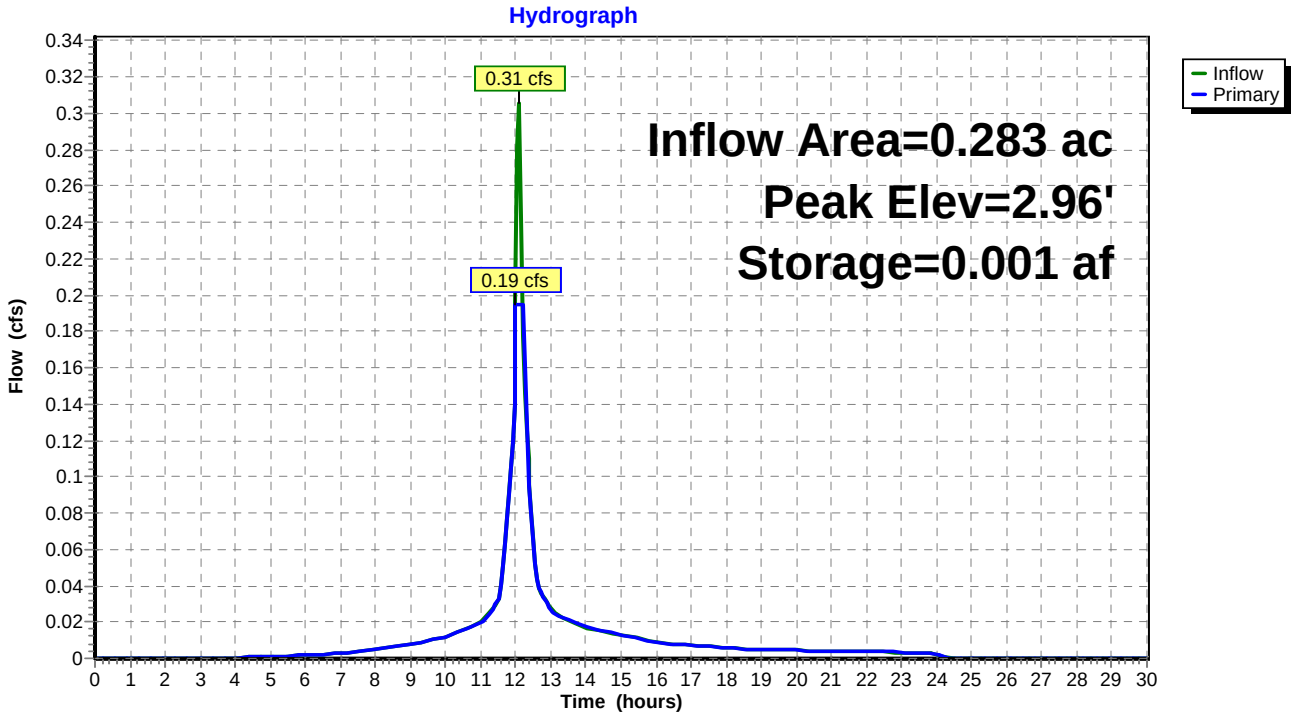
Plug-Flow detention time= 3.8 min calculated for 0.023 af (100% of inflow)
Center-of-Mass det. time= 0.8 min (782.5 - 781.8)

Volume	Invert	Avail.Storage	Storage Description
#1	2.25'	0.001 af	**10.00'W x 6.00'L x 1.00'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	2.25'	**140.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.19 cfs @ 12.00 hrs HW=2.26' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.19 cfs)

Pond 18P: Filterra 6x10



Summary for Pond 19P: Filterra 6x10

Inflow Area = 0.283 ac,100.00% Impervious, Inflow Depth = 1.00"
Inflow = 0.31 cfs @ 12.09 hrs, Volume= 0.023 af
Outflow = 0.19 cfs @ 12.00 hrs, Volume= 0.023 af, Atten= 36%, Lag= 0.0 min
Primary = 0.19 cfs @ 12.00 hrs, Volume= 0.023 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 2.96' @ 12.19 hrs Surf.Area= 0.001 ac Storage= 0.001 af

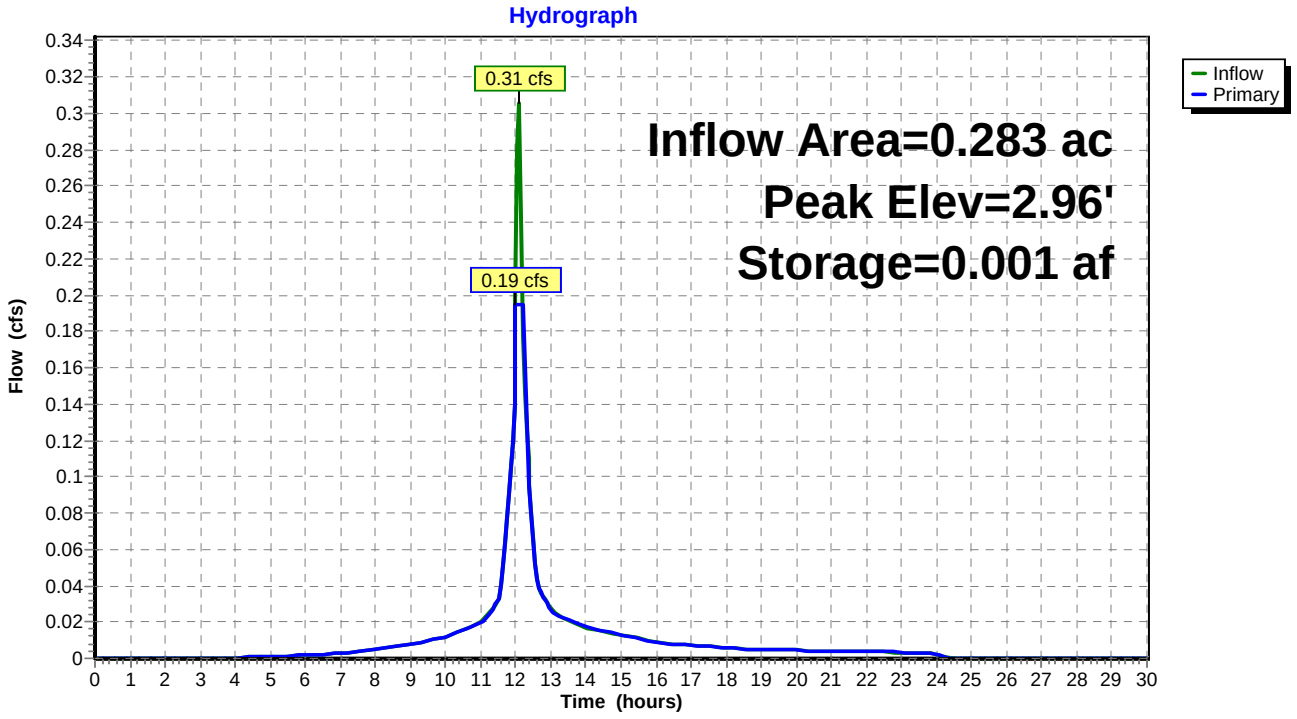
Plug-Flow detention time= 3.8 min calculated for 0.023 af (100% of inflow)
Center-of-Mass det. time= 0.8 min (782.5 - 781.8)

Volume	Invert	Avail.Storage	Storage Description
#1	2.25'	0.001 af	**10.00'W x 6.00'L x 1.00'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	2.25'	**140.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.19 cfs @ 12.00 hrs HW=2.26' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.19 cfs)

Pond 19P: Filterra 6x10



Summary for Pond 20P: Filterra 4x8

Inflow Area = 0.151 ac,100.00% Impervious, Inflow Depth = 1.00"
Inflow = 0.16 cfs @ 12.09 hrs, Volume= 0.013 af
Outflow = 0.10 cfs @ 12.00 hrs, Volume= 0.012 af, Atten= 36%, Lag= 0.0 min
Primary = 0.10 cfs @ 12.00 hrs, Volume= 0.012 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 2.96' @ 12.19 hrs Surf.Area= 0.001 ac Storage= 0.001 af

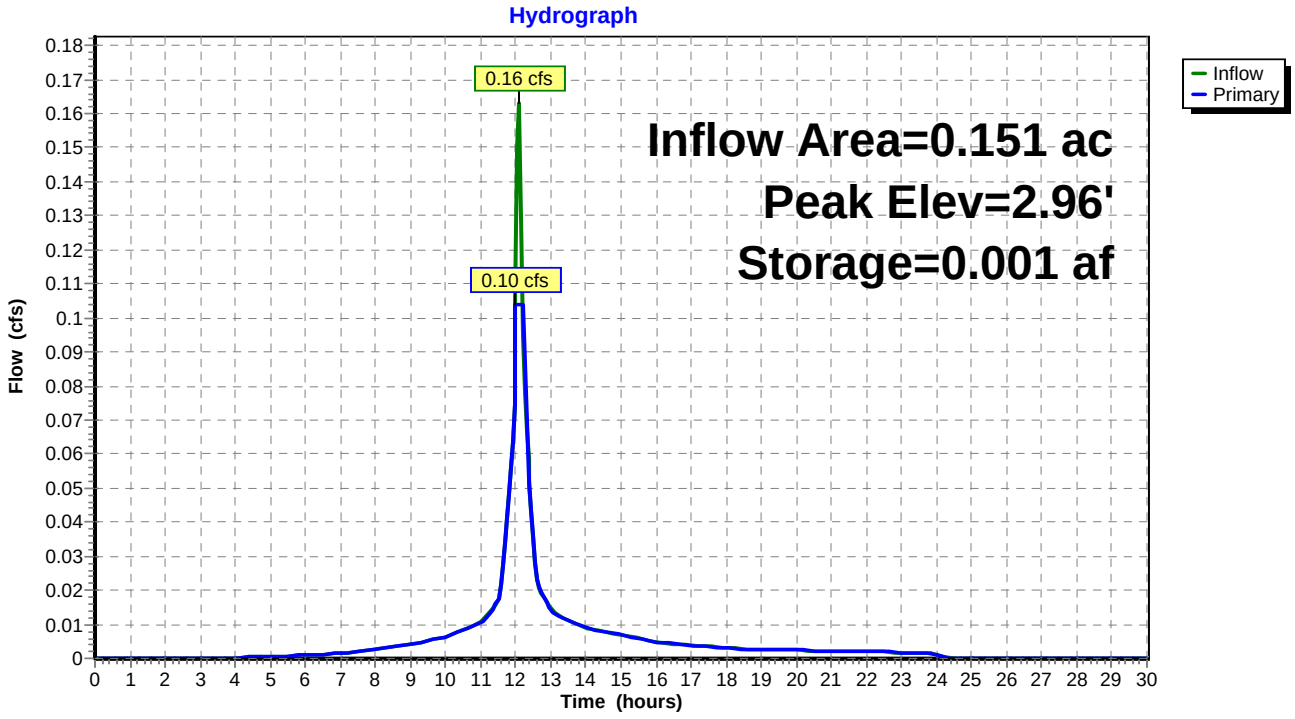
Plug-Flow detention time= 2.6 min calculated for 0.012 af (100% of inflow)
Center-of-Mass det. time= 0.7 min (782.5 - 781.8)

Volume	Invert	Avail.Storage	Storage Description
#1	2.25'	0.001 af	**8.00'W x 4.00'L x 1.00'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	2.25'	**140.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.10 cfs @ 12.00 hrs HW=2.26' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.10 cfs)

Pond 20P: Filterra 4x8



APPENDICES

USGS LOCUS MAP

PREPARED FOR:

The Northbridge Companies
71 Third Avenue
Burlington, MA 01803

USGS LOCUS MAP

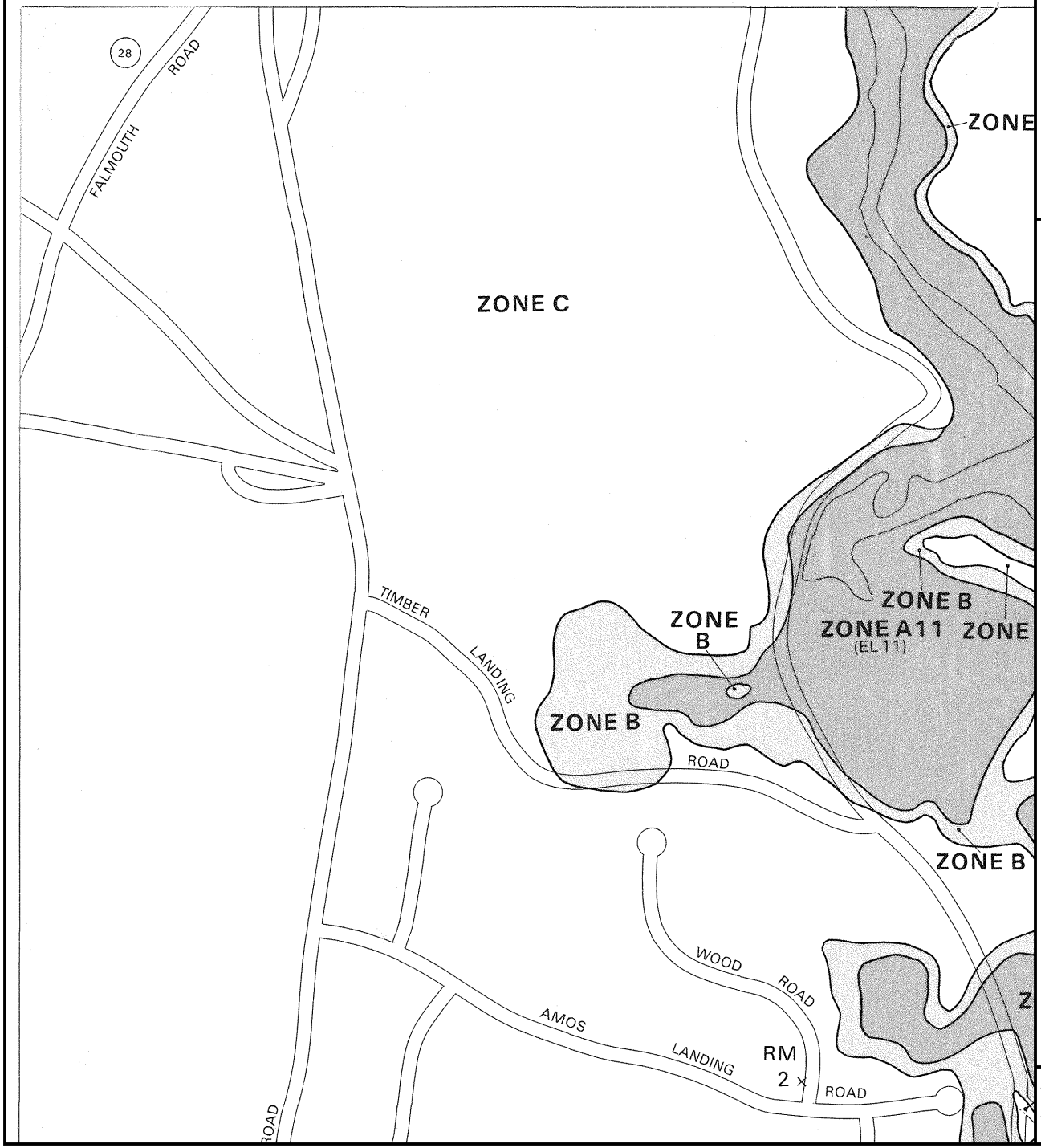
Source: MassGIS

Northbridge Mashpee Commons
58 Great Neck Road, South Mashpee, MA

BSC GROUP
349 Route 28, Unit D
W. Yarmouth, Massachusetts
02673
508 778 8919

Job No.: 2-3216.00 Date: 9/10/2015
Scale: 1"=1,000±' Revised:
Dwg. No: Figure:

FEMA MAP



N

APPROXIMATE SCALE

500 0 500 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

TOWN OF
MASHPEE,
MASSACHUSETTS
BARNSTABLE COUNTY

PANEL 7 OF 10
(SEE MAP INDEX FOR PANELS NOT PRINTED)

- NOTE -

THIS MAP INCORPORATES APPROXIMATE BOUNDARIES OF COASTAL BARRIER RESOURCES SYSTEM UNITS AND/OR OTHERWISE PROTECTED AREAS ESTABLISHED UNDER THE COASTAL BARRIER IMPROVEMENT ACT OF 1990 (PL 101-591).

COMMUNITY-PANEL NUMBER
250009 0007 F

MAP REVISED:
JULY 2, 1992

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

SOIL SURVEY MAP

Hydrologic Soil Group—Barnstable County, Massachusetts
(Mashpee Commons)

Map Scale: 1:1,300 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Barnstable County, Massachusetts
Survey Area Data: Version 10, Dec 5, 2013

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 30, 2011—Oct 8, 2011

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Barnstable County, Massachusetts (MA001)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
252C	Carver coarse sand, 8 to 15 percent slopes	A	0.2	4.0%
259B	Carver loamy coarse sand, 3 to 8 percent slopes	A	4.2	96.0%
Totals for Area of Interest			**4.4**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

SOIL TEST PIT LOGS

Commonwealth of Massachusetts
City/Town of

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

A. Facility Information

GNRS - MA LLC.
Owner Name

68 GREAT NECK ROAD SOUTH — MAP 74, PARCEL 27
Street Address — Map/Lot #

MASHPEE — MA — 02649
City — State — Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade ☐ Repair

2. Published Soil Survey Available? ☒ Yes ☐ No — If yes: WEB SOIL SURVEY (Year Published) — (Publication Scale) — ① 252 C ② 259 B (Soil Map Unit)
   ① CARVER COARSE SAND, 8 TO 15 % SLOPES
   ② CARVER LOAMY COARSE SAND, 3 TO 8 % SLOPES
   Soil Name
   NONE
   Soil Limitations

3. Surficial Geological Report Available? ☐ Yes ☐ No — If yes: (Year Published) (Publication Scale) (Map Unit)
   Geologic Material — Landform

4. Flood Rate Insurance Map
   Above the 500-year flood boundary? ☒ Yes ☐ No — Within the 100-year flood boundary? ☐ Yes ☒ No
   Within the 500-year flood boundary? ☐ Yes ☒ No — Within a velocity zone? ☐ Yes ☒ No

5. Wetland Area: National Wetland Inventory Map — (Map Unit) (Name)
   Wetlands Conservancy Program Map — (Map Unit) (Name)

6. Current Water Resource Conditions (USGS): 9/2014 (Month/Year) — Range: ☐ Above Normal ☐ Normal ☐ Below Normal

7. Other references reviewed:

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

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

Deep Observation Hole Number: TP-1 | 9/24/14 (Date) | 9:00 AM (Time) | 62° CLEAR (Weather)

1. Location

Ground Elevation at Surface of Hole: 59.7 Location (identify on plan): _____

2. Land Use: WOODLAND (e.g., woodland, agricultural field, vacant lot, etc.) | NO (Surface Stones) | 3-8% (Slope (%))

Vegetation | Landform | Position on Landscape (attach sheet)

3. Distances from: Open Water Body _____ feet | Drainage Way _____ feet | Possible Wet Area _____ feet

Property Line _____ feet | Drinking Water Well _____ feet | Other _____ feet

4. Parent Material: GLACIAL OUTWASH Unsuitable Materials Present: ☐ Yes ☐ No

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

5. Groundwater Observed: ☐ Yes ☒ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Estimated Depth to High Groundwater: _____ inches _____ elevation

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-1

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-3	A	2.5Y 4/2				LS					
3-9	E	2.5Y 7/1				LS					
9-22	B_w	2.5Y 6/8				LS					
22-41	C_1	2.5Y 6/6				MS					
41-106	C_2	2.5Y 6/3				CS	15%				

Additional Notes:

NO REDOXIMORPHIC FEATURES OBSERVED

NO GROUNDWATER OBSERVED

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-2 | 9/24/14 (Date) | 9:00 AM (Time) | 62° CLEAR (Weather)

1. Location

Ground Elevation at Surface of Hole: 56.2 Location (identify on plan): _____

2. Land Use: WOODLAND (e.g., woodland, agricultural field, vacant lot, etc.) | NO (Surface Stones) | 3-8 % (Slope (%))

Vegetation | Landform | Position on Landscape (attach sheet)

3. Distances from:

Open Water Body	____ feet	Drainage Way	____ feet	Possible Wet Area	____ feet
Property Line	____ feet	Drinking Water Well	____ feet	Other	____ feet

4. Parent Material: GLACIAL OUTWASH Unsuitable Materials Present: ☐ Yes ☐ No

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

5. Groundwater Observed: ☐ Yes ☒ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Estimated Depth to High Groundwater: _____ inches _____ elevation

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-2

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-22	Bw	2.5Y 6/6				LS					
22-110	C	2.5Y 6/3				CS	15%				

Additional Notes:

NO REDOXIMORPHIC FEATURES OBSERVED

NO GROUNDWATER OBSERVED

TOPSOIL HAS BEEN STRIPPED

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TF-3 | 9/24/14 (Date) | 9:00 AM (Time) | 62° CLEAR (Weather)

1. Location

Ground Elevation at Surface of Hole: 53.6 Location (identify on plan): _____

2. Land Use: WOODLAND (e.g., woodland, agricultural field, vacant lot, etc.) | NO (Surface Stones) | 8-15% (Slope (%))

Vegetation _____ | Landform _____ | Position on Landscape (attach sheet) _____

3. Distances from:

Open Water Body	____ feet	Drainage Way	____ feet	Possible Wet Area	____ feet
Property Line	____ feet	Drinking Water Well	____ feet	Other	____ feet

4. Parent Material: GLACIAL OUTWASH Unsuitable Materials Present: ☐ Yes ☐ No

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

5. Groundwater Observed: ☐ Yes ☒ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Estimated Depth to High Groundwater: _____ inches _____ elevation

Commonwealth of Massachusetts
City/Town of

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

C. On-Site Review (continued)

Deep Observation Hole Number: TP-3

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10	E	2.5Y 7/1				MS					
10-22	Bw	10YR 5/8				LS					
22-62	C_1	2.5Y 6/4				M/C S					
62-108	C_2	5Y 6/3				FSL					
108-127	C_3	2.5Y 6/3				CS	15%				

Additional Notes:

TOP SOIL HAS BEEN STRIPPED

BOG IRON CONCENTRATIONS FROM 12-36"

NO REDOXIMORPHIC FEATURES OR GROUNDWATER OBSERVED

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-4 | 9/24/14 (Date) | 9:00 AM (Time) | 62° CLEAR (Weather)

1. Location

Ground Elevation at Surface of Hole: 65.2 Location (identify on plan): _____

2. Land Use: WOODLAND (e.g., woodland, agricultural field, vacant lot, etc.) | NO (Surface Stones) | 3-8% (Slope (%))

Vegetation _____ | Landform _____ | Position on Landscape (attach sheet) _____

3. Distances from: Open Water Body _____ feet | Drainage Way _____ feet | Possible Wet Area _____ feet

Property Line _____ feet | Drinking Water Well _____ feet | Other _____ feet

4. Parent Material: _____ Unsuitable Materials Present: ☐ Yes ☐ No

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

5. Groundwater Observed: ☐ Yes ☒ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Estimated Depth to High Groundwater: _____ inches _____ elevation

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-4

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-3	A	2.5Y 4/2				LS					
3-8	E	2.5Y 7/1				LS					
8-32	Bw	2.5Y 6/8				LS					
32-49	C_1	2.5Y 7/3				FINE SL					
49-110	C_2	2.5Y 6/3				CS					

Additional Notes:

NO REDOXIMORPHIC FEATURES OR GROUNDWATER OBSERVED

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-5 | 9/24/14 (Date) | 9:00 AM (Time) | 62° CLEAR (Weather)

1. Location

Ground Elevation at Surface of Hole: 65.5 Location (identify on plan): _____

2. Land Use: WOODLAND (e.g., woodland, agricultural field, vacant lot, etc.) | NO (Surface Stones) | 0-3 % (Slope (%))

Vegetation | Landform | Position on Landscape (attach sheet)

3. Distances from: Open Water Body _____ feet | Drainage Way _____ feet | Possible Wet Area _____ feet

Property Line _____ feet | Drinking Water Well _____ feet | Other _____ feet

4. Parent Material: GLACIAL OUTWASH Unsuitable Materials Present: ☐ Yes ☐ No

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

5. Groundwater Observed: ☐ Yes ☒ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Estimated Depth to High Groundwater: _____ inches _____ elevation

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-5

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-4	A	2.5Y 4/2				LS					
4-8	E	2.5Y 7/1				LS					
8-24	B_w	2.5Y 6/8				LS					
24-39	C_1	2.5Y 6/6				M/F S					
39-69	C_2	2.5Y 7/3				FINE SL					
69-108	C_3	2.5Y 6/3				CS	15%				

Additional Notes:

NO REDOXIMORPHIC FEATURES OR GROUNDWATER OBSERVED

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-6 | 9/24/14 (Date) | 9:00 AM (Time) | 62° CLEAR (Weather)

1. Location

Ground Elevation at Surface of Hole: 64.8 | Location (identify on plan):

2. Land Use: WOODLAND (e.g., woodland, agricultural field, vacant lot, etc.) | NO (Surface Stones) | 3-8% (Slope (%))

Vegetation | Landform | Position on Landscape (attach sheet)

3. Distances from: Open Water Body ____ feet | Drainage Way ____ feet | Possible Wet Area ____ feet

Property Line ____ feet | Drinking Water Well ____ feet | Other ____ feet

4. Parent Material: GLACIAL OUTWASH | Unsuitable Materials Present: ☐ Yes ☐ No

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

5. Groundwater Observed: ☐ Yes ☒ No | If yes: Depth Weeping from Pit | Depth Standing Water in Hole

Estimated Depth to High Groundwater: ____ inches | ____ elevation

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-6

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-4	A	2.5Y 4/2				LS					
4-9	E	2.5Y 7/1				LS					
9-23	B_w	2.5Y 6/3				LS					
23-54	C_1	2.5Y 6/6				M/F S					
54-64	C_2	2.5Y 7/3				FINE SL					
64-108	C_3	2.5Y 6/3				CS	15%				

Additional Notes:

NO REDOXIMORPHIC FEATURES OR GROUNDWATER OBSERVED

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

	A.	B.
☐ Depth observed standing water in observation hole	inches	inches
☐ Depth weeping from side of observation hole	inches	inches
☐ Depth to soil redoximorphic features (mottles)	inches	inches
☐ Groundwater adjustment (USGS methodology)	inches	inches

2. Index Well Number _____ Reading Date _____ Index Well Level _____

Adjustment Factor _____ Adjusted Groundwater Level _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material
   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?
      ☐ Yes ☐ No
   b. If yes, at what depth was it observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

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

Signature of Soil Evaluator

9/24/14
Date

BRIAN G. YERGATIAN / SE #3009
Typed or Printed Name of Soil Evaluator / License #

10/24/05
Date of Soil Evaluator Exam

Name of Board of Health Witness

Board of Health

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

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Field Diagrams

Use this sheet for field diagrams:

(SEE SITE PLANS)

1.0 CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL PLAN

This Section specifies requirements and suggestions for implementation of a Storm Water Pollution Prevention Plan (SWPPP) for the development of the **Northbridge at Mashpee Commons Assisted Living, Mashpee, Massachusetts**. The SWPPP shall be provided and maintained on-site by the Contractor(s) during all construction activities. The SWPPP shall be updated as required to reflect changes to construction activity.

The storm water pollution prevention measures contained in the SWPPP shall be at least the minimum required by Local Regulations. The Contractor shall provide additional measures to prevent pollution from stormwater discharges in compliance with the National Pollution Discharge Elimination System (NPDES) Phase II permit requirements and all other local, state and federal requirements.

The SWPPP shall include provisions for, but not be limited to, the following:

1. Construction Trailers
2. Lay-down Areas
3. Equipment Storage Areas
4. Stockpile Areas
5. Disturbed Areas

The Contractor shall NOT begin construction without submitting evidence that a NPDES Notice of Intent (NOI) governing the discharge of storm water from the construction site for the entire construction period has been filed at least fourteen (14) days prior to construction. It is the Contractor's responsibility to complete and file the NOI.

The cost of any fines, construction delays and remedial actions resulting from the Contractor's failure to comply with all provisions of local regulations and Federal NPDES permit requirements shall be paid for by the Contractor at no additional cost to the Owner.

As a requirement of the EPA's NPDES permitting program, each Contractor and Subcontractor responsible for implementing and maintaining stormwater Best Management Practices shall execute a Contractor's Certification form.

Erosion and Sedimentation Control

The Contractor shall be solely responsible for erosion and sedimentation control at the site. The Contractor shall utilize a system of operations and all necessary erosion and sedimentation control measures, even if not specified herein or elsewhere, to minimize erosion damage at the site to prevent the migration of sediment into environmentally sensitive areas. Environmentally sensitive areas include all wetland resource areas within, and downstream of, the site, and those areas of the site that are not being altered.

Erosion and sedimentation control shall be in accordance with this Section, the design drawings, and the following:

- National Pollutant Discharge Elimination System General Permit for Discharges from Construction Activities issued by the Environmental Protection Agency (EPA), February 16, 2012.

- Massachusetts Stormwater Management Handbook issued by the Massachusetts Department of Environmental Protection, February 2008.
- Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas, A Guide for Planners, Designers and Municipal Officials, March 1997.

The BMP's presented here should be used as a guide for erosion and sedimentation control and are not intended to be considered specifications for construction. The most important BMP is maintaining a rapid construction process, resulting in prompt stabilization of surfaces, thereby reducing erosion potential. Given the primacy of rapid construction, these guidelines have been designed to allow construction to progress with essentially no hindrance by the erosion control methods prescribed. These guidelines have also been designed with sufficient flexibility to allow the contractor to modify the suggested methods as required to suit seasonal, atmospheric, and site-specific physical constraints.

Another important BMP is the prevention of concentrated water flow. Sheet flow does not have the erosive potential of a concentrated rivulet. These guidelines recommend construction methods that allow localized erosion control and a system of construction, which inhibits the development of shallow concentrated flow. These BMP's shall be maintained throughout the construction process.

CONTACT INFORMATION AND RESPONSIBLE PARTIES

The following is a list of all project-associated parties:

Owner/Applicant
Northbridge Company
71 Third Avenue
Burlington, MA 01803

Contractor (Anticipated)
TBD

Engineering Consultant
BSC Group
15 Elkins Street
Boston, MA 02127

Contact: Brian Yergation, P.E.
Phone: (617) 896–4590
Email: byergation@bscgroup.com

1.01 Procedural Conditions of the Construction General Permit (CGP)

The following list outlines the Stormwater responsibilities for all construction operators working on the Project. The operators below agree, through a cooperative agreement, to abide by the following conditions throughout the duration of the construction project, effective the date of signature of the required SWPPP. These conditions apply to all operators on the project site.

The project is subject to EPA's NPDES General Permit through the CGP. The goal of this permit is to prevent the discharge of pollutants associated with construction activity from entering the existing and proposed storm drain system or surface waters.

All contractors/operators involved in clearing, grading, and excavation construction activities must sign the appropriate certification statement, which will remain with the SWPPP. The owner must also sign a certification, which is to remain with the SWPPP in accordance with the signatory requirements of the SWPPP.

Once the SWPPP is finalized, a signed copy, plus supporting documents, must be maintained at the project site during construction. A copy must remain available to EPA, state and local agencies, and other interested parties during normal business hours.

The following items associated with this SWPPP must be posted in a prominent place at the construction site until final stabilization has been achieved:

- The completed/submitted NOI form
- Location where the public can view the SWPPP during normal business hours
- A copy of the signed/submitted NOI, permit number issued by the EPA and a copy of the current CGP.

Project specific SWPPP documents are not submitted to the US EPA unless the agency specifically requests a copy for review. If SWPPP documents are requested by a permitting authority, the permitee(s) will submit them in a timely manner.

EPA inspectors will be allowed free and unrestricted access to the project site and all related documentation and records kept under the conditions of the permit.

The permitee is expected to keep all BMPs and stormwater controls operating correctly and maintained regularly.

Any additions to the project which will significantly change the anticipated discharges of pollutants must be reported to the EPA. The EPA should also be notified in advance of any anticipated events of noncompliance. The permittee must also orally inform the EPA of any discharge, which may endanger health or the environment within 24 hours, with a written report following within 5 days.

In maintaining the SWPPP, all records and supporting documents will be compiled together in an orderly fashion. Inspection reports and amendments to the SWPPP must remain with the document. Federal regulations require permitee(s) to keep their Project Specific SWPPP and all reports and documents for at least three years after the project is complete.

1.02 Project Description and Intended Construction Sequence

The site is currently vacant, with a sanitary sewer force main and an associated driveways to the waste water treatment facility located to the rear of the site. The development activities will include the following major components:

;

- Site grading and installation of site utilities, including underground stormwater management system;
- Construction of approximately 70 units of assisted living housing space;
- Construction of surface parking lot areas;
- Construction of two courtyard areas
- Landscaping associated with utilities and grading.

Soil disturbing activities will include installing stabilized construction exits, installation of erosion and sedimentation controls, grading, stormwater management system, utilities, building foundations, construction of roadways, a parking structure and parking lots and preparation for final seeding, mulching and landscaping. Please refer to Table 1 for the projects anticipated construction timetable. A description of BMPs associated with project timetable and construction-phasing elements is provided in this SWPPP.

Table 1 – Anticipated Construction Timetable

Construction Phasing Activity	Anticipated Timetable
Clearing, Grubbing and Stripping of Limits of Construction	To be determined
Rough Site Grading and Site Utilities	To be determined
Building Foundation and Shell	To be determined
Parking	To be determined
Landscaping	To be determined
Final Clean-up	To be determined

1.03 Potential Sources of Pollution

Any project site activities that have the potential to add pollutants to runoff are subject to the requirements of this sample SWPPP. Listed below are a description of potential sources of pollution from both sediment addition to stormwater runoff, and pollutants from sources other than sedimentation.

Table 2 – Potential Sources of Sediment to Storm Water Runoff

Potential Source	Activities/Comments
Construction Site Entrance and Site Vehicles	Vehicles leaving the site can track soils onto public roadways. Site Vehicles can readily transport exposed soils throughout the site and off-site areas.
Grading Operations	Exposed soils have the potential for erosion and discharge of sediment to off-site areas.
Material Excavation, Relocation, and Stockpiling	Stockpiling of materials during excavation and relocation of soils can contribute to erosion and sedimentation. In addition fugitive dust from stockpiled material, vehicle transport and site grading can be deposited in wetlands and waterway.
Landscaping Operations	Landscaping operations specifically associated with exposed soils can contribute to erosion and sedimentation. Hydroseeding, if not properly applied, can run off to adjacent wetlands and waterways.

Table 3 – Potential Pollutants and Sources, other than Sediment to Storm Water Runoff

Potential Source	Activities/Comments
Staging Areas and Construction Vehicles	Vehicle refueling, minor equipment maintenance, sanitary facilities and hazardous waste storage
Materials Storage Area	General building materials, solvents, adhesives, paving materials, paints, aggregates, trash, etc.
Construction Activities	Construction, paving, curb/gutter installation, concrete pouring/mortar/stucco

1.04 Erosion and Sedimentation Control Best Management Practices

The project site is characterized primarily by impervious surface. All construction activities will implement Best Management Practices (BMPs) in order to minimize overall site disturbance and impacts to the sites natural features. Please refer to the following sections for a detailed description of site specific BMPs. In addition, an Erosion and Sedimentation Control Plan is provided in the Site Plans.

1.05 Timetable and Construction Phasing

This section provides the Owner and Contractor with a suggested order of construction that shall minimize erosion and the transport of sediments. The individual objectives of the construction techniques described herein shall be considered an integral component of the project design intent of each project phase. The construction sequence is not intended to prescribe definitive construction methods and should not be interpreted as a construction specification document. It is likely that portions of the development area will be constructed in phases. However, the Contractor shall follow the general construction phase principles provided below:

- Protect and maintain existing vegetation wherever possible.

- Minimize the area of disturbance.
- To the extent possible, route unpolluted flows around disturbed areas.
- Install mitigation devices as early as possible.
- Minimize the time disturbed areas are left unstabilized.
- Maintain siltation control devices in proper condition.
- The contractor should use the suggested sequence and techniques as a general guide and modify the suggested methods and procedures as required to best suit seasonal, atmospheric, and site specific physical constraints for the purpose of minimizing the environmental impact of construction.

Clearing, Grubbing and Stripping to Limits of Construction

- Install perimeter erosion control devices as required to prevent sediment transport into resource areas.
- Place a ring of silt socks and/or hay bales around stockpiles.
- Stabilize all exposed surfaces that will not be under immediate construction.
- Store and/or dispose all stumps and tree clearing debris as indicated in accordance with all applicable local, state, and federal regulations.

Parking Areas Sub-base Construction

- Install temporary culverts and diversion ditches and additional erosion control devices as required by individual construction area constraints to direct potential runoff toward detention areas designated for the current construction phase.
- Compact gravel as work progresses to control erosion potential.
- Apply water to control air suspension of dust.
- Avoid creating an erosive condition due to over-watering.
- Install piped utility systems as required as work progresses, keeping all inlets sealed until all downstream drainage system components are functional.

Binder Construction

- Fine grade gravel base and install processed gravel to the design grades.
- Compact pavement base as work progresses.
- Install pavement binder course starting from the downhill end of the site and work toward the top.

Finish Paving

- Repair and stabilize damaged side slopes.
- Clean inverts of drainage structures.
- Install final top course of pavement.

Final Clean-up

- Clean inverts of culverts and catch basins.
- Remove sediment and debris from rip-rap outlet areas.
- Remove perimeter erosion control devices only after permanent vegetation and erosion control has been fully established.

1.06 Site Stabilization

Grubbing Stripping and Grading

- Erosion control devices shall be in place as shown on the design plans before grading commences.
- Stripping shall be done in a manner, which will not concentrate runoff. If precipitation is expected, earthen berms shall be constructed around the area being stripped, with a silt sock, silt fence or hay bale dike situated in an arc at the low point of the berm.
- If intense precipitation is anticipated, silt socks, hay bales, dikes and /or silt fences shall be used as required to prevent erosion and sediment transport. The materials required shall be stored on site at all time.
- If water is required for soil compaction, it shall be added in a uniform manner that does not allow excess water to flow off the area being compacted.
- Dust shall be held at a minimum by sprinkling exposed soil with an appropriate amount of water.

Maintenance of Disturbed Surfaces

- Runoff shall be diverted from disturbed side slopes in both cut and fill.
- Mulching may be used for temporary stabilization.
- Silt sock, hay bale or silt fences shall be set where required to trap products of erosion and shall be maintained on a continuing basis during the construction process.

Loaming and Seeding

- Loam shall not be placed unless it is to be seeded directly thereafter.
- All disturbed areas shall have a minimum of 4-inches of loam placed before seeding and mulching.
- Consideration shall be given to hydro-mulching, especially on slopes in excess of 3H: 1V.
- Loamed and seeded slopes shall be protected from washout by mulching or other acceptable slope protection until vegetation begins to grow.

Stormwater Management System Installation

- The stormwater management system shall be installed from the downstream end up and in a manner which will not allow runoff from disturbed areas to enter pipes.
- Excavation for the system shall not be left open when rainfall is expected overnight. If left open under other circumstances, pipe ends shall be closed by a staked board or by an equivalent method.
- All catch basin openings shall be covered by a silt bag between the grate and the frame or protected from sediment by silt fence surrounding the catch basin grate.

Completion of Paved Areas

- During the placement of sub-base and pavement, entrances to the stormwater management system shall be sealed when rain is expected. When these entrances are closed, consideration must be given to the direction of run-off and measures shall be undertaken to minimize erosion and to provide for the collection of sediment.
- In some situations it may be necessary to keep catch basins open.
- Appropriate arrangements shall be made downstream to remove all sediment deposition.

Stabilization of Surfaces

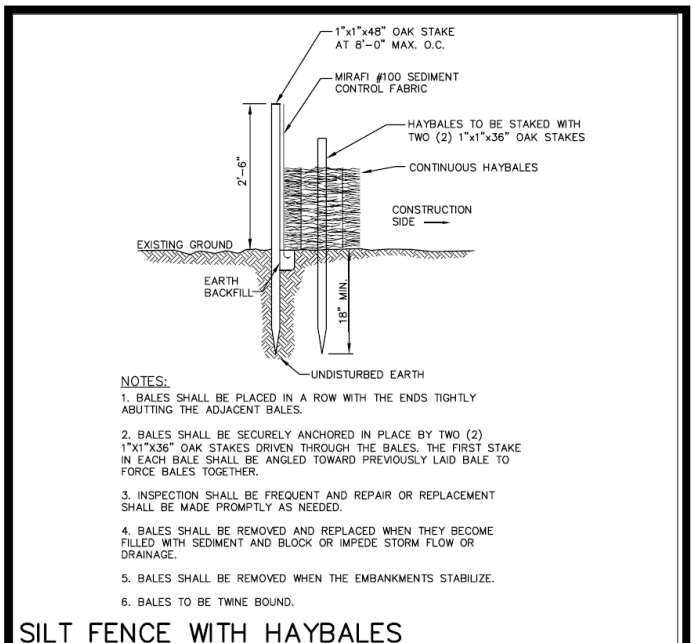
- Stabilization of surfaces includes the placement of pavement, rip-rap, wood bark mulch and the establishment of vegetated surfaces.
- Upon completion of construction, all surfaces shall be stabilized even though it is apparent that future construction efforts will cause their disturbance.
- Vegetated cover shall be established during the proper growing season and shall be enhanced by soil adjustment for proper pH, nutrients and moisture content.
- Surfaces that are disturbed by erosion processes or vandalism shall be stabilized as soon as possible.
- Areas where construction activities have permanently or temporarily ceased shall begin stabilization activities immediately and be stabilized within 14-days from the last construction activity.
- Hydro-mulching of grass surfaces is recommended, especially if seeding of the surfaces is required outside the normal growing season.
- Hay mulch is an effective method of temporarily stabilizing surfaces, but only if it is properly secured by branches, weighted snow fences or weighted chicken wire.

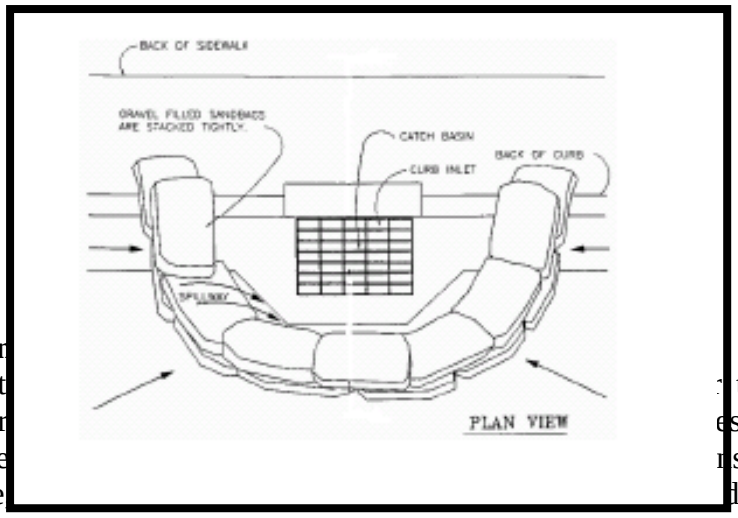
1.07 Temporary Structural Erosion Control Measures

Temporary erosion control measures serve to minimize construction-associated impacts to wetland resource and undisturbed areas. Please refer to the following sections for a description of temporary erosion control measures implemented as part of the project and this sample SWPPP.

1.07.1 Silt Socks, Hay bales, and Silt Fencing

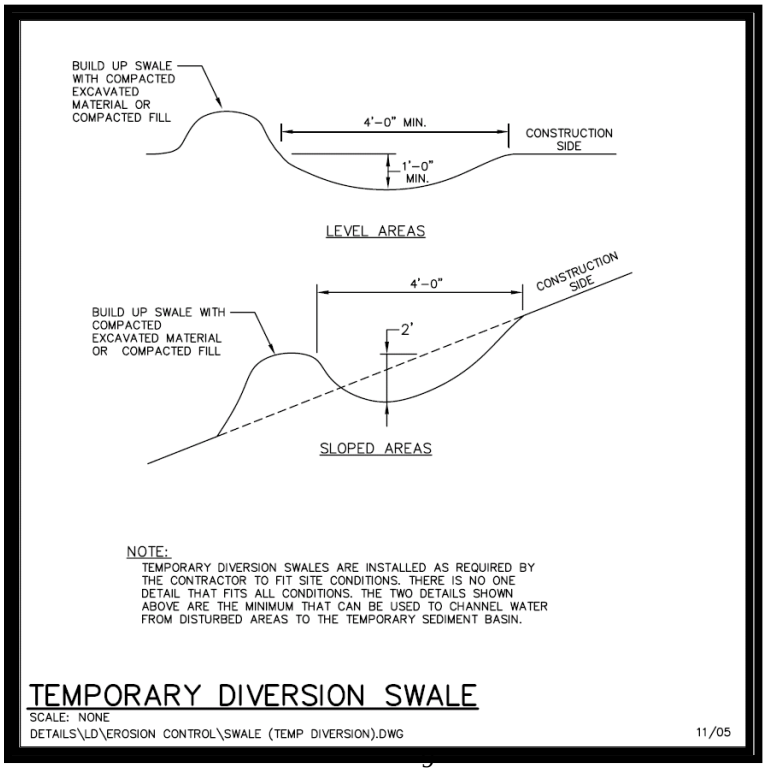
Siltation barriers composed of silt socks or double-staked hay bales and trenched silt fence will be installed as shown on the Site Plans. The siltation barriers will demarcate the limit of work, form a work envelope and provide additional assurance that construction equipment will not enter the adjacent wetlands or undisturbed portions of the site. All barriers will remain in place until disturbed areas are stabilized.





