515 Somerville Avenue

Somerville, Massachusetts

September 12, 2014

DCI Project No 2013-099.00

Stormwater Management Report

Prepared For:

DG Realty & Development

Design Consultants, Inc.

CIVIL ENGINEERS and LAND SURVEYORS

120 Middlesex Avenue, Suite 20

Somerville, MA 02145

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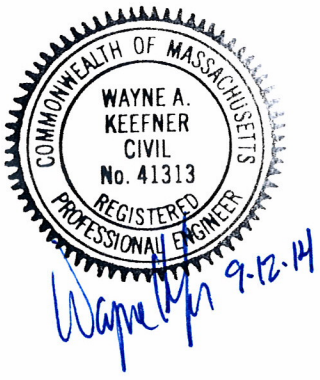

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INTRODUCTION

The following report details the hydrologic study performed by Design Consultants, Inc. (DCI), on behalf of **DG Real Estate Development**, for an existing 1.076-acre site located at 515 Somerville Avenue in Somerville, Massachusetts. The redevelopment of the site entails the construction of 10 residential buildings containing a total of 30 units.

The stormwater drainage system is designed to mitigate the stormwater runoff from the site. The proposed site will have connections to municipal water, sanitary sewer and stormwater systems.

EXISTING CONDITION

At the time this project first began in 2004, a large building and several smaller buildings were present on site. Since that time, these buildings have been demolished in preparation of the proposed development and the site has been cleared. For the purpose of this report, the existing hydrology of the site will be taken as it was prior to demolition.

The site area consists of 46,852 sf recently subdivided into 10 by-right parcels. The adjacent property to the north contains a catch basin that ties into the subject site's stormwater system. The additional offsite area that contributes stormwater to that catch basin is approximately 6,000 sf and is considered in this report. The site is comprised of three interconnected buildings and a garage.

The existing drainage has been subdivided into two subcatchment areas, subcatchments 1 and 2, as shown in **Appendix A**. Stormwater runoff from subcatchment 1 is collected by two catch basins, which connect to an 8-inch vitrified clay pipe which is tributary to the 66-inch drain in Somerville Avenue. Stormwater runoff from subcatchment 2 is collected by three catch basins, directed to a 15-inch PVC pipe which is tributary to the 18-inch brick combined sewer in Laurel Street. The contributing stormwater from offsite is collected by a catch basin that ties into an onsite catch basin where it combines with site stormwater that discharges to Laurel Street. A plan of existing drainage areas is included as **Appendix A**.

Soils

Geotechnical Consultants Incorporated performed test pit explorations during a site investigation on April 11, 2007. According to the report, dated May 11, 2007, a total of six test pits were excavated. Test pit depths ranged from about 4.5 feet to 11 feet below ground surface. The generalized profile of subsurface conditions over the property consists of:

- A surficial layer of asphalt cover (approx. 2 inches thick); underlain by

- Urban fill, which is generally granular but contains ash, brick, wood, and other construction or demolition debris (very common for urban fill in this area). In turn, underlain by:
- Fine to medium tan/yellow sand. Gradation and silt content of the sand varies widely.

Based on the NRCS Web Soil Survey, this area is identified as Urban Land with no defined hydrologic soil group (HSG). The Geotechnical Report shows that sands are present on site beneath the urban fill. We do not believe the urban fill to be a restrictive layer, therefore, the sands are considered to be the limiting soil and an HSG of A has been utilized in these calculations. An infiltration rate of 2.41 inches per hour has been used in the calculations, as provided in Table 2.3.3 1982 Rawls Rates, Volume 3, Chapter 1, page 22 of the Massachusetts Stormwater Handbook. The Web Soil Survey and the Geotechnical Report are attached as **Appendix B**.

Depth to Groundwater

According to the site investigation of April 11, 2007, no groundwater was encountered in any test pit to the depths explored upon completion, except TP-4 where water was observed seeping into the excavation at a depth of 11 feet. The depth to groundwater will be confirmed prior to construction and any final adjustments to the stormwater system will be made at that time.

PROPOSED CONDITION

The proposed redevelopment of the site will entail the construction of 10 residential buildings with a total building footprint of approximately 15,087 sf. There are 50 surface parking spaces proposed with site access provided off both Somerville Avenue and Laurel Street. Other site improvements include an updated drainage and sewer system, as well as additional landscape areas.

The proposed stormwater system in subcatchment 1 will consists of a closed system of drain manholes and catch basins that will collect and convey surface stormwater to the 18" combined sewer in Laurel Street. The proposed stormwater system in subcatchment 2 will also include a closed system of drain manholes and catch basins to collect and convey surface stormwater and will outlet into the 66" drain in Somerville Avenue. A plan of proposed drainage areas is attached as **Appendix C**.

The proposed site is graded in such a way that the surface runoff will flow towards catch basins, and roof runoff will be collected in gutters and downspouts before being directed towards the site drainage system. The surface runoff will not be directed onto the abutters' properties.

Stormwater Management Policy

The project will comply with the City of Somerville's Storm Water Management Policy.

Hydrologic Calculations

Drainage calculations were conducted to evaluate peak discharges from the project site under the pre-development and post-development conditions and are attached as **Appendix D**. As required under the City's Stormwater Management Policy, peak discharges under post-development condition will be less than the pre-development conditions. The results of these calculations for the 2, 10, 25 and 100-Year, 24-Hour Storm events are shown in Table 1, below.

Table 1

		Somerville Avenue		Laurel Street		Total	
		Rate (cfs)	Volume (cf)	Rate (cfs)	Volume (cf)	Rate (cfs)	Volume (cf)
2 Year (3.20")	Pre	1.74	6,025	1.99	6,753	3.73	12,778
	Post	0.94	3,237	1.42	4,595	2.36	7,832
10 Year (4.80")	Pre	2.63	9,265	3.03	10,515	5.66	19,780
	Post	1.79	5,937	2.40	7,831	4.19	13,768
25 Year (5.50")	Pre	3.01	10,685	3.49	12,164	6.50	22,849
	Post	2.18	7,210	2.84	9,288	5.02	16,499
100 Year (6.50")	Pre	3.57	12,713	4.13	14,523	7.70	27,235
	Post	2.77	9,093	3.46	11,396	6.23	20,490

4:1 Infiltration/Inflow Calculation

The Developer must coordinate with the City of Somerville to satisfy the 4:1 I/I policy. The City is in the process of developing a fee for 4:1 I/I mitigation, based on the increased sewage flow from new development. The City has made it clear that the mitigation cannot be achieved through onsite stormwater storage, therefore, coordination between the Developer and City is necessary to determine how the mitigation will be achieved.

The volume required to be removed from the Municipal System, related to this proposed development, has been calculated and is included in this report as **Appendix E.**

CONCLUSION

The proposed site development incorporates a stormwater collection and treatment system that reduces peak run-off rates and overall discharge volume, compared to the existing site. The offsite stormwater system that is currently routed through the subject site will be maintained. The site has been graded to prevent storm runoff from flowing onto abutting private properties. Runoff from all proposed surface parking will be collected and treated and roof runoff will also be directed towards drainage structures.

