

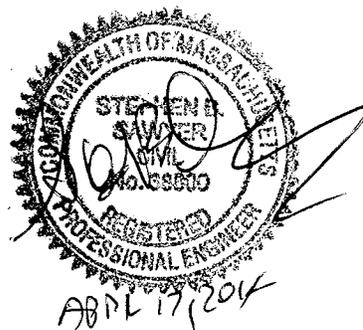
STORMWATER MANAGEMENT REPORT
FOR
PROPOSED RETAIL & RESIDENTIAL RE-DEVELOPMENT
2 – 8 BROADWAY & 8 MOUNT PLEASANT STREET
SOMERVILLE, MA

Prepared for:

LOLASTAR, LLC
47 Craftsland Road, Chestnut Hill, MA 02467

Prepared by:

Design Consultants, Inc.
120 Middlesex Avenue, Suite 20
Somerville, Massachusetts 02145



DCI Project #: 2013-040

April, 2014

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PROPOSED CONDITIONS

The proposed re-development includes renovation of existing buildings at 2-4 Broadway, and the demolition and reconstruction at 8 Broadway. At 8 Mt. Pleasant Street the rear portion of building will be demolished and the remaining portion moved with new addition to the rear of the relocated building. Parking will be provided in a 6-space parking garage under building at rear of 8 Broadway and 4 space garage at rear of 8 Mt. Pleasant. The site will be accessed by relocation of the existing 12 foot wide driveway curb cut. Landscape area is proposed on the easterly of the site. A row of 6 Contactor[®] EZ-24 cultec chambers is proposed in the landscape area which will collect most of the building roof runoff. The runoff from building roofs is considered clean and is discharged directly to cultec chambers. Overflow pipes for the system are located at the downspout at each roof drain. Other landscape areas are proposed beside the buildings, along the driveway and southern of the site.

The project additionally proposes permeable pavers on the surface driveway and walkways not shielded by the building above. The permeable driveway and walkway surface are designed to pitch down half percent slope toward Mt. Pleasant St. driveway curb cut. See Appendix B, *Figure 2* for proposed drainage areas

During part of the Broadway Reconstruction Project, a 12" Corrugated Polyethylene Pipe (CPP) and a new catch basin (in front of #4 Broadway) will be installed.

Drainage:

Drainage calculations were modeled using HydroCAD[®] to evaluate peak discharges from the project site under the pre-development and post-development conditions (See Appendix C). As required under the City of Somerville's Stormwater Management Policy, peak discharges under post development conditions will be less than the pre-development conditions.

The proposed stormwater management system includes roof drains and an infiltration chambers for roof runoff that is collected and piped to the infiltration chambers. The overflow will discharge thru downspout into landscape areas. The proposed mitigation will substantially reduce the stormwater flow from the property exceeding the City's stormwater management requirements.

4:1 Infiltration/Inflow Removal:

The 4:1 I-I requirement stipulates that for every increased gallon of sewage flow per day, four gallons of stormwater are stored and infiltrated onsite. The volume of stormwater represents the required amount to be stored/infiltrated per year. Calculations for the 4:1 I-I requirement are provided as Appendix D of this report.

HYDROLOGIC MODEL

The hydrologic model used for this analysis is based upon the SCS Method. Both existing and proposed conditions are modeled for the 2-year, 10-year, 25-year and 100-year storm events. The SCS Method allows for variable rainfall intensity throughout the storm duration, peaking near the middle of the Type III, 24-hour storm. The drainage area's time of concentration (t_c), assumed to be six minutes for this site.

The designed on-site stormwater management system collects and infiltrates site runoff reducing off-site flows for all storm events.

