STORMWATER MANAGEMENT REPORT

for:

Morefield's Handcrafted Ice Cream

Block(s): 807
Lot(s): 8 & 9
Borough of Westwood
Bergen County, New Jersey

Prepared By:

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WAL
MEA # 2020.022
Dated: August 13, 2020
Revised: -

menlo
engineering
associates

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INTRODUCTION

The following Stormwater Management Report details the design of the stormwater management plan for a proposed Ice Cream Parlor and an existing bank located in the Borough of Westwood, Bergen County, New Jersey and has been prepared by Menlo Engineering Associates, Inc. in accordance with the standards of the Borough of Westwood, the County of Bergen, the New Jersey Soil Conservation Service, and the New Jersey Department of Environmental Protection. This report supplements, and should be reviewed in conjunction with the project development plans prepared by Menlo Engineering Associates, Inc.

It is the intent of this report to aid and assist Engineers at the Municipal, County, and State levels in evaluating the drainage calculations and considerations incorporated in the design as shown on the plans submitted. This office will readily respond to questions and requests for additional calculations or verification of the proposed design by Municipal, County, or State Engineers, and will be responsive to their suggestions and modifications to the design in conformance to the applicable codes in the interest of land use control consistent with environmental protection.

The proposed redevelopment does not result in a net increase in impervious coverage of more than 0.25 acres (0.09 acres) nor propose more than 1.0 acres (0.16 acres) of disturbance. Therefore, the stormwater management regulations are not triggered, and stormwater management is not required.

CRITERIA

In the hydraulic designs involved in this project, the drainage areas have been determined by electronic digitizer from the U.S.G.S. Quadrangle map, topographic survey prepared by Saladin Associates and field observations to determine basin limits and off-site and on-site areas. The Soil Conservation Service Soil Survey maps are used for hydrological soil group classification. Existing and proposed conditions are calculated for the 2, 10 and 100-year flows. On-site storm sewer collection systems were sized for the 25-year storm.

PROJECT LOCATION & DESCRIPTION

This report examines the drainage characteristics and designs for a 0.565-acre+/- tract of land situated in the Borough of Westwood, Bergen County, New Jersey. The applicant proposes to redevelop the existing 2-1/2 story dwelling to a proposed ice cream parlor on Lot 9 and the existing bank to remain on Lot 8. Access to the site is provided through a driveway off Center Avenue.

STORMWATER MANAGEMENT PLAN & DESIGN

The guidelines for hydraulic design, as prepared by the Soil Conservation District, the Borough of Westwood, Bergen County and the New Jersey Department of Environmental Protection have been utilized for the drainage design of this project. The purpose of the drainage design is for the post-development peak drainage flow pattern to continue, as it exists today.

The stormwater management plan for the site is to construct an underground seepage system.

Summary of the Runoff Analysis:

The 0.565-acre+/- parcel's existing conditions currently contains an existing 2-1/2 story dwelling with a gravel driveway and parking area on Lot 9 and an existing 1 story bank with a paved parking lot on Lot 8. The existing drainage pattern of most of the 0.22 acres area analyzed, drains from south to north and drains towards the northerly corner of property. The other areas of the property and drainage patterns shall remain as is. See Existing Drainage Area Map.

The developer is proposing to redevelop the existing 2-1/2 story dwelling to a proposed ice cream parlor on Lot 9 and extend the existing Lot 8 parking lot onto Lot 9. The proposed drainage pattern of most of the 0.22 acres area analyzed (0.18 acres) drains into the proposed underground seepage pits. The remaining area analyzed (0.04 acres) drains overland to the west onto Broadway, as it does in the existing conditions. See Proposed Drainage Area Map.

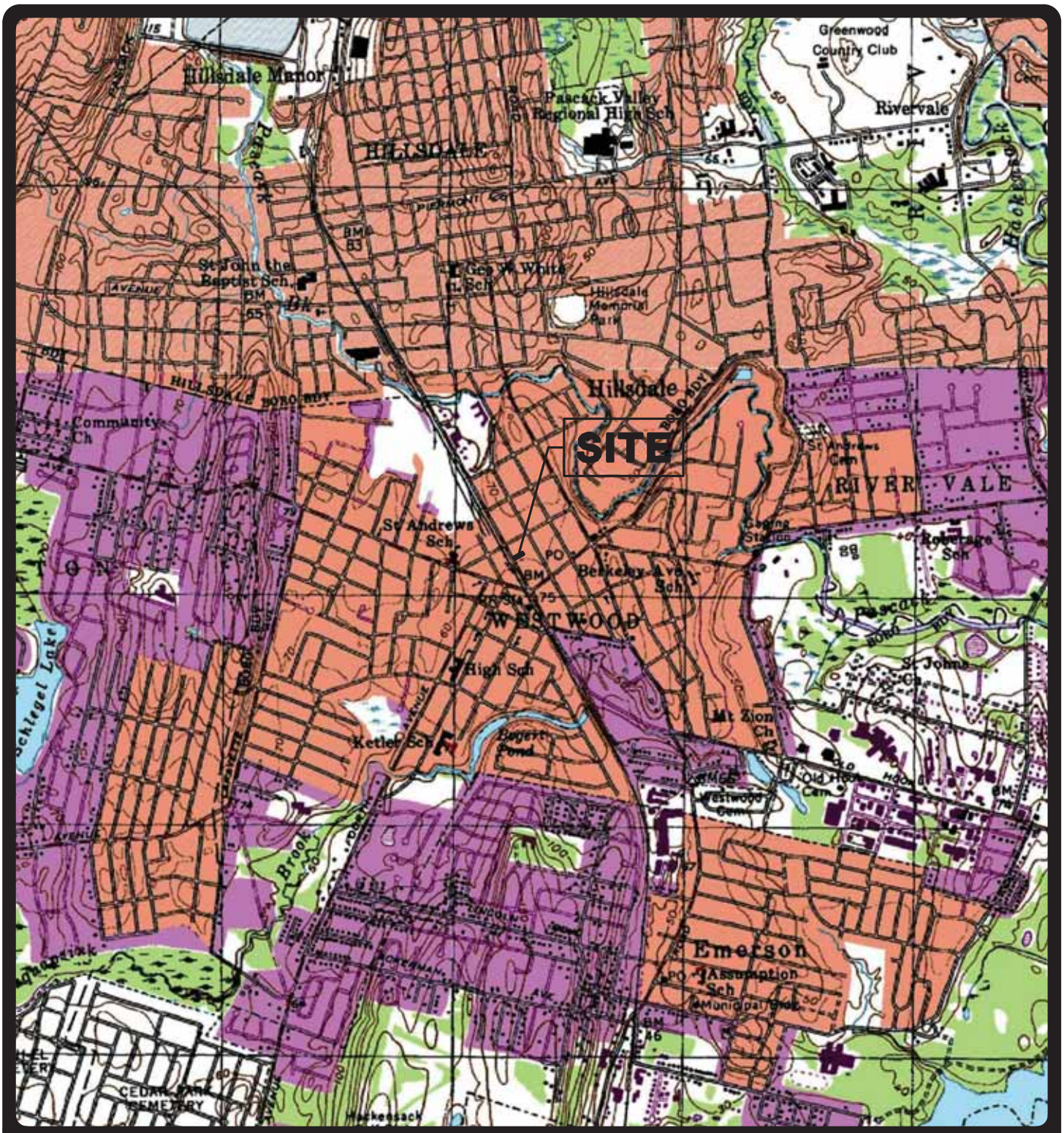
The Modified Rational Method was used for analysis.