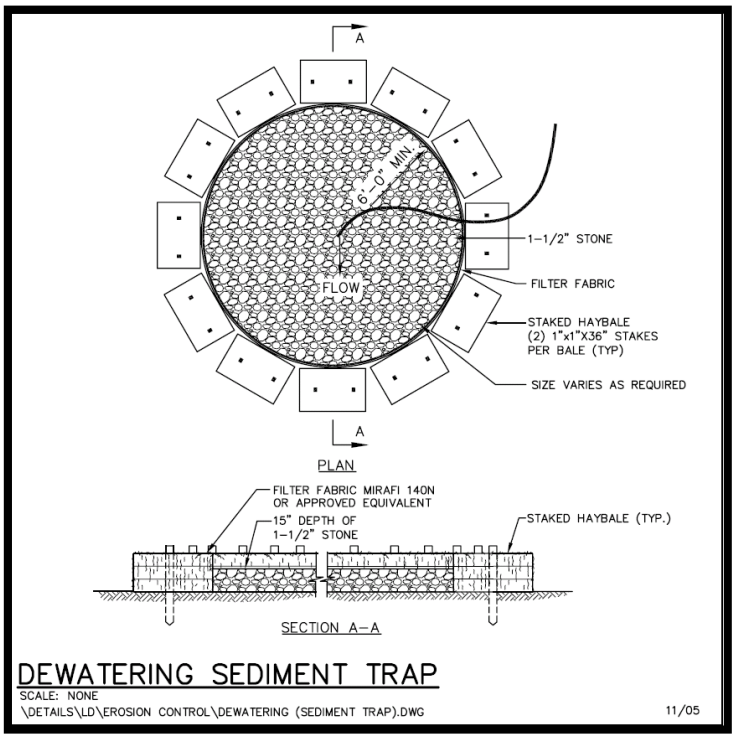
1.07.2 Ten

A t r temporarily diverting
stor es during storm events.
The nstruction begins at the
site diversion swale should
be routinely compacted or seeded to minimize the amount of exposed soil.



1.07.3 Dewatering Basins

Dewatering may be required during stormwater management system installation, foundation construction, and/or utility installation. Dewatering basins shall be constructed under the direction of the Engineer and Licensed Site Professional (LSP). Should the need for dewatering arise, groundwater will be pumped directly into a temporary settling basin, which will act as a sediment trap during construction. All temporary settling basins will be located within close proximity of daily work activities. Prior to discharge, all groundwater will be treated by means of the settling basin or acceptable substitute. Discharges from sediment basins will be free of visible floating, suspended and settleable solids that would impair the functions of a wetland or degrade the chemical composition of the wetland resource area receiving ground or surface water flows and will be to the combined system.



1.07.4 Material Stockpiling Locations

Materials from piping and trench excavation associated with the subsurface utility work will be contained with a single row of silt socks and/or hay bales.

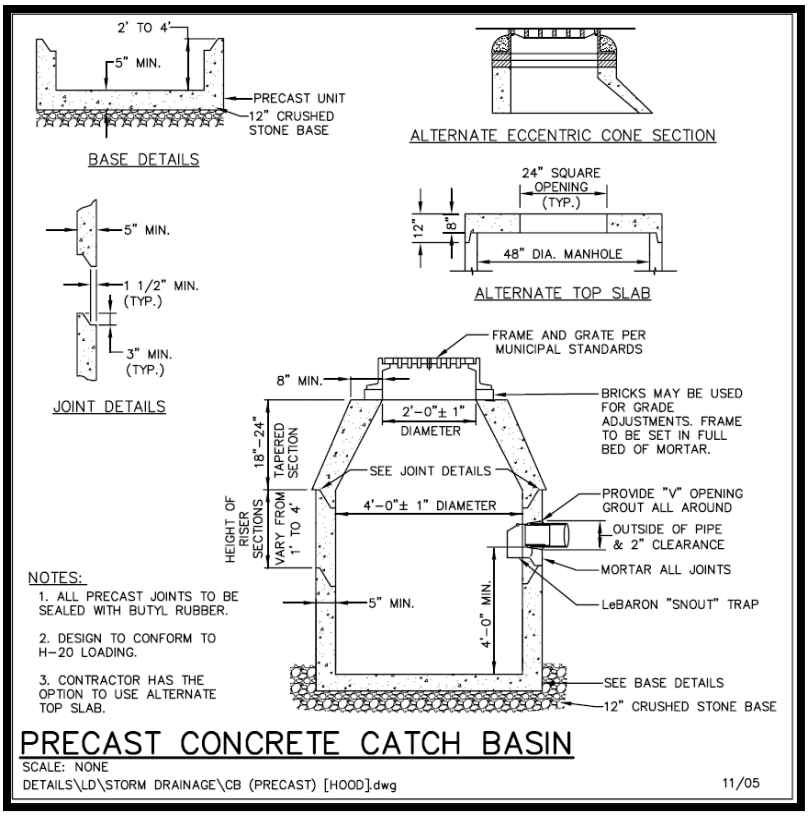
1.08 Permanent Structural Erosion Control Measures

Permanent erosion control measures serve to minimize post-construction impacts to wetland resource areas and undisturbed areas. Please refer to the following sections for a description of permanent erosion control measures implemented as part of the project and this SWPPP.

1.08.1 Catch Basins with Deep Sumps, Hooded Traps and Oil Absorbent Pillows

Parking lots will be curbed and provided with catch basins to collect runoff. The entire stormwater management system for each respective project phase will be installed during the initial phases of construction. The system will be installed from the downstream end up, and in a manner which will not allow runoff from disturbed areas to enter the pipes.

The catch basins will be inspected and cleaned as necessary (sediment depth of 12-inches) at least two times per year. The optimum time for cleaning is during the period just after the snowmelt of late winter and prior to the onset of heavy spring precipitation. All sediments and hydrocarbons will be properly handled and disposed of in accordance with local state and federal guidelines and regulations.



1.08.3 Detention System

Maintenance is required for the proper operation of the underground detention systems. The use of pretreatment BMPs will minimize failure and maintenance requirements.

After construction, the detention system shall be inspected after every major storm for the first few months to ensure proper stabilization and function. Water levels in the access ports shall be recorded over several days to check the drainage of the systems. It is recommended that a log book be maintained showing the depth of water in the detention system at each observation in order to determine the rate at which the system dewaters after runoff producing storm events. Once the performance characteristics of the detention system have been verified, the monitoring schedule can be reduced to an annual basis, unless the performance data suggests that a more frequent schedule is required.

Preventive maintenance on the detention system shall be performed at least twice a year, and sediment shall be removed from any and all pretreatment and collection structures. Sediment shall be removed when deposits approach within six inches of the invert heights of connecting pipes between unit rows, or in sumped inlet structures.

1.09 Good Housekeeping Best Management Practices

1.09.1 Material Handling and Waste Management

Solid waste generation during the construction period will be primarily construction debris. The debris will include scrap lumber (used forming and shoring pallets and

other shipping containers), waste packaging materials (plastic sheeting and cardboard), scrap cable and wire, roll-off containers (or dumpsters) and will be removed by a contract hauler to a properly licensed landfill. The roll-off containers will be covered with a properly secured tarp before the hauler exits the site. In addition to construction debris, the construction work force will generate some amount of household-type wastes (food packing, soft drink containers, and other paper). Trash containers for these wastes will be located around the site and will be emptied regularly so as to prevent wind-blown litter. This waste will also be removed by a contract hauler.

All hazardous waste material such as oil filters, petroleum products, paint and equipment maintenance fluids will be stored in structurally sound and sealed shipping containers in the hazardous-materials storage area and segregated from other non-waste materials. Secondary containment will be provided for all materials in the hazardous materials storage area and will consist of commercially available spill pallets. Additionally, all hazardous materials will be disposed of in accordance with federal, state and municipal regulations.

Temporary sanitary facilities (portable toilets) will be provided at the site. The toilets will be located away from a concentrated flow path and traffic flow and will have collection pans underneath as secondary treatment. All sanitary waste will be collected from an approved party at a minimum of three times per week.

1.09.2 Building Material Staging Areas

Construction equipment and maintenance materials will be stored at the combined staging area and materials storage areas. Silt fence will be installed around the perimeter to designate the staging and materials storage area. A watertight shipping container will be used to store hand tools, small parts and other construction materials.

Non-hazardous building materials such as packaging material (wood, plastic and glass) and construction scrap material (brick, wood, steel, metal scraps, and pine cuttings) will be stored in a separate covered storage facility adjacent to other stored materials. All hazardous-waste materials such as oil filters, petroleum products, paint and equipment maintenance fluids will be stored in structurally sound and sealed containers under cover within the hazardous materials storage area.

Large items such as framing materials and stockpiled lumber will be stored in the open storage area. Such materials will be elevated on wood blocks to minimize contact with runoff.

The combined storage areas are expected to remain clean, well-organized and equipped with ample cleaning supplies as appropriate for the materials being stored. Perimeter controls such as containment structures, covers and liners will be repaired or replaced as necessary to maintain proper function.

1.09.3 Designated Washout Areas

Designated temporary concrete washout areas will be constructed, as required, to minimize the pollution potential associated with concrete, paint, stucco, mixers etc. Signs will, if required, be posted marking the location of the washout area to ensure that concrete equipment operators use the proper facility. Concrete pours will not be conducted during or before an anticipated precipitation event. All excess concrete and concrete washout slurries from the concrete mixer trucks and chutes will be discharged to the washout area or hauled off-site for disposal.

1.09.4 Equipment/Vehicle Maintenance and Fueling Areas

Several types of vehicles and equipment will be used on-site throughout the project including graders, scrapers, excavators, loaders, paving equipment, rollers, trucks and trailers, backhoes and forklifts. All major equipment/vehicle fueling and maintenance will be performed off-site. A small, 20-gallon pickup bed fuel tank will be kept on-site in the combined staging area. When vehicle fueling must occur on-site, the fueling activity will occur in the staging area. Only minor equipment maintenance will occur on-site. All equipment fluids generated from maintenance activities will be disposed of into designated drums stored on spill pallets. Absorbent, spill-cleanup materials and spill kits will be available at the combined staging and materials storage area. Drip pans will be placed under all equipment receiving maintenance and vehicles and equipment parked overnight.

1.09.5 Equipment/Vehicle Wash down Area

All equipment and vehicle washing will be performed off-site.

1.09.6 Spill Prevention Plan

A spill containment kit will be kept on-site in the Contractor's trailer and/or the designated staging area throughout the duration of construction.

1.09 Inspections

Maintenance of existing and proposed BMP's to address stormwater management facilities during construction is an on-going process. The purpose of the inspections is to observe all sources of stormwater or non-stormwater discharge as identified in the SWPPP as well as the status of the receiving waters and fulfill the requirements of the Order of Conditions. The following sections describe the appropriate inspection measures to adequately implement the project's SWPPP. A blank inspection form is provided at the end of this section. Completed inspection forms are to be maintained on site.

1.10.1 Inspection Personnel

The owner's appointed representative will be responsible for performing regular inspections of erosion controls and ordering repairs as necessary.

1.10.2 Inspection Frequency

Inspections will be performed by qualified personnel once every 7 days in accordance with the CGP and the Town of Burlington Conservation Commission.

The inspections must be documented on the inspection form provided at the end of this section, and completed forms will be provided to the on-site supervisor and maintained at the Owner's office throughout the entire duration of construction.

1.10.3 Inspection Reporting

Each inspection report will summarize the scope of the inspection, name(s) and qualifications of personnel making the inspection, and major observations relating to the implementation of the SWPPP, including compliance and non-compliance items. Completed inspection reports will remain with the completed SWPPP on site.

1.11 Amendment Requirements

The final SWPPP is intended to be a working document that is utilized regularly on the construction site, and provides guidance to the Contractor. It must reflect changes made to the originally proposed plan and will be updated to include project specific activities and ensure that they are in compliance with the NPDES General Permit and state and local laws and regulations. It should be amended whenever there is a change in design, construction, operation or maintenance that affects discharge of pollutants. The following items should be addressed should an amendment to the SWPPP occur:

- Dates of certain construction activities such as major grading activities, clearing and initiation of and completion of stabilization measures should be recorded.
- Future amendments to the SWPPP will be recorded as required. As this SWPPP is amended, all amendments will be kept on site and made part of the SWPPP.
- Upon completion of site stabilization (completed as designed and/or 70% background vegetative cover), it can be documented and marked on the plans. Inspections are no longer required at this time.
- Corrective action reports.
- Inspections often identify areas not included in the original SWPPP, which will require the SWPPP to be amended. These updates should be made within seven days of being recognized by the inspector.

Commonwealth of Massachusetts

Division of Fisheries & Wildlife

MassWildlife

Wayne F. MacCallum, *Director*

November 13, 2013

Arnold Chace
Mashpee Commons Limited Partnership
PO Box 1530
Mashpee MA 02649

RE: Project Location: Route 28 & Great Neck Road South, Mashpee
Project Description: Mashpee Commons Trout Pond Development
NHESP File No.: 00-7563

Dear Mr. Chace:

Thank you for submitting the MESA Project Review Checklist, site plans depicting the Limit of Future Development ("Trout Pond Open Space Plan" dated November 7, 2013) and other required materials to the Natural Heritage and Endangered Species Program of the MA Division of Fisheries & Wildlife (the "Division") for review pursuant to the Massachusetts Endangered Species Act (MESA) (MGL c.131A) and its implementing regulations (321 CMR 10.00).

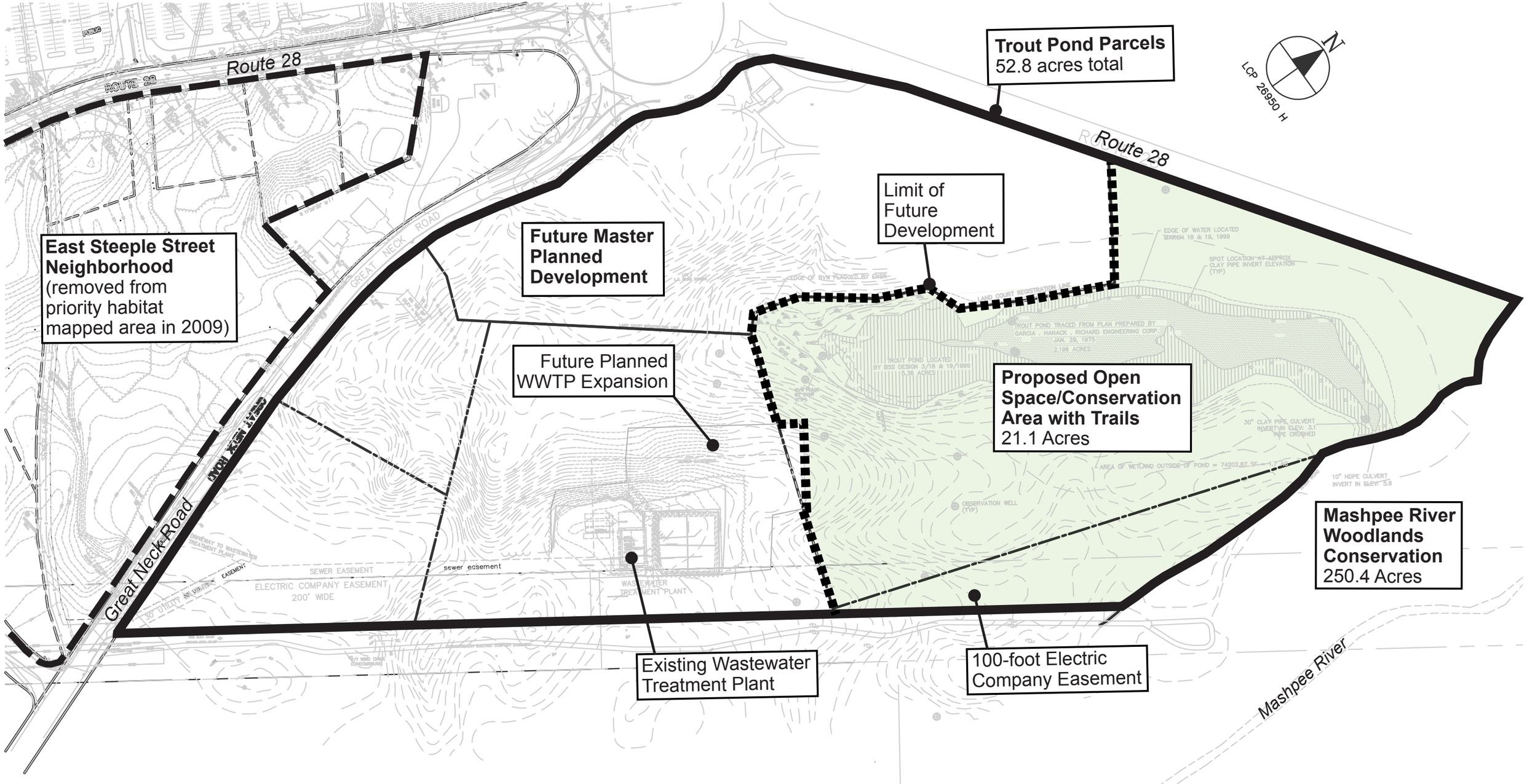
Based on a review of the information that was provided and the information that is currently contained in our database, the Division has determined that this project, as currently proposed, **will not result in a prohibited "take"** of state-listed rare species. This determination is a final decision of the Division of Fisheries & Wildlife pursuant to 321 CMR 10.18. Any changes to the proposed project or any additional work beyond the limit of development shown on the site plans may require an additional filing with the Division pursuant to the MESA. This project may be subject to further review if no physical work is commenced within five years from the date of issuance of this determination, or if there is a change to the project.

Please note that this determination addresses only the matter of state-listed species and their habitats. If you have any questions regarding this letter please contact Emily Holt, Endangered Species Review Assistant, at (508) 389-6385.

Sincerely,

Thomas W. French, Ph.D.
Assistant Director

cc: Jonathan Ford, Morris Beacon Design



MORRIS BEACON design
460 Harris Ave., Unit 104
Providence, RI 02909
t: 401.451.5123
www.morrisbeacon.com
CIVIL ENGINEERING. PLANNING. URBAN DESIGN.
implementing community vision

Notes:
1. Existing conditions per "Topographic Plan of Land" by BSS Design dated 11/6/07.
2. Future Trout Pond master planned development planning and coordination with permitting authorities is in progress.

Trout Pond Open Space Plan

Mashpee Commons - Mashpee, MA

November 7, 2013
Scale: 1"=200'

ECONOMIC & FISCAL IMPACT ANALYSIS:
MASHPEE SENIOR HOUSING FACILITY

Prepared

by

Clyde W. Barrow, Ph.D., General Manager
Pyramid Associates, LLC

for

THE NORTHBRIDGE COMPANIES

for submission

to the

CAPE COD COMMISSION

NOVEMBER 2015

ECONOMIC & FISCAL IMPACT ANALYSIS:

MASHPEE SENIOR HOUSING FACILITY

MAJOR FINDINGS

Investment:
$23.3 million senior residential care facility

Direct Economic Impacts (Construction):
85 jobs and $4.3 million in employee compensation
Average Annual Wage = $50,753

Indirect & Induced Economic Impacts (Construction):
50 jobs and $2.0 million in employee compensation

Direct Economic Impacts (Operations):
56 jobs (48.5 FTE) and $2.2 million in employee compensation
+ additional 25% ($538,369) toward fringe benefits
Average Annual Wage = $38,455

Indirect & Induced Economic Impacts (Operations):
19 jobs and $661,000 in employee compensation

Fiscal Impact:
$138,561 net additional property tax revenue annually to the Town of Mashpee

CONTENTS

CONTENTS

FIGURES

TABLES

[This page left blank intentionally]

1.00 PURPOSE OF THE REPORT

The Northbridge Companies, based in Burlington, Massachusetts is proposing a 2-story approximately 65,000 square feet senior residential care facility to be constructed on 4.93 acres of land zoned for commercial development at 66 Great Neck Road South (just north of the road's intersection with Donnas Lane) in Mashpee, Massachusetts.[1] The proposed senior residential care facility qualifies as a Development of Regional Impact (DRI) under the Cape Cod Commission Act of 1990, particularly as implemented in Section 3(e)(i) of the Commission's *Enabling Regulations Governing Review of Developments of Regional Impact*, which state that a project qualifies as a DRI if it involves "new construction of any building or buildings (including any accessory and auxiliary structures) with a Gross Floor Area greater than 10,000 square feet."[2]

For purposes of providing an economic and fiscal impact analysis of the proposed senior residential care facility, it is assumed that the project will be reviewed by the Cape Cod Commission against the Economic Development Goals and the Minimum Performance Standards (MPS) established in the 2012 Regional Policy Plan (RPP) and the Cape Cod Commission's *Economic Development Technical Bulletin, No. 04-002.*

The 2012 RPP (pp. 109-113) establishes four major Economic Development (ED) Goals:

> **ED1** To promote the design and location of development and redevelopment to preserve the Cape's environmental and cultural heritage, use infrastructure efficiently, minimize adverse impacts, and enhance the quality of life for Cape Codders.
>
> **ED2** To promote a balanced regional economy with a broad business, industry, employment, cultural, and demographic mix capable of support year-round and quality employment opportunities.[3]
>
> **ED3** To promote economic activity that retains and attracts income to the region and benefits residents, thus increasing economic opportunity for all.[4]

[1] The parcel is 44,012 square feet.

[2] Barnstable County Ordinance, 90-12 (as subsequently amended and revised, effective March 2011).

[3] Economic Development Goal 2 has three sub-goals, which include (1) a prohibition on Class III casino gaming, (2) the creation of quality employment opportunities by DRIs by providing competitive wages consistent with the state average for that industry, employer-supported medical and retirement benefits packages, training opportunities beyond that need to perform the current job, and opportunities for advancement, and (3) support for employee housing by providing housing for 10 percent of the establishment's year-round employees by providing actual units or through participation in the Housing Assistance Corporation's Employer Assisted Housing Program (or its equivalent) for 10 percent of year-round employees.

[4] Economic Development Goal 3 has seven sub-goals, including (1) that DRIs employ a majority of local residents and use a majority of local contractors, suppliers, professional service providers, and products during the planning, construction, and operational phases of the project, (2) DRIs allow for local ownership of non-formula businesses consistent with the economic, environmental and community character goals of this RPP, (3) DRIs employ or directly benefit residents with disabilities, minorities, elderly, unemployed, and

> **ED4** To provide adequate capital facilities and infrastructure that meet community and regional needs, expand community access to services, and improve the reliability and quality of services.[5]

The Commission's *Economic Development Technical Bulletin, No. 04-002* is designed to provide DRI applicants with written parameters for the Commission's review process and to assist them in providing the data and other information necessary for the Commission and its staff to make an informed review. In particular, MPS 3.1.1 states that in reviewing any Development of Regional Impact, the Commission weighs the estimated/anticipated benefits and detriments of the project and that the applicant bears the burden of demonstrating to the Commission that the benefits of the project outweigh the detriments. MPS 3.1.1 further states that the Commission will evaluate the economic impacts of proposed developments by taking into account net job creation, fiscal impact, employee benefits, housing needs, and services and/or products provided. The Commission will consider any negative or positive impacts that a project may have on the Cape Cod economy. Therefore, as stated in the *Economic Development Technical Bulletin* (2004, 1), the economic data that the DRI applicants are "responsible for providing" are at least those that the Commission needs to minimally fulfill its obligation to "evaluate the economic impacts of the proposed developments" and "consider any negative or positive impacts that a project may have on the Cape Cod economy."

The Regional Policy Plan, Part I.3, Minimum Performance Standard (MPS) 3.1.1 states that "Commercial/Industrial Developments of Regional Impact applicants shall be responsible for providing economic data" to the Commission. For this purpose, and in compliance with this standard, The Northbridge Companies retained Dr. Clyde W. Barrow, Ph.D., General Manager of Pyramid Associates, LLC and Chair of the Department of Political Science at the University of Texas – Rio Grande Valley (see Appendix B) to prepare an economic and fiscal impact analysis of the proposed development.

---

under-employed residents, and/or hires minority- and women-owned contractors, (4) DRIs export goods and services not previously exported, (5) DRIs provide goods and services locally that were previously imported into the region, (6) DRIs add value to goods prior to their final sale not previously added locally, and (7) DRIs have a positive net fiscal impact on the community where they are located.

[5] Economic Development Goal 4 has two sub-goals, including (1) the development of infrastructure and/or capital facilities be in response to existing regional demand and improve the availability, reliability, quality, and cost of services and (2) DRIs provide fiber optic or equivalent high-speed broadband connections for businesses, residents, and institutions, without restrictions on applications, devices, and content and without connection preferences to any individual provider of telecommunications services.

2.00 PROJECT INFORMATION

2.10 PROJECT DESCRIPTION

The proposed Mashpee Senior Housing Facility will be a 2-story approximately 65,000 square feet senior residential care facility to be constructed on 4.93 acres of land zoned for commercial development at 66 Great Neck Road South (just north of the road's intersection with Donnas Lane) in Mashpee, Massachusetts.[6] The facility will include 52 residential care units and 20 Alzheimer's units (see Figure 1 – Floor Plan).

Health Care Valuation Advisors, Inc. (HCVA, Inc.) prepared a separate market feasibility analysis, which should be read as background to the economic and fiscal impact analysis.[7] HCVA, Inc. identifies the primary market area for the proposed facility as the towns of Mashpee, Barnstable, Falmouth, Bourne, and Sandwich (see Figure 2). The secondary market area includes other communities on Cape Cod, as well as those further away, including a significant portion of residents (25%) who will come from outside the local area to be closer to children and other family members (HCVA, Inc. 2015, 66-67). The target resident for the facility is a senior age 75 or older who lives alone, owns their own home, and who requires assistance with activities of daily living (ADL) and/or suffers from Alzheimer's disease or other related dementia.

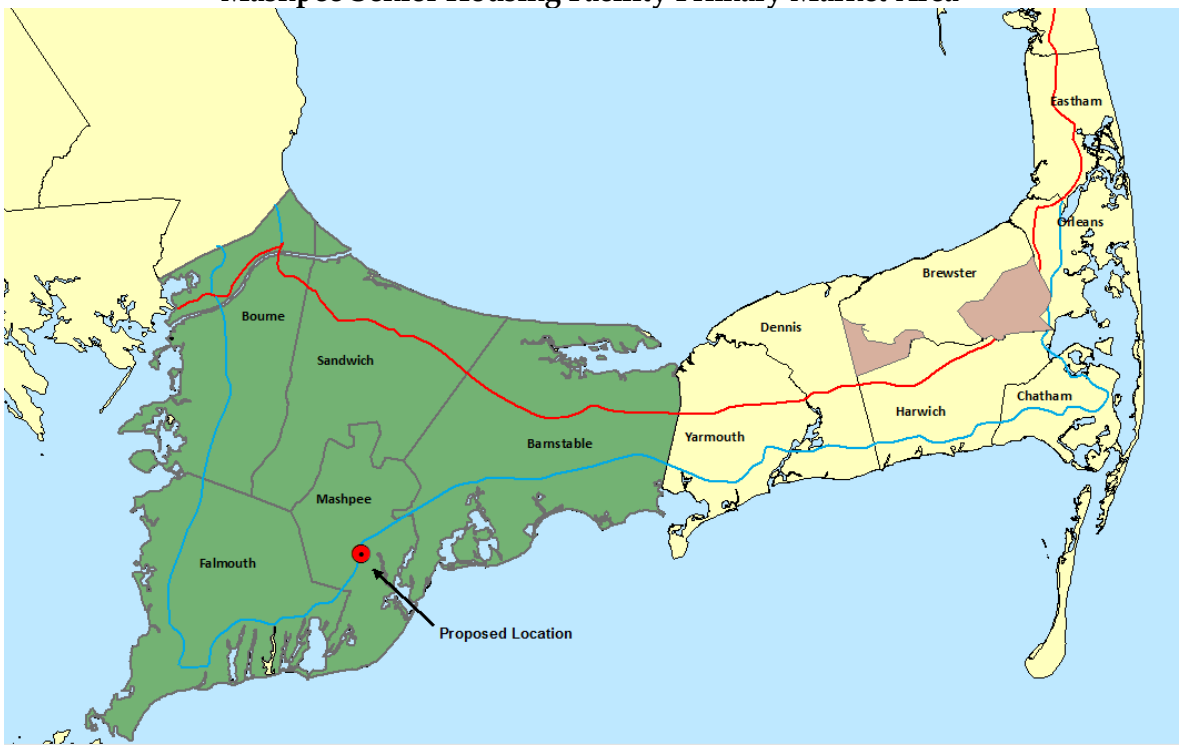
HCVA, Inc.'s study estimates that under current and projected 5-year market conditions there is current (2015) unmet demand for 162 traditional assisted living units and current unmet demand for 35 memory-impaired (Alzheimer's) units (HCVA, Inc. 2015, 70, 80). By 2020, the unmet demand increases to 182 traditional assisted living units and 40 memory-impaired units (HCVA 2014, 70, 80). These estimates account for vacancies at existing comparable senior housing facilities in the primary market area as well as new supply already approved and under development in the primary market area.

[6] The parcel is 44,012 square feet.

[7] Health Care Valuation Advisors, Inc., *A Limited-Scope Restricted-Use Market Feasibility Analysis and Study of Proposed Seniors Housing Facility: Great Neck Road South, Mashpee, Massachusetts* (Princeton, Mass., 2015).

Figure 1
Floor Plan (1st Floor) of Proposed Mashpee Senior Housing Facility

Figure 2
Mashpee Senior Housing Facility Primary Market Area



The proposed Mashpee Senior Housing Facility will be competing directly against 10 other specialized facilities in the primary market area that offer various combinations of skilled nursing care, residential care, and memory-impaired care (see Figure 3).[8]

Figure 3
Location of Competitors to Mashpee Senior Housing Facility

[8] See, Ibid. (2015, 10-52) for a detailed description of comparable facilities, including additional assisted living facilities under development in the primary market area (Ibid., 53-55).

Based on the number of units available after the construction of the Mashpee senior Housing Facility, the proposed Mashpee facility will capture approximately 10% of the traditional assisted living market in the primary market area and about 6% of the Alzheimer's market in the primary market area (see Table 1). The facility will have a zero percent (0%) market share of independent living units and skilled nursing units.

Table 1

MASHPEE SENIOR HOUSING FACILITY MARKET SHARE: NUMBER OF UNITS (EXISTING & APPROVED)

	Assisted Living	Memory-Impaired
Heritage at Falmouth	56	-
Atria Woodbriar	180	44
Cape Cod Senior Residences	60	-
Decatur House	31	-
Mayflower Place	10	75
Emeritus at Cape Cod	60	20
Brookside at Regency	-	29
Harbor Point at Centerville	-	65
Keystone Place	55	20
Bridges at Mashpee	-	60
Total	**452**	**313**
Proposed Mashpee Senior Housing Facility	50	20
New Total	**502**	**333**
Mashpee SHF Market Share (by units available)	10%	6%

Source: Calculated from data in HCVA, Inc. (2015, 10, 53). **Note:** Includes additional units being added or under development at Decatur House, Keystone Place, Mayflower Place, and Bridges at Mashpee.

HCVA, Inc. estimates that 75% of the Mashpee facility's assisted living and memory-impaired units will be occupied by residents who currently reside within the primary market area and that 25% of the units will be occupied by residents who currently reside in the Mid- or Lower Cape or off-Cape.[9] However, without the construction of additional capacity in these market niches, underserved residents who either require or want these services will be forced to import their purchases from off-Cape locations by seeking these services at off-Cape facilities. Consequently, the proposed senior housing facility will have a nearly 100% export factor, because the new facility will serve unmet demand that will otherwise leave the Cape for facilities elsewhere, while also capturing a significant portion of customers (up to 25%) from off-Cape.

In addition, this export income re-circulates in the local economy through the salaries and wages paid to employees (see Section 3.41 below) and through direct local purchases from Cape-based vendors. The IMPlan econometric model for Barnstable County indicates that comparable Nursing & Community Care Facilities (IMPlan Code 483) in the county have

[9] Ibid. (2015, 67).

a Local Purchase Percentage of 99.27%, which means that nearly all direct non-payroll purchases are made from vendors in the local market area.[10]

2.20 PROJECT LOCATION

The proposed senior residential care facility is not located in a Certified Growth Activity Center or Growth Incentive Zone.[11] It is not located in an Industrial and Service Trade Area, nor is it located in a Village.[12]

The Cape Cod Commission Act also authorizes the Commission to designate specific resource-sensitive areas as Districts of Critical Planning Concern (DCPC) for specific planning and regulatory efforts. The proposed senior residential care facility will not be located in a DCPC as there are not CDPCs in the Town of Mashpee.[13]

2.30 CAPITAL INVESTMENT

The Mashpee Senior Housing Facility will require approximately $23.3 million in total capital investment. The capital investment includes $13.1 million in building and construction (56.2%), $0.9 million in furnishings, furniture, and equipment (3.7%), $2.2 million in fees, interest, and insurance (9.8%), $2.3 million in professional services (9.8%),[14] and $2.1 million in land value and acquisition (8.9%), and $2.7 million in miscellaneous start-up costs, such as management, marketing, and contingencies (11.6%) (see Table 2).[15]

[10] Implan's Local Purchase Percentage is derived from the U.S. Bureau of Economic Analysis Input-Output Accounts. The I/O Accounts are developed from a variety of data sources, but the most important source of information is the U.S. Economic Census, which is conducted every five years, see, U.S. Bureau of Economic Analysis, *Concepts and Methods of the U.S. Input-Output Accounts* (Washington, D.C.: U.S. Department of Commerce, 2009), Chaps. 1, 3.

[11] Cape Cod Commission, *Regional Policy Plan, 2012,* pp. 6, A5 defines Growth Incentive Zones (GIZ) as "areas suitable for concentrated mixed-use development that qualify for more streamlined regulatory standards under the Regional Policy Plan for projects reviewed as Developments of Regional Impact (DRIs). These zones are proposed by a municipality and designated by the Commission through a process separate from that of Certified Growth/Activity Centers. This process does not require that a town have a certified Local Comprehensive Plan.

[12] Cape Cod Commission, Cape Code Regional Land Use Vision Map, 2011, see, http://www.capecodcommission.org/resources/RPP/capevision_09RPP_amend0311.pdf

[13] Cape Cod Commission, *Regional Policy Plan, 2012,* pp. 3-5.

[14] Includes architectural and construction engineering services, legal services, environmental consultants, traffic engineering, civil and site engineers, land and building appraisals, market feasibility analysis, and economic and fiscal impact analysis.

[15] All financial and economic impact data is reported in 2014 dollars to facilitate accurate comparisons with Massachusetts Department of Labor and Workforce Development ES-202 and Occupational Wage data. The most recent ES-202 data available at the time this report was prepared was 3rd Quarter 2014.

Table 2

Mashpee Senior Housing Facility:
Estimated Capital Investment

Item		Estimated Cost
Professional Services	$	2,292,000
Insurance, Fees, & Interest	$	2,283,063
Furniture, Furnishings, Equipment	$	857,500
Land Value & Acquisition	$	2,075,000
Miscellaneous Start-Up Costs	$	2,716,153
Sub-Total	$	10,223,716
Building & Construction	$	13,103,750
TOTAL	**$**	**23,327,466**

Source: The Northbridge Companies (2014).

[This page left blank intentionally]

3.00 ECONOMIC & EMPLOYMENT IMPACTS

3.10 DEFINITIONS

Economic impacts measure the importance of an economic activity primarily in terms of the output, employment, and personal income generated by that activity:

> **Output** -- the value of goods and services produced at the identified business establishment or construction project.
>
> **Employment** -- the number of people employed at the identified business establishment or construction project, including wage and salary employees and self-employed persons.
>
> **Personal Income** -- the wages, benefits, and other income derived from employment that is linked geographically to the identified work site.

Economic impacts consist of direct impacts, indirect impacts, induced impacts, and total impacts:

Direct Economic Impacts are the economic activities carried out at a business establishment or construction project and are therefore an immediate consequence of the economic activity that would not have occurred in the absence of the business establishment or construction project.

Indirect Economic Impacts are generated by off-site economic activities that are attributable to the identified business establishment. These economic activities occur mainly as a result of *non-payroll expenditures* or *local purchases* by the business within a defined local area (e.g., county). Local expenditures include a range of operating expenses such as construction materials, office supplies, motor transport, horticultural services, furniture, utilities, maintenance and repairs, business machines, business services, management consulting, and so forth. Indirect impacts differ from direct impacts insofar as they originate entirely off-site, although the indirect impacts would not have occurred in the absence of the identified business establishment.

Induced Economic Impacts are the multiplier effects of the direct and indirect impacts created by successive rounds of spending by employees and proprietors.[16]

Total Economic Impacts are the sum of the direct, indirect, and induced impacts.

[16] Most of the take-home income earned by employees is spent locally. Some of this spending becomes income to local individuals who provide services to employees. Some the spending by employees goes to local businesses and becomes income to the business owners and their employees. Subsequently, part of these second-round incomes are also spent locally and thus become income to another set of individuals. As successive rounds of spending occur, additional income is created in the local area, region, and state. The impact of these successive rounds of spending is called a "multiplier effect."

3.20 METHODOLOGY

The North American Industry Classification System (NAICS) classifies all business establishments into one or more of twenty major Sectors. The Mashpee Senior Housing Facility will be classified under NAICS Sector Code 62331 Community Care Facilities for the Elderly, which is defined as follows:

> "This industry comprises establishments primarily engaged in providing residential and personal care services for (1) the elderly and other persons who are unable to fully care for themselves and/or (2) the elderly and other persons who do not desire to live independently. The care typically includes room, board, supervision, and assistance in daily living, such as housekeeping services. In some instances these establishments provide skilled nursing care for residents in separate on-site facilities" (Executive Office of the President, 2012, 824-25).

Economic models can be used to forecast personal income, employment, business sales, and value-added impacts for most industries, including residential care facilities. The available models represent a continuum of sophistication and cost that must be balanced against project budgets and the potential size of project impacts (where dynamic modeling becomes more important). The available models consist of Input/Output Models and Economic Simulation Models.

Input/Output (I/O) Models are essentially accounting tables which trace the linkages of inter-industry purchases and sales within a given county, region, state, or country. They utilize information on technologies and local trade. Technology data consists of information on the inputs from other industries that are used to produce a dollar of output for each specific industry. Local trade data consists of information on how much of a given industry's purchases are supplied by other firms located within the study area. The I/O model yields multipliers that are used to calculate the total direct, indirect, and induced effect on jobs, income, and output generated per dollar of spending on various types of goods and services in the study area. Input/Output Models calibrated for specific counties are commercially available for any part of the United States from the Minnesota IMPlan Group (MIG, Inc.) and the U.S. Bureau of Economic Analysis (RIMS II – Regional Input/Output Multiplier System II).

The indirect and induced economic impacts of the proposed Mashpee Senior Housing Facility were calculated and specified using IMPLAN (Impact Analysis for PLANing), which is an Input/Output modeling system developed by applied economists at the University of Minnesota and the U.S. Forest Service. Figures on direct employment supplied by The Northbridge Companies were confirmed using IMPLAN by insuring that standard input (labor)/output (sales) accounts were consistent with established data for Barnstable County and with comparable facilities in the county. The IMPLAN modeling system has been in use since 1979 and is currently used by over 500 private consulting firms, university research centers, and government agencies. The IMPLAN modeling system uses input-output analysis to construct quantitative models of trade flow

relationships between businesses and between businesses and final consumers. From this data, one can examine the effects of a change in one or several economic activities to predict its effect on a specific state, regional, or local economy (impact analysis).

The IMPLAN input-output accounts capture all monetary market transactions for consumption in a given time period. The IMPLAN input-output accounts are based on industry survey data collected periodically by the U.S. Bureau of Economic Analysis and follow a balanced account format recommended by the United Nations. IMPLAN also includes social accounting data (e.g., personal income and gross state product) that makes it possible to measure non-industrial transactions such as the payment of indirect taxes by businesses and households. The IMPLAN database provides data coverage for the entire United States by county and has the ability to incorporate user-supplied data at each stage of the model building process to insure that estimates of economic impacts are both up-to-date and specific to an economic area.[17] IMPLAN can construct local input-output models in units as small as five-zip code clusters.

IMPLAN's Regional Economic Accounts and Social Accounting Matrices are used to construct local, county, or state-level multipliers specific to an economic area. Multipliers describe the response of an economy to a change in demand or production. The multipliers allow economic impact analysis to move from a descriptive input-output model to a predictive model. Each industry that produces goods or services generates demand for other goods and services and this demand is multiplied through a particular economy until it dissipates through "leakage" to economies outside the specified area. Thus, multipliers calculate the response of the economic area to a change in demand or production.

IMPLAN models *discern and calculate leakage* from local, regional, and state economic areas based on workforce configuration, the inputs required by specific types of businesses, and the availability of both inputs in the economic area. Consequently, *economic impacts that accrue to other regions or states as a consequence of a change in demand are not counted as impacts within the economic area*. The model accounts for substitution and displacement effects by deflating industry-specific multipliers to levels well below those recommended by the U.S. Bureau of Economic Analysis. In addition, multipliers are applied only to *personal disposable income* to obtain a more realistic estimate of the multiplier effects from increased demand. The model only includes personal income such as wages, benefits, and proprietor income that are linked geographically to the workplace site. The reliability of these estimates has been proven through empirical testing.

A predictive model is constructed by specifying a series of new expenditures in a specific economic area (e.g., new employment or construction) which is then applied to the industry multipliers for that particular region. Based on these calculations, the model estimates final demand, which includes employment, employee compensation (excluding

[17] The IMPLAN modeling system draws on a variety of statistical sources, including the Bureau of Labor Statistics Growth Model, Bureau of the Census, ES-202 employment and earnings data, the Regional Economic Information System (REIS), and the Bureau of Economic Analysis Gross State Product data.

benefits), and point-of-work personal income (including benefits). The initial IMPLAN data details all purchases in a given area, including imported goods and services. Importantly, IMPLAN's Regional Economic Accounts exclude imports to an economic area so the calculation of economic impacts identifies only those impacts specific to the targeted economic area.

IMPLAN calculates this distinction by applying Regional Purchase Coefficients (RPC) to predict regional purchases based on an economic area's particular characteristics. The Regional Purchase Coefficient represents the proportion of goods and services that will be purchased regionally under normal circumstances, based on the area's economic characteristics described in terms of actual trade flows within the area. IMPLAN also contains a Local Purchase Percentage (LPP) that allows one to calculate the maximum possible economic impacts on an area if all inputs that can be purchased within the area are purchased within that area. The LPP is useful for calculating the potential impact of local vendor and employment preference arrangements.

Economic impacts are normally calculated separately for the *construction phase* and *operations phase* of a business establishment. The economic impacts of construction and other capital expenditures are inherently limited in duration and last only as long as construction and related capital purchases are underway. The operations phase of a business establishment generates economic impacts that continue as long as the facility remains in existence.

3.21 Assignment to IMPLAN Industry Sectors

Construction and building expenditures were assigned to IMPlan Code 52 Commercial of New Health Care Structures for purposes of calculating direct, indirect, and induced impacts. Operations phase revenues were assigned to IMPlan Code 483 Nursing & Community Care Facilities for purposes of calculating indirect and induced impacts.

3.22 Regional Purchase Coefficient

The IMPLAN model assumes that all construction is purchased from local contractors, who then purchase goods and services from inside and outside the local area according to the average for the industry. This assumption has been adjusted downward to an RPC of 66.9%, by excluding expenditures for fees, interest, insurance, professional services, and land values to generate a more accurate estimate of construction-related output, employment, and income impacts for Barnstable County.[18]

3.23 Trade and Freight Margins

When a business establishment purchases goods or services, the expenditure covers at least the price of the goods or services, but it may also include the cost of shipping,

[18] The rationale for the downward adjustment of RPC is that most payments for fees, interest, insurance, and professional services will go to off-Cape suppliers, while land purchases do not generate any direct construction employment.

insurance, wholesale margin, retail margin, and brokerage fees. IMPlan provides sector-specific margins to account for these out-of-region expenditures. It is assumed that construction services are purchased directly from contractors.

3.30 CONSTRUCTION PHASE

The Northbridge Companies provided the Consultant with its estimated capital budget for the proposed Mashpee Senior Housing Facility. The proposed Mashpee Senior Housing Facility will require approximately $23.3 million in total capital investment. The capital investment consists of $13.1 million in building and construction (56.2%), $0.9 million in furnishings, furniture, and equipment (3.7%), $2.2 million in fees, interest, and insurance (9.8%), $2.3 million in professional services (9.8%),[19] $2.1 million in land acquisition (8.9%), and $2.7 million in miscellaneous start-up costs, such as management, marketing, and contingencies (11.6%).

Many items that will likely be purchased outside of Barnstable County, such as fees, interest, insurance, and most professional services were excluded from the calculation of construction phase economic impacts, since these expenditures do not generate construction jobs within Barnstable County. For the same reason, the estimated expenditure for land acquisition was excluded from the calculation of construction phase economic impacts.

After these adjustments, the Consultant estimates that the Direct Economic Impact on Barnstable County will be approximately $15.6 million in building and construction expenditures in Barnstable County spread over Calendar Years 2016 and 2017 of the project (i.e., the construction phase).

3.31 Direct Employment & Compensation Impacts

The IMPLAN model predicts that construction of the Mashpee Senior Housing Facility will generate 85 direct construction jobs over an 18-month period and $4.3 million in direct employee compensation (see Table 3). These jobs will have an annual average wage of $50,753 (2014 dollars), which does not include payments for fringe benefits.

Table 3
Mashpee Senior Housing Facility:
Employment & Compensation Impacts of Construction Phase

	Direct	Indirect	Induced	Total
Employment	85	25	25	135
Compensation	$4,314,018	$1,038,710	$1,008,710	$6,361,438
Annual Avg. Wage	$50,753	$41,548	$40,348	$47,122

Source: Implan Version 3.0 (2015). **Note:** 2014 dollars.

[19] Includes architectural and construction engineering services, legal services, environmental consultants, traffic engineering, civil and site engineers, land and building appraisals, market feasibility analysis, and economic and fiscal impact analysis.

3.32 Indirect & Induced Employment & Compensation Impacts

The IMPLAN model predicts that construction of the Mashpee Senior Housing Facility will generate or sustain an additional 25 jobs in Barnstable County through indirect impacts (i.e., construction-related purchases) and 25 jobs through induced impacts (i.e., consumer purchases by construction workers). The employment generated by indirect and induced impacts will generate or sustain an additional $2.0 million in employee compensation in Barnstable County (see Table 3).[20]

The IMPLAN modeling system is able to specify the sector distribution of indirect and induced impacts by calculating the regional effect of construction purchases based on the BEA's input-output accounts for Barnstable County and by calculating the effect of increased consumer demand (employment) from gross state product data. The model predicts that indirect and induced impacts will be distributed widely across the county and that these impacts will be distributed across 32 of IMPLAN's 536 industry account sub-codes.

The most significant indirect and induced impacts will occur in sectors that provide construction-related inputs (e.g., management of companies and enterprises, wholesale trade, real estate, legal services) and consumer services to construction industry employees (e.g., restaurants, retail, and health care) (see Table 4).