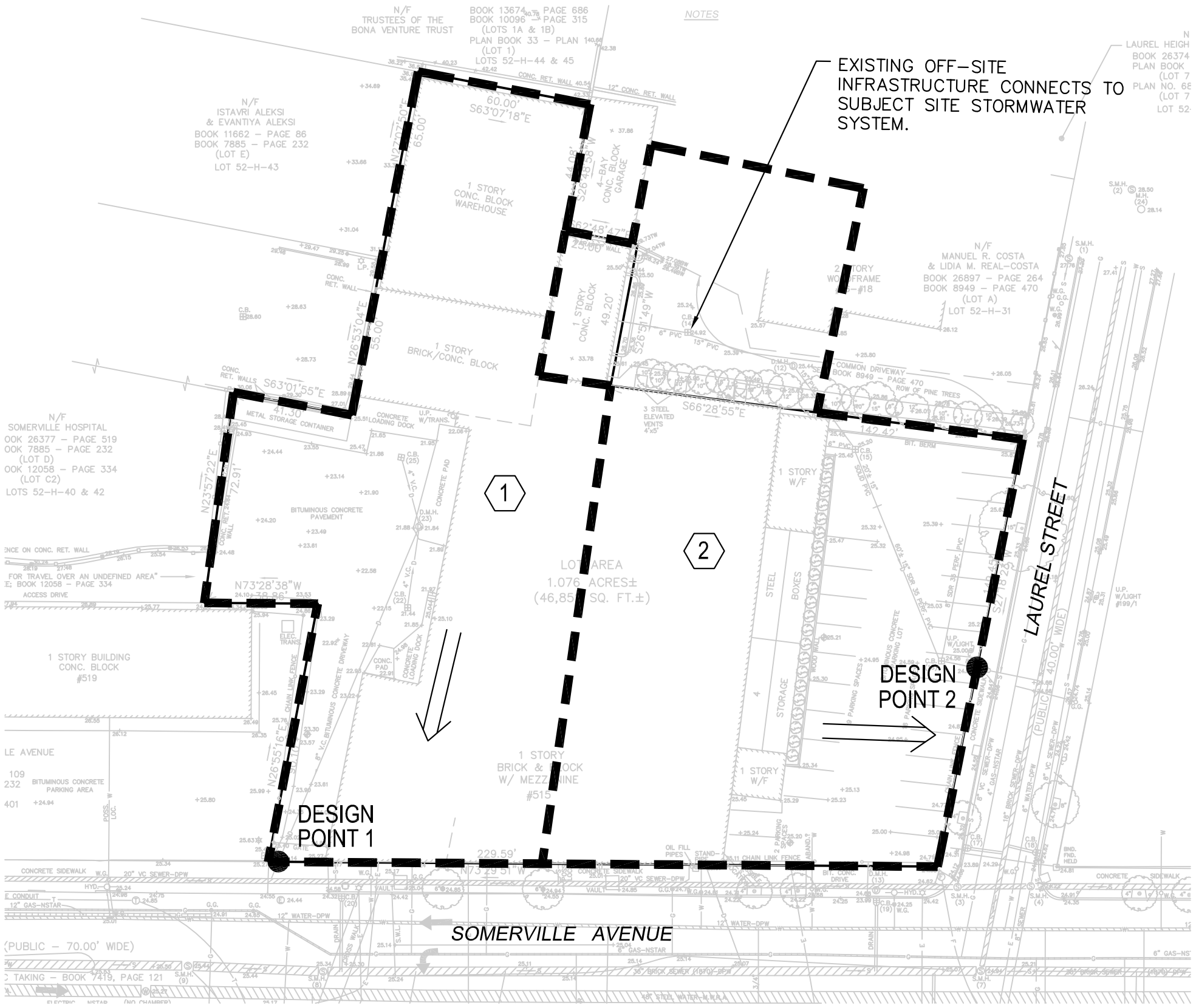
APPENDIX A

EXISTING DRAINAGE AREAS

LEGEND

1 — SUBCATCHMENT NUMBER

SUBCATCHMENT AREA



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REV. No.	DESCRIPTION	DATE

STAMP

515 SOMERVILLE AVENUE
SOMERVILLE,, MA

DATE: 07.03.14
SCALE: 1"=40'
DR. BY: BP
CHK. BY: WK
PROJECT No.: 2013-099

N

EXISTING CATCHMENT AREAS

APPENDIX B

SOIL INFORMATION

Map Scale: 1:1,840 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

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: Middlesex County, Massachusetts
Survey Area Data: Version 13, Dec 17, 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—May 1, 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 — Middlesex County, Massachusetts (MA017)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
602	Urban land		9.0	56.2%
627C	Newport-Urban land complex, 3 to 15 percent slopes	C	7.1	43.8%
Totals for Area of Interest			**16.1**	**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

Geotechnical Consultants, Inc.
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MEMORANDUM

To: Doug Greymont
From: Dick Pizzi
Date: 11 May 2007
Subject: Urban Heights Condominium
515 Somerville Avenue - Somerville, MA
GCI Reference No. 2072701

Dear Doug:

This memo summarizes our findings regarding the test pit explorations and other information obtained during a site investigation of 11 April 2007. As requested, also presented is a summary of design recommendations regarding the foundation and site preparation for the proposed building. The information contained herein and attached should be considered "preliminary" in nature to allow the design development to proceed. Once the configuration of the proposed buildings is finalized, including a complete grading plan, additional explorations and testing should be conducted better define the subsurface conditions and assess the impact on the proposed construction.

The project consists of the construction of four condominium buildings. Each building will be four storeys with below grade parking beneath a portion of each building. In the largest building, fronting on Somerville Avenue, approximately one-half of the ground level will be used as commercial space.

We understand the building will be constructed utilizing wood framing and bearing wall construction. Basement/garage walls will be cast-in-place concrete and the lowest floor slab will be constructed as a slab-on-grade.

At present, no site plan or grading plan was available for our review. It is anticipated that some grade changes will be necessary to accommodate traffic flow and access into the garage level at each building. The proposed grading and floor elevations will significantly impact the site preparation required for this project.

A total of six test pits were excavated on 11 April 2007 by others. Test pit depths ranged from about 4½± to 11± below ground surface. The locations were selected by others and the very approximate locations are shown on the location sketch attached for your reference. Test pit logs of the exposed conditions were prepared by a field engineer and are also attached for reference.

201 Boston Post Road West • Marlborough, Massachusetts 01752

Subsurface Conditions
Based on the test pit information, the subsurface conditions over the property are relatively uniform. The generalized profile consists of:

- a surficial layer of asphalt cover (approximately 2-inches thick); underlain by
- URBAN FILL which is generally granular but contains ash, brick, wood, and other construction or demolition debris. In turn, underlain by
- fine to medium tan/yellow SAND. Gradation and silt content of the sand varies widely. However, these variations do not impact the geotechnical considerations of this project.

The urban fill soils ranges in thickness from about 5½ to 8 feet. At test pit TP-6, the fill is underlain by a one foot thick layer of dark brown peat and organic silt.

No groundwater was encountered in any test pit to the depths explored upon completion, except TP-4 where water was observed seeping into the excavation at a depth of 11 feet.

Site Preparation
The urban fill and organic soils found in the test pit excavations are not suitable for load support under the proposed building footings. The preferred and recommended method of site preparation is the complete removal of all fill and organic soils within the building footprint and replacement with structural backfill as described below. However, as we discussed, there is considerable cost savings if only the zone of fill below the footings is removed and replaced with structural backfill. The quantity of fill to be removed and the quantity of structural backfill will depend upon the final grading plan adopted for this project.

While removing only the fill and other unsuitable materials below the footings and replacing this zone with structural backfill will provide adequate support for the footings and supported superstructure, this method will leave the slab, underslab utilities and any partition walls that bear on the slab at risk to damage due to future settlement. The project Owner must evaluate the risk and cost-benefit and clearly accept the potential liability for any damage caused by settlement of the urban fill soils or other material which are left in place within the building footprint.

Beneath all footings, all unsuitable materials must be removed down to the natural undisturbed sand subgrade. In areas which are over-excavated, structural backfill must be placed within the footing zone of stress influence. The zone of stress influence is define by a line starting at the outside edge of the footing and extending outward and

downward at a 1:1 slope to the top of acceptable subgrade soils.

All backfill used for load support must consist of structural backfill. Structural backfill must be placed in maximum 12-inch lifts (loose measure) and compacted to at least 95% modified Proctor density.

Based on the test pit information, we do not anticipate any dewatering will be needed during the removal of unsuitable soils. The elevations of the garage level footings and floor slabs should be reviewed to determine whether dewatering is likely to be required. Adequate site drainage must be provided to preclude the accumulation of surface water within the building footprint area. Drainage or dewatering, where needed, must be done so that all work can proceed in-the-dry. It is imperative that all exposed subgrade soils be protected from water and prolonged exposure to freezing temperatures.

Some of the fill soils found in the test pits may be suitable for re-use. Re-used material must be predominantly granular, able to be compacted with relative ease and free from decayable matter. Imported material used for structural backfill should consist of clean well-graded granular soil or other dense processed aggregate with gradation limits as follows and have no stones larger than 3" (three inches):

Sieve Size	Percent Passing
3"	100
½"	50-85
No. 4	40-75
No. 50	8-28
No. 200	0-8

The material used as structural backfill must be free of organic material, loam, snow, ice, frozen soil and other objectionable material. All structural fill, should be placed in 12-inch loose lifts and compacted to a modified Proctor density of 95 percent (ASTM D1557). Prior to construction, a sample of the proposed structural fill material(s) should be obtained directly from the source location and tested to assure proper gradation and verify the material is free from oil or hazardous material as defined by the *Massachusetts Contingency Plan* (MCP).

Excavation for footings and exposed subgrade should be inspected by a qualified geotechnical engineer to ensure adequacy of the subgrade soils. The placement of all structural backfill must be inspected and certified as to its adequacy in compliance with the *Massachusetts State Building Code*.

Backfill soil placed outside the building footprint in areas of non-load support may be "ordinary fill". Ordinary fill should consist of granular soil containing no decayable matter such as roots, wood, organic soil, etc. Ordinary fill should be placed in layers and compacted with available construction equipment to reduce future settlement.

Spread Footing Foundations

All of the structures can be founded on spread footings. New footings can be sized for an allowable contact pressure of up to two tons per square foot (4,000 psf) for footings bearing on the natural undisturbed sand. For lightly loaded walls and isolated columns, minimum dimensions of two feet wide for strip footings and three feet square for column footings should be maintained. Exterior footings, or interior footings in areas subject to freezing temperatures must be placed at least to the minimum frost depth of four feet.

Ground Floor/Basement or Slabs

The ground floor or garage floor slab for each building can be designed as a slab-on-grade. These slabs should be reinforced for crack control and the thickness can be determined using a modulus of subgrade reaction of 200 pci using either the PCA or WRI method.

Although vapor barriers may aggravate problems associated with plastic shrinkage and cracking, we recommend placing a vapor barrier below the slab-on-grade. The vapor barrier should consist of minimum 10 mil thickness polyethylene. The sheets should be overlapped at least one foot at the joints.

Seismic Considerations

Earthquake loadings must be considered under requirements of Sections 1612 and 1805 of the Sixth Edition of the Massachusetts *State Building Code*. Section 1612.4.2 covers lateral forces imposed on structures from earthquake shaking and Section 1805.3 relates to the liquefaction potential of the underlying soils. A site coefficient is used in determining seismic lateral loads induced in a building during the design earthquake.

According to the Massachusetts State Building Code, the bearing soils, including structural backfill, beneath the foundation area of all proposed buildings are of soil profile type S_1. For computation of earthquake induced loads, a site coefficient, S factor of 1.0, should be used. The bearing soils are not susceptible to liquefaction. For site retaining walls and foundation walls supporting unbalanced earth pressures, seismic wall loading must be included in the design as described below.

For the analysis of earth quake loading, the allowable bearing pressure and passive resistance may be increased by a factor of one-third.

Foundation Walls Retaining Earth

The garage foundation walls must be designed to resist unbalanced lateral earth pressures.

For yielding walls, wall where the rotation (Δ/H) is at least 0.004, use a triangular loading with an equivalent fluid pressure based on a unit weight of 45 pounds per cubic foot.

For non-yielding walls for which tilting or deflection required to develop active earth pressures is not tolerable, such as walls restrained by framed floors, use a triangular loading with an equivalent fluid pressure based on a unit weight of 65 pounds per cubic foot.

Passive pressures can be calculated using a triangular loading with an equivalent fluid pressure based on a unit weight of 300 pounds per cubic foot. Sliding resistance for concrete footings formed on natural sand can be calculated using a friction factor of 0.55.

In addition, during an earthquake, additional earth pressures will develop against foundation walls. We recommend that these walls be designed to resist the additional force calculated in accordance with the Massachusetts *State Building Code* as follows:

$$P = 5.4 \times H^2$$

in which P is the total dynamic force in pounds per linear foot and H is the total vertical depth of wall below ground surface in feet. This dynamic force should be distributed as an inverted triangle over the depth of the wall below grade and added to the recommended static lateral pressures to establish the total exterior pressures for wall design. For the analysis of earth quake loading, the allowable bearing pressure and passive resistance may be increased by a factor of one-third.