Summary Tables:

The following tables summarize the reduction of runoff for the 2, 10, and 100-year storm events:

EXISTING & PROPOSED CONDITIONS

STORM	EXISTING CONDITIONS (CFS)	PROPOSED OVERLAND (CFS)	PROPOSED SEEPAGE PIT (CFS)	PROPOSED TOTAL (CFS)	REDUCTION PROVIDED (%)
100	1.48	0.28	0	0.28	81.1%
10	1.07	0.20	0	0.20	81.3%
2	0.87	0.16	0	0.16	81.6%



U.S.G.S. MAP

Quad Name: Hackensack
Borough Of Westwood
Bergen County

N

BLOCK	LOT
807	9

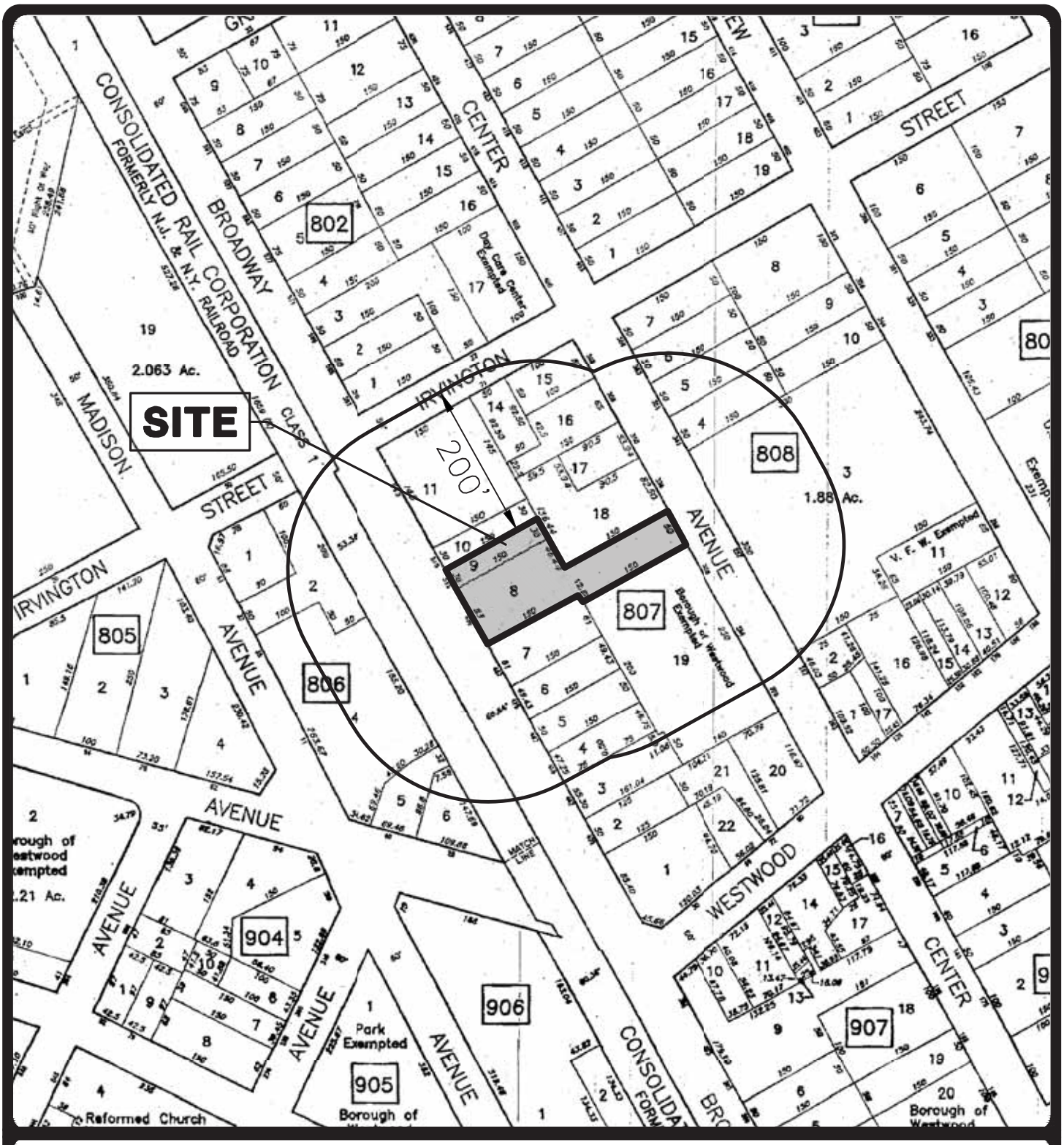
MENLO ENGINEERING ASSOCIATES, INC.
261 CLEVELAND AVENUE
HIGHLAND PARK, NJ 08904
(732) 846-8585

State Plane Coordinates:
N: 786,896.08 ft.
E: 620,945.93 ft.

