## Utility Analysis

The following report is submitted relating to the Site Plan entitled, "Planned Unit Development, Preliminary Master Plan, XMBLY, Somerville, Massachusetts", dated March 2018.

For the Site Location Map, refer to Figure 3.1.
For existing utilities referenced in this report please refer to the drawing in the Appendix A - Civil Site Plans, entitled:
$>$ Existing Conditions Plan of Land, SV-1, dated November 2017.
$>$ For proposed utilities referenced in this Chapter please refer to the drawings in the Appendix A - Civil Site Plans, entitled:
> Grading, Drainage, and Erosion Control Plan, C-4, dated March 2018
> Utility Plan, C-5, dated March 2018

### 6.1 Study Description

This analysis describes the existing and proposed on-site and surrounding utility infrastructure supporting the proposed XMBLY development (the "Project") at 5 Middlesex Avenue, Somerville, MA (the "Site"). The Site was partially developed as part of the Assembly Square Development and its various phases. The report uses and makes references to the previously submitted Utility Analysis prepared by VHB as part of the Assembly Square Amended Preliminary Master Plan, Planned Unit Development submitted to the City in May 2014 which relied upon the Assembly Square Development Utility Analysis confirmed and updated the findings in a report by Green International Affiliates, In., ("GIA"), which analyzed for the Somerville Office of Housing and Community development ("OHCD"), all existing utilities, and future improvements within the Assembly Square Revitalization Area ("ASRA"). The GIA report was completed in November 2001 and entitled "Utility Analysis Report ("UAR") for Assembly Square Revitalization Area Somerville, Massachusetts".

Existing utilities and associated infrastructure within the Site and surrounding roadways were obtained from actual on the ground survey performed by VHB in November 2017 supplemented by additional subsurface investigations, field observation and information of record.

This report was prepared using information in the 2014 AMP-PUD submission and 2001 GIA report. This report contains all the utility existing information, data and
analyses that are valid for current conditions. This report identifies the availability and adequacy of the existing utility facilities and infrastructure that will serve Blocks $21,23,24,25$, and 26 of the Project.

### 6.2 Water Supply and Distribution

The City of Somerville owns and maintains the public water distribution system that services the ASRA. The City's water distribution system supplies both domestic and fire protection water to the area. The following sections describe the existing water system surrounding the Project Site and its capability to service the proposed development.

### 6.2.1 Existing

This existing water system is part of a City-wide interconnected network that is supplied by the Massachusetts Water Resources Authority ("MWRA") through seven metered connections. The City is supplied by both MWRA's high service and low service pressure systems. The water distribution system within the Assembly Square area is part of the City's low service system.

MWRA Meter 91 is located at the intersection of the Fellsway West and Middlesex Avenue and provides the closest supply of water to the Assembly Square area from a 48-inch cast iron water main located in Middlesex Fells Parkway ("Fellsway"). The City does not have any water storage facilities or any pumping stations that service this area.

The water distribution system surrounding the Site is described as follows:
> The primary connection to the MWRA meter is a 20-inch diameter cast iron main installed in 1925 by the City within and along Middlesex Avenue.
$>$ Several branch lines of varying diameter feed off the 20 -inch main between Middlesex Avenue and the Fellsway.
$>$ A new 20-inch water main from the existing 20-inch water main in Middlesex Avenue, continues along Grand Union Boulevard to Foley Street then continues west along Foley Street to Middlesex Avenue where the new 20 -inch water main is looped into the existing 20 -inch water main in Middlesex Avenue. The newly constructed 20-inch main in Foley Street replaced the existing 12-inch water main installed in 1928 as part of the infrastructure improvements for the Assembly Row.
> Water mains were extended ranging in size from 8 to 20 -inch, from the newly constructed 20-inch water main in Grand Union Boulevard along Artisan Way, Great River Road, Canal Street, Foley Street and Revolution Drive where they are interconnected to create multiple looped systems.
> The remainder of the system along Foley Street, Grand Union Boulevard and Mystic Avenue consist of a 12 -inch diameter pipe interconnected to create several loops.