Dampproofing

It is assumed groundwater levels are below the garage floor slab or other below ground habitable space. This assumption must be verified after the site grading and floor level elevations have been established. Provided the foundation walls are not subjected to hydrostatic pressures, waterproofing is not required.

All below grade foundation walls which have support unbalance earth fills, must be dampproofed. The purpose of the dampproofing is to prevent efflorescence of the concrete. Dampproofing must be applied on the exterior surface of walls must extend from the top of the footing to above ground level.

Prior to the application of the dampproofing, all holes and recesses resulting from the removal of form ties must be sealed with bituminous material or other appropriate

sealants. Dampproofing should consist unmodified or modified asphaltic or bituminous material applied to at least a 6 mil thickness.

It has been our pleasure serving you. Should you have any questions about the enclosed information or require additional information, please do not hesitate to contact this office.

Sincerely,
GEOTECHNICAL CONSULTANTS, INC.

Richard Pizzi, P.E.
RP/prr

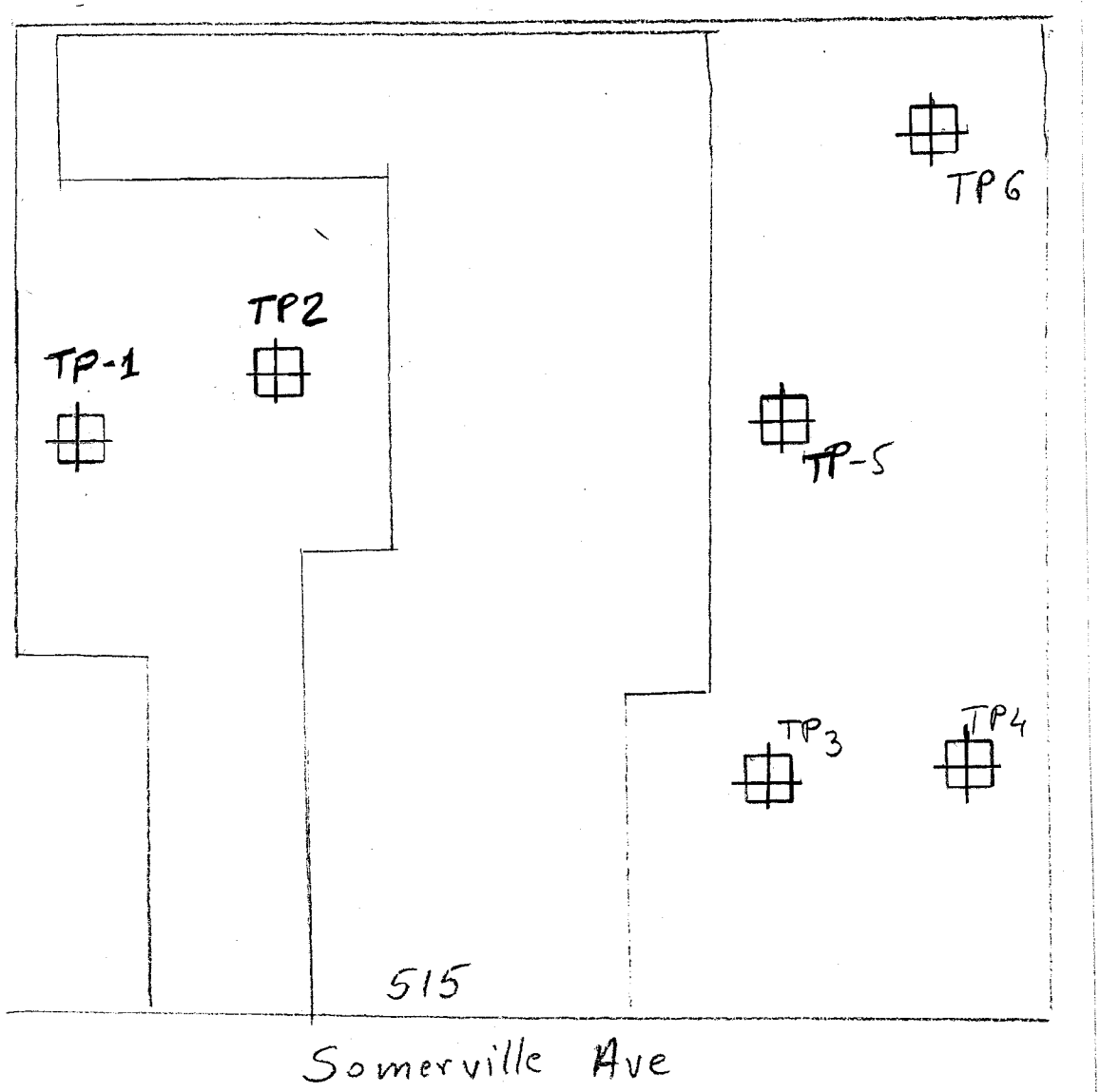
Attachments

Geotechnical Consultants, Inc.

201 Boston Post Road West
Marlborough, MA 01752
Telephone: (508) 229-0900

Project:	515 Somerville Ave.	Date:	04.11.2007
Location:	Somerville, Massachusetts	Job #:	2072701
Contractor:		Weather:	Sunny, 40s

LOCATION PLAN



Scale: NTS

LOG OF TEST PITS

Project:	515 Sommerville Ave.	**Date:**	11-Apr-07
Location:	Somerville, Ma	**Weather:**	Sunny 40s
		Designation:	TP- 1
STRATUM (ft.)	**Description**	**GCI Job#:**	2072701

From:	To:	
		Surf. EL.
0'-0"	0'-2"	Asphalt
0'-2"	8'-0"	Sand (fine to mid) clean yellow
		Silty clay
	8'-6"±	

Water Level: No water

Remarks:

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LOG OF TEST PITS

Project:	**515 Sommerville Ave.**	**Date:**	11-Apr-07
Location:	**Somerville, Ma**	**Weather:**	Sunny 40s
		Designation:	TP- 2
STRATUM (ft.)	**Description**	**GCI Job#:**	2072701

From:	To:	Surf. EL.
0'-0"	0'-2"	Asphalt
0'-02"	4'-6"	Sand (fine to mid) smells chemicals dark
		SIDEWALL COLLAPSING -- could not excavate further due to proximity of existing tank

Water Level: no water

Remarks: Sides collapsing

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LOG OF TEST PITS

Project:	**515 Sommerville Ave.**	**Date:**	11-Apr-07
Location:	**Somerville, Ma**	**Weather:**	Sunny 40s
		Designation:	TP- 3
STRATUM (ft.)	**Description**	**GCI Job#:**	2072701

From:	To:	Surf. EL.
0'-0"	0'-02"	Aspalt
	6'-6"	Urban fill - ash, wood, metal, bricks, glas, concrete
	7'-2"	Clay with silt
	8'-6"	Sand yellow (fine to mid) dark yellow

Water Level: no water

Remarks:

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LOG OF TEST PITS

Project:	515 Sommerville Ave.	**Date:**	11-Apr-07
Location:	Somerville, Ma	**Weather:**	Sunny 40s
		Designation:	TP- 4
		GCI Job#:	2072701

STRATUM (ft.) From:	To:	Description
		Surf. EL.
0'-0"	0'-2"	Asphalt
	6'-6"	Urban fill (ash, bricks, wood, metal, concrete)
		Sand
	11'-00"	Sand dark yellow (fine to mid)
		(Full Range of Excavator depth) Out of excavator

Water Level: 11'-00"

Remarks:

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LOG OF TEST PITS

Project:	**515 Sommerville Ave.**	**Date:**	11-Apr-07
Location:	**Somerville, Ma**	**Weather:**	Sunny 40s
		Designation:	TP-5
STRATUM (ft.)	**Description**	**GCI Job#:**	2072701
From: / **To:**		Surf. EL.	

From:	To:	Description
0'-0"	0'-2"	Asphalt
	6'-0"	Urban fill
	8'-4"	Sand dark yellow
		Stop

Water Level: no water

Remarks:

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LOG OF TEST PITS

Project:	**515 Sommerville Ave.**	**Date:**	11-Apr-07
Location:	**Somerville, Ma**	**Weather:**	Sunny 40s
		Designation:	TP- 6
STRATUM (ft.)	**Description**	**GCI Job#:**	2072701

From:	To:	Surf. EL.
0'0"	0'-2"	Asphalt
	5'-6"	Urban fill
	7'.7"	Dark Brown Peat / Organic Silt
	9'-0"	Sand gray
	9'-6"	Sand brown

Water Level: no water

Remarks:

