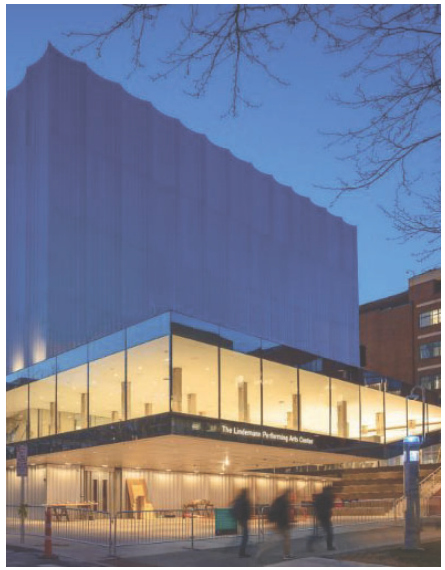
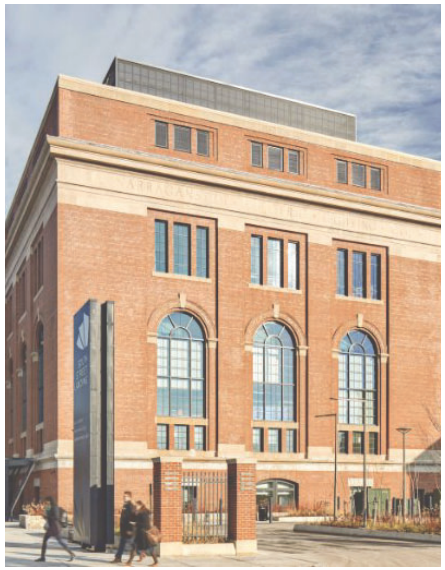
BROWN

INSTITUTIONAL MASTER PLAN

2023

"The mission of Brown University is to serve the community, the nation and the world by discovering, communicating and preserving knowledge and understanding in a spirit of free inquiry, and by educating and preparing students to discharge the offices of life with usefulness and reputation. We do this through a partnership of students and teachers in a unified community known as a university-college."

CONTENTS

EXECUTIVE SUMMARY

In 2013, the Corporation of Brown University adopted the Handbook for Physical Planning, a document that, alongside subsequent area master planning studies and Brown's Institutional Master Plan, serves as the foundation for Brown's physical campus development.

Brown's planning efforts are also carefully coordinated with the City of Providence. As part of its broader commitment to being a good neighbor, Brown is submitting the following Institutional Master Plan, which outlines the University's plans for physical development over the next 5 to 10 years. The University's goal is to move forward with two major projects that advance Brown's research and athletics in a way that simultaneously aligns with the aspirations and needs of the State of Rhode Island, the City of Providence and the College Hill, Fox Point and Jewelry District neighborhoods.

Since the last IMP in 2017, Brown's campus planning efforts have invested $619 million in construction projects, including new construction, major renovations, infrastructure renewal and public realm improvements.

The construction projects are just one way Brown plays a vital role in the local economy. Capital projects on campus employ hundreds of trades workers and apprentices, enabling the University to sponsor a labor initiative, Building Futures, that benefits people under-represented in the construction field, creating new opportunities for local residents to build careers. Building Futures provides a pathway for low-income Rhode Islanders seeking well-paying careers in the building trades, an industry that continues to face a worker shortage. Over its first 15 years, 128 Building Futures pre-apprenticeship program graduates have logged upwards of 465,000 hours on 34 different construction projects at Brown, many progressing into well-paying construction careers.

In the last ten years, Brown has brought new life to the Jewelry District primarily as an anchor tenant sparking public-private partnerships that led to the development of the neighborhood's most prominent projects, including South Street Landing and Point 225 and helped to attract Wexford Science + Technology, Ancora L&G, the Cambridge Innovation Center and many other private partners to the state. As a result, the Jewelry District is now home to significant academic, research, administrative and residential space that has helped position Providence as a leader and destination for biomedical innovation.

The capital projects included in Brown's 2023 Institutional Master Plan will continue to propel Rhode Island's growing presence in the life sciences sector. Of the proposed projects, the University is planning to build a new laboratory space for cutting-edge life sciences research, a critical step that delivers on Brown's operational plan to grow its overall research enterprise. The Operational Plan for Investing in Research aligns with Brown's strategic plan, Building on Distinction. The plan builds on substantial growth in research activity at Brown in recent years and provides a comprehensive strategy for targeted investments and increased support structures for faculty, staff and students, as well as investments in facilities that support research.

EXECUTIVE SUMMARY

Investments in new facilities with the lab space, technology and infrastructure to enable cutting-edge research will enable Brown to make an even greater positive impact in improving healthcare for Rhode Island communities. Brown researchers and physician-scientists are making discoveries that transform care for Rhode Island patients and their families in real ways every day, including new treatments for cancer, addiction and Alzheimer's Disease.

It is important to note that planning for Brown's campus is continuous. Several planning efforts are underway and represent the projects seeking approval in this IMP and in the statement of 10-year goals. Many of the projects in this plan require complex multi-year efforts, including planning and design, enabling, phased construction, and fundraising, all of which are subject to change. The intent is to provide an overview of proposed significant changes, including improvements in the public right-of-ways, new buildings, renovation projects that alter building uses, demolitions, and changes in real estate holdings.

This plan does not intend to provide a detailed list of all projects the University will undertake. Typically, the University performs nearly 200 small construction projects each year, including maintenance projects and interior fit-out projects required to accommodate the needs of specific academic or administrative units. These projects are not included in this Institutional Master Plan, as they typically do not affect the overall character of the campus. Priority projects are listed on the following page and summarized in this plan.

LAND ACKNOWLEDGEMENT STATEMENT

Brown University is located in Providence, Rhode Island, on lands that are within the ancestral homelands of the Narragansett Indian Tribe. We acknowledge that beginning with colonization and continuing for centuries the Narragansett Indian Tribe have been dispossessed of most of their ancestral lands in Rhode Island by the actions of individuals and institutions. We acknowledge our responsibility to understand and respond to those actions. The Narragansett Indian Tribe, whose ancestors stewarded these lands with great care, continues as a sovereign nation today. We commit to working together to honor our past and build our future with truth.

EXECUTIVE SUMMARY

COMPLETED PROJECTS (since 2017 IMP)

ACADEMIC

Sharpe House Renovation and Relocation
164 Angell Street Renovation
School of Professional Studies*
Nelson Center for Entrepreneurship*
Lincoln Field Building Renovation

RESIDENCE HALLS & CAMPUS LIFE

Sternlicht Commons and Health & Wellness Center
Stonewall Center

ATHLETIC

Center for Lacrosse and Soccer
Brown Stadium Turf Renovation
Meehan Auditorium Renovation Phase I
Marston Boathouse Renewal Phase II

PROPOSED NEW CONSTRUCTION PROJECTS

Integrated Life Sciences Building (ILSB)
Athletics Indoor Practice Facility

PROPOSED DEMOLITIONS / RELOCATION

ILSB will require the following building demolitions:
233 Richmond Street
261 Richmond Street

*Partnership Project

PROPOSED CHANGES TO STREETS

No requests for streets or private right-of-ways to be abandoned or new streets to be established.

ANTICIPATED PROJECTS OVER NEXT 10 YEARS

Athletics Facility
200 Dyer/Parcel 14 & 15 Development*
Academic Facility
Residential Renewal
Dining Renewal
Barus & Holley / Prince Lab Renovation

COMPLETED MASTER PLANNING STUDIES

Student Housing Masterplan
Decarbonization Roadmap
John Carter Brown Library Masterplan
Transportation Management Plan
Athletics Strategic Roadmap

PROJECTS UNDERWAY

Andrews House Renovation and Conversion of Parking to Green Space
Churchill House Renovation
Chen Family Hall, William and Ami Danoff Hall
The Lindemann Performing Arts Center

EXECUTIVE SUMMARY

Campus Map
https://www.brown.edu/facilities/campus-maps

PLANNING CONTEXT

BUILDING ON DISTINCTION

In 2013, the Corporation of Brown University adopted the 'Building on Distinction' strategic plan, which established a far-reaching set of goals that will enhance the quality of our academic and campus environment. This plan is continuously monitored and adjusted, and it continues to focus the University's efforts in its pursuit of excellence.

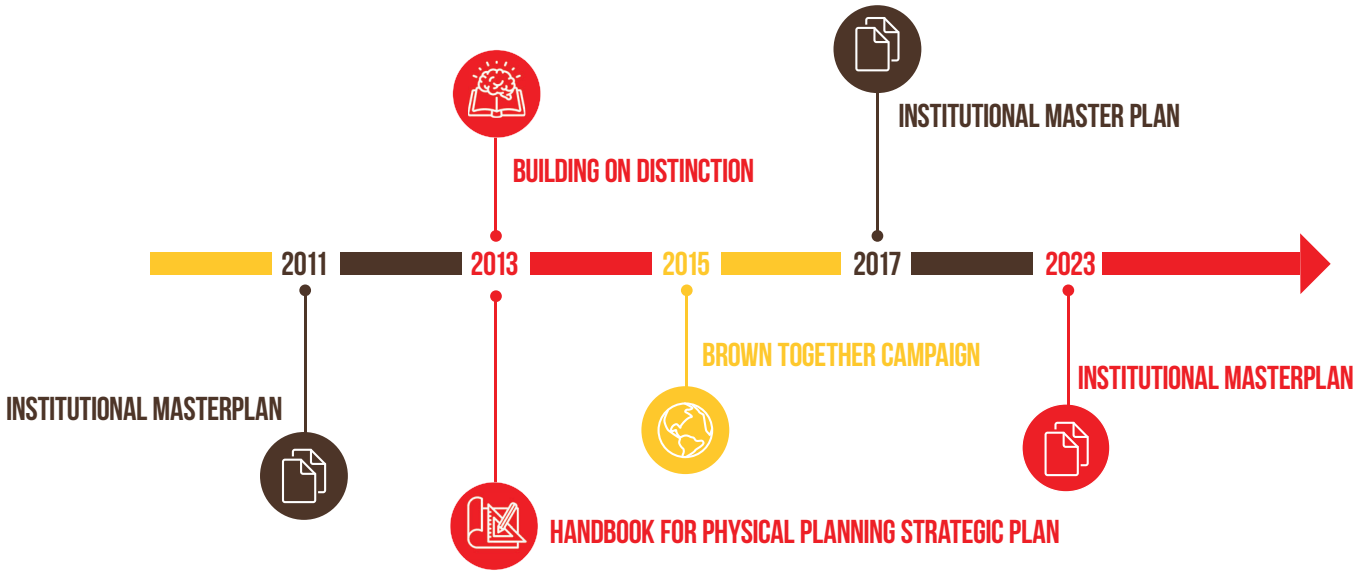
HANDBOOK FOR PHYSICAL PLANNING

In 2013, the Brown Corporation adopted the Handbook for Physical Planning. This handbook serves as a guide for decisions about campus planning and design.

The handbook focuses on the following interdependent planning principles:

- Strengthen the physical campus analog for the Open Curriculum
- Prioritize academic uses in the core
- Celebrate the Brown scale
- Energize the core with a mixture of uses
- Engage Thayer Street
- Connect the campus
- Consolidate landholdings and catalyze partnerships

A complete version of 'Building on Distinction,' the Handbook for Physical Planning, and many of the area master plans can be found at: http://www.brown.edu/Facilities/Building_Brown/resources/

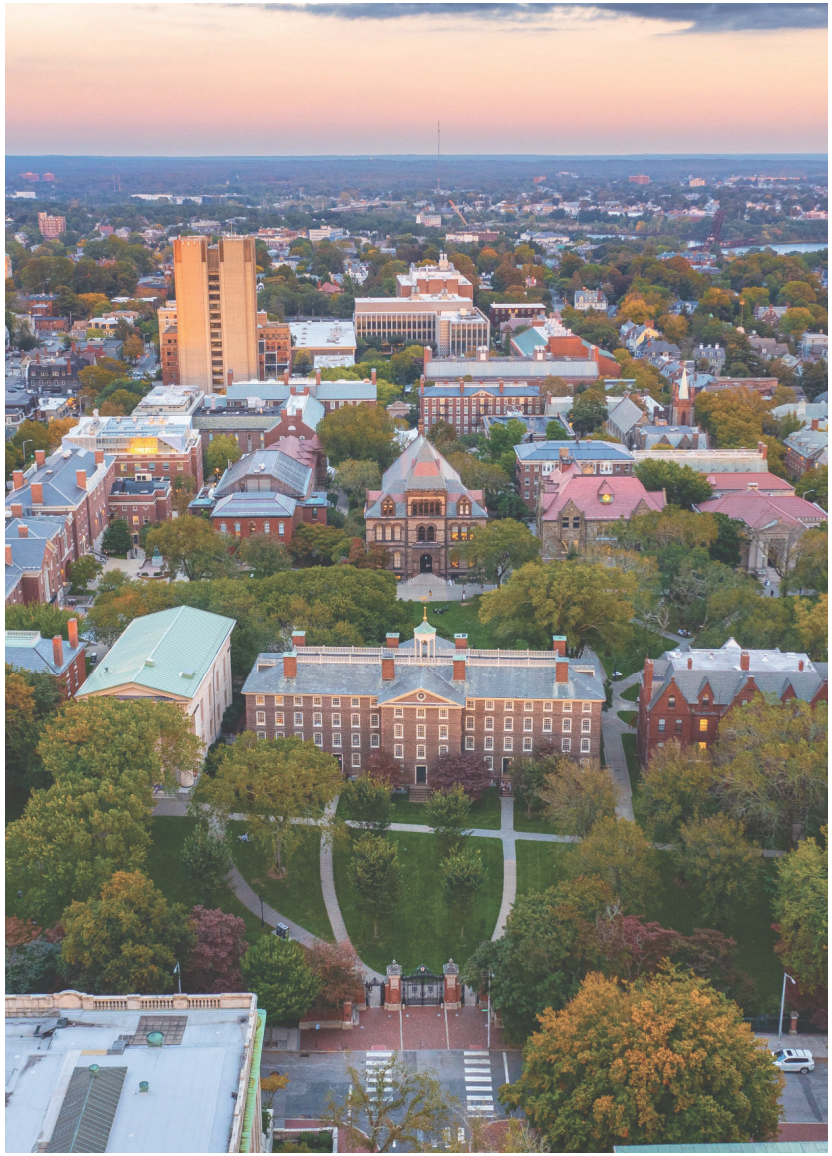


PLANNING CONTEXT

COMMUNITY ENGAGEMENT

The University's planning process is open and iterative, with regular opportunities for community engagement. Brown staff meet regularly with neighborhood organizations, elected officials, and allied institutions to share Brown's plans for development and solicit feedback. The public engagement process in the development of this Institutional Master Plan was as follows:

5/26/23	City of Providence Pre-Application Meeting
5/30/23	Local elected officials
5/31/23	ILSB Jewelry District neighbors
6/5/23	College Hill Neighborhood Association
6/6/23	Thayer Street District Management Authority
6/7/23	Providence Preservation Society
6/8/23	Community Working Group
6/12/23	Fox Point Neighborhood Association
6/13/23	Jewelry District Association
6/20/23	Brown-hosted Community Meeting
6/26/23	Ward One Community Meeting



CAMPUS FOOTPRINT

Top: College Hill, 1870
Bottom: Campus Aerial View, 1908

CAMPUS HISTORY

Brown University and the City of Providence have been woven together almost from the beginning. As a result, it is difficult to describe Brown's history adequately without also talking about Providence's history. The following excerpt from the Strategic Framework for Physical Planning describes the history of both the campus and the city:

The City of Providence was founded in 1636 by Roger Williams. The site he selected, in the territory of the Narragansett Indians (land not included in the chartered British colony), was on the Eastern shore of the Providence river at the head of Narragansett Bay, at the junction of the Moshassuck and Woonasquatucket Rivers. The early development of the city did not include the construction of churches or a defined town hall or green. The settlers instead laid out a series of strip house lots, which extended back from what today is Main Street. Houses were built at the front of the lots, while orchards and gardens extended east along the length of the narrow plots up the hill away from the river. Providence was mainly an agricultural community until the 18th century, when trading with other colonies, the West Indies, Africa, and England transformed it into a major seaport. This led to dense city fabric of residences, commercial enterprise and new civic buildings along the edge of the waterfront. The population tripled during this period, and by 1776, one third of the residents of Providence had established their homes across the river on the Western bank, mainly along today's Weybosset, and Westminster Streets.

