



Chapter 8

Utilities and Infrastructure

Introduction

This chapter describes the existing sanitary sewer, water supply, stormwater, natural gas, steam, electrical and telecommunications systems serving the Boston College campus. It includes consideration of any proposed improvements to these systems to meet current demands or serve future needs. The infrastructure evaluation is based on information from various utility companies provided by the Boston College Capital Planning and Engineering Group. The following pages describe the various infrastructure systems currently serving the campus, identify planned improvements, estimate future demands with the projects in the IMP and respond to the comments received on the IMPNF.

Boston College maintains its utility systems at a high level, performing regular inspection, evaluation and repair of existing systems. As a result, construction of separate utility systems for each proposed project will not be required. Because systems are generally already in place to serve the entire campus, only new connections will be needed between new or renovated buildings and the existing infrastructure systems.

Boston College is currently working with the Boston Water and Sewer Commission (BWSC), KeySpan, NSTAR and several engineering consultants to plan for the necessary utilities to serve facilities proposed in the IMP. The major efforts, which are underway, include:

- Evaluation of campus districts for the implementation of hot water and chilled water plants, with the objective of providing improved efficiency through district plants, while maintaining adequate redundancy and reliability.

- Modeling of storm water drainage for the current surface conditions and infrastructure, as well as build-out of the Institutional Master Plan proposed projects and planned infrastructure upgrades.
- Geotechnical evaluation of the Chestnut Hill and Brighton campuses to assess the feasibility of geothermal exchange wells.
- Campus-wide evaluation of existing and projected thermal and electrical loads to assess the feasibility of combined heat and power installations.

Sanitary Sewer System

Existing System Conditions

The existing sanitary sewer system within the Boston portion of the University campus is owned and maintained by Boston College. BWSC owns and maintains the sewer systems in the public streets surrounding the campus. As shown in Figure 8-1, the existing sewer collection system for the campus consists of two sewer networks.

Network 1 collects wastewater from the Brighton Campus and portions of the Lower and Middle campuses. A 10-inch sewer main in Commonwealth Avenue, which has a high point near the proposed Fine Arts District, splits and travels west to Lake Street and east to Greycliff Road. There is a 12-inch sewer main in Lake Street that increases in size to a 15-inch main as it flows to the north. The Greycliff Road sewer line is a 12-inch main that increases to 18 inches, and again to 30 inches, as it flows to the north. The two sewer mains combine north of the Brighton Campus in Lake Street into a 36-inch by 38-inch box culvert that flows northerly.

Network 2 collects wastewater generation from the Middle and Upper campuses via a 12-inch sewer main that flows westerly in Beacon Street. Several connections to this main collect the wastewater generated on the Newton section of the Boston College campus.

Both Network 1 and Network 2 wastewater flows are collected by BWSC systems that discharge to the MWRA's Brighton Branch Sewer, which flows to the MWRA High Level Sewer. That sewer ultimately discharges to the MWRA's Nut Island Treatment Plant.

Future Sewer Demand

Sewer demand for existing Boston College buildings and the proposed future projects outlined in this plan are compiled in Table 8-1. The sewage demands shown in this table are based on Massachusetts Department of Environmental Protection (DEP) Title V generation rates, which provide a common reference to compare the demand for the existing uses that will be removed and proposed new uses. Historically, these generation rates are higher than

observed flows for the campus as a whole, but provide a reasonable guideline for design of individual facilities.