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Telephone (508) 229-0900

APPENDIX C

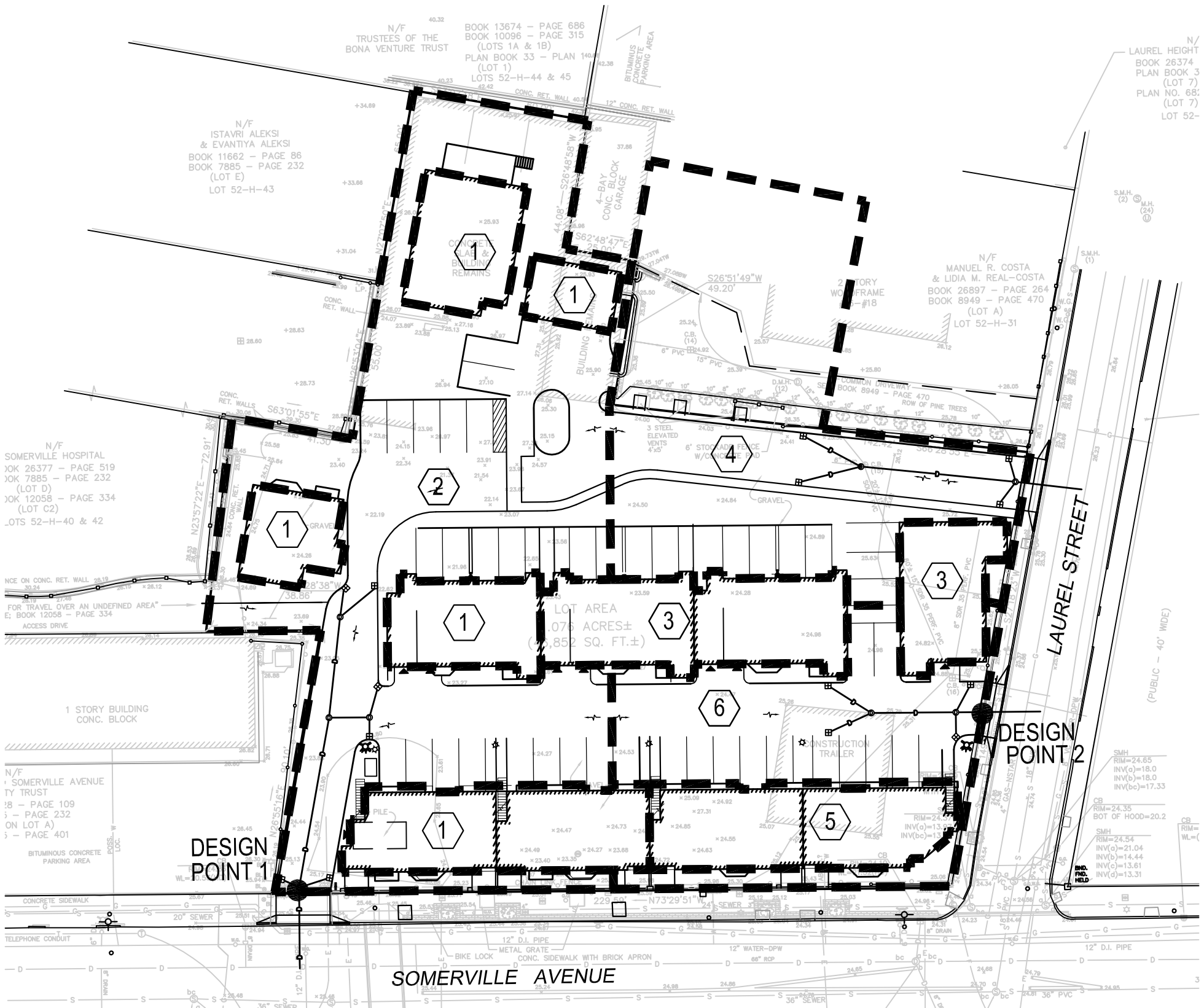
PROPOSED DRAINAGE AREAS

31

LEGEND

1 — SUBCATCHMENT NUMBER

SUBCATCHMENT AREA



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Somerville, MA 02145
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REV. No.	DESCRIPTION	DATE
1	Update bldg and parking layout	9/12/14

STAMP

515 SOMERVILLE AVENUE
SOMERVILLE,, MA

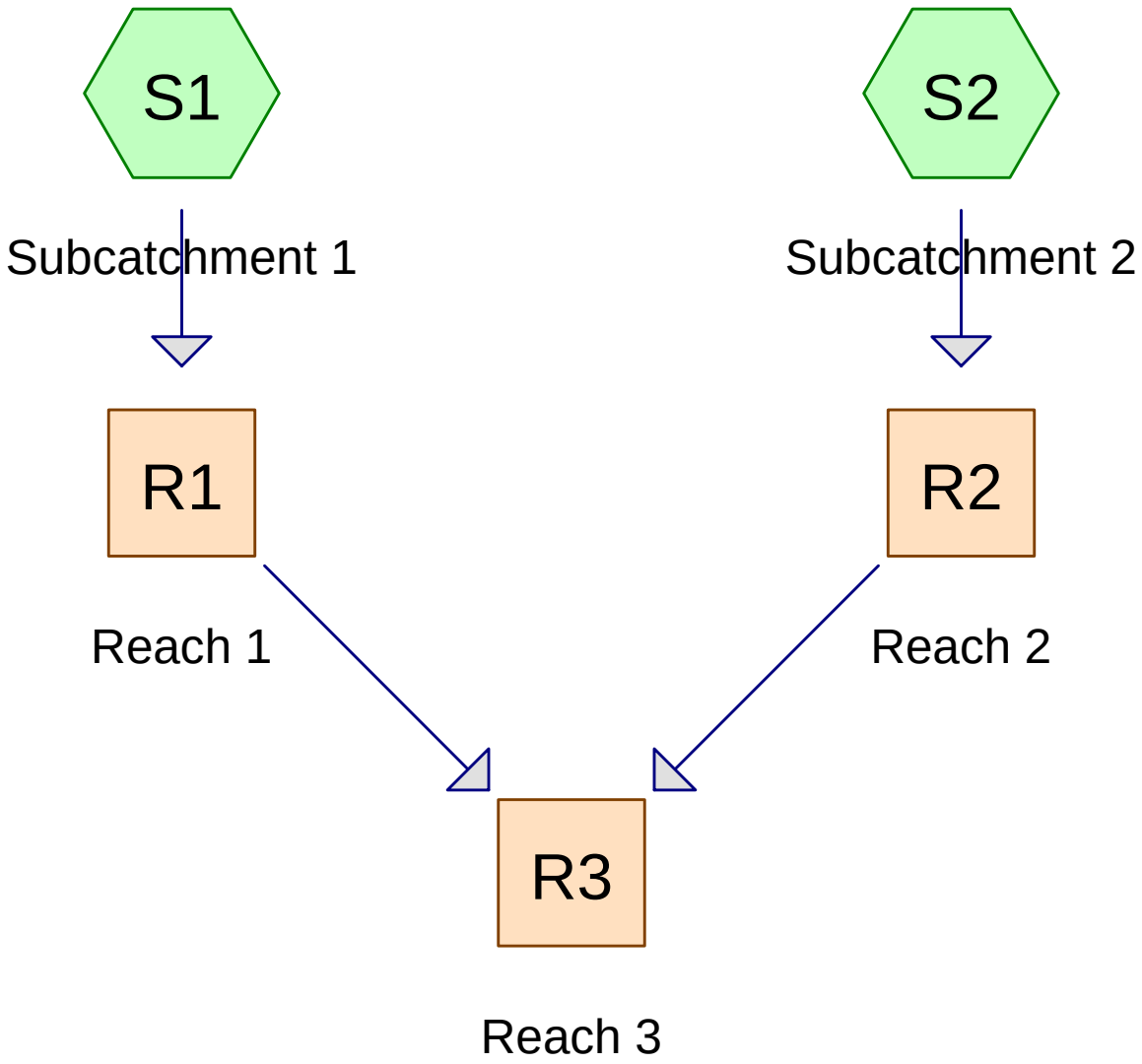
DATE: 07.03.14
SCALE: 1"=40'
DR. BY: BP
CHK. BY: WK
PROJECT No.: 2013-099

N

PROPOSED CATCHMENT AREAS

APPENDIX D

DRAINAGE CALCULATIONS



Subcat Reach Pond Link

Drainage Diagram for 13-099 EXISTING
Prepared by Design Consultants, Inc., Printed 7/3/2014
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Time span=0.00-25.00 hrs, dt=0.01 hrs, 2501 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment S1: Subcatchment 1 Runoff Area=24,364 sf 100.00% Impervious Runoff Depth=2.97"
Tc=6.0 min CN=98 Runoff=1.74 cfs 6,025 cf

Subcatchment S2: Subcatchment 2 Runoff Area=28,369 sf 96.77% Impervious Runoff Depth=2.86"
Tc=6.0 min CN=97 Runoff=1.99 cfs 6,753 cf

Reach R1: Reach 1 Inflow=1.74 cfs 6,025 cf
Outflow=1.74 cfs 6,025 cf

Reach R2: Reach 2 Inflow=1.99 cfs 6,753 cf
Outflow=1.99 cfs 6,753 cf

Reach R3: Reach 3 Inflow=3.73 cfs 12,778 cf
Outflow=3.73 cfs 12,778 cf

Summary for Subcatchment S1: Subcatchment 1

Runoff = 1.74 cfs @ 12.08 hrs, Volume= 6,025 cf, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.20"

Area (sf)	CN	Description
24,364	98	Impervious
24,364		100.00% Impervious Area

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

Summary for Subcatchment S2: Subcatchment 2

Runoff = 1.99 cfs @ 12.08 hrs, Volume= 6,753 cf, Depth= 2.86"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.20"

Area (sf)	CN	Description
27,454	98	Impervious
915	69	50-75% Grass cover, Fair, HSG B
28,369	97	Weighted Average
915		3.23% Pervious Area
27,454		96.77% Impervious Area

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

Summary for Reach R1: Reach 1

Inflow Area = 24,364 sf,100.00% Impervious, Inflow Depth = 2.97" for 2yr event
Inflow = 1.74 cfs @ 12.08 hrs, Volume= 6,025 cf
Outflow = 1.74 cfs @ 12.08 hrs, Volume= 6,025 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

Summary for Reach R2: Reach 2

Inflow Area = 28,369 sf, 96.77% Impervious, Inflow Depth = 2.86" for 2yr event
Inflow = 1.99 cfs @ 12.08 hrs, Volume= 6,753 cf
Outflow = 1.99 cfs @ 12.08 hrs, Volume= 6,753 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

Summary for Reach R3: Reach 3

Inflow Area = 52,733 sf, 98.26% Impervious, Inflow Depth = 2.91" for 2yr event
Inflow = 3.73 cfs @ 12.08 hrs, Volume= 12,778 cf
Outflow = 3.73 cfs @ 12.08 hrs, Volume= 12,778 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

Time span=0.00-25.00 hrs, dt=0.01 hrs, 2501 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment S1: Subcatchment 1 Runoff Area=24,364 sf 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98 Runoff=2.63 cfs 9,265 cf

Subcatchment S2: Subcatchment 2 Runoff Area=28,369 sf 96.77% Impervious Runoff Depth=4.45"
Tc=6.0 min CN=97 Runoff=3.03 cfs 10,515 cf

Reach R1: Reach 1 Inflow=2.63 cfs 9,265 cf
Outflow=2.63 cfs 9,265 cf

Reach R2: Reach 2 Inflow=3.03 cfs 10,515 cf
Outflow=3.03 cfs 10,515 cf

Reach R3: Reach 3 Inflow=5.66 cfs 19,780 cf
Outflow=5.66 cfs 19,780 cf

Summary for Subcatchment S1: Subcatchment 1

Runoff = 2.63 cfs @ 12.08 hrs, Volume= 9,265 cf, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.80"