### 6.2.2 Required Water Demands

## Projected Water Use

Estimates of water demand have conservatively been determined assuming water use is equivalent to wastewater flows calculated in accordance with Massachusetts Department of Environmental Protection ("MassDEP") Wastewater Design Flows in 314 CMR 7.15. However, these flows are likely to be reduced in recognition of Proponent's commitment to implement water conservation measures and maximizing water efficiency within building during the design development phase for each Block. In all cases, the City's water distribution system is anticipated to provide sufficient capabilities to meet the normal daily peak demands of the Project.

The projected water consumption rates used to calculate Maximum Projected Water Flow below assume water use to be equivalent to wastewater flows calculated in accordance with the MassDEP Wastewater Design Flow Guidelines in 314 CMR 7.15, generally as follows:
> Office Space/Lab/Research \& Development: 75 gallons per day per 1,000 square feet
> Apartments: 110 gallons per day per bedroom
> Retail: 50 gallons per day per 1,000 square feet
> Restaurant: 35 gallons/seat
Because the DEP wastewater design flows are considered very conservative in relation to actual flow volumes, therefore, no increase in water consumptive rates have been applied to these figures.

Table 6-1 - Maximum Projected Water Use

|  | Unit - Wastewater <br> Rate (GPD) | Total Size of <br> Building Program | Water Use 100\% of <br> Wastewater Rate (GPD) |
| :--- | :---: | :---: | :---: |
| Land Use | $75 / 1,000$ SF | $786,000 \mathrm{SF}$ | 58,950 |
| Office/Lab/Research |  |  |  |
| \& Development* | 110/bedroom | 674 Bedrooms | 74,140 |
| Residential | $50 / 1,000 \mathrm{SF}$ | $20,000 \mathrm{SF}$ | 1,000 |
| Retail | 35/seat | 238 seats | 8,330 |
| Restaurant | $50 /$ person/shift | 8 people/ | $800 \_$ |
| Fire Station |  | 2 shifts |  |
| Total |  | $\mathbf{1 4 3 , 2 2 0}$ |  |

*Program excludes the flow produced for the existing 162,000 SF office building and historic flow from the former cinema

Utility Analysis

## Fire Flow Demand

The water system within the Site provides both domestic and fire flow water supply. The City's existing water distribution network within this area has, on average, fire hydrants located 300 feet apart throughout the entire area. This spacing meets the typical maximum recommended distance between hydrants in an urban setting.

The minimum Needed Fire Flow ("NFF") for MWRA Meter 91 and maximum Insurance Services Office ("ISO") requirements for a Community are:

Fire Flowrate
Estimated minimum NFF requirements to be supplied by MWRA for meter 91 : 2,000 gpm

Maximum requirements a community is required to supply according to the ISO:
$3,500 \mathrm{gpm}$
The required minimum residual pressure at any location within the distribution system during a fire flow situation is 20 psi.

### 6.2.3 Proposed Water

A hydraulic analysis was also performed on the City water system as part of the Assembly Row PUD-PMP that indicates the existing municipal water system has sufficient capacity for existing maximum daily demands plus a 3,500 gpm fire flow demand while maintaining greater than the minimum required pressure of 20 pounds per square inch ("psi") throughout the system. Independent hydrant flow tests conducted in Foley Street verify the existing available flows, pressures, and the ability to accommodate the added load.

A fire flow of $3,500 \mathrm{gpm}$ is the maximum flow a community is required to supply according to the ISO standards.

Based on VHB's analysis, the Future Maximum Day Demand and 3,500 gpm fire flow can be achieved within the Site after the proposed water improvements are constructed.

The Project proposes the following water mains and service connections:
> A proposed 12 -inch water main in proposed "Road K" that creates a loop through the Site connecting the City of Somerville's 20 -inch main in Foley Street to the existing 12-inch main in Revolution Drive.
> Block 21 connection into the City of Somerville's 20-inch main in Foley Street and into the proposed 12 -inch main in "Road K" for domestic and fire services.
> Block 23 connection to the proposed 12-inch main in "Road K" and to the existing 12 -inch main in Revolution Drive for domestic and water services.
> Block 24, the existing building at 5 Middlesex Avenue, will maintain its existing service connections to Mystic Avenue.
> Block 25 , connection directly into the proposed 12 -inch main in "Road K" for domestic and fire services.
> Block 26, connection to the existing 12-inch main in Revolution Drive or into the proposed 12 -inch main in "Road K" for domestic and fire services.