Table 8-1 Summary of Sewer Generation (Based on Title V, Massachusetts DEP)¹

Network/Land Use	Title V Flow Unit	Title V Flow Rate	Sewer Flow (GPD)
SEWER NETWORK 1			
Reduce Existing (Through Demolitions)			
Administrative/Academic	182,851 sf	75 gpd/1000 sf	-13,714
Residential	975 beds	65 gpd/bed	-63,375
Total Reduction			-77,089
Add Demand			
Administrative/Academic	649,059 sf	75 gpd/1000 sf	48,679
Residential	1,770 beds	65 gpd/bed	115,050
Total Added Demand			163,729
Net New Demand			
Administrative	466,208 sf	75 gpd/1000 sf	34,966
Residential	795 beds	65 gpd/bed	51,675
Total Net New Demand			86,641
SEWER NETWORK 2			
Existing Office Flow			
Existing Residential Flow	65,141sf	75 gpd/1000 sf	-4,886
Total Existing Flow	0 beds	65 gpd/bed	0
Future Office Flow			
Future Residential Flow	425,000 sf	75 gpd/1000 sf	31,875
Total Future Flow	0 beds	65 gpd/bed	0
Net New Demand			
Administrative	359,859 sf	75 gpd/1000 sf	26,989
Residential	0 beds	65 gpd/bed	0
Total Net New Demand			26,989
Both Networks			
Administrative	826,067 sf	75 gpd/1000 sf	61,955
Residential	795 beds	65 gpd/bed	51,675
Total for Both Networks			113,630

Note: Future flows are based on the net change in land uses in the 10-year IMP. Only the changes in the areas served by the respective networks are included. Numbers of beds do not include 2000 Commonwealth Avenue, which is an existing building. The number of beds also include 75 units of faculty and graduate housing on Foster Street.

¹ Massachusetts DEP Title V sewage generation rates were used to determine flows. The “Office Building” rate of 75 gallons per day (gpd) per 1,000 square feet was used to estimate administrative building generation rates. The “Boarding Schools/Colleges” rate of 65 gpd per person (bed) was used to calculate sewer flows for residential buildings.

Based on the net new square footage of building area and net new number of beds in the proposed future projects, approximately 86,600 gpd will be generated to network 1 and approximately 27,000 gpd to network 2. Total net new demand to the BWSC system is projected to be approximately 113,600 gpd.

Proposed Sanitary Sewer Improvements

Proposed improvements to the sanitary collection system are primarily related to providing connection points and capacity for new projects. The design of new facilities contributing additional flows to the system, or necessitating connection to the municipal sewer main, will require review by BWSC, under its Site Plan Review Process, on a project-by-project basis.

Future flows from the Jesuit faculty and graduate housing, student housing, Recreation Center, University Center and Fine Arts District projects will be directed to Network 1. The portion of the Lower Campus that discharges to sewer Network 2 will likely require the relocation of existing private infrastructure to accommodate the construction of new buildings.

Boston College is evaluating a flow-monitoring program to verify actual flows in the existing sewers, assess available capacity, observe inflow/infiltration during storm events and verify if existing sewer infrastructure requires improvements.

Water Supply System

Existing System Conditions

The water supply for domestic use and fire protection services is supplied to Boston College by the Massachusetts Water Resources Authority (MWRA) and BWSC via water mains in Lake Street, Commonwealth Avenue and Beacon Street, as shown in Figure 8-2. Boston College owns and maintains all water supply system components within the campus, except mains just passing through (easements).

The Brighton Campus is served by a 12-inch main in Lake Street and a 16-inch main in Commonwealth Avenue. The Chestnut Hill Campus is served by a MWRA owned and maintained 36-inch water main in Beacon Street.

Boston College will perform hydrant flow tests in the vicinity of the campus. The test results will provide information required to adequately size any new water infrastructure for the proposed projects.

Future Water Demand

Domestic water demand is based on estimated sewage generation with an added factor of 10 percent for consumption, system losses and other uses. Based upon sewage generation rates outlined in Table 8-1, the proposed projects will require approximately an additional 125,000 gpd of domestic water.

Water conservation methods, such as low-flow fixtures, waterless urinals and grey water systems are being evaluated by Boston College on a project-by-project basis. These systems have been piloted successfully on campus. The BWSC has indicated that the existing water mains adjacent to the campus appear to have adequate capacity for the future demand. Based on the net new square footage of building areas and net new number of beds, several areas of the campus will demand more water, while a few areas will require minimal to no additional water. Areas with a substantial increase in demand for water include the More Hall site, Shea Field and the Brighton Campus. The Lower Campus Quadrangle area will experience only a minimal increase or no increase in water demand.

Proposed Water System Improvements

Proposed improvements to the water distribution systems are primarily related to providing connection points for new projects. The design of new facilities requiring additional demand, or necessitating connection to the municipal water main, will require review by BWSC, under its Site Plan Review Process, on a project-by-project basis.