As colonial life became more prosperous and Providence became a wealthy, more cosmopolitan society, a new awareness about social standing developed. At the same time, a widespread religious revival was enveloping the new world which fostered the growth of burgeoning ideologies, including a new religious sect called Baptists. This nascent social awareness, coupled with the need to educate the day's new religious leaders, led to the founding of the state's first institution of higher learning.

CAMPUS FOOTPRINT

Top: Pembroke College 1910
Bottom: John Hay Library 1912

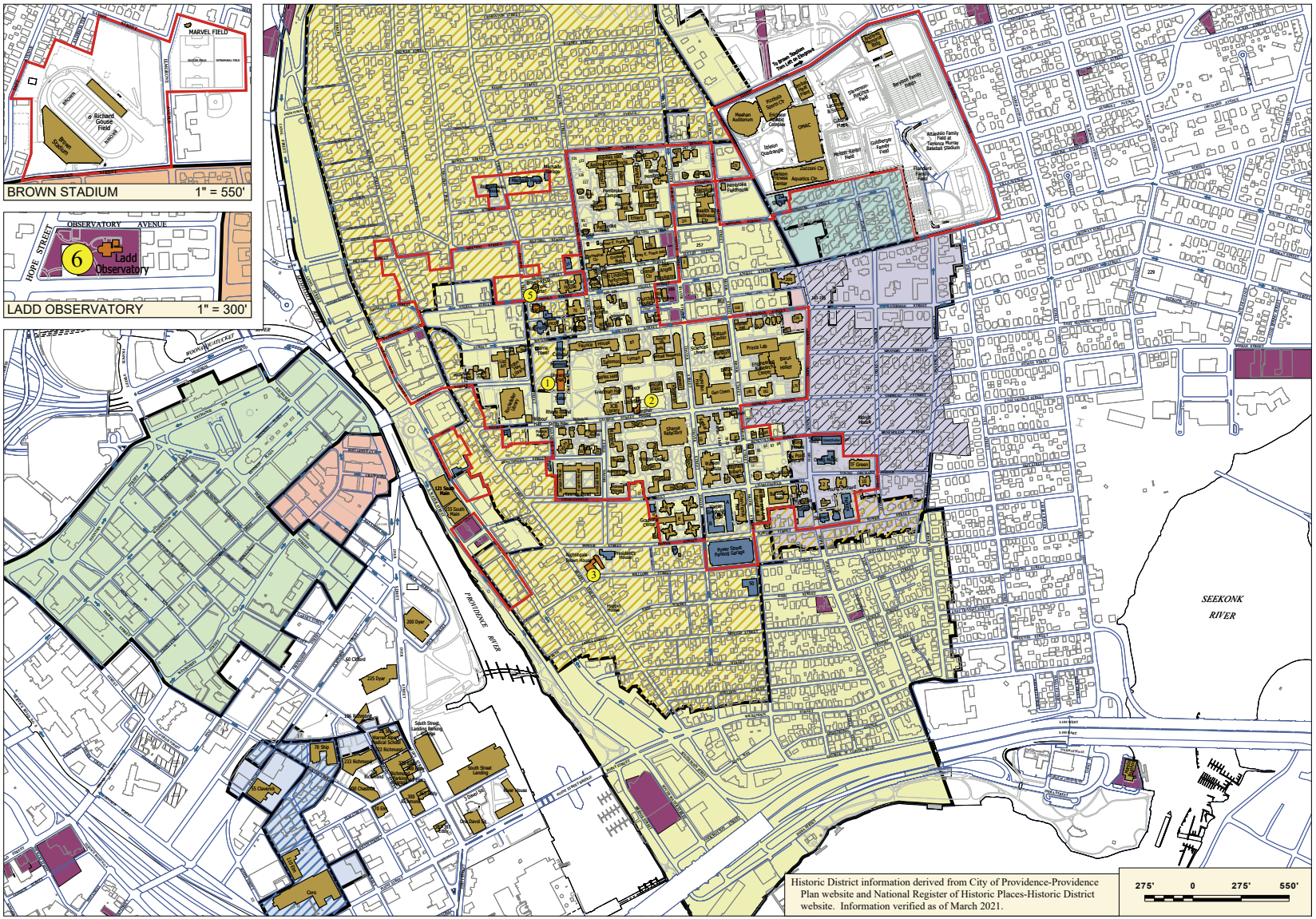
Rhode Island College was begun in Newport, Rhode Island in 1764, with James Manning as its first president. In the search for the college's permanent home, however, Providence, as the birthplace of the colony and the seat of the Baptist Church, prevailed, and in 1770 the Corporation quickly erected University Hall, the institution's first building at the top of what is now known as College Hill. The next building, a dormitory called Hope College, was not added to the campus for almost 50 years.

The campus continued to grow slowly but by 1904 all the buildings around the main green had been constructed. The athletic field to the East of the green, called Lincoln Field, was transformed into a building site for Lyman Gymnasium (1891) and the dormitory, Maxcy Hall (1895). Pembroke College, the companion institution for women (1897) was constructed a few blocks to the North.

In 1901, the Olmsted brothers were engaged by the Corporation to develop a plan for Lincoln Field and areas to the North. The plan completed the arrangement of buildings defining Lincoln Field, proposed an amphitheater to negotiate the grade change between Maxcy and Lyman, and a mid-block walkway North to the Pembroke campus. The plan served as a guide for the building sites, but the landscape elements were never realized.

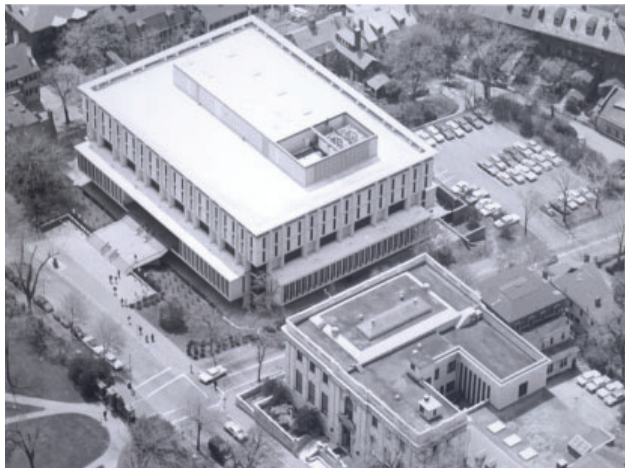
By 1938, the Brown Campus had grown to include the entire block bounded by Waterman, Prospect, Thayer, and George Streets, as well as other sites beyond the core campus including the new John Hay Library across Prospect Street (1910), Ladd Observatory (1891), and Brown Stadium (1925). At this time several buildings had been completed at Pembroke Campus as well. The University had also begun to acquire houses in the surrounding community.

CAMPUS FOOTPRINT



Historic District Map
https://www.brown.edu/facilities/campus-maps

CAMPUS FOOTPRINT



Top: Keeney Quadrangle 1950s
Bottom: Rockefeller Library 1966

The years between 1938 and 1975 were a period of rapid expansion. Three major residential quadrangles transformed the area to the South of the campus: Wriston Quadrangle (1951), Keeney Quadrangle (1957), and the Graduate Center (1968). To the west, Rockefeller Library (1964) and List Art Center (1970) defined the gateway to the downtown part of the city. To the North, a new Biomedical Center (1969) and the Brown Office Building (1969) began to close the gap between Brown's main campus and the Pembroke campus. Barus & Holley science building (1965), the Sciences Library (1971), and the beginnings of a new athletic complex, Meehan Auditorium (1961) and Smith Swim Center (1973), expanded Brown to the east. The acquisition of the Bryant College Campus in 1969 provided several blocks of land with small residential and academic buildings to the east of Brook Street.

Following 1975, campus athletic facilities continued to grow, with the completion of the Olney-Margolies Athletic Center and Pizzitola Sports Center (1989). Student housing at New Pembroke (1979) and Vartan Gregorian Quadrangle (1991) added new on-campus resources. Major buildings for the sciences in recent years include Geo Chemistry (1982), Watson C.I.T. (1988) and Macmillan Hall (1998), concentrating science buildings along Manning Walk, and the continued growth of bio-medical space along Meeting Street. The Power Street Parking Garage (1988) is the first such facility on the Brown campus.

Beginning in 2000, the effort to "consolidate the core" began to take shape with the construction of the Watson Institute (2002) and the Sidney Frank Life Sciences Building (2006), while non-academic facilities such as the 295 Lloyd Avenue building (2003) hugged the edge of campus. The Granoff Center for the Creative Arts (2011), Nelson Fitness Center (2012), and the new Applied Math Building (2015) began to define "Brown Scale."

The goal of consolidating the core continued with the building of the Sternlict Commons and University Health and Wellness Center (2021), which houses

CAMPUS FOOTPRINT

Top: Metcalf Research Building
Bottom: Rhode Island Hall

all of Brown's core health and wellness services in one building, as well as the Chen Family and William and Ami Danoff Hall (to be completed in 2023). These new residence halls advance Brown's commitment to increasing its on-campus housing inventory, which not only strengthens the living and learning experience for undergraduates, but also alleviates the impact that the demand for off-campus rental units has upon local neighborhoods in Providence. Other notable projects sought to strengthen the academic mission of the University; notably with renovation of Churchill House and The Lindemann Performing Arts Center (both to be completed in 2023).

HISTORIC PRESERVATION

Adaptive reuse projects, such as Friedman Hall, Smith-Buonanno Hall, Rhode Island Hall, Pembroke Hall, Metcalf Research Building, Hunter Laboratory, and the joining of buildings on Brown Street for the English Department, indicate a new approach to revitalization of historic buildings on the campus. Similarly, the Watson Institute expansion at Stephen Robert Hall signals a new direction in carefully fitting modern buildings into historic contexts.

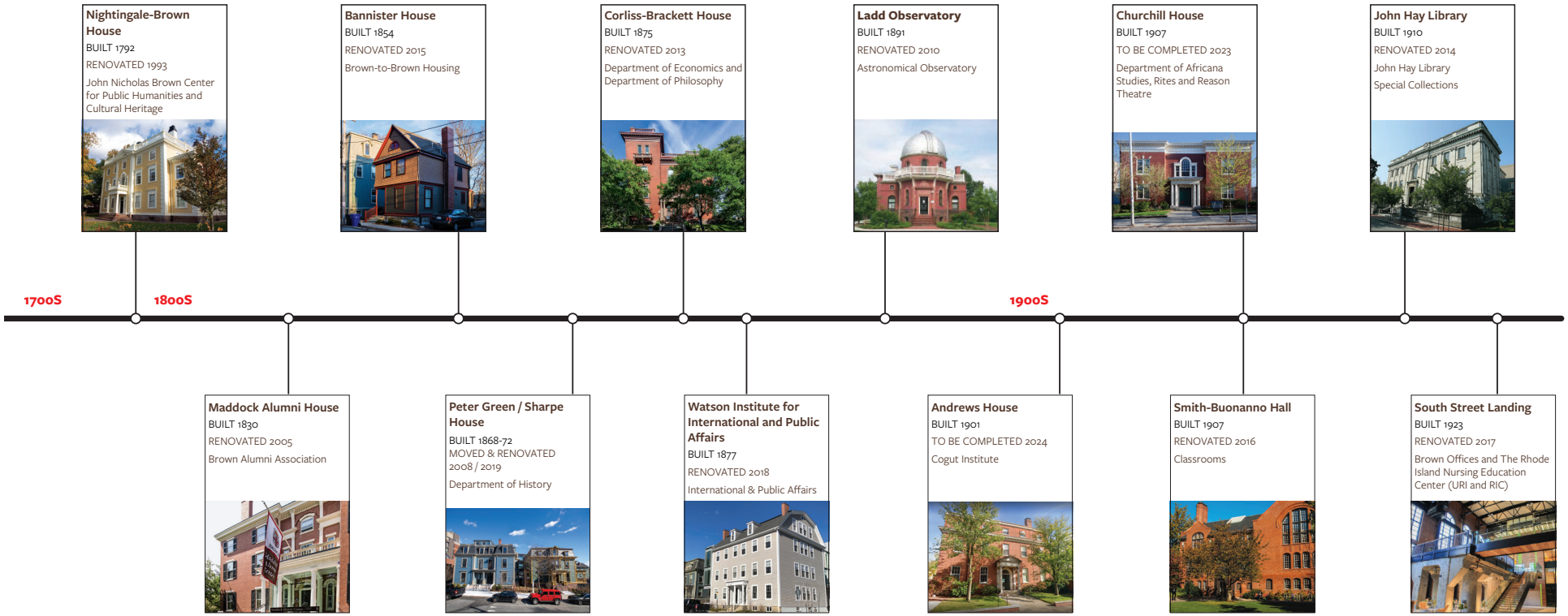
Today, the Brown campus contains five buildings listed on the National Register of Historic Places, two of which are identified as National Landmarks (University Hall and Nightingale Brown House). The campus is also overlaid with five National Historic Districts, and many of Brown buildings are identified as contributing structures within these historic districts. As such, any project utilizing federal funds is required to adhere to Section 106 in the National Historic Preservation Act. In addition, many buildings fall within one of three local historic districts, so projects affecting the exterior of these buildings are reviewed by the Providence Historic District Commission.

The map on the following page illustrates the boundaries of the various historic districts and identifies those buildings listed individually on the National Register of Historic Places.

CAMPUS FOOTPRINT

Brown's commitment to historic preservation guides its vision for the future of the campus built environment and has deemed the University a nationally recognized leader in historic preservation. In 2019, the newly renovated and repurposed South Street Landing, a previously abandoned power plant turned modern mixed-use facility, was awarded the Richard H. Driehaus Foundation National Preservation Award. The University's efforts to honor the past through such projects has awarded it over 20 historic preservation awards at the city, state, and national level.