### 6.3 Sanitary Sewer

The City of Somerville Owns and maintains the sanitary sewer system in the ASRA. The sanitary sewer is a separated system with storm drainage collected in an independent system.

### 6.3.1 Existing

The ASRA sewer shed begins with an eight-inch sewer main at the north end of ASRA. The sewer trunk line flows from North to South within Grand Union Boulevard gradually increasing to an 18 -inch at the intersection of Foley Street and Grand Union Boulevard. The trunk line continues to flow within Grand Union Boulevard towards the southern end of the ASRA, where the sewer system connects into a 24inch pipe on North Union Street prior to discharging to the City of Somerville Regulator Manhole, which is the connection to the MWRA system.

During the permitting for the Assembly Row development, the total peak sewer flows were projected for the full-buildout of the Assembly Row development which was calculated to generate approximately 3.11 million gallons per day (MGD). The 18-inch sewer trunk line has a design capacity of approximately 5.1 MGD at a slope of approximately 0.003 with an average velocity of 5 feet per second.

### 6.3.2 Proposed

The average daily wastewater flows rates are based on MassDEP, Sewer System Extension and Connection, regulation 314 CMR 715. The proposed land use areas and calculated flow rates are shown on Figure 6.1.

The existing 18 -inch trunk line sewer system has adequate capacity to accept the proposed peak flows of the XMBLY Development. All four (4) proposed development blocks (Blocks 21, 23, 25, and 26) will be serviced via connections into the proposed 8 -inch sewer main within "Road K " or to a proposed 8 -inch sewer main flowing west to east within the proposed "Road L", and connect into the existing 18 -inch trunk line in Grand Union Boulevard. The existing 18 -inch sewer trunk line will have enough capacity to handle all peak sewer demands of the Proposed Development with an excess capacity of approximately 1.0 MGD +/-. The

Grand Union Boulevard sewer trunk line ultimately flows southerly within Grand Union Boulevard to a $3^{\prime} 3^{\prime \prime}$ by $3^{\prime}-11^{\prime \prime}$ MWRA sewer interceptor near North Union Street. The MWRA interceptor conveys flow to the Charlestown Pumping Station and eventually to the Deer Island Treatment Plant. The Project will increase wastewater flows to the MWRA interceptor sewer.

### 6.3.3 Sewer Mitigation

The City of Somerville requires Inflow and Infiltration ("I\&|") improvements for developments with greater than 2,000 GPD of sewer flow. The policy requires the proponent to remove or cause the removal of a minimum of four (4) gallons of I/I flow for each gallon of new wastewater generated. Alternatively, the City has created a mitigation fund which provides developers the option to contribute to the fund in lieu of performing infrastructure improvements. The Proponent will work closely with the City to determine the I\&I mitigation for the Project through the PUD and Special Permit processes.

### 6.4 Stormwater

### 6.4.1 Existing Drainage Conditions

The Project Site was previously covered with existing buildings and parking lots or areas that were previously developed with buildings and since been demolished. The Site is generally flat, ranging from approximate elevation 9.0 feet (NGVD) to 14.0 feet (NGVD) except for the eastern edge of the Site that has a 3:1 slope up to an elevation of 14.0 feet (NGVD) to transition into Grand Union Boulevard. Much of the Site is covered by impervious parking or near-impervious surfaces with minimal landscape islands or features. Much of pervious area is found adjacent to Grand Union Boulevard. See Plan Sv-1 Existing Conditions Plan of Land in Appendix A.

The existing on-site drainage systems collect and convey stormwater runoff from the impervious areas via a closed drainage system of catch basins, pipes, and manholes, that connects into the existing stormwater infrastructure in the abutting streets. The eastern half of the Site conveys the stormwater runoff to the existing stormwater infrastructure in Foley Street and Grand Union Boulevard which flows East to the recently built 72-inch drainage outfall and ultimately discharging to the Mystic River downstream of the Amelia Earhart Dam. The western half of the Site conveys the stormwater runoff to the existing stormwater infrastructure near the intersection of Foley Street and Middlesex Avenue which flows North to the existing 84-inch drainage outfall and ultimately discharging in the Mystic River upstream of the Amelia Earhart Dam. See Figure 6.3 Existing Drainage Areas for the Site's existing drainage boundaries.