0 1,000' 2,000'
500' 1,500'

Scale: 1"=2,000± ft *Job # 2020.022*

JSJ



TAX MAP

Sheet Number: 8
Borough Of Westwood
Bergen County

N

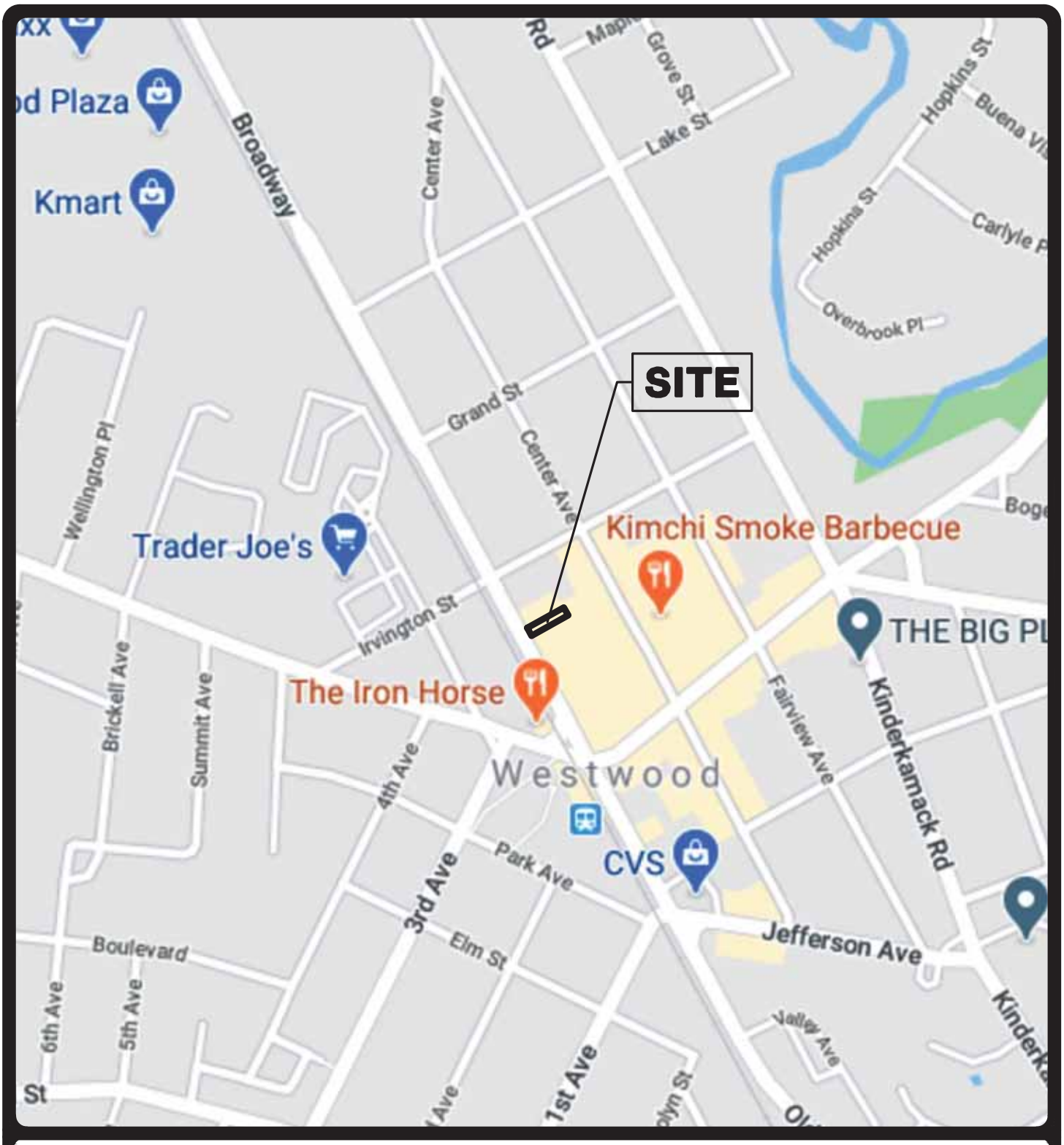
BLOCK	LOTS
807	8 & 9

MENLO ENGINEERING ASSOCIATES, INC.
261 CLEVELAND AVENUE
HIGHLAND PARK, NJ 08904
(732) 846-8585

0 50' 100' 150' 200'