Table 4

Industry	Indirect	Induced	Total Off-site
Management of companies and enterprises	10	0	**10**
Wholesale trade businesses	3	0	**3**
Real estate establishments	2	1	**3**
Legal services	2	1	**3**
Retail - Furniture & home furnishings stores	2	0	**2**
Full service restaurants	1	1	**2**
Retail Stores - Clothing & Accessories	0	2	**2**
Limited service restaurants	0	1	**1**
Hospitals	0	1	**1**
Architectural, engineering, & related services	1	0	**1**
Retail Stores - Miscellaneous	0	1	**1**
Retail Stores - Food & beverage stores	0	1	**1**
Offices of physicians	0	1	**1**
Landscape & horticultural services	1	0	**1**
Monetary authorities and deposit credit intermediation	1	0	**1**
Accounting, tax preparation, bookkeeping, & payroll services	1	0	**1**
Retail - Health & personal care stores	0	1	**1**
Automotive repair & maintenance, except car washes	0	1	**1**

Source: IMPLan Version 3.0 (2015).

[20] All financial and economic impact data is reported in 2014 dollars to facilitate accurate comparisons with Massachusetts Department of Labor and Workforce Development ES-202 and Occupational Wage data. The most recent ES-202 data available at the time this report was prepared was 3rd Quarter 2014.

3.40 OPERATIONS PHASE

The operations phase of any business establishment generates economic impacts that continue as long as the establishment remains in existence. The IMPLAN modeling system uses U.S. Bureau of Labor Statistics earnings and income data and the U.S. Bureau of Economic Analysis Regional Economic Information System (REIS) to calculate place of work income. These estimates are based on direct employment estimates specific to the different aspects of an establishment's operations and based on actual rates of compensation in a particular region. The direct, indirect, and induced impacts have been estimated on the basis of current (2014) earnings specific to the local area and on the basis of a staffing matrix specific to the proposed Mashpee Senior Housing Facility.

3.41 Direct Employment & Compensation Impacts

The data provided by The Northbridge Companies indicates that the proposed Mashpee Senior Housing Facility will have 48.5 full-time equivalent employees and a total employee headcount of 56 when it reaches full capacity in 2019 (see Table 5).[21] Approximately 71% of the facility's employees will be full-time employees, while the remaining 29% will be part-time employees.

The total direct wages and salaries paid to these employees annually will be nearly $2.2 million (2014 dollars). This translates into average annual earnings of $38,455 (not including fringe benefits).[22]

The proposed Mashpee Senior Housing Facility will spend approximately $538,369 annually on employer payroll taxes (e.g., unemployment insurance, Social Security) and employee fringe benefits (e.g., health insurance), which is equal to twenty-five percent (25%) of employee wages and salaries.

Table 5

Mashpee Senior Housing Facility:
Employment & Compensation Impacts of Operations Phase

	Direct	Indirect	Induced	Total
Employment	56	6	13	75
Compensation	$2,153,474	$211,235	$450,224	$2,814,933
Annual Avg. Wage	$38,455	$35,206	$34,633	$37,532
Employer Taxes & Benefits	$538,369	--	--	--
Benefits as % of Wages	25.0%	--	--	--

Note: 2014 dollars.

[21] It is estimated that the Mashpee Senior Housing Facility will have 40 full-time employees and 16 part-time employees.

[22] All financial and economic impact data is reported in 2014 dollars to facilitate accurate comparisons with Massachusetts Department of Labor and Workforce Development ES-202 and Occupational Wage data. The most recent ES-202 data available at the time this report was prepared was 3rd Quarter 2014.

3.42 Indirect & Induced Employment & Compensation Impacts

The proposed Mashpee Senior Housing Facility will sustain or generate an additional 6 jobs in Barnstable County through indirect impacts (i.e., facility-related non-payroll purchases) and 13 jobs through induced impacts (i.e., employee purchases) by FY 2019 as the facility reaches operational maturity (see Table 5). The employment generated by indirect and induced impacts will sustain or generate an additional $661,459 million in employee compensation in Barnstable County.

The IMPLAN modeling system is able to specify the sector distribution of indirect and induced impacts by calculating the regional effect of a business establishment's purchases based on the BEA's input-output accounts for Barnstable County and by calculating the effect of increased consumer demand (employment) from gross state product data. The model predicts that indirect and induced impacts will be distributed across 77 of IMPLAN's 536 industry account sub-codes. The most significant indirect and induced impacts will occur in sectors that provide operational inputs to the facility or that provide retail, health care, and real estate services to the facility's employees (see Table 6).

Table 6

Mashpee Senior Housing Facility:
Sector Distribution of Major Indirect and Induced Employment Impacts During Operations Phase

Industry	Indirect	Induced	Total Off-Site
Real estate establishments	2	1	**3**
Full-service restaurants	0	1	**1**
Limited-service restaurants	0	1	**1**
Hospitals	0	1	**1**
Dry-cleaning & laundry services	1	0	**1**
Offices of physicians	0	1	**1**
Retail - Food & beverage stores	0	1	**1**

Source: IMPLan Version 3.0 (2015).

3.50 TOTAL COMBINED EMPLOYMENT IMPACTS

The total economic impacts for construction and operations combined will be realized over a five year period that includes the beginning of construction, the opening of the residential care facility, and a ramp-up to full operating capacity. The estimated rate at which these impacts will be realized in Barnstable County is illustrated in Table 7.

Table 7

Mashpee Senior Housing Facility:
Total Combined Employment Impacts

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Direct Economic Impacts	**29**	**56**	**45**	**56**	**56**
Construction	29	56	-	-	-
Operations	0	0	45	56	56
Indirect Economic Impacts	**9**	**17**	**5**		**6**
Construction	9	17	-	-	-
Operations	-	-	5	6	6
Induced Economic Impacts	**9**	**17**	**10**	**13**	**13**
Construction	9	17	-	-	-
Operations	-	-	10	13	13
Total Economic Impacts	**46**	**89**	**60**	**75**	**75**
Construction	46	89	-	-	-
Operations	-	0	60	75	75

Sources: IMPlan Version 3.0 (2015), Pyramid Associates, LLC (2015), & The Northbridge Companies (2015).
Note: Direct, Indirect & Induced jobs = total jobs (i.e., full-time + part-time).

[This page left blank intentionally]

4.00 JOB QUALITY AND STAFFING MATRIX

The average annual wage for all employees (head count) at the Mashpee Senior Housing Facility is estimated to be $38,455 (2014 dollars). The annual average wage for all private sector employees in Barnstable County is $38,376 (Q3 2014). The annual average wage for comparable facilities in Barnstable County is $31,720 (Q3 2014) and the annual average wage for comparable facilities in Massachusetts is $27,248 (see Table 8).

The Mashpee Senior Housing Facility will pay average annual wages equal to the average for all private sector establishments in Barnstable County (+0.2%), but 21.2% higher than comparable establishments in Barnstable County and 41.1% higher than comparable establishments in Massachusetts (see Table 8).

Table 8

Mashpee Senior Housing Facility:
Comparison of Annual Average Wages to Barnstable County and Massachusetts Wages

NAICS Code	Employer Category	Annual Average Wage (Q3 2014)	MSHF Wage Differential Compared to…
6233	Mashpee Senior Housing Facility	$ 38,455	-------
	All Private Sector (Barnstable County)	$ 38,376	0.2%
	All Private Sector (Massachusetts)	$ 60,372	-36.3%
623	Nursing & Residential Care Facilities (Barnstable County)	$ 34,788	10.5%
623	Nursing & Residential Care Facilities (Massachusetts)	$ 33,800	13.8%
6233	Community Care Facilities for the Elderly (Barnstable County)	$ 31,720	21.2%
6233	Community Care Facilities for the Elderly (Massachusetts)	$ 27,248	41.1%

Source: The Northbridge Companies (2014); Massachusetts Department of Labor & Workforce Development (2014 3rd Quarter). **Note:** Annual Average Wage for Mashpee Senior Housing Facility calculated using head count instead of FTE to insure comparability to ES-202 data.

4.10 STAFFNG MATRIX

The occupational matrix of a senior residential care facility is distributed among a wide variety of occupations and professions that require many different types of skills and levels of skills. The Mashpee Senior Housing Facility will require managers, activities directors, marketing staff, social workers, care aides, housekeeping staff, utility aides, chefs, wait staff, and receptionists.

Table 9 provides an estimated staffing profile for the Mashpee Senior Housing Facility, including total FTEs, annual payroll and salaries, hourly rates, and comparisons to the wages paid in the same occupations in the state of Massachusetts and Barnstable County. The Mashpee Senior Housing Facility will pay above average wages in 14 of the 21 occupational categories for which comparative data is available at the county level. It will pay average wages in 2 of the 21 occupational categories for which comparative data is available at the county level. The highest salary of $103,000 will be paid to the facility's

Executive Director, while the lowest annual salaries of $23,566 will be paid to housekeeping staff. On an hourly basis, the highest salary is equivalent to a wage of $49.52 per hour, while the lowest wage paid will be $11.33 per hour, which is 26% higher than the state's statutory minimum wage of $9.00 per hour.[23]

Table 9 also lists the minimum educational requirements for each occupation based on the Bureau of Labor Statistics *Occupational Outlook Handbook, 2013-2014* and the Standard Occupational Classification (SOC). Nearly ten (9.75) FTE positions require a bachelor's degree or higher, 9 FTE positions require an associate's degree, 24.25 FTE positions require a high school (H.S.) diploma or additional technical post-secondary education (P.S.E.), and 5.5 FTE positions require less than a high school diploma.

[23] See, http://www.mass.gov/lwd/labor-standards/minimum-wage/

Table 9

MASHPEE SENIOR HOUSING FACILITY: STAFFING PROFILE & WAGE COMPARISONS TO STATE & WORKFORCE INVESTMENT AREA

Position	FTEs	Annual Payroll (2014 Dollars)	Annualized Wages Per FTE	Hourly Rate	State (Mean Annual Wage)	Cape & Islands WIA (Mean Annual Wage)	SOC Code	Mashpee/WIA Wage Differential	Minimum Educational Requirement
Front Office:									
Executive Director	1.00	$ 103,000	$ 103,000	$ 49.52	$ 115,580	$ 97,139	11-9199	6%	Bachelor's degree
Business Office Manager	1.00	$ 61,800	$ 61,800	$ 29.71	$ 77,350	$ 72,638	13-1199	-15%	Bachelor's degree
Lead Receptionist	1.00	$ 30,636	$ 30,636	$ 14.73	$ 30,610	$ 28,873	43-4171	6%	High school diploma or equivalent
Receptionist	1.00	$ 29,994	$ 29,994	$ 14.42	$ 30,610	$ 28,873	43-4171	4%	High school diploma or equivalent
Marketing									
Marketing Director	1.00	$ 63,000	$ 63,000	$ 30.29	$ 72,980	$ 63,286	13-1161	0%	Master's degree
Community Outreach	1.00	$ 46,350	$ 46,350	$ 22.28	$ 39,470	$ 35,431	21-1099	31%	Bachelor's degree
Programming									
Social Programming Director	1.00	$ 51,500	$ 51,500	$ 24.76	$ 43,800	$ 45,899	39-1021	12%	High school diploma or equivalent
Social Programming Assistant	2.00	$ 59,987	$ 29,994	$ 14.42	$ 26,150	$ 24,952	39-9032	20%	High school diploma or equivalent
Food Service:									
Food Service Director	1.00	$ 61,800	$ 61,800	$ 29.71	$ 56,140	$ 67,424	11-9051	-8%	High school diploma or equivalent
Chefs	2.25	$ 81,947	$ 36,421	$ 17.51	$ 32,580	$ 36,572	35-2012	0%	High school diploma or equivalent
Utility	1.50	$ 44,990	$ 29,994	$ 14.42	$ 23,740	$ 23,214	35-2021	29%	Less than high school
Dining Room Supervisor	7.00	$ 230,951	$ 32,993	$ 15.86	$ 26,220	$ 21,672	35-9011	52%	High school diploma or equivalent
Generations:									
Generations Manager	1.00	$ 59,740	$ 59,740	$ 28.72	$ 62,990	$ 58,963	21-1029	1%	Bachelor's degree
Care Aides - ALZ (CNAs)	8.00	$ 349,440	$ 43,680	$ 21.00	$ 26,120	$ 29,142	39-9021	50%	HS diploma or equivalent/Technical Cert.
Programming	1.00	$ 32,260	$ 32,260	$ 15.51	$ 26,150	$ 24,952	39-9032	29%	Bachelor's degree
Resident Care:									
Director of Resident Care	1.00	$ 77,250	$ 77,250	$ 37.14	$ 76,030	$ 71,010	21-1029	9%	Bachelor's degree
Resident Care Employees	2.75	$ 230,951	$ 83,982	$ 40.38	$ 62,990	$ 58,963	21-1029	42%	Bachelor's degree
Medical Technician	9.00	$ 388,927	$ 43,214	$ 20.78	$ 43,880	$ 52,384	29-2012	-18%	Associate's degree
Maintenance:									
Maintenance Director	1.00	$ 51,500	$ 51,500	$ 24.76	$ 46,270	$ 47,608	37-1011	8%	High school diploma or equivalent
Assistant	1.00	$ 24,694	$ 24,694	$ 11.87	$ 31,160	$ 34,118	37-2011	-28%	Less than high school
Housingkeeping:									
Housekeepers	3.00	$ 72,758	$ 24,253	$ 11.66	$ 26,430	$ 27,567	37-2012	-12%	Less than high school
TOTAL FTEs	**48.50**	**$ 2,153,474**							
Average Annual Wage (by FTE)			$ 44,402						
Median Annual Wage			$ 32,260						

Sources: The Northbridge Companies (2015); Massachusetts Department of Labor & Workforce Development (2015).

4.20 FRINGE BENEFITS

The Northbridge Companies provides a wide array of fringe benefits to its full-time and part-time employees. The benefits include comprehensive health (medical, dental, and vision), short-term and long-term disability insurance, educational assistance and tuition reimbursement, paid sick days, paid vacations days, and opportunities for in-house advancement and training. A schedule of benefits is shown below:

Group Medical Insurance:
Eligibility: Each full-time employee working 30 hours or more per week, including spouse, domestic partners, and children to age 26 (unless otherwise defined by state law). Waiting period of 30 to 60 days from date of employment.
Benefit: Employees pay 40% and Northbridge pays 60% of premium.

Group Dental Insurance:
Eligibility: Each full-time employee working 30 hours or more per week, including spouse, domestic partners, and children to age 26 (unless otherwise defined by state law). Waiting period of 30 to 60 days from date of employment.
Benefit: Employees pay 50% and Northbridge pays 50% of premium.

Short Term and/or Long-Term Disability Insurance. The Northbridge Companies pays for a small long-term disability insurance policy and offers optional employee paid insurance policies.

Paid Holidays: New Year's Day, President's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas Day

Educational Assistance and Tuition Reimbursement. Northbridge pays for books and supplies for college classes and for other vocational certifications.

Stafford Management LLC 401(k) Retirement Savings Plan
Eligibility: Full-time associates age 21+ are eligible to enroll after six months of employment. Part-time associates are eligible to enroll after one year of employment (and 1,000 hours of service).
Benefit: Stafford Management may match up to the first 6% of eligible contributions.
Paid Time Off (PTO).
Eligibility: PTO is accrued on a bi-weekly basis provided one works a minimum of 22.5 hours a week with accrual rates based on years of service.
Benefit: See Table 10.

Table 10

Paid Time Off: Accrual Rates			
Hourly Associates	**0-5 Years Service**	**6-10 Years Service**	**10+ Years Service**
Vacation	10 days	15 days	20 days
Sick/Personal	8 days	8 days	8 days
Department Heads	**0-5 Years Service**	**6-10 Years Service**	**10+ Years Service**
Vacation	15 days	20 days	20 days
Sick/Personal	8 days	8 days	10 days

Source: The Northbridge Companies (2015).

Colonial Life Optional Insurance

Eligibility: Full-time and part-time associates working at least 20 hours per week.

Benefit: Associates are responsible for the cost of this plan, but may pay for coverage through payroll deduction with pre-tax dollars. Insurance coverages available include life insurance, disability insurance, accident insurance, cancer insurance, critical illness insurance, and hospital confinement insurance.

Additional Benefits:

Northbridge Online University – Offers easy access to ongoing training and license re-certification programs.
Credit Union
Discounts on BJ's Wholesale Club membership and AAA membership
Employee/Resident Referral Bonus
Discount Movie Passes
Quarterly Bonuses
Direct Deposit

[This page left blank intentionally]

5.00 FISCAL IMPACT INFORMATION

5.10 PROPERTY TAX PAYMENTS

The Mashpee Senior Housing Facility will require approximately $23.3 million in total capital investment. The capital investment includes $13.1 million in building and construction (56.2%), $0.9 million in furnishings, furniture, and equipment (3.7%), $2.2 million in fees, interest, and insurance (9.8%), $2.3 million in professional services (9.8%),[24] and $2.1 million in land value and acquisition (8.9%), and $2.7 million in miscellaneous start-up costs, such as management, marketing, and contingencies (11.6%).

It is assumed that real property (buildings and land) will be taxed at their full value of $16.0 million at Mashpee's FY 2014 property tax rate, which is $9.11 per $1,000 assessed value.[25]

The Mashpee Senior Housing Facility will annually pay $145,760 in property taxes to the Town of Mashpee, which is a net increase of $138,561 over current tax payments on the unoccupied land.

5.20 MUNICIPAL SERVICES

5.21 Water

The project budget includes the cost of water connections.

5.22 Sewer

The Town of Mashpee does not provide municipal sewer service. Consequently, the Mashpee Senior Housing Facility will tie into and receive services from the existing Mashpee Commons Sewer Treatment Plant.

5.23 Solid Waste

The Mashpee Senior Housing Facility will purchase solid waste disposal services from a private vendor. Consequently, it will not place any new demand on the town's Department of Public Works, which is responsible for solid waste disposal. In addition, the Mashpee Senior Housing Facility will purchase snow removal services from a local private vendor for purposes of clearing its own driveways and parking lots.

---

[24] Includes architectural and construction engineering services, legal services, environmental consultants, traffic engineering, civil and site engineers, land and building appraisals, market feasibility analysis, and economic and fiscal impact analysis.

[25] The Town of Mashpee has a single tax rate for residential, commercial, and industrial property of $9.11 per $1,000 assessed value, see, Massachusetts Department of Revenue, Massachusetts Department of Revenue, Division of Local Services, *Municipal Data Bank/Local Aid Section: Tax Rates by Class*, *FY 2015.*

5.24 Public Schools

The residents of the Mashpee Senior Housing Facility are elderly and, consequently, they will not have any school-aged children. Based on U.S. Census data, 20.7% of all households in Barnstable County have school-aged children.[26] Consequently, it is estimated that approximately 12 of the facility's total number of employees will have school-aged children, but it is anticipated that most of the facility's employees will come from the local area and, hence, their children are already being accommodated at existing public and private schools. In addition, it is not expected that all of these employees will live in Mashpee so any minimal impact on the public schools will be dispersed among several communities.

5.25 Public Safety

The Mashpee Senior Housing Facility will not generate automobile or foot traffic comparable to that of other commercial establishments, such as retail outlets, banks, or legal and medical offices. The primary traffic flows will consist of individuals visiting residents and employees coming to and from work each day. This type of facility is comparatively calm and will not place a significant burden on the town's public safety services.

The Mashpee Senior Housing Facility will have an internal emergency call system for medical or other emergencies as part of its menu of residential care services. This system provides in-house response for acute health issues and, consequently, the system also serves as a screen to prevent unnecessary or minor calls to the town's Emergency Medical Services.

The Northbridge Companies own and/or manages 8 senior residential care facilities in eastern Massachusetts with a total of 617 beds and each of these facilities generate an average of 1 to 2 calls per month to EMS. Most outside calls are placed to non-emergency ambulance companies.

5.26 Human Services

The Mashpee Senior Housing Facility residents will not generate any additional demand for human services other than those that will be accommodated by the facility's medical, living assistance, and activities staff. It is anticipated that most of the facility's employees will come from the local area and, hence, any human service needs generated by those employees are already being accommodated by existing human service programs.

5.27 Parks & Recreation

[26] U.S. Census, *American Community Survey, 2008-2012*. This compares to 28.8% of the Massachusetts population with school-aged children.

The Mashpee Senior Housing Facility residents will not generate any additional demand for parks or recreation. The facility will offer recreational activities and other entertainment as part of its menu of residential care services. It is anticipated that most of the facility's employees will come from the local area and, hence, any demand for parks or recreational services generated by those employees are already being accommodated by existing parks and recreational programs.

5.28 Public Transit

The Mashpee Senior Housing Facility's residents will not generate any additional demand for public transit. The facility will offer transportation for shopping, medical visits, recreational activities, and other entertainment as part of its menu of residential care services. This transportation will be provided with the facility's own vehicles and drivers. It is anticipated that most of the facility's employees will come from the local area and, hence, any demand for public transit generated by those employees is already being accommodated by existing public transit services or it will be accommodated by existing capacity.

5.30 OTHER PROJECT BENEFITS

The Mashpee Senior Housing Facility will provide an under-supplied service primarily for local residents. The HCVA, Inc. market feasibility analysis estimates that 75% of the facility's residents will come from the primary local market area.

However, in addition to providing this high quality service to local residents, the proposed development will also bring additional benefits to area residents. Northbridge is committed to creating a positive impact on employees, residents, and the communities where they operate senior care residential facilities.[27] The Northbridge Commitment to Social Responsibility includes participation in, or sponsorship of, the following programs:

EAT FRESH, EAT LOCAL

The Northbridge Companies work with local farmers and food producers in Massachusetts and New Hampshire to provide fresh and healthy choices for facility residents.[28] The average distance food travels in the United States is fifteen hundred miles, but by buying produce from local farmers Northbridge reduces the carbon footprint created by shipping via trucks and planes, and conserves the energy that would have been used to transport the food. Local farmers also use less packaging, which reduces the waste sent to landfills.

[27] The Northbridge Companies currently own and/or manage 8 senior residential care facilities in Massachusetts, Maine, and New Hampshire with 617 residents and 758 employees. These facilities are located in Plymouth, North Dartmouth, Tewksbury, Needham, Burlington, and Wayland, Massachusetts; Milford, New Hampshire; and Westbrook, Maine.

[28] Truro Vineyards of Cape Cod (North Truro, Massachusetts) is among the six partners in this program.

SENIOR GREEN

Northbridge uses recycled paper goods and EnergyStar™ rated fixtures and appliances, and its composts kitchen waste at its facilities. Finding the highest impact point where residents' comfort and environmentally sound management intersect is the primary goal of SeniorGreen®.

LEARNING FOR LIFE

Northbridge supports continuous learning through its partnership with Care2Learn, an online healthcare education provider. Northbridge's Learning for Life enables associates to access educational, training and personal improvement programs 24/7. It provides Continuing Education Unit (CEU) credits to nurses and can teach Certified Nursing Assistants (CNAs) how to do their job better. Care2Learn also provides basic classes on skills for everyday life, such as balancing a check book and understanding credit.

THE BRAIN GYM

Northbridge facilities offer an innovative computer-based "mind fitness" program to keep the mind sharp and allow residents to stay connected to family and friends. Touch screen technology and easy to use suites of games, exercises, e-mail, Skype, photo galleries, and calendars help residents stay engaged, while having fun using the latest technology.

ARTISTS IN RESIDENCE

Northbridge founders Jim Coughlin and Wendy Nowokunski were originally artists and, consequently, they decided to bring artwork to the residents with "Artists in Residence." Each Northbridge community is staffed with a professional artist who is skilled in teaching and motivating residents to express themselves through art.

CARITAS COMMUNITIES

The Northbridge Companies supports Caritas Communities, which provides housing solutions for low income individuals. Through Single Room Occupancy (SRO) housing Caritas provides affordable housing for over 895 people in Boston. Caritas provides an option for people who may have been forced to live in a shelter or on the streets otherwise. Jim Coughlin, CEO of Northbridge, is an active Board Member of Caritas Communities and chairs the annual fundraising dinner. In addition, The Northbridge Companies has assisted Caritas in establishing its social media platform in an effort to enhance their fundraising activities, create better awareness of their programs and further the mission of the organization.

ALZHEIMER'S ASSOCIATION

The Alzheimer's Association's mission is to cure Alzheimer's disease through cutting-edge research, while providing relief and help to those affected by this disease. Northbridge currently provides care to 250 residents with Alzheimer's and the company has an additional 219 units under construction. All of the company's communities participate annually in the Walk to End Alzheimer's -- raising money and hope for a cure.

ONE FUND BOSTON

Governor Deval Patrick created One Fund Boston in the wake of the 2013 Boston Marathon tragedy. One Fund raises money to support the victims and their families of the bombings. Autumn Glen residents stepped up and coordinated a Spaghetti Dinner fundraiser for the community and raised $2,500. Northbridge remains committed to support this worthy cause.

PAN-MASS CHALLENGE

Eight years ago, Jim Coughlin's mother-in-law was receiving cancer treatment at The Dana Farber Cancer Institute. As a way to support her, Jim committed to riding The Pan-Mass Challenge, an annual bike-a-thon that supports cancer research at Dana- Farber. Participants of the PMC ride 192 miles over a two day period. To date, the team Jim co-founded has raised $250,000 to support Dana Farber. Jim and Wendy, as well as many of the Northbridge team, ride in the PMC.

ONE ANGEL FOUNDATION

Wendy Nowokunski is one of the founders of the One Angel Foundation in honor of her niece, Jenna Agule Jenna was tragically lost in a skiing accident at the age of 22. In Jenna's short life, she had committed herself to numerous philanthropic endeavors. The One Angel Foundation furthers her life's mission and works to support impoverished children and their communities. By supporting education and providing clean affordable housing One Angel gives hope and a smile to children around the world. Many of the Northbridge communities raise funds in support of the One Angel Foundation. In addition, the corporate staff participates in the world wide annual Hike a Mountain Day which has raised $25,000 to date.

ACCESS SPORT AMERICA

AccesSportAmerica is a non-profit that seeks to encourage higher levels of fitness for both children and adults with disabilities. They use challenging and exhilarating sports to aid the level of fitness each person can achieve, while engaging them socially and emotionally. Sports can provide an outlet for those with disabilities to express themselves and are beneficial for not only the body but the mind. ASA currently impacts 2,000 children and adults with disabilities. Northbridge is a corporate sponsor of the AccesSportAmerica Mayor's Cup Regatta in Boston.

FRIENDS FOREVER

Friends Forever's goal is to advocate for peace between feuding cultures. Specifically, they bring youth from Northern Ireland and youth from Israel together to create trust and friendship between the different cultures. The program starts off with a two week stay in the US for team building and self-exploration activities. Throughout the two weeks the group unifies into a team, inspiring the youths to bring change to their communities back home. The two week trip to the US is followed by an 11 month reflection phase back in their native countries. Northbridge will host this year's group of students by permitting the group to stay at Stonebridge of Burlington for the duration of their stay in the US.

CHRISTMAS IN THE CITY

Christmas in the City brings the Christmas spirit to Boston's less-fortunate. Every year Christmas in the City provides thousands of children with gifts and entertainment. Each child receives a personal gift selected from their wish list, and parents are offered amenities like haircuts. Entertainment, rides, and Santas are just some of the attractions offered every year at Christmas in the City. This fun and heartwarming event reminds us of the true gift of giving -bringing smiles to the face of every child. This past Christmas over thirty Northbridge associates volunteered and financially supported this worthy cause.

HABITAT FOR HUMANITY

Affordable housing is an issue facing many of Northbridge's caregivers. Northbridge has been a longtime supporter of this word-renowned organization and recently participated in a community build project in Boston.

SOURCES CONSULTED

Barnstable County, Massachusetts. 2012. *Cape Cod Regional Policy Plan*. Barnstable, Mass.

Cape Cod Commission. 2004. *Economic Development Technical Bulletin, No. 04-002.* Barnstable, Massachusetts.

Cape Cod Commission. 2011 (March). *Enabling Regulations Governing Review of Developments of Regional IMPact*, Barnstable County Ordinance, 90-12 (as amended and revised). Barnstable, Mass.

Cape Cod Commission, *Cape Code Regional Land Use Vision Map, 2011*, see, Available at http://www.capecodcommission.org/resources/RPP/capevision_09RPP_amend0311.pdf

Commonwealth of Massachusetts. 2014. "Municipal Data Base: Fiscal Year 2014 Tax Rates by Class." Boston: Department of Revenue, Division of Local Services. Available at https://dlsgateway.dor.state.ma.us/DLSReports/DLSReportViewer.aspx?ReportName=PropTaxTrend_Combined_cy&ReportTitle=Property+Tax+Trend+Report+2014

Commonwealth of Massachusetts. 2015. "Employment and Wages (ES-202)." Boston: Department of Labor and Workforce Development. Available at: http://lmi2.detma.org/lmi/lmi_es_a.asp#IND_LOCATION

Commonwealth of Massachusetts. 2015. "Occupational Employment and Wage Statistics." Boston: Department of Labor and Workforce Development. Available at http://lmi2.detma.org/lmi/lmi_oes_a.asp#3

Executive Office of the President. 2012. *North American Industry Classification System*. Washington, D.C.: Office of Management and Budget.

Health Care Valuation Advisors, Inc. 2015. *A Limited-Scope Restricted-Use Market Feasibility Analysis and Study of Proposed Seniors Housing Facility; Great Neck Road South, Mashpee, Massachusetts.* Princeton, Mass.

Massachusetts Department of Revenue, Massachusetts Department of Revenue, Division of Local Services, *Municipal Data Bank/Local Aid Section: Tax Rates by Class, FY 2015.* Available at https://dlsgateway.dor.state.ma.us/DLSReports/DLSReportViewer.aspx?ReportName=TaxRatesbyClass&ReportTitle=Tax%20Rates%20by%20Class.

U.S. Bureau of Economic Analysis. 2009. *Concepts and Methods of the U.S. Input-Output Accounts*. Washington, D.C.: U.S. Department of Commerce.

U.S. Bureau of Labor Statistics. 2013. *Occupational Outlook Handbook, 2013-2014*. Washington, D.C.

U.S. Bureau of the Census. 2013. *American Community Survey, 2005-2009*. Washington, D.C.

Appendix A: About the Author

Clyde W. Barrow, Ph.D.

Dr. Clyde W. Barrow is Chair of the Department of Political Science at the University of Texas Rio Grande Valley (2014 – present) and a former Chancellor Professor of Public Policy and Director of the Center for Policy Analysis at the University of Massachusetts, Dartmouth (1987-2014). In addition to teaching and conducting research at UTRGV, he has served as a consultant to state, federal, and local government agencies, private companies, business and trade associations, non-profit organizations, and educational institutions across the United States.

Dr. Barrow specializes in market feasibility, economic impact, industrial base, and public policy analysis, particularly as related to problems of regional economic development. His work has involved a wide variety of industries, including retail trade, science and technology, textiles and apparel, health care, national defense, education, health care, arts and crafts, cultural economic development, tourism, leisure and hospitality, and public infrastructure development.

Dr. Barrow's research has been published in 8 books and more than 100 scholarly journals and book chapters. He has also authored more than 300 applied policy monographs and dozens of articles in trade publications, magazines, and newspapers. He has delivered invited talks to more than 100 business and community groups and delivered expert testimony to numerous state legislatures, executive and regulatory state and federal agencies and in judicial and arbitration proceedings. His research and expert commentary have been cited in more than 3,000 newspaper articles, including the *Wall Street Journal, New York Times, Financial Times, Washington Post, Christian Science Monitor, USA Today, Forbes,* and *Time*.

Dr. Barrow holds a B.A. in Political Science from Texas A&M University at Kingsville and an M.A. and Ph.D. in Political Science from the University of California, Los Angeles.

Appendix B: About Pyramid Associates, LLC

Pyramid Associates, LLC is a registered Massachusetts company (established 2006) with offices in Westport, Massachusetts and Edinburg, Texas. The company specializes in providing custom designed applied policy and economic research for clients in the public, private, and non-profit sectors, including many Fortune 500 companies. The company's areas of expertise include:

- Retail gravity modeling;
- Economic impact and economic base analysis;
- Industry analysis;
- Workforce development planning;
- Public opinion polling and behavioral survey research.

The partners and employees at Pyramid Associates, LLC have conducted research on a wide variety of industries, including:

- Leisure, hospitality, and tourism
- Retail trade,
- Marine science and technology,
- Technology assessment,
- Textiles and apparel,
- Health care,
- Education,
- Arts and crafts,
- Cultural economic development,
- Public infrastructure development, and
- Economic and community indicators.

MASHPEE COMMONS LIMITED PARTNERSHIP

September 28, 2015

Cape Cod Commission
3225 Main Street
Barnstable, MA 02630

Attn: Jonathon Idman, Chief Regulatory Officer

Re: Northbridge

Dear Mr. Idman,

Mashpee Commons Limited Partnership (MCLP) owns and operates a Wastewater Treatment Facility with a Groundwater Discharge Permit capacity of 180,000 gallons per day (GPD). Please let this letter serve as a commitment by MCLP to provide capacity within its facility for the proposed Northbridge Assisted Living and Memory Care Facility.

Based upon the program submitted by the applicant, there will be 70 units in the facility. Using the Title V calculation of 150 GPD per unit, a total of 10,500 gallons will be reserved.

Should you have any questions, or require further information, please contact me at 508-477-5400. Thank you in advance for your attention to this matter.

Regards,

Thomas K. Feronti, Jr.
Mashpee Commons Limited Partnership

MASHPEE COMMONS • NORTH MARKET STREET
P.O. BOX 1530 • MASHPEE, MA 02649 • 508/477-5400 • FAX 508/477-4306

Northbridge Assisted Living

at Mashpee Commons

Estimated Wastewater Flow Rates

Northbridge Assisted Living at Mashpee Commons Title 5 Flow Rates				
Unit Type	# of Units	Flow Rate	Total Flow	
Studio	20	110	2,200	gpd
1 BR	38	110	4,180	gpd
2 BR	12	150	1,800	gpd
Total	70		8,180	gpd

Affirmative Marketing and Selection of Tenant Plan
Northbridge at Mashpee Commons

I. Purpose of this Plan

Northbridge at Mashpee Commons sets forth this Affirmative Fair Housing Marketing Plan to ensure that all applicants are treated fairly and consistently in its Marketing Program.

The purpose of this plan is to provide a community at Northbridge at Mashpee Commons that will reflect racial and economic diversity. It is anticipated that the residents at Northbridge at Mashpee Common will be representative of Barnstable County's overall elderly population. The program shall ensure that any gronp(s) of persons ordinarily not likely to apply for this housing without special outreach know about the available housing, feel welcome to apply and have the opportunity to become a part of the Northbridge at Mashpee Commons community.

The Owners will comply with all federal, state and local fair housing and civil rights laws and with all equal opportunity requirements in administrative procedures. In carrying out this marketing program and resident selection process, the Owners will not discriminate based on race, color, creed, religion, sex, familial status, sexual orientation, national or ethnic origin, handicap, citizenship, ancestry or marital status, public assistance, gender identity or any other basis prohibited by law. This applies to accepting and processing applications, assigning units, and certifying and re-certifying eligibility for assistance.

All marketing staff and all other persons involved in processing and/or handling applications will be trained in: (1) procedures and policy matters, mindful of relevant federal, state, and municipal orders, laws, and statutes dealing with civil rights and fair housing, including but not limited to, our commitment to providing applicants and residents with disabilities reasonable accommodation of rules, policies, practices, or services, and reasonable modification of the housing, when such accommodations or modifications are necessary to afford the person with a disability equal opportunity to use and enjoy the housing; (2) this Marketing Plan; and (3) applicable regulations governing the selection of applicants for this housing, including, but not limited to, Title VIII of the Civil Rights Act of 1968 and its amendments: M.G.L. Chapter 151B. In addition, the appropriate complaint procedures will be explained so that applicants may avail themselves of that process if they feel discrimination has occurred. Marketing staff will receive training on the use and appropriate review of the paperwork and processing required in marketing the units.

The supervisory staff persons of the Management Agent will be responsible for administering all training required by this plan.

II. Income eligibility for Low and Moderate Income Units (subject to change)

A. Rent Levels

Rents do not changed based on income. This is not subsidized housing. Tenants are responsible for paying the full amount of rent each month. Please see AHl.ll: Pricing and Rents of Affordable Units

III. Marketing and Selection Process

A. Advertising

The advertising component of the Marketing Plan will include the following:

1. The Fair Housing Logo used by the U.S. Department of Housing and Urban Development (HUD) shall be prominently displayed in the onsite Management Office.

2. All brochures, pamphlets and other literature will display the Fair Housing and Barrier- Free Logos.

3. If human likeness or models are used, they will reflect a mix of minority and majority models, which reflect the affirmative fair marketing goals for Northbridge at Mashpee, and persons who appear to have visible disabilities.

B. Application distribution and acceptance

Mashpee will consist of six memory care/assisted living affordable beds and will be available on a first come, first serve basis. Residents will have to qualify both clinically and financially before being considered for an affordable unit at Northbridge at Mashpee.

IV. Continuing Affirmative Marketing Objectives

In order to maintain the affirmative marketing objectives on an on-going basis for the entire Development, continuing compliance is also an objective of the Marketing Plan. In the event that Northbridge at Mashpee cannot attract a diverse population that would benefit from the secure memory care environment provided by Northbridge at Mashpee after an extensive outreach effort, the Owners will fill all the units, but will remain committed to its purpose and continue its efforts to attract a diverse population.

V. Public Inspection of the Marketing Plan

A copy of this Marketing Plan shall be available for public inspection by any interested group or individual at the Marketing/Management Office at Northbridge at Mashpee or other designated temporary location.

NORTHBRIDGE AT MASHPEE COMMON

WASTE MANAGEMENT PLAN

Northbridge at Mashpee Commons based on its experience owning and operating assisted living and memory care facilities. It has an extensive program within its communities to dispose of various waste products. The various methods used from waste disposal are as follows:

I. Hazardous Medical Waste, Sharps, Fluorescent, and Twist Bulbs:

a. Sharps Disposal: Sharps utilized in our Wellness Center are put in a medical sharps container after each use. This container is located in the Wellness Center, which is locked when not occupied by wellness department staff members. The wellness department staff calls the maintenance department when the container needs to be emptied. They bring the container to the medical waste room and disposes of the sharps containers into a larger medical waste bin. This bin is then picked up monthly by the medical waste vendor. Any resident who has the need of a sharps container can also contact the maintenance department and they follow the same procedure as with the wellness department sharps.

b. Medical Waste: Any medical waste accumulated at our Wellness Center location is properly disposed of in designated bag waste bins. Once full, the staff member contacts the maintenance department, who brings it to the locked medical waste storage area of the building, and placed in larger medical waste containers. The medical waste is picked up by a medical waste vendor on a monthly basis.

c. Fluorescent and twist light bulbs: Used light bulbs containing hazardous materials are placed in a separate container in our locked hazmat room to be taken when a contracted waste vendor picks up the trash every month.

II Food Waste:

a. Food waste from the central kitchen is disposed of in the regular trash. It is taken out to the dumpster/compactor daily. The compactor is picked up weekly by a contractor waste removal company.

b. Put in the household trash, which is taken out daily to our dumpster/compactor It is estimated approximately 75 pounds of food waste per day will be generated by the proposed project.

III Other

a. Batteries and Paint: Any used batteries which contain toxic materials are kept in a bin in the locked maintenance shop in the basement. They are returned to interstate Battery

Center, 254 Unit G, Faunce Corner Road, North Dartmouth, MA 02747, no less than once per year. All paint utilized is latex based paint. When cans are all used, they are left in the open to dry out, then placed in the regular trash for proper disposal.

In addition to the above the community will recycle cardboard. Glass, plastic, and metal. These items are placed in a separate recycle container on the premises, and picked up by the waste disposal company.

NATURAL RESOURCES INVENTORY

Cape Cod Commission Regional Policy Plan
Technical Bulletin 92-002
Developments of Regional Impact

Assessor's Map 74 Parcel 27
Great Neck Road South
Mashpee, Massachusetts

August 2015

Prepared for:

Ray Mitrano
Waypoint KLA
8 Glover Road
Wayland, MA 01778

Prepared by:

Horsley Witten Group, Inc.
90 Route 6A
Sandwich, MA 02563

NATURAL RESOURCES INVENTORY
Northbridge Mashpee Commons

Great Neck Road South, Mashpee, MA

Town of Mashpee Assessor's Map 74 Parcel 27

Contents

NATURAL RESOURCES INVENTORY
Northbridge Mashpee Commons

Great Neck Road South, Mashpee, MA
Town of Mashpee Assessor's Map 74 Parcel 27

1.0 INTRODUCTION

The Applicant, The Northbridge Companies, proposes to construct an assisted living facility at Mashpee Commons off Great Neck Road, just south of the rotary in Mashpee, Massachusetts. This project will require site review from the Cape Cod Commission (Commission) as a Development of Regional Impact (DRI). In accordance with the Commission's Regional Policy Plan, Minimum Performance Standard 2.4.1.1, applications for a DRI that propose to alter undeveloped areas shall require the submittal of a Natural Resources Inventory (NRI) identifying the presence of wildlife and plant habitat that will serve as a guide for the proposed development.

Horsley Witten Group, Inc. (HW) was retained by the Applicant to conduct an inventory of the natural resources within undeveloped portions of this site. The vegetation and wildlife components of this NRI have been completed in accordance with the guidelines developed by the Commission in Technical Bulletin 92-002 entitled *Development of Regional Impact Guidelines for Natural Resources Inventory (Plant and Wildlife Habitat Assessment)*.

This report provides a brief site overview; details the methodology used in the inventory; describes the soils, plant communities, and wildlife habitat present within the site; and discusses potential impacts associated with the proposed development.

2.0 GENERAL SITE DESCRIPTION

The approximately 5-acre site is located east of Great Neck Road South and is immediately north of an existing powerline/utility easement Mashpee, Massachusetts (Figure 1). A wastewater treatment facility is located on the adjoining parcel to the northeast, and the unimproved access road to this facility bisects the parcel from southwest to northeast. The site consists primarily of undeveloped woodlands. Just offsite, a second unimproved roadway associated with the utility right-of-way traverses the center of the easement and is parallel to the southeastern parcel boundary (Figure 2).

3.0 METHODOLOGY

Prior to conducting field assessments, HW reviewed existing source data, including the USGS topographic map, Massachusetts Natural Heritage and Endangered Species Program (NHESP) Natural Heritage Atlas and common and rare species lists, the USDA Natural Resources

Conservation Service (NRCS) Soils Survey for Barnstable County, MA, and available source data from the Massachusetts Geographic Information Service (MassGIS) to identify the presence of natural resources within the project area.

Field investigations were conducted by qualified individuals with academic backgrounds in related disciplines, including botany, soil science, and wildlife biology, and with prior professional experience in conducting natural resources inventories on Cape Cod. The credentials of personnel involved are provided in Appendix A.

3.1 Wildlife Assessment

Site observations were conducted on February 25 and 28, 2014. Site visits conducted for the purpose of wildlife use assessments were timed to occur "within one hour of sunrise and within one hour of sunset during good weather," in accordance with Technical Bulletin 92-002. All site evaluations emphasized the following with respect to wildlife habitat:

- Avifauna, both migratory and resident species;
- Mammals;
- Herpetofauna (reptiles and amphibians); and
- Rare Species

According to the Massachusetts Natural Heritage Atlas (13th Edition, October 1, 2008), this site is mapped within an area of *Estimated Habitat of Rare Wildlife and Certified Vernal Pools* or within a *Priority Habitat of Rare Species* (Figure 3). We understand that this designation is due to the presence of two state-listed species, Eastern Box Turtle (*Terrapene carolina*) and Northern Parula (*Parula americana*).

3.2 Vegetation Communities Inventory

HW observed site conditions to identify and describe upland and wetland plant communities located on the site. Plant species and their relative abundance were observed within the canopy, shrub, and groundcover/herbaceous layers. Portions of this site have been identified as a Significant Natural Resource Area: a combination of Unfragmented Forested Habitat (MacConnell), Critical Upland Area (APCC Atlas), and Wetlands (DEP) (Figures 4 and 5).

3.3 Soil Survey

The Natural Resources Conservation Service identifies this site as falling within two soil types, as described in the *Soil Survey of Barnstable County, Massachusetts* (March 1993). Map 32 of this survey identifies Carver loamy coarse sand (CcB; 3 to 8 percent slopes) as the predominant soil type for this site (Figure 6). Carver loamy coarse sand is very deep, gently sloping, and excessively drained generally located in broad areas on outwash plains or sandy glacial lake deposits. Typically the surface is covered with an organic layer about two inches thick comprised of loose, undecomposed pine needles, leaves and twigs, and one inch of matted,

partly decomposed to well decomposed organic material. The surface layer is very friable loamy coarse sand about three inches this and the subsoil is coarse sand about 33 inches thick.

A small area of Carver coarse sand (CdC; 8 to 15 percent slopes) is located in the northeast area of the parcel. This is also a very deep and excessively drained soil and is strongly sloping and most commonly located on small hills and ridges in areas of ice-contact deposits and on the side slopes of swales on outwash plains. The surface is typically covered with a loose layer of undecomposed pine needles, leaves, and twigs and is about one inch thick. The surface layer of the soil is loose coarse sand seven inches thick, while the subsoil is approximately 33 inches of coarse sand that is friable to very friable. The substratum extends to a depth of 65 inches and is also loose coarse sand.

4.0 RESULTS

4.1 Existing Vegetation Communities

The *Classification of the Natural Communities of Massachusetts* (NHESP 2001; "CNC") to classify the existing terrestrial (i.e., upland) habitats observed at the site.

4.1.1 Pitch Pine – Oak Forest

The predominant terrestrial plant community type for this site is pitch pine – oak forest. Carver coarse sand with zero to 35 percent slopes supports the site's forested upland habitats. Canopy species commonly occurring within these upland habitats are typical and include pitch pine (*Pinus rigida*) as well as white oak (*Quercus alba*), black oak (*Quercus velutina*), and scarlet oak (*Quercus coccinea*). Less commonly observed upland canopy species are red maple (*Acer rubrum*), sassafras (*Sassafras albidum*), eastern red cedar (*Juniperus virginiana*), and eastern white pine (*Pinus strobus*). Live trees are generally between seven and ten inches in diameter at breast height (DBH). The tree canopy provides nearly complete cover across the site. A number of standing dead trees (i.e., snags) are located throughout the parcel and range from 4 to 12 inches DBH.