Table 1

Stormwater Runoff Summary

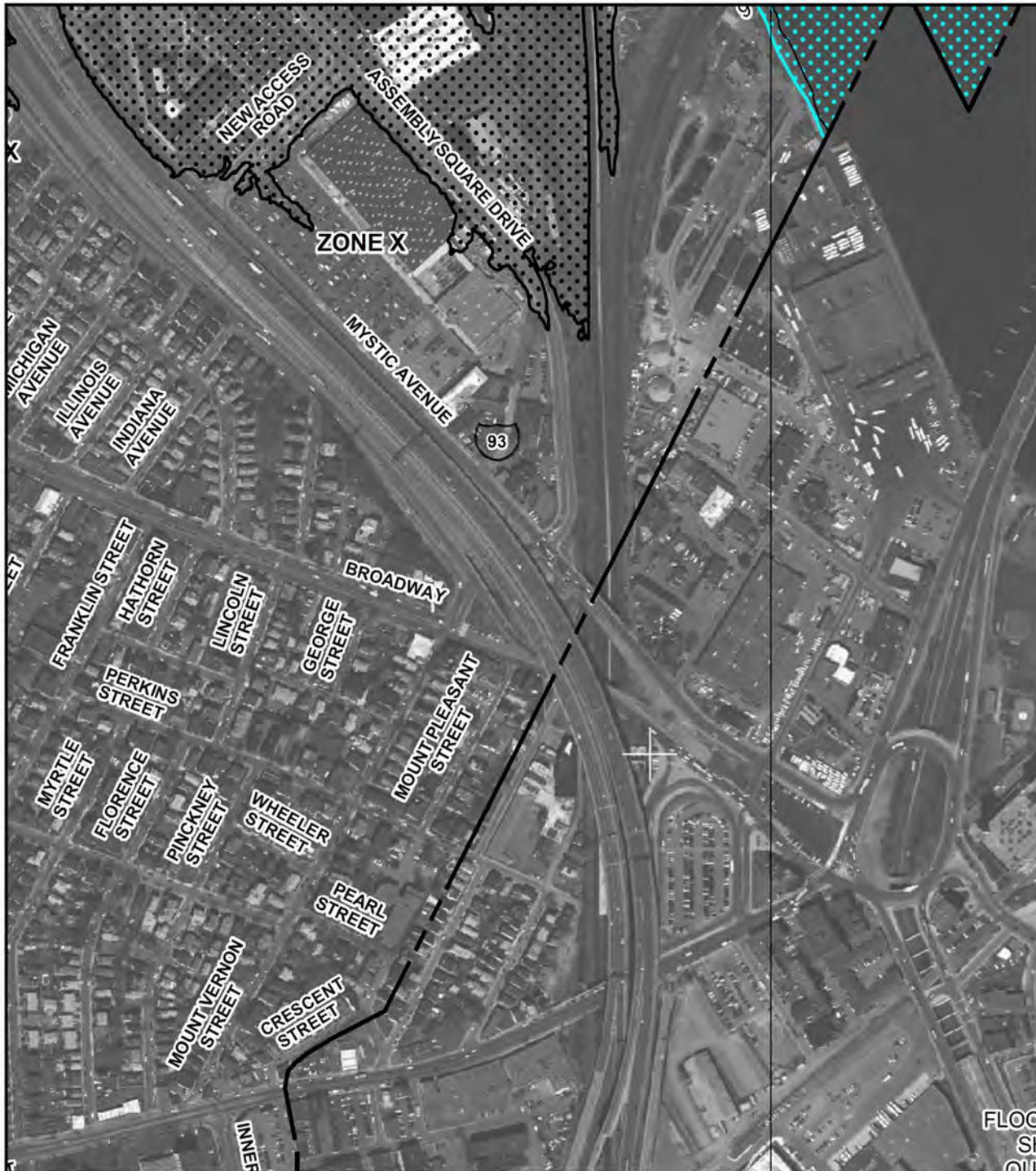
		Rate (cfs)	Volume (cf)
2 Year (3.10")	Pre	0.64	2,069
	Post	0.59	1,932
10 Year (4.50")	Pre	1.02	3,344
	Post	0.93	3,115
25 Year (5.50")	Pre	1.28	4,272
	Post	1.18	3,991
100 Year (6.60")	Pre	1.57	5,302
	Post	1.45	4,973

CONCLUSION

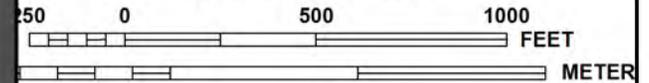
Based on DCI's analysis of the existing and proposed conditions, the proposed site condition exceed the criteria set forth by the City of Somerville. Off-site runoff volume and peak flow rate for the 2, 10, 25 and 100-year storm events are substantially decreased. The 4:1 I/I requirement will be met. DCI concludes that the proposed development at 2-8 Broadway & 8 Mt. Pleasant Street, Somerville, MA adheres to all applicable stormwater management policies.