Scale: 1"=200± ft *Job # 2020.022*

JSJ



ROAD MAP

Borough Of Westwood
Bergen County

N

BLOCK	LOT
807	9

MENLO ENGINEERING ASSOCIATES, INC.
261 CLEVELAND AVENUE
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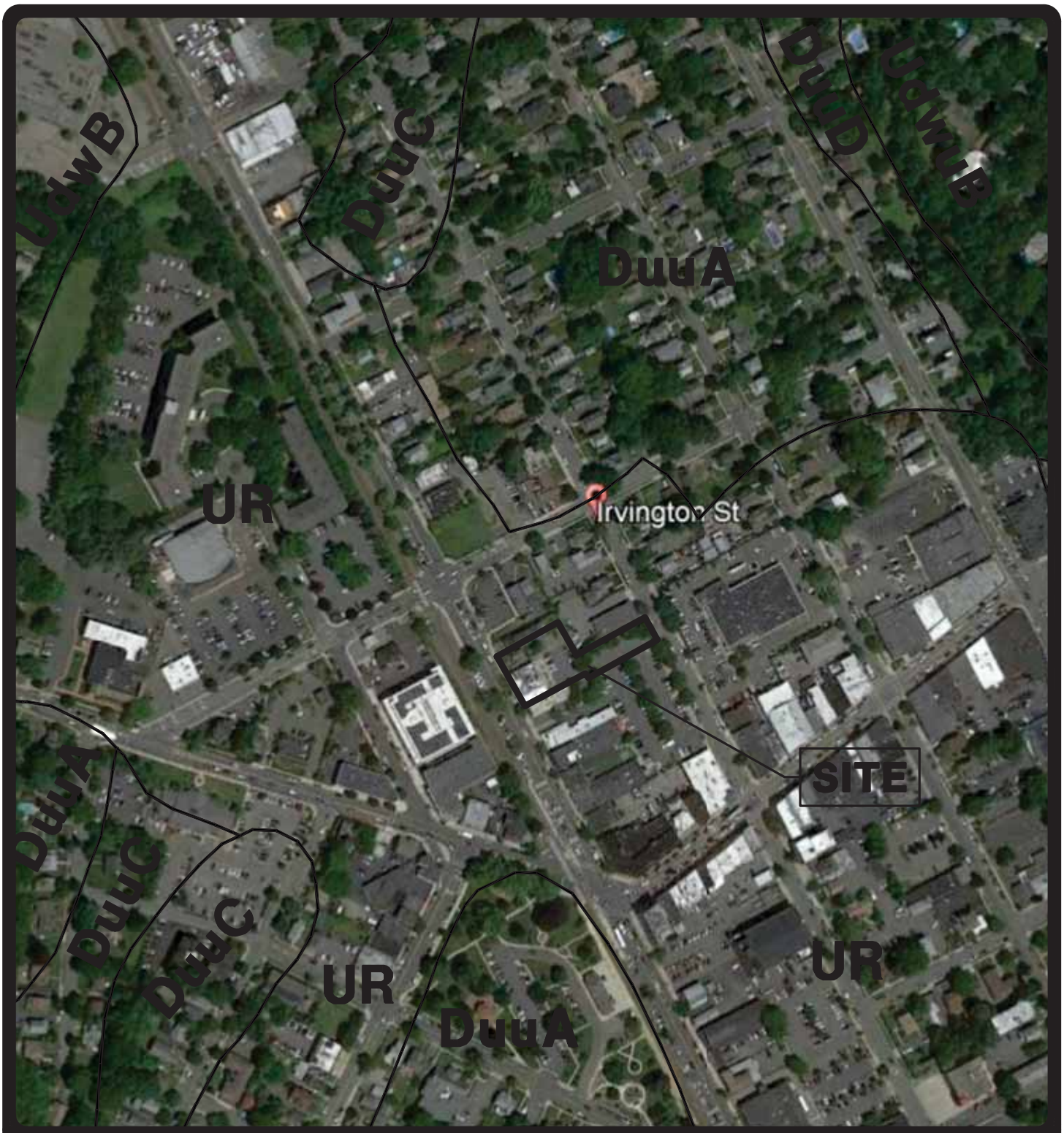
0 250' 500'
125' 375'

Scale: 1"=500±ft *Job # 2020.022*

JSJ



SOILS MAP

Soil Type: UR (Urban land)
Borough Of Westwood
Bergen County

N

BLOCK
807

LOT
8 & 9

MENLO ENGINEERING ASSOCIATES, INC.
261 CLEVELAND AVENUE
HIGHLAND PARK, NJ 08904
(732) 846-8585

0 75' 150' 225' 300'

Scale: 1"=300± ft

Job # 2020.022

JSJ

APPENDIX A: EXISTING CONDITIONS

PRE-DEVELOPMENT DRAINAGE CONDITION
(Existing Drainage Area)

I. Total Drainage Area: 0.22 Acres

II. Soil Groups/Types:

		Type
UR	- Urban Land	C
DVA	-Dunellen-Urban Land (adjacent soil)	

III. Time of Concentration: 10 Minutes

IV Rainfall Intensity:

Storm	Rainfall(in.)
100-YR	8.0
10-YR	5.8
2-YR	4.7

V. Weighted 'c' Calulation:

Land Use	Area	% of Cover	C Value	Total
Impervious	0.1 Acres	0.45	0.99	0.45
Gravel	0.07 Acres	0.32	0.84	0.27
Grass	0.05 Acres	0.23	0.51	0.12
			Weighted 'c':	0.84

VI. $Q=ciA$

	c	*I*	*A*	=	Q
Q_{100}=	0.84	8.00	0.22	=	1.48
Q_{10}=	0.84	5.80	0.22	=	1.07
Q_2=	0.84	4.70	0.22	=	0.87

APPENDIX B: PROPOSED CONDITIONS

POST-DEVELOPMENT DRAINAGE CONDITION
(Proposed Overland Drainage Area)

I. Total Drainage Area: 0.04 Acres

II. Soil Groups/Types:

		Type
UR	- Urban Land	C
DVA	-Dunellen-Urban Land (adjacent soil)	

III. Time of Concentration: 10 Minutes

IV Rainfall Intensity:

Storm	Rainfall(in.)
100-YR	8.0
10-YR	5.8
2-YR	4.7

V. Weighted 'c' Calulation:

Land Use	Area	% of Cover	C Value	Total
Impervious	0.03 Acres	0.75	0.99	0.74
Grass	0.01 Acres	0.25	0.51	0.13
			Weighted 'c':	0.87

VI. Q=c*iA*

Q=	*c*	*I*	*A*	=	Q
Q_{100}=	0.00	8.00	0.04	=	0.00
Q_{10}=	0.00	5.80	0.04	=	0.00
Q_2=	0.00	4.70	0.04	=	0.00

POST-DEVELOPMENT DRAINAGE CONDITION
(Proposed Drainage Area Into Seepage Pits)

I. Total Drainage Area: 0.18 Acres

II. Soil Groups/Types:

		Type
UR	- Urban Land	C
DVA	-Dunellen-Urban Land (adjacent soil)	

III. Time of Concentration: 10 Minutes

IV Rainfall Intensity:

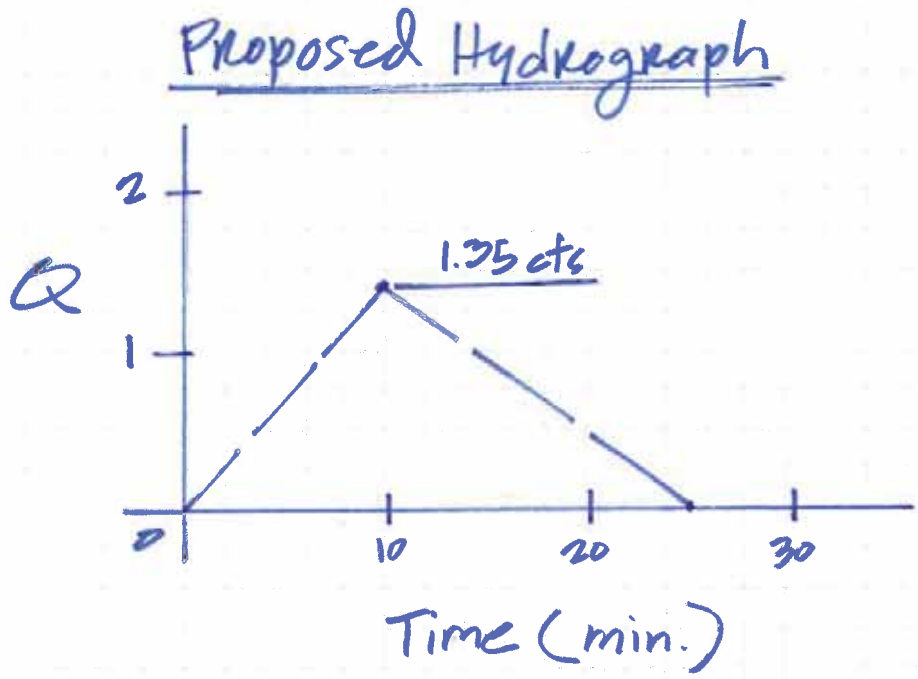
Storm	Rainfall(in.)
100-YR	8.0
10-YR	5.8
2-YR	4.7

V. Weighted 'c' Calulation:

Land Use	Area	% of Cover	C Value	Total
Impervious	0.16 Acres	0.89	0.99	0.88
Grass	0.02 Acres	0.11	0.51	0.06
			Weighted 'c':	0.94

VI. Q=c*iA*

	c	*I*	*A*	=	Q
Q_{100}=	0.94	8.00	0.18	=	1.35
Q_{10}=	0.94	5.80	0.18	=	0.98
Q_2=	0.94	4.70	0.18	=	0.80



PROPOSED RUNOFF VOLUME TO SEEPAGE PITS

Volume 100-Year= (1.35 cfs)(25 min)(60 sec/min) / 2 = 1,013 CF
Volume 10-Year = (0.98 cfs)(25 min)(60 sec/min) / 2 = 735 CF
Volume 2-Year = (0.80 cfs)(25 min)(60 sec/min) / 2 = 600 CF

PROPOSED VOLUME IN SEEPAGE PITS

Seepage Pit Volume = (3-feet radius^2)(3.14)(3-feet high) x 4 pits = 339 CF
Stone Volume = ((24-feet x 24-feet x 4.83-feet) – 340 CF) x 30% voids = 733 CF
Total Volume = 1,072 CF

PROPOSED RUNOFF FROM SEEPAGE PITS

Volume in Seepage Pits = 1,072 CF > 100 Year Volume into Seepage Pits = 1,013 CF
Therefore 100 Year Runoff = 0 cfs

SEEPAGE PIT DRAIN TIME

Per Bergen County Soils Survey, DVA-Dunellen Urban Land Permeability Rate 0.6-6.0 in/hr (average 3 in/hr)
Seepage Pits/Stone height = 4.83-feet (58-inches)
Drain time = (58-inches / 3 in/hr)(factor safety 2.0) = approximately 39 hours

APPENDIX C: PIPE CALCULATIONS

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan

Project File: New.stm	Number of lines: 1	Date: 8/20/2020

Storm Sewers v2019.20

Pipe Calc

Line No.	Inlet ID	Line ID	Gnd/Rim El Up (ft)	Line Length (ft)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	i Inlet (in/hr)	Incr Q (cfs)	Total Area (ac)	Tc (min)	i Sys (in/hr)	Total Runoff (cfs)	Known Q (cfs)	Flow Rate (cfs)	Capac Full (cfs)	Line Size (in)	Line Slope (%)	Vel Ave (ft/s)	Invert Up (ft)	Invert Dn (ft)	n-val Pipe
1	A1	P1	64.70	73.0	0.06	0.90	10.0	6.95	0.38	0.06	10.0	6.95	0.38	0.00	0.38	4.72	12	1.04	2.41	62.78	62.02	0.010

Project File: New.stm | Number of lines: 1 | Date: 8/20/2020

NOTES: Intensity = 102.61 / (Inlet time + 16.50) ^ 0.82 -- Return period = 25 Yrs. ; ** Critical depth

APPENDIX D: SOILS INFORMATION

DVA Dunellen-Urban land complex, nearly level

This unit consists of nearly level well drained Dunellen soils and Urban land. It occurs throughout the county, between the Ramapo River and the Palisades range, on broad outwash plains or stream terraces. Individual areas are dominantly irregular or oval in shape. Most areas are between 5 to 185 acres in size. Slopes range from 0 to 3 percent. The Dunellen soils and Urban land occur in such intricate patterns or small areas in this unit that they could not be shown separately on the soil map. This complex consists of about 55 percent Dunellen soils, 30 percent Urban land and 15 percent other soils.

Typically, Dunellen soils have a very dark grayish brown loam surface layer about 6 inches thick. The subsoils is about 29 inches thick. The upper 10 inches is friable, dark yellowish brown loam. The lower 19 inches is friable, brown loam. The substratum is stratified reddish brown gravelly sand, and loamy sand and brown sandy loam to a depth of 66 inches. In some areas in the Northern Valley the lower subsoil and substratum contain thick layers of silt and very fine sand that are frequently saturated.