Through conversations with BWSC and MWRA, the location and size of existing water mains can provide sufficient domestic water and fire protection services to each new building or building addition through new services from the existing or relocated water mains. Improvements to the Brighton Campus will provide the opportunity to install a fire protection loop and master metering as appropriate to assist in the implementation of water conservation methods.

The Lower Campus is served from BWSC infrastructure, and master metered via a sub-surface vault located in St. Thomas More Road. This vault may be affected by proposed improvements outlined in the IMP. Boston College anticipates close coordination during permitting and construction with BWSC and MWRA due to their facilities in the area.

Storm Drainage System

Existing System Conditions

The existing stormwater system on campus is owned and maintained by Boston College. BWSC owns and maintains the stormwater systems in the public streets surrounding the campus.

As shown in Figure 8-3, there are separate existing stormwater systems serving the Brighton and Chestnut Hill Campuses. These two large drainage areas, which are separated by Commonwealth Avenue, are further divided into smaller sub-basins. Chandler Pond is located upstream of these drainage areas and does not receive runoff from Boston College. As a result, stormwater discharge from the proposed future projects at Boston College will have no impact on Chandler Pond.

The Brighton Campus network discharges into a 24-inch storm drain in Lake Street and a 12-inch storm drain in Greycliff Road. The Chestnut Hill Campus ultimately discharges into a 36-inch by 40-inch box culvert that flows easterly in Boylston Street.

Existing drainage system and flooding problems on the Lower Campus have been well documented. Evaluations performed by various consultants to Boston College indicate the prime contributors to flooding problems include runoff from surrounding elevated areas of the campus, and the confluence of flows from these surrounding areas to a single discharge point from the campus.

Future Storm Flows

For some of the proposed future projects in this IMP, the total amount of impervious area will be reduced. This reduction will result in a decrease in stormwater peak flows to the Chestnut Hill Campus and Brighton Campus drainage systems. Other sites will have an increase in impervious area and will require measures to mitigate peak flows from these sites.

The reduction in impervious areas on some sites, coupled with the construction of subsurface infiltration/retention areas with other projects, will help alleviate some of the existing drainage issues on campus. Boston College will implement stormwater management techniques on a sub-watershed level to minimize pollutant loads and runoff volumes from individual sites.

Proposed Storm Drainage System Improvements

In an effort to improve its existing stormwater infrastructure, Boston College is working with a team that is developing a campus-wide analytical stormwater model of both existing conditions and full build-out of projects presented in the Institutional Master Plan. The goal of the modeling effort is to identify specific improvements that will both alleviate current problems and create opportunities for innovative stormwater management.

Inherent in the modeling effort, best management practices (BMPs) and Low Impact Development (LID) techniques have enabled the University to prioritize sustainability in the development of its stormwater management plan through the full build-out of the IMP. Boston College's Director of Sustainability and Energy Management will work with the Facilities Management Department and others on campus to identify particular LID

strategies that can be applied to both existing infrastructure improvements and the development of new projects.

Their evaluation of sustainable on-site stormwater management will include the following:

- Each building site is being evaluated to be a “net-zero” contributor to additional campus storm drainage. Further, each site will be viewed as an opportunity to mitigate peak stormwater flows.
- For some of the proposed future projects in this IMP, the total amount of impervious area will be reduced. The reduction in impervious areas, coupled with the construction of subsurface infiltration/retention areas with individual projects, will help alleviate some of the existing drainage issues on campus.
- The University will implement stormwater management techniques on a sub-watershed level to minimize pollutant loads and runoff volumes from the individual sites.
- Preventative techniques to reduce runoff accumulation that are being considered include rain gardens, constructed wetland enhancements, and bioswale retention areas that are able to absorb, hold, and filter stormwater.
- The University will also evaluate individual site and economic feasibility of structural retention installations. These may include rainwater harvesting configurations such as sub-surface detention tanks and rain barrels to capture roof runoff. Captured water is not potable but will be redirected toward grounds maintenance irrigation needs, equipment/surface washing, and similar needs. It may otherwise be directed to natural retention areas for groundwater recharge.
- Boston College plans to assess potential pilot locations for vegetated or “green” roof installations that include native species, control runoff flows, and reduce building energy needs. Locations are limited due to structural concerns at many of the existing, historic buildings, but new construction projects will be targeted for these opportunities.
- In low to moderate traffic areas such as pathways, porous pavement/concrete products and loose material cover such as mulching, packed dirt and gravel, are considered as viable alternatives to traditional, impervious asphalt pavement.
- In addition to managing stormwater quantity on-site, the University will continue stormwater quality improvement measures, such as reducing the use of salt, pesticides and chemical fertilizers.
- The University will purchase either stencils or castings at catch basins with the legend, “Don’t dump... drains to the Charles River.” This is an important part of everyday operations on the campus, in addition to Construction Stormwater Management protocol for capital projects, and helps control stockpiling, washing and risk management for other drained materials.

The University's stormwater infrastructure is also discussed in Chapter 10, *Environmental Sustainability*.

Ongoing improvements to Boston College's stormwater collection system are primarily related to improving the existing on-campus conditions, and to mitigating impacts of future development. The design of new facilities necessitating connection to the municipal stormwater systems will require review by BWSC, under its Site Plan Review Process, on a project-by-project basis. Stormwater management controls, including a Stormwater Pollution Prevention Plan (SWPPP), will be established in compliance with BWSC standards and the Massachusetts DEP Stormwater Management Policy.

Natural Gas System

Existing System Conditions

The buildings on the Brighton Campus are supplied with gas by KeySpan Gas Company via Commonwealth Avenue, Lake Street and Foster Street. Gas service to the Chestnut Hill Campus is through a number of connections in Commonwealth Avenue, St. Thomas More Road and Beacon Street.

Proposed Gas Service Improvements

The future development of the campus as outlined in the IMP will likely require centralized heating and cooling plants. Boston College is currently exploring options for the locations of these plants and the opportunity for cogeneration systems. Boston College will continue to coordinate with KeySpan, along with other service providers, as these designs progress.

Steam Distribution

Existing System Conditions

The majority of the academic buildings on the Middle Campus use steam for space heating and domestic hot water. Two plants located on the Middle Campus supply steam through a campus distribution network.

Steam service to the Chestnut Hill Campus is supplied by six steam loops. Steam operates year round except during maintenance periods in the middle of the summer. The condensate from each building is returned via underground piping mains to the central plant.

An existing central heating plant is located north of Beacon Street and southwest of Conte Forum and serves much of the Middle and Lower Campuses via a network of distribution pipes which are either directly buried or installed in piping tunnels. This boiler plant provides 65 PSIG steam to the campus distribution network. The distribution system is

continually upgraded to maintain a reliable and efficient distribution network. The buildings on the Brighton Campus are equipped with stand-alone heating plants.

Electrical Service

Existing System Conditions

The Chestnut Hill Campus is currently served by three 13.8 kV primary electrical lines from NSTAR's Watertown (467), Brighton (329) and Newton (17) stations. On a daily basis, the campus operates on two of these lines and utilizes the third line for back-up service. The electrical service for the campus is currently at capacity. With the added demand from the proposed future projects, the electrical service for the campus will be supplemented during the build-out. The electrical service enters the campus at the 110 St. Thomas More Road residence hall on the Lower Campus where the primary switchgear is located. The Brighton Campus is served by individual building transformers operated directly by NSTAR.

Proposed Electrical Service Improvements

The existing switchgear located at the 110 St. Thomas More Road residence hall has limited space available for expansion. Boston College is planning to build a new substation for the Middle Campus to accommodate added load and to free up capacity for the switchgear on the Lower Campus.

Telecommunications

The Boston College campus is supplied with telecommunications carrier service from Verizon, AT&T and PaeTec. Services include local, long distance and 800 telephone services, as well as a variety of carrier services for data communications. The fire alarm and telecommunications services are privately owned and maintained by Boston College. The telecommunications and data systems are distributed throughout all campus buildings in University-owned conduit systems.