Area (sf)	CN	Description
24,364	98	Impervious
24,364		100.00% Impervious Area

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

Summary for Subcatchment S2: Subcatchment 2

Runoff = 3.03 cfs @ 12.08 hrs, Volume= 10,515 cf, Depth= 4.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.80"

Area (sf)	CN	Description
27,454	98	Impervious
915	69	50-75% Grass cover, Fair, HSG B
28,369	97	Weighted Average
915		3.23% Pervious Area
27,454		96.77% Impervious Area

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

Summary for Reach R1: Reach 1

Inflow Area = 24,364 sf,100.00% Impervious, Inflow Depth = 4.56" for 10-yr event
Inflow = 2.63 cfs @ 12.08 hrs, Volume= 9,265 cf
Outflow = 2.63 cfs @ 12.08 hrs, Volume= 9,265 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

Summary for Reach R2: Reach 2

Inflow Area = 28,369 sf, 96.77% Impervious, Inflow Depth = 4.45" for 10-yr event
Inflow = 3.03 cfs @ 12.08 hrs, Volume= 10,515 cf
Outflow = 3.03 cfs @ 12.08 hrs, Volume= 10,515 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

Summary for Reach R3: Reach 3

Inflow Area = 52,733 sf, 98.26% Impervious, Inflow Depth = 4.50" for 10-yr event
Inflow = 5.66 cfs @ 12.08 hrs, Volume= 19,780 cf
Outflow = 5.66 cfs @ 12.08 hrs, Volume= 19,780 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

Time span=0.00-25.00 hrs, dt=0.01 hrs, 2501 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment S1: Subcatchment 1 Runoff Area=24,364 sf 100.00% Impervious Runoff Depth=5.26"
Tc=6.0 min CN=98 Runoff=3.01 cfs 10,685 cf

Subcatchment S2: Subcatchment 2 Runoff Area=28,369 sf 96.77% Impervious Runoff Depth=5.15"
Tc=6.0 min CN=97 Runoff=3.49 cfs 12,164 cf

Reach R1: Reach 1 Inflow=3.01 cfs 10,685 cf
Outflow=3.01 cfs 10,685 cf

Reach R2: Reach 2 Inflow=3.49 cfs 12,164 cf
Outflow=3.49 cfs 12,164 cf

Reach R3: Reach 3 Inflow=6.50 cfs 22,849 cf
Outflow=6.50 cfs 22,849 cf

Summary for Subcatchment S1: Subcatchment 1

Runoff = 3.01 cfs @ 12.08 hrs, Volume= 10,685 cf, Depth= 5.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=5.50"

Area (sf)	CN	Description
24,364	98	Impervious
24,364		100.00% Impervious Area

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

Summary for Subcatchment S2: Subcatchment 2

Runoff = 3.49 cfs @ 12.08 hrs, Volume= 12,164 cf, Depth= 5.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr Rainfall=5.50"

Area (sf)	CN	Description
27,454	98	Impervious
915	69	50-75% Grass cover, Fair, HSG B
28,369	97	Weighted Average
915		3.23% Pervious Area
27,454		96.77% Impervious Area

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

Summary for Reach R1: Reach 1

Inflow Area = 24,364 sf,100.00% Impervious, Inflow Depth = 5.26" for 25yr event
Inflow = 3.01 cfs @ 12.08 hrs, Volume= 10,685 cf
Outflow = 3.01 cfs @ 12.08 hrs, Volume= 10,685 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

Summary for Reach R2: Reach 2

Inflow Area = 28,369 sf, 96.77% Impervious, Inflow Depth = 5.15" for 25yr event
Inflow = 3.49 cfs @ 12.08 hrs, Volume= 12,164 cf
Outflow = 3.49 cfs @ 12.08 hrs, Volume= 12,164 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

Summary for Reach R3: Reach 3

Inflow Area = 52,733 sf, 98.26% Impervious, Inflow Depth = 5.20" for 25yr event
Inflow = 6.50 cfs @ 12.08 hrs, Volume= 22,849 cf
Outflow = 6.50 cfs @ 12.08 hrs, Volume= 22,849 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

Time span=0.00-25.00 hrs, dt=0.01 hrs, 2501 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment S1: Subcatchment 1 Runoff Area=24,364 sf 100.00% Impervious Runoff Depth=6.26"
Tc=6.0 min CN=98 Runoff=3.57 cfs 12,713 cf

Subcatchment S2: Subcatchment 2 Runoff Area=28,369 sf 96.77% Impervious Runoff Depth=6.14"
Tc=6.0 min CN=97 Runoff=4.13 cfs 14,523 cf

Reach R1: Reach 1 Inflow=3.57 cfs 12,713 cf
Outflow=3.57 cfs 12,713 cf

Reach R2: Reach 2 Inflow=4.13 cfs 14,523 cf
Outflow=4.13 cfs 14,523 cf

Reach R3: Reach 3 Inflow=7.70 cfs 27,235 cf
Outflow=7.70 cfs 27,235 cf

Summary for Subcatchment S1: Subcatchment 1

Runoff = 3.57 cfs @ 12.08 hrs, Volume= 12,713 cf, Depth= 6.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=6.50"

Area (sf)	CN	Description
24,364	98	Impervious
24,364		100.00% Impervious Area

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

Summary for Subcatchment S2: Subcatchment 2

Runoff = 4.13 cfs @ 12.08 hrs, Volume= 14,523 cf, Depth= 6.14"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs
Type III 24-hr 100yr Rainfall=6.50"

Area (sf)	CN	Description
27,454	98	Impervious
915	69	50-75% Grass cover, Fair, HSG B
28,369	97	Weighted Average
915		3.23% Pervious Area
27,454		96.77% Impervious Area

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

Summary for Reach R1: Reach 1

Inflow Area = 24,364 sf,100.00% Impervious, Inflow Depth = 6.26" for 100yr event
Inflow = 3.57 cfs @ 12.08 hrs, Volume= 12,713 cf
Outflow = 3.57 cfs @ 12.08 hrs, Volume= 12,713 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

Summary for Reach R2: Reach 2

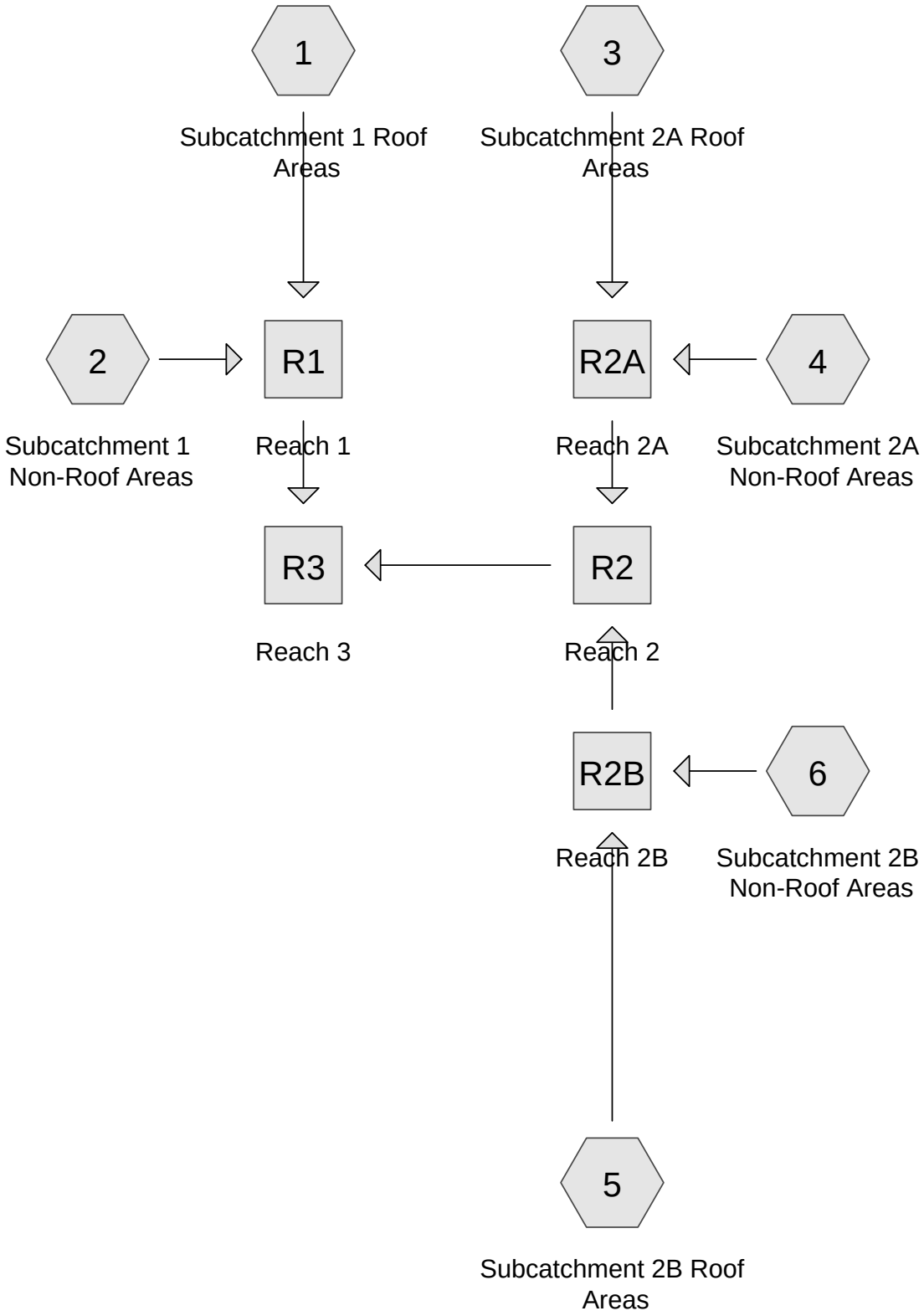
Inflow Area = 28,369 sf, 96.77% Impervious, Inflow Depth = 6.14" for 100yr event
Inflow = 4.13 cfs @ 12.08 hrs, Volume= 14,523 cf
Outflow = 4.13 cfs @ 12.08 hrs, Volume= 14,523 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

Summary for Reach R3: Reach 3

Inflow Area = 52,733 sf, 98.26% Impervious, Inflow Depth = 6.20" for 100yr event
Inflow = 7.70 cfs @ 12.08 hrs, Volume= 27,235 cf
Outflow = 7.70 cfs @ 12.08 hrs, Volume= 27,235 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs



Subcat Reach Pond Link

Drainage Diagram for 13-099 PR
Prepared by Design Consultants, Inc., Printed 9/11/2014

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
11,506	61	>75% Grass cover, Good, HSG B (2, 4, 6)
11,967	75	Unit Pavers (2, 4, 6)
10,461	98	Roofs, HSG C (1, 5)
2,809	98	Unconnected pavement, HSG A (6)
4,061	98	Unconnected pavement, HSG B (2)
7,303	98	Unconnected pavement, HSG C (4)
4,626	98	Unconnected roofs, HSG C (3)
52,733		**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Subcatchment 1 Roof Runoff Area=7,574 sf 100.00% Impervious Runoff Depth>2.97"
Tc=6.0 min CN=98 Runoff=0.54 cfs 1,871 cf

Subcatchment 2: Subcatchment 1 Runoff Area=18,693 sf 21.72% Impervious Runoff Depth>0.88"
Tc=6.0 min UI Adjusted CN=71 Runoff=0.40 cfs 1,366 cf

Subcatchment 3: Subcatchment 2A Roof Runoff Area=4,626 sf 100.00% Impervious Runoff Depth>2.97"
Tc=6.0 min CN=98 Runoff=0.33 cfs 1,143 cf

Subcatchment 4: Subcatchment 2A Runoff Area=12,617 sf 57.88% Impervious Runoff Depth>1.83"
Tc=6.0 min CN=86 Runoff=0.62 cfs 1,927 cf

Subcatchment 5: Subcatchment 2B Roof Runoff Area=2,887 sf 100.00% Impervious Runoff Depth>2.97"
Tc=6.0 min CN=98 Runoff=0.21 cfs 713 cf

Subcatchment 6: Subcatchment 2B Runoff Area=6,336 sf 44.33% Impervious Runoff Depth>1.54"
Tc=6.0 min CN=82 Runoff=0.26 cfs 811 cf

Reach R1: Reach 1 Inflow=0.94 cfs 3,237 cf
Outflow=0.94 cfs 3,237 cf

Reach R2: Reach 2 Inflow=1.42 cfs 4,595 cf
Outflow=1.42 cfs 4,595 cf

Reach R2A: Reach 2A Inflow=0.95 cfs 3,070 cf
Outflow=0.95 cfs 3,070 cf

Reach R2B: Reach 2B Inflow=0.47 cfs 1,524 cf
Outflow=0.47 cfs 1,524 cf

Reach R3: Reach 3 Inflow=2.36 cfs 7,832 cf
Outflow=2.36 cfs 7,832 cf

Total Runoff Area = 52,733 sf Runoff Volume = 7,832 cf Average Runoff Depth = 1.78"
44.51% Pervious = 23,473 sf 55.49% Impervious = 29,260 sf

Summary for Subcatchment 1: Subcatchment 1 Roof Areas

Runoff = 0.54 cfs @ 12.08 hrs, Volume= 1,871 cf, Depth> 2.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
7,574	98	Roofs, HSG C
7,574		100.00% Impervious Area

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

Summary for Subcatchment 2: Subcatchment 1 Non-Roof Areas

Runoff = 0.40 cfs @ 12.10 hrs, Volume= 1,366 cf, Depth> 0.88"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
	4,061	98	Unconnected pavement, HSG B
	7,942	61	>75% Grass cover, Good, HSG B
*	6,690	75	Unit Pavers
	18,693	74	Weighted Average, UI Adjusted CN = 71
	14,632		78.28% Pervious Area
	4,061		21.72% Impervious Area
	4,061		100.00% Unconnected

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

Summary for Subcatchment 3: Subcatchment 2A Roof Areas

Runoff = 0.33 cfs @ 12.08 hrs, Volume= 1,143 cf, Depth> 2.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
4,626	98	Unconnected roofs, HSG C
4,626		100.00% Impervious Area
4,626		100.00% Unconnected

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

Summary for Subcatchment 4: Subcatchment 2A Non-Roof Areas

Runoff = 0.62 cfs @ 12.09 hrs, Volume= 1,927 cf, Depth> 1.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
	7,303	98	Unconnected pavement, HSG C
	2,314	61	>75% Grass cover, Good, HSG B
*	3,000	75	Unit Pavers
	12,617	86	Weighted Average
	5,314		42.12% Pervious Area
	7,303		57.88% Impervious Area
	7,303		100.00% Unconnected

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

Summary for Subcatchment 5: Subcatchment 2B Roof Areas

Runoff = 0.21 cfs @ 12.08 hrs, Volume= 713 cf, Depth> 2.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
2,887	98	Roofs, HSG C
2,887		100.00% Impervious Area

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

Summary for Subcatchment 6: Subcatchment 2B Non-Roof Areas

Runoff = 0.26 cfs @ 12.09 hrs, Volume= 811 cf, Depth> 1.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
	2,809	98	Unconnected pavement, HSG A
	1,250	61	>75% Grass cover, Good, HSG B
*	2,277	75	Unit Pavers
	6,336	82	Weighted Average
	3,527		55.67% Pervious Area
	2,809		44.33% Impervious Area
	2,809		100.00% Unconnected

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

Summary for Reach R1: Reach 1

Inflow Area = 26,267 sf, 44.30% Impervious, Inflow Depth > 1.48" for 2-Year event
Inflow = 0.94 cfs @ 12.09 hrs, Volume= 3,237 cf
Outflow = 0.94 cfs @ 12.09 hrs, Volume= 3,237 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Reach R2: Reach 2

Inflow Area = 26,466 sf, 66.59% Impervious, Inflow Depth > 2.08" for 2-Year event
Inflow = 1.42 cfs @ 12.09 hrs, Volume= 4,595 cf
Outflow = 1.42 cfs @ 12.09 hrs, Volume= 4,595 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Reach R2A: Reach 2A

Inflow Area = 17,243 sf, 69.18% Impervious, Inflow Depth > 2.14" for 2-Year event
Inflow = 0.95 cfs @ 12.09 hrs, Volume= 3,070 cf
Outflow = 0.95 cfs @ 12.09 hrs, Volume= 3,070 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Reach R2B: Reach 2B

Inflow Area = 9,223 sf, 61.76% Impervious, Inflow Depth > 1.98" for 2-Year event
Inflow = 0.47 cfs @ 12.09 hrs, Volume= 1,524 cf
Outflow = 0.47 cfs @ 12.09 hrs, Volume= 1,524 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Reach R3: Reach 3

Inflow Area = 52,733 sf, 55.49% Impervious, Inflow Depth > 1.78" for 2-Year event
Inflow = 2.36 cfs @ 12.09 hrs, Volume= 7,832 cf
Outflow = 2.36 cfs @ 12.09 hrs, Volume= 7,832 cf, Atten= 0%, Lag= 0.0 min

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

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Subcatchment 1 Roof Runoff Area=7,574 sf 100.00% Impervious Runoff Depth>4.56"
Tc=6.0 min CN=98 Runoff=0.82 cfs 2,878 cf

Subcatchment 2: Subcatchment 1 Runoff Area=18,693 sf 21.72% Impervious Runoff Depth>1.96"
Tc=6.0 min UI Adjusted CN=71 Runoff=0.97 cfs 3,059 cf

Subcatchment 3: Subcatchment 2A Roof Runoff Area=4,626 sf 100.00% Impervious Runoff Depth>4.56"
Tc=6.0 min CN=98 Runoff=0.50 cfs 1,758 cf

Subcatchment 4: Subcatchment 2A Runoff Area=12,617 sf 57.88% Impervious Runoff Depth>3.28"
Tc=6.0 min CN=86 Runoff=1.10 cfs 3,446 cf

Subcatchment 5: Subcatchment 2B Roof Runoff Area=2,887 sf 100.00% Impervious Runoff Depth>4.56"
Tc=6.0 min CN=98 Runoff=0.31 cfs 1,097 cf

Subcatchment 6: Subcatchment 2B Runoff Area=6,336 sf 44.33% Impervious Runoff Depth>2.90"
Tc=6.0 min CN=82 Runoff=0.49 cfs 1,530 cf

Reach R1: Reach 1 Inflow=1.79 cfs 5,937 cf
Outflow=1.79 cfs 5,937 cf

Reach R2: Reach 2 Inflow=2.40 cfs 7,831 cf
Outflow=2.40 cfs 7,831 cf

Reach R2A: Reach 2A Inflow=1.60 cfs 5,204 cf
Outflow=1.60 cfs 5,204 cf

Reach R2B: Reach 2B Inflow=0.80 cfs 2,627 cf
Outflow=0.80 cfs 2,627 cf

Reach R3: Reach 3 Inflow=4.19 cfs 13,768 cf
Outflow=4.19 cfs 13,768 cf

Total Runoff Area = 52,733 sf Runoff Volume = 13,768 cf Average Runoff Depth = 3.13"
44.51% Pervious = 23,473 sf 55.49% Impervious = 29,260 sf

Summary for Subcatchment 1: Subcatchment 1 Roof Areas

Runoff = 0.82 cfs @ 12.08 hrs, Volume= 2,878 cf, Depth> 4.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
7,574	98	Roofs, HSG C
7,574		100.00% Impervious Area

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

Summary for Subcatchment 2: Subcatchment 1 Non-Roof Areas

Runoff = 0.97 cfs @ 12.09 hrs, Volume= 3,059 cf, Depth> 1.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

	Area (sf)	CN	Description
	4,061	98	Unconnected pavement, HSG B
	7,942	61	>75% Grass cover, Good, HSG B
*	6,690	75	Unit Pavers
	18,693	74	Weighted Average, UI Adjusted CN = 71
	14,632		78.28% Pervious Area
	4,061		21.72% Impervious Area
	4,061		100.00% Unconnected

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

Summary for Subcatchment 3: Subcatchment 2A Roof Areas

Runoff = 0.50 cfs @ 12.08 hrs, Volume= 1,758 cf, Depth> 4.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
4,626	98	Unconnected roofs, HSG C
4,626		100.00% Impervious Area
4,626		100.00% Unconnected