The University invests annually to preserving historic buildings, over 100 of which Brown has adapted for academic use. The buildings below are representative sample showing Brown's commitment to historic preservation:



CAMPUS FOOTPRINT

Top: River House, 1 Point Street
Middle: The Packet Building, 155 South Main Street
Bottom: Henry Lippitt House, 200 Hope Street

EXISTING CAMPUS & PROPERTY HOLDINGS

Brown University, founded in 1764, is a teaching and research institution with approximately 7,200 undergraduate students, 2,900 graduate students, 4,765 employees, and 585 medical students. It currently owns 238 buildings totaling over 7.47 million square feet. Most buildings are located on College Hill and in the Jewelry District, within a half mile from the historic College Green. A few specific functions are located beyond this, including the Brown Stadium almost two miles north of the center of the campus, the Marston Boathouse and located on India Point, historic Ladd Observatory located on Doyle Avenue, and the Library Annex and other support facilities located at 10 Park Lane. Brown also owns a 339-acre property in Bristol, RI, which includes a museum collection and research facility. In addition, the University leases approximately 244,000 square feet located in the College Hill area, the Jewelry District, and Butler Hospital.

Building usage generally reflects the historic growth pattern of the campus. Most academic space is clustered around the core of the campus – the College Green, Lincoln Field, Manning Walk, The Walk, and Pembroke Campus. Residence Halls are clustered on the north and south ends of campus, specifically on the northern Pembroke campus, south of the College Green in Wriston and Kenney Quads – both built in the post-war years - and in and around the former Bryant Campus. Athletic facilities are grouped to the northeast of campus on the former Aldridge Dexter Asylum. In between there are a number of houses, many of which have been acquired and adapted over time to serve various academic and administrative functions. Several of these houses are significant contributors to the ambiance of the University and the neighborhood, and some are historic structures of national importance.

CAMPUS FOOTPRINT

RECENT CHANGES IN PROPERTY HOLDINGS

Since the 2017 Institutional Master Plan, the University has made changes in property holdings reflecting the planning principles in the Handbook for Physical Planning, including both the sale of underutilized properties and acquisitions in key locations.

Acquisitions:

- 200 Chestnut Street
- 261 Richmond Street
- 300 Richmond Street
- 70 Elm Street
- 165 Angell Street
- 200 Hope Street
- 126 Power Street
- 155 South Main Street
- 1 Point Street
- 37 George Street
- 242 Meeting Street
- 205 Meeting Street
- 215 Meeting Street
- 172 Cushing Street
- 365 Eddy Street Unit 1
- 365 Eddy Street Unit 2
- 80 Power Street
- 152 Chestnut Street
- 125 Hope Street
- 387-397 Eddy Street
- 250 India Street

Dispositions:

- 383 Benefit Street
- 165-167 Lloyd Avenue
- 107 Benevolent Street
- 10 Davol Square
- 37 Cooke Street
- 193 Hope Street
- 195 Hope Street
- 13 Phillips Street
- 271 Tockwotten Street
- 80 Power Street (Planned, Brown to Brown),
- 126 Power Street (Planned, Brown to Brown)

CAMPUS INFRASTRUCTURE

PEDESTRIAN IMPROVEMENTS

Because of Brown's integration into the fabric of the city, public streets are an important part of the pedestrian circulation system of the campus. Consequently, the University has been investing over $200,000 per year in streetscape and pedestrian improvements on city streets. The work includes sidewalk replacement (over 19,000 linear feet replaced since 2000), accessible curb cuts, new street trees (40 total in the last five years) with an engineered soil mix, and crosswalks. Standard details have been developed in cooperation with the Department of Public Works, the City Forester, and a team of landscape architects, and will be followed for all improvement projects on College Hill. A separate set of standard details has been developed for the Jewelry District and will continue to be used in this area.

ADDITIONAL PEDESTRIAN RELATED ENHANCEMENTS

Brown will continue to partner with the City of Providence to invest in public realm streetscape and pedestrian improvements on city streets including sidewalk replacement, accessible curb cuts, new street trees, and crosswalks at various locations in the campus.

The University will work with the City of Providence Department of Public Works and Division of Traffic Engineering to identify and implement additional measures to further enhance the overall pedestrian environment around the Brown University campus. These measures would complement the capacity enhancement and pedestrian improvement measures that have already been implemented around the campus, and they can be tailored to meet specific needs of the individual locations where such improvements are necessary.

CAMPUS INFRASTRUCTURE

- Sidewalks in Good Condition (12,951.3 Linear Ft.)
- Sidewalks in Use Caution Condition (7,337.6 Linear Ft.)
- Sidewalks Replaced 2000-2023 (20,652.2 Linear Ft.)
- Sidewalks in Need of Repair (643.9 Linear Ft.)
- Brown University Buildings

Sidewalk Inventory Map
https://www.brown.edu/facilities/campus-maps

CAMPUS INFRASTRUCTURE

TRANSPORTATION MANAGEMENT PLAN: 'AROUND BROWN'

In 2022 Brown finalized a comprehensive Transportation Management Plan, 'Around Brown,' to help anticipate and prepare for campus changes to ensure that transportation systems and offerings are intuitive, responsive, convenient, flexible, effective, and supportive of core campus goals. Changing travel practices and behaviors over the long term are key to Brown's sustainability outlook, and to creating a vibrant pedestrian and cycling campus environment. In order for Brown to address current and projected needs, a suite of top strategies with supporting actions were recommended.

The top Transportation Management recommendations include:

- Provide daily and flexible parking options
- Make improvements to shuttle service to increase ridership and reliability
- Attract RIPTA ridership through information, incentives, travel training, and promotions
- Centralize transportation communication

Utilizing and supporting RIPTA, Zipcar, Spin Scooters, electric vehicle charging stations and biking are all part of Brown's overall strategy towards a cohesive transportation program. Consolidating all transit choices and resources in one place is the University's main strategy to encourage more non-auto trips and decrease reliance on driving and parking.

PARKING, TRAFFIC AND TRANSPORTATION STUDY

Brown University commissioned a comprehensive parking, traffic, and transportation study led by a consultant that re-established a transportation baseline for the campus and assessed the impacts of the IMP project during construction and after completion.

Several important changes since 2017 have altered travel patterns and parking demand. These include the following:

- In 2017, more than 400 Brown employees who previously worked in offices on College Hill campus relocated to offices at South Street Landing in the Jewelry District.
- Beginning with the COVID-19 pandemic in 2020, more Brown employees began working partly or fully remotely from off-campus locations. Some employees are now permanently remote while others have hybrid work arrangements.
- In 2022, Brown completed its campus transportation management plan, 'Around Brown.'

Existing Conditions

The analysis of existing conditions included a review of prior studies, field observation, new traffic data collection, consultation with City of Providence staff, and analysis and documentation. Traffic volumes have continued to decline. The 2017 IMP transportation element compared traffic data collected in 2017 with 2011 data and reported a 10% weighted average decrease in traffic volumes over the six-year period. These reductions preceded the relocation of approximately 400 employees from College Hill to the Jewelry District.

CAMPUS INFRASTRUCTURE

Since 2017, in addition to the employee relocation, demand for parking has declined, mainly due to the ability for some staff to work remotely all or part of the time. In addition, in 2022, Brown completed its campus transportation management plan, 'Around Brown.'

Study Area

The study area for the 2023 IMP transportation element was expanded to include the School of Public Health on South Main Street and the Warren Albert Medical School and other Brown-owned or leased facilities are located within the Jewelry District.

Transportation Resources and Patterns

Transportation resources include:

1. Walking: Campus and municipal facilities include a robust network of campus pathways to encourage walking along with a network of sidewalks and accessible curb ramps
2. Bicycling: Outdoor bicycle parking facilities are throughout Brown's campuses. The 2023 IMP transportation element includes the results of a comprehensive field inventory of such facilities. In addition, short-term bicycle rentals are available through a private vendor.
3. Scooters: e-scooter rentals are available throughout the City of Providence.
4. Shuttles: Brown operates three scheduled campus shuttle routes, a shuttle for riders with accessibility needs, and an on-demand service for door-to-door transportation when other services are not provided.
5. RIPTA UPASS Bus Passes: Through a partnership between Brown and RIPTA, faculty, staff, and students can ride RIPTA for free with a Brown ID. Brown reimburses RIPTA for each trip taken using UPASS.
6. Car Sharing/Zipcar: Brown provides resources for car sharing through an arrangement with Zipcar with 17 parking spaces round campus. Vehicles are open to anyone, including undergraduates (18+).
7. Parking: Brown's parking resources for employees, students, and visitors include on-street spaces leased through an arrangement with the City of Providence, Brown-owned on-street spaces on streets the university fully controls, and off-street spaces (surface lots and garages). Consistent with observed reductions in traffic, parking demand at Brown has also declined considerably. At present, any Brown employee who wishes to obtain a parking permit may do so. Prior to the COVID-19 pandemic, employees without assigned parking spaces often had to be placed on a waiting list.
8. Traffic Volumes: Data compiled for the 2023 IMP included 16 intersections and six roadway segments, including eight intersections and two roadway segments also counted in 2016 (for the 2017 IMP). Volumes continue to decline (by 22% in the morning peak hour and by 11% in the afternoon peak hour. The overall decline continues a trend of declining volumes noted in the 2017 IMP Update, which showed a 10% decline from 2011 volumes. An analysis of the signalized and unsignalized intersections did not reveal any significant deficiencies.

CAMPUS INFRASTRUCTURE

Existing and Future Parking Requirements

Article 14 of the City of Providence zoning ordinance establishes institutional parking requirements and includes a provision for the grandfathered deficiency of vehicle and bicycle parking spaces of the immediate previous use. In other words, when the ordinance was enacted, because Brown's parking supply was lower than the calculated requirement by 931 spaces, Brown was and is permitted to carry that shortfall forward. Currently, the available supply exceeds the requirement by 442 spaces. By the IMP horizon year of 2027, the available supply will decline by 127 spaces. The demand in 2027 will increase by 100 spaces, resulting in a future surplus of 215 spaces.

Transportation Demand Management

Transportation demand management (TDM) is a suite of policies, programs, and strategies aimed at reducing the use of single-driver private automobiles and encouraging the use of alternatives to driving alone. Brown has supported TDM for many years through a variety of means including offering free shuttle services, fully subsidizing the use of RIPTA bus services, investing in projects and programs that support bicycling and walking, and offering a commuter flexible spending benefit to faculty and staff.

In 2022, Brown completed Around Brown, the university's transportation management plan. Around Brown documented student and employee travel behavior, incorporated input through surveys and other outreach activities, and recommended a suite of improvements and activities to promote use of public transportation, walking, bicycling, and other measures aimed at reducing the use of use of private automobiles.

CAMPUS INFRASTRUCTURE

Future Conditions

The analysis of future conditions focused on traffic circulation and parking. The future traffic analysis includes assumptions about background growth in traffic and growth associated with the IMP. Intersection operations do not change significantly. Just two signalized intersections are forecast to experience a slight degradation in the future (Lloyd/Brook/Hope, and South Main/College). Neither location is expected to see unacceptable levels of congestion.

Integrated Life Sciences Building (ILSB)

Located in the Jewelry District, the ILSB is the primary new building project evaluated for this 2023 IMP Transportation Element. The current phase of the ILSB project is anticipated to add 195 new employees to the Jewelry District. Based on prior surveys, traffic data analysis, the proximity of the ILSB to the regional highway network, and access and egress patterns, peak period traffic associated with the ILSB would be dispersed. No single study intersection is expected to see more than 25 cars related to ILSB during peak commuting times

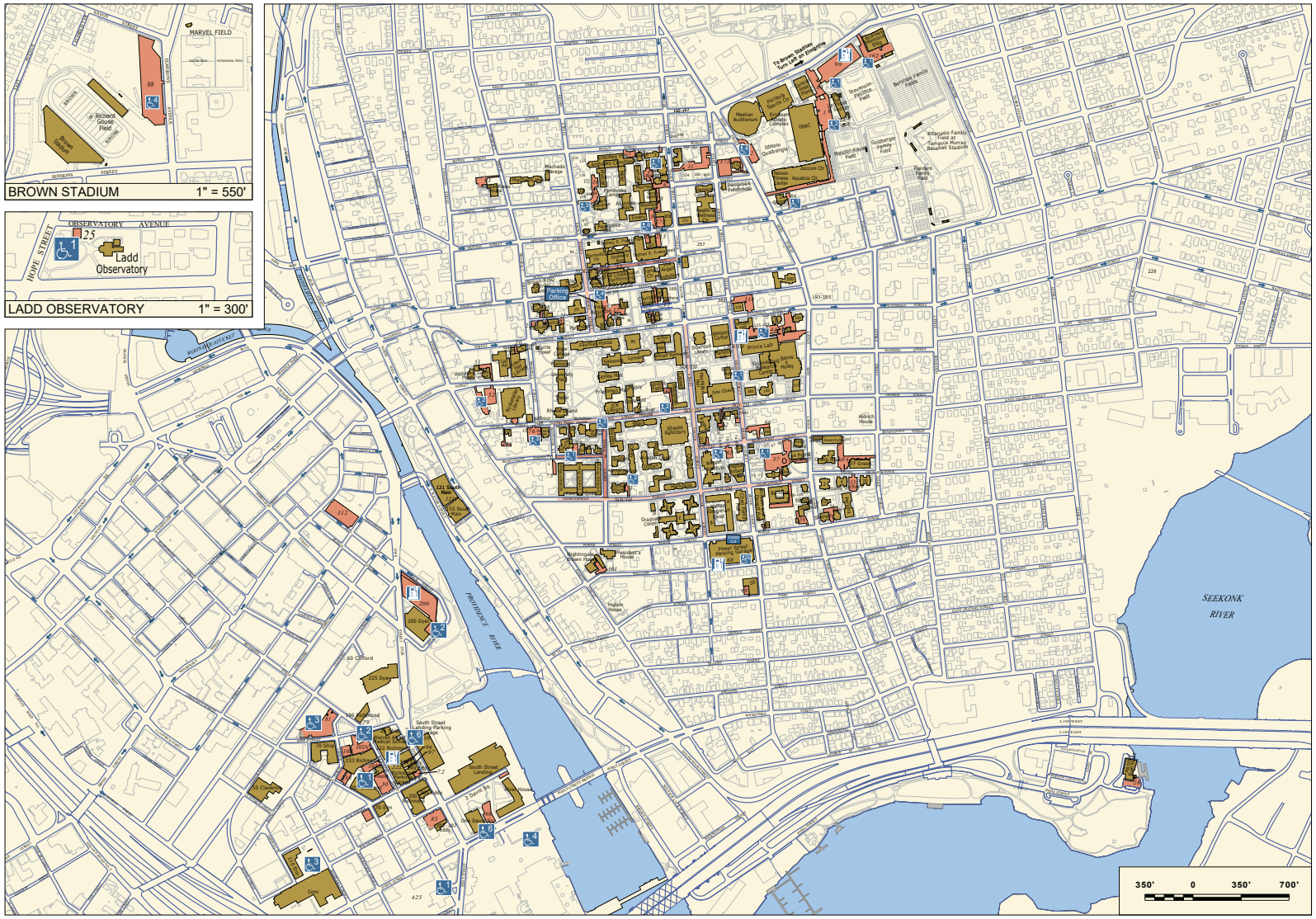
Athletics Indoor Practice Facility

Brown is proposing to construct an approximately 76,000 square foot indoor practice facility on the existing Meister Kavan Field site. This facility is not expected to attract new vehicular traffic or result in an increase of large athletic events since it is for practice. There will be no loss of parking with this proposed project.

Construction Considerations

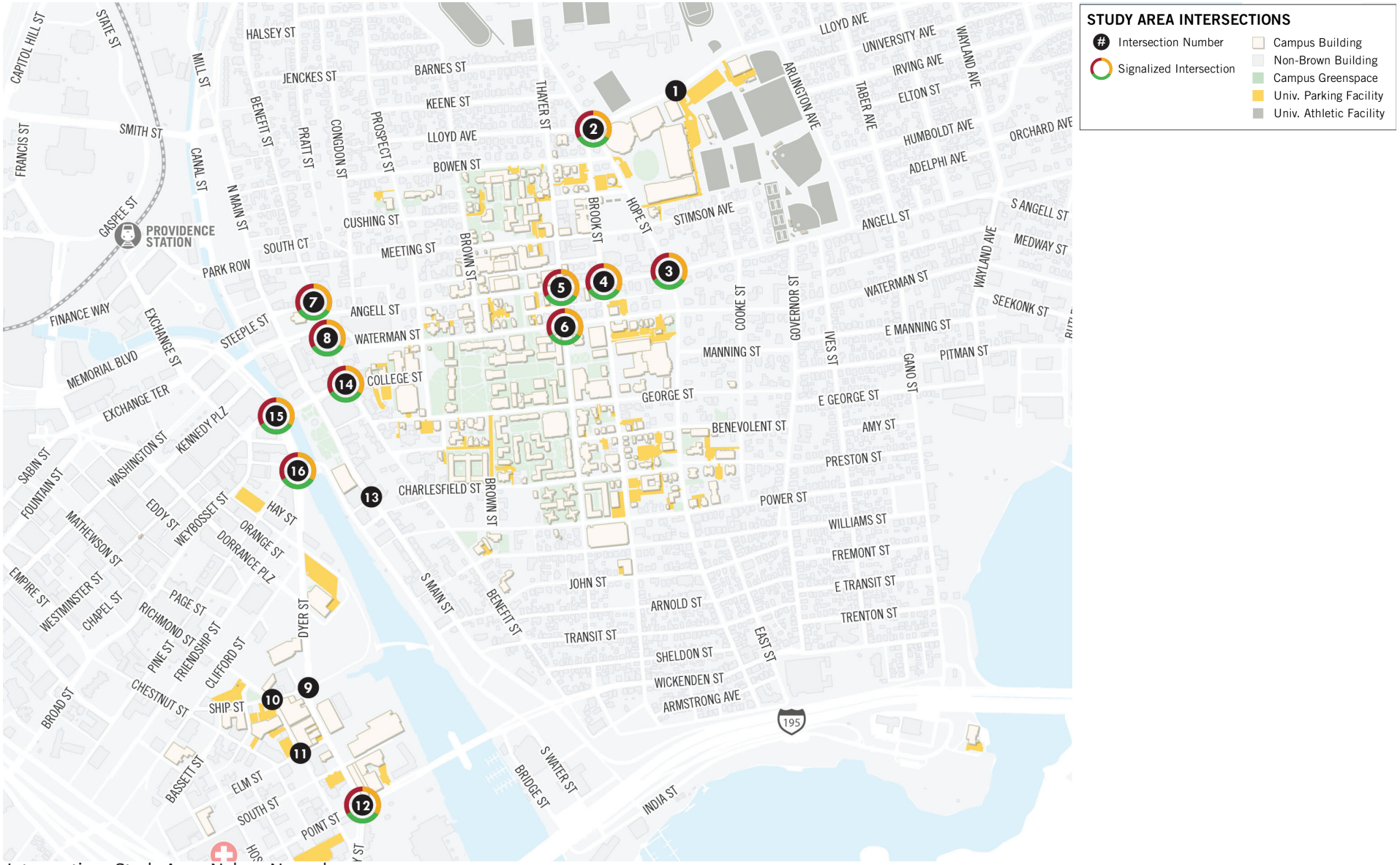
Brown has policies and procedures in place to manage and limit the impact of construction activities. This includes parking restrictions, traffic management and truck routes, and site-safety and pedestrian access.

CAMPUS INFRASTRUCTURE



Existing Parking Map
https://www.brown.edu/facilities/campus-maps

CAMPUS INFRASTRUCTURE



Intersections Study Area, Nelson Nygard

BROWN UNIVERSITY IMPACTS

TREE CANOPY INVENTORY SUMMARY

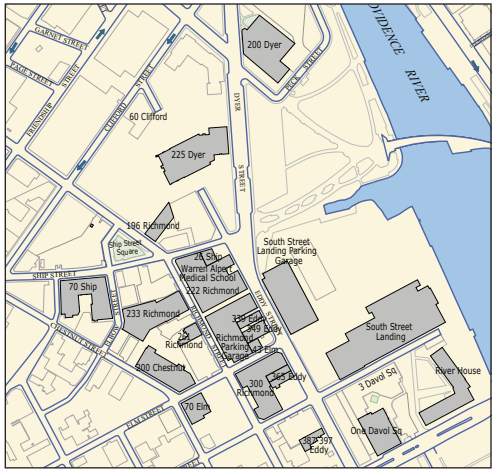
Brown's campus remains one of the greenest parts of the city, something that is readily apparent when looking at aerial photography. In compliance with Section 425 of the Zoning Ordinance, the University has updated its calculation of the overall tree canopy on campus. As demonstrated below, the overall canopy of Brown's campus is well above the required 30 percent.

In the past several years, clusters of new trees have been planted in several areas of campus, often as part of major construction projects. A few examples are 450 Brook Street, Sternlicht Commons and Brown University Health & Wellness Center and 250 and 259 Brook Street.

	Tree Canopy (SF)	Lot Area (SF)	Ratio
Athletic Complex	601,800	1,701,340	35%
Pembroke Field	48,000	102,777	47%
Pembroke Campus	291,300	423,487	69%
The Walk Area	145,900	378,506	39%
Main Campus	370,100	600,315	62%
Libraries	90,900	406,429	22%
Science Quad	244,720	514,646	48%
Keeney Quad	77,400	183,450	42%
Wriston Quad	173,300	340,852	51%
South Campus	204,300	485,915	42%
East Campus	228,000	369,162	62%
Jewelry District	214,600	582,987	37%
Total Canopy	2,690,520	6,089,866	44%

BROWN UNIVERSITY IMPACTS

Green Space Map - College Hill



Green Space Map - Jewelry District

Brown University Buildings

Brown University Green Spaces

BROWN UNIVERSITY IMPACTS

BROWN AND PROVIDENCE

At the heart of the relationship between the University and the people and organizations in the city and state is a commitment to productive engagement and partnership. In everything from improving medical care and public health, to community engagement activities, support for schools and our role in fueling the regional economy, we are deeply committed to investing in the success of our local community.

Health and Medicine

As a research university with the only schools of medicine and public health in the state, Brown contributes to world-class medical care, strong patient outcomes and innovative solutions for pressing health challenges facing communities across Rhode Island through its Warren Alpert Medical School, School of Public Health and affiliated programs.

Public Schools

For decades, Brown has worked closely with school leaders in Providence to support K-12 education through teaching, training and mentoring, research, volunteer efforts and financial investments aligned with the schools' priorities.

Economic Impact and Community Engagement

Brown is a vital anchor institution in the City of Providence and Rhode Island that plays a significant role in the economic well-being of the state. As a nonprofit academic institution driven by a mission of service, Brown makes a significant impact through its research and teaching, as well as its community engagement activities. Students, faculty and staff partner with local stakeholders to run after-school programs, address homelessness, assist refugees, provide health care, clean streets, curate museum exhibitions and much more.

Top Left: Uprooting Medea; Top Right: BEAM Program
Bottom Left: South Street Landing; Bottom Right: Haffenreffer Museum

PUBLIC ACCESS STATEMENT

The Brown University campus offers our neighbors many opportunities for education, contemplation, entertainment, and more. From its commitments to public art and local foods to its offerings of significant lecture series and film screenings, Brown welcomes friends and neighbors to campus. Brown reserves its rights as a private property owner to restrict public access at any time in order to preserve the safety and welfare of its students, faculty, staff, and property.

For more information, please visit: http://brown.edu/gcr/resources

BROWN UNIVERSITY IMPACTS

SUSTAINABILITY SUMMARY

Brown developed one of the first environmental studies units in the country, and made impressive strides toward energy efficiency on campus long before it was commonplace. Brown's sustainability program office was established and formally recognized in 1990. In 2007, Brown made its first pledge to reduce greenhouse gas emissions which set the stage for an even more ambitious goal, announced by the University in 2019, to cut emissions to net-zero by 2040.

Over the years sustainability at Brown has been guided by strategic planning committees always comprised of faculty, students, and staff. The most recent committee developed the University's first Sustainability Strategic Plan, the guiding document for all sustainability efforts at Brown. Upon assessing the scale of environmental problems and the University's ability to enact change, the following objectives became a priority:

- Reduce greenhouse gas emissions (net-zero by 2040)
- Reduce nutrient pollution
- Safeguard human health
- Reduce water use and impacts
- Curb biodiversity loss

In line with these objectives, the University's framework for focused sustainability action can be divided into three categories:

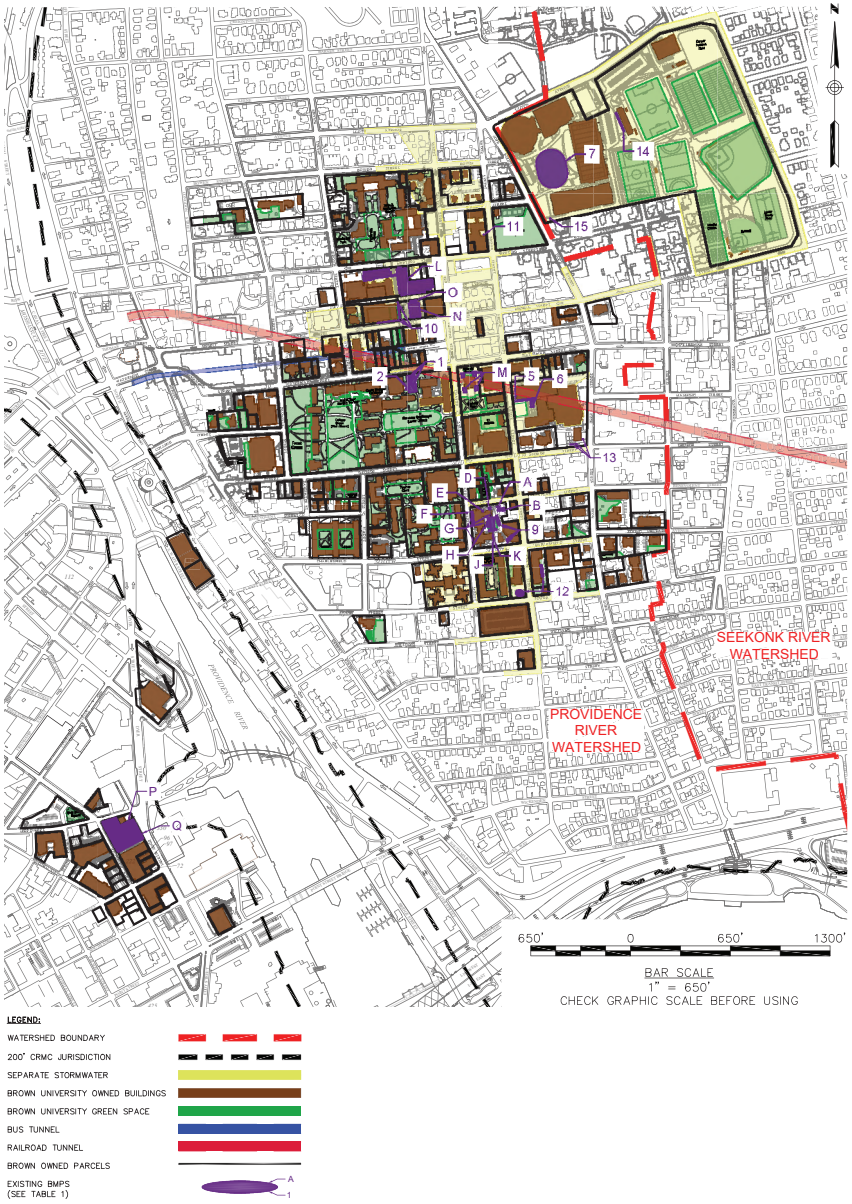
1. Changes to campus operations
2. Expansion of education in sustainability
3. Engagement beyond the Brown campus

The Sustainability Strategic Plan is an important step towards the University's objectives regarding the integration of sustainability into the fabric of the campus and it will require the collaboration of both administrative and academic departments across the institution to realize this vision.

As part of this plan, Brown continues to pursue widespread electrification of both facilities and vehicle fleets. The University has maintained and will continue to update electrical demand master planning. At this time, no new supply infrastructure to the college hill campus is anticipated before 2038. Conditions, requirements, and potential implementation strategies will remain in the planning foreground as requirements and capacities become clear.

Dry Bridge Solar Field, North Kingstown, RI

BROWN UNIVERSITY IMPACTS



STORMWATER MASTER PLAN SUMMARY

With Woodward & Curran's assistance, the University prepared an update to the 2017 Stormwater Masterplan. The Stormwater Masterplan was developed to help the University achieve the following goals associated with stormwater:

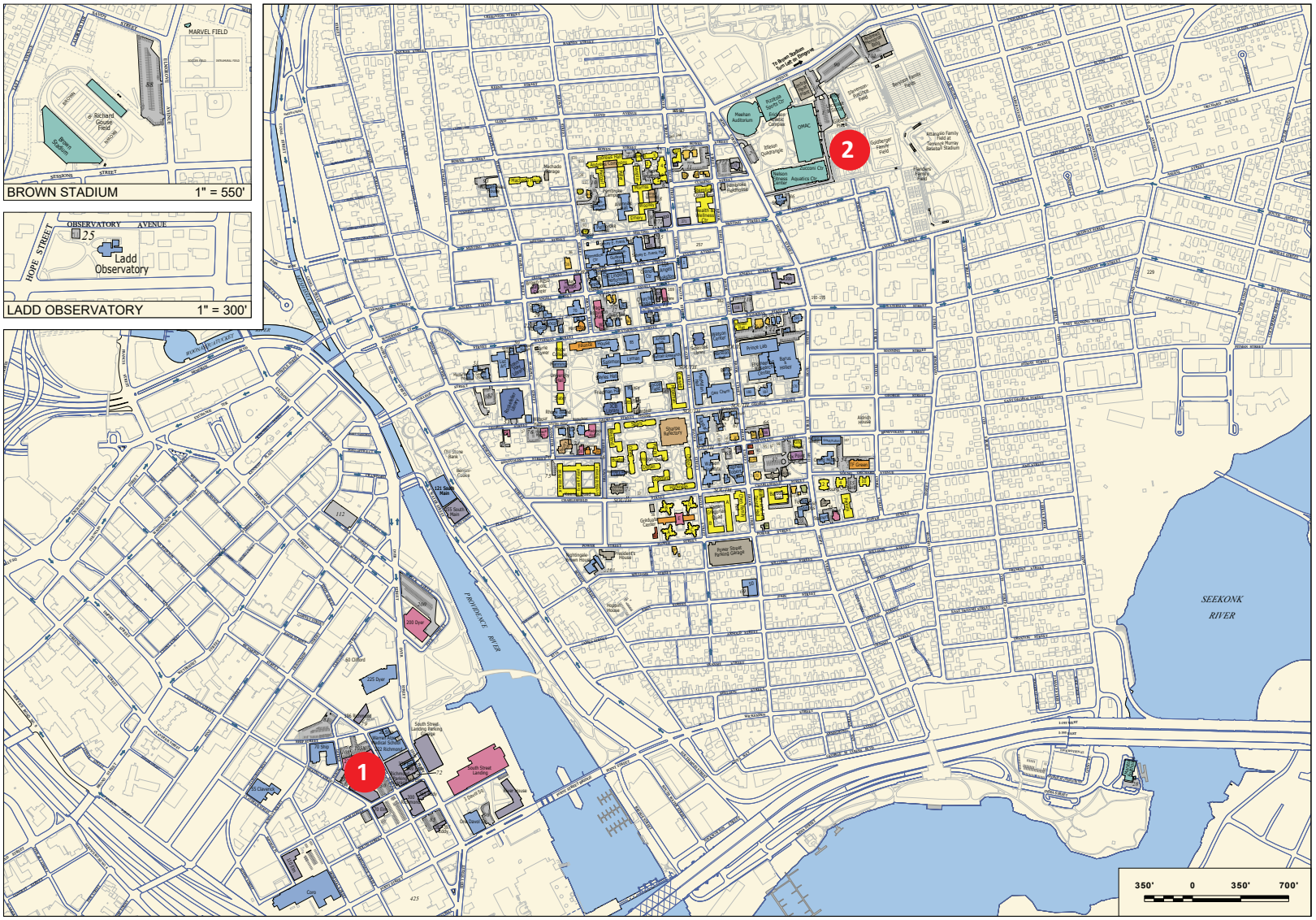
- Cleaner stormwater discharges to surrounding surface waters by creating a mechanism to manage stormwater on a campus-wide basis rather than a project by project basis.
- Reduces costs associated with implementing stormwater management systems, due to flexibility in where those systems can be constructed.
- Allows for greater development flexibility and design options, especially on smaller lots which are less able to fit larger stormwater management systems.

This Plan addresses the requirements of three regulatory agencies: Rhode Island Department of Environmental Management (RIDEM), City of Providence and the Narragansett Bay Commission (NBC)

Aligned with the University's plans for future development, it provides a strategy for treating stormwater prior to discharge to separate storm sewers and for eliminating stormwater from the combined sewer system.

The plan implements a credit and debit tracking system to assure that the stormwater management requirements imposed by the three agencies are met or exceeded at all times. The baseline date for the tracking system agreed upon by RIDEM, the City, and NBC is January 1, 2011, which coincides with the release of RIDEM's Stormwater Design and Installation Manual (RISDISM), and the 2011 Brown University's Institutional Master Plan (IMP) on file with the City.

UNIVERSITY PRIORITIES



1 *Integrated Life Sciences Building*
233 Richmond Street

2 *Athletics Practice Facility*
Erickson Athletic Complex

- Academic
- Administrative
- Residence Hall
- Auxiliary Properties
- Student Life
- Dining
- Library
- Athletic Facility
- Commercial
- Inactive
- Support
- Affiliated
- Independent
- Brown to Brown Home Ownership Program

Existing Building Function Map with Proposed Project Sites

UNIVERSITY PRIORITIES

INTEGRATED LIFE SCIENCES BUILDING

A new life sciences space has been a long-standing goal of the University that dates back to the Building on Distinction strategic plan (2013) and the BrownTogether fundraising campaign (2015). The University envisioned a facility that provides state-of-the-art laboratory space for researchers in biology, medicine, brain science, bioengineering, public health and other disciplines to work together on pressing health-related issues.

In line with this vision, Brown intends to construct a 7-story plus penthouse, 300,000 GSF +/- Integrated Life Sciences Building. The new building will accommodate wet, dry, and computational labs for approximately 76 new and existing faculty in 6 major program areas; offices, workstations, and collaboration spaces; as well as a ground floor that hosts a forum, gallery and cafe.

Located at 233 Richmond Street in the heart of Providence's Jewelry District, the new Integrated Life Sciences Building is situated opposite the Warren Alpert Medical School and in close proximity to Brown's School of Public Health, enabling cross-departmental collaboration.

The existing site consists of two Brown-owned buildings at 233 and 261 Richmond, as well as associated surface parking lots, which will be demolished to enable construction of the new facility. The Kilguss Research Institute at 200 Chesnut will remain and the siting of the ILSB will allow for future expansion and development.

UNIVERSITY PRIORITIES

CREATING A NEW ACTIVE URBAN ENVIRONMENT

- The Site Plan enhances the public realm
- Strengthens connections to the neighborhood
- Promotes new pedestrian activity
- Creates a new sense of place

ZONING

The site is zoned as a D-1-100 district with I-3E and I-3H overlays. The anticipated building height is 130’ plus 30’ for the penthouse. Brown shall appear before the DDRC and/ or the City Plan Commission, as applicable, if the project requires any variances.

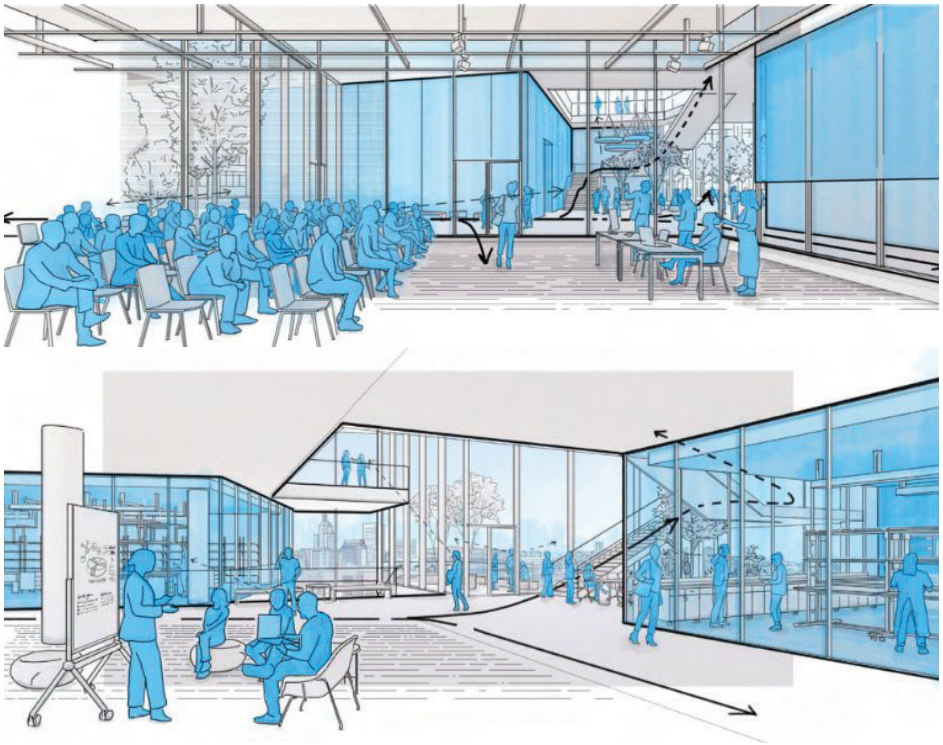
Site Plan / Ground Floor Plan

Program Connections

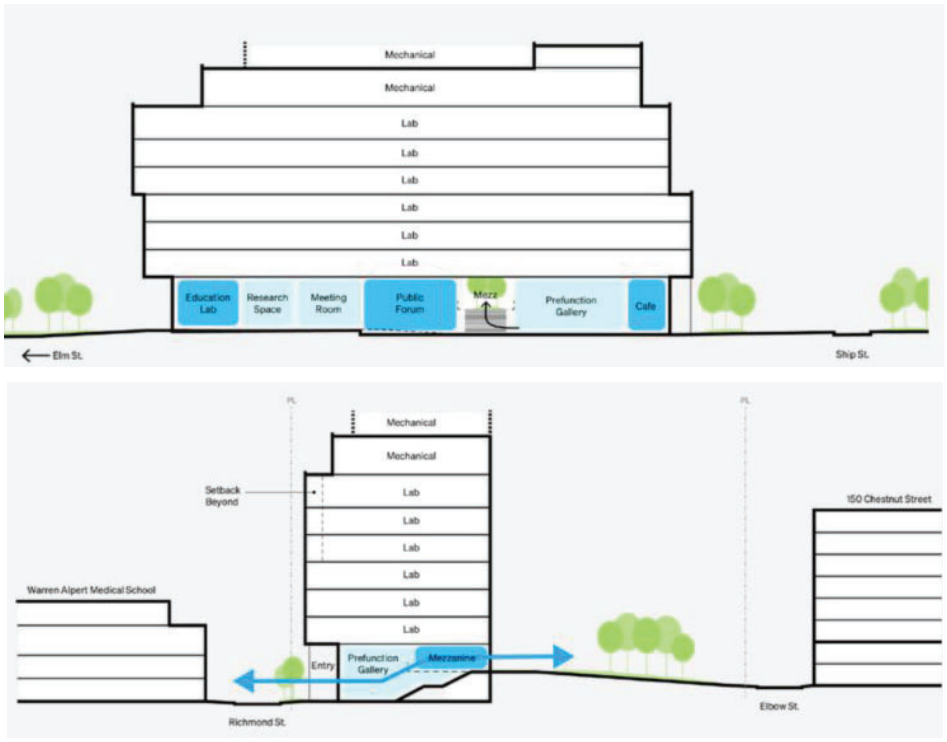
UNIVERSITY PRIORITIES

DESIGN AND MASSING

The design breaks down scale, while providing ample outdoor - indoor connections and plenty of opportunities for light, shade and gathering.

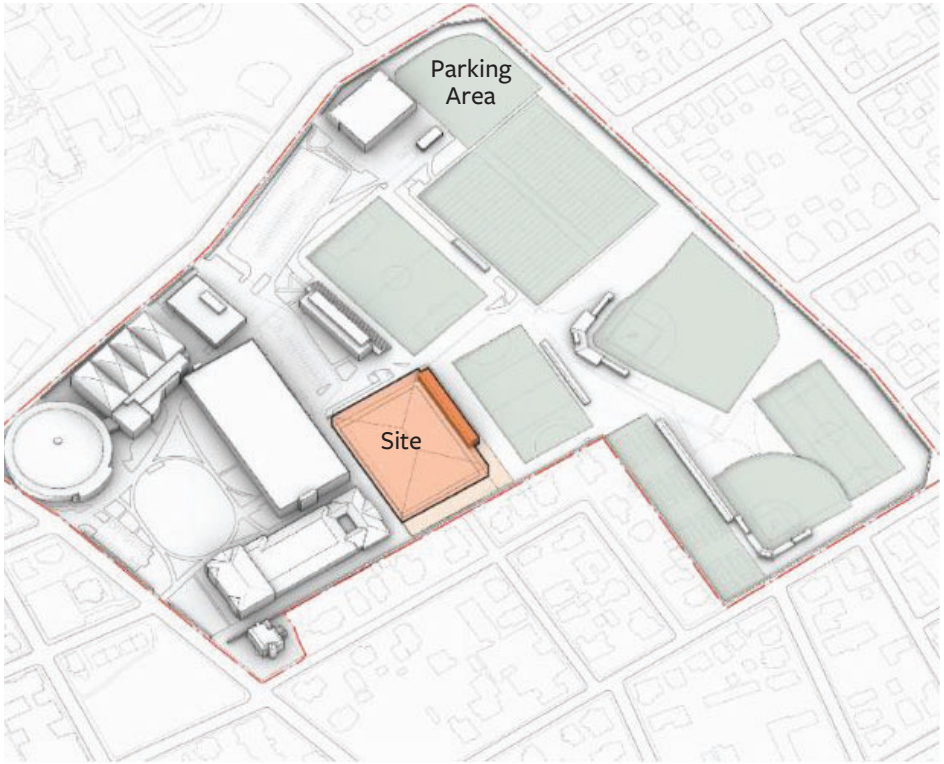


Perspective Vignettes



Conceptual Section Diagrams

UNIVERSITY PRIORITIES



Site Plan

ATHLETICS INDOOR PRACTICE FACILITY

Included in the University's plans to optimize the Erickson Athletic Complex is the construction of a new Indoor Practice Facility. The primary program is a new indoor turf field that will operate as a practice facility for football, lacrosse, soccer, and field hockey. In addition to the turf, the building program will include a small entry lobby, restrooms, and equipment storage.

The proposed 76,000 GSF +/- facility will displace the underutilized Meister Kavan Field behind the OMAC and will not result in any reduction in parking. Spectator seating and the pressbox for the Goldberger Field will be relocated to the east side of the existing field as part of project enabling. Brown will temporarily move service vehicles to the area east of 295 Lloyd, in order to accomodate more spectator and visitor parking on game and event days.

ZONING

The proposed Practice Facility is located within the I-2 Educational Institutional District. The anticipated building height is 65' at the roof peak. The building will fully comply with zoning setbacks and dimensional standards of the district.

UNIVERSITY PRIORITIES

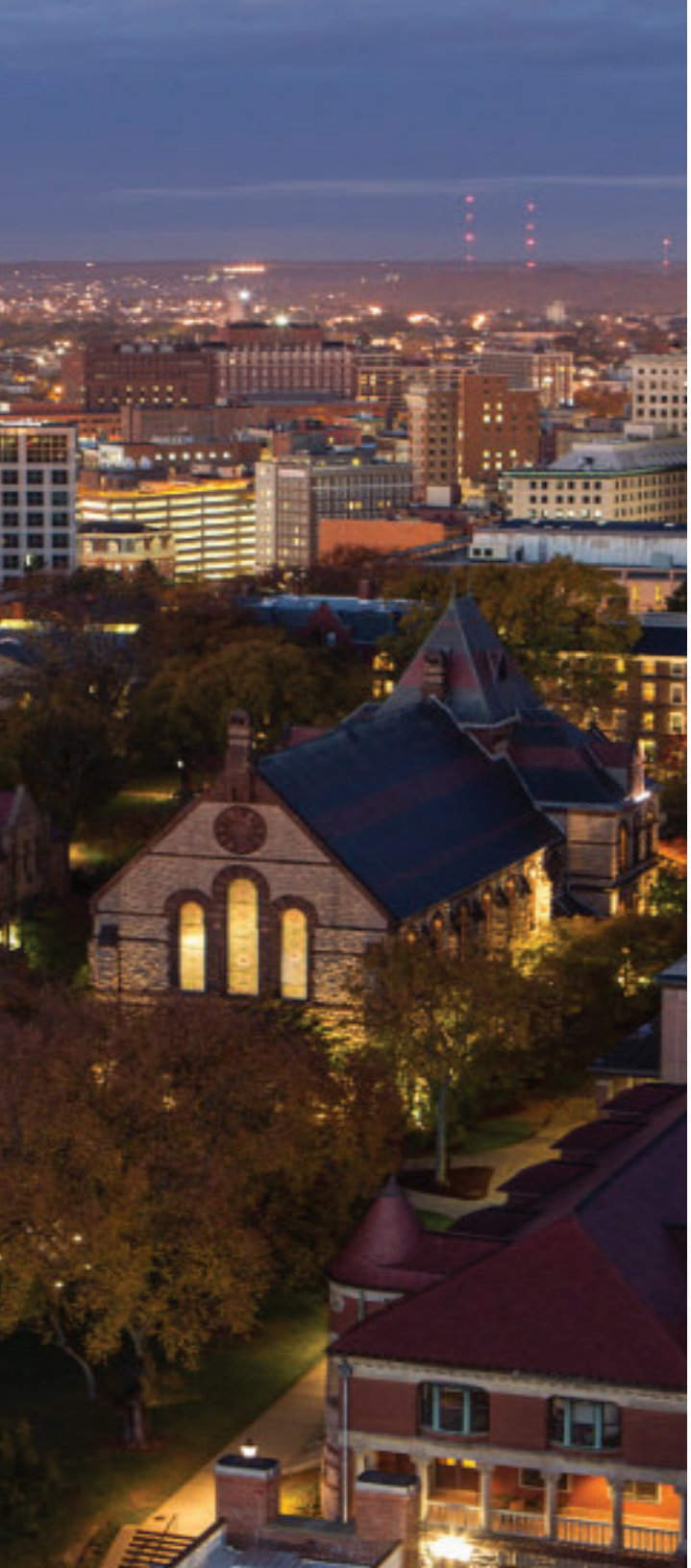
Top: 181 Bowen Street
Bottom: 126 Power Street

BROWN TO BROWN HOME OWNERSHIP PROGRAM

Seventeen years ago, in 2006, the University launched the Brown to Brown Home Ownership Program primarily as a pilot. The program is designed to encourage home ownership by faculty and staff adjacent to campus, and to return these properties to owner occupied, tax-paying status. Houses identified for the program are first renovated or constructed, and then sold to faculty or staff at a discounted price, with the University retaining the right to repurchase the properties in the future. Since the program's inception, the University has renovated and sold 19 properties, with a combined assessed value of $16.9M returned to city tax rolls.

Construction of a new two story home at 181 Bowen Street was completed in Summer 2022. It accommodates 3 bedrooms, living and kitchen areas, laundry facilities, and a private yard space. For the upcoming year, the University is planning to renovate the interior of an existing two-family home at 126 Power Street into a single family dwelling under the Brown to Brown housing program. Plans are also underway to renovate 80 Power Street under this program.

For more information about this program, see:
http://www.brown.edu/Facilities/browntobrown/



APPENDICES

A. Buildings Owned or Leased by Brown, Arranged by Plat and Lot Number
B. Index of Institutional Master Plan Submittal Requirements
C. Traffic and Transportation Component
D. Stormwater Management Plan
E. Athletics Event Parking Management Plan

Appendix A

Buildings Owned or Leased by Brown

Plat Numbe	Lot Number	Property Type	Property Name	Address Line 1	Ownership Status	Year of Construction	Building Usage	Property Code
4	4022	Building	Edgewood Yacht Club	1 Shaw Ave	Owned	2017	ATHLETICS	100328
7	3	Building	Brown Stadium	112 Sessions St	Owned	1925	ATHLETICS	100067
7	8	Building	Marvel Shed	425 Elmgrove Ave	Owned		ATHLETICS	100307
7	88	Building	Brown Stadium	112 Sessions St	Owned	1925	ATHLETICS	100067
7	89	Building	Brown Stadium	112 Sessions St	Owned	1925	ATHLETICS	100067
7	90	Building	Brown Stadium	112 Sessions St	Owned	1925	ATHLETICS	100067
7	91	Building	Brown Stadium	112 Sessions St	Owned	1925	ATHLETICS	100067
7	92	Building	Brown Stadium	112 Sessions St	Owned	1925	ATHLETICS	100067
7	93	Building	Brown Stadium	112 Sessions St	Owned	1925	ATHLETICS	100067
7	94	Building	Brown Stadium	112 Sessions St	Owned	1925	ATHLETICS	100067
8	265	Building	Ladd Observatory	210 Doyle Ave	Owned	1891	ACAD	100250
8	267	Building	Ladd Observatory	210 Doyle Ave	Owned	1891	ACAD	100250
10	227	Terrain	Green, Rochambeau Lower Garden		Owned			200172
10	229	Building	Rochambeau House	84 Prospect St	Owned	1929	ACAD	100253
10	284	Building	Olive St 020	20 Olive St	Owned	1885	AUXILIARY	100180
10	296	Building	Meeting St 205	205 Meeting St	Owned	1983	COMMERCIAL	100352
10	298	Parking	Meeting St 215 Parking	215 Meeting St	Owned			200412
10	302	Building	Thayer St 272	272 Thayer St	Owned	1976	COMMERCIAL	100324
10	333	Building	West House	91 Brown St	Owned	1885	RES HALL	100183
10	347	Building	Machado (Antonio) House	87 Prospect St	Owned	1912	RES HALL	100208
10	347	Building	Machado House Garage	116 Brown St	Owned		SUPPORT	100243
10	542	Parking	Prospect St 84 Parking	84 Prospect St	Owned			200082
10	577	Building	New Pembroke No. 1	302 Thayer St	Owned	1974	RES HALL	100150
10	577	Building	New Pembroke No. 2	306 Thayer St	Owned	1974	RES HALL	100166
10	577	Building	New Pembroke No. 3	308 Thayer St	Owned	1974	RES HALL	100194
10	577	Building	New Pembroke No. 4	300 Thayer St	Owned	1974	RES HALL	100221
10	580	Building	Bowen St 219	219 Bowen St	Owned	1896	RES HALL	100188
10	704	Building	BioMed ACF	173 Meeting St	Owned	1969	ACAD	100002
10	704	Building	BioMed Ctr	171 Meeting St	Owned	1969	ACAD	100091
10	704	Building	BioMed Grimshaw-Gudewi	175 Meeting St	Owned	1989	ACAD	100117
10	704	Building	Sidney E. Frank Hall Life Sci	185 Meeting St	Owned	2006	ACAD	100114
10	717	Building	Granoff Ctr For The Creativ	154 Angell St	Owned	2011	ACAD	100305
10	718	Building	Angell St 164	164 Angell St	Owned	1969	ACAD	100144
10	720	Building	Brown St 111	111 Brown St	Owned	1900	RES HALL	100261
10	720	Building	Cushing St 084-086	84-86 Cushing St	Owned	1895	AUXILIARY	100005
10	722	Building	Alumnae Hall	194 Meeting St	Owned	1926	ACAD	100076
10	722	Building	Andrews Hall	211 Bowen St	Owned	1947	RES HALL	100103
10	722	Building	Champlin: Pembroke Quad	208 Meeting St	Owned	1960	RES HALL	100119
10	722	Building	Emery: Pembroke Quad	200 Meeting St	Owned	1963	RES HALL	100235
10	722	Building	Metcalf Hall	98 Cushing St	Owned	1919	RES HALL	100084
10	722	Building	Miller Hall	118 Cushing St	Owned	1910	RES HALL	100179
10	722	Building	Morriss Hall: Pembroke Qu	206 Meeting St	Owned	1960	RES HALL	100097
10	722	Building	Pembroke Hall	172 Meeting St	Owned	1897	ACAD	100195
10	722	Building	Smith-Buonanno Hall	95 Cushing St	Owned	1907	ACAD	100170
10	722	Building	Verney-Woolley Hall: Pemb	204 Meeting St	Owned	1960	DINING	100012
10	722	Building	Woolley Hall: Pembroke Qu	202 Meeting St	Owned	1963	RES HALL	100126
10	732	Building	The Lindemann Performing	144 Angell St	Owned	2023	ACAD	100336
10	733	Parking	Olive St Parking	Olive St	Owned			200248
10	734	Building	Peter Green House	79 Brown St	Owned	1890	ACAD	100252
10	734	Building	Sharpe House	79 Brown St	Owned	1873	ACAD	100210
10	735	Parking	Olive St Parking	Olive St	Owned			200248
11	8	Parking	Stimson 2 Parking	2 Stimson Ave	Owned			200134
11	110	Building	Stimson Ave 002	2 Stimson Ave	Owned	1861	ACAD	100196
11	116	Building	Central Heat Plant	235 Lloyd Ave	Owned	1969	SUPPORT	100093
11	133	Building	Andrews Memorial Building	295 Lloyd Ave	Owned	2003	SUPPORT	100135
11	133	Building	Lacrosse Soccer	245 Lloyd Ave	Owned	2020	ATHLETICS	100357
11	133	Building	Meehan Auditorium	235 Hope St	Owned	1961	ATHLETICS	100021
11	133	Building	Nelson Fitness Center	225 Hope St	Owned	2012	ATHLETICS	100227
11	133	Building	Olney-Margolies Athletic Ce	229 Hope St	Owned	1981	ATHLETICS	100059
11	133	Building	Pizzitola	233 Hope St	Owned	1989	ATHLETICS	100267
12	50	Building	South Main St 121	121 South Main St	Owned	1983	ACAD	100228
12	73	Building	South Main St 155	155 South Main Street	Owned	1970	ACAD	100362
12	154	Building	Corliss-Brackett	45 Prospect St	Owned	1877	ACAD	100272
12	154	Building	Fones Alley 008	8 Fones Alley	Owned	1900	ACAD	100132
12	158	Building	Brown St 070	70 Brown St	Owned	2001	ACAD	100162
12	159	Building	Page-Robinson Hall	69 Brown St	Owned	1962	ADMIN	100031
12	159	Building	Walter Hall	80 Waterman St	Owned	1884	ACAD	100100
12	161	Building	Angell St 129	129 Angell St	Owned	1849	AUXILIARY	100141
12	162	Building	Urban Environmental Lab	135 Angell St	Owned	1984	ACAD	100211
12	164	Terrain	Green, The Walk South	143 Angell St	Owned			200165

Appendix A

Buildings Owned or Leased by Brown

Plat Numbe	Lot Number	Property Type	Property Name	Address Line 1	Ownership Status	Year of Construction	Building Usage	Property Code
12	165	Terrain	Green, The Walk South	143 Angell St	Owned			200165
12	167	Building	Churchill House	155 Angell St	Owned	1907	ACAD	100081
12	169	Building	Angell St 165	165 Angell St	Owned	1910	COMMERCIAL	100382
12	170	Building	Hemisphere Bldg	167 Angell St	Owned	1989	ADMIN	100283
12	177	Building	Angell St 195	195 Angell St	Owned	1902	ACAD	100186
12	191	Building	Lippitt House	96 Waterman St	Owned	1900	ACAD	100169
12	192	Building	Waterman St 094	94 Waterman St	Owned	1860	ACAD	100293
12	194	Terrain	Green, The Walk South	143 Angell St	Owned			200165
12	196	Building	Waterman St 086	86 Waterman St	Owned	1880	AUXILIARY	100154
12	197	Parking	Page-Robinson Hall Parking	69 Brown St	Owned			200131
12	198	Building	Norwood House	82 Waterman St	Owned	1865	ACAD	100048
12	201	Building	Brown St 068.5	68.5 Brown St	Owned	2001	ACAD	100140
12	201	Building	Partridge Hall & Annex	68 Brown St	Owned	1894	STUDENT AC	100151
12	203	Building	Waterman St 070	70 Waterman St	Owned	1859	ACAD	100125
12	204	Building	Mencoff Hall	68 Waterman St	Owned	1844	ACAD	100185
12	205	Building	Robinson Hall	64 Waterman St	Owned	1878	ACAD	100223
12	217	Building	MacFarlane House	48 College St	Owned	1845	ACAD	100178
12	218	Building	Gerard House, Samuel N.	54 College St	Owned	1838	ACAD	100019
12	219	Terrain	Green, List Art		Owned			200173
12	220	Building	List (Albert & Vera) Art Buil	64 College St	Owned	1971	ACAD	100020
12	222	Building	Blistein House	57 Waterman St	Owned	1867	ACAD	100143
12	222	Building	John Hay Library	20 Prospect St	Owned	1910	LIBRARY	100122
12	222	Building	List (Albert & Vera) Art Buil	64 College St	Owned	1971	ACAD	100020
12	222	Building	Prospect House	36 Prospect St	Owned	1875	ACAD	100034
12	228	Building	List (Albert & Vera) Art Buil	64 College St	Owned	1971	ACAD	100020
12	234	Parking	College St 51 Parking	51 College St	Owned			200800
12	235	Building	Angell St 127	127 Angell St	Owned	1853	AUXILIARY	100115
12	241	Building	Rockefeller (John D., Jr.) Lib	10 Prospect St	Owned	1964	LIBRARY	100288
12	241	Building	Wilbour Hall	2 Prospect St	Owned	1888	ACAD	100062
12	249	Building	Arnold Lab	91 Waterman St	Owned	1915	ACAD	100278
12	249	Building	Carrie Tower	69 Waterman St	Owned	1904	SUPPORT	100271
12	249	Building	Caswell Hall	168 Thayer St	Owned	1903	RES HALL	100004
12	249	Building	Faunce House	75 Waterman St	Owned	1903	STUDENT AC	100044
12	249	Building	Friedman Hall	90 George St	Owned	1891	ACAD	100013
12	249	Building	Gardner House	106 George St	Owned	1806	SUPPORT	100175
12	249	Building	Gardner House - Garage	106 George St	Owned	1806	SUPPORT	100205
12	249	Building	Hegeman Hall	128 George St	Owned	1926	RES HALL	100264
12	249	Building	Hope College	71 Waterman St	Owned	1822	RES HALL	100045
12	249	Building	John Carter Brown Library	94 George St	Owned	1904	LIBRARY	100008
12	249	Building	Lincoln Field Building	180 Thayer St	Owned	1903	ACAD	100284
12	249	Building	Littlefield Hall	102 George St	Owned	1926	RES HALL	100046
12	249	Building	Lyman Hall	83 Waterman St	Owned	1891	ACAD	100110
12	249	Building	Manning Hall	21 Prospect St	Owned	1834	ACAD	100096
12	249	Building	Maxcy Hall	108 George St	Owned	1895	ACAD	100265
12	249	Building	Medical Research Lab	89 Waterman St	Owned	1965	ACAD	100101
12	249	Building	Metcalf Research Building	190 Thayer St	Owned	1923	ACAD	100136
12	249	Building	Rhode Island Hall	60 George St	Owned	1840	ACAD	100099
12	249	Building	Salomon Ctr For Teaching	79 Waterman St	Owned	1862	ACAD	100050
12	249	Building	Sayles Hall	81 Waterman St	Owned	1881	ACAD	100158
12	249	Building	Slater Hall	70 George St	Owned	1879	RES HALL	100060
12	249	Building	University Hall	1 Prospect St	Owned	1770	ADMIN	100182
12	249	Building	Waterman St 085	85 Waterman St	Owned	1958	ACAD	100274
12	262	Building	Meiklejohn House	159 George St	Owned	1900	ACAD	100071
12	271	Building	Watson Center For Informa	115 Waterman St	Owned	1988	ACAD	100073
12	272	Building	Marston Hall	346 Brook St	Owned	1926	ACAD	100239
12	272	Building	Sciences Library	201 Thayer St	Owned	1971	LIBRARY	100086
12	306	Building	Kassar (Edward W.) House	151 Thayer St	Owned	1894	ACAD	100192
12	319	Building	Kassar (Edward W.) House	151 Thayer St	Owned	1894	ACAD	100192
12	326	Building	Faculty Club	1 Bannister St	Owned	1865	DINING	100282
12	327	Building	Faculty Club	1 Bannister St	Owned	1865	DINING	100282
12	333	Building	Horace Mann House	47 George St	Owned	1854	ADMIN	100207
12	334	Parking	Horace Mann, George St Pa	47 George St	Owned			200145
12	335	Parking	Horace Mann, George St Pa	47 George St	Owned			200145
12	337	Building	Faculty Club	1 Bannister St	Owned	1865	DINING	100282
12	340	Building	Shirley Miller House	59 George St	Owned	1915	ACAD	100268
12	341	Building	Faculty Club	1 Bannister St	Owned	1865	DINING	100282
12	341	Building	George St 067	67 George St	Owned	1821	ACAD	100095
12	344	Building	Benevolent St 026	26 Benevolent St	Owned	1823	STUDENT AC	100142
12	346	Building	Faculty Club	1 Bannister St	Owned	1865	DINING	100282
12	370	Building	George St 155	155 George St	Owned	1930	ACAD	100146

Appendix A

Buildings Owned or Leased by Brown

Plat Numbe	Lot Number	Property Type	Property Name	Address Line 1	Ownership Status	Year of Construction	Building Usage	Property Code
12	373	Building	Benevolent St 074-080	74-80 Benevolent St	Owned	1883	AUXILIARY	100214
12	374	Building	Thayer St 135	135 Thayer St	Owned	1928	ACAD	100289
12	389	Terrain	Green, Benevolent St Park	62-64 Benevolent St	Owned			200026
12	408	Building	Benevolent St 083-085	83 Benevolent St	Owned	1857	COMMERCIAL	100231
12	415	Building	Hirschfeld House	163 George St	Owned	1900	ACAD	100218
12	436	Terrain	Brook St 310	310 Brook St	Owned			200816
12	452	Terrain	Green, The Walk South	143 Angell St	Owned			200165
12	455	Building	Archibald-Bronson: Keeney	17 Benevolent St	Owned	1957	RES HALL	100258
12	455	Building	Everett-Poland: Keeney Qu	13 Benevolent St	Owned	1957	RES HALL	100263
12	455	Building	Jameson-Mead: Keeney Qu	11 Benevolent St	Owned	1957	RES HALL	100057
12	456	Building	Buxton House: Wriston Qua	27 Brown St	Owned	1951	RES HALL	100174
12	456	Building	Chapin House: Wriston Qua	116 Thayer St	Owned	1951	RES HALL	100163
12	456	Building	Diman House: Wriston Qua	41 Charlesfield St	Owned	1951	RES HALL	100164
12	456	Building	Goddard House: Wriston Q	39 Charlesfield St	Owned	1951	RES HALL	100157
12	456	Building	Harkness House: Wriston Q	47 Charlesfield St	Owned	1951	RES HALL	100219
12	456	Building	Marcy House: Wriston Qua	115 George St	Owned	1951	RES HALL	100193
12	456	Building	Sears House: Wriston Quad	113 George St	Owned	1951	RES HALL	100181
12	456	Building	Wayland House: Wriston Q	31 Brown St	Owned	1951	RES HALL	100088
12	457	Building	Sharpe Refectory	144 Thayer St	Owned	1951	DINING	100276
12	458	Building	Andrews House	13 Brown St	Owned	1900	SUPPORT	100200
12	458	Building	Annmary Brown Memorial	21 Brown St	Owned	1905	LIBRARY	100230
12	458	Building	Olney House: Wriston Quad	29 Brown St	Owned	1951	RES HALL	100033
12	469	Building	Maddock Alumni Center	38 Brown St	Owned	1830	ADMIN	100058
12	469	Building	Nicholson House	71 George St	Owned	1872	ACAD	100240
12	474	Building	Barus Building	340 Brook St	Owned	1885	ACAD	100171
12	474	Building	Geo-Chem Bldg	156 George St	Owned	1982	ACAD	100056
12	474	Building	Macmillan Hall	167 Thayer St	Owned	1998	ACAD	100032
12	481	Building	George St 025	25 George St	Owned	1913	ACAD	100006
12	490	Building	Charlesfield St 059	59 Charlesfield St	Owned	1877	ACAD	100248
12	490	Building	Stephen Robert Hall	280 Brook St	Owned	2018	ACAD	100333
12	490	Building	Watson Institute	111 Thayer St	Owned	2002	ACAD	100155
12	491	Building	Benevolent St 020	20 Benevolent St	Owned	1820	ADMIN	100090
12	491	Building	Stonewall House	22 Benevolent St	Owned	1816	SUPPORT	100116
13	17	Building	Cushing St 172	172 Cushing St	Owned	1890	COMMERCIAL	100256
13	18	Parking	Cushing St 172 Parking Lot	172 Cushing St	Owned			200797
13	19	Parking	Cushing St 172 Parking Lot	172 Cushing St	Owned			200797
13	30	Building	Thayer St 271	271 Thayer St	Owned	1994	COMMERCIAL	100318
13	40	Building	Pembroke Field House	171 Cushing St	Owned	1873	SUPPORT	100167
13	75	Building	Waterman St 118-120	118-120 Waterman St	Owned	1970	COMMERCIAL	100332
13	76	Building	Minden Hall	121 Waterman St	Owned	1912	RES HALL	100209
13	77	Building	Hope St 200	200 Hope St	Owned	1855	AUXILIARY	100377
13	81	Building	Waterman St 129	129 Waterman St	Owned	1871	AUXILIARY	100225
13	82	Building	Waterman St 131	131 Waterman St	Owned	1852	ACAD	100255
13	83	Building	Waterman St 133	133 Waterman St	Owned	1885	ACAD	100290
13	85	Building	Hope St 190	190 Hope St	Owned	1865	ACAD	100109
13	85	Building	Waterman St 137	137 Waterman St	Owned	1910	ACAD	100025
13	110	Building	George St 180	180 George St	Owned	1960	ACAD	100236
13	110	Building	George St 182	182 George St	Owned	1885	ACAD	100249
13	129	Building	Benevolent St 088	88 Benevolent St	Owned	1867	INDEPENDNT	100279
13	130	Building	Benevolent St 086	86 Benevolent St	Owned	1865	AUXILIARY	100259
13	132	Building	Brook St 287	287 Brook St	Owned	1970	AUXILIARY	100173
13	132	Building	Brook St 291	291 Brook St	Owned	1970	AUXILIARY	100202
13	133	Terrain	Benevolent St 089	89 Benevolent St	Owned			200406
13	136	Parking	Charlesfield 75 Parking	75 Charlesfield St	Owned			200056
13	137	Building	Brook St 281-283	281-283 Brook St	Owned	1980	AUXILIARY	100105
13	138	Building	King House	154 Hope St	Owned	1895	RES HALL	100238
13	140	Building	Charlesfield St 071-073	71-73 Charlesfield St	Owned	1870	AUXILIARY	100018
13	142	Building	Charlesfield St 075	75 Charlesfield St	Owned	1967	SUPPORT	100043
13	144	Building	Charlesfield St 075	75 Charlesfield St	Owned	1967	SUPPORT	100043
13	144	Building	Fiering House	79 Charlesfield St	Owned	1865	SUPPORT	100068
13	145	Building	Grant Fulton	105 Benevolent St	Owned	1845	ACAD	100030
13	145	Building	Morrison-Gerard Studio	151 Hope St	Owned	1845	ACAD	100009
13	145	Building	Orwig Music Hall	1 Young Orchard Ave	Owned	1905	ACAD	100010
13	147	Building	T.F. Green Hall	7 Young Orchard St	Owned	1959	STUDENT AC	100241
13	169	Building	Fox Point Day Care Ctr	150 Hope St	Owned	1960	INDEPENDNT	100107
13	185	Building	Hope St 199 - Unit 3	199 Hope St - Unit 3	Owned	1863	COMMERCIAL	100353
13	223	Building	Benevolent St 084	84 Benevolent St	Owned	1865	AUXILIARY	100245
13	250	Building	Bowen St 251	251 Bowen St	Owned	1900	AUXILIARY	100246
13	251	Building	Bowen St 247	247 Bowen St	Owned	1895	AUXILIARY	100038
13	259	Building	Fox Point Day Care Ctr	150 Hope St	Owned	1960	INDEPENDNT	100107

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Buildings Owned or Leased by Brown

Plat Numbe	Lot Number	Property Type	Property Name	Address Line 1	Ownership Status	Year of Construction	Building Usage	Property Code
13	271	Building	Waterman St 125-127	125 Waterman St	Owned	1863	AUXILIARY	100197
13	272	Parking	Hope & Waterman Parking	190 Hope St	Owned			200103
13	272	Parking	Minden Hall (South) Parking	121 Waterman St	Owned			200015
13	272	Parking	Waterman St 133 Parking	133 Waterman St	Owned			200098
13	297	Building	Brook St 456	456 Brook St	Owned	1885	AUXILIARY	100118
13	297	Building	Cushing St 154	154 Cushing St	Owned	1895	AUXILIARY	100094
13	297	Building	Cushing St 166	166 Cushing St	Owned	1885	AUXILIARY	100120
13	297	Building	Thayer St 307	307 Thayer St	Owned	1865	COMMERCIAL	100024
13	297	Building	Thayer St 315	315 Thayer St	Owned	1910	RES HALL	100051
13	307	Building	Barus & Holley	184 Hope St	Owned	1965	ACAD	100077
13	307	Building	Engineering Research Cente	345 Brook St	Owned	2017	ACAD	100331
13	307	Building	Hope St 170	170 Hope St	Owned	2015	ACAD	100326
13	307	Building	Prince Engineering Lab	355 Brook St	Owned	1962	ACAD	100275
13	314	Building	Sternlicht Commons	450 Brook St	Owned	2021	RES HALL	100338
13	315	Building	Sternlicht Commons	450 Brook St	Owned	2021	RES HALL	100338
16	164	Building	Hope St 134	134 Hope St	Owned	1910	BRN2BRN	100134
16	198	Building	Power St 089	89 Power St	Owned	1842	AUXILIARY	100127
16	202	Building	Nightingale-Brown House	357 Benefit St	Owned	1792	ACAD	100266
16	253	Building	John St 050	50 John St	Owned	1910	ACAD	100148
16	437	Building	President's House	55 Power St	Owned	1922	SUPPORT	100085
16	519	Building	Feinstein	130 Hope St	Owned	1917	ACAD	100069
16	534	Building	Power St 126	126 Power St	Owned	1900	AUXILIARY	100365
16	538	Building	Giddings House	128 Hope St	Owned	1908	ACAD	100070
16	538	Building	Giddings House - Garage	128 Hope St	Owned	2008	ACAD	100133
16	541	Parking	John St 50 Parking	50 John St	Owned			200101
16	568	Building	Charlesfield St 108-110	108-110 Charlesfield St	Owned	1910	AUXILIARY	100159
16	597	Building	Charlesfield St 038	38 Charlesfield St	Owned	1845	SUPPORT	100217
16	597	Building	Graduate Ctr A	40 Charlesfield St	Owned	1968	RES HALL	100082
16	597	Building	Graduate Ctr B	44 Charlesfield St	Owned	1968	RES HALL	100108
16	597	Building	Graduate Ctr C	82 Thayer St	Owned	1968	RES HALL	100176
16	597	Building	Graduate Ctr D	90 Thayer St	Owned	1968	RES HALL	100206
16	597	Building	Graduate Ctr E	42 Charlesfield St	Owned	1968	ADMIN	100273
16	598	Building	Barbour Hall	100 Charlesfield St	Owned	1904	RES HALL	100129
16	621	Building	Power St 80	80 Power St	Owned	1830	BRN2BRN	100390
16	633	Building	Power St Parking Garage	101 Power St	Owned	1988	SUPPORT	100138
16	642	Building	Vartan Gregorian Quad A	103 Thayer St	Owned	1991	RES HALL	100036
16	642	Building	Vartan Gregorian Quad B	101 Thayer St	Owned	1991	RES HALL	100061
16	672	Building	Chen Family Hall	250 Brook Street	Owned	2023	RES HALL	100359
16	673	Building	William and Ami Danoff Ha	259 Brook Street	Owned	2023	RES HALL	100381
17	54	Building	Marston Boathouse	258 India St	Owned	1967	ATHLETICS	100220
17	169	Building	Young Orchard Ave 004	4 Young Orchard Ave	Owned	1973	RES HALL	100226
17	260	Building	Young Orchard Ave 002	2 Young Orchard Ave	Owned	1973	RES HALL	100198
17	261	Building	Steinert Center	148 Power St	Owned	1966	ACAD	100153
17	262	Building	Dyer House	150 Power St	Owned	1822	ADMIN	100190
17	262	Building	Perkins Hall	154 Power St	Owned	1960	RES HALL	100222
17	602	Building	Hope St 125	125 Hope St	Owned	1819	ADMIN	100395
17	604	Building	Young Orchard Ave 002	2 Young Orchard Ave	Owned	1973	RES HALL	100198
17	605	Building	Young Orchard Ave 010	10 Young Orchard Ave	Owned	1973	RES HALL	100242
20	205	Building	Dyer St 200	200 Dyer St	Owned	1948	ADMIN	100313
20	353	Building	Richmond St 196	196 Richmond St	Owned	1920	COMMERCIAL	100015
21	67	Parking	Richmond 233 North Parkin	233 Richmond St	Owned			200233
21	105	Building	Ship St 070	70 Ship St	Owned	1902	ACAD	100035
21	110	Parking	Elbow St 006 Parking	6 Elbow St	Owned			200188
21	114	Parking	Chestnut St 152	152 Chestnut St	Owned			200821
21	120	Building	Chestnut St 200	200 Chestnut St	Owned	1900	COMMERCIAL	100385
21	121	Parking	Richmond & Elm Parking	Richmond & Elm	Owned			200241
21	122	Parking	Richmond & Elm Parking	Richmond & Elm	Owned			200241
21	123	Parking	Richmond & Elm Parking	Richmond & Elm	Owned			200241
21	124	Building	Richmond St 261	261 Richmond St	Owned	1950	COMMERCIAL	100386
21	127	Building	Richmond St 233	233 Richmond St	Owned	1970	ADMIN	100102
21	132	Building	Richmond St 222	222 Richmond St	Owned	1928	ACAD	100152
21	132	Building	Richmond St 222 Parking G	222 Richmond St	Owned	1989	COMMERCIAL	100128
21	140	Parking	Elm 43 Parking	43 Elm St	Owned			200235
21	141	Building	Eddy St 349	349 Eddy St	Owned	1968	COMMERCIAL	100064
21	146	Building	Ship St 026	26 Ship St	Owned	1900	ACAD	100329
21	147	Parking	Richmond St 297	297 Richmond St	Owned			200819
21	165	Building	Richmond St 300	300 Richmond St	Owned	1990	COMMERCIAL	100387
21	166	Parking	South St 61	61 South St	Owned			200819
21	168	Parking	Richmond St 317	317 Richmond St	Owned			200819
21	169	Parking	Richmond St 307	307 Richmond St	Owned			200819

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Buildings Owned or Leased by Brown

Plat Numbe	Lot Number	Property Type	Property Name	Address Line 1	Ownership Status	Year of Construction	Building Usage	Property Code
21	183	Parking	Elm St 72	72 Elm St	Owned			200818
21	303	Parking	Malcom Grear Parking	387 Eddy St	Owned			200192
21	304	Parking	Malcom Grear Parking	387 Eddy St	Owned			200192
21	305	Parking	Malcom Grear Parking	387 Eddy St	Owned			200192
21	306	Building	Eddy St 391	391 Eddy St	Owned	1900	COMMERCIAL	100392
21	309	Building	Eddy St 391	391 Eddy St	Owned	1900	COMMERCIAL	100392
21	340	Building	Eddy St 365 - Unit 1	365 Eddy St - Unit 1	Owned	1900	COMMERCIAL	100354
21	340	Building	Eddy St 365 - Unit 2	365 Eddy St - Unit 2	Owned	1900	COMMERCIAL	100355
21	391	Building	Elm St 043	43 Elm St	Owned	1945	SUPPORT	100311
21	398	Building	Eddy St 339	339 Eddy St	Owned	1900	ACAD	100184
21	400	Building	Richmond St 300	300 Richmond St	Owned	1990	COMMERCIAL	100387
21	407	Building	Davol Sq 001	1 Davol Sq	Owned	1900	COMMERCIAL	100277
21	417	Building	Elm St 070	70 Elm St	Owned	1900	COMMERCIAL	100384
21	446	Parking	Ship St Parking	70 Ship St	Owned			200190
21	454	Building	River House Apartments	1 Point St	Owned	2018	COMMERCIAL	100358
50	719	Building	Park Lane 010	10 Park Ln	Owned	1969	SUPPORT	100098
50	721	Building	Park Lane 010	10 Park Ln	Owned	1969	SUPPORT	100098
		Parking	Brook & Bowen St Parking	251 Bowen St	Owned			200005
		Parking	Brown & Benevolent Parkin	Brown & Benevolent Streets	Owned			200247

Leased Locations

Plat Numbe	Lot Number	Property Type	Property Name	Address Line 1	Ownership Status	Year of Construction	Building Usage	Property Code
10	705	Building	Hillel House	80 Brown St	Leased	1950	INDEPENDNT	100026
13	49	Building	Euclid Ave 001	1 Euclid Ave	Leased		ACAD	100345
20	400	Building	Dyer St 225	225 Dyer St	Leased		ACAD	100347
21	14	Building	Claverick St 055	55 Claverick St., 3rd Flr	Leased		ACAD	100351
21	202	Building	Elm St 110	110 Elm St	Leased	1848	COMMERCIAL	100063
21	318	Parking	Richmond St 425 Parking	425 Richmond St	Leased			200752
21	430	Building	South Street Landing	350 Eddy St	Leased	2017	ADMIN	100322
21	444	Building	Coro Center West	1 Hoppin St	Leased		ACAD	100393
21	452	Parking	South Street Landing Parkin	330 Eddy St	Leased			200751
38	2	Building	Butler Hospital Center Hous	345 Blackstone Blvd	Leased		ACAD	100367
38	2	Building	Butler Hospital Duncan Buil	345 Blackstone Blvd	Leased		HOSPITAL	100292
57	335	Building	Pavillion 66	66 Pavillion Ave	Leased		ACAD	100391

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Submittal Requirements, per City of Providence Zoning Ordinance, approved May 2, 2016	**Page(s) where referenced**
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b. Existing conditions	8, 17
c. Information relating to Historic Places/District	13-16
d. Statement of 10 year goals and 5 year objectives	7, 9, 24
e. Proposed changes in land holdings including newly acquired property and property to be sold	7, 18
f. Proposed changes to streets	7
g. Major repairs or renovations that would result in a change of general land use category	N/A
h. New structures, additions, parking facilities, outdoor facilities, or action that results in rerouting traffic	7, 21-26, 33-36
i. Proposed demolition	7
j. Parking plan	25
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l. Certificate for hospitals regulated by the Dept. of Health	N/A
m. Traffic study	21-24
n. Implementation plan	All
o. Public participation process	10
p. Inventory of tree canopy & landscaping	27-28
q. Public access statement	29

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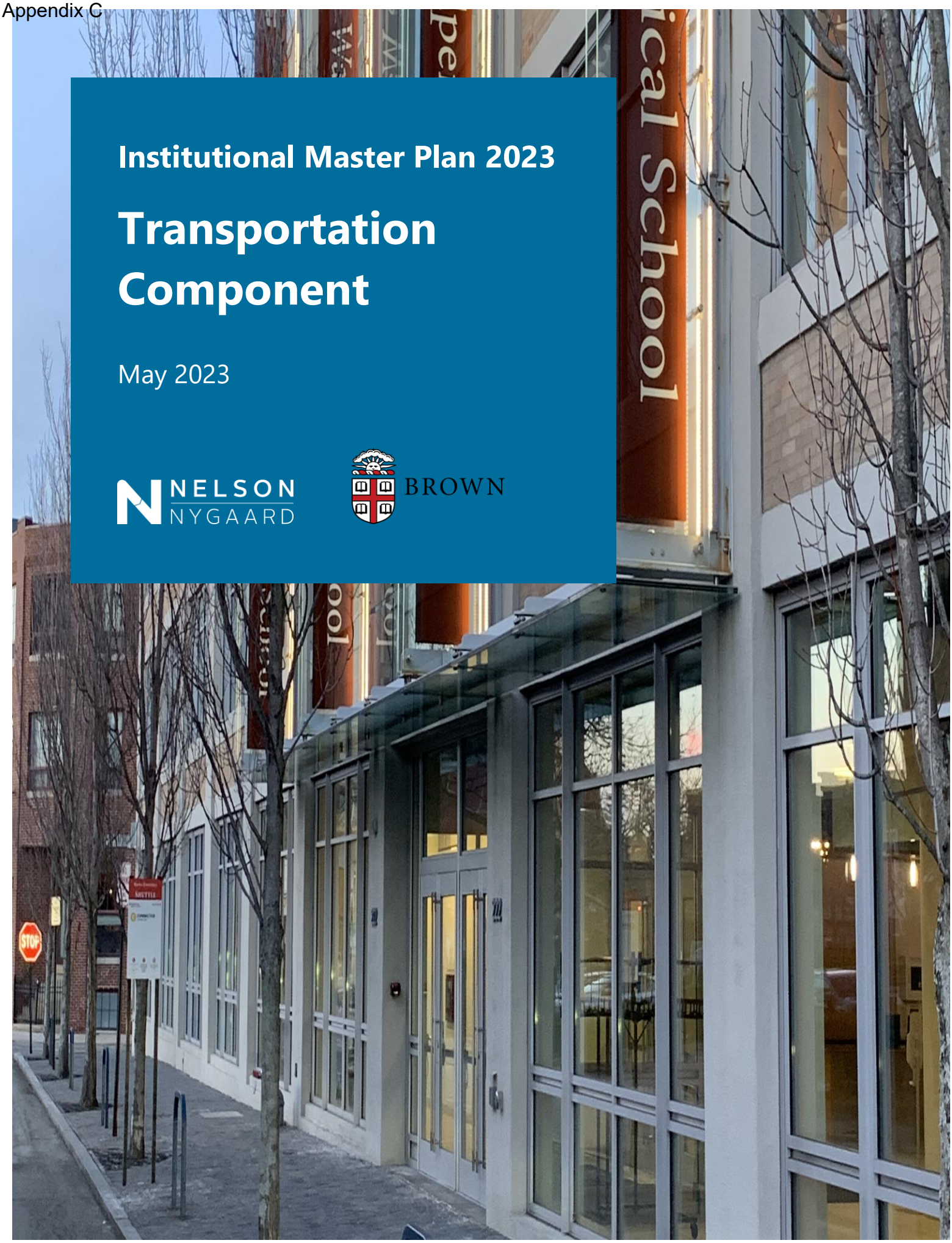

Institutional Master Plan 2023

Transportation Component

May 2023

NELSON NYGAARD

BROWN

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1 INTRODUCTION AND SUMMARY

INTRODUCTION

This report serves as the transportation component of Brown University's Institutional Master Plan 2023 (IMP). It describes transportation resources serving the College Hill and Jewelry District campuses, evaluates traffic conditions, and describes the transportation elements of Brown's proposed capital projects. These include an indoor practice facility on the College Hill campus (Erickson Athletic Complex) and an integrated life sciences building (ILSB) in the Jewelry District.

The scope of work for the study of traffic conditions and impacts of traffic generation from proposed projects was developed in consultation with the City of Providence Department of Planning and Development and Department of Public Works.[1]

The report also includes an analysis of parking requirements in accordance with the City of Providence zoning ordinance and describes transportation demand management strategies included in Around Brown, Brown's 2022 transportation management plan.

Key Transportation-Related Changes Since 2017

Several important changes since 2017 have altered travel patterns and parking demand. These include the following:

- In 2017, more than 400 Brown employees who previously worked in offices on College Hill campus relocated to offices at South Street Landing in the Jewelry District.
- Beginning with the COVID-19 pandemic in 2020, more Brown employees began working partly or fully remotely from off-campus locations. Some employees are now permanently remote while others have hybrid work arrangements.
- In 2022, Brown completed its campus transportation management plan, Around Brown.

The report provides further discussion of the ongoing and anticipated effects of these changes.

[1] Meeting held on October 25, 2022, with Alex Ellis, Nate Urso, and Liza Farr

SUMMARY

Existing Conditions

The analysis of existing conditions included a review of prior studies, field observation, new traffic data collection, consultation with City of Providence staff, and analysis and documentation. Traffic volumes have continued to decline. The 2017 IMP transportation element compared traffic data collected in 2017 with 2011 data and reported a 10% weighted average decrease in traffic volumes over the six-year period. These reductions preceded the relocation of approximately 400 employees from College Hill to the Jewelry District.

Since 2017, in addition to the employee relocation, demand for parking has declined, mainly due to the ability for some staff to work remotely all or part of the time. In addition, in 2022, Brown completed its campus transportation management plan, Around Brown.

Study Area

The study area for the 2023 IMP transportation element was expanded to include the School of Public Health on South Main Street and the Warren Albert Medical School and other Brown-owned or leased facilities are located within the Jewelry District.

Transportation Resources and Patterns

Transportation resources include:

- Walking: Campus and municipal facilities include a robust network of campus pathways to encourage walking along with a network of sidewalks and accessible curb ramps.
- Bicycling: Outdoor bicycle parking facilities are throughout Brown's campuses. The 2023 IMP transportation element includes the results of a comprehensive field inventory of such facilities. In addition, short-term bicycle rentals are available through a private vendor.
- Scooters: e-scooter rentals are available throughout the City of Providence.
- Shuttles: Brown operates three scheduled campus shuttle routes, a shuttle for riders with disabilities, and an on-demand service for door-to-door transportation when other services are not provided.
- RIPTA UPASS Bus Passes: Through a partnership between Brown and RIPTA, faculty, staff, and students can ride RIPTA for free with a Brown ID. Brown reimburses RIPTA for each trip taken using UPASS.
- Car Sharing/Zipcar: Brown provides resources for car sharing through an arrangement with Zipcar with 17 parking spaces round campus. Vehicles are open to anyone, including undergraduates (18+).

- Parking: Brown's parking resources for employees, students, and visitors include on-street spaces leased through an arrangement with the City of Providence, Brown-owned on-street spaces on streets the university fully controls, and off-street spaces (surface lots and garages). Consistent with observed reductions in traffic, parking demand at Brown has also declined considerably. At present, any Brown employee who wishes to obtain a parking permit may do so. Prior to the COVID-19 pandemic, employees without assigned parking spaces often had to be placed on a waiting list.
- Traffic Volumes: Data compiled for the 2023 IMP included 16 intersections and six roadway segments, including eight intersections and two roadway segments also counted in 2016 (for the 2017 IMP). Volumes continue to decline (by 22% in the morning peak hour and by 11% in the afternoon peak hour. The overall decline continues a trend of declining volumes noted in the 2017 IMP Update, which showed a 10% decline from 2011 volumes. An analysis of the signalized and unsignalized intersections did not reveal any significant deficiencies.

Existing and Future Parking Requirements

Article 14 of the City of Providence zoning ordinance establishes institutional parking requirements and includes a provision for the grandfathered deficiency of vehicle and bicycle parking spaces of the immediate previous use. In other words, when the ordinance was enacted, because Brown's parking supply was lower than the calculated requirement by 931 spaces, Brown was and is permitted to carry that shortfall forward. Currently, the available supply exceeds the requirement by 442 spaces. By the IMP horizon year of 2027, the available supply will decline by 127 spaces. The demand in 2027 will increase by 100 spaces, resulting in a future surplus of 215 spaces.

Transportation Demand Management

Transportation demand management (TDM) is a suite of policies, programs, and strategies aimed at reducing the use of single-driver private automobiles and encouraging the use of alternatives to driving alone. Brown has supported TDM for many years through a variety of means including offering free shuttle services, fully subsidizing the use of RIPTA bus services, investing in projects and programs that support bicycling and walking, and offering a commuter flexible spending benefit to faculty and staff.

In 2022, Brown completed Around Brown, the university's transportation management plan. Around Brown documented student and employee travel behavior, incorporated input through surveys and other outreach activities, and recommended a suite of improvements and activities to promote use of public transportation, walking, bicycling, and other measures aimed at reducing the use of use of private automobiles.

Future Conditions

The analysis of future conditions focused on traffic circulation and parking. The future traffic analysis includes assumptions about background growth in traffic and growth associated with the IMP. Intersection operations do not change significantly. Just two signalized intersections are forecast to experience a slight degradation in the future (Lloyd/Brook/Hope, and South Main/College). Neither location is expected to see unacceptable levels of congestion.

Integrated Life Sciences Building (ILSB)

Located in the Jewelry District, the ILSB is the primary new building project evaluated for this 2023 IMP Transportation Element. The current phase of the ILSB project is anticipated to add 195 new employees to the Jewelry District. Based on prior surveys, traffic data analysis, the proximity of the ILSB to the reginal highway network, and access and egress patterns, peak period traffic associated with the ILSB would be dispersed. No single study intersection is expected to see more than 25 cars related to ILSB during peak commuting times

Athletics Indoor Practice Facility

Brown is proposing to construct an approximately 76,000 square foot indoor practice facility on the existing Meister Kavan Field site. This facility is not expected to attract new vehicular traffic or result in an increase of large athletic events since it is for practice. There will be no loss of parking with this proposed project.

Construction Considerations

Brown has policies and procedures in place to manage and limit the impact of construction activities. This includes parking restrictions, traffic management and truck routes, and site-safety and pedestrian access.

2 EXISTING CONDITIONS

INTRODUCTION

The Nelson\Nygaard team evaluated existing transportation infrastructure, systems, and services within Brown's main campus on College Hill, around the School of Public Health located at 121 South Main Street, and around the Warren Alpert Medical School in the Jewelry District. This