Appendix A

FEMA Flood Insurance Rate Map



MAP SCALE 1" = 500'



NFIP

PANEL 0439E

FIRM

FLOOD INSURANCE RATE MAP

MIDDLESEX COUNTY,
MASSACHUSETTS
(ALL JURISDICTIONS)

PANEL 439 OF 656

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EVERETT, CITY OF	250192	0439	E
MEDFORD, CITY OF	250205	0439	E
SOMERVILLE, CITY OF	250214	0439	E

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.



MAP NUMBER

25017C0439E

EFFECTIVE DATE

JUNE 4, 2010

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD
SH
OUT

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

Appendix B

Figure 1 – Existing Drainage Areas

Figure 2 – Proposed Drainage Areas

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Design Consultants, Inc.
 Consulting Engineers and Surveyors
 120 MIDDLESEX AVENUE
 SOMERVILLE, MA 02145
 617-776-3350

68 PLEASANT STREET
 NEWBURYPORT, MA 01960
 978-358-7173

SCALE:	
HORIZ:	1" = 20'
VERT:	
NO.	DATE
	BY
REVISIONS	

DESIGN:	SBS
DRAWING:	SSW
CHECKED:	DG
APPROVED:	SBS

EXIST DRAINAGE AREAS

2-8 BROADWAY & 8 MT. PLEASANT STREET

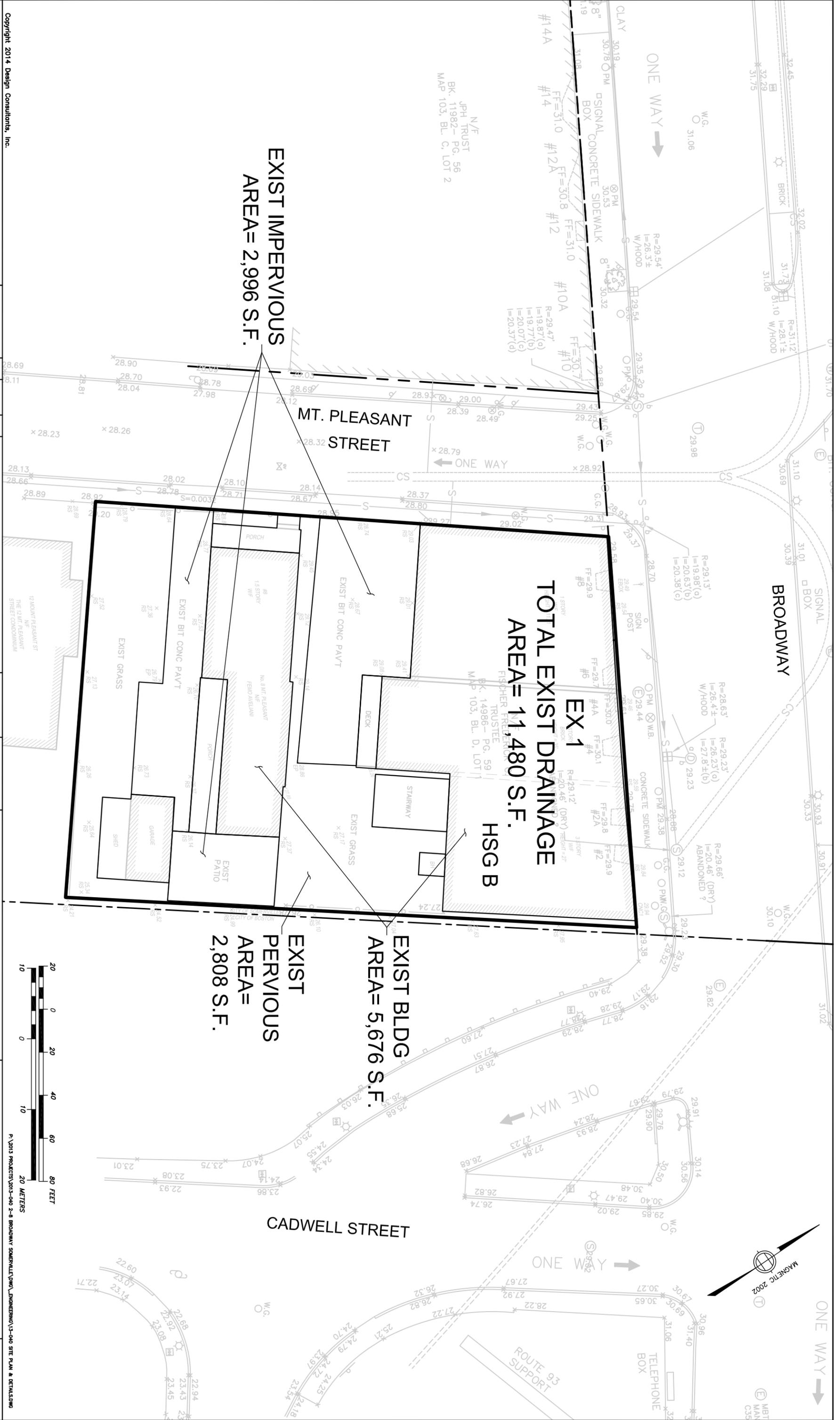
PLAN OF LAND IN SOMERVILLE, MASSACHUSETTS