The understory plant community is shrub-dominated with sparse herbaceous cover. Commonly observed species include arrowwood (*Viburnum dentatum*), nannyberry (*Viburnum lentago*), maleberry (*Lyonia ligustrina*), black huckleberry (*Gaylussacia baccata*), highbush blueberry (*Vaccinium corymbosum*), patches of sheep laurel (*Kalmia angustifolia*), and oak and sassafras seedlings. Groundcover consists of carpets of wintergreen (*Gaultheria procumbens*), trailing arbutus (*Epigaea repens*), pipsissewa (*Chimaphila* sp.), club moss (*Lycopodium complanatum* and *L. obscurum)*, and bracken fern (*Pteridium aquilinum*). The understory is somewhat sparse in the north and east portions of the parcel, while the shrub and groundcover layers are considerably denser in the south and west areas of the site. Dense patches of common greenbrier (*Smilax rotundifolia*) occur along the western margins of the site. The floor of the forested upland habitats is a relatively thick (i.e., four to eight-inch) layer consisting of oak leaf, pine needle, twig, and fibric organic matter.

A linear stretch of edge habitat is located along the southeast parcel boundary, where the site abuts the maintained utility easement. This area is maintained as an open low growing shrub community supporting seedling species as found within the adjacent forested community.

4.1.2 Off-Site Wetland Areas

Trout Pond and an associated Bordering Vegetated Wetland (BVW) are located north of this site, west of the utility right-of-way, and east of Route 28. This wetland was delineated by HW on March 11, 2014. The wetland area was assessed as part of a separate NRI. Trout Pond is a kettle-hole pond that ultimately drains into the Mashpee River to the east. The banks confining the pond are steeply sloping and forested. Patches of emergent and semi-emergent wetland vegetation occur along the perimeter of the pond. The BVW is, in most places, very narrow as a result of the steep topography and averages two to eight feet wide. Plant species observed within the wetland include sweet pepperbush (*Clethra alnifolia*), swamp azalea (*Rhododendron viscosum*), highbush blueberry (*Vaccinium corymbosum*), cinnamon fern (*Osmunda cinnamomea*), and *Sphagnum* moss.

4.1.3 Invasive Species Presence

Non-native, invasive species were observed in one location adjacent to the site. A small, isolated patch of common reed (*Phragmites australis*) occurs along the edge of the utility easement just off site beyond the eastern corner of the parcel boundary.

4.2 Wildlife Habitat

As required in the RPP and Technical Bulletin 92-002, the NRI is designed to survey and document significant wildlife habitat, including physical evidence of wildlife use such as the presence of nests; burrows; dens; active snags in standing dead timber; feeding, migratory or breeding activities; presence of scat; browse or antler rubs; scent posts; game rails; and identification of migration corridors used along unfragmented or contiguous landscapes. Following the literature review and identification of vegetation communities, each of the cover types was inspected for the presence of significant wildlife features.

In an inventory of wildlife habitat, it is the physical structure of the landscape and associated features that are observed and assessed for relative habitat quality, rather than the presence of individual animal species. However, direct sightings of mammals, avifauna, and herpetofauna (reptiles and amphibians), as well as other indirect evidence of wildlife use of this site, were recorded during the course of the field visits. Potential species utilizing this habitat, given the species' range, documented occurrences within Cape Cod, and the likelihood of a given habitat to provide important food, cover, breeding, over-wintering, dispersal or migratory habitat, are listed in Appendix B.

4.2.1 Avifauna

A diverse community of bird species were noted, most being edge or woodland species. During the site visits, nine bird species were observed including Black-capped Chickadee, Tufted

Titmouse, Golden Crowned Kinglets, Goldfinch, Downy Woodpecker, Nuthatch, Song Sparrow, Herring Gull, and American Crow. A complete list of all species observed or heard is provided in Appendix B.

This parcel is also mapped as habitat for the state-threatened Northern Parula. This bird is typically found in wet woodlands, river margins, pond shores, or even small depressions. It begins nesting in late May or early June and often nests in association with the moss-like lichen, Old Man's Beard (*Usnea* spp.). The nest is generally in a hollowed out bunch of lichen (resembling a grey pouch) in a deciduous or coniferous tree. This species also demonstrates nesting site fidelity, and occupies the same nesting site in successive seasons and lays eggs in the same nest or a nearby nest. The Parula feeds on small insects and spiders.

While the site visits occurred outside of the nesting period and this species was not observed, the off-site habitats surrounding Trout Pond and the Mashpee River provide some of the elements characteristic of Parula habitat, including both deciduous and coniferous trees, possessing significant amounts of lichen available for nest construction. These features were not observed within or immediately adjacent to the subject parcel.

4.2.2 Mammals

The project site offers suitable habitat for numerous mammalian wildlife. Various species of fruit bearing shrubs such as nannyberry provide an important food source for mammals (as well as avifauna). Trout Pond and the Mashpee River provide a continual source of water. The pitch pine/oak forest and nearby wetlands offer suitable coverage for a number of mammals including Eastern whitetail deer, coyote, fox, grey squirrel, white-footed mouse, raccoons, meadow voles, and chipmunks. While the subject parcel is somewhat distant from the wetland areas, it also supports some of the same upland site characteristics, albeit, closer to developed lands and adjacent to a major roadway, such as mast and berry producing plants which would contribute to the available food source for wildlife. .

Indications of wildlife use were observed throughout the property, including wildlife trails traversing the property. The utility easement (power line right of way) located to the east of the site is a potential travel corridor for larger mammals such as deer, coyote, and fox.

4.2.3 Rare Species

No federally or state-listed species were observed during HW's site visits. As noted above, the site is mapped for habitat associated with two stat-listed species.

4.2.4 Herpetofauna

Amphibians

This site may provide suitable upland habitat for amphibians, particularly non-obligate vernal pool species, which may utilize nearby Trout Pond. The subject parcel does not support breeding habitat for amphibian species due to the absence of wetlands; and no certified or

potential vernal pools are documented within the general surrounding area. This parcel may be part of the home range or migration corridor for species that are supported by wetlands off-site.

Reptiles

Suitable habitat exists on and adjacent to the site for a number of reptiles, including snakes and turtles, including potentially the Eastern Box Turtle. This forested habitat is characteristic of upland habitat favored by the box turtle and the exposed sandy soils along the utility easement likely provide suitable nesting habitat within close proximity to the site.

Invertebrates

It is anticipated that the subject site would support common invertebrate species common to Cape Cod pitch-pine oak forest communities. Off-site wetland habitats would also likely support aquatic invertebrate species that are dependent on an aquatic environment for a portion of or their life cycle include dragonflies and damselflies (Order *Odonata*), caddisflies (Order *Trichoptera*), and mayflies (Order *Ephemeroptera*).

5.0 POTENTIAL DEVELOPMENT IMPACT

Proposed project involves the construction of an assisted living facility occupying the majority of the parcel to the north and west of the existing gravel access road to the wastewater treatment facility. An 80 to 100 foot wide band of undisturbed forested area will remain intact between the gravel access road and the open corridor along the utility easement. This forested area will likely continue to serve as a wildlife corridor for wildlife traveling along the utility right of way, as it connects to undisturbed forested lands to the northeast along Trout Pond. Otherwise, the remaining portions of this site are proposed for development with the exception of a small area in the northwestern corner of the parcel.

Off-set open space will be provided at a comparable 2:1 ratio further south along Great Neck Road South. The open space lands set aside are adjacent to existing conservation lands or otherwise dedicated open space.

5.1 Goals and Policies of the Regional Policy Plan

The goals and the Minimum Performance Standards (MPS) for wildlife and plant habitat and open space under the RPP are as follows:

Wildlife And Plant Habitat Goal – WPH1: Prevent Loss, Minimize Adverse Impact, and Maintain Diversity. *To prevent loss or degradation of critical wildlife and plant habitat, to minimize the adverse impact of new development on wildlife and plant habitat, and to maintain existing populations and species diversity.*

Open Space Goal - OS1: Open Space and Natural Resources. *To preserve and enhance the availability of open space that provides wildlife habitat and recreational opportunities, and protects the region's natural resources and character, Barnstable County shall strive to protect remaining developable land.*

5.2 Development Impact

The proposed development will result in both short term and long-term alterations to the existing vegetation and wildlife habitat. No unique features or vegetation communities were observed within this parcel, and as such, the loss of the vegetation is less likely to have an adverse effect on the existing populations of wildlife or on the species diversity. As noted above, the proximity of this parcel to Great Neck Road and location between the roadway and the wastewater treatment plant may render this site less valuable to the preservation of local wildlife populations. The maintenance of a contiguous forested corridor adjacent to the utility easement will help to preserve a corridor for local wildlife migration. There is no proposed fencing associated with the assisted living facility.

6.0 MINIMUM PERFORMANCE STANDARDS

6.1 Wildlife and Plant Habitat

A brief discussion of the MPS and Best Development Practices (BDPs) relative to the protection of Wildlife and Plant Habitat with respect to the project is provided below.

WPH1.1 Natural Resources Inventory
Applications for Developments of Regional Impact that propose to alter undeveloped areas shall contain a natural resources inventory. Such inventory shall identify the presence and location of wildlife and plant habitat, including vernal pools, and serve as a guide for the layout of the development. Developments shall be planned to minimize adverse impacts to wildlife and plant habitat. Guidance on preparation of natural resources inventories can be found in Development of Regional Impact Guidelines for Natural Resources Inventory (Plant and Wildlife Habitat Assessment), Technical Bulletin 92-002, as amended.

An NRI has been provided.

WPH1.2 Clearing and Grading

Clearing of vegetation and alteration of natural topography shall be minimized, with native vegetation planted as needed to enhance or restore wildlife habitat. Standing specimen trees shall be protected. The Commission may require designation of building envelopes (for structures, driveways, lawns, etc.), where appropriate, to limit removal of vegetation.

Site clearing and grading will preserve an 80 to 100 foot undisturbed forested corridor along the eastern property boundary, adjacent to the utility easement. No standing specimen trees were observed during the NRI. The use of native vegetation similar to native shrub and tree species observed within the parcel is recommended for use in landscaping.

WPH1.3 Wildlife and Plant Habitat

Fragmentation of wildlife and plant habitat shall be minimized by the establishment of greenways and wildlife corridors of sufficient width to protect not only edge species but also species that inhabit the interior forest, as well as by the protection of large unfragmented areas, and the use of open space or cluster development. Wildlife shall be provided with opportunities for passage under or across roads and through developments where such opportunities will maintain the integrity of wildlife corridors. Fencing shall not be constructed so as to interfere with identified wildlife migration corridors.

Development of this site is concentrated toward the existing roadway (Great neck Road South) and the existing gravel access driveway for the WWTF. An undisturbed forested corridor will remain to maintain the integrity of the wildlife corridor adjacent to the utility easement, and no fencing is proposed.

WPH1.4 Rare Species

DRIs within critical wildlife and plant habitat areas shall submit the development proposal to the Massachusetts Natural Heritage Program for review and comment. DRIs that would adversely affect habitat of local populations of rare wildlife and plants shall not be permitted. Development may be permitted where the proponent can demonstrate that such development will not adversely affect such habitat. A wildlife and plant habitat management plan may be required as a condition of approval when development or redevelopment is permitted in critical wildlife and plant habitat areas.

We understand that the project proponents in conjunction with Mashpee Commons LP have already undergone review with NHESP and that certain preservation and mitigation measures have been agreed upon for this and the future development of the adjacent lands.

WPH1.5 Vernal Pools

Where a project site is located adjacent to a vernal pool (as defined herein), development shall be prohibited within a 350-foot undisturbed buffer around these resources. New stormwater discharges shall be located a minimum of 100 feet from vernal pools.

There are no vernal pools at or adjacent to the site.

WPH1.6 Invasive Species

Development on sites where a natural resources inventory identifies the presence of invasive plant species shall provide and implement a management and restoration plan detailing the management of, and where possible, the eradication of the invasive species present, and for revegetating the site with native species. A current listing of invasive species can be found on the web at www.massnrc.org/mipag/invasive.htm.

One small patch of *Phragmites* was documented during the NRI, located within the utility easement corridor. To the extent that the proponents have access and authority to manage this small patch, we recommend that measures to control its growth and spread be implemented.

WPH1.7 Habitat Restoration [BDP]

Measures to restore altered or degraded upland habitat areas are encouraged where ecologically appropriate (for example, sandplain grasslands, pine barrens, etc.).

The parcel to the immediate north has an unimproved looped driveway from Great Neck Road. While this site could provide potential for habitat restoration, given its proximity to the roadway, and that the parcel is part of a master plan for future development in this area, it does not appear to be an appropriate site for restoration.

WPH1.8 Un-development [BDP]

In redevelopment projects in sensitive or significant habitats, including mapped estimated or priority habitat as identified by the Natural Heritage Program, efforts to remove existing development from sensitive or significant habitat areas are encouraged.

Not applicable to this site.

6.2 Open Space and Recreation

It is our understanding that the project proponents have come to an agreement with the land owners, Mashpee Commons LP to fulfill the open space requirement by off-site preservation of land further south along Great Neck Road. The preserved lands are contiguous with larger undeveloped forested parcels that are also mapped as rare species habitat and support occasional areas of wetland habitat. As this parcel is mapped as an SNRA (see Figure 5), open space preservation will be provided at a 2:1 ratio with the proposed development.

7.0 SUMMARY

The site consists of approximately five acres of undeveloped forested land that supports a pitch pine-mixed oak community typical of Cape Cod. No wetland resources are located at the site and no unique features or specimen trees were encountered. While the subject site is located within an area designated as SNRA for rare species habitat, we understand that previous discussions with NHESP will result in the preservation of the most important components of the larger, surrounding lands. The proposed assisted living facility will allow for preservation of a

wildlife corridor along the adjacent utility easement. As such we believe that the proposed project is consistent with the MPS under the RPP for wildlife and plant habitat.

Off-site preservation of open space will be provided at a 2:1 ratio (open space to development) in accordance with the open space requirements, and will contribute to the RPP goals of preserving and enhancing the availability of open space to provide wildlife habitat.

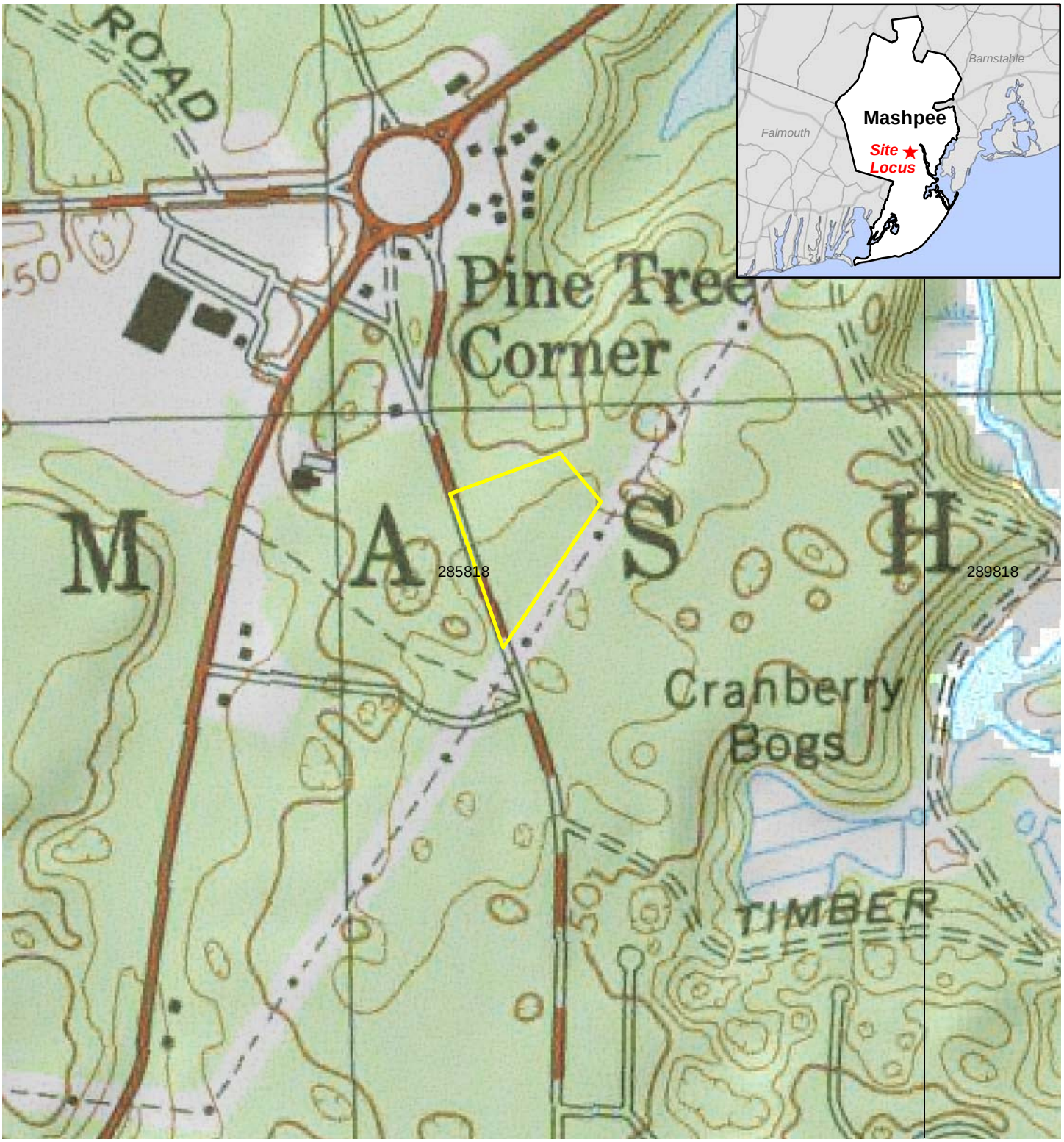
8.0 REFERENCES

DeGraaf, R.M., Rudis, D.D. September 1983. New England Wildlife: Habitat, Natural History, and Distribution. United States Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. General Technical Report NE-108.

DeGraaf, R.M., and D.A. Richard. Forest Wildlife of Massachusetts: Cover Type, Size Class, and Special Habitat Relationships. Cooperative Extension, University of Massachusetts, Amherst, Massachusetts.

Swain, P.C. and J.B. Kearsley. 2011. Classification of the Natural Communities of Massachusetts. Version 1.4. Natural Heritage & Endangered Species Program, Massachusetts Division of Fisheries and Wildlife. Westborough, MA. URL: http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/natural-communities/classification-of-natural-communities.html#

Tekiela, S. 2000. Birds of Massachusetts, Field Guide. Adventure Publications, Cambridge, Massachusetts.



Document Path: H:\Projects\2014\14023 Northbridge-Mashpee Commons Asst Living\GIS\Maps\USGS_Locus.mxd

Legend

Site Parcel

Falmouth Topographic Quadrangle

N

0 1000

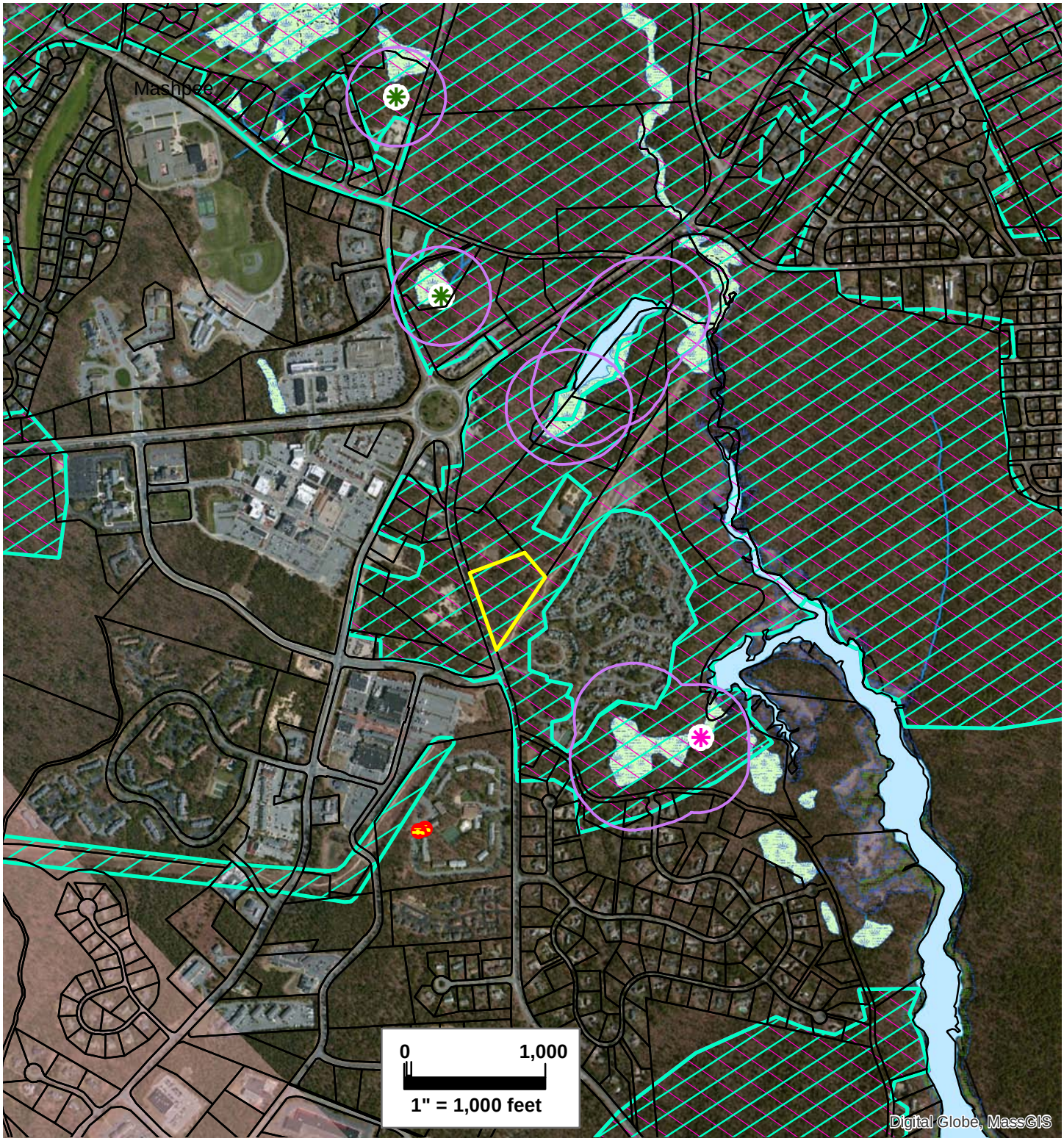
1" = 500 feet

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Sandwich, MA • 02563
Tel: 508-833-6600 • Fax: 508-833-3150 • www.horsleywitten.com

USGS Topographic Quadrangles Northbridge Mashpee, MA

Date: 7/15/2015

Figure 1



Document Path: H:\Projects\2014\14023 Northbridge-Mashpee Commons Asst Living\GIS\Maps\150716_Existing_Constraints.mxd

Legend

**GIS Data - MassGIS*

- Wooded marsh
- Open Water
- NHESP Certified Vernal Pools
- Potential Vernal Pools
- NHESP Priority Habitats of Rare Species
- NHESP Estimated Habitats of Rare Wildlife
- Non-Community Groundwater Source
- Project Locus
- DEP Approved Zone IIs
- 350 Foot Buffer

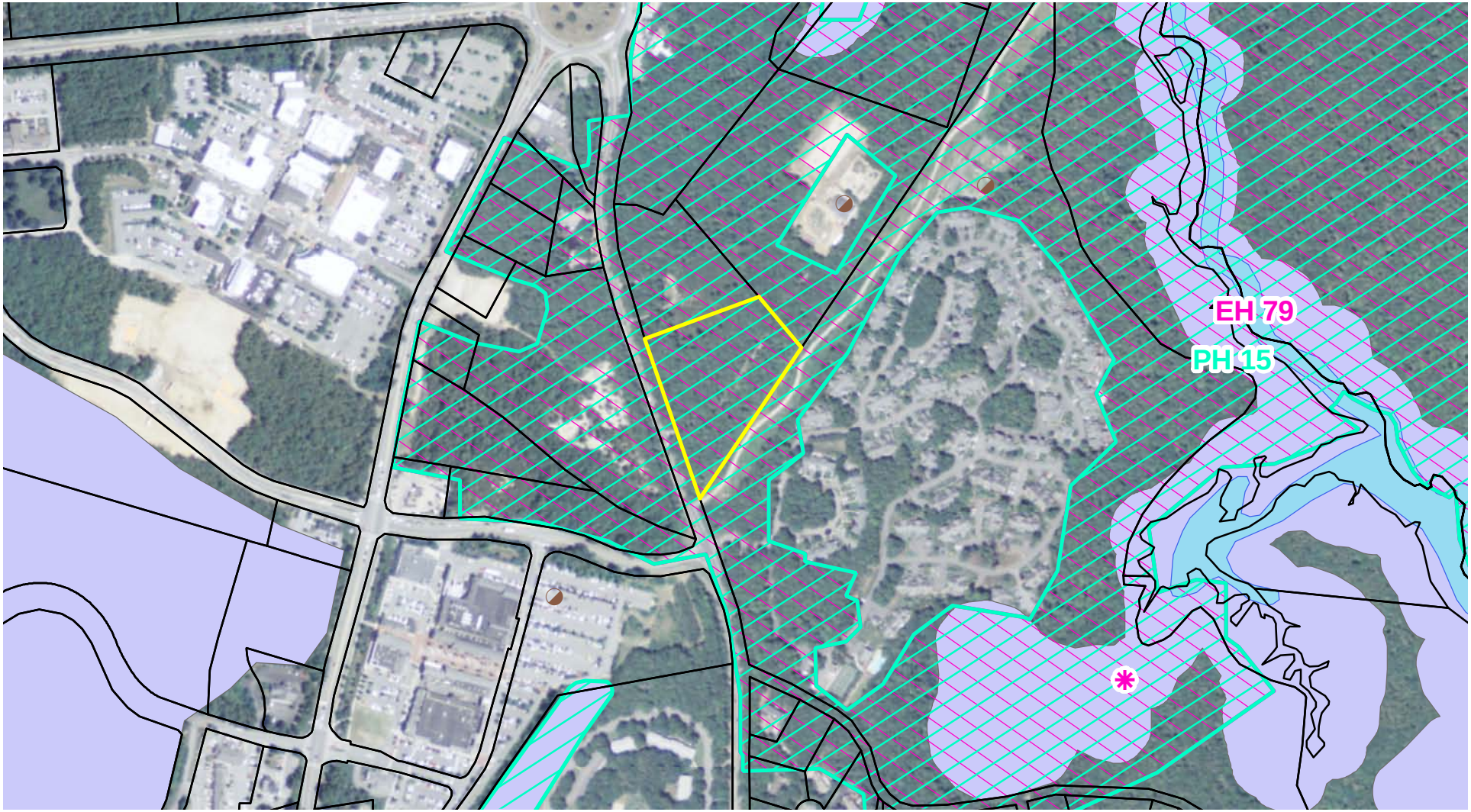
N

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Sandwich, MA • 02563
Tel: 508-833-6600 • Fax: 508-833-3150 • www.horsleywitten.com

Existing Constraints
Northbridge
Masphee, MA

Date: 7/16/2015

Figure 4



Document Path: H:\Projects\2014\14023 Northbridge-Mashpee Commons Asst Living\GIS\Maps\NHESP.mxd

Legend

- NHESP Priority Habitats of Rare Species
- NHESP Estimated Habitats of Rare Wildlife
- NHESP Certified Vernal Pools
- NHESP Living Waters Core Habitats
- BM2_CORE_HABITAT

GIS Data - MassGIS

N

0 500

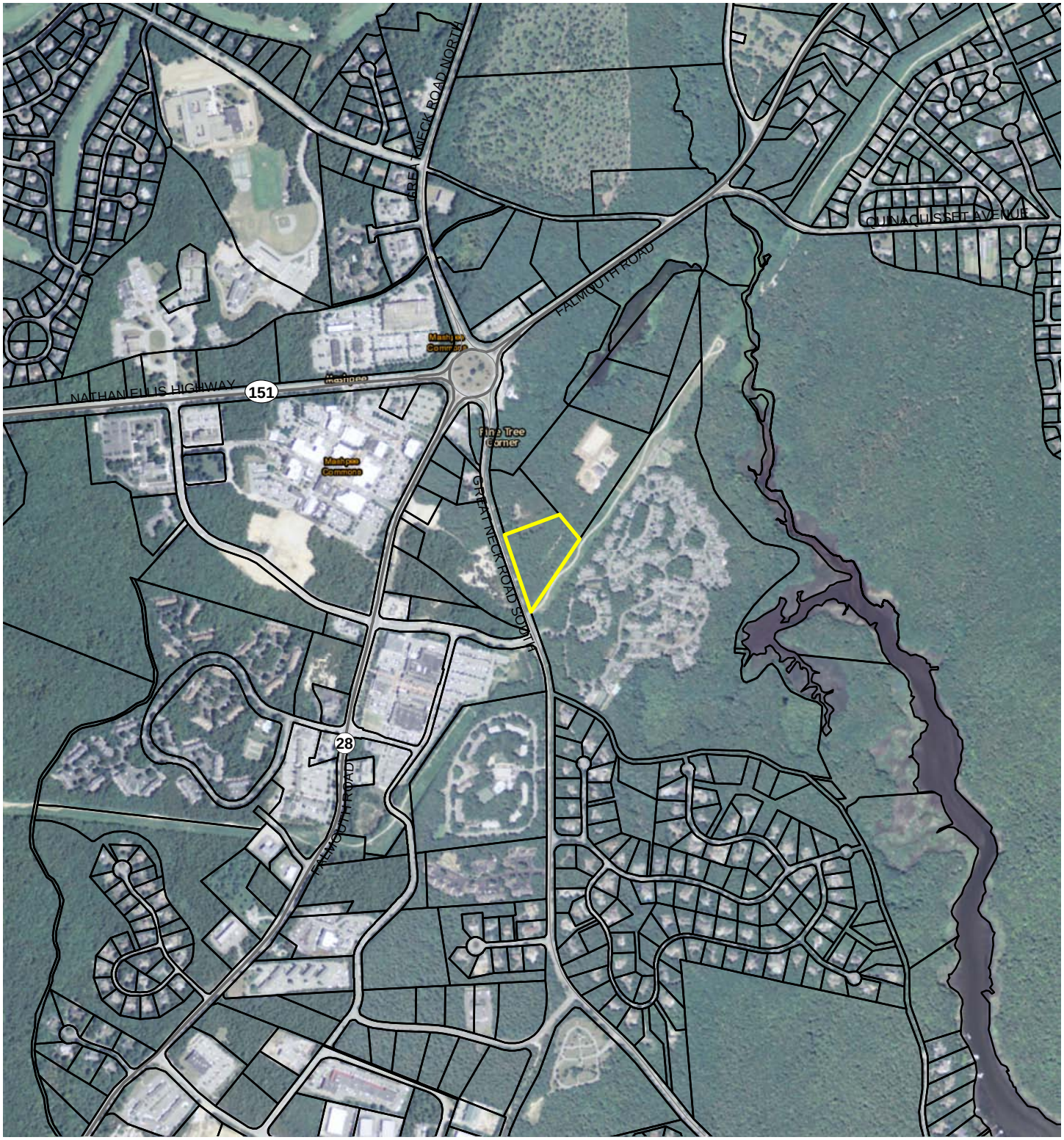
1" = 500 feet

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Sandwich, MA • 02563
Tel: 508-833-9600 • Fax: 508-833-3150 • www.horsleywitten.com

Natural Heritage & Endangered Species Program (NHESP) Northbridge Mashpee, MA

Date: 7/15/2015

Figure 3



Document Path: H:\Projects\2014\14023 Northbridge-Mashpee Commons Asst Living\GIS\Maps\Aerial.mxd

*Parcels - MassGIS 2011

Legend

- Site Parcel
- Parcels

N

0 1000

1" = 1000 feet

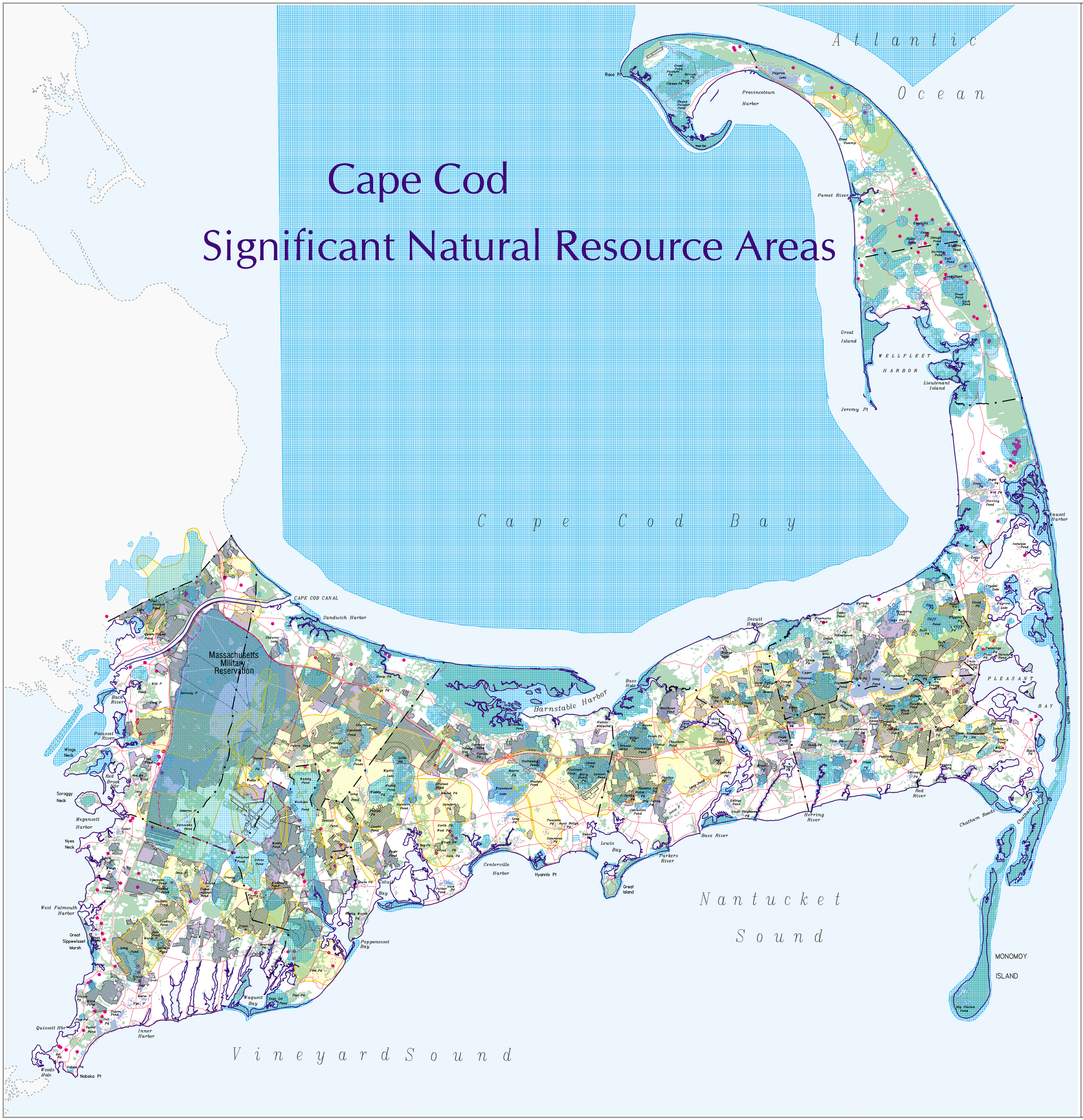
Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Sandwich, MA • 02563
Tel: 508-833-6600 • Fax: 508-833-3150 • www.horsleywitten.com

Aerial Photo
Northbridge
Mashpee, MA

Date: 7/15/2015

Figure 2

Cape Cod
Significant Natural Resource Areas



Regional Policy Plan

Effective April 29, 2002

Cape Cod Significant Natural Resource Areas

- Significant Natural Resource Area: combination of Unfragmented Forested Habitat (MacConnell), Critical Upland Area (APCC Atlas), Wetland (DEP)
- Water Body
- 350 foot buffer of Vernal Pool (APCC Atlas and NHESP)
- Public Water Supply Wellhead Protection Area
- Potential Public Water Supply Area (PLAAP)
- Rare Wetland Wildlife Habitat and Priority Sites for Rare Species and Natural Communities from NHESP and from APCC Atlas

- Major Road
- Edge of Wellhead Protection Area
- 300 foot buffer from pond shore
- Mass. Military Reservation

1 square mile
100 acres

Data Sources:

Habitat Information: Combination of Mass. NHESP and APCC: Critical Upland Areas, Vernal Pools, Rare Wetland Wildlife Habitat, Priority Sites for Rare Species and Natural Communities: 1:25,000 (NHESP Data is from 1999 – 2001) USGS Quadrangles in the "Cape Cod Critical Habitats Atlas," Association for the Preservation of Cape Cod, 1990, with assistance from the Mass. Natural Heritage and Endangered Species Program. (Selected habitat areas of State listed rare plants and animals (not for use with the Wetlands Protection Act.)

Identified Wellhead Protection Areas: (Zones of Contribution) 1:25,000, CCC Water Resources Department updates to 2001, which include various private consulting firms and DEP.

Potential Public Water Supply Tracts: From the "Priority Land Acquisition Assessment Project" (PLAAP), June 1999, CCC Water Resources Office. This was the follow – up investigation of USGS's "Water Resources Investigations Report" of 1994.

Unfragmented Forest Habitat: 1:25,000, 1999 MacConnell (*) Forest category greater than 125 acres.

Wetlands: 1:5,000, 1999 DEP Wetlands Conservancy Program.

* MacConnell landuse: (digital) 1999. MacConnell landuse is from aerial photo interpretation (1:25,000 scale). Digitized by the Resource Mapping – Land Information Systems Department of Forestry and Wildlife Management, U Mass, Amherst in cooperation with the EOEA MassGIS project and the Cape Cod Commission. Further explanation of the land use categories may be found in the publication "Remote Sensing 20 Years Change in Barnstable, Dukes, and Nantucket Counties, Mass, 1951 – 1971" W. P. MacConnell, U Mass.

Non – digital data was automated by the Cape Cod Commission GIS staff using the ARC/INFO GIS software.

This map was produced by the Cape Cod Commission's Geographic Information System department for the Regional Policy Plan update, submitted January 10, 2002, effective April 29, 2002, with any amendments listed below:

Corrections are welcome at the Cape Cod Commission office.

Basemap features: MassGIS, (digital), 1988, from 1:25,000 scale USGS Quadrangle Sheets; late 1970's and earlier 1:100,000 scale maps. Includes ponds, roads, coastline, town boundaries.

This map is illustrative and all depicted boundaries are approximate. It is intended for planning purposes only – – not site specific purposes.

Scale – 1:80,000

Massachusetts State Plane Feet

Map Registered to North American Datum – 1927

0 5000 10000 15000 20000 25000

0 1 2 3 4 5

Miles

Land Use · Roads · DCPCs · Parcels · Demographics · Environmental · DRIs ·

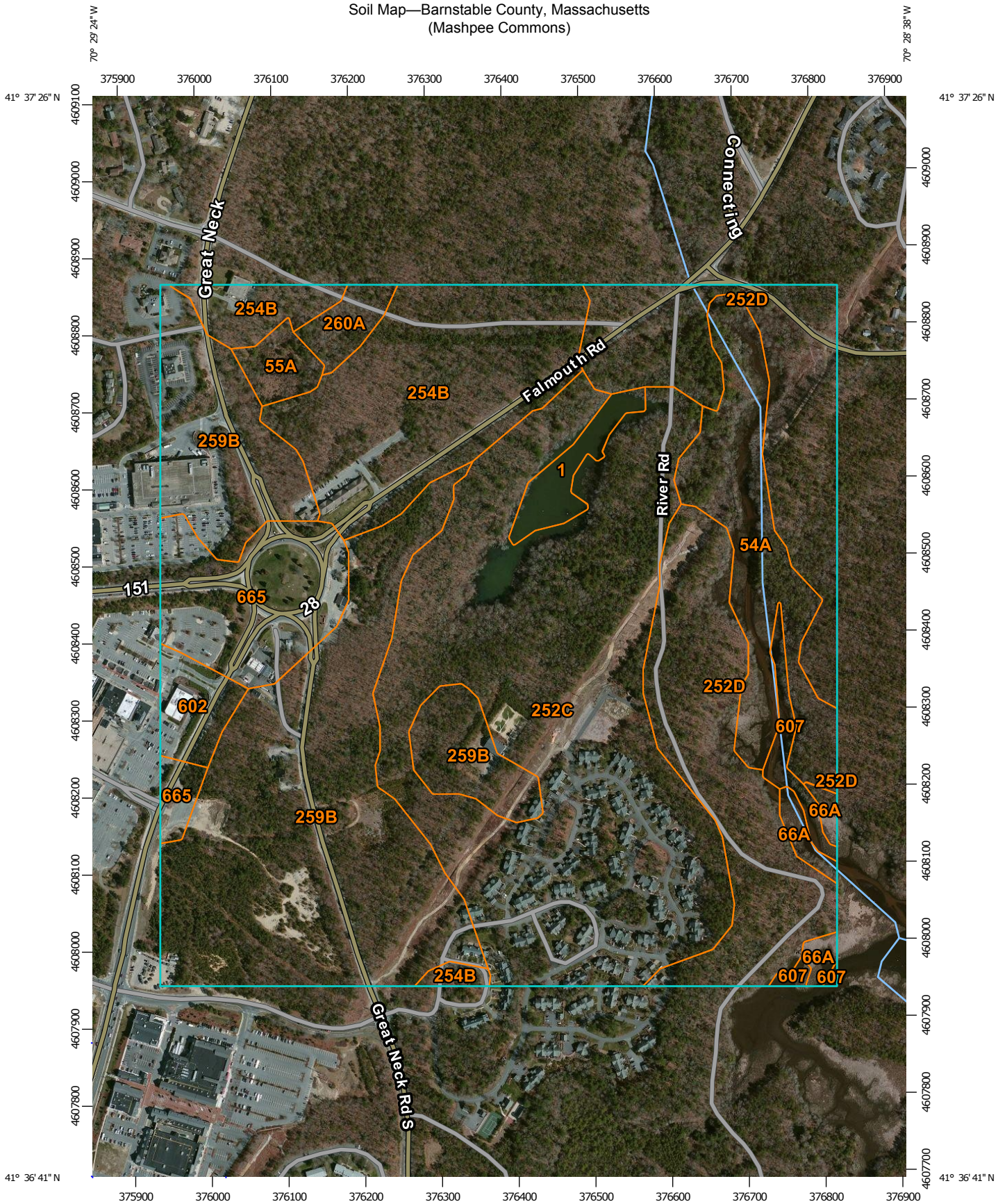
Cape Cod Commission GIS Services

N W CCC E S

Figure 5

revision 042202

Soil Map—Barnstable County, Massachusetts
(Mashpee Commons)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Barnstable County, Massachusetts
Survey Area Data: Version 10, Dec 5, 2013

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 30, 2011—Oct 8, 2011

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

Map Unit Legend

Barnstable County, Massachusetts (MA001)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
1	Water	2.5	1.3%
54A	Freetown and Swansea mucks, 0 to 1 percent slopes	12.8	6.4%
55A	Freetown coarse sand, 0 to 1 percent slopes	1.9	1.0%
66A	Ipswich, Pawcatuck, and Matunuck peats, 0 to 1 percent slopes	1.8	0.9%
252C	Carver coarse sand, 8 to 15 percent slopes	55.6	27.9%
252D	Carver coarse sand, 15 to 35 percent slopes	33.4	16.7%
254B	Merrimac sandy loam, 3 to 8 percent slopes	23.3	11.7%
259B	Carver loamy coarse sand, 3 to 8 percent slopes	49.7	24.9%
260A	Sudbury fine sandy loam, 0 to 3 percent slopes	1.9	1.0%
602	Urban land	2.9	1.5%
607	Water, saline	2.0	1.0%
665	Udipsamments, smoothed	11.4	5.7%
Totals for Area of Interest		**199.2**	**100.0%**

Appendix A
QUALIFICATIONS

Personnel involved in conducting the natural resources inventory have academic backgrounds in disciplines related to the specific components of the investigation including botany, soil science, and wildlife biology. Each of these professionals has experience in conducting related investigations on Cape Cod.

Amy M. Ball, PWS, CWS

Amy Ball has more than 19 years of professional experience as a wetlands scientist and ecologist specializing in wetland botany and ecology, rare species and wildlife habitat assessments, wetland restoration and mitigation, environmental assessment and monitoring, and environmental policy evaluation. As a Project Manager and Senior Ecologist with the Horsley Witten Group, served as the project manager for the natural resources investigation.

Ms. Ball manages projects requiring inland and coastal wetland resource area determinations, wildlife habitat assessments, impact mitigation, and regulatory compliance. Ms. Ball has directed and participated in several large and small scale natural resources inventories on Cape Cod, including a substantial vegetative community assessment in the Pleasant Bay Area of Critical Environmental Concern and at the Provincetown Municipal Airport, each of which included rare plant and habitat assessments.

Ms. Ball also manages project permitting for projects requiring federal, state, regional, and local permits pursuant to laws, regulations, and policies governing water resource and rare species protection. Ms. Ball frequently appears before local conservation commissions and state and federal regulatory authorities as a project representative or reviewing consultant, and has served as an expert witness on several occasions.

Amanda Crouch-Smith, PWS[1]

Amanda Crouch-Smith is an Environmental and Wetland Scientist with more than seven years of professional experience. She specializes in wetland and coastal botany, ecology, tree survey assessments, rare species and wildlife habitat assessments, environmental assessment and monitoring, and environmental policy evaluation for the Horsley Witten Group, Inc. (HW). Amanda provides support in a variety of areas, including projects requiring inland and coastal wetland resource area determinations, wetland restoration and impact mitigation, wildlife habitat assessments, and regulatory compliance. She also prepares permit applications and written narratives for projects requiring federal, state, and local permits pursuant to laws, regulations, and policies governing wetlands protection.

[1] Ms. Crouch-Smith left HW in April 2015.