Urban land consists of areas with an impervious surface such as buildings, paved driveways or parking lots, patios and paved walkways.

Included in mapping are narrow areas of Dunellen soils that are greater than 2 percent slopes, small areas of poorly drained Pascack soils in depressions or adjacent to water courses, and areas of soil having gray mottles in the subsoil and substratum between 18 and 40 inches below the surface. Also included are Riverhead soils west of Saddle River and in the northern part of the county. Included soils make up about 15 percent of the mapped acreage.

Permeability of the Dunellen soils is moderate or moderately rapid in the subsoil and rapid in the substratum. Surface runoff is slow in the Dunellen part of the complex and very rapid in the Urban land part. The hazard of erosion is slight. The available water capacity is moderate. In unlimed areas, the reaction is very strongly or strongly acid in the surface and subsoil layers and strongly or moderately acid in the lower subsoil and substratum layers. Frost action is moderate.

Areas of this complex are used for single family residential uses. Individual lots vary in size from primarily 1/4 acre or less in the central and southeastern parts of the county up to 1 acre in the northeast and western parts of the county.

The rapid permeability in the substratum and the moderate potential frost action are the major limiting factors for community and recreational facilities development. There are limitations for the installation of on-site sanitary disposal

facilities due to the soils rapid permeability and the potential for waste disposal effluent to contaminate the ground water. Downslope movement of water along the top of the subsoil or stratified substratum is also a limitation for dwillings with basements. There are slight limitations for lawns and landscaping.

Land capability subclass is not assigned.

UR Urban land

This unit is nearly level or gently sloping. It occurs throughout the survey area except in the boro of Alpine and west of the Mahwah River in the boros of Mawah and Oakland. Individual areas are irregular in shape and range from 5 to more than 750 acres in size. Slopes range from 1 to 5 percent.

This unit has been cut or filled and covered with an impervious surface such as paving materials or buildings over 85 percent of the areas.

Included in mapping are high density residential areas that are less than 85 percent covered and contain reworked soil material or Udorthents. In the Meadowlands area, the soils are either Udorthents, loamy or Udorthents, wet substratum. Included areas make up about 25 percent of the unit.

This unit is used for commercial and industrial development such as shopping malls and office building complexes. Some areas are utilized for central school sites.

Capability subclass is not assigned.

TABLE J.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH					Pct
Ad---------- Adrian	0-25	---	0.30-0.55	0.2-6.0	0.35-0.45	5.6-7.3	----------	----	4	2	55-75
	25-66	1-4	1.40-1.75	6.0-20	0.05-0.07	6.1-7.3	Low----------	0.15			
BoB, BoC, BoD, BoE---------- Boonton	0-6	7-15	1.30-1.45	0.6-2.0	0.11-0.16	4.5-5.5	Low----------	0.37	3	5	2-4
	6-23	10-18	1.55-1.65	0.6-2.0	0.08-0.19	4.5-6.0	Low----------	0.37			
	23-41	7-15	1.65-1.80	<0.2	0.06-0.10	5.6-6.5	Low----------	0.28			
	41-66	5-15	1.55-1.65	0.06-2.0	0.05-0.16	5.6-7.3	Low----------	0.37			
BrB, BrC, BrD---- Boonton	0-6	7-15	1.45-1.60	0.6-2.0	0.11-0.19	4.5-5.5	Low----------	0.37	3	8	2-4
	6-23	10-18	1.55-1.65	0.6-2.0	0.08-0.19	4.5-5.5	Low----------	0.37			
	23-41	7-15	1.65-1.75	<0.2	0.06-0.10	5.1-6.5	Low----------	0.28			
	41-66	5-15	1.55-1.65	0.06-2.0	0.05-0.16	5.6-7.3	Low----------	0.37			
BsB*, BsC*, BsD*, BsE*:											
Boonton--------	0-6	7-15	1.45-1.60	0.6-2.0	0.11-0.19	4.5-5.5	Low----------	0.37	3	8	2-4
	6-23	10-18	1.55-1.65	0.6-2.0	0.08-0.19	4.5-5.5	Low----------	0.37			
	23-41	7-15	1.65-1.75	<0.2	0.06-0.10	5.1-6.5	Low----------	0.28			
	41-66	5-15	1.55-1.65	0.06-2.0	0.05-0.16	5.6-7.3	Low----------	0.37			
Rock outcrop.											
BUB*, BUC*, BUD*, BUE*:											
Boonton--------	0-6	7-15	1.30-1.45	0.6-2.0	0.11-0.16	4.5-5.5	Low----------	0.37	3	5	2-4
	6-23	10-18	1.55-1.65	0.6-2.0	0.08-0.19	4.5-6.0	Low----------	0.37			
	23-41	7-15	1.65-1.80	<0.2	0.06-0.10	5.6-6.5	Low----------	0.28			
	41-66	5-15	1.55-1.65	0.06-2.0	0.05-0.16	5.6-7.3	Low----------	0.37			
Urban land.											
Ca---------- Carlisle	0-66	---	0.13-0.23	0.2-6.0	0.35-0.45	4.5-7.8	----------	----	5	2	>70
DuB, DuC, DuD---- Dunellen	0-3	5-20	1.10-1.30	2.0-6.0	0.13-0.16	4.5-5.5	Low----------	0.24	3	---	2-4
	3-26	5-18	1.20-1.40	0.6-6.0	0.10-0.20	4.5-5.5	Low----------	0.32			
	26-66	5-15	1.30-1.50	>6.0	0.05-0.10	5.1-6.0	Low----------	0.24			
DVA*, DVB*, DVC*, DVD*:											
Dunellen-------	0-3	5-20	1.10-1.30	2.0-6.0	0.13-0.16	4.5-5.5	Low----------	0.24	3	---	2-4
	3-26	5-18	1.20-1.40	0.6-6.0	0.10-0.20	4.5-5.5	Low----------	0.32			
	26-66	5-15	1.30-1.50	>6.0	0.05-0.10	5.1-6.0	Low----------	0.24			
Urban land.											
FL. Fluvaquents											
HaB---------- Haledon	0-8	10-25	1.20-1.40	0.6-2.0	0.16-0.20	5.1-6.0	Low----------	0.28	3	---	2-4
	8-31	10-20	1.30-1.50	0.6-2.0	0.14-0.19	5.1-6.0	Low----------	0.43			
	31-43	10-20	1.60-1.80	0.06-0.6	0.06-0.10	5.6-7.3	Low----------	0.24			
	43-66	10-20	1.30-1.50	0.06-0.6	0.06-0.10	5.6-7.3	Low----------	0.20			
HbB---------- Haledon	0-8	10-25	1.20-1.40	0.6-2.0	0.16-0.20	5.1-6.0	Low----------	0.24	3	---	2-4
	8-31	10-20	1.30-1.50	0.6-2.0	0.14-0.19	5.1-6.0	Low----------	0.43			
	31-43	10-20	1.60-1.80	0.06-0.6	0.06-0.10	5.6-7.3	Low----------	0.24			
	43-66	10-20	1.30-1.50	0.06-0.6	0.06-0.10	5.6-7.3	Low----------	0.20			
HuB*:											
Haledon---------	0-8	10-25	1.20-1.40	0.6-2.0	0.16-0.20	5.1-6.0	Low----------	0.28	3	---	2-4
	8-31	10-20	1.30-1.50	0.6-2.0	0.14-0.19	5.1-6.0	Low----------	0.43			
	31-43	10-20	1.60-1.80	0.06-0.6	0.06-0.10	5.6-7.3	Low----------	0.24			
	43-66	10-20	1.30-1.50	0.06-0.6	0.06-0.10	5.6-7.3	Low----------	0.20			
Urban land.											
HvA---------- Hasbrouck	0-7	15-25	1.40-1.60	0.6-2.0	0.15-0.22	4.5-6.5	Low----------	0.37	4	---	3-5
	7-29	20-30	1.50-1.65	0.6-2.0	0.08-0.18	4.5-6.5	Low----------	0.37			
	29-40	10-20	1.65-1.85	<0.2	0.06-0.10	5.6-6.5	Low----------	0.24			
	40-66	3-10	1.50-1.65	0.6-6.0	0.05-0.12	6.1-7.8	Low----------	0.24			
HzB---------- Hibernia	0-6	7-15	1.22-1.35	0.6-2.0	0.10-0.16	3.6-5.5	Low----------	0.28	3	---	2-5
	6-30	10-18	1.25-1.42	0.6-2.0	0.10-0.16	4.5-5.5	Low----------	0.32			
	30-46	5-15	1.55-1.70	0.06-0.2	0.06-0.10	4.5-5.5	Low----------	0.28			
	46-66	5-10	1.50-1.75	6.0-20	0.06-0.09	4.5-5.5	Low----------	0.17			