PREPARED FOR
LOLASTAR LLC

PROJECT NO.
 2013-040

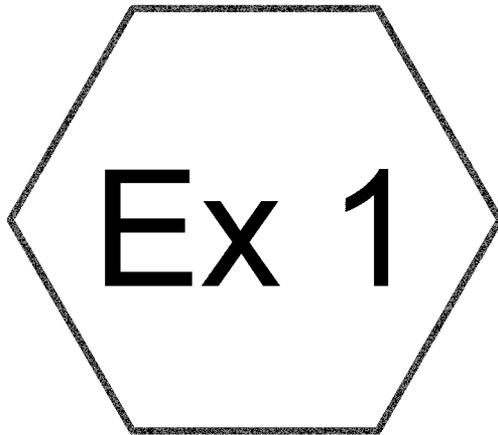
DATE: APR. 15, 2014

FIGURE 1

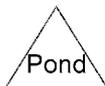
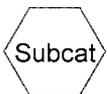


Appendix C

Drainage Calculations



Ex 1



13-040 Exist

Type III 24-hr 2-Year Rainfall=3.10"

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Summary for Subcatchment Ex 1: Ex 1

Runoff = 0.64 cfs @ 12.09 hrs, Volume= 2,069 cf, Depth> 2.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Description
	5,676	98	Roofs, HSG B
*	2,996	98	Deck, stairs, porch, paved parking, HSG B
	2,808	69	50-75% Grass cover, Fair, HSG B
	11,480	91	Weighted Average
	2,808		24.46% Pervious Area
	8,672		75.54% Impervious Area

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

13-040 Exist

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

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Summary for Subcatchment Ex 1: Ex 1

Runoff = 1.02 cfs @ 12.09 hrs, Volume= 3,344 cf, Depth> 3.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

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

Area (sf)	CN	Description
5,676	98	Roofs, HSG B
* 2,996	98	Deck, stairs, porch, paved parking, HSG B
2,808	69	50-75% Grass cover, Fair, HSG B
11,480	91	Weighted Average
2,808		24.46% Pervious Area
8,672		75.54% Impervious Area

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

13-040 Exist

Type III 24-hr 25-Year Rainfall=5.50"

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Summary for Subcatchment Ex 1: Ex 1

Runoff = 1.28 cfs @ 12.09 hrs, Volume= 4,272 cf, Depth> 4.47"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
5,676	98	Roofs, HSG B
* 2,996	98	Deck, stairs, porch, paved parking, HSG B
2,808	69	50-75% Grass cover, Fair, HSG B
11,480	91	Weighted Average
2,808		24.46% Pervious Area
8,672		75.54% Impervious Area