Appendix B - Wildlife Observations

Northbridge Parcel, Mashpee, MA
February 2014

Common Name	Scientific Name	HABITAT TYPE	
		Pitch Pine/ Mixed Oak Forest	Off-site Forested Wetland and Pond Complex
Birds			
American crow	*Corvus brachyrhynchos*	x	x
American goldfinch	*Carduelis tristis*	x	x
American robin	*Turdus migratorius*	o	o
Black-capped chickadee	*Cyanocitta cristata*	x	x
Blue Jay	*Parus atricapillus*	x	x
Bufflehead	*Bucephala albeola*		x
Carolina wren	*Thryothorus ludovicianus*	o	x
Catbird	*Dumetella carolinensis*	o	o
Downy woodpecker	*Picoides pubescens*	x	x
Eastern towhee	*Pipilo erythrophthalmus*	o	o
Great-blue heron	*Ardea herodias*		x
Hairy woodpecker	*Picoides villosus*	o	x
Herrring Gull	*Larus argentatus*		x
Hooded merganser	*Lophodytes cucullatus*		x
Mallard	*Anas platyrhynchos*		x
Morning dove	*Zenaida macroura*	x	o
Northern cardinal	*Cardinalis cardinalis*	x	x
Northern flicker	*Colaptes auratus*	o	x
Northern Parula	*Setophaga americana*		o
Osprey	*Pandion haliaetus*	x (overhead)	x
Pine warbler	*Dendroica pinus*	o	o
Red-bellied woodpecker	*Melanerpes carolinus*	o	x
Red-tailed hawk	*Buteo jamaicensis*	o	o
Red-winged blackbird	*Agelaius phoeniceus*		x
Ring-necked duck	*Aythya collaris*		x
Song sparrow	*Melospiza melodia*	o	x
Tree swallows	*Tachycineta bicolor*		o
Tufted titmouse	*Parus bicolor*	x	x
White-breasted nuthatch	*Sitta carolinensis*	x	x
Mammals			
White-tailed deer	*Odocoileus virginianus*	o	x
Common raccoon	*Procyon lotor*	o	o
Eastern gray squirrel	*Sciurus carolinensis*	x	x
Northern short-tailed Shrew	*Blarina brevicauda*	o	o
Eastern Chipmunk	*Tamias striatus*	o	o
Virginia Opossum	*Didelphis virginiana*	o	o
Woodland Vole	*Microtus pinetorum*	o	o
Grey Fox	*Urocyon cinereoargenteus*	o	o
Striped skunk	*Mephitis mephitis*	o	o
Fisher	*Martes pennanti*	o	x
Coyote	*Canis latrans*	o	o
Common Muskrat	*Ondatra zibethicus*		x
Reptiles/Amphibians			
Eastern Box Turtle	*Terrapene carolina*	o	o
Bullfrog	*Rana catesbeiana*		o
Green Frog	*Rana clamitans*		o
Eastern Red-backed Salamander	*Plethodon cinereus*	o	o
Eastern Racer	*Coluber constrictor*	o	o
Eastern Ribbon Snake	*Thamnophis sauritus*	o	o
Common Garter Snake	*Thamnophis sirtalis*	o	o

Key
x = species observed or heard
o = species anticipated to occur in habitat

July 1, 2015 Draft

LANDSCAPE MAINTENANCE CONTRACT
Northbridge at
Mashpee Commons

This Landscape Maintenance Agreement (this "Agreement") is made this _____day of _____,201_ by and between the Northbridge Companies, (hereafter, the "Owners") and _____ Landscaping (hereafter the "Landscaper").

WHEREAS, on , 2013, the Cape Cod Commission approved the Owners' Development of Regional Impact permit application (Project# (hereafter the "Permit"), allowing an approximately 65,000 square foot development of a memory care assisted living project called Northbridge at Mashpee Commons (hereafter, the "Project"); and

WHEREAS, condition ____ of the Permit requires that the Owners submit to the Cape Cod Commission a landscape maintenance contract for three (3) growing seasons for the new landscaping proposed in connection with the Project;

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Owners and Landscaper agree as follows relative to the new landscaping associated with the Project:

General Requirements

1. Landscaper will supervise the installation of the plant materials shown on the approved landscape plan for the Project prepared by BSC Group, PC, dated July xx, 2015, entitled "Northbridge Mashpee Commons," Sheet L- entitled "Planting Plan" (the "Plan") and will perform such plant maintenance as described herein.

2. The maintenance obligations of this Agreement shall take effect as of the time that the plantings, as shown on the Plan, are installed. Landscaper shall maintain the specified plantings as shown on the Plan for three (3) full growing seasons commencing on or about _____ __, 201_ .

3. The obligations and terms set forth in this Agreement shall terminate three (3) years from completion of the initial installation of all plantings shown on the Plan.

4. During the term of this Agreement, any plantings, as shown on the Plan, which die or show significant die back shall be replaced, and if any substitute plantings are different from those shown on the Plan, verbal approval of any such substitute plantings by the Cape Cod Commission staff shall be required.

5. In the event that the Landscaper fails to perform the services described herein to the Owners' satisfaction, the Owners may, by 30 days written notice to Landscaper at the address above, cancel and terminate this Agreement. If the Owners terminate this Agreement prior to expiration of three full growing seasons, the Owners shall hire a

similarly qualified landscape maintenance contractor to complete the term of this Agreement.

Maintenance Specifications

1. Integrated Pest Management. Landscaper shall implement an integrated pest management ("IPM") system that emphasizes monitoring and use of bio-rational pesticides to maintain the health of the plantings. During the term of this Agreement, new grasses and plantings, as shown on the Plan, shall be monitored at weekly intervals during the spring for soil moisture conditions, pest infestation and symptoms of stress as follows:

    a. Plant Watering Specifications for the Project

        1. For the new plantings within range of the Owners' irrigation system, the automated irrigation system shall be calibrated for drip irrigation, and may be adjusted, as necessary, based on soil moisture content and during the growing season.

        n. The automated irrigation system shall operate only in the morning or evening hours.

        111. Automated systems shall not over-spray onto surrounding pavement.

        IV. The irrigation system shall be maintained to ensure that all areas receive sufficient water to encourage rapid, healthy establishment and strong growth.

        v. The maintenance program for the irrigation system shall include routinely inspecting all water lines, valves and pumps for leaks.

        VI. For any of the plantings shown on the Plan which are not within range of the Owners' automated irrigation system, these plantings shall be hand-watered. Specifically, the root balls of shrubs and trees shall be deeply irrigated every 5 to 7 days when rainfall does not provide 1 inch of water per week.

        vn. All new plantings shown on the Plan, whether served by the Owners' irrigation system or not, shall be monitored and, if showing signs of stress related to under-watering, they shall be deeply hand watered as needed.

    b. Pesticide Requirements

        1. Pests shall be managed in accordance with IPM practices that emphasize the use of bio-rational (nontoxic) pesticides when necessary to prevent damage to plantings.

c. Fertilization Requirements

1. Organic fertilizer and lawn care is recommended.

n. Soil and plant tissue shall be tested and slow-release fertilizer shall be applied as needed to maintain healthy growing conditions for shrubs, trees and grasses.

111. Fertilizer shall not be used in bio-retention areas unless it is organic and worked into the soil under the mulch.

d. Mulching Requirements

1. By April 15th, weather permitting, all old mulch shall be removed from the base of shrubs and the root flare of all trees, and fresh mulch shall be applied. The depth of mulching shall be 3-4 inches, but shall not exceed 4 inches total.

n. In bio-retention areas, only composted, shredded hardwood bark mulch shall be used and shall be applied no deeper than 2-3 inches.

111. Mulch shall be monitored and adjusted as necessary to ensure that it does not collect against the root collars of trees.

e. Pruning Requirements

1. Trees and shrubs shall be monitored and pruned as needed to remove weak, diseased or damaged limbs/braches in order to avoid the need for pesticide applications and to maintain proper form.

2. Staking Requirements.

a. All new trees shown on the Plan shall be staked and guyed for the first growing season.

b. Guys shall be inspected and adjusted periodically through the first year to ensure that they do not girdle or otherwise injure the trees.

c. Stakes and guys shall be removed after one year unless otherwise indicated.

3. Tree Wrap Requirements.

a. Any tree wraps not removed at the time of planting shall be removed when this contract takes effect.

4. Seeding Requirements.

a. Within the Project area, as shown on the Plan, eroded or damaged lawn, naturalized areas and storm-water bio-infiltration areas shall be repaired as

appropriate. Such areas shall be over-seeded or re-planted, as necessary, using draught resistant or wet-tolerant erosion control/restoration seed, as appropriate for the location and function.

WITNESS the execution hereof under seal as of the date first above written.

The Northbridge Companies,

By:_____
Name:
Title:

[LANDSCAPER],

By:_____
Name:
Title:

TURF MANAGEMENT AND INTEGRATED PEST MANAGEMENT PLAN

Northbridge at Mashpee Commons

Mashpee, MASSACHUSETTS

June 29, 2015

Integrated Pest Management

1. Integrated Pest Management (IPM) is a management and decision-making system that uses cultural practices to promote healthy turfgrass and plants that has a competitive advantage against pests and environmental stress. The IPM system will encourage the use of organic based fertilizers, appropriate irrigation techniques and qualified professionals to ensure to the protection of the surrounding environment and resource areas. The IPM system will focus on: (1) turfgrass and plant establishment, (2) application of all chemicals by a professional, (3) pesticide and herbicide management, (4) fertilizer management, (5) irrigation management, and (6) property owner education.

Turfgrass Establishment

1. All lawn areas will be seeded or sodded with a mix of fescue species. This mix will establish quickly, reducing the need for fertilizers, irrigation and pest management during germination.

2. A minimum of 4-6 inches of organic screened loam will be required prior to planting the turfgrass. This will ensure proper cation exchange sites necessary to hold the nutrients needed for establishment and maintenance.

3. Organic based fertilizers shall be used to provide a slow release nitrogen source, ensuring all available nitrogen will be used by the turfgrass.

4. The turfgrass seed mixture shall contain endophyte enhanced seed whenever commercially available. Endophyte enhanced seed exhibits a higher overall vigor and resists insects feeding on foliar sections of the plant, reducing the use of pesticides.

5. During establishment, turfgrass seedlings shall be irrigated 3-4 times per day for a maximum duration of 5 minutes each time. The goal of irrigation during establishment is to maintain adequate moisture within the top 1 inch of the topsoil. The soil will not be watered beyond its water holding capacity at any time during establishment, minimizing any potential leaching of fertilizer. The irrigation system will be equipped with moisture sensors and a “smart” controller to minimize unnecessary irrigation.

6. Turfgrass will be maintained at an approximate height of 1.5 inches. Turfgrass clippings will be returned to the turf canopy creating a green compost.

Pesticide and Herbicide Management

1. Pesticides and herbicides will not be used on a regular basis within the turfgrass or planted areas. Suspected disease or insects must be confirmed by a qualified

professional. A written report shall document the disease and must be presented to the owner. The report shall contain a justification for the application of a pesticide / herbicide including observation and documentation of signs and /or symptoms of disease or pests, establishment of thresholds which would trigger a pesticide/herbicide application and organic or cultural alternatives to chemical pesticides, if applicable.

2. All applicable alternatives to chemical usage must be considered before application.

3. If a chemical application is deemed necessary the product shall be chosen based upon efficacy, potential environmental toxicity, and health risks.

Fertilizer Management

1. Fertilizer management will focus on an organic based approach. Organic fertilizers provide a slow-release nitrogen source that will be fully utilized by the turfgrass. This system prevents leaching of excess nitrogen into the soil. Additionally, total amounts of nitrogen will be limited and applied only during the active growing season of the turfgrass.

2. Organic fertilizers or water insoluble nitrogen sources of greater than 75 percent will be used on the turfgrass.

3. No more than 1.5 lbs. of nitrogen per 1,000 square feet will be applied during each growing season after the establishment of turfgrass. The growing season is approximately April – October for this property in Brewster, Massachusetts.

4. The soil shall be tested every year, or as needed, to determine the soil pH to custom tailor the fertilizer program.

Irrigation Management

1. Conservation of the water resources will be the goal of the irrigation of turfgrass and plantings within the site. The timing and quantity of irrigation will be restricted to prevent over-watering and limit potential leaching of fertilizers.

2. Automatic irrigation systems equipped with a “smart” controller and moisture sensing devices shall be set to water turfgrass and plantings during the early morning hours (approximately 3 – 6 a.m.). This will decrease the leaf wetness period, minimizing development of diseases and maximizing the water resources by not watering during the hottest time of the day.

3. Not more than ½ inch per week of supplemental irrigation will be applied to the turfgrass or planted areas. The goal would be to replace the moisture in overly dry areas of the soil.

4. The typical irrigation schedule may be 3-4 times per week for 15-20 minutes each period.

Educational Program

1. An important component of a successful IPM system will involve an education of the property owner on the principles, goals and success of the IPM. Documentation of the fertilizer applications will be provided to the owner by the professional providing the application.

2. The goal of the IPM system is to protect the groundwater resources by developing a responsible management system. Appropriate seed / plant selection, cultural practices, and responsible fertilizer management will provide assurance that potential nitrogen leaching is minimized. Additionally, justification for any applications of fertilizer by a professional guarantees responsible management.

Mashpee Commons WWTP
2014-2015 Daily Flows and Nitrogen Lev

Day of Month	Month												Average
	October	November	December	January	February	March	April	May	June	July	August	September	
1	36,846	33,271	36,740	37,375	27,433	31,261	30,036	36,381	26,099	37,287	30,983	34,233	
2	42,850	27,632	30,486	32,174	22,987	27,093	31,709	41,624	26,841	43,783	38,792	35,377	
3	37,526	28,911	29,338	38,121	26,724	27,710	27,389	30,355	31,338	47,293	36,174	36,344	
4	43,202	30,292	31,273	35,176	27,426	33,021	41,683	32,029	29,748	48,921	40,986	39,174	
5	42,160	29,058	37,258	31,450	4,593	34,042	32,952	30,435	32,022	37,841	43,452	44,085	
6	30,704	35,856	40,405	35,093	0	32,759	30,021	32,479	34,488	38,125	39,219	39,255	
7	32,099	32,634	34,245	24,442	16,305	35,371	30,013	30,086	29,961	34,380	45,090	34,345	
8	22,392	36,847	28,132	32,111	24,579	34,795	29,449	32,790	32,440	38,887	48,493	36,922	
9	45,612	37,825	32,847	36,999	23,486	35,996	30,707	39,025	29,778	40,872	40,847	32,608	
10	34,666	32,228	31,846	42,512	23,296	34,916	34,219	37,055	30,694	36,985	42,464	35,416	
11	40,775	36,318	32,325	35,964	28,255	25,515	36,423	32,826	31,046	36,985	42,376	35,510	
12	37,524	36,907	33,657	36,136	27,480	32,092	29,622	24,070	36,427	28,599	49,358	38,610	
13	32,470	37,684	38,087	37,476	32,632	25,069	30,809	43,522	38,028	26,189	42,459	35,959	
14	30,928	32,218	37,776	35,824	33,490	42,312	27,175	37,025	26,051	34,484	39,568	28,985	
15	32,221	40,882	35,837	34,843	22,704	38,672	30,157	41,236	39,120	44,939	46,331	30,355	
16	38,057	39,645	30,751	39,281	30,578	31,192	35,417	43,421	36,055	23,216	42,460	36,002	
17	33,576	35,436	36,592	47,272	29,173	31,406	32,621	45,666	33,399	30,095	43,840	38,834	
18	35,026	33,509	34,785	40,951	31,286	27,301	45,554	29,018	35,301	30,095	40,507	39,172	
19	29,876	29,864	35,562	32,720	34,352	29,950	41,870	31,595	39,801	45,899	42,551	42,088	
20	29,064	31,413	38,381	29,225	32,520	32,275	30,628	24,830	43,616	41,274	39,615	35,746	
21	4,513	28,384	39,188	32,571	37,494	32,641	25,733	28,453	37,331	36,069	40,475	32,889	
22	4,702	33,603	35,996	31,058	35,925	26,536	36,485	32,999	32,208	39,938	42,469	33,029	
23	0	33,809	35,807	39,394	28,492	26,566	33,518	35,921	5,027	40,616	41,567	33,022	
24	0	30,446	36,149	37,529	28,556	27,597	37,134	41,908	0	33,806	38,031	5,150	
25	0	27,789	11,541	31,598	29,955	29,812	38,752	34,132	19,977	33,805	40,756	0	
26	0	31,140	34,275	20,942	29,226	29,914	33,743	25,391	36,589	48,211	36,310	19,710	
27	14,755	15,655	38,357	5,090	31,855	30,797	7,207	26,026	42,097	42,472	39,224	31,610	
28	31,177	32,986	38,188	6,775	33,278	41,378	24,511	30,379	41,749	45,790	40,426	32,829	
29	26,899	39,419	31,430	22,385		41,008	30,858	27,741	39,659	38,320	41,715	24,109	
30	32,054	38,000	31,443	28,433		30,716	32,022	31,735	38,413	41,238	37,077	35,926	
31	30,139		48,362	34,039		28,350		29,287		30,983	42,249		
Effluent Total Nitrogen	2.1	4.9	2.6	6.3	5.3	2.8	4.9	4.8	3.6	3.9	5.3	3.3	**4.2**

10/15/2015

Jeffrey Gould

Southeast Regional Office

20 Riverside Drive

Lakeville, MA 02347

Enclosed is the September 2015 Discharge Monitoring Report for Permit #306
Month/Year

for MASHPEE COMMONS in MASHPEE

The following reports are included in this submittal:

☑ Monthly-Inf / Eff	☐ Quarterly-Inf / Eff	☐ Annual-Inf / Eff
☑ Monthly-Mon Well	☐ Quarterly-Mon Well	☐ Annual-Mon Well
☐ Daily-Daily		

For questions on this report please contact: Joyce Anderson
Name

NOV - 3 2015

At: 508.248-2892
Phone

JAnderson@rhwhite.com
Email

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system design to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information. The information submitted is to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Joyce C Anderson
Signature

Joyce Anderson
Print Name

10/15/2015
Date

CC: Wastewater Management Program/DEP, One Winter St/5th floor, Boston, Ma. 02108
MASHPEE Board of Health
Mashpee Commons Limited Partnership

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Groundwater Discharge Permit Program

Groundwater Permit

Permit Number: 306-4

Facility: Mashpee Commons

Sampling Date: September 2015

Daily Readings/Analysis Information

Date	Effluent Flow GPD	Reuse Flow GPD	Irrigation Flow GPD	Turbidity	Influent pH	Effluent pH	Chlorine Residual (mg/l)	UV Intensity (%)
1	34233					7.4		4.3
2	35377					7.8		5.7
3	36344					7.6		62.9
4	39174					7.4		40
5	44085							
6	39255							
7	34345							
8	36922					7.3		11.4
9	32608					7.6		11.4
10	35416					7.5		8.6
11	35510					7.5		11.4
12	38610							
13	35959							
14	28985					7.8		7.1
15	30355					7.5		37.1
16	36002					7.6		34.3
17	38834					7.6		14.3
18	39172					7.3		24.3
19	42088							
20	35746							
21	32889					7.8		12.9
22	33029					7.4		52.9
23	33022					7.5		30
24	5150					7.8		51.4
25	0					NS		200
26	19710							
27	31610							
28	32829					7.6		11.4
29	24109					7.5		11.4
30	35926					7.7		14.3
31								

Massachusetts Department of Environmental Protection

Bureau of Resource Protection - Groundwater Discharge Permit Program

Permit Number: 306-4

Facility: Mashpee Commons

Frequency: Monthly

Groundwater Permit

DISCHARGE MONITORING REPORT

Sampling Date: 9/10/15

Contaminant Analysis Information

For "0" below detection limit, or not detected, enter "ND"
TNTC = too numerous to count.
NS = Not Sampled

Parameter / Contaminant	Units	Influent	Effluent	Effluent Method Detection Limit
BOD	mg/l	1300	ND	3
TSS	mg/l	790	2.2	2
Total Solids	mg/l	1800	680	10
Ammonia-N	mg/l	42		
Nitrate-N	mg/l		2.4	0.05
Total Nitrogen(NO3+NO2+TKN)	mg/l		3.26	0.5
Oil & Grease	mg/l		1.5	0.5

NOV - 3 2015

Massachusetts Department of Environmental Protection

Bureau of Resource Protection - Groundwater Discharge Permit Program

Permit Number: 306-4

Facility: Mashpee Commons

Frequency: Monthly

Groundwater Permit

MONITORING WELL DATA REPORT

Sampling Date: 9/2/2015

Contaminant Analysis Information

For "0" below detection limit, or not detected, enter "ND"
TNTC = too numerous to count.
NS = Not Sampled
DRY = Not Enough water in well to sample

Parameter / Contaminant	Units	GZA2	GZA4	MW1	MW2	SH2
pH	SU	5.8	5.9	5.2	6.8	6.5
Static Water Level	Feet	37.8	27.3	29.6	43.4	45.1
Specific Conductance	umhos/c	540	563.0	610	486	88

Massachusetts Department of Environmental Protection

Bureau of Resource Protection - Groundwater Discharge Permit Program

Permit Number: 306-4

Facility: Mashpee Commons

Frequency: Monthly

Groundwater Permit

MONITORING WELL DATA REPORT

Sampling Date: 9/2/2015

Contaminant Analysis Information

For "0" below detection limit, or not detected, enter "ND"
TNTC = too numerous to count.
NS = Not Sampled
DRY = Not Enough water in well to sample

Parameter / Contaminant	Units	ES1	ES2	ES3
pH	SU	6.3	6.4	6.3
Static Water Level	Feet	20.4	30.4	30.5
Specific Conductance	umhos/c	103	692.0	917

**NOTE: WELL REPORTING REQUESTED BY TOWN OF MASHPEE

NOV - 3 2015

R.I. ANALYTICAL
Specialists in Environmental Services

CERTIFICATE OF ANALYSIS

Whitewater, Inc.
Attn: Mr. David Boucher
Wastewater Division
253B Worcester Rd., Bldg 2
Charlton, MA 01507

Date Received: 9/10/2015
Date Reported: 9/17/2015
P.O. #:
Work Order #: 1509-19441

DESCRIPTION: PROJECT# 717 MASHPEE COMMONS - WWTP - MONTHLY

Subject sample(s) has/have been analyzed by our Warwick, R.I. laboratory with the attached results.

Reference: All parameters were analyzed by U.S. EPA approved methodologies.
The specific methodologies are listed in the methods column of the Certificate of Analysis.

Data qualifiers (if present) are explained in full at the end of a given sample's analytical results.
The Detection Limit is defined as the lowest level that can be reliably achieved during routine laboratory conditions.
The Certificate of Analysis shall not be reproduced except in full, without written approval of R.I. Analytical.
Results relate only to samples submitted to the laboratory for analysis.
Test results are not blank corrected.

Certification # (as applicable to the sample's origin state):
RI LAI0033, MA M-RI015, CT PH-0508, ME RI00015, NH 2537, NY 11726

If you have any questions regarding this work, or if we may be of further assistance, please contact our customer service department.

Approved by:

enc: Chain of Custody

R.I. Analytical Laboratories, Inc.

CERTIFICATE OF ANALYSIS

Whitewater, Inc.
Date Received: 9/10/2015
Work Order #: 1509-19441

Sample # 001
SAMPLE DESCRIPTION: INFLUENT-COMPOSITE
SAMPLE TYPE:COMPOSITE
SAMPLE DATE/TIME: 9/08/2015 - 9/09/2015

PARAMETER	SAMPLE RESULTS	DET. LIMIT	UNITS	METHOD	DATE/TIME ANALYZED	ANALYST
BOD 5	1300	600	mg/l	SM5210B 21ed	9/10/2015 20:42	KL
Total Suspended Solids	790	2.0	mg/l	SM2540D 18-21ed	9/15/2015 9:02	KG
Total Solids	1800	10	mg/l	SM2540B 18-21ed	9/16/2015 9:06	KG
Ammonia (as N)	42	0.50	mg/l	SM4500NH3-B,H 18-21ed	9/16/2015 22:02	JGL

Sample # 002
SAMPLE DESCRIPTION: EFFLUENT-COMPOSITE
SAMPLE TYPE:COMPOSITE
SAMPLE DATE/TIME: 9/08/2015 - 9/09/2015

PARAMETER	SAMPLE RESULTS	DET. LIMIT	UNITS	METHOD	DATE/TIME ANALYZED	ANALYST
BOD 5	<3.0	3.0	mg/l	SM5210B 21ed	9/10/2015 20:44	KL
Total Suspended Solids	2.2	2.0	mg/l	SM2540D 18-21ed	9/15/2015 9:02	KG
Total Solids	680	10	mg/l	SM2540B 18-21ed	9/16/2015 9:06	KG
Nitrite (as N)	<0.05	0.05	mg/l	EPA 300.0	9/11/2015 3:27	TAH
Nitrate (as N)	2.4	0.05	mg/l	EPA 300.0	9/11/2015 3:27	TAH
TKN (as N)	0.86	0.50	mg/l	SM4500NOrg-D 18-21ed	9/11/2015 12:41	NJJ
Total Nitrogen (as N)	3.26	0.50	mg/l	CALCULATION	9/11/2015 12:41	NJJ

Sample # 003
SAMPLE DESCRIPTION: EFFLUENT-GRAB
SAMPLE TYPE:GRAB
SAMPLE DATE/TIME: 9/09/2015 @ 09:30

PARAMETER	SAMPLE RESULTS	DET. LIMIT	UNITS	METHOD	DATE/TIME ANALYZED	ANALYST
Oil & Grease Gravimetric	1.5	0.5	mg/l	EPA 1664A	9/17/2015 7:09	WWW

NOV - 3 2015

R.I. ANALYTICAL
Specialists in Environmental Services

CHAIN OF CUSTODY RECORD

41 Illinois Avenue
Warwick, RI 02888-3007
800-937-2580 • Fax: 401-738-1970

131 Coolidge St., Suite 105
Hudson, MA 01749-1331
800-937-2580 • Fax: 978-568-0078

Date Collected	Time Collected	Field Sample Identification	Grab or Composite	# of Containers & Type [C]	Preservation Code [P]	Matrix Code [M]	BOD – Biochemical O_2 Demand	TSS – Suspended Solids	TS – Total Solids	NH_3 – Ammonia Nitrogen as N	O&G – Oil & Grease (1664)	NO_3 – Nitrate Nitrogen as N	NO_2 – Nitrite Nitrogen as N	TKN – Total Kjeldahl Nitrogen	TN – Total Nitrogen Calculation	[P]
9-8-15 To 9-9-15	10:00 To 9:00 AM	Influent – Composite	C	1P	NP	WW	X	X	X							
			C	1P	S	WW				X						
↓	↓	Effluent – Composite	C	1P	NP	WW	X	X	X			X	X			
			C	1P	S	WW								X	X	
9-9-15	9:30 AM	Effluent - Grab	G	~~2AG~~ (G)	S	WW					X					

NOV – 3 2015

Field Kits
NH3: 0-25 mg/L
NO3: 1-7 mg/L

Client Information

Company Name: Whitewater, Inc.
Address: 253B Worcester Road, Building 2
City / State / Zip: Charlton, MA 01507
Telephone: 508-248-2892 Fax: 508-248-2895
Contact Person: David Boucher

Project Information

Project Name: Mashpee Commons – WWTP – Monthly
P.O. Number: Project Number: 717
Report To: David Boucher Phone: 508-864-0840 Fax: 508-248-2895
Sampled by: DAVID FISHER
Quote No: WWI031038
Email address: dboucher@rhwhite.com ~~jmurphy@rhwhite.com~~ ~~esmith@rhwhite.com~~ japrea@rhwhite.com CHAYWARD

Relinquished By	Date	Time	Received By	Date	Time
Dave Fisher	9/10/15	1355	Brandon Ashworth	9/10/15	1355
Brandon Ashworth	9/10/15	1700		9/10/15	17:00

Turn Around Time
Normal | X | EMAIL Report
X 5 Business days.
Rush – Date Due: ___/___/___

Project Comments
Circle if applicable: GW-1, GW-2, GW-3, S-1, S-2, S-3
MCP Data Enhancement QC Package? No
Temperature Upon Receipt 4.2 °C

Lab Use Only
X Sample Pick Up Only
X Shipped on ice
Workorder No: 15091944

Containers: P=Poly, G=Glass, AG=Amber Glass, V=Vial, St=Sterile Preservatives: A=Ascorbic Acid, NH4=NH_4Cl, H=HCl, M=MeOH, N=HNO_3, NP=None, S=H_2SO_4, SB=$NaHSO_4$, SH=NaOH, T=$Na_2S_2O_3$, Z=ZnOAc
Matrix Codes: GW=Groundwater, SW=Surface Water, WW=Wastewater, DW=Drinking Water, S=Soil, SL=Sludge, A=Air, B=Bulk/Solid, O=_____

Permits or Actions

Special Permit for Assisted Living Facility from the Mashpee Planning Board - Application filed concurrently

TOWN OF MASHPEE
OFFICE OF SELECTMEN

16 Great Neck Road North
Mashpee, Massachusetts 02649
Telephone - (508) 539-1401
bos@mashpeema.gov

Resolution

to
The Cape Cod Commission
from
The Town of Mashpee
Board of Selectmen
relative to
Northbridge at Mashpee Commons
Assisted Living

Resolution pursuant to Cape Cod Commission Regional Policy Plan Economic Development Goas ED1.3

The Board of Selectmen of the Town of Mashpee by a vote of this date resolve the following:

The Northbridge Companies proposes to develop the property located at 68 Great Neck Road South, in Mashpee, MA with an Assisted Living Facility containing 70 units.

The proposed location is consistent with the goals of the Mashpee Comprehensive Plan. The project site is within an area designated in the Land Use and Growth Management Element as a Regional Growth Center. The site is located in the Commercial C-1 zoning district which permits the proposed use by special permit.

The project site is located adjacent to the Mashpee Commons Wastewater Treatment Facility and within the Mashpee Water District Service Area. Both facilities have available capacity for and have agreed to provide service to the proposed project.

This Resolution voted by the Town of Mashpee Board of Selectmen on September 28, 2015.

John J. Cahalane
Chairman, Board of Selectmen

A TRUE COPY, ATTEST

TOWN CLERK OF MASHPEE, MA

BSC GROUP
Thoughtfully transforming our environments

33 Waldo Street
Worcester, MA 01608

Tel: 508-792-4500
800-288-8123
Fax: 508-792-4509

www.bscgroup.com

August 22, 2014

Mr. Andrew Marks
Operations Manager
Mashpee Water District
79 Industrial Drive
Mashpee, MA 02649

Re: Northbridge Assisted Living, Mashpee Commons

Dear Mr. Marks

Pursuant to our telephone conversation I transmit this letter to the Mashpee Water District to request water service to Great Neck Road, Mashpee, MA for the proposed Northbridge Assisted Living Facility.

The proposed development will consist of 82 beds in 70 units in a single structure. Attached please find a copy of concept plan for the project.

We will be making an application to the Town of Mashpee and the Cape Cod Commission in mid-September. The Cape Cod Commission application requires verification water service from the water service provider that water service is available for the project.

As per our discussion, it is our understanding there will be a development fee of $650.00 per unit. Additionally, as the property is only served by a 2 inch water main. An extension of the water main on Great Neck Road will be required and your office will furnish the location and plans of the existing main.

Your assistance in the matter is greatly appreciated. Please feel free to contact me if you require any additional information regarding this request.

Yours truly

Russell J. Burke
Director of Planning

Attachment

Cc; Ray Mitrano

Engineers
Environmental Scientists
GIS Consultants
Landscape Architects
Planners
Surveyors

IES ROAD REPORT
PHOTOMETRIC FILENAME : HERITAGE TYPE III 40W-4000K~5000K.IES

DESCRIPTIVE INFORMATION (From Photometric File)

IESNA:LM-63-2002
[TEST]
[TESTLAB]
[MANUFAC]LP1-N27-40W-4000K/5000K
[LUMINAIRE]

CHARACTERISTICS

IES Classification	Type III
Longitudinal Classification	Medium
Lumens Per Lamp	4800 (1 lamp)
Total Lamp Lumens	4800
Luminaire Lumens	4800
Downward Total Efficiency	100 %
Total Luminaire Efficiency	100 %
Luminaire Efficacy Rating (LER)	120
Total Luminaire Watts	40
Ballast Factor	1.00
Upward Waste Light Ratio	0.00
Maximum Candela	2548.508
Maximum Candela Angle	72H 70V
Maximum Candela (<90 Degrees Vertical)	2548.508
Maximum Candela Angle (<90 Degrees Vertical)	72H 70V
Maximum Candela At 90 Degrees Vertical	0 (0.0% Lamp Lumens)
Maximum Candela from 80 to <90 Degrees Vertical	465.473 (9.7% Lamp Lumens)
Cutoff Classification (deprecated)	Full Cutoff

LUMINAIRE CLASSIFICATION SYSTEM (LCS)

	Lumens	% Lamp	% Luminaire
FL - Front-Low (0-30)	380.3	7.9	7.9
FM - Front-Medium (30-60)	1554.1	32.4	32.4
FH - Front-High (60-80)	1243.5	25.9	25.9
FVH - Front-Very High (80-90)	71.7	1.5	1.5
BL - Back-Low (0-30)	302.6	6.3	6.3
BM - Back-Medium (30-60)	824.1	17.2	17.2
BH - Back-High (60-80)	389.9	8.1	8.1
BVH - Back-Very High (80-90)	33.8	0.7	0.7
UL - Uplight-Low (90-100)	0.0	0.0	0.0
UH - Uplight-High (100-180)	0.0	0.0	0.0
Total	4800.0	100.0	100.0
BUG Rating	B1-U0-G1		

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

IES ROAD REPORT
PHOTOMETRIC FILENAME : HERITAGE TYPE III 40W-4000K~5000K.IES

CANDELA TABULATION

Vert. Angles	Horizontal Angles									
	0	5	15	25	35	45	55	65	72	75
0.0	793.168	793.168	793.168	793.168	793.168	793.168	793.168	793.168	793.168	793.168
2.5	808.349	808.349	806.345	805.199	803.767	803.195	801.189	800.617	799.471	799.184
5.0	822.959	822.671	820.381	818.948	816.656	814.652	811.501	808.923	806.345	805.199
7.5	836.995	836.707	834.416	833.843	829.835	827.828	822.959	818.948	814.939	813.505
10.0	851.889	851.889	849.599	847.021	843.583	839.859	835.563	830.979	826.109	825.537
12.5	865.639	865.639	863.347	859.909	856.471	853.036	848.739	844.443	840.432	839.572
15.0	878.529	878.529	875.379	871.940	867.931	864.780	861.916	858.191	853.607	851.889
17.5	891.705	891.705	887.981	883.685	878.816	876.811	876.237	875.091	871.653	869.936
20.0	903.164	903.164	900.300	895.143	890.560	891.133	893.997	896.575	894.857	893.711
22.5	916.052	916.627	913.475	908.319	904.883	910.037	916.913	924.647	924.647	922.928
25.0	930.375	930.375	926.939	921.211	920.064	931.235	945.557	958.161	960.452	959.308
27.5	944.699	944.699	940.688	934.385	938.109	956.443	979.072	998.836	1004.279	1003.993
30.0	960.165	959.308	954.437	949.568	960.452	988.811	1021.180	1050.396	1060.993	1060.709
32.5	975.920	975.348	970.192	965.609	984.228	1025.763	1073.885	1116.279	1132.033	1132.607
35.0	995.972	995.684	989.956	986.519	1013.731	1066.437	1137.475	1195.911	1217.395	1217.968
37.5	1022.037	1022.324	1015.451	1016.309	1051.543	1112.556	1205.076	1283.277	1312.781	1313.925
40.0	1050.396	1051.255	1044.381	1054.121	1096.801	1165.835	1275.829	1370.069	1404.729	1405.303
42.5	1077.036	1078.755	1072.739	1093.936	1148.361	1228.565	1348.873	1449.701	1476.627	1475.769
45.0	1098.233	1101.097	1096.513	1132.607	1203.645	1300.177	1427.360	1522.459	1554.828	1555.972
47.5	1113.988	1115.993	1115.420	1169.273	1255.777	1377.804	1520.167	1617.845	1651.072	1651.360
50.0	1128.023	1130.889	1131.460	1202.499	1310.489	1459.727	1622.141	1727.267	1753.047	1749.899
52.5	1133.465	1134.897	1141.487	1232.289	1362.336	1542.223	1722.684	1826.951	1847.575	1842.419
55.0	1129.741	1134.324	1149.507	1257.783	1409.599	1623.860	1821.793	1916.895	1934.081	1925.775
57.5	1112.269	1117.997	1143.204	1280.413	1453.139	1692.895	1918.613	2005.693	2005.980	1994.521
60.0	1096.227	1102.816	1141.487	1295.021	1493.243	1757.917	2020.303	2098.500	2068.997	2054.101
62.5	1041.516	1050.971	1115.707	1302.755	1526.469	1815.207	2115.975	2211.933	2133.733	2112.537
65.0	918.059	927.511	1018.315	1252.913	1531.340	1871.063	2192.169	2334.245	2244.876	2210.215
67.5	672.001	683.460	800.903	1081.332	1425.927	1848.721	2244.016	2441.091	2403.280	2360.313
70.0	310.508	319.388	408.757	667.705	1096.227	1592.637	2184.148	2493.509	2548.508	2501.817
72.5	172.155	173.300	195.356	276.420	530.497	1055.265	1804.035	2333.388	2392.395	2335.392
75.0	145.228	145.801	155.540	183.612	237.749	469.771	1017.455	1657.661	1708.933	1667.973
77.5	128.327	128.900	139.213	158.691	184.757	246.629	416.492	809.209	931.808	910.897
80.0	109.421	110.569	120.880	138.640	164.133	206.241	270.117	390.997	465.473	445.709
82.5	85.935	86.221	93.668	109.709	135.488	189.628	242.907	277.852	289.311	282.435
85.0	62.732	64.164	73.329	79.059	87.365	144.941	207.959	236.317	237.749	228.012
87.5	24.635	26.640	53.565	59.581	43.539	50.128	135.201	183.039	182.180	168.717
90.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Vert. Angles	Horizontal Angles									
	85	90	95	105	115	125	135	145	155	165
0.0	793.168	793.168	793.168	793.168	793.168	793.168	793.168	793.168	793.168	793.168
2.5	796.607	794.315	794.028	791.164	788.012	784.575	781.137	779.419	778.273	776.556
5.0	799.756	795.747	793.741	787.725	781.424	774.263	767.101	762.519	758.795	755.357
7.5	805.199	799.756	796.033	786.293	775.408	763.377	752.493	744.187	737.025	732.443
10.0	813.792	806.631	800.903	786.580	770.253	752.779	737.597	725.567	715.827	709.525
12.5	824.964	816.943	808.923	789.444	767.101	743.900	724.135	707.521	694.917	687.469
15.0	839.285	829.260	819.521	794.601	765.669	736.165	711.245	690.621	674.865	665.413
17.5	856.759	845.587	833.843	802.621	767.101	731.296	700.645	675.439	655.388	643.071
20.0	879.388	867.071	852.176	814.652	770.253	728.144	691.765	659.684	635.909	621.300
22.5	908.319	894.284	875.379	828.115	775.695	726.999	683.460	645.648	618.436	602.396
25.0	943.552	927.511	904.309	847.307	784.575	727.859	675.153	632.187	602.967	585.209
27.5	986.805	967.900	941.548	872.800	798.324	729.863	668.851	621.300	588.932	568.595

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

IES ROAD REPORT
PHOTOMETRIC FILENAME : HERITAGE TYPE III 40W-4000K~5000K.IES

CANDELA TABULATION - (Cont.)

30.0	1042.091	1020.033	988.811	906.887	818.375	735.591	664.268	611.563	574.036	549.117
32.5	1110.836	1083.909	1046.385	948.421	844.156	744.187	663.121	601.823	557.136	526.773
35.0	1191.328	1158.387	1112.843	995.684	873.947	756.503	663.121	590.651	537.085	500.420
37.5	1279.839	1237.445	1181.303	1042.377	905.741	770.540	661.691	576.329	512.164	468.912
40.0	1363.767	1313.353	1248.331	1094.223	939.255	785.435	658.539	557.136	480.083	426.231
42.5	1432.801	1382.100	1314.500	1148.647	970.765	799.471	652.524	530.784	437.404	384.697
45.0	1513.579	1457.723	1385.825	1203.932	1000.269	809.495	639.920	491.253	394.723	350.896
47.5	1595.503	1532.197	1455.429	1256.924	1029.200	816.656	615.572	445.709	358.629	320.532
50.0	1674.275	1600.371	1517.589	1305.619	1053.261	817.229	576.615	401.597	322.252	284.727
52.5	1743.309	1661.385	1574.592	1350.879	1072.739	807.776	526.487	356.625	281.861	247.776
55.0	1803.748	1718.675	1631.595	1385.251	1079.327	772.544	463.469	305.637	241.187	214.833
57.5	1853.591	1769.089	1686.305	1404.729	1067.583	702.652	387.561	254.077	205.095	185.903
60.0	1895.697	1814.061	1739.584	1402.437	1024.615	585.781	305.351	207.673	175.019	163.561
62.5	1937.807	1864.476	1783.124	1370.929	942.979	422.221	228.869	171.008	152.675	146.947
65.0	2001.969	1917.181	1794.011	1291.584	768.820	277.565	177.024	146.373	136.921	134.629
67.5	2105.089	1968.740	1765.651	1157.813	484.093	194.211	149.524	130.333	124.319	123.744
70.0	2170.399	1956.709	1651.360	943.839	271.837	159.836	131.479	116.583	112.860	113.147
72.5	1939.523	1696.045	1344.576	615.572	188.767	140.357	115.152	103.693	101.687	103.120
75.0	1372.363	1144.924	834.704	322.539	162.988	120.593	100.543	91.663	90.804	92.521
77.5	691.765	526.487	378.681	199.081	150.671	101.403	87.365	80.204	79.632	82.209
80.0	324.257	274.129	233.167	170.435	122.313	84.787	75.908	69.605	69.321	70.465
82.5	212.543	197.361	179.315	156.972	89.085	72.185	66.455	59.581	55.856	55.284
85.0	124.891	138.353	148.667	120.307	63.589	57.004	51.273	47.837	45.259	42.395
87.5	40.961	61.012	103.980	67.028	37.524	34.947	20.051	26.353	27.499	26.925
90.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Vert. Angles	**Horizontal Angles**	
	175	**180**
0.0	793.168	793.168
2.5	777.413	777.413
5.0	755.357	755.357
7.5	731.296	731.009
10.0	707.808	707.521
12.5	684.892	684.319
15.0	661.404	661.117
17.5	637.343	637.056
20.0	615.285	614.427
22.5	595.233	594.089
25.0	577.475	576.043
27.5	557.997	556.277
30.0	536.513	534.508
32.5	512.164	510.160
35.0	483.807	480.656
37.5	446.855	443.989
40.0	402.171	400.164
42.5	364.357	362.641
45.0	335.713	333.711
47.5	305.637	303.919
50.0	270.117	268.399
52.5	236.031	235.172
55.0	207.387	207.100
57.5	181.605	181.605
60.0	161.555	161.841
62.5	146.373	146.947
65.0	134.057	134.629

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

IES ROAD REPORT
PHOTOMETRIC FILENAME : HERITAGE TYPE III 40W-4000K~5000K.IES

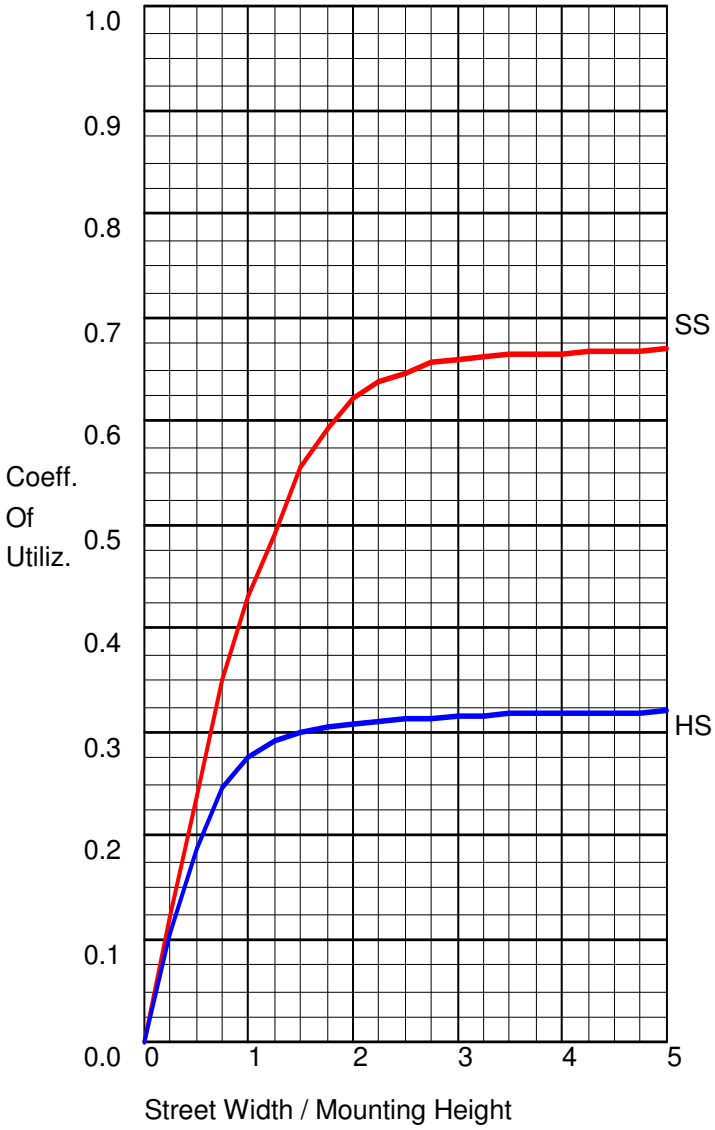
CANDELA TABULATION - (Cont.)