NRCS Soil Maps for Middlesex County (NRCS Web Soil Survey, 12-21-2017) show the existing soils to be Urban Land with wet substratum (603) and Udorthents with wet substratum (655) (see Figure 6.2). Geotechnical information available at the time
of this memo classify the soils as hydrologic soils group $D$, which has low infiltration potential. The cover condition and soils present in the Site result in minimal infiltration of stormwater under existing conditions. Areas to the North and East of the Site that were historically occupied with railroad and manufacturing facilities were redeveloped into mixed-use buildings that were required to limit infiltration during redevelopment.

### 6.4.2 Proposed Stormwater Management System

An overall goal of the Project is to provide a comprehensive stormwater management system designed to enhance the water resources both on the Site and downstream. The analysis outlined in this section concludes that the Project will vastly improve the existing conditions on the Site and accomplish this goal by:
> Implementing an environmentally sensitive site design that creates additional open space areas and significantly reduces the amount of onsite paved surface parking areas thereby re-establishing components of a natural water cycle (evapotranspiration, groundwater recharge and runoff) on the Site.
> Improving the surface water and groundwater quality by implementing integrated stormwater controls throughout the Project area including the use of Low Impact Development (LID) techniques, where feasible, as well as traditional stormwater Best Management Practices (BMPs) combined with a thorough Operation and Maintenance Plan.
> The stormwater management system is designed to attenuate the peak rate and volume of runoff to meet existing conditions.

The Project, under proposed conditions, maintains the existing hydrologic conditions and corresponding drainage subwatersheds. The eastern half of the Site will convey stormwater runoff to the 72 -inch outfall and the western half of the Site will convey stormwater runoff to the 84 -inch outfall. The Project shall install new drainage infrastructure within the proposed "Road K" and "Road L". Roof drains from the proposed buildings and site drainage associated with the five (5) blocks will connect directly into the existing drainage infrastructure in Revolution Drive, Grand Union Boulevard, Middlesex Avenue, and Foley Street, or into the proposed drainage infrastructure in "Road K" and "Road L". See Figure 6.4 Proposed Drainage Areas for the Site's proposed drainage area boundaries.

Stormwater runoff from the Site will be collected in a series of deep-sump catch basins with oil/debris traps and treated by proprietary particle separators and nonstructural BMPs before discharging to either the 72 -inch trunk line or to the 84-inch outfall. Regular sweeping programs for roads, parking, and loading areas, and a scheduled catch basin cleaning program will be proposed for pollutant source reduction. LID stormwater management techniques and BMPs will be incorporated into the design as much as possible for stormwater quality and temperature control as the design development of each block progress.

Utility Analysis

A Long-Term Operations and Maintenance ("O\&M") Plan will be prepared in future Special Permit and Subdivision applications. The O\&M Plan will provide detailed procedures and a schedule for maintaining each of the BMPs. It is anticipated that the O\&M plan will be formalized in an agreement with the City to maintain the proposed BMPs.

Refer to Plan C-4 Grading, Drainage, and Erosion Control Plan in Appendix A for the proposed drainage infrastructure in the Site and in the proposed roadways. After the PUD-PMP process, the Project will submit more detailed plans and information regarding the water quality design and stormwater runoff mitigation analysis as part of the Subdivision of Land, Proposed Roadway Applications, and Special Permit Applications on a Block by Block basis.

### 6.5 Private Utilities

The follow sections describe the existing and proposed private utilities surrounding the XMBLY Site:

### 6.5.1 Gas

Gas services to the Site are provided by National Grid. The existing gas lines surrounding the Site are as follows:
> 12-inch gas main running north-south along the centerline of Middlesex Avenue
> 20-inch gas main along the centerline of Mystic Avenue
> 8 -inch gas main running east-west along Foley Street
> 12-inch existing gas line that on the eastern part of the Site that continues south on Grand Union Boulevard and east on Revolution Drive.

There are no gas services on Revolution Drive west of Grand Union Boulevard.
Service to all Blocks will be provided from existing gas mains surrounding the Site. Refer to Plan C-5 Utility Plan in Appendix A for potential gas connections to each of the four proposed blocks. Block 24, which is the existing office building, will maintain its existing gas connections to Mystic Avenue.