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

13-040 Exist

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

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Summary for Subcatchment Ex 1: Ex 1

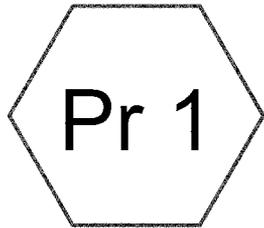
Runoff = 1.57 cfs @ 12.09 hrs, Volume= 5,302 cf, Depth> 5.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

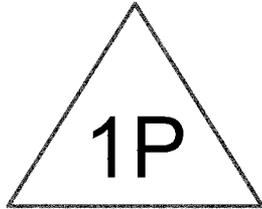
Type III 24-hr 100-Year Rainfall=6.60"

Area (sf)	CN	Description
5,676	98	Roofs, HSG B
* 2,996	98	Deck, stairs, porch, paved parking, HSG B
2,808	69	50-75% Grass cover, Fair, HSG B
11,480	91	Weighted Average
2,808		24.46% Pervious Area
8,672		75.54% Impervious Area

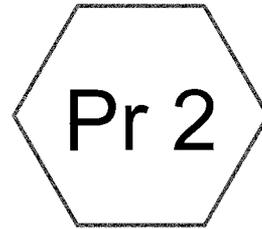
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,



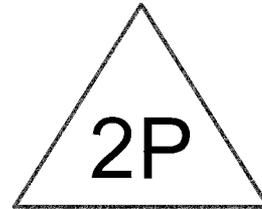
Bldg Roof



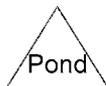
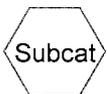
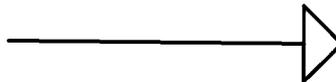
EZ-24 Cultec



Permeable Paver &
Landscape



Offsite



13-040 Prop

Type III 24-hr 2-Year Rainfall=3.10"

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Summary for Subcatchment Pr 1: Bldg Roof

Runoff = 0.53 cfs @ 12.09 hrs, Volume= 1,883 cf, Depth> 2.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
7,883	98	Roofs, HSG B
7,883		100.00% Impervious Area

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

Summary for Subcatchment Pr 2: Permeable Paver & Landscape

Runoff = 0.06 cfs @ 12.11 hrs, Volume= 231 cf, Depth> 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
* 495	98	Deck, stairs, porch, conc pad, brick wall, HSG B
* 1,680	70	Permeable pav't, HSG B
1,422	61	>75% Grass cover, Good, HSG B
3,597	70	Weighted Average
3,102		86.24% Pervious Area
495		13.76% Impervious Area

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

Summary for Pond 1P: EZ-24 Cultec

[93] Warning: Storage range exceeded by 2.96'

Inflow Area = 7,883 sf, 100.00% Impervious, Inflow Depth > 2.87" for 2-Year event
 Inflow = 0.53 cfs @ 12.09 hrs, Volume= 1,883 cf
 Outflow = 0.53 cfs @ 12.09 hrs, Volume= 1,829 cf, Atten= 0%, Lag= 0.0 min
 Discarded = 0.00 cfs @ 2.65 hrs, Volume= 127 cf
 Primary = 0.53 cfs @ 12.09 hrs, Volume= 1,702 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 27.09' @ 12.09 hrs Surf.Area= 68 sf Storage= 54 cf

Plug-Flow detention time= 30.2 min calculated for 1,825 cf (97% of inflow)
 Center-of-Mass det. time= 12.7 min (769.3 - 756.6)

13-040 Prop

Type III 24-hr 2-Year Rainfall=3.10"