67.5	123.171	123.744
70.0	112.573	112.860
72.5	103.120	102.835
75.0	94.240	94.240
77.5	83.356	83.356
80.0	71.612	71.612
82.5	56.429	56.429
85.0	29.217	26.353
87.5	14.036	11.744
90.0	0.000	0.000

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

IES ROAD REPORT
PHOTOMETRIC FILENAME : HERITAGE TYPE III 40W-4000K~5000K.IES

COEFFICIENTS OF UTILIZATION



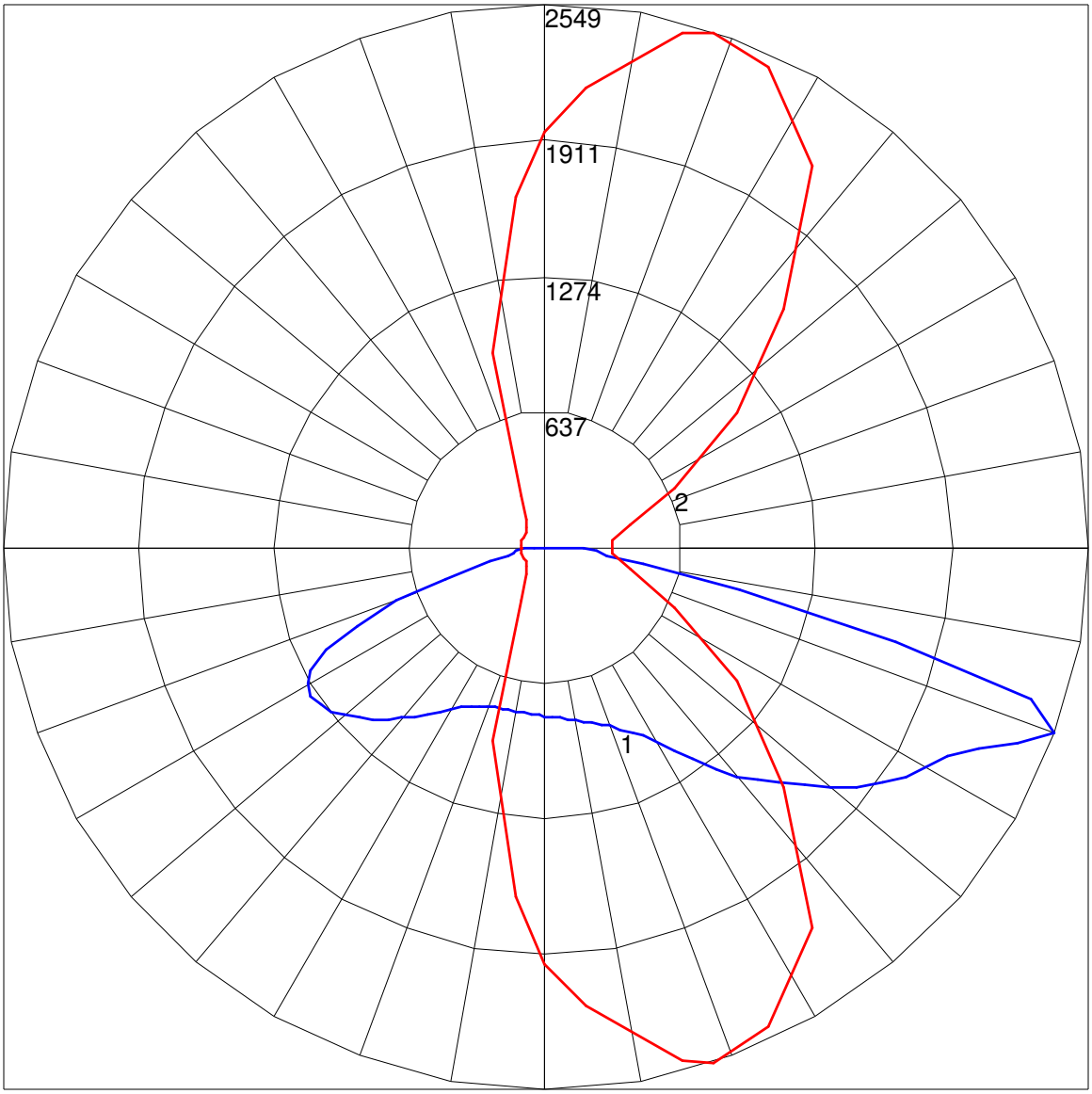
FLUX DISTRIBUTION

	Lumens	Percent Of Lamp
Downward Street Side	3249.6	67.7
Downward House Side	1550.5	32.3
Downward Total	4800.1	100.0
Upward Street Side	0.0	0.0
Upward House Side	0.0	0.0
Upward Total	0.0	0.0
Total Flux	4800.1	100.0

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

IES ROAD REPORT
PHOTOMETRIC FILENAME : HERITAGE TYPE III 40W-4000K~5000K.IES

POLAR GRAPH

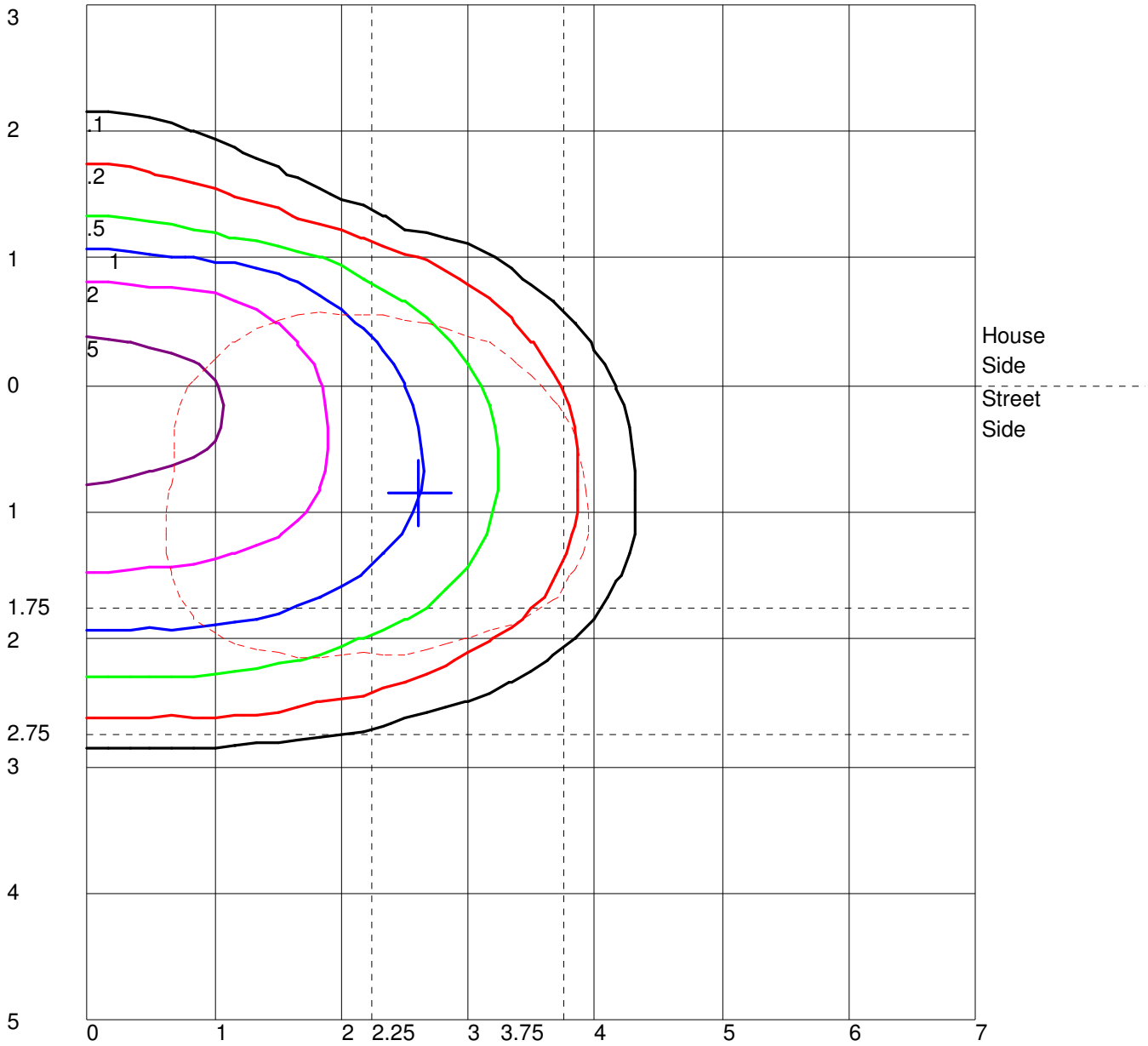


Maximum Candela = 2548.508 Located At Horizontal Angle = 72, Vertical Angle = 70
1 - Vertical Plane Through Horizontal Angles (72 - 252) (Through Max. Cd.)
2 - Horizontal Cone Through Vertical Angle (70) (Through Max. Cd.)

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

IES ROAD REPORT
PHOTOMETRIC FILENAME : HERITAGE TYPE III 40W-4000K~5000K.IES

ISOFOOTCANDLE LINES OF HORIZONTAL ILLUMINANCE



Distance In Units Of Mounting Height

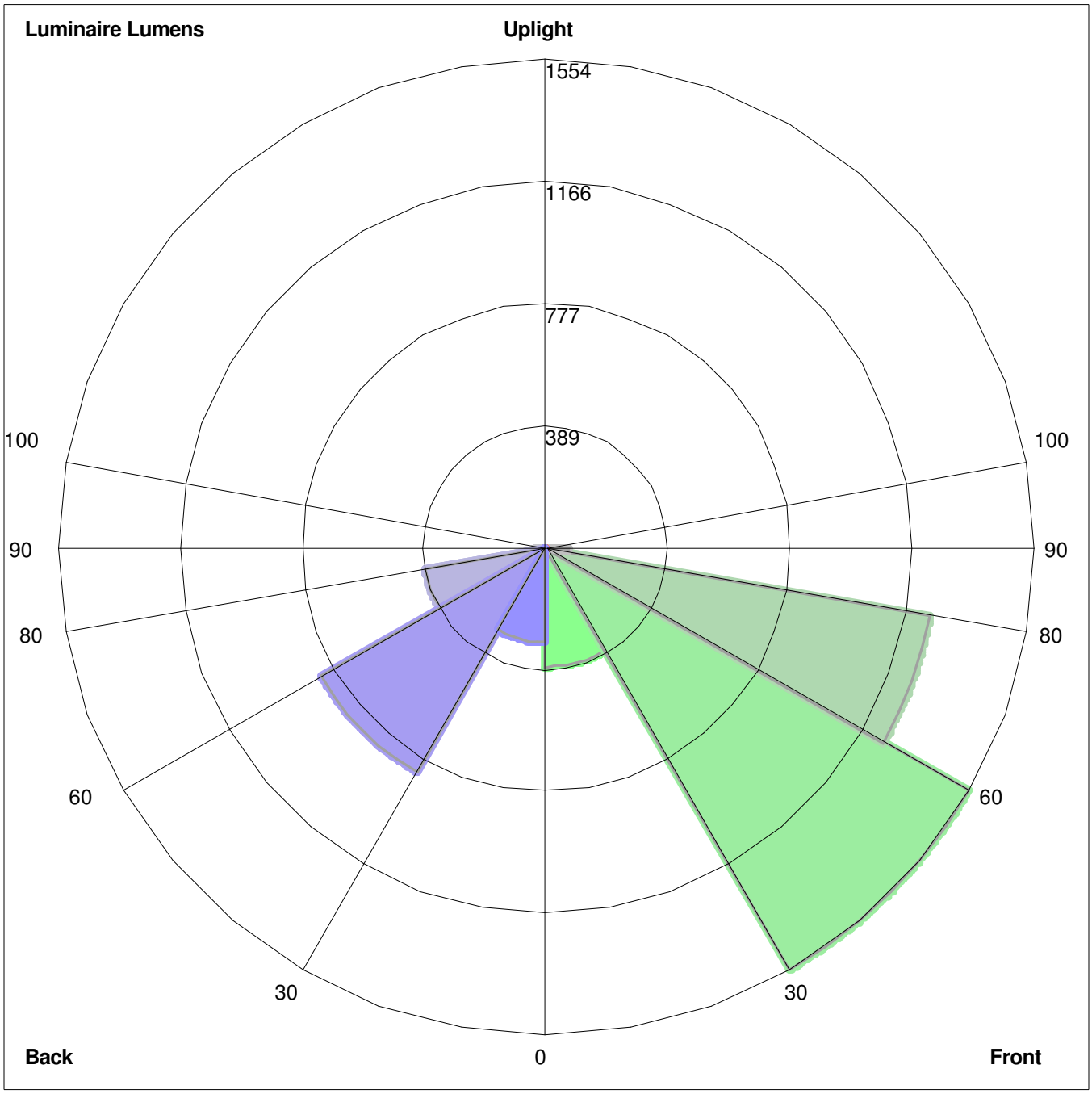
Values Based On 10 Foot Mounting Height

1/2 Maximum Candela Trace Shown As Dashed Curve

(+) = Maximum Candela Point

IES ROAD REPORT
PHOTOMETRIC FILENAME : HERITAGE TYPE III 40W-4000K~5000K.IES

LUMINAIRE CLASSIFICATION SYSTEM (LCS) GRAPH



Luminaire Lumens:
Front: Low=380.3, Medium=1554.1, High=1243.5, Very High=71.7
Back: Low=302.6, Medium=824.1, High=389.9, Very High=33.8
Uplight: Low=0.0, High=0.0

BUG Rating : B1-U0-G1

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

IES ROAD REPORT
PHOTOMETRIC FILENAME : LP1-N27-40W-4000K~5000K HERITAGE TYPE V.IES

DESCRIPTIVE INFORMATION (From Photometric File)

IESNA:LM-63-2002
[TEST]
[TESTLAB]
[MANUFAC]LP1-N27-40W-4000K/5000K
[LUMINAIRE]

CHARACTERISTICS

IES Classification	Type III
Longitudinal Classification	Medium
Lumens Per Lamp	4400 (1 lamp)
Total Lamp Lumens	4400
Luminaire Lumens	4400
Downward Total Efficiency	100 %
Total Luminaire Efficiency	100 %
Luminaire Efficacy Rating (LER)	110
Total Luminaire Watts	40
Ballast Factor	1.00
Upward Waste Light Ratio	0.00
Maximum Candela	2336.132
Maximum Candela Angle	72H 70V
Maximum Candela (<90 Degrees Vertical)	2336.132
Maximum Candela Angle (<90 Degrees Vertical)	72H 70V
Maximum Candela At 90 Degrees Vertical	0 (0.0% Lamp Lumens)
Maximum Candela from 80 to <90 Degrees Vertical	426.684 (9.7% Lamp Lumens)
Cutoff Classification (deprecated)	Full Cutoff

LUMINAIRE CLASSIFICATION SYSTEM (LCS)

	Lumens	% Lamp	% Luminaire
FL - Front-Low (0-30)	348.6	7.9	7.9
FM - Front-Medium (30-60)	1424.5	32.4	32.4
FH - Front-High (60-80)	1139.8	25.9	25.9
FVH - Front-Very High (80-90)	65.7	1.5	1.5
BL - Back-Low (0-30)	277.4	6.3	6.3
BM - Back-Medium (30-60)	755.5	17.2	17.2
BH - Back-High (60-80)	357.4	8.1	8.1
BVH - Back-Very High (80-90)	31.0	0.7	0.7
UL - Uplight-Low (90-100)	0.0	0.0	0.0
UH - Uplight-High (100-180)	0.0	0.0	0.0
Total	4399.9	100.0	100.0
BUG Rating	B1-U0-G1		

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

IES ROAD REPORT
PHOTOMETRIC FILENAME : LP1-N27-40W-4000K~5000K HERITAGE TYPE V.IES

CANDELA TABULATION

Vert. Angles	Horizontal Angles									
	0	5	15	25	35	45	55	65	72	75
0.0	727.071	727.071	727.071	727.071	727.071	727.071	727.071	727.071	727.071	727.071
2.5	740.987	740.987	739.149	738.099	736.786	736.261	734.424	733.898	732.848	732.585
5.0	754.378	754.115	752.016	750.703	748.602	746.764	743.876	741.512	739.149	738.099
7.5	767.245	766.982	764.882	764.356	760.681	758.842	754.378	750.703	747.027	745.713
10.0	780.898	780.898	778.798	776.436	773.284	769.870	765.932	761.731	757.267	756.742
12.5	793.502	793.502	791.402	788.251	785.099	781.950	778.010	774.072	770.396	769.608
15.0	805.318	805.318	802.430	799.279	795.603	792.715	790.089	786.675	782.474	780.898
17.5	817.396	817.396	813.983	810.045	805.581	803.743	803.217	802.167	799.016	797.442
20.0	827.900	827.900	825.274	820.548	816.346	816.872	819.498	821.860	820.285	819.235
22.5	839.715	840.241	837.352	832.626	829.475	834.201	840.504	847.593	847.593	846.018
25.0	852.845	852.845	849.693	844.442	843.392	853.631	866.761	878.315	880.414	879.365
27.5	865.974	865.974	862.297	856.520	859.934	876.739	897.482	915.600	920.589	920.326
30.0	880.152	879.365	874.901	870.437	880.414	906.410	936.081	962.863	972.578	972.317
32.5	894.594	894.070	889.343	885.141	902.209	940.282	984.394	1023.255	1037.697	1038.223
35.0	912.974	912.711	907.460	904.309	929.253	977.568	1042.686	1096.251	1115.945	1116.470
37.5	936.868	937.131	930.829	931.617	963.914	1019.843	1104.654	1176.337	1203.383	1204.432
40.0	962.863	963.651	957.349	966.277	1005.401	1068.681	1169.510	1255.897	1287.668	1288.194
42.5	987.283	988.859	983.344	1002.775	1052.664	1126.186	1236.467	1328.893	1353.575	1352.788
45.0	1006.714	1009.339	1005.138	1038.223	1103.341	1191.829	1308.413	1395.587	1425.258	1426.308
47.5	1021.155	1022.993	1022.468	1071.833	1151.130	1262.987	1393.487	1483.025	1513.483	1513.746
50.0	1034.022	1036.647	1037.172	1102.291	1201.281	1338.083	1486.963	1583.328	1606.960	1604.073
52.5	1039.010	1040.323	1046.363	1129.598	1248.808	1413.705	1579.127	1674.705	1693.611	1688.884
55.0	1035.596	1039.797	1053.715	1152.968	1292.132	1488.539	1669.978	1757.154	1772.908	1765.293
57.5	1019.580	1024.831	1047.938	1173.712	1332.044	1551.820	1758.729	1838.552	1838.815	1828.311
60.0	1004.875	1010.915	1046.363	1187.103	1368.805	1611.424	1851.943	1923.626	1896.581	1882.927
62.5	954.723	963.389	1022.731	1194.192	1399.264	1663.940	1939.643	2027.606	1955.923	1936.492
65.0	841.554	850.219	933.455	1148.504	1403.728	1715.141	2009.488	2139.725	2057.803	2026.030
67.5	616.001	626.505	734.161	991.221	1307.100	1694.661	2057.015	2237.666	2203.007	2163.620
70.0	284.632	292.772	374.694	612.063	1004.875	1459.918	2002.136	2285.718	2336.132	2293.332
72.5	157.807	158.859	179.076	253.385	486.289	967.327	1653.699	2138.939	2193.029	2140.776
75.0	133.126	133.651	142.578	168.311	217.937	430.623	932.667	1519.523	1566.523	1528.976
77.5	117.634	118.159	127.612	145.467	169.361	226.078	381.784	741.775	854.157	834.990
80.0	100.303	101.354	110.807	127.086	150.456	189.054	247.608	358.415	426.684	408.567
82.5	78.773	79.036	85.862	100.566	124.198	173.825	222.664	254.698	265.201	258.899
85.0	57.504	58.817	67.219	72.470	80.086	132.863	190.630	216.624	217.937	209.010
87.5	22.582	24.420	49.102	54.616	39.911	45.950	123.935	167.785	166.998	154.657
90.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Vert. Angles	Horizontal Angles									
	85	90	95	105	115	125	135	145	155	165
0.0	727.071	727.071	727.071	727.071	727.071	727.071	727.071	727.071	727.071	727.071
2.5	730.222	728.121	727.858	725.233	722.344	719.193	716.043	714.467	713.417	711.842
5.0	733.109	729.434	727.596	722.081	716.305	709.741	703.177	698.976	695.562	692.411
7.5	738.099	733.109	729.697	720.769	710.791	699.763	689.785	682.170	675.607	671.405
10.0	745.976	739.412	734.161	721.032	706.065	690.047	676.131	665.103	656.175	650.399
12.5	756.217	748.864	741.512	723.657	703.177	681.908	663.790	648.561	637.008	630.181
15.0	769.346	760.155	751.228	728.384	701.864	674.818	651.974	633.069	618.627	609.962
17.5	785.362	775.122	764.356	735.737	703.177	670.354	642.259	619.153	600.772	589.481
20.0	806.106	794.815	781.161	746.764	706.065	667.466	634.119	604.711	582.917	569.525
22.5	832.626	819.760	802.430	759.105	711.054	666.416	626.505	591.844	566.900	552.196
25.0	864.922	850.219	828.950	776.697	719.193	667.205	618.890	579.504	552.721	536.441
27.5	904.571	887.242	863.085	800.067	731.797	669.041	613.113	569.525	539.854	521.212

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.

Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

CANDELA TABULATION - (Cont.)

30.0	955.249	935.030	906.410	831.313	750.177	674.293	608.912	560.599	526.201	503.357
32.5	1018.267	993.584	959.187	869.386	773.809	682.170	607.862	551.671	510.708	482.876
35.0	1092.050	1061.855	1020.105	912.711	801.117	693.461	607.862	541.430	492.328	458.718
37.5	1173.186	1134.325	1082.861	955.511	830.263	706.328	606.549	528.302	469.485	429.836
40.0	1250.120	1203.907	1144.303	1003.038	860.984	719.982	603.661	510.708	440.076	390.712
42.5	1313.401	1266.925	1204.958	1052.927	889.868	732.848	598.147	486.552	400.953	352.638
45.0	1387.447	1336.246	1270.339	1103.604	916.913	742.037	586.593	450.316	361.829	321.654
47.5	1462.545	1404.515	1334.145	1152.180	943.433	748.602	564.274	408.567	328.744	293.822
50.0	1534.752	1467.007	1391.124	1196.818	965.490	749.127	528.565	368.130	295.397	261.000
52.5	1598.033	1522.936	1443.376	1238.305	983.344	740.462	482.613	326.907	258.374	227.128
55.0	1653.436	1575.452	1495.629	1269.814	989.383	708.165	424.847	280.168	221.088	196.931
57.5	1699.125	1621.665	1545.781	1287.668	978.618	644.097	355.264	232.905	188.004	170.411
60.0	1737.723	1662.890	1594.619	1285.568	939.231	536.967	279.905	190.367	160.433	149.930
62.5	1776.322	1709.103	1634.531	1256.686	864.398	387.036	209.797	156.757	139.952	134.701
65.0	1835.139	1757.416	1644.509	1183.952	704.752	254.435	162.271	134.176	125.510	123.410
67.5	1929.665	1804.679	1618.514	1061.329	443.752	178.026	137.064	119.472	113.958	113.433
70.0	1989.532	1793.651	1513.746	865.185	249.184	146.517	120.522	106.868	103.454	103.717
72.5	1777.896	1554.708	1232.528	564.274	173.037	128.662	105.556	95.052	93.214	94.527
75.0	1257.998	1049.514	765.145	295.660	149.405	110.544	92.164	84.024	83.237	84.811
77.5	634.119	482.613	347.124	182.490	138.114	92.952	80.086	73.520	72.996	75.359
80.0	297.236	251.285	213.736	156.232	112.120	77.722	69.582	63.805	63.544	64.594
82.5	194.831	180.915	164.372	143.891	81.661	66.169	60.917	54.616	51.202	50.677
85.0	114.482	126.823	136.277	110.281	58.291	52.253	47.000	43.850	41.486	38.861
87.5	37.548	55.928	95.315	61.442	34.397	32.034	18.380	24.157	25.207	24.682
90.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Vert. Angles	**Horizontal Angles**	
	175	**180**
0.0	727.071	727.071
2.5	712.629	712.629
5.0	692.411	692.411
7.5	670.354	670.092
10.0	648.824	648.561
12.5	627.818	627.292
15.0	606.286	606.024
17.5	584.230	583.968
20.0	564.012	563.224
22.5	545.631	544.581
25.0	529.352	528.039
27.5	511.497	509.921
30.0	491.804	489.965
32.5	469.485	467.647
35.0	443.489	440.601
37.5	409.617	406.991
40.0	368.656	366.818
42.5	333.995	332.421
45.0	307.738	305.901
47.5	280.168	278.592
50.0	247.608	246.033
52.5	216.361	215.574
55.0	190.104	189.841
57.5	166.473	166.473
60.0	148.092	148.355
62.5	134.176	134.701
65.0	122.885	123.410

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

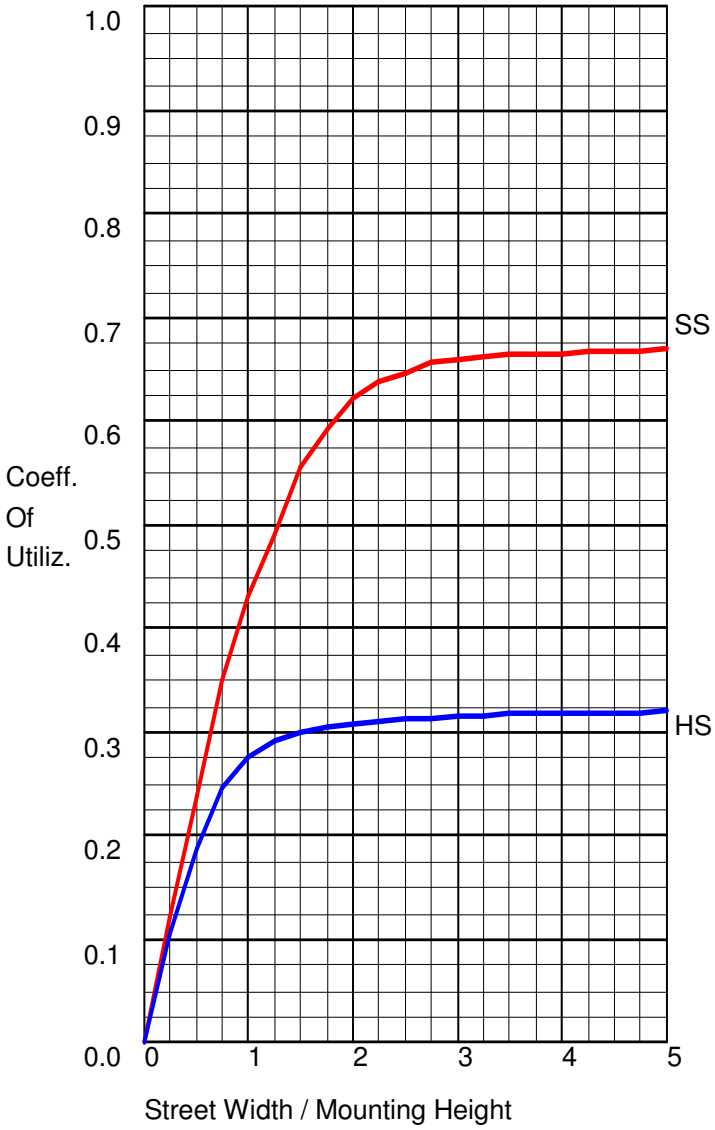
CANDELA TABULATION - (Cont.)

67.5	112.907	113.433
70.0	103.192	103.454
72.5	94.527	94.265
75.0	86.387	86.387
77.5	76.409	76.409
80.0	65.644	65.644
82.5	51.727	51.727
85.0	26.783	24.157
87.5	12.866	10.765
90.0	0.000	0.000

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

IES ROAD REPORT
PHOTOMETRIC FILENAME : LP1-N27-40W-4000K~5000K HERITAGE TYPE V.IES

COEFFICIENTS OF UTILIZATION



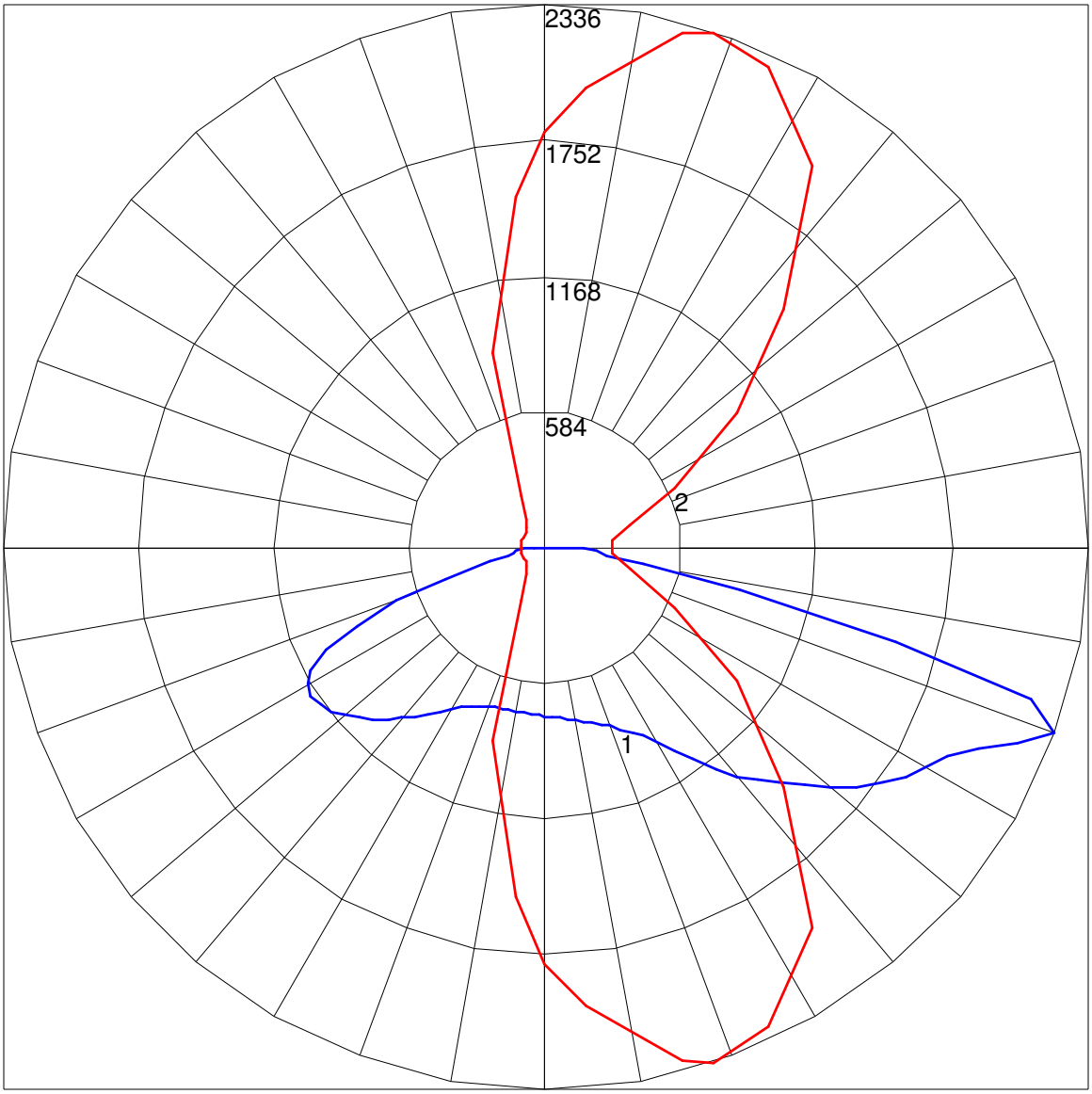
FLUX DISTRIBUTION

	Lumens	Percent Of Lamp
Downward Street Side	2978.8	67.7
Downward House Side	1421.3	32.3
Downward Total	4400.1	100.0
Upward Street Side	0.0	0.0
Upward House Side	0.0	0.0
Upward Total	0.0	0.0
Total Flux	4400.1	100.0

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

IES ROAD REPORT
PHOTOMETRIC FILENAME : LP1-N27-40W-4000K~5000K HERITAGE TYPE V.IES

POLAR GRAPH

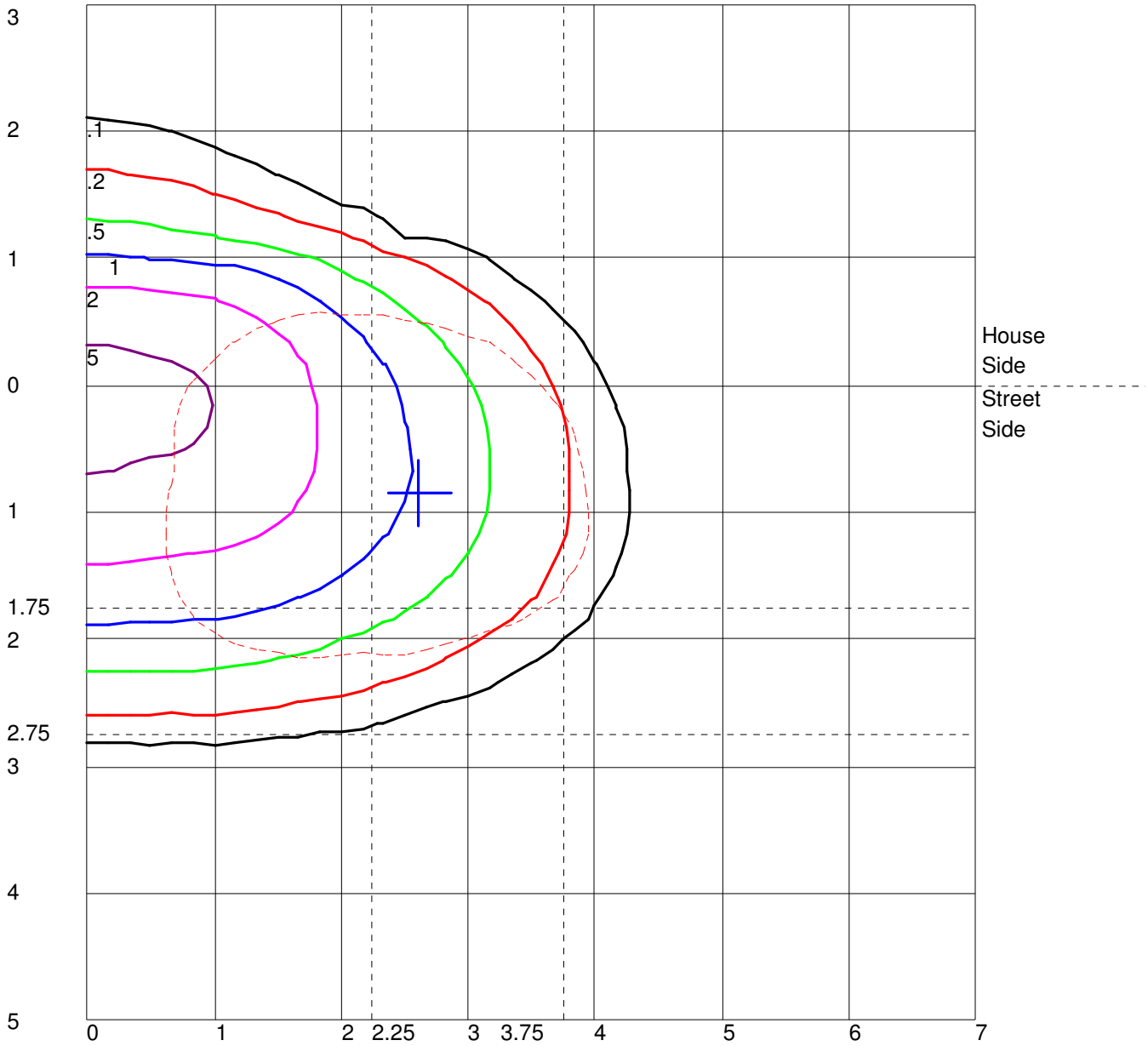


Maximum Candela = 2336.132 Located At Horizontal Angle = 72, Vertical Angle = 70
1 - Vertical Plane Through Horizontal Angles (72 - 252) (Through Max. Cd.)
2 - Horizontal Cone Through Vertical Angle (70) (Through Max. Cd.)

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

IES ROAD REPORT
PHOTOMETRIC FILENAME : LP1-N27-40W-4000K~5000K HERITAGE TYPE V.IES

ISOFOOTCANDLE LINES OF HORIZONTAL ILLUMINANCE



Distance In Units Of Mounting Height

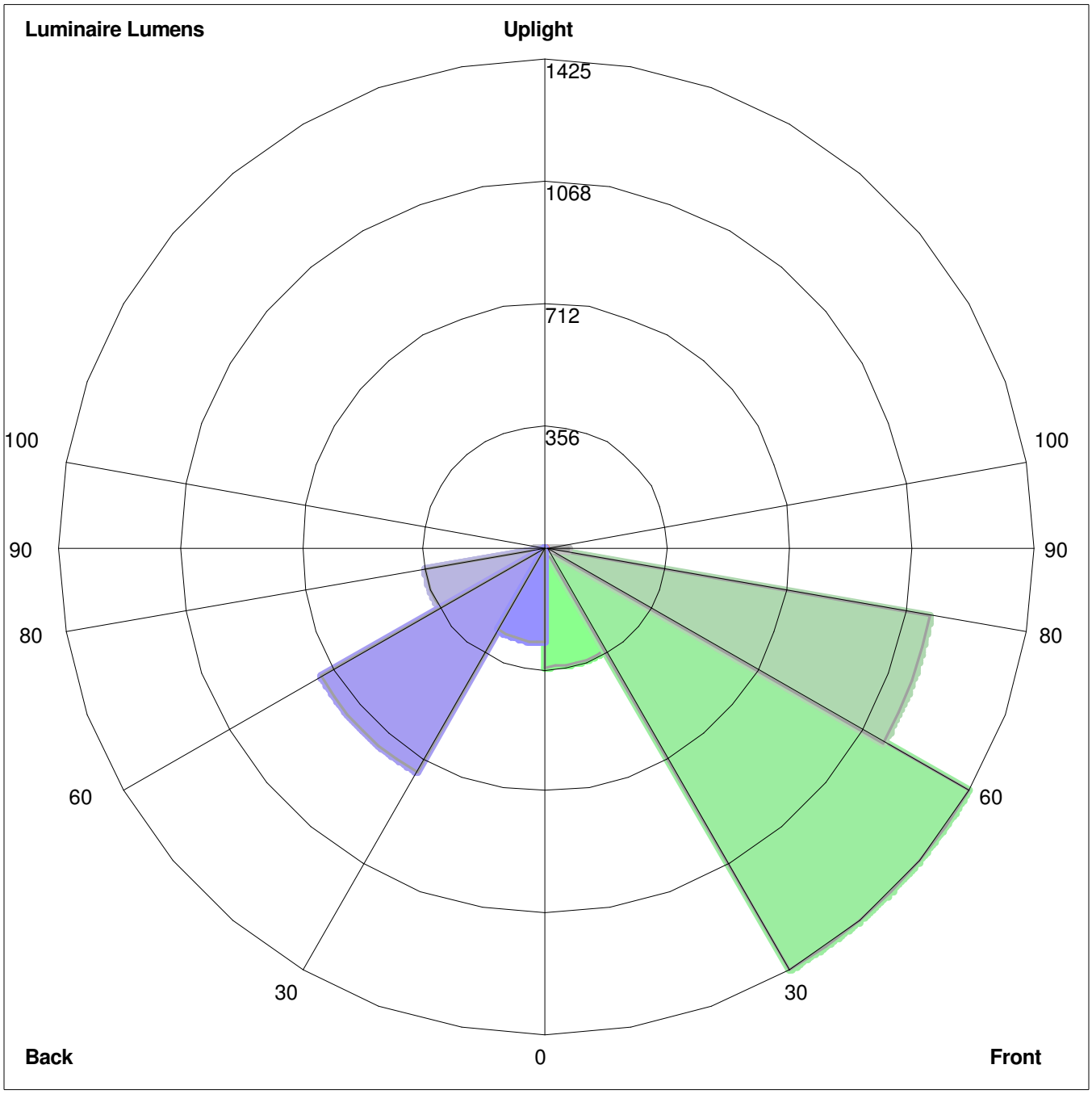
Values Based On 10 Foot Mounting Height

1/2 Maximum Candela Trace Shown As Dashed Curve

(+) = Maximum Candela Point

IES ROAD REPORT
PHOTOMETRIC FILENAME : LP1-N27-40W-4000K~5000K HERITAGE TYPE V.IES

LUMINAIRE CLASSIFICATION SYSTEM (LCS) GRAPH



Luminaire Lumens:
Front: Low=348.6, Medium=1424.5, High=1139.8, Very High=65.7
Back: Low=277.4, Medium=755.5, High=357.4, Very High=31.0
Uplight: Low=0.0, High=0.0

BUG Rating : B1-U0-G1

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

IES ROAD REPORT
PHOTOMETRIC FILENAME : LP1-N27-80W-4000K~5000K TYPE III MED.IES

DESCRIPTIVE INFORMATION (From Photometric File)

IESNA:LM-63-2002
[TEST]
[TESTLAB]
[MANUFAC]LP1-N27-80W-4000K/5000K
[LUMINAIRE]

CHARACTERISTICS

IES Classification	Type III
Longitudinal Classification	Medium
Lumens Per Lamp	9600 (1 lamp)
Total Lamp Lumens	9600
Luminaire Lumens	9600
Downward Total Efficiency	100 %
Total Luminaire Efficiency	100 %
Luminaire Efficacy Rating (LER)	120
Total Luminaire Watts	80
Ballast Factor	1.00
Upward Waste Light Ratio	0.00
Maximum Candela	5097.016
Maximum Candela Angle	72H 70V
Maximum Candela (<90 Degrees Vertical)	5097.016
Maximum Candela Angle (<90 Degrees Vertical)	72H 70V
Maximum Candela At 90 Degrees Vertical	0 (0.0% Lamp Lumens)
Maximum Candela from 80 to <90 Degrees Vertical	930.947 (9.7% Lamp Lumens)
Cutoff Classification (deprecated)	Full Cutoff

LUMINAIRE CLASSIFICATION SYSTEM (LCS)

	Lumens	% Lamp	% Luminaire
FL - Front-Low (0-30)	760.6	7.9	7.9
FM - Front-Medium (30-60)	3108.1	32.4	32.4
FH - Front-High (60-80)	2486.9	25.9	25.9
FVH - Front-Very High (80-90)	143.4	1.5	1.5
BL - Back-Low (0-30)	605.2	6.3	6.3
BM - Back-Medium (30-60)	1648.3	17.2	17.2
BH - Back-High (60-80)	779.9	8.1	8.1
BVH - Back-Very High (80-90)	67.6	0.7	0.7
UL - Uplight-Low (90-100)	0.0	0.0	0.0
UH - Uplight-High (100-180)	0.0	0.0	0.0
Total	9600.0	100.0	100.0
BUG Rating	B2-U0-G2		

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

IES ROAD REPORT
PHOTOMETRIC FILENAME : LP1-N27-80W-4000K~5000K TYPE III MED.IES

CANDELA TABULATION

Vert. Angles	Horizontal Angles									
	0	5	15	25	35	45	55	65	72	75
0.0	1586.336	1586.336	1586.336	1586.336	1586.336	1586.336	1586.336	1586.336	1586.336	1586.336
2.5	1616.699	1616.699	1612.691	1610.397	1607.533	1606.389	1602.379	1601.235	1598.941	1598.368
5.0	1645.917	1645.341	1640.763	1637.896	1633.312	1629.304	1623.003	1617.845	1612.691	1610.397
7.5	1673.989	1673.413	1668.832	1667.685	1659.669	1655.656	1645.917	1637.896	1629.877	1627.011
10.0	1703.779	1703.779	1699.197	1694.043	1687.165	1679.717	1671.125	1661.957	1652.219	1651.075
12.5	1731.277	1731.277	1726.693	1719.819	1712.941	1706.072	1697.477	1688.885	1680.864	1679.144
15.0	1757.059	1757.059	1750.757	1743.880	1735.861	1729.560	1723.832	1716.381	1707.213	1703.779
17.5	1783.411	1783.411	1775.963	1767.371	1757.632	1753.621	1752.475	1750.181	1743.307	1739.872
20.0	1806.328	1806.328	1800.600	1790.285	1781.120	1782.267	1787.995	1793.149	1789.715	1787.421
22.5	1832.104	1833.253	1826.949	1816.637	1809.765	1820.075	1833.827	1849.293	1849.293	1845.856
25.0	1860.749	1860.749	1853.877	1842.421	1840.128	1862.469	1891.115	1916.323	1920.904	1918.616
27.5	1889.397	1889.397	1881.376	1868.771	1876.219	1912.885	1958.144	1997.672	2008.557	2007.987
30.0	1920.331	1918.616	1908.875	1899.136	1920.904	1977.621	2042.360	2100.792	2121.987	2121.419
32.5	1951.840	1950.696	1940.384	1931.219	1968.456	2051.525	2147.771	2232.557	2264.067	2265.213
35.0	1991.944	1991.368	1979.912	1973.037	2027.461	2132.875	2274.949	2391.821	2434.789	2435.936
37.5	2044.075	2044.648	2030.901	2032.619	2103.085	2225.112	2410.152	2566.555	2625.563	2627.851
40.0	2100.792	2102.509	2088.763	2108.243	2193.603	2331.669	2551.659	2740.139	2809.459	2810.605
42.5	2154.072	2157.509	2145.477	2187.872	2296.723	2457.131	2697.747	2899.403	2953.253	2951.539
45.0	2196.467	2202.195	2193.027	2265.213	2407.291	2600.355	2854.720	3044.917	3109.656	3111.944
47.5	2227.976	2231.987	2230.840	2338.547	2511.555	2755.608	3040.333	3235.691	3302.144	3302.720
50.0	2256.045	2261.779	2262.920	2404.997	2620.979	2919.453	3244.283	3454.533	3506.093	3499.797
52.5	2266.931	2269.795	2282.973	2464.579	2724.672	3084.445	3445.368	3653.901	3695.149	3684.837
55.0	2259.483	2268.648	2299.013	2515.565	2819.197	3247.720	3643.587	3833.789	3868.163	3851.549
57.5	2224.539	2235.995	2286.408	2560.827	2906.277	3385.789	3837.227	4011.387	4011.960	3989.043
60.0	2192.453	2205.632	2282.973	2590.043	2986.485	3515.835	4040.605	4197.000	4137.995	4108.203
62.5	2083.032	2101.941	2231.413	2605.509	3052.939	3630.413	4231.949	4423.867	4267.467	4225.075
65.0	1836.117	1855.021	2036.629	2505.827	3062.680	3742.125	4384.339	4668.491	4489.752	4420.429
67.5	1344.003	1366.920	1601.805	2162.664	2851.853	3697.443	4488.032	4882.181	4806.560	4720.626
70.0	621.016	638.776	817.515	1335.411	2192.453	3185.275	4368.296	4987.019	5097.016	5003.635
72.5	344.309	346.600	390.712	552.840	1060.995	2110.531	3608.069	4666.776	4784.790	4670.784
75.0	290.456	291.603	311.080	367.224	475.499	939.541	2034.909	3315.323	3417.867	3335.947
77.5	256.653	257.800	278.427	317.381	369.515	493.259	832.984	1618.419	1863.616	1821.795
80.0	218.843	221.139	241.760	277.280	328.267	412.483	540.235	781.995	930.947	891.419
82.5	171.869	172.443	187.336	219.419	270.976	379.256	485.813	555.704	578.621	564.869
85.0	125.464	128.328	146.659	158.117	174.731	289.883	415.917	472.635	475.499	456.024
87.5	49.269	53.280	107.131	119.163	87.077	100.256	270.403	366.077	364.360	337.435
90.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Vert. Angles	Horizontal Angles									
	85	90	95	105	115	125	135	145	155	165
0.0	1586.336	1586.336	1586.336	1586.336	1586.336	1586.336	1586.336	1586.336	1586.336	1586.336
2.5	1593.213	1588.629	1588.056	1582.328	1576.024	1569.149	1562.275	1558.837	1556.547	1553.112
5.0	1599.512	1591.493	1587.483	1575.451	1562.848	1548.525	1534.203	1525.037	1517.589	1510.715
7.5	1610.397	1599.512	1592.067	1572.587	1550.816	1526.755	1504.987	1488.373	1474.051	1464.885
10.0	1627.584	1613.261	1601.805	1573.160	1540.507	1505.557	1475.195	1451.133	1431.653	1419.051
12.5	1649.928	1633.885	1617.845	1578.888	1534.203	1487.800	1448.269	1415.043	1389.835	1374.939
15.0	1678.571	1658.520	1639.043	1589.203	1531.339	1472.331	1422.491	1381.243	1349.731	1330.827
17.5	1713.517	1691.173	1667.685	1605.243	1534.203	1462.592	1401.291	1350.877	1310.776	1286.141
20.0	1758.776	1734.141	1704.352	1629.304	1540.507	1456.288	1383.531	1319.368	1271.819	1242.600
22.5	1816.637	1788.568	1750.757	1656.229	1551.389	1453.997	1366.920	1291.296	1236.872	1204.792
25.0	1887.104	1855.021	1808.619	1694.613	1569.149	1455.717	1350.307	1264.373	1205.933	1170.419
27.5	1973.611	1935.800	1883.096	1745.600	1596.648	1459.725	1337.701	1242.600	1177.864	1137.189

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.

Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

IES ROAD REPORT
PHOTOMETRIC FILENAME : LP1-N27-80W-4000K~5000K TYPE III MED.IES

CANDELA TABULATION - (Cont.)

30.0	2084.181	2040.067	1977.621	1813.773	1636.749	1471.181	1328.536	1223.125	1148.072	1098.235
32.5	2221.672	2167.819	2092.771	1896.843	1688.312	1488.373	1326.243	1203.645	1114.272	1053.547
35.0	2382.656	2316.773	2225.685	1991.368	1747.893	1513.005	1326.243	1181.301	1074.171	1000.840
37.5	2559.677	2474.891	2362.605	2084.755	1811.483	1541.080	1323.381	1152.659	1024.328	937.824
40.0	2727.533	2626.707	2496.661	2188.445	1878.509	1570.869	1317.077	1114.272	960.165	852.461
42.5	2865.603	2764.200	2629.000	2297.293	1941.531	1598.941	1305.048	1061.568	874.808	769.395
45.0	3027.157	2915.445	2771.651	2407.864	2000.539	1618.989	1279.840	982.507	789.445	701.792
47.5	3191.005	3064.395	2910.859	2513.848	2058.400	1633.312	1231.144	891.419	717.259	641.064
50.0	3348.549	3200.741	3035.179	2611.237	2106.523	1634.459	1153.229	803.195	644.504	569.453
52.5	3486.619	3322.771	3149.184	2701.757	2145.477	1615.552	1052.973	713.251	563.723	495.552
55.0	3607.496	3437.349	3263.189	2770.501	2158.653	1545.088	926.939	611.275	482.373	429.667
57.5	3707.181	3538.179	3372.611	2809.459	2135.165	1405.304	775.123	508.155	410.189	371.805
60.0	3791.395	3628.123	3479.168	2804.875	2049.229	1171.563	610.701	415.347	350.037	327.123
62.5	3875.613	3728.952	3566.248	2741.859	1885.957	844.443	457.739	342.016	305.349	293.893
65.0	4003.939	3834.363	3588.021	2583.168	1537.640	555.131	354.048	292.747	273.843	269.259
67.5	4210.179	3937.480	3531.301	2315.627	968.187	388.421	299.048	260.667	248.637	247.488
70.0	4340.797	3913.419	3302.720	1887.677	543.675	319.672	262.957	233.165	225.720	226.293
72.5	3879.045	3392.091	2689.152	1231.144	377.533	280.715	230.304	207.387	203.373	206.240
75.0	2744.725	2289.848	1669.408	645.077	325.976	241.187	201.085	183.325	181.608	185.043
77.5	1383.531	1052.973	757.363	398.163	301.341	202.805	174.731	160.408	159.264	164.419
80.0	648.515	548.259	466.333	340.869	244.627	169.573	151.816	139.211	138.643	140.931
82.5	425.085	394.723	358.629	313.944	178.171	144.371	132.909	119.163	111.712	110.568
85.0	249.781	276.707	297.333	240.613	127.179	114.008	102.547	95.675	90.517	84.789
87.5	81.923	122.024	207.960	134.056	75.048	69.893	40.101	52.707	54.997	53.851
90.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Vert. Angles	**Horizontal Angles**	
	175	**180**
0.0	1586.336	1586.336
2.5	1554.827	1554.827
5.0	1510.715	1510.715
7.5	1462.592	1462.019
10.0	1415.616	1415.043
12.5	1369.784	1368.637
15.0	1322.808	1322.235
17.5	1274.685	1274.112
20.0	1230.571	1228.853
22.5	1190.467	1188.179
25.0	1154.949	1152.085
27.5	1115.995	1112.555
30.0	1073.027	1069.016
32.5	1024.328	1020.320
35.0	967.613	961.312
37.5	893.709	887.979
40.0	804.341	800.328
42.5	728.715	725.283
45.0	671.427	667.421
47.5	611.275	607.837
50.0	540.235	536.797
52.5	472.061	470.344
55.0	414.773	414.200
57.5	363.211	363.211
60.0	323.109	323.683
62.5	292.747	293.893
65.0	268.115	269.259

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

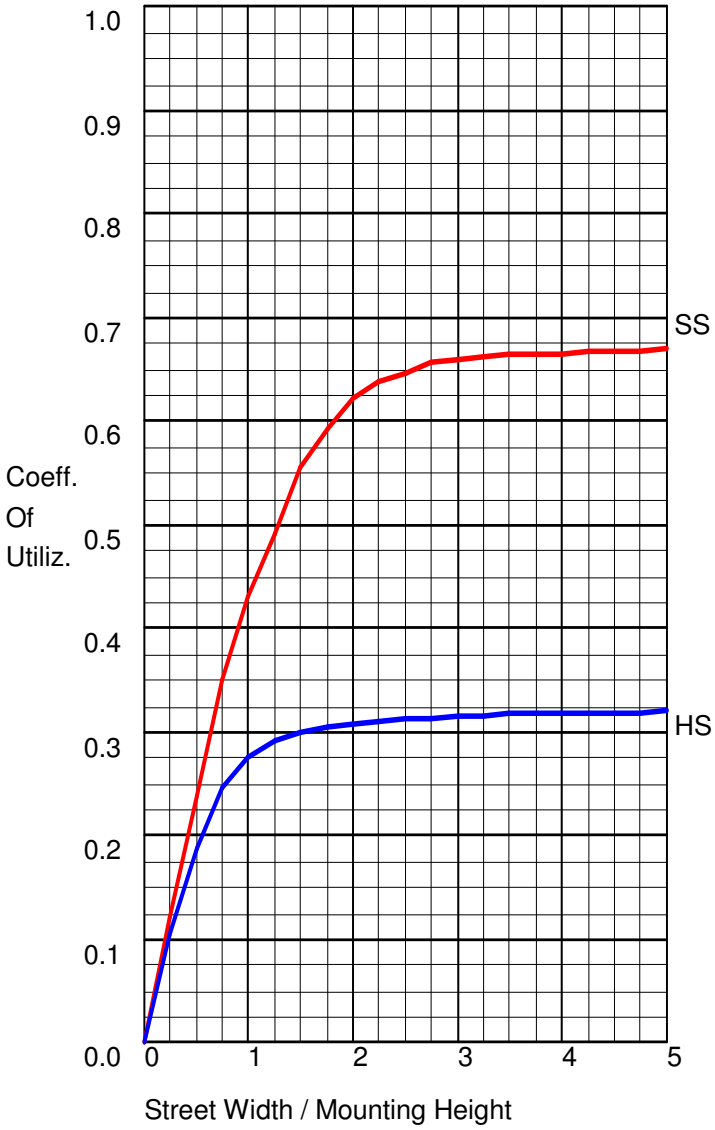
CANDELA TABULATION - (Cont.)

67.5	246.341	247.488
70.0	225.147	225.720
72.5	206.240	205.669
75.0	188.480	188.480
77.5	166.712	166.712
80.0	143.224	143.224
82.5	112.859	112.859
85.0	58.435	52.707
87.5	28.072	23.488
90.0	0.000	0.000

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

IES ROAD REPORT
PHOTOMETRIC FILENAME : LP1-N27-80W-4000K~5000K TYPE III MED.IES

COEFFICIENTS OF UTILIZATION



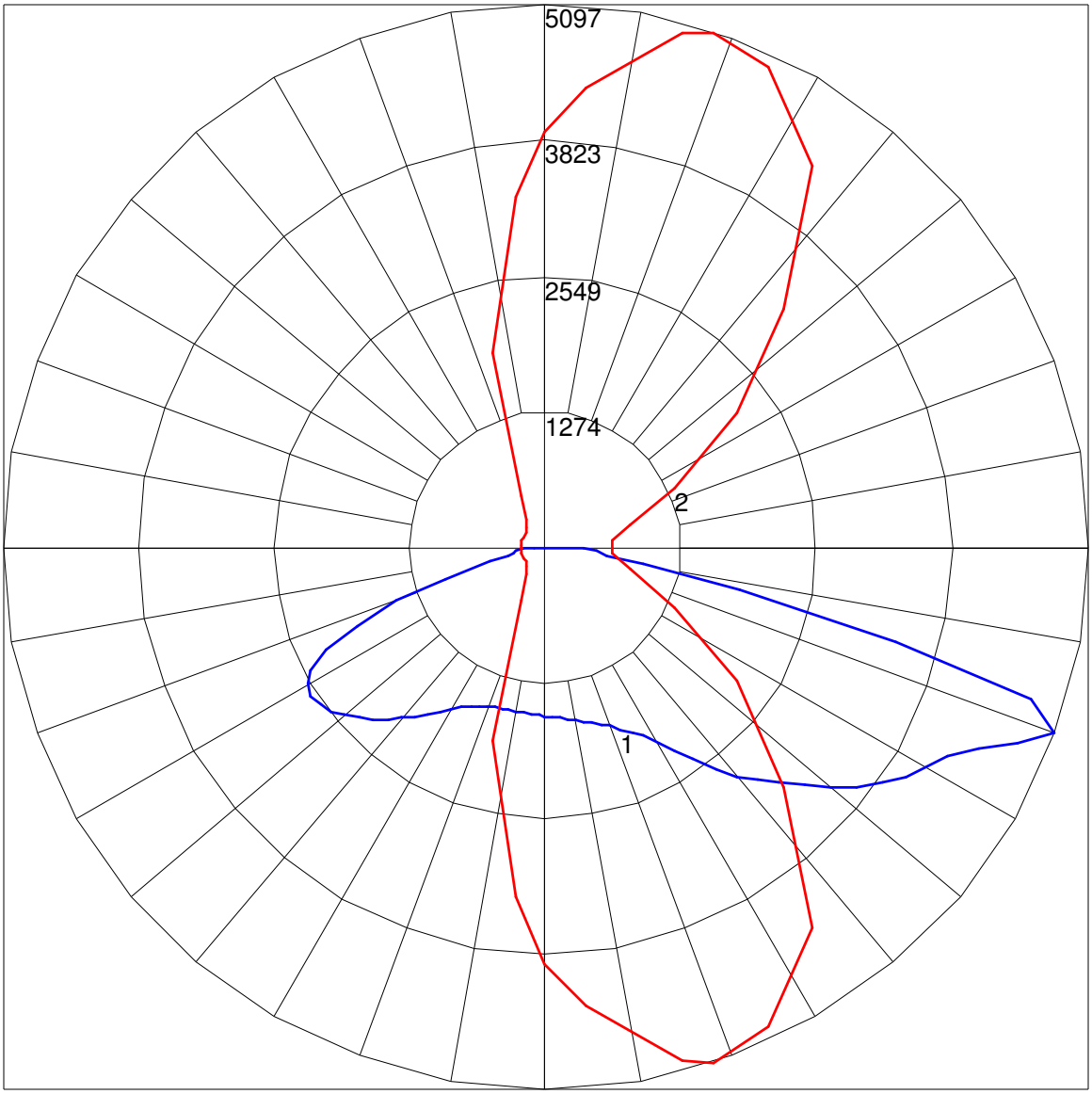
FLUX DISTRIBUTION

	Lumens	Percent Of Lamp
Downward Street Side	6499.1	67.7
Downward House Side	3100.9	32.3
Downward Total	9600.0	100.0
Upward Street Side	0.0	0.0
Upward House Side	0.0	0.0
Upward Total	0.0	0.0
Total Flux	9600.0	100.0

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

IES ROAD REPORT
PHOTOMETRIC FILENAME : LP1-N27-80W-4000K~5000K TYPE III MED.IES

POLAR GRAPH

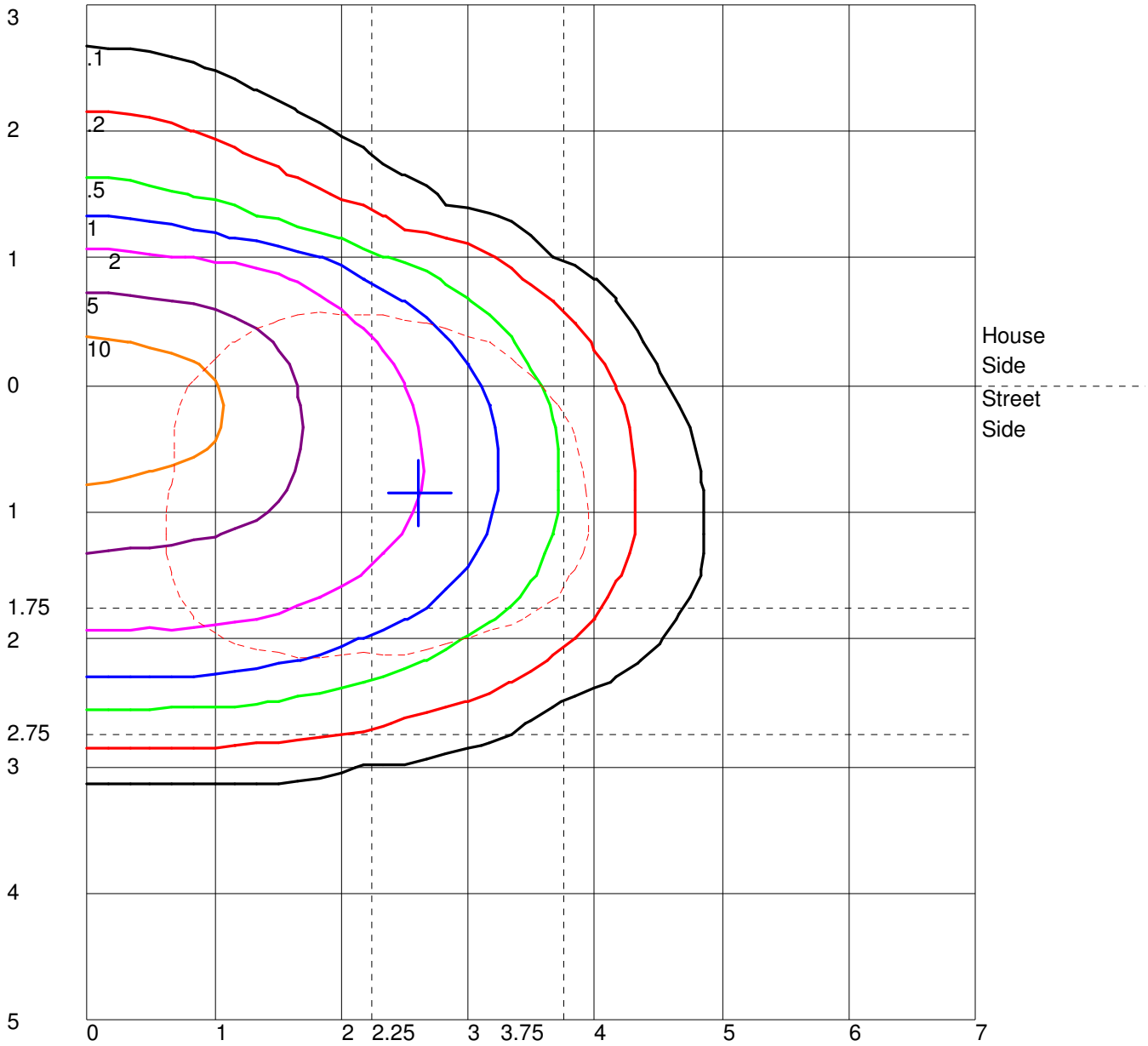


Maximum Candela = 5097.016 Located At Horizontal Angle = 72, Vertical Angle = 70
1 - Vertical Plane Through Horizontal Angles (72 - 252) (Through Max. Cd.)
2 - Horizontal Cone Through Vertical Angle (70) (Through Max. Cd.)

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

IES ROAD REPORT
PHOTOMETRIC FILENAME : LP1-N27-80W-4000K~5000K TYPE III MED.IES

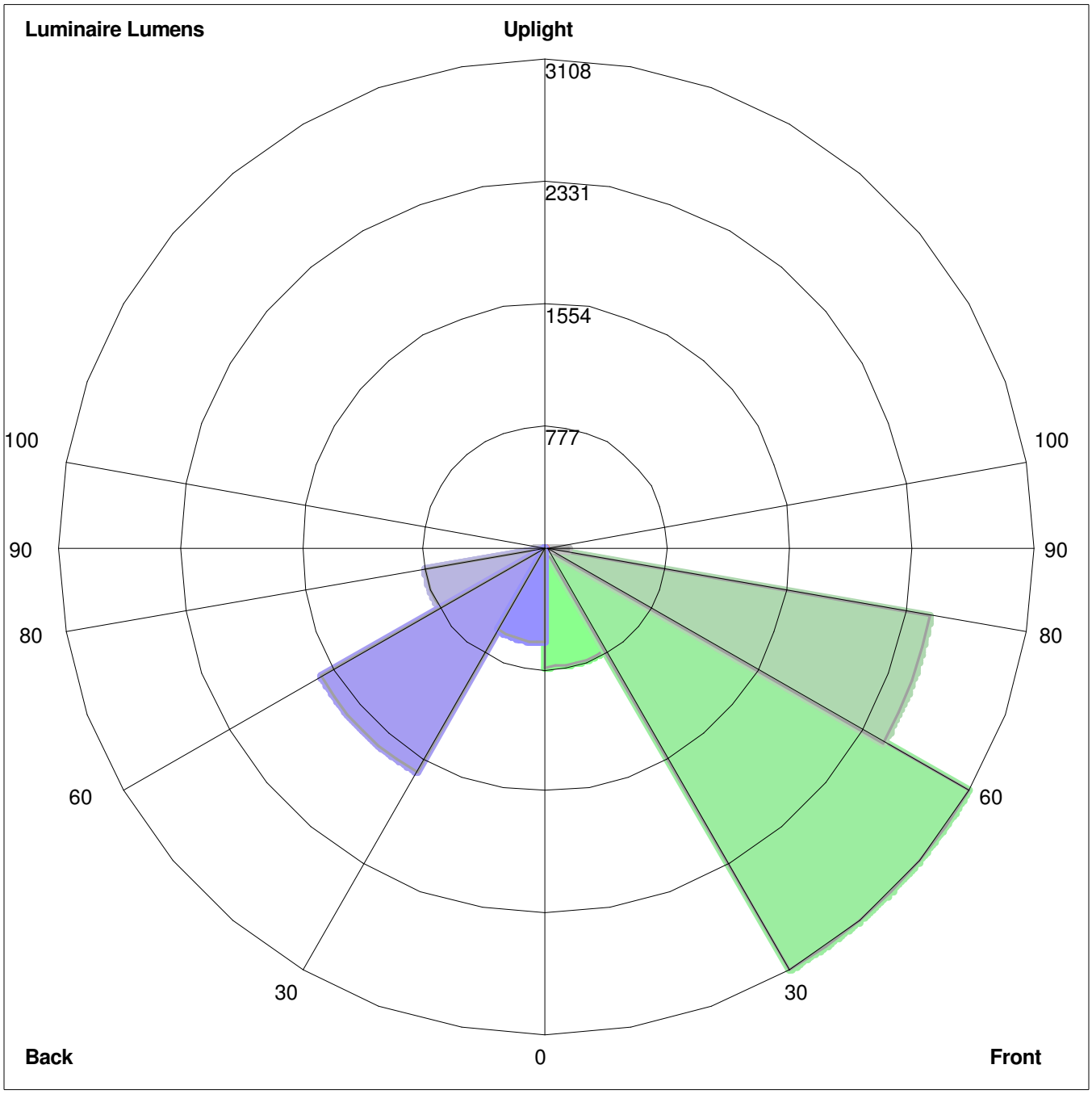
ISOFOOTCANDLE LINES OF HORIZONTAL ILLUMINANCE



Distance In Units Of Mounting Height
Values Based On 10 Foot Mounting Height
1/2 Maximum Candela Trace Shown As Dashed Curve
(+) = Maximum Candela Point

IES ROAD REPORT
PHOTOMETRIC FILENAME : LP1-N27-80W-4000K~5000K TYPE III MED.IES

LUMINAIRE CLASSIFICATION SYSTEM (LCS) GRAPH



Luminaire Lumens:
Front: Low=760.6, Medium=3108.1, High=2486.9, Very High=143.4
Back: Low=605.2, Medium=1648.3, High=779.9, Very High=67.6
Uplight: Low=0.0, High=0.0

BUG Rating : B2-U0-G2

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

IES ROAD REPORT
PHOTOMETRIC FILENAME : LP3-N39-80W-4000K~5000K TYPE II.IES

DESCRIPTIVE INFORMATION (From Photometric File)

IESNA:LM-63-2002
[TEST]
[TESTLAB]
[ISSUEDATE]
[MANUFAC]LP3-N39-80W-4000K/5000K
[LUMINAIRE]

CHARACTERISTICS

IES Classification	Type II
Longitudinal Classification	Very Short
Lumens Per Lamp	8800 (1 lamp)
Total Lamp Lumens	8800
Luminaire Lumens	8800
Downward Total Efficiency	100 %
Total Luminaire Efficiency	100 %
Luminaire Efficacy Rating (LER)	110
Total Luminaire Watts	80
Ballast Factor	1.00
Maximum Candela	3674.41
Maximum Candela Angle	200H 17.1V
Maximum Candela (<90 Degrees Vertical)	3674.41
Maximum Candela Angle (<90 Degrees Vertical)	200H 17.1V
Maximum Candela At 90 Degrees Vertical	35.867 (0.4% Lamp Lumens)
Maximum Candela from 80 to <90 Degrees Vertical	338.123 (3.8% Lamp Lumens)
Cutoff Classification (deprecated)	Cutoff

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

IES ROAD REPORT
PHOTOMETRIC FILENAME : LP3-N39-80W-4000K~5000K TYPE II.IES

CANDELA TABULATION

Vert. Angles	Horizontal Angles									
	0	10	20	30	40	50	60	70	80	90
0.0	3521.161	3521.161	3521.161	3521.161	3521.161	3521.161	3521.161	3521.161	3521.161	3521.161
0.9	3547.787	3549.600	3543.984	3539.455	3538.006	3533.478	3528.042	3527.318	3523.332	3517.175
1.8	3563.368	3557.752	3554.128	3550.687	3545.795	3541.449	3537.824	3534.745	3528.406	3525.507
2.7	3571.700	3574.417	3567.171	3563.729	3559.018	3553.403	3548.331	3545.432	3538.369	3528.768
3.6	3586.192	3583.656	3580.032	3572.967	3567.895	3567.351	3561.193	3551.773	3544.709	3539.455
4.5	3594.524	3597.060	3587.640	3586.373	3579.307	3575.322	3568.982	3561.374	3551.592	3548.876
5.4	3606.842	3608.111	3599.234	3591.989	3587.459	3584.562	3575.866	3566.809	3561.193	3554.491
6.3	3617.169	3617.529	3607.387	3602.677	3594.344	3588.909	3581.481	3574.055	3567.351	3565.179
7.2	3626.769	3624.776	3618.798	3613.727	3603.762	3594.886	3588.003	3582.207	3574.780	3571.700
8.1	3633.290	3631.116	3624.956	3616.443	3604.668	3594.344	3587.459	3581.843	3580.032	3578.582
9.0	3637.818	3636.188	3627.855	3617.710	3607.023	3597.060	3591.989	3584.924	3582.387	3577.677
9.9	3639.448	3634.557	3626.586	3617.529	3604.851	3594.161	3587.459	3585.287	3580.576	3581.301
10.8	3639.629	3632.747	3625.320	3612.639	3599.776	3588.909	3582.207	3580.396	3580.213	3582.568
11.7	3637.457	3630.210	3621.154	3604.306	3590.358	3578.582	3575.866	3574.055	3575.866	3576.591
12.6	3628.942	3624.414	3615.537	3597.605	3585.287	3573.692	3567.351	3563.368	3571.700	3572.425
13.5	3622.239	3609.378	3602.677	3581.118	3570.975	3558.476	3553.586	3549.962	3557.208	3567.171
14.4	3612.639	3600.684	3588.728	3567.895	3559.382	3538.730	3536.558	3537.281	3549.056	3552.861
15.3	3599.776	3585.648	3576.047	3549.056	3539.636	3526.413	3524.963	3520.977	3530.579	3540.541
16.2	3583.656	3567.715	3555.758	3534.020	3517.717	3507.573	3505.037	3508.118	3522.608	3531.484
17.1	3564.273	3553.403	3538.188	3512.100	3505.579	3488.552	3490.365	3492.537	3504.855	3512.645
18.0	3552.861	3533.297	3514.456	3489.276	3480.039	3467.902	3465.911	3470.981	3483.480	3499.783
18.9	3534.384	3518.986	3500.872	3469.531	3460.656	3448.158	3451.418	3453.590	3469.531	3479.495
19.8	3521.521	3494.168	3472.974	3438.376	3428.774	3416.637	3427.506	3429.499	3448.518	3462.467
20.7	3493.443	3471.707	3444.714	3416.998	3408.666	3386.748	3397.615	3413.013	3430.041	3434.932
21.6	3462.650	3442.722	3422.978	3382.942	3371.714	3366.820	3380.226	3386.386	3399.971	3409.571
22.5	3440.730	3406.492	3388.922	3348.344	3336.568	3328.597	3346.170	3361.206	3370.263	3386.386
23.4	3401.420	3379.865	3363.743	3320.629	3311.934	3304.507	3321.534	3328.237	3350.336	3353.416
24.3	3375.155	3336.750	3319.179	3278.783	3267.551	3262.841	3283.493	3289.108	3309.034	3325.337
25.2	3331.498	3302.513	3270.812	3246.901	3234.945	3215.381	3237.661	3258.495	3280.232	3288.021
26.1	3296.172	3251.611	3235.490	3190.202	3185.671	3184.042	3202.700	3204.149	3233.495	3242.011
27.0	3240.921	3194.187	3181.145	3155.965	3133.140	3127.525	3148.174	3167.558	3197.448	3207.049
27.9	3187.485	3155.785	3141.111	3097.634	3091.113	3088.939	3108.503	3108.141	3136.401	3152.884
28.8	3146.183	3097.996	3080.607	3039.305	3032.239	3029.523	3046.370	3048.181	3078.976	3112.489
29.7	3088.397	3057.238	3040.935	2998.907	2992.026	2987.134	3007.784	3007.423	3042.204	3054.341
30.6	3048.181	2998.183	2979.888	2937.500	2934.420	2929.891	2950.362	2948.369	2982.244	3017.386
31.5	2988.945	2958.514	2917.573	2897.284	2896.018	2867.758	2890.221	2908.516	2940.036	2955.434
32.4	2923.732	2890.038	2876.090	2833.339	2837.507	2826.276	2853.627	2847.469	2879.895	2896.018
33.3	2876.815	2820.840	2807.797	2767.401	2776.641	2762.510	2792.763	2802.726	2817.218	2851.997
34.2	2807.253	2771.750	2765.045	2723.202	2732.258	2723.563	2750.917	2738.055	2773.198	2784.973
35.1	2756.895	2698.202	2690.776	2656.359	2663.603	2662.516	2684.435	2670.848	2701.645	2740.050
36.0	2679.907	2649.655	2616.868	2609.260	2615.057	2598.935	2620.672	2627.736	2654.545	2669.037
36.9	2630.635	2573.574	2567.594	2537.888	2547.305	2553.465	2574.116	2561.073	2582.992	2598.390
37.8	2557.087	2499.482	2493.142	2490.426	2475.028	2486.985	2506.004	2514.339	2537.888	2552.197
38.7	2485.354	2450.754	2443.508	2419.597	2428.110	2437.169	2459.268	2444.232	2469.776	2482.455
39.6	2437.169	2378.294	2372.860	2346.775	2358.187	2366.882	2384.997	2369.782	2399.490	2435.719
40.5	2361.267	2325.945	2321.959	2297.322	2309.278	2319.423	2337.898	2318.334	2351.666	2361.811
41.4	2307.103	2246.962	2247.145	2219.065	2235.369	2241.710	2265.078	2245.514	2274.315	2308.192
42.3	2222.508	2193.523	2172.147	2168.343	2187.002	2164.177	2189.721	2192.437	2223.957	2232.469
43.2	2138.817	2113.637	2121.064	2091.899	2117.623	2114.181	2137.731	2115.812	2143.527	2151.317
44.1	2084.292	2037.555	2046.795	2023.245	2042.628	2044.800	2060.562	2064.184	2064.548	2096.790
45.0	2009.658	1987.015	1998.971	1978.138	1993.899	1996.072	2010.744	1988.644	2015.455	2017.085
45.9	1959.843	1912.925	1924.699	1907.490	1921.258	1924.699	1940.460	1914.011	1940.641	1964.371
46.8	1882.130	1862.386	1854.052	1859.306	1875.609	1853.689	1867.277	1865.103	1891.007	1882.674

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.

Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

CANDELA TABULATION - (Cont.)

47.7	1831.952	1782.497	1803.693	1785.577	1803.875	1802.967	1819.995	1792.824	1811.663	1794.816
48.6	1741.921	1699.714	1727.247	1736.849	1731.778	1728.697	1752.427	1743.915	1760.218	1737.755
49.5	1643.557	1638.123	1674.172	1661.672	1683.229	1680.513	1703.879	1665.116	1677.614	1646.457
50.4	1573.996	1537.404	1587.041	1584.503	1611.677	1611.856	1625.443	1581.425	1574.359	1580.156
51.3	1457.338	1464.584	1524.544	1529.253	1559.687	1562.948	1571.460	1519.834	1500.451	1472.191
52.2	1374.915	1347.563	1424.912	1444.656	1483.062	1490.850	1492.299	1419.477	1398.828	1357.162
53.1	1248.292	1269.306	1318.759	1387.596	1432.700	1409.334	1404.443	1346.838	1329.629	1280.537
54.0	1129.460	1150.653	1251.011	1297.565	1357.525	1351.365	1338.867	1235.974	1215.144	1166.957
54.9	1047.219	1029.285	1145.037	1199.021	1274.740	1259.524	1238.873	1126.923	1102.830	1095.767
55.8	932.552	949.578	1071.493	1127.649	1214.780	1194.855	1171.667	1051.566	1032.907	990.699
56.7	864.077	842.521	964.253	1020.769	1121.668	1090.151	1058.811	934.364	932.008	924.398
57.6	773.321	781.836	853.751	949.942	1055.007	980.737	943.240	862.627	867.700	842.521
58.5	705.212	707.023	787.271	849.223	948.672	909.184	871.323	773.140	786.002	775.859
59.4	668.617	646.881	700.137	784.372	844.693	810.096	770.785	721.876	740.173	740.173
60.3	629.129	616.267	649.417	695.609	780.930	749.411	708.471	656.299	684.378	690.175
61.2	606.121	578.225	589.456	622.969	690.536	668.800	632.025	605.940	636.916	659.199
62.1	574.603	556.850	543.988	584.565	640.177	623.513	594.891	579.674	609.383	616.810
63.0	556.669	526.961	520.620	537.103	585.471	569.893	554.131	545.980	575.145	578.588
63.9	530.946	510.113	494.173	511.382	556.850	530.401	521.708	526.055	552.684	555.581
64.8	508.846	487.652	479.681	479.862	519.895	508.483	503.956	499.606	523.519	526.235
65.7	494.354	467.725	458.667	453.596	488.194	480.406	481.492	478.050	499.426	509.207
66.6	472.616	454.501	445.625	437.835	469.174	463.559	466.999	463.919	484.934	486.203
67.5	457.943	434.574	426.786	415.555	442.725	439.829	446.350	444.900	463.378	471.348
68.4	436.385	422.256	408.853	401.062	425.336	416.822	426.241	432.038	449.611	445.805
69.3	417.185	405.409	397.439	380.413	399.613	401.788	412.113	405.409	415.735	409.395
70.2	403.962	389.286	381.134	367.368	373.708	379.144	390.375	380.049	393.816	391.461
71.1	386.026	379.324	370.267	348.168	355.955	362.296	367.006	355.050	370.267	374.433
72.0	375.158	364.832	353.601	328.059	328.964	339.472	333.313	338.927	352.333	363.565
72.9	359.580	349.254	337.661	315.561	308.132	311.031	314.473	328.785	342.007	347.623
73.8	342.913	330.959	324.979	293.642	291.467	283.136	299.980	308.496	324.979	331.501
74.7	307.951	299.075	306.865	279.874	272.990	262.484	284.221	295.453	313.930	304.511
75.6	285.491	286.757	278.244	261.216	252.521	251.434	270.273	282.591	295.998	263.027
76.5	235.854	277.881	262.664	243.100	234.588	238.392	253.971	274.078	282.772	203.612
77.4	162.309	255.601	247.990	221.906	212.124	222.450	240.022	257.230	263.933	146.006
78.3	111.769	233.318	231.688	204.336	195.277	205.422	223.900	235.854	238.753	110.500
79.2	93.472	204.517	216.835	185.677	169.011	186.219	203.067	215.385	218.465	93.653
80.1	79.160	170.641	197.631	171.910	132.783	167.561	187.669	202.522	199.263	83.146
81.0	69.199	146.731	169.192	151.802	103.255	147.636	169.917	190.568	179.699	74.814
81.9	58.330	121.369	155.607	133.144	78.619	128.797	147.456	163.396	154.338	62.676
82.8	47.642	96.371	124.812	114.847	62.858	108.509	125.537	148.723	138.396	53.981
83.7	38.223	71.917	94.558	87.132	47.279	84.776	72.822	122.456	112.131	44.744
84.6	27.896	47.099	55.431	58.149	32.970	60.322	44.019	94.921	86.590	36.591
85.5	18.658	23.549	22.644	24.093	21.194	34.600	25.361	36.230	55.250	27.896
86.4	11.776	11.776	11.412	11.593	13.223	15.037	15.758	17.572	25.541	19.744
87.3	9.782	10.143	9.421	9.601	10.143	10.143	10.327	10.327	11.412	12.498
88.2	9.238	9.238	8.876	8.876	9.057	9.238	9.238	9.238	9.238	9.963
89.1	8.876	8.876	8.695	8.695	9.057	8.695	8.695	8.695	8.876	9.238
90.0	8.695	8.513	8.152	8.332	8.332	8.695	8.695	8.513	8.695	8.876

Vert. Angles	**Horizontal Angles**									
	100	**110**	**120**	**130**	**140**	**150**	**160**	**170**	**180**	**190**
0.0	3521.161	3521.161	3521.161	3521.161	3521.161	3521.161	3521.161	3521.161	3521.161	3521.161
0.9	3507.210	3503.044	3498.333	3496.342	3493.081	3490.001	3489.095	3489.459	3530.579	3524.963
1.8	3514.819	3511.379	3502.139	3497.248	3496.342	3491.812	3491.451	3490.727	3524.421	3521.341
2.7	3520.977	3516.450	3510.654	3504.132	3499.241	3501.233	3499.783	3495.617	3521.882	3518.260

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

CANDELA TABULATION - (Cont.)

3.6	3531.123	3524.963	3516.269	3517.717	3509.929	3508.660	3505.579	3503.224	3525.143	3519.530
4.5	3541.449	3536.739	3527.137	3525.326	3516.992	3518.080	3515.725	3510.654	3526.413	3527.137
5.4	3547.245	3543.802	3536.919	3539.636	3531.848	3534.020	3525.143	3527.682	3539.274	3531.667
6.3	3559.744	3556.483	3550.505	3546.701	3543.984	3543.621	3538.550	3535.650	3552.497	3544.526
7.2	3564.998	3566.809	3561.918	3561.918	3553.586	3555.758	3548.512	3551.955	3559.563	3557.389
8.1	3575.322	3575.505	3570.250	3572.605	3570.431	3564.273	3563.004	3567.171	3576.411	3568.440
9.0	3583.837	3583.292	3580.576	3578.946	3575.686	3577.858	3574.597	3578.765	3588.003	3587.098
9.9	3583.837	3584.924	3585.648	3588.184	3584.742	3585.287	3582.568	3589.814	3603.220	3598.690
10.8	3585.103	3590.539	3591.445	3591.989	3592.713	3592.713	3592.350	3595.974	3612.277	3612.097
11.7	3586.553	3592.350	3594.161	3593.619	3596.699	3597.423	3597.060	3604.126	3628.400	3627.311
12.6	3583.474	3591.989	3595.430	3593.980	3599.055	3598.690	3601.045	3607.929	3641.623	3636.731
13.5	3579.671	3582.568	3593.074	3592.531	3597.060	3594.706	3602.132	3611.552	3647.239	3649.956
14.4	3569.706	3577.677	3584.018	3583.474	3589.995	3591.445	3602.677	3609.922	3654.305	3660.826
15.3	3557.933	3565.179	3573.692	3577.858	3585.287	3587.640	3596.155	3609.378	3660.281	3668.072
16.2	3548.331	3553.586	3566.446	3564.635	3572.967	3579.127	3592.169	3604.487	3662.455	3671.513
17.1	3528.587	3540.360	3547.606	3555.033	3560.469	3568.076	3581.301	3599.776	3661.368	3671.693
18.0	3516.086	3518.080	3530.398	3533.297	3547.606	3555.216	3576.953	3589.814	3660.101	3671.332
18.9	3497.611	3504.313	3513.732	3510.471	3532.209	3542.897	3561.374	3576.227	3655.751	3669.519
19.8	3474.603	3477.322	3488.010	3496.886	3518.260	3526.051	3548.693	3570.250	3648.145	3660.826
20.7	3455.584	3458.481	3469.352	3472.432	3495.255	3511.379	3538.369	3554.128	3639.087	3656.476
21.6	3427.686	3430.947	3441.272	3451.235	3471.524	3492.356	3520.435	3542.171	3629.847	3641.985
22.5	3407.942	3410.296	3423.339	3425.150	3455.945	3471.524	3507.210	3522.427	3615.900	3628.760
23.4	3377.690	3378.957	3391.094	3406.675	3428.594	3457.214	3489.640	3503.224	3602.132	3618.798
24.3	3338.019	3343.995	3357.582	3372.980	3407.397	3432.760	3465.366	3490.727	3587.098	3598.147
25.2	3312.839	3317.185	3333.852	3340.010	3377.326	3413.738	3448.700	3465.003	3567.895	3585.103
26.1	3269.545	3275.161	3294.181	3312.839	3355.227	3384.573	3416.457	3445.077	3551.592	3562.643
27.0	3239.292	3243.460	3265.196	3268.276	3317.910	3345.084	3396.348	3409.753	3522.790	3545.251
27.9	3185.671	3191.831	3211.395	3236.395	3275.703	3317.005	3354.503	3384.031	3493.081	3510.654
28.8	3151.255	3137.850	3160.131	3190.382	3243.821	3272.261	3327.692	3340.010	3472.974	3477.322
29.7	3093.469	3101.440	3125.350	3140.748	3196.542	3239.475	3280.776	3294.000	3435.657	3450.512
30.6	3032.059	3040.574	3071.005	3105.242	3161.037	3191.831	3228.785	3257.950	3408.121	3407.580
31.5	2992.026	3003.982	3032.239	3049.087	3106.331	3136.037	3192.918	3205.780	3357.582	3377.326
32.4	2936.231	2943.297	2975.722	3008.147	3056.152	3101.076	3138.756	3165.022	3323.707	3330.411
33.3	2892.213	2900.003	2937.681	2953.623	3020.103	3041.479	3101.801	3106.872	3269.906	3276.791
34.2	2825.187	2835.332	2876.271	2916.124	2961.774	3005.793	3041.660	3049.811	3211.940	3242.011
35.1	2755.627	2770.845	2812.327	2858.337	2923.369	2947.824	2980.432	3008.510	3175.165	3180.600
36.0	2706.174	2726.282	2769.395	2802.000	2863.592	2909.240	2938.950	2947.643	3116.654	3139.842
36.9	2637.337	2656.359	2709.253	2759.974	2821.927	2845.475	2876.090	2905.074	3073.724	3078.615
37.8	2590.964	2611.071	2666.321	2697.297	2761.605	2779.537	2834.247	2836.599	3011.950	3037.494
38.7	2519.954	2540.604	2600.384	2652.734	2696.028	2736.244	2768.306	2793.305	2951.629	2978.258
39.6	2472.311	2470.500	2532.813	2590.238	2653.821	2670.307	2724.108	2721.027	2907.247	2909.785
40.5	2397.678	2425.938	2485.898	2521.402	2582.992	2622.845	2652.190	2649.473	2836.058	2865.402
41.4	2324.855	2350.035	2421.047	2474.667	2535.714	2549.661	2580.818	2599.659	2790.408	2793.486
42.3	2273.230	2297.685	2375.759	2401.483	2460.900	2472.673	2531.002	2526.111	2715.231	2745.121
43.2	2193.523	2221.966	2303.661	2353.660	2386.447	2422.132	2456.733	2480.099	2665.233	2672.479
44.1	2136.461	2168.887	2254.753	2280.477	2338.262	2348.405	2408.185	2408.365	2591.507	2597.124
45.0	2054.945	2092.443	2179.033	2233.377	2261.818	2298.952	2335.001	2332.646	2518.324	2548.937
45.9	1979.044	2016.361	2110.558	2161.461	2210.370	2223.232	2257.469	2279.751	2469.592	2473.397
46.8	1924.699	1966.365	2061.647	2087.371	2132.476	2170.156	2201.494	2199.863	2389.708	2419.958
47.7	1838.653	1885.029	1985.023	2033.569	2081.937	2085.742	2119.798	2150.048	2335.543	2340.073
48.6	1780.507	1825.793	1933.395	1948.248	2003.498	2002.593	2065.272	2068.713	2253.666	2286.453
49.5	1686.671	1735.218	1854.234	1894.447	1925.968	1949.337	1986.290	2015.274	2168.527	2199.682
50.4	1615.297	1638.847	1762.935	1816.012	1872.348	1873.254	1935.205	1933.576	2111.463	2114.723
51.3	1498.640	1572.004	1697.177	1733.044	1792.099	1823.255	1856.226	1848.619	2022.521	2061.647
52.2	1388.682	1462.229	1600.808	1678.700	1741.379	1748.442	1773.441	1787.572	1962.379	1976.871
53.1	1318.759	1385.060	1538.854	1595.554	1664.210	1675.622	1718.554	1687.759	1861.297	1917.816

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.

Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

CANDELA TABULATION - (Cont.)