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

Summary for Subcatchment 4: Subcatchment 2A Non-Roof Areas

Runoff = 1.10 cfs @ 12.09 hrs, Volume= 3,446 cf, Depth> 3.28"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

	Area (sf)	CN	Description
	7,303	98	Unconnected pavement, HSG C
	2,314	61	>75% Grass cover, Good, HSG B
*	3,000	75	Unit Pavers
	12,617	86	Weighted Average
	5,314		42.12% Pervious Area
	7,303		57.88% Impervious Area
	7,303		100.00% Unconnected

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

Summary for Subcatchment 5: Subcatchment 2B Roof Areas

Runoff = 0.31 cfs @ 12.08 hrs, Volume= 1,097 cf, Depth> 4.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
2,887	98	Roofs, HSG C
2,887		100.00% Impervious Area

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

Summary for Subcatchment 6: Subcatchment 2B Non-Roof Areas

Runoff = 0.49 cfs @ 12.09 hrs, Volume= 1,530 cf, Depth> 2.90"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.80"

	Area (sf)	CN	Description
	2,809	98	Unconnected pavement, HSG A
	1,250	61	>75% Grass cover, Good, HSG B
*	2,277	75	Unit Pavers
	6,336	82	Weighted Average
	3,527		55.67% Pervious Area
	2,809		44.33% Impervious Area
	2,809		100.00% Unconnected

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

Summary for Reach R1: Reach 1

Inflow Area = 26,267 sf, 44.30% Impervious, Inflow Depth > 2.71" for 10-year event
Inflow = 1.79 cfs @ 12.09 hrs, Volume= 5,937 cf
Outflow = 1.79 cfs @ 12.09 hrs, Volume= 5,937 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Reach R2: Reach 2

Inflow Area = 26,466 sf, 66.59% Impervious, Inflow Depth > 3.55" for 10-year event
Inflow = 2.40 cfs @ 12.09 hrs, Volume= 7,831 cf
Outflow = 2.40 cfs @ 12.09 hrs, Volume= 7,831 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Reach R2A: Reach 2A

Inflow Area = 17,243 sf, 69.18% Impervious, Inflow Depth > 3.62" for 10-year event
Inflow = 1.60 cfs @ 12.09 hrs, Volume= 5,204 cf
Outflow = 1.60 cfs @ 12.09 hrs, Volume= 5,204 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Reach R2B: Reach 2B

Inflow Area = 9,223 sf, 61.76% Impervious, Inflow Depth > 3.42" for 10-year event
Inflow = 0.80 cfs @ 12.09 hrs, Volume= 2,627 cf
Outflow = 0.80 cfs @ 12.09 hrs, Volume= 2,627 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Reach R3: Reach 3

Inflow Area = 52,733 sf, 55.49% Impervious, Inflow Depth > 3.13" for 10-year event
Inflow = 4.19 cfs @ 12.09 hrs, Volume= 13,768 cf
Outflow = 4.19 cfs @ 12.09 hrs, Volume= 13,768 cf, Atten= 0%, Lag= 0.0 min

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

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Subcatchment 1 Roof Runoff Area=7,574 sf 100.00% Impervious Runoff Depth>5.26"
Tc=6.0 min CN=98 Runoff=0.94 cfs 3,319 cf

Subcatchment 2: Subcatchment 1 Runoff Area=18,693 sf 21.72% Impervious Runoff Depth>2.50"
Tc=6.0 min UI Adjusted CN=71 Runoff=1.25 cfs 3,892 cf

Subcatchment 3: Subcatchment 2A Roof Runoff Area=4,626 sf 100.00% Impervious Runoff Depth>5.26"
Tc=6.0 min CN=98 Runoff=0.57 cfs 2,027 cf

Subcatchment 4: Subcatchment 2A Runoff Area=12,617 sf 57.88% Impervious Runoff Depth>3.93"
Tc=6.0 min CN=86 Runoff=1.31 cfs 4,134 cf

Subcatchment 5: Subcatchment 2B Roof Runoff Area=2,887 sf 100.00% Impervious Runoff Depth>5.26"
Tc=6.0 min CN=98 Runoff=0.36 cfs 1,265 cf

Subcatchment 6: Subcatchment 2B Runoff Area=6,336 sf 44.33% Impervious Runoff Depth>3.53"
Tc=6.0 min CN=82 Runoff=0.60 cfs 1,862 cf

Reach R1: Reach 1 Inflow=2.18 cfs 7,210 cf
Outflow=2.18 cfs 7,210 cf

Reach R2: Reach 2 Inflow=2.84 cfs 9,288 cf
Outflow=2.84 cfs 9,288 cf

Reach R2A: Reach 2A Inflow=1.88 cfs 6,161 cf
Outflow=1.88 cfs 6,161 cf

Reach R2B: Reach 2B Inflow=0.96 cfs 3,127 cf
Outflow=0.96 cfs 3,127 cf

Reach R3: Reach 3 Inflow=5.02 cfs 16,499 cf
Outflow=5.02 cfs 16,499 cf

Total Runoff Area = 52,733 sf Runoff Volume = 16,499 cf Average Runoff Depth = 3.75"
44.51% Pervious = 23,473 sf 55.49% Impervious = 29,260 sf

Summary for Subcatchment 1: Subcatchment 1 Roof Areas

Runoff = 0.94 cfs @ 12.08 hrs, Volume= 3,319 cf, Depth> 5.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.50"

Area (sf)	CN	Description
7,574	98	Roofs, HSG C
7,574		100.00% Impervious Area

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

Summary for Subcatchment 2: Subcatchment 1 Non-Roof Areas

Runoff = 1.25 cfs @ 12.09 hrs, Volume= 3,892 cf, Depth> 2.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.50"

	Area (sf)	CN	Description
	4,061	98	Unconnected pavement, HSG B
	7,942	61	>75% Grass cover, Good, HSG B
*	6,690	75	Unit Pavers
	18,693	74	Weighted Average, UI Adjusted CN = 71
	14,632		78.28% Pervious Area
	4,061		21.72% Impervious Area
	4,061		100.00% Unconnected

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

Summary for Subcatchment 3: Subcatchment 2A Roof Areas

Runoff = 0.57 cfs @ 12.08 hrs, Volume= 2,027 cf, Depth> 5.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.50"

Area (sf)	CN	Description
4,626	98	Unconnected roofs, HSG C
4,626		100.00% Impervious Area
4,626		100.00% Unconnected

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

Summary for Subcatchment 4: Subcatchment 2A Non-Roof Areas

Runoff = 1.31 cfs @ 12.09 hrs, Volume= 4,134 cf, Depth> 3.93"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.50"

	Area (sf)	CN	Description
	7,303	98	Unconnected pavement, HSG C
	2,314	61	>75% Grass cover, Good, HSG B
*	3,000	75	Unit Pavers
	12,617	86	Weighted Average
	5,314		42.12% Pervious Area
	7,303		57.88% Impervious Area
	7,303		100.00% Unconnected

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

Summary for Subcatchment 5: Subcatchment 2B Roof Areas

Runoff = 0.36 cfs @ 12.08 hrs, Volume= 1,265 cf, Depth> 5.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.50"

Area (sf)	CN	Description
2,887	98	Roofs, HSG C
2,887		100.00% Impervious Area

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

Summary for Subcatchment 6: Subcatchment 2B Non-Roof Areas

Runoff = 0.60 cfs @ 12.09 hrs, Volume= 1,862 cf, Depth> 3.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.50"

	Area (sf)	CN	Description
	2,809	98	Unconnected pavement, HSG A
	1,250	61	>75% Grass cover, Good, HSG B
*	2,277	75	Unit Pavers
	6,336	82	Weighted Average
	3,527		55.67% Pervious Area
	2,809		44.33% Impervious Area
	2,809		100.00% Unconnected

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

Summary for Reach R1: Reach 1

Inflow Area = 26,267 sf, 44.30% Impervious, Inflow Depth > 3.29" for 25-year event
Inflow = 2.18 cfs @ 12.09 hrs, Volume= 7,210 cf
Outflow = 2.18 cfs @ 12.09 hrs, Volume= 7,210 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Reach R2: Reach 2

Inflow Area = 26,466 sf, 66.59% Impervious, Inflow Depth > 4.21" for 25-year event
Inflow = 2.84 cfs @ 12.09 hrs, Volume= 9,288 cf
Outflow = 2.84 cfs @ 12.09 hrs, Volume= 9,288 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Reach R2A: Reach 2A

Inflow Area = 17,243 sf, 69.18% Impervious, Inflow Depth > 4.29" for 25-year event
Inflow = 1.88 cfs @ 12.09 hrs, Volume= 6,161 cf
Outflow = 1.88 cfs @ 12.09 hrs, Volume= 6,161 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Reach R2B: Reach 2B

Inflow Area = 9,223 sf, 61.76% Impervious, Inflow Depth > 4.07" for 25-year event
Inflow = 0.96 cfs @ 12.09 hrs, Volume= 3,127 cf
Outflow = 0.96 cfs @ 12.09 hrs, Volume= 3,127 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Reach R3: Reach 3

Inflow Area = 52,733 sf, 55.49% Impervious, Inflow Depth > 3.75" for 25-year event
Inflow = 5.02 cfs @ 12.09 hrs, Volume= 16,499 cf
Outflow = 5.02 cfs @ 12.09 hrs, Volume= 16,499 cf, Atten= 0%, Lag= 0.0 min

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

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Subcatchment 1 Roof Runoff Area=7,574 sf 100.00% Impervious Runoff Depth>6.26"
Tc=6.0 min CN=98 Runoff=1.11 cfs 3,949 cf

Subcatchment 2: Subcatchment 1 Runoff Area=18,693 sf 21.72% Impervious Runoff Depth>3.30"
Tc=6.0 min UI Adjusted CN=71 Runoff=1.66 cfs 5,145 cf

Subcatchment 3: Subcatchment 2A Roof Runoff Area=4,626 sf 100.00% Impervious Runoff Depth>6.26"
Tc=6.0 min CN=98 Runoff=0.68 cfs 2,412 cf

Subcatchment 4: Subcatchment 2A Runoff Area=12,617 sf 57.88% Impervious Runoff Depth>4.88"
Tc=6.0 min CN=86 Runoff=1.61 cfs 5,132 cf