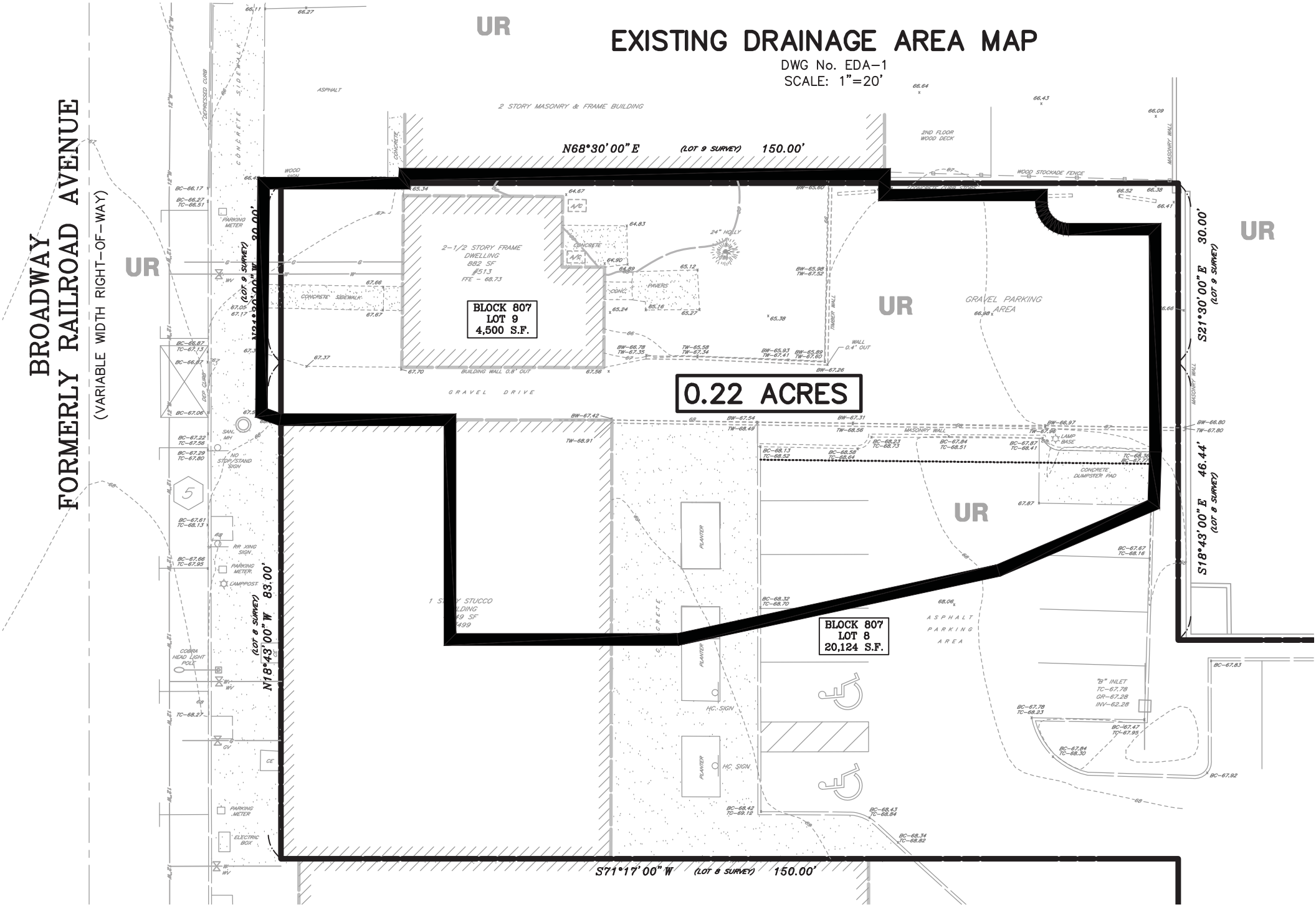
TABLE K.--SOIL AND WATER FEATURES--Continued