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Volume	Invert	Avail.Storage	Storage Description
#1A	23.00'	15 cf	1.42'W x 48.08'L x 1.13'H Field A 77 cf Overall - 39 cf Embedded = 37 cf x 40.0% Voids
#2A	23.04'	39 cf	Cultec C-EZ-24 x 6 Inside #1 Effective Size= 15.8"W x 12.0"H => 0.82 sf x 8.00'L = 6.5 cf Overall Size= 16.0"W x 12.5"H x 8.50'L with 0.50' Overlap
		54 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	23.00'	1.020 in/hr Exfiltration over Surface area
#2	Primary	24.10'	4.0" Round Culvert L= 5.0' Ke= 1.000 Inlet / Outlet Invert= 23.00' / 24.10' S= -0.2200 ' /' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Discarded OutFlow Max=0.00 cfs @ 2.65 hrs HW=23.03' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.00 cfs)**Primary OutFlow** Max=0.52 cfs @ 12.09 hrs HW=26.95' (Free Discharge)↑**2=Culvert** (Inlet Controls 0.52 cfs @ 5.92 fps)**Summary for Pond 2P: Offsite**

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 11,480 sf, 72.98% Impervious, Inflow Depth > 2.02" for 2-Year event
 Inflow = 0.59 cfs @ 12.09 hrs, Volume= 1,932 cf
 Primary = 0.59 cfs @ 12.09 hrs, Volume= 1,932 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

13-040 Prop

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

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Summary for Subcatchment Pr 1: Bldg Roof

Runoff = 0.78 cfs @ 12.09 hrs, Volume= 2,799 cf, Depth> 4.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
7,883	98	Roofs, HSG B
7,883		100.00% Impervious Area

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

Summary for Subcatchment Pr 2: Permeable Paver & Landscape

Runoff = 0.15 cfs @ 12.10 hrs, Volume= 501 cf, Depth> 1.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
* 495	98	Deck, stairs, porch, conc pad, brick wall, HSG B
* 1,680	70	Permeable pav't, HSG B
1,422	61	>75% Grass cover, Good, HSG B
3,597	70	Weighted Average
3,102		86.24% Pervious Area
495		13.76% Impervious Area

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

Summary for Pond 1P: EZ-24 Cultec

[93] Warning: Storage range exceeded by 6.14'

[85] Warning: Oscillations may require Finer Routing>1

Inflow Area = 7,883 sf, 100.00% Impervious, Inflow Depth > 4.26" for 10-Year event
 Inflow = 0.78 cfs @ 12.09 hrs, Volume= 2,799 cf
 Outflow = 0.77 cfs @ 12.09 hrs, Volume= 2,745 cf, Atten= 0%, Lag= 0.0 min
 Discarded = 0.00 cfs @ 1.75 hrs, Volume= 131 cf
 Primary = 0.77 cfs @ 12.09 hrs, Volume= 2,614 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 30.26' @ 12.09 hrs Surf.Area= 68 sf Storage= 54 cf

Plug-Flow detention time= 22.6 min calculated for 2,745 cf (98% of inflow)
 Center-of-Mass det. time= 10.1 min (759.5 - 749.4)

13-040 Prop

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

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Volume	Invert	Avail.Storage	Storage Description
#1A	23.00'	15 cf	1.42'W x 48.08'L x 1.13'H Field A 77 cf Overall - 39 cf Embedded = 37 cf x 40.0% Voids
#2A	23.04'	39 cf	Cultec C-EZ-24 x 6 Inside #1 Effective Size= 15.8"W x 12.0"H => 0.82 sf x 8.00'L = 6.5 cf Overall Size= 16.0"W x 12.5"H x 8.50'L with 0.50' Overlap
		54 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	23.00'	1.020 in/hr Exfiltration over Surface area
#2	Primary	24.10'	4.0" Round Culvert L= 5.0' Ke= 1.000 Inlet / Outlet Invert= 23.00' / 24.10' S= -0.2200 1' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Discarded OutFlow Max=0.00 cfs @ 1.75 hrs HW=23.04' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.00 cfs)**Primary OutFlow** Max=0.75 cfs @ 12.09 hrs HW=29.97' (Free Discharge)↑**2=Culvert** (Inlet Controls 0.75 cfs @ 8.63 fps)**Summary for Pond 2P: Offsite**