Subcatchment 5: Subcatchment 2B Roof Runoff Area=2,887 sf 100.00% Impervious Runoff Depth>6.26"
Tc=6.0 min CN=98 Runoff=0.42 cfs 1,505 cf

Subcatchment 6: Subcatchment 2B Runoff Area=6,336 sf 44.33% Impervious Runoff Depth>4.44"
Tc=6.0 min CN=82 Runoff=0.75 cfs 2,347 cf

Reach R1: Reach 1 Inflow=2.77 cfs 9,093 cf
Outflow=2.77 cfs 9,093 cf

Reach R2: Reach 2 Inflow=3.46 cfs 11,396 cf
Outflow=3.46 cfs 11,396 cf

Reach R2A: Reach 2A Inflow=2.29 cfs 7,544 cf
Outflow=2.29 cfs 7,544 cf

Reach R2B: Reach 2B Inflow=1.17 cfs 3,852 cf
Outflow=1.17 cfs 3,852 cf

Reach R3: Reach 3 Inflow=6.23 cfs 20,490 cf
Outflow=6.23 cfs 20,490 cf

Total Runoff Area = 52,733 sf Runoff Volume = 20,490 cf Average Runoff Depth = 4.66"
44.51% Pervious = 23,473 sf 55.49% Impervious = 29,260 sf

Summary for Subcatchment 1: Subcatchment 1 Roof Areas

Runoff = 1.11 cfs @ 12.08 hrs, Volume= 3,949 cf, Depth> 6.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=6.50"

Area (sf)	CN	Description
7,574	98	Roofs, HSG C
7,574		100.00% Impervious Area

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

Summary for Subcatchment 2: Subcatchment 1 Non-Roof Areas

Runoff = 1.66 cfs @ 12.09 hrs, Volume= 5,145 cf, Depth> 3.30"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=6.50"

	Area (sf)	CN	Description
	4,061	98	Unconnected pavement, HSG B
	7,942	61	>75% Grass cover, Good, HSG B
*	6,690	75	Unit Pavers
	18,693	74	Weighted Average, UI Adjusted CN = 71
	14,632		78.28% Pervious Area
	4,061		21.72% Impervious Area
	4,061		100.00% Unconnected

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

Summary for Subcatchment 3: Subcatchment 2A Roof Areas

Runoff = 0.68 cfs @ 12.08 hrs, Volume= 2,412 cf, Depth> 6.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=6.50"

Area (sf)	CN	Description
4,626	98	Unconnected roofs, HSG C
4,626		100.00% Impervious Area
4,626		100.00% Unconnected

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

Summary for Subcatchment 4: Subcatchment 2A Non-Roof Areas

Runoff = 1.61 cfs @ 12.09 hrs, Volume= 5,132 cf, Depth> 4.88"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=6.50"

	Area (sf)	CN	Description
	7,303	98	Unconnected pavement, HSG C
	2,314	61	>75% Grass cover, Good, HSG B
*	3,000	75	Unit Pavers
	12,617	86	Weighted Average
	5,314		42.12% Pervious Area
	7,303		57.88% Impervious Area
	7,303		100.00% Unconnected

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

Summary for Subcatchment 5: Subcatchment 2B Roof Areas

Runoff = 0.42 cfs @ 12.08 hrs, Volume= 1,505 cf, Depth> 6.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=6.50"

Area (sf)	CN	Description
2,887	98	Roofs, HSG C
2,887		100.00% Impervious Area

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

Summary for Subcatchment 6: Subcatchment 2B Non-Roof Areas

Runoff = 0.75 cfs @ 12.09 hrs, Volume= 2,347 cf, Depth> 4.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=6.50"

	Area (sf)	CN	Description
	2,809	98	Unconnected pavement, HSG A
	1,250	61	>75% Grass cover, Good, HSG B
*	2,277	75	Unit Pavers
	6,336	82	Weighted Average
	3,527		55.67% Pervious Area
	2,809		44.33% Impervious Area
	2,809		100.00% Unconnected

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

Summary for Reach R1: Reach 1

Inflow Area = 26,267 sf, 44.30% Impervious, Inflow Depth > 4.15" for 100-year event
Inflow = 2.77 cfs @ 12.09 hrs, Volume= 9,093 cf
Outflow = 2.77 cfs @ 12.09 hrs, Volume= 9,093 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Reach R2: Reach 2

Inflow Area = 26,466 sf, 66.59% Impervious, Inflow Depth > 5.17" for 100-year event
Inflow = 3.46 cfs @ 12.08 hrs, Volume= 11,396 cf
Outflow = 3.46 cfs @ 12.08 hrs, Volume= 11,396 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Reach R2A: Reach 2A

Inflow Area = 17,243 sf, 69.18% Impervious, Inflow Depth > 5.25" for 100-year event
Inflow = 2.29 cfs @ 12.08 hrs, Volume= 7,544 cf
Outflow = 2.29 cfs @ 12.08 hrs, Volume= 7,544 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Reach R2B: Reach 2B

Inflow Area = 9,223 sf, 61.76% Impervious, Inflow Depth > 5.01" for 100-year event
Inflow = 1.17 cfs @ 12.09 hrs, Volume= 3,852 cf
Outflow = 1.17 cfs @ 12.09 hrs, Volume= 3,852 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Reach R3: Reach 3

Inflow Area = 52,733 sf, 55.49% Impervious, Inflow Depth > 4.66" for 100-year event
Inflow = 6.23 cfs @ 12.09 hrs, Volume= 20,490 cf
Outflow = 6.23 cfs @ 12.09 hrs, Volume= 20,490 cf, Atten= 0%, Lag= 0.0 min

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

APPENDIX E

SANITARY SEWER CALCULATIONS & 4:1 I/I CALCULATIONS

I. INTRODUCTION

The following sewerage calculations are based upon 310 CMR 15.203, 314 CMR 7.15 and architectural floor plans provided by PQA.

II. CALCULATIONS

Number of Bedrooms	69
Average Daily Flow (110 gal/day/bedroom)	7,590 gpd
Peaking Factor	5.5
Total Peak Flow	29 gal/min
Slope	0.020
Pipe Size	6”

III. DESIGN

PVC pipe (Manning’s roughness coefficient = 0.011) at the calculated slope and diameter is adequate for flows of 385 gal/min and less. The proposed design falls within acceptable limits.

IV. CONCLUSION

Six-inch (6”) PVC, SDR 35, ASTM D3034 is proposed for the sewer line.

INFILTRATION/INFLOW REMOVAL CALCULATIONS

I. INTRODUCTION

The following infiltration/inflow removal calculations are based upon 310 CMR 15.203, the sewer calculations previously presented, 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	1,500 gpd*
Proposed Average Daily Sewer Flow	7,590 gpd
Additional Average Daily Flow	6,090 gpd
Four Times Additional Average Daily Flow	24,360 gpd

* based on anecdotal evidence of a maximum of 75 employees and a commercial use of "Factory, Industrial Plant, Warehouse or Dry Storage Space with cafeteria" with a daily design flow of 20 GPD/person

III. REMOVAL

The required 24,360 gpd of infiltration/inflow will be removed from the combined sewer system by utilizing individual drywells. Converting 24,360 gallons to cubic feet results in a volume of 3,256 gallons. Each of the ten proposed homes will have a 500 gallon drywell, resulting in a total volume of stormwater to be removed from the combined system of 5,000 gallons.

The drywells have been included in the hydrology calculations, Table 1 indicates total volume reductions (storage plus infiltration) of 5,967 gallons, 6,537 gallons, 6,862 gallons and 7,206 gallons for the 2 year, 10 year, 25 year and 100 year storms respectively. All of these volume reductions exceed the required removal of 3,256 gallons.

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.

APPENDIX F

DOMESTIC WATER DEMAND CALCULATIONS AND PIPE SIZING

Design Consultants, Inc.
120 Middlesex Ave Suite 20
Somerville, MA 02145

7/3/2014

DOMESTIC WATER DEMAND
CALCULATIONS AND PIPE SIZING

LOCATION: 515 Somerville Ave — Design Consultants, Inc.

DESCRIPTION OF FACILITY: Residential — Calc by: BTP

Architectural Reference Plans: by PQA — Date: 7/3/2014

UNITS	DESCRIPTION (DCI Job#: 2013-099)	FACTOR	HOT	COLD
69	BATHTUBS (W/WO SHOWERHEAD)	2	138	138
0	DRINKING FOUNTAIN	1	N/A	0
30	DISHWASHER (DOMESTIC)	2	60	60
30	KITCHEN SINKS (RESIDENTIAL)	2	60	60
0	KITCHEN SINKS (COMMERCIAL)	6	0	0
69	LAVATORIES	1	69	69
30	WASHING MACHINE/LAUNDRY TRAY	2	0	60
0	URINALS (FLUSH VALVE TYPE)	6	N/A	0
69	WATER CLOSETS (TANK TYPE)	1	N/A	69
0	WATER CLOSETS (FLUSH VALVE TYPE)	12	N/A	0
0	HOSE FAUCET/SILL COCK/HOSE BIBBS	2	N/A	0
0	OTHER	0	0	0

adding HOT & COLD values yields… FIXTURE UNITS: 783 = 327 + 456

SELECT PROPER DEMAND FACTOR FROM TBL 2 (SEE BELOW) 0.35

MULTIPLY TOTAL x DEMAND FACTOR (FROM TABLE 2) 783 x 0.35 = 274.1

A CAPACITY VALUE OF 274.1 WOULD REQUIRE A WATER SERVICE SIZE OF : 4"

(SEE TABLE 3 BELOW)

TABLE 2

OCCUPANCY USE		DEMAND FACTOR
RES.	1 OR 2 FAMILY	0.50
	MULTI-RESIDENTIAL	0.35
	HOTEL	0.70
BUS.	GENERAL	0.25
	RESTAURANT/CAFÉ	0.70

TABLE 3

SERVICE PIPE SIZE	CAPACITY VALUE
3/4 "	NOT RECOMMENDED
1 "	9.1 TO 16.5
1 1/2 "	16.6 TO 55.0
2 "	55.1 TO 107.499
4 "	107.5 TO 700

Note: Calculations based upon Mass. Plumbing Codes (248 CMR 10.14)

Note: Calculations are preliminary, to be confirmed by Registered MEP Engineer.