### 6.5.2 Electrical

There are several existing electric duct banks and manholes surrounding the Site in Middlesex Avenue, Foley Street, and Revolution Drive. Eversource provides the electricity for the ASRA.

Electric conduits run east-west on the northern side of Foley Street, with an electric manhole ("EMH") at the northeast corner of Foley Street and Middlesex Avenue intersection. This EMH can be utilized as a proposed connection point for Block 21.

The Project proposes to connect a new electrical duct bank to an existing EMH at the northeast corner of the "Road L" and Grand Union Boulevard intersection, run the proposed duct bank east-west along "Road L", and split the duct bank north and south along "Road K" and connect into the existing electrical duct bank in Revolution Drive. This new electrical duct bank will be used to service Blocks 21, 23, 25, and 26. See Plan C-5 Utility Plan in Appendix A.

There are also several existing EMHs are located on the eastern edge of Middlesex Avenue that can be used as proposed connection points for Blocks 21.

The existing building at Block 24 will maintain its existing electrical connections.
VHB will design the conduit and manhole system in conjunction with Eversource in order to accommodate the Project's required electrical infrastructure.

### 6.5.3 Telephone Communications and Cable

Verizon, Comcast, and RCN provide telephone communication services to the Project Area. The system consists solely of underground duct banks. Telecom conduits are located along Grand Union Boulevard, east of the Site, including combined telecom manholes ("TMH") for Comcast, RCN, and Federal Realty owned house conduits, and separate TMHs for Verizon. A pair of these manholes are located just east of Block 23 on Grand Union Boulevard. A combined RCN and Comcast duct bank and series of manholes begin on Middlesex Avenue just west of Block 21, running north along Middlesex. This duct bank splits north and east at the intersection of Middlesex and Foley Street through a TMH. The RCN/Comcast duct bank runs east/west along the south side of Foley Street north of the Project and bends south onto Grand Union Boulevard.

Under proposed conditions, a new duct bank for RCN, Comcast, and Verizon conduits is proposed to be constructed along Roads "K" and "L" to provide service to each individual block. The proposed conduits would connect into the north side of the RCN/Comcast/FRIT and Verizon TMHs in Grand Union Boulevard, run north along Grand Union Boulevard, bend west down the intersection of "Road L" and Grand Union Boulevard, and run west/east in "Road K". These new telephone duct banks will be used to service Blocks 21, 23, 25, and 26. The ductbanks will terminate at proposed TMHs at either end of "Road K". See Plan C-5 Utility Plan in Appendix A.

The existing building at Block 24 will maintain its existing electrical connections.
VHB will design the conduit and manhole system in conjunction with Verizon, Comcast, and RCN to accommodate the required telephone communication infrastructure.

## Chapter 6 Figures

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VHB
101 Walnut Street
Watertown, MA 02172
(617) 924-1770

Figure 6.1-Projected Sewer Flows and I/I Mitigation
Project: XMBLY Planned Unit Development Proj. No.:
Proj. No:
Computed by:
Checked by:
14000.00

3/1/2018
DAH
RH

| Block | Use | Area ${ }^{1}$ (SF) | Unit | Bedroom | Quantity | Unit Flow ${ }^{3}$ (Gal/Unit) | Average Flow (GPD) | Total Block <br> Flow (GPD) | Total <br> Development Flow (GPD) | New Sewer Flow ${ }^{45}$ (GPD) | Required I/I 4:1 Mitigation (GPD) | Comments |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Block 21 | Retail | 17,000 | 1000 SF |  | 17.0 | 50 | 850 | 53,600 | 155,370 | 143,220 | 572,880 |  |
|  | Restaurant ${ }^{2}$ | 3,000 | seat |  | 100 | 35 | 3,500 |  |  |  |  |  |
|  | Office/Lab/R\&D | 646,000 | 1,000 SF | - | 646 | 75 | 48,450 |  |  |  |  |  |
|  | Fire Station | 16,000 | person/2 shifts | - | 16 | 50 | 800 |  |  |  |  |  |
| Block 23 | Residential | 324,000 | Bedroom | 424 | 424 | 110 | 46,640 | 51,470 |  |  |  | 329 units |
|  | Restaurant ${ }^{2}$ | 4,140 | seat |  | 138 | 35 | 4,830 |  |  |  |  |  |
| Block 24 | Office/Lab/R\&D | 162,000 | 1,000 SF | - | 162 | 75 | 12,150 | 12,150 |  |  |  | Existing Building Program (modified |
| Block 25 | Apartments | 187,000 | Bedroom | 250 | 250 | 110 | 27,500 | 27,650 |  |  |  | 167 units |
|  | Retail/Active | 3,000 | 1000 SF |  | 3.0 | 50 | 150 |  |  |  |  |  |
| Block 26 | Office/Lab | 140,000 | 1,000 SF |  | 140 | 75 | 10,500 | 10,500 |  |  |  |  |