54.0	1206.809	1265.683	1436.325	1537.768	1587.401	1619.647	1629.065	1616.747	1791.738	1817.459
54.9	1131.634	1184.165	1362.777	1438.860	1534.868	1535.594	1569.288	1506.067	1683.954	1700.077
55.8	1029.827	1060.261	1250.827	1369.118	1451.903	1479.618	1472.555	1383.610	1565.844	1620.372
56.7	930.921	951.391	1136.525	1265.139	1396.653	1392.667	1366.401	1299.195	1481.792	1496.104
57.6	869.873	885.090	1056.094	1160.073	1307.347	1331.076	1293.218	1170.761	1351.004	1411.145
58.5	793.792	791.799	937.444	1087.976	1242.495	1226.192	1175.288	1088.521	1262.965	1287.963
59.4	752.127	737.454	866.070	983.634	1137.974	1115.872	1090.693	960.809	1130.003	1201.918
60.3	697.965	669.887	761.183	914.255	1028.921	1040.515	964.070	880.199	1001.931	1068.593
61.2	664.270	620.976	664.451	807.377	951.752	927.478	878.930	775.135	927.478	939.979
62.1	620.613	594.891	612.825	706.659	845.782	853.570	764.627	689.994	832.557	860.997
63.0	585.110	561.741	558.480	650.867	785.097	745.064	668.436	644.163	780.025	768.613
63.9	564.457	542.539	531.307	584.021	701.768	652.134	613.911	585.833	716.624	719.885
64.8	535.837	516.815	499.970	547.974	630.759	601.593	546.344	557.031	682.929	665.357
65.7	518.990	501.056	482.578	504.861	591.630	542.719	509.752	523.519	642.171	628.403
66.6	496.890	480.223	461.203	481.311	543.808	510.476	467.544	499.970	606.666	608.296
67.5	475.515	460.842	440.915	451.060	518.084	470.985	437.835	486.564	587.645	583.116
68.4	460.842	447.980	428.416	423.342	483.667	449.247	422.618	468.086	562.827	568.262
69.3	435.299	429.322	409.939	407.764	461.929	421.712	402.693	455.951	546.524	546.524
70.2	404.142	414.105	398.163	386.209	431.677	396.533	390.375	439.285	523.519	530.946
71.1	377.513	376.608	380.049	372.441	401.788	380.594	372.802	429.322	501.600	507.577
72.0	365.920	357.769	352.877	351.969	382.043	356.681	362.296	414.105	487.652	486.383
72.9	350.159	347.804	330.233	330.051	354.508	334.037	347.804	399.977	466.638	473.341
73.8	337.297	329.509	312.662	308.857	329.509	312.117	335.306	386.570	447.617	452.507
74.7	322.988	317.916	301.974	275.889	306.865	290.923	322.625	373.166	430.953	440.190
75.6	308.315	307.046	288.387	265.202	288.751	278.969	309.945	362.296	417.909	422.618
76.5	288.387	298.894	278.969	254.332	268.099	269.729	298.714	348.528	402.693	411.569
77.4	263.389	283.136	265.202	242.739	243.644	252.340	283.136	315.923	387.839	395.991
78.3	224.442	269.368	256.326	229.152	223.900	229.876	260.673	299.258	358.493	381.860
79.2	181.148	241.290	243.825	216.109	208.322	206.508	249.622	285.127	328.964	343.457
80.1	147.273	226.435	222.811	207.234	181.328	192.560	236.762	270.818	307.227	326.610
81.0	125.537	215.929	204.336	193.646	162.128	174.990	223.175	257.051	258.498	311.031
81.9	102.710	197.815	189.663	159.592	132.783	158.505	210.313	237.847	188.575	294.003
82.8	84.960	172.996	176.801	143.287	96.371	143.650	182.417	202.522	133.505	277.700
83.7	67.749	156.693	141.115	129.339	72.822	117.202	153.432	185.133	107.059	255.601
84.6	52.714	130.969	103.618	108.509	54.889	102.529	135.679	167.924	93.653	218.828
85.5	42.027	96.914	62.315	82.785	42.569	78.438	105.429	134.413	81.879	201.437
86.4	29.346	57.424	38.042	62.135	32.606	58.691	58.330	105.790	71.734	174.265
87.3	15.037	19.564	21.919	26.448	23.729	40.577	34.961	66.118	62.315	148.541
88.2	10.327	10.506	10.506	14.128	13.407	18.838	16.848	22.100	52.351	119.377
89.1	9.421	9.238	9.421	10.143	10.868	10.868	11.232	11.051	42.208	81.879
90.0	8.876	8.876	9.057	9.238	9.421	9.601	9.238	9.601	33.875	35.867

Vert. Angles	**Horizontal Angles**									
	200	**210**	**220**	**230**	**240**	**250**	**260**	**270**	**280**	**290**
0.0	3521.161	3521.161	3521.161	3521.161	3521.161	3521.161	3521.161	3521.161	3521.161	3521.161
0.9	3524.421	3520.435	3515.000	3520.253	3514.639	3511.921	3508.298	3510.471	3506.487	3500.508
1.8	3517.900	3517.717	3512.645	3514.819	3512.645	3513.190	3509.929	3512.284	3507.573	3503.950
2.7	3516.450	3513.732	3512.284	3510.471	3512.645	3514.456	3512.284	3512.464	3514.456	3512.284
3.6	3519.530	3514.275	3513.914	3513.732	3514.095	3518.260	3517.175	3518.622	3522.066	3518.260
4.5	3524.963	3520.797	3520.435	3519.530	3526.051	3525.868	3528.042	3528.224	3532.028	3531.123
5.4	3532.028	3528.768	3530.217	3527.499	3532.209	3536.739	3541.449	3541.085	3547.062	3542.897
6.3	3545.795	3540.905	3542.171	3540.180	3544.526	3546.157	3551.231	3550.505	3557.208	3554.308
7.2	3554.128	3555.033	3557.933	3549.056	3556.664	3562.823	3569.525	3567.715	3575.505	3574.236
8.1	3568.800	3565.904	3567.895	3567.351	3575.686	3574.780	3580.576	3588.909	3590.900	3586.373
9.0	3589.270	3580.757	3585.287	3582.932	3588.728	3591.084	3601.407	3599.959	3603.945	3600.321

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.

Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

CANDELA TABULATION - (Cont.)

9.9	3602.315	3600.321	3595.069	3594.706	3600.140	3608.111	3610.827	3619.160	3619.160	3615.537
10.8	3618.254	3610.103	3612.639	3607.023	3616.079	3619.704	3627.855	3629.305	3631.297	3625.140
11.7	3628.036	3628.217	3628.581	3620.065	3625.140	3630.572	3637.818	3641.803	3643.797	3638.363
12.6	3643.615	3634.196	3637.276	3631.661	3636.188	3637.276	3647.600	3654.666	3650.861	3642.890
13.5	3656.657	3648.869	3646.513	3638.181	3645.064	3647.783	3656.116	3659.556	3658.287	3647.419
14.4	3663.179	3655.751	3651.044	3645.428	3648.505	3650.861	3657.565	3664.808	3662.092	3648.688
15.3	3670.608	3665.172	3657.927	3648.505	3650.136	3656.476	3662.455	3667.527	3664.448	3649.594
16.2	3674.048	3665.172	3658.651	3649.050	3651.766	3654.121	3664.628	3667.164	3659.556	3645.244
17.1	3674.410	3665.897	3656.657	3650.499	3647.419	3651.766	3659.918	3667.527	3654.847	3639.448
18.0	3671.693	3665.172	3651.224	3644.339	3644.522	3649.050	3654.666	3661.006	3649.774	3629.486
18.9	3668.977	3662.455	3645.608	3639.268	3634.016	3644.159	3650.680	3651.044	3636.552	3618.618
19.8	3658.287	3650.136	3636.552	3628.036	3623.508	3635.826	3637.276	3643.978	3624.595	3601.045
20.7	3649.594	3638.363	3624.414	3617.529	3615.174	3619.160	3632.927	3630.755	3606.661	3583.656
21.6	3637.276	3625.681	3609.016	3600.501	3599.234	3608.472	3612.277	3614.268	3591.989	3568.800
22.5	3623.690	3609.378	3590.358	3588.728	3587.823	3591.445	3595.430	3596.516	3570.794	3543.079
23.4	3606.297	3597.423	3577.858	3572.605	3569.345	3579.671	3580.576	3572.967	3555.577	3528.042
24.3	3580.213	3574.960	3557.569	3549.600	3549.781	3562.460	3558.476	3561.193	3529.492	3502.139
25.2	3568.982	3561.374	3541.629	3537.824	3534.927	3547.970	3541.991	3534.384	3500.508	3480.763
26.1	3541.085	3536.013	3514.639	3512.645	3507.210	3520.797	3514.275	3513.370	3478.589	3446.163
27.0	3521.161	3508.118	3496.342	3493.443	3490.545	3490.907	3479.676	3480.219	3441.272	3411.202
27.9	3486.379	3486.379	3468.626	3465.185	3459.569	3468.988	3456.671	3457.034	3415.913	3383.487
28.8	3464.821	3449.424	3433.302	3445.258	3441.092	3430.947	3418.267	3413.738	3371.714	3335.844
29.7	3425.150	3422.795	3408.666	3411.382	3401.420	3404.136	3391.638	3367.728	3322.621	3301.246
30.6	3382.942	3380.226	3365.552	3372.255	3357.221	3360.663	3342.184	3334.397	3289.290	3251.611
31.5	3350.700	3335.118	3337.837	3342.004	3325.337	3312.295	3309.578	3287.115	3236.031	3200.889
32.4	3300.340	3302.332	3292.550	3297.621	3276.247	3277.333	3256.863	3252.517	3199.622	3164.661
33.3	3267.732	3254.872	3241.466	3267.551	3240.380	3223.171	3199.622	3197.267	3145.639	3111.039
34.2	3211.395	3219.003	3205.055	3215.926	3185.671	3182.775	3160.492	3138.032	3106.511	3073.360
35.1	3154.695	3164.478	3155.965	3160.131	3129.516	3123.540	3101.440	3099.084	3049.811	3012.314
36.0	3116.837	3124.083	3118.285	3123.720	3092.382	3082.782	3061.948	3041.299	2987.859	2970.287
36.9	3055.789	3068.833	3061.587	3069.919	3029.523	3021.190	3000.539	2997.822	2946.918	2910.327
37.8	3014.669	3014.125	3026.626	3031.697	2988.401	2959.600	2935.506	2938.042	2877.177	2848.194
38.7	2953.079	2976.989	2968.837	2976.084	2929.710	2920.652	2891.669	2894.387	2831.891	2805.623
39.6	2908.335	2920.292	2907.429	2935.870	2868.663	2854.171	2823.556	2824.101	2763.959	2734.614
40.5	2844.570	2878.626	2868.482	2872.649	2825.006	2807.253	2778.271	2750.556	2692.587	2687.515
41.4	2775.735	2812.145	2804.176	2807.617	2756.895	2737.331	2705.449	2703.457	2640.597	2617.229
42.3	2729.542	2745.845	2758.524	2760.699	2711.245	2663.603	2656.176	2629.547	2564.153	2542.053
43.2	2657.444	2699.653	2688.602	2690.051	2639.148	2613.787	2579.732	2575.385	2513.431	2487.528
44.1	2609.441	2631.177	2615.237	2641.142	2591.324	2532.089	2502.019	2493.687	2432.640	2410.360
45.0	2540.060	2586.978	2566.869	2569.044	2515.424	2481.913	2449.487	2415.431	2378.294	2358.187
45.9	2470.500	2519.229	2493.687	2493.866	2441.516	2410.177	2368.332	2363.442	2295.874	2281.562
46.8	2420.863	2472.131	2445.863	2444.958	2390.432	2358.550	2315.618	2280.112	2214.175	2229.029
47.7	2343.333	2400.939	2370.143	2367.969	2310.363	2277.938	2231.928	2221.602	2158.019	2147.149
48.6	2290.619	2323.589	2316.343	2312.357	2254.571	2198.597	2144.977	2137.006	2071.429	2065.814
49.5	2216.166	2270.695	2237.179	2228.303	2172.873	2144.252	2088.096	2077.771	2016.904	2011.108
50.4	2163.997	2190.082	2155.484	2172.329	2093.349	2058.206	2002.412	1981.763	1932.851	1926.329
51.3	2084.111	2137.731	2100.776	2089.182	2036.649	1999.516	1937.924	1883.399	1842.822	1872.709
52.2	1999.695	2059.656	2012.918	2004.587	1949.879	1914.011	1831.590	1813.113	1775.797	1786.664
53.1	1940.641	1976.327	1955.494	1948.068	1891.187	1823.981	1757.499	1697.540	1659.861	1695.005
54.0	1847.893	1916.911	1868.907	1862.566	1801.700	1758.223	1642.471	1618.017	1581.242	1625.624
54.9	1780.687	1821.808	1780.143	1799.890	1741.559	1647.543	1527.442	1496.826	1461.865	1512.044
55.8	1663.484	1754.421	1716.380	1703.698	1645.007	1570.374	1447.012	1374.372	1382.160	1429.984
56.7	1538.312	1645.188	1617.292	1610.046	1535.231	1455.344	1320.753	1295.390	1252.277	1310.971
57.6	1452.808	1570.735	1547.549	1546.825	1457.518	1377.089	1232.713	1174.566	1118.772	1229.997
58.5	1315.679	1455.888	1440.490	1445.745	1339.228	1253.365	1104.641	1093.048	1032.726	1105.186
59.4	1224.381	1328.541	1364.591	1373.467	1258.437	1131.090	988.163	976.751	910.270	976.207

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.

Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

CANDELA TABULATION - (Cont.)

60.3	1084.171	1239.959	1241.589	1258.437	1135.800	1048.849	921.320	910.633	840.346	892.697
61.2	995.771	1100.295	1116.417	1178.188	1014.068	927.842	839.622	831.651	755.932	776.765
62.1	870.961	1006.461	1032.726	1053.920	934.544	855.200	795.060	769.336	692.529	708.653
63.0	756.292	871.686	907.371	928.567	824.588	760.822	737.273	730.752	659.742	626.773
63.9	695.066	748.685	826.579	852.484	757.561	691.805	701.226	677.132	617.897	571.884
64.8	624.056	679.488	721.151	754.302	674.958	656.482	651.953	645.976	593.078	547.068
65.7	590.906	598.877	637.461	698.507	630.759	614.275	610.107	608.840	563.733	520.620
66.6	555.762	557.755	592.356	629.671	579.494	590.726	585.471	577.139	546.888	507.216
67.5	532.031	511.743	541.271	580.580	541.271	556.487	553.951	558.661	524.605	489.463
68.4	520.077	489.825	515.729	554.131	521.164	536.381	536.017	531.852	503.230	477.687
69.3	503.956	466.638	488.738	522.614	495.985	511.924	512.468	515.004	489.282	460.479
70.2	493.629	450.152	473.885	505.586	480.586	490.368	488.919	490.368	466.999	442.001
71.1	479.862	440.915	454.863	481.131	460.117	474.971	470.805	470.805	450.152	427.873
72.0	470.261	428.053	436.204	464.283	442.725	452.327	440.009	431.133	412.294	401.062
72.9	455.951	417.004	423.887	442.184	431.314	427.873	416.641	403.237	386.933	368.275
73.8	442.906	407.222	401.062	418.815	403.237	400.157	394.360	387.657	368.817	350.522
74.7	429.684	395.446	388.565	402.693	381.499	384.396	382.043	370.812	351.789	335.850
75.6	420.626	384.759	374.977	381.499	363.201	372.983	370.991	355.414	342.371	324.074
76.5	411.025	374.797	362.659	359.035	352.877	360.124	360.846	329.509	328.964	312.117
77.4	399.977	363.565	344.906	336.392	338.022	347.443	341.465	281.322	313.387	302.518
78.3	384.034	355.414	333.856	319.547	320.813	335.667	322.807	193.646	295.453	293.279
79.2	367.912	344.543	319.363	306.322	308.132	318.822	299.799	142.201	282.047	281.685
80.1	334.400	331.681	297.988	291.467	294.003	306.322	277.881	117.927	264.838	264.658
81.0	319.908	302.155	280.055	276.431	276.431	282.410	226.072	105.065	228.610	241.109
81.9	303.785	281.685	255.781	258.498	257.051	255.421	190.930	95.283	211.944	229.697
82.8	287.482	259.947	227.160	243.100	232.413	240.022	166.836	84.235	193.830	215.748
83.7	270.998	238.392	187.309	202.886	214.843	222.811	136.585	75.538	162.854	190.930
84.6	238.753	219.370	133.869	182.778	197.631	195.821	114.486	67.931	143.832	175.532
85.5	217.740	191.111	93.110	167.924	162.854	176.982	94.742	59.054	117.927	146.548
86.4	191.474	171.004	75.177	138.579	121.551	150.173	81.155	49.998	94.378	102.893
87.3	151.622	136.585	62.315	115.935	79.705	124.268	66.662	42.388	68.473	49.998
88.2	84.596	105.429	49.815	82.240	49.998	64.488	47.823	32.970	36.411	30.795
89.1	51.628	77.349	39.128	46.012	35.506	37.136	31.521	28.802	26.990	26.448
90.0	35.143	35.506	31.340	29.889	27.171	26.266	26.809	25.904	25.724	24.819

Vert. Angles	**Horizontal Angles**						
	300	**310**	**320**	**330**	**340**	**350**	**360**
0.0	3521.161	3521.161	3521.161	3521.161	3521.161	3521.161	3521.161
0.9	3500.508	3493.262	3494.531	3494.168	3495.255	3495.073	3547.787
1.8	3502.319	3502.863	3506.668	3500.872	3503.044	3506.124	3563.368
2.7	3511.739	3506.487	3512.826	3512.645	3515.181	3512.464	3571.700
3.6	3520.977	3518.805	3523.696	3521.161	3527.499	3524.238	3586.192
4.5	3533.297	3530.037	3530.579	3533.114	3535.650	3539.455	3594.524
5.4	3546.882	3538.730	3547.245	3543.440	3552.497	3546.157	3606.842
6.3	3557.933	3557.933	3563.004	3557.027	3561.013	3561.918	3617.169
7.2	3575.686	3570.250	3572.425	3571.336	3572.967	3570.794	3626.769
8.1	3585.287	3582.932	3586.373	3579.307	3583.656	3584.018	3633.290
9.0	3598.147	3595.069	3591.445	3592.169	3594.344	3592.169	3637.818
9.9	3610.827	3605.937	3603.037	3598.147	3600.321	3600.865	3639.448
10.8	3620.429	3611.914	3609.016	3602.677	3605.212	3606.481	3639.629
11.7	3627.131	3618.798	3613.002	3604.851	3604.126	3606.661	3637.457
12.6	3631.842	3621.154	3610.827	3605.392	3602.857	3605.937	3628.942
13.5	3635.463	3620.790	3609.741	3604.668	3601.227	3601.951	3622.239
14.4	3634.016	3617.169	3603.762	3598.147	3591.625	3596.516	3612.639
15.3	3628.942	3610.283	3599.234	3590.900	3584.742	3588.547	3599.776

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

CANDELA TABULATION - (Cont.)

16.2	3621.515	3605.212	3586.373	3584.742	3575.322	3579.127	3583.656
17.1	3615.174	3594.344	3574.055	3571.156	3566.265	3568.440	3564.273
18.0	3599.595	3583.474	3564.635	3559.018	3554.491	3558.658	3552.861
18.9	3588.364	3568.982	3551.231	3549.056	3544.890	3543.802	3534.384
19.8	3571.700	3552.316	3538.911	3537.100	3529.492	3532.934	3521.521
20.7	3551.773	3537.824	3520.071	3523.332	3513.190	3510.471	3493.443
21.6	3536.195	3517.175	3505.579	3501.958	3497.611	3489.095	3462.650
22.5	3512.100	3502.502	3485.655	3482.938	3475.692	3473.698	3440.730
23.4	3495.797	3476.234	3460.656	3464.642	3457.214	3445.622	3401.420
24.3	3467.540	3459.206	3442.178	3440.187	3428.049	3425.513	3375.155
25.2	3446.344	3432.216	3414.101	3416.998	3389.102	3390.008	3331.498
26.1	3413.013	3401.420	3392.724	3384.392	3362.474	3350.517	3296.172
27.0	3372.436	3373.523	3355.046	3358.668	3320.447	3321.171	3240.921
27.9	3345.445	3333.127	3311.570	3313.019	3286.573	3270.270	3187.485
28.8	3301.427	3304.326	3280.594	3260.488	3232.771	3235.490	3146.183
29.7	3269.001	3253.603	3231.865	3226.069	3196.542	3176.434	3088.397
30.6	3217.916	3202.700	3195.817	3173.354	3141.473	3139.481	3048.181
31.5	3161.761	3168.463	3141.834	3134.227	3080.426	3081.150	2988.945
32.4	3124.806	3117.562	3104.881	3079.157	3040.935	3023.726	2923.732
33.3	3069.919	3080.607	3048.362	3020.103	2979.345	2984.599	2876.815
34.2	3034.233	3023.546	2990.756	2981.157	2938.950	2921.378	2807.253
35.1	2976.084	2981.157	2951.992	2917.753	2873.193	2877.540	2756.895
36.0	2935.326	2923.369	2889.858	2872.285	2803.268	2802.181	2679.907
36.9	2874.824	2863.048	2845.839	2807.797	2753.634	2730.447	2630.635
37.8	2805.806	2818.305	2779.537	2765.409	2681.539	2678.095	2557.087
38.7	2762.690	2753.997	2713.239	2698.202	2632.810	2609.441	2485.354
39.6	2696.028	2706.174	2667.588	2630.090	2562.523	2563.973	2437.169
40.5	2648.568	2631.540	2596.398	2580.818	2512.164	2488.976	2361.267
41.4	2573.755	2558.719	2545.494	2507.092	2437.531	2444.413	2307.103
42.3	2499.302	2506.548	2466.876	2457.094	2364.347	2365.071	2222.508
43.2	2447.674	2425.213	2413.437	2377.934	2311.632	2286.634	2138.817
44.1	2369.782	2369.599	2332.466	2294.061	2232.108	2229.753	2084.292
45.0	2319.603	2289.353	2249.498	2240.985	2177.403	2145.519	2009.658
45.9	2241.710	2236.818	2194.792	2161.280	2097.695	2094.434	1959.843
46.8	2187.365	2156.026	2113.637	2108.566	2020.889	2017.990	1882.130
47.7	2107.297	2077.950	2057.482	2029.947	1969.625	1945.351	1831.952
48.6	2024.150	2023.970	1975.966	1977.232	1896.259	1895.717	1741.921
49.5	1971.617	1940.097	1894.811	1895.353	1845.358	1816.012	1643.557
50.4	1891.551	1883.399	1840.467	1817.642	1763.298	1757.499	1573.996
51.3	1836.301	1803.150	1758.768	1762.209	1703.337	1656.781	1457.338
52.2	1748.986	1723.807	1702.793	1679.968	1601.713	1588.127	1374.915
53.1	1662.036	1671.455	1621.638	1622.363	1493.024	1475.271	1248.292
54.0	1602.438	1589.757	1567.113	1526.717	1421.107	1356.256	1129.460
54.9	1510.594	1532.696	1484.509	1427.267	1306.441	1274.560	1047.219
55.8	1443.207	1441.216	1392.847	1358.070	1224.381	1145.581	932.552
56.7	1333.251	1351.729	1326.910	1245.756	1097.939	1059.897	864.077
57.6	1254.451	1289.232	1223.837	1171.667	970.410	938.529	773.321
58.5	1133.806	1189.964	1151.739	1057.725	887.264	836.542	705.212
59.4	1011.893	1119.133	1040.697	977.657	773.684	778.395	668.617
60.3	932.552	1007.908	928.383	859.186	707.928	704.486	629.129
61.2	820.058	932.189	855.200	743.795	630.759	668.256	606.121
62.1	751.221	823.499	752.127	672.241	591.087	627.498	574.603
63.0	661.554	723.325	690.719	585.471	547.249	594.891	556.669
63.9	592.173	668.075	611.920	540.002	521.525	577.139	530.946
64.8	555.945	603.949	569.529	493.266	508.846	550.690	508.846
65.7	514.643	571.342	520.620	464.103	492.179	536.561	494.354

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

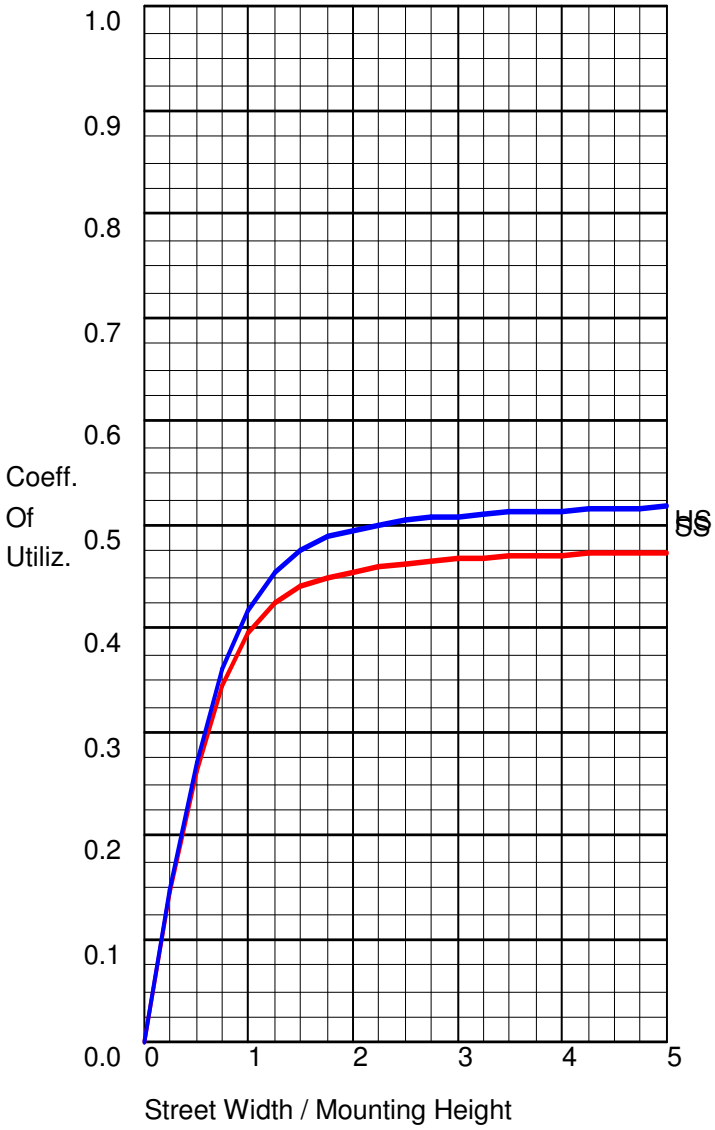
CANDELA TABULATION - (Cont.)

66.6	494.898	532.576	483.847	450.152	481.854	516.092	472.616
67.5	470.985	501.600	463.919	432.943	466.999	503.050	457.943
68.4	457.762	483.302	436.749	422.256	451.966	482.941	436.385
69.3	438.923	456.856	420.082	406.134	441.820	463.014	417.185
70.2	419.176	439.104	396.715	395.991	426.786	449.611	403.962
71.1	405.953	412.113	374.797	380.049	416.279	430.589	386.026
72.0	384.759	393.816	359.940	363.926	401.788	418.996	375.158
72.9	356.138	367.006	338.567	353.964	388.020	403.054	359.580
73.8	324.979	344.543	318.097	337.661	375.339	390.195	342.913
74.7	303.241	318.639	300.525	326.068	361.390	375.519	307.951
75.6	293.279	292.554	289.837	311.756	351.248	360.304	285.491
76.5	280.961	268.280	275.709	302.155	330.959	327.335	235.854
77.4	268.462	252.702	259.041	284.221	306.501	312.117	162.309
78.3	257.411	238.392	234.948	265.202	292.554	295.998	111.769
79.2	246.544	225.891	218.645	251.976	280.780	278.605	93.472
80.1	236.398	212.668	204.154	235.312	268.462	255.781	79.160
81.0	213.029	195.821	178.793	217.015	250.165	230.963	69.199
81.9	198.721	170.097	139.485	199.806	230.602	188.575	58.330
82.8	185.495	153.072	101.262	176.437	205.241	164.664	47.642
83.7	160.135	136.043	81.516	161.585	185.314	136.405	38.223
84.6	129.522	113.036	69.562	134.413	153.072	115.211	27.896
85.5	75.177	97.638	55.611	114.125	121.732	92.928	18.658
86.4	53.981	71.734	44.383	70.647	74.269	64.127	11.776
87.3	39.492	48.368	34.961	38.947	36.411	36.411	9.782
88.2	29.889	29.709	28.079	26.629	26.629	27.535	9.238
89.1	25.904	26.085	25.724	24.999	25.541	26.085	8.876
90.0	24.999	25.361	25.361	24.819	25.180	25.724	8.695

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

IES ROAD REPORT
PHOTOMETRIC FILENAME : LP3-N39-80W-4000K~5000K TYPE II.IES

COEFFICIENTS OF UTILIZATION



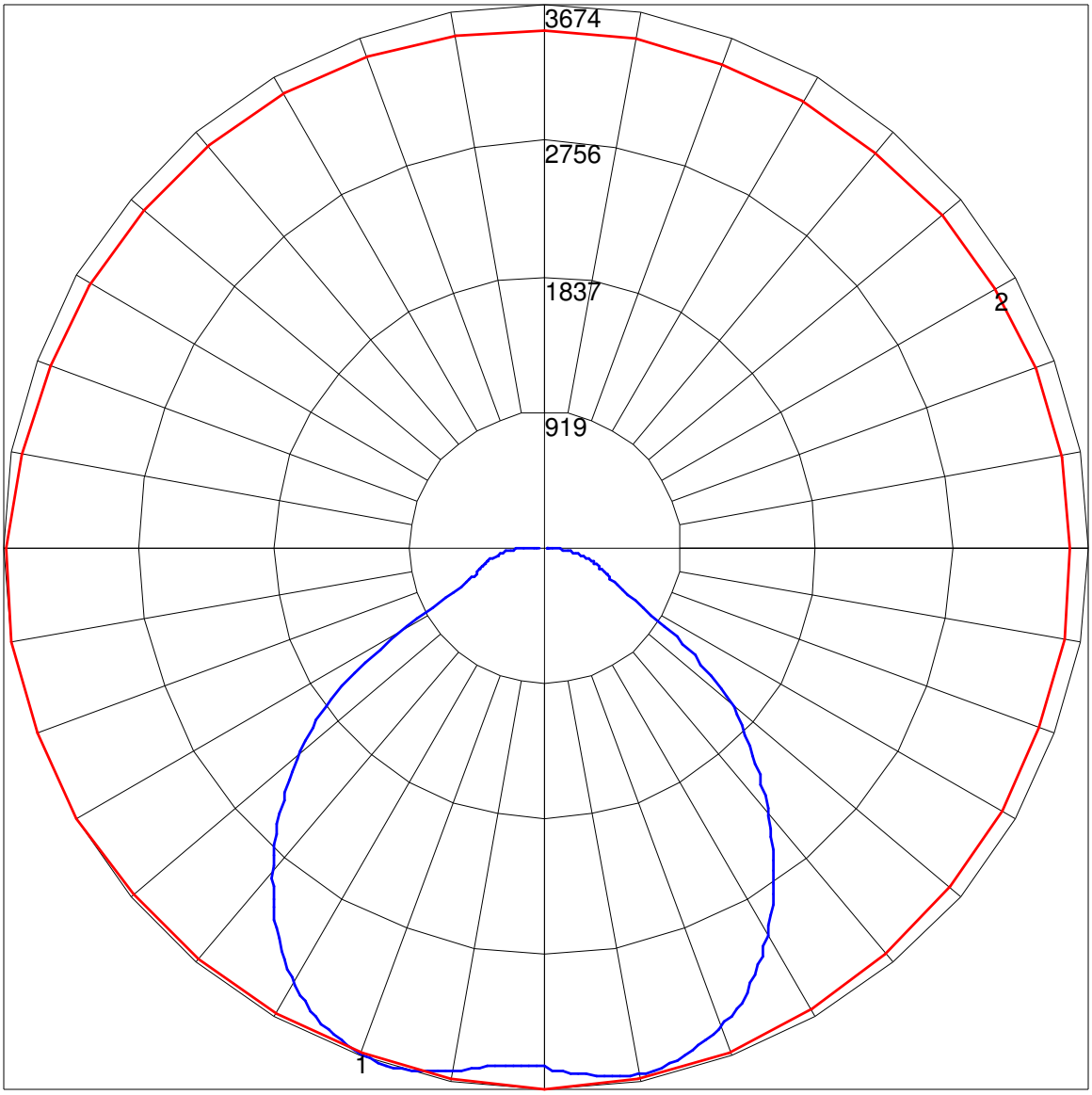
FLUX DISTRIBUTION

	Lumens	Percent Of Lamp
Downward Street Side	4197.0	47.7
Downward House Side	4603.0	52.3
Downward Total	8800.0	100.0
Upward Street Side	0.0	0.0
Upward House Side	0.0	0.0
Upward Total	0.0	0.0
Total Flux	8800.0	100.0

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

IES ROAD REPORT
PHOTOMETRIC FILENAME : LP3-N39-80W-4000K~5000K TYPE II.IES

POLAR GRAPH

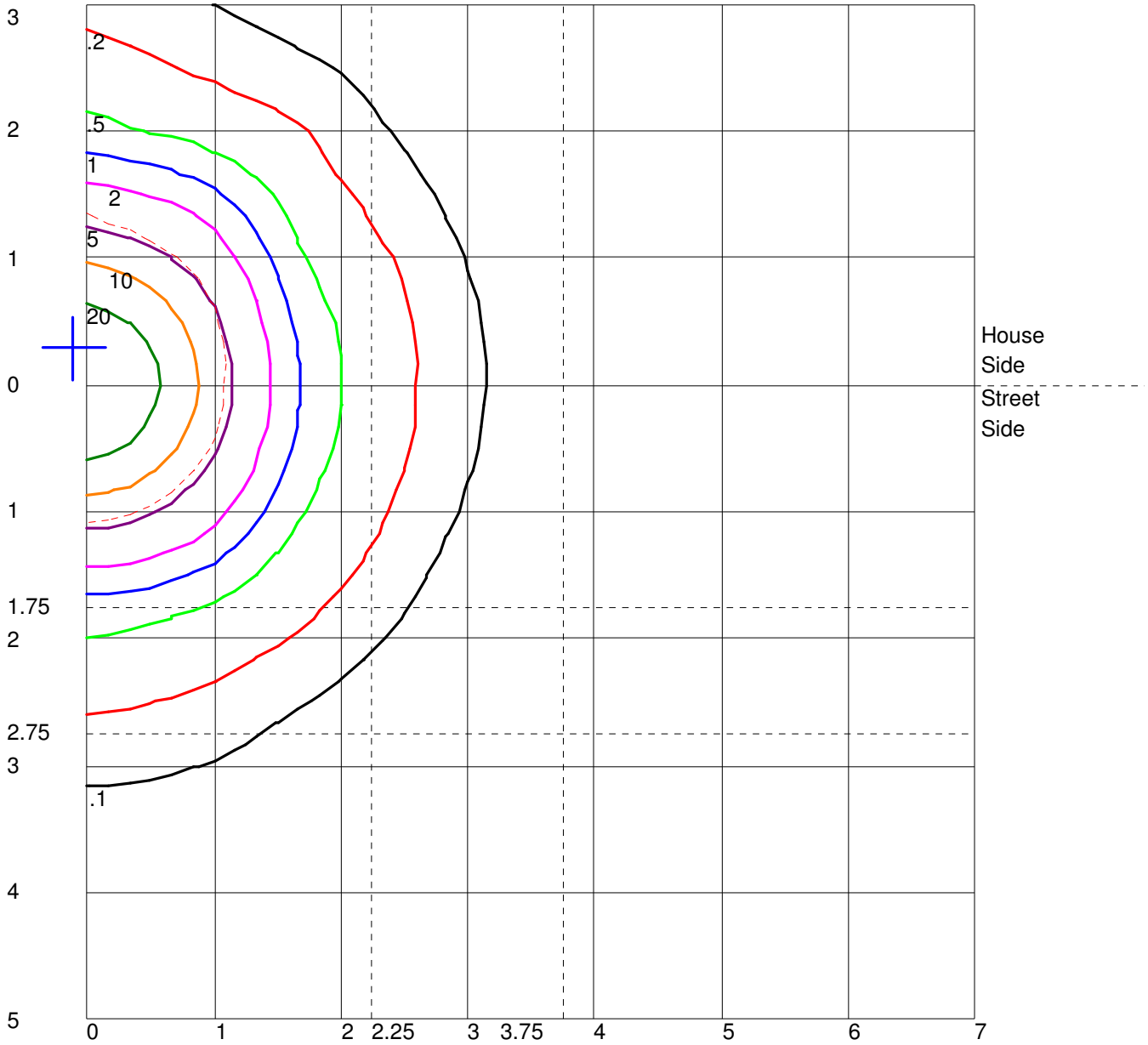


Maximum Candela = 3674.41 Located At Horizontal Angle = 200, Vertical Angle = 17.1
1 - Vertical Plane Through Horizontal Angles (200 - 20) (Through Max. Cd.)
2 - Horizontal Cone Through Vertical Angle (17.1) (Through Max. Cd.)

Photometric Toolbox Professional Edition - Copyright 2002-2011 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

IES ROAD REPORT
PHOTOMETRIC FILENAME : LP3-N39-80W-4000K~5000K TYPE II.IES

ISOFOOTCANDLE LINES OF HORIZONTAL ILLUMINANCE



Distance In Units Of Mounting Height
Values Based On 10 Foot Mounting Height
1/2 Maximum Candela Trace Shown As Dashed Curve
(+) = Maximum Candela Point

Lumark

DESCRIPTION

The patented Lumark Crosstour™ LED Wall Pack Series of luminaries provides an architectural style with super bright, energy efficient LEDs. The low-profile, rugged die-cast aluminum construction, universal back box, stainless steel hardware along with a sealed and gasketed optical compartment make the Crosstour impervious to contaminants. The Crosstour wall luminaire is ideal for wall/surface, inverted mount for façade/canopy illumination, post/bollard, site lighting, floodlight and low level pathway illumination including stairs. Typical applications include building entrances, multi-use facilities, apartment buildings, institutions, schools, stairways and loading docks test.

Catalog #		**Type**
Project		
Comments		**Date**
Prepared by		

SPECIFICATION FEATURES

Construction

Slim, low-profile LED design with rugged one-piece, die-cast aluminum hinged removable door and back box. Matching housing styles incorporate both a small and large design. The small housing is available in 7W and 18W. The large housing is available in the 26W model. Patent pending secure lock hinge feature allows for safe and easy tool-less electrical connections with the supplied push-in connectors. Back box includes three (3) half-inch, NPT threaded conduit entry points. The universal back box supports both the small and large forms and mounts to standard 3-1/2" to 4" round and octagonal, 4" square, single gang and masonry junction boxes. Key hole gasket allows for adaptation to junction box or wall. External fin design extracts heat from the fixture surface. One-piece silicone gasket seals door and back box. Minimum 5" wide pole for site lighting application. Not recommended for car wash applications.

Optical

Silicone sealed optical LED chamber incorporates a custom engineered mirrored anodized reflector providing high-efficiency illumination. Optical assembly includes impact-resistant tempered glass and meets IESNA requirements for full cutoff compliance. Solid state LED Crosstour luminaries are thermally optimized with five (5) lumen packages in cool 5000K or neutral warm 3500K LED color temperature (CCT).

Electrical

LED driver is mounted to the die-cast housing for optimal heat sinking. LED thermal management system incorporates both conduction and natural convection to transfer heat rapidly away from the LED source. 7W models operate in -40°C to 40°C [-40°F to 104°F]. 18W and 26W models operate in -40°C to 40°C [-40°F to 104°F]. High ambient 50°C models available. Crosstour luminaires maintain greater than 90% of initial light output after 72,000 hours of operation. Three (3) half-inch NPT threaded conduit entry points allow for thru-branch wiring. Back box is an authorized electrical wiring compartment. Integral LED electronic driver incorporates surge protection. 120-277V 50/60Hz or 347V 60Hz models.

Finish

Crosstour is protected with a Super durable TGIC carbon bronze or summit white polyester powder coat paint. Super durable TGIC powder coat paint finishes withstand extreme climate conditions while providing optimal color and gloss retention of the installed life.

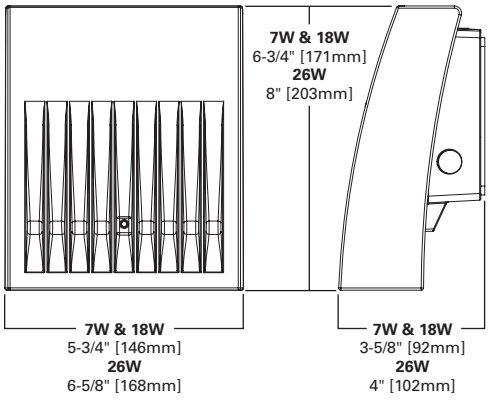
Warranty

Five-year warranty.

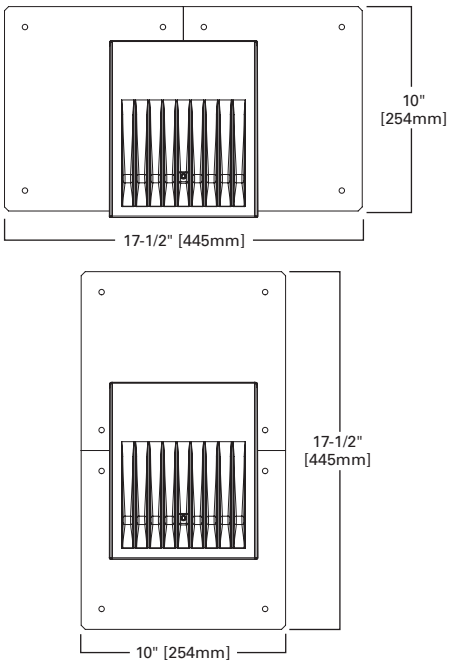
XTOR
CROSSTOUR LED

APPLICATIONS:
WALL / SURFACE
POST / BOLLARD
LOW LEVEL
FLOODLIGHT
INVERTED
SITE LIGHTING

DIMENSIONS



ESCUTCHEON PLATES



CERTIFICATION DATA

UL/cUL Wet Location Listed
LM79 / LM80 Compliant
ROHS Compliant
ADA Compliant
NOM Compliant Models
IP66 Ingressed Protection Rated
Title 24 Compliant
DesignLights Consortium® Qualified*

TECHNICAL DATA

40°C Maximum Ambient Temperature
External Supply Wiring 90°C Minimum

EPA

Effective Projected Area (Sq. Ft.):
XTOR1A/XT0R2A=0.34
XTOR3A=0.45

SHIPPING DATA:

Approximate Net Weight:
3.7 – 5.25 lbs. [1.7 – 2.4 kgs.]

Powering Business Worldwide

*www.designlights.org

LUMEN MAINTENANCE

Ambient Temperature	TM-21 Lumen Maintenance (72,000 Hours)	Theoretical L70 (Hours)
XTOR1A Model		
25°C	> 92%	> 290,000
40°C	> 92%	> 290,000
50°C	> 91%	> 270,000
XTOR2A Model		
25°C	> 91%	> 270,000
40°C	> 90%	> 260,000
50°C	> 88%	> 225,000
XTOR3A Model		
25°C	> 91%	> 280,000
40°C	> 91%	> 270,000
50°C	> 89%	> 240,000

LUMENS - CRI/CCT TABLE

LED Information	XTOR1A	XTOR2A	XTOR2A-N	XTOR3A	XTOR3A-N
Delivered Lumens (Wall Mount)	722	1,633	1,523	2,804	2,284
Delivered Lumens (With Flood Accessory Kit) [1]	468	1,060	978	2,168	1,738
B.U.G. Rating [2]	B0-U0-G0	B1-U0-G0	B1-U0-G0	B1-U0-G0	B1-U0-G0
CCT (Kelvin)	5,000	5,000	3,500	5,000	3,500
CRI (Color Rendering Index)	65	65	70	65	70
Power Consumption (Watts)	7W	18W	18W	26W	26W

NOTES: 1 Includes shield and visor. **2** B.U.G. Rating does not apply to floodlighting.

CURRENT DRAW

Voltage	Model Series		
	XTOR1A	XTOR2A	XTOR3A
120V	0.05A	0.15A	0.22A
208V	0.03A	0.08A	0.13A
240V	0.03A	0.07A	0.11A
277V	0.03A	0.06A	0.10A
347V	0.025A	0.058A	0.082A

ORDERING INFORMATION

Sample Number: XTOR2A-N-WT-PC1

Series [1]	**LED Kelvin Color**	**Housing Color**	**Options** (Add as Suffix)	**Accessories** (Order Separately)
XTOR1A=Small Door, 7W **XTOR2A**=Small Door, 18W **XTOR3A**=Small Door, 26W	**[Blank]**=Bright White (Standard) 5000K **N**=Neutral Warm White, 3500K [2]	**[Blank]**=Carbon Bronze (Standard) **WT**=Summit White	**PC1**=Photocontrol 120V [3] **PC2**=Photocontrol 208-277V [3, 4] **347V**=347V [5] **HA**=50°C High Ambient [5]	**WG/XTOR**=Wire Guard [6] **XTORFLD-KNC**=Knuckle Floodlight Kit [7] **XTORFLD-TRN**=Trunnion Floodlight Kit [7] **XTORFLD-KNC-WT**=Knuckle Floodlight Kit, Summit White [7] **XTORFLD-TRN-WT**=Trunnion Floodlight Kit, Summit White [7] **EWP/XTOR**=Escutcheon Wall Plate, Carbon Bronze **EWP/XTOR-WT**=Escutcheon Wall Plate, Summit White

NOTES: 1 DesignLights Consortium® Qualified. Refer to www.designlights.org Qualified Products List under Family Models for details. **2** XTOR1A not available in 3500K. **3** Photocontrols are factory installed. **4** Order PC2 for 347V models. **5** Thru-branch wiring not available with HA option or with 347V. **6** Wire guard for wall/surface mount. Not for use with floodlight kit accessory. **7** Floodlight kit accessory supplied with knuckle (KNC) or trunnion (TRN) base, small and large top visors and small and large impact shields.

STOCK ORDERING INFORMATION

7W Series	18W Series	26W Series
XTOR1A=7W, 5000K, Carbon Bronze	XTOR2A=18W, 5000K, Carbon Bronze	XTOR3A=26W, 5000K, Carbon Bronze
XTOR1A-WT=7W, 5000K, Summit White	XTOR2A-N=18W, 3500K, Carbon Bronze	XTOR3A-N=26W, 3500K, Carbon Bronze
XTOR1A-PC1=7W, 5000K, 120V PC, Carbon Bronze	XTOR2A-WT=18W, Summit White	XTOR3A-WT=26W, Summit White
	XTOR2A-PC1=18W, 120V PC, Carbon Bronze	XTOR3A-PC1=26W, 120V PC, Carbon Bronze

5-DAY QUICK SHIP ORDERING INFORMATION

7W Series	18W Series	26W Series
XTOR1A-WT-PC1=7W, 5000K, Summit White, 120V PC	XTOR2A-PC2=18W, 5000K, 208-277V PC, Carbon Bronze	XTOR3A-PC2=26W, 5000K, 208-277V PC, Carbon Bronze
	XTOR2A-WT-PC1=18W, 5000K, Summit White, 120V PC	XTOR3A-WT-PC1=26W, 5000K, Summit White, 120V PC
	XTOR2A-WT-PC2=18W, 5000K, Summit White, 208-277V PC	XTOR3A-WT-PC2=26W, 5000K, Summit White, 208-277V PC
	XTOR2A-N-WT=18W, 3500K, Summit White	XTOR3A-N-WT=26W, 3500K, Summit White
	XTOR2A-N-PC1=18W, 3500K, 120V PC, Carbon Bronze	XTOR3A-N-PC1=26W, 3500K, 120V PC, Carbon Bronze
	XTOR2A-N-PC2=18W, 3500K, 208-277V PC, Carbon Bronze	XTOR3A-N-PC2=26W, 3500K, 208-277V PC, Carbon Bronze
	XTOR2A-N-WHT-PC1=18W, 3500K, Summit White, 120V PC	XTOR3A-N-WHT-PC1=26W, 3500K, Summit White, 120V PC
	XTOR2A-N-WT-PC2=18W, 3500K, Summit White, 208-277V PC	XTOR3A-N-WT-PC2=26W, 3500K, Summit White, 208-277V PC