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 11,480 sf, 72.98% Impervious, Inflow Depth > 3.26" for 10-Year event
 Inflow = 0.93 cfs @ 12.09 hrs, Volume= 3,115 cf
 Primary = 0.93 cfs @ 12.09 hrs, Volume= 3,115 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

13-040 Prop

Type III 24-hr 25-Year Rainfall=5.50"

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Summary for Subcatchment Pr 1: Bldg Roof

Runoff = 0.95 cfs @ 12.09 hrs, Volume= 3,455 cf, Depth> 5.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
7,883	98	Roofs, HSG B
7,883		100.00% Impervious Area

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

Summary for Subcatchment Pr 2: Permeable Paver & Landscape

Runoff = 0.23 cfs @ 12.10 hrs, Volume= 723 cf, Depth> 2.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
* 495	98	Deck, stairs, porch, conc pad, brick wall, HSG B
* 1,680	70	Permeable pav't, HSG B
1,422	61	>75% Grass cover, Good, HSG B
3,597	70	Weighted Average
3,102		86.24% Pervious Area
495		13.76% Impervious Area

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

Summary for Pond 1P: EZ-24 Cultec

[93] Warning: Storage range exceeded by 9.22'

[88] Warning: Qout>Qin may require Finer Routing>1

Inflow Area = 7,883 sf, 100.00% Impervious, Inflow Depth > 5.26" for 25-Year event
 Inflow = 0.95 cfs @ 12.09 hrs, Volume= 3,455 cf
 Outflow = 0.95 cfs @ 12.09 hrs, Volume= 3,401 cf, Atten= 0%, Lag= 0.0 min
 Discarded = 0.00 cfs @ 1.40 hrs, Volume= 132 cf
 Primary = 0.95 cfs @ 12.09 hrs, Volume= 3,268 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 33.35' @ 12.09 hrs Surf.Area= 68 sf Storage= 54 cf

Plug-Flow detention time= 18.9 min calculated for 3,394 cf (98% of inflow)
 Center-of-Mass det. time= 8.8 min (754.9 - 746.1)

13-040 Prop

Type III 24-hr 25-Year Rainfall=5.50"

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Volume	Invert	Avail.Storage	Storage Description
#1A	23.00'	15 cf	1.42'W x 48.08'L x 1.13'H Field A 77 cf Overall - 39 cf Embedded = 37 cf x 40.0% Voids
#2A	23.04'	39 cf	Cultec C-EZ-24 x 6 Inside #1 Effective Size= 15.8"W x 12.0"H => 0.82 sf x 8.00'L = 6.5 cf Overall Size= 16.0"W x 12.5"H x 8.50'L with 0.50' Overlap
		54 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	23.00'	1.020 in/hr Exfiltration over Surface area
#2	Primary	24.10'	4.0" Round Culvert L= 5.0' Ke= 1.000 Inlet / Outlet Invert= 23.00' / 24.10' S= -0.2200 1' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Discarded OutFlow Max=0.00 cfs @ 1.40 hrs HW=23.04' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.00 cfs)**Primary OutFlow** Max=0.93 cfs @ 12.09 hrs HW=32.90' (Free Discharge)↑**2=Culvert** (Inlet Controls 0.93 cfs @ 10.61 fps)**Summary for Pond 2P: Offsite**

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 11,480 sf, 72.98% Impervious, Inflow Depth > 4.17" for 25-Year event
 Inflow = 1.18 cfs @ 12.09 hrs, Volume= 3,991 cf
 Primary = 1.18 cfs @ 12.09 hrs, Volume= 3,991 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

13-040 Prop

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

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Summary for Subcatchment Pr 1: Bldg Roof

Runoff = 1.14 cfs @ 12.09 hrs, Volume= 4,176 cf, Depth> 6.36"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.60"

Area (sf)	CN	Description
7,883	98	Roofs, HSG B
7,883		100.00% Impervious Area

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

Summary for Subcatchment Pr 2: Permeable Paver & Landscape

Runoff = 0.31 cfs @ 12.09 hrs, Volume= 985 cf, Depth> 3.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.60"

Area (sf)	CN	Description
* 495	98	Deck, stairs, porch, conc pad, brick wall, HSG B
* 1,680	70	Permeable pav't, HSG B
1,422	61	>75% Grass cover, Good, HSG B
3,597	70	Weighted Average
3,102		86.24% Pervious Area
495		13.76% Impervious Area

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

Summary for Pond 1P: EZ-24 Cultec

[93] Warning: Storage range exceeded by 13.09'

[85] Warning: Oscillations may require Finer Routing>1

Inflow Area = 7,883 sf, 100.00% Impervious, Inflow Depth > 6.36" for 100-Year event
 Inflow = 1.14 cfs @ 12.09 hrs, Volume= 4,176 cf
 Outflow = 1.14 cfs @ 12.09 hrs, Volume= 4,121 cf, Atten= 1%, Lag= 0.0 min
 Discarded = 0.00 cfs @ 1.15 hrs, Volume= 134 cf
 Primary = 1.14 cfs @ 12.09 hrs, Volume= 3,988 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 37.22' @ 12.09 hrs Surf.Area= 68 sf Storage= 54 cf

Plug-Flow detention time= 16.1 min calculated for 4,113 cf (98% of inflow)
 Center-of-Mass det. time= 7.5 min (750.9 - 743.3)

13-040 Prop

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

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Volume	Invert	Avail.Storage	Storage Description
#1A	23.00'	15 cf	1.42'W x 48.08'L x 1.13'H Field A 77 cf Overall - 39 cf Embedded = 37 cf x 40.0% Voids
#2A	23.04'	39 cf	Cultec C-EZ-24 x 6 Inside #1 Effective Size= 15.8"W x 12.0"H => 0.82 sf x 8.00'L = 6.5 cf Overall Size= 16.0"W x 12.5"H x 8.50'L with 0.50' Overlap
		54 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	23.00'	1.020 in/hr Exfiltration over Surface area
#2	Primary	24.10'	4.0" Round Culvert L= 5.0' Ke= 1.000 Inlet / Outlet Invert= 23.00' / 24.10' S= -0.2200 1' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Discarded OutFlow Max=0.00 cfs @ 1.15 hrs HW=23.04' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.00 cfs)**Primary OutFlow** Max=1.11 cfs @ 12.09 hrs HW=36.60' (Free Discharge)↑**2=Culvert** (Inlet Controls 1.11 cfs @ 12.68 fps)**Summary for Pond 2P: Offsite**

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 11,480 sf, 72.98% Impervious, Inflow Depth > 5.20" for 100-Year event
 Inflow = 1.45 cfs @ 12.09 hrs, Volume= 4,973 cf
 Primary = 1.45 cfs @ 12.09 hrs, Volume= 4,973 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Appendix D

4:1 I-I Calculations

INFILTRATION/INFLOW REMOVAL CALCULATIONS

I. INTRODUCTION

The following infiltration/inflow removal calculations are based upon 310 CMR 15.203, the sewer calculations presented above, and the storm drainage calculations summarized in Table I. The City of Somerville requires that infiltration/inflow removal of four times the proposed additional average daily sewer flow must be provided by the project.

II. CALCULATIONS

Existing Average Daily Sewer Flow	15 x 110 gpd/bed = 1,650 gpd Total = 1,650 gpd
Proposed Average Daily Sewer Flow	48 x 110 gpd/bed = 5,280gpd Total = 5,280
Additional Average Daily Flow	3,630 gpd
Four Times Additional Average Daily Flow	14,520 gpd = 0.022 cfs

III. REMOVAL

The required 0.022 cfs of infiltration/ inflow will be removed from the combined sewer system by peak flow reduction in the storm drainage from the site. Subtraction of the proposed flow rates from the existing flow rates given in Table 1 indicates flow reductions of 0.05 cfs, 0.09 cfs, 0.10 cfs and 0.12 cfs for the 2 yr., 10yr., 25 yr., and 100 yr. Storms respectively. All of these flow reductions exceed the required removal of 0.022 cfs.

IV. CONCLUSION

Because the storm drainage flow reductions provided by the project exceed the required infiltration/inflow removal rate we conclude that the proposed design meets and exceeds the requirement for infiltration/inflow removal.