Notes:

1) Retail/Active use space was allocated $15 \%$ restaurant. Building Program information taken from SGA Site Program dated 2/09/2018.
2) Restaurant seats are calculated based on 30 square feet per seat
3) Average flows for Massachusetts are based on 310 CMR 15: Title V. Fire Station Sewer Flow Rate assumed 50gal/person/shift
4) Excludes flows from existing building from Block 24
5) Sewer flows are conveyed into Grand Union Boulevard sewer main, which discharges into the Somerville/Medford MWRA Intercepter Sewer.

$\begin{array}{llllll}\mathrm{N} & 0 & 250 & 500 & 1000 & 1500\end{array}$ Meters

## MAP LEGEND

| Area of Interest (AOI) | $\square$ | C |
| :---: | :---: | :---: |
| Area of Interest (AOI) | $\square$ | C/D |
| Soils |  | D |
| Soil Rating Polygons |  |  |
| A | $\square$ | Not rated or not available |
| A/D | Water Features |  |
|  | $\sim$ | Streams and Canals |
| B |  |  |
|  | Transportation |  |
| B/D | H+ | Rails |
| C | $\sim$ | Interstate Highways |
| C/D | $\cdots$ | US Routes |
| D | $\approx$ | Major Roads |
| Not rated or not available | - | Local Roads |
| Soil Rating Lines | Background |  |
| $\cdots$ A |  | Aerial Photography |
| $\cdots$ A/D |  |  |
| $\cdots$ B |  |  |
| $\cdots$ B/D |  |  |
| $\cdots \mathrm{C}$ |  |  |
| $\cdots \mathrm{C} / \mathrm{D}$ |  |  |
| $\cdots$ D |  |  |
| * Not rated or not available |  |  |
| Soil Rating Points |  |  |
| $\square \quad \mathrm{A}$ |  |  |
| $\square \quad \mathrm{A} / \mathrm{D}$ |  |  |
| $\square \quad \mathrm{B}$ |  |  |
| - B/D |  |  |

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service Web Soil Survey URL
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 17, Oct 6, 2017

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts Survey Area Data: Version 13, Oct 6, 2017

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soi properties, and interpretations that do not completely agree across soil survey area boundaries

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 10, 2014—Aug 25, 2014

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

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
| :--- | :--- | :--- | ---: | ---: |
| 1 | Water |  | 220.2 | $15.5 \%$ |
| 602 | Urban land |  | 149.6 | $10.5 \%$ |
| 603 | Urban land, wet <br> substratum | Newport-Urban land <br> complex, 3 to 15 <br> percent slopes | D | 117.2 |


| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
| :--- | :--- | ---: | ---: | ---: |
| 1 | Water |  | 59.0 | $4.2 \%$ |
| 602 | Urban land, 0 to 15 <br> percent slopes | 0.1 | $0.0 \%$ |  |
| 603 | Urban land, wet <br> substratum, 0 to 3 <br> percent slopes |  | 111.3 | $7.8 \%$ |
| $627 C$ | Newport-Urban land <br> complex, 3 to 15 <br> percent slopes | B | 9.9 | $0.7 \%$ |
| 628 C | Canton-Urban land <br> complex, 3 to 15 <br> percent slopes | A | 9.4 | $0.7 \%$ |
| 655 | Udorthents, wet <br> substratum |  | $\mathbf{2 1 . 4}$ |  |
| Subtotals for Soil Survey Area | $\mathbf{2 1 1 . 3}$ | $\mathbf{1 . 5 \%}$ |  |  |
| Totals for Area of Interest | $\mathbf{1 , 4 2 0 . 8}$ | $\mathbf{1 4 . 9 \%}$ |  |  |

## 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