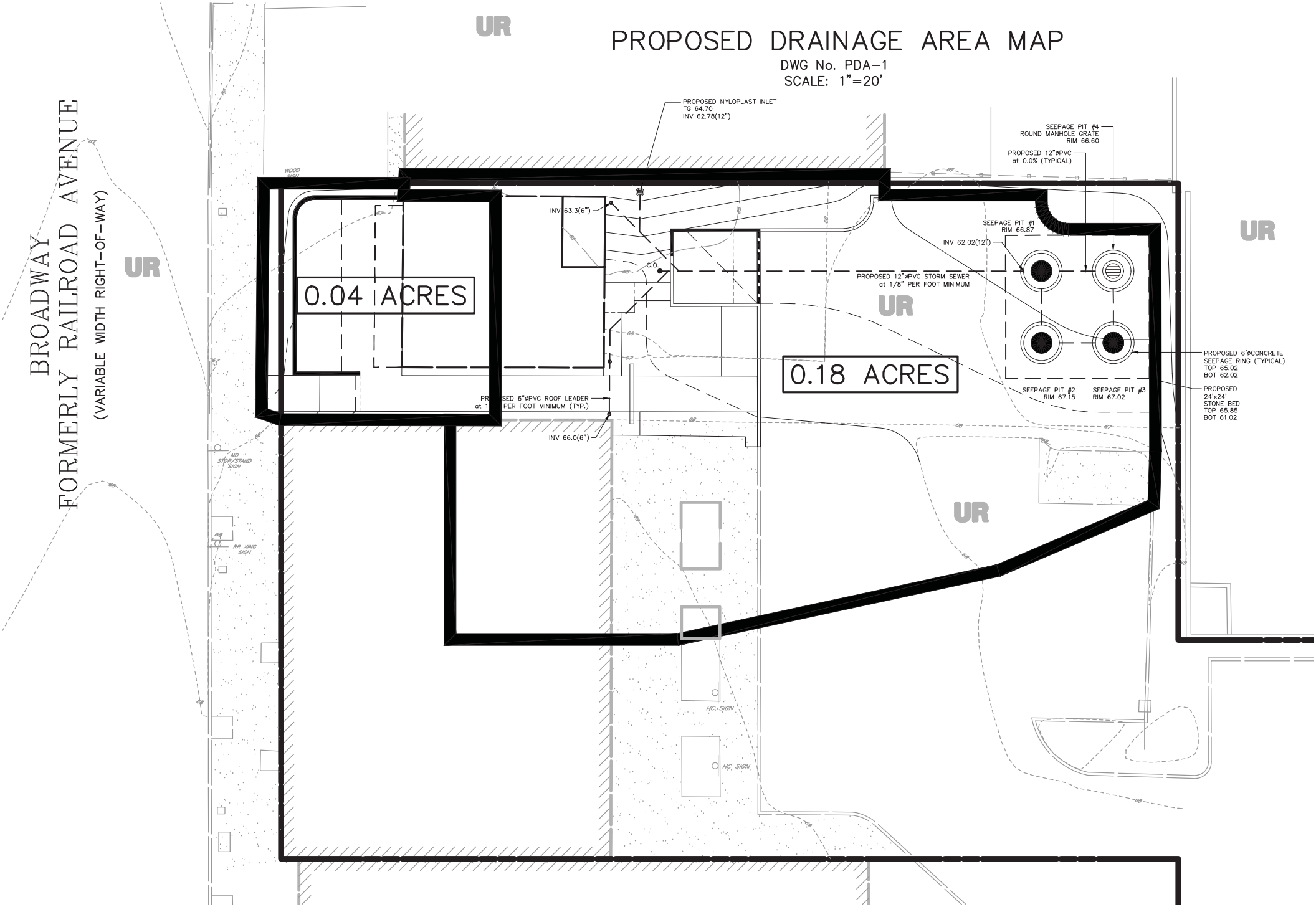
Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Subsidence: Initial	Subsidence: Total	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In	In		
Sulfaquents.											
Ua, Ub. Udorthents											
Uc*: Udorthents.											
Urban land.											
Ud, Ue. Udorthents											
Uf*: Udorthents.											
Urban land.											
UR*. Urban land											
WeB, WeC, WeD, WeE, WrD------ Wethersfield	C	None-------	---	---	1.5-2.5	Perched	Feb-Apr	---	---	Low------	Moderate.
WsB*, WsC*, WsD*, WsE*: Wethersfield-	C	None-------	---	---	1.5-2.5	Perched	Feb-Apr	---	---	Low------	Moderate.
Rock outcrop.											
WUB*, WUC*, WUD*: Wethersfield-	C	None-------	---	---	1.5-2.5	Perched	Feb-Apr	---	---	Low------	Moderate.
Urban land.											

DRAINAGE AREA MAPS

EXISTING DRAINAGE AREA MAP

DWG No. EDA–1
SCALE: 1"=20'



PROPOSED DRAINAGE AREA MAP

DWG No. PDA-1
SCALE: 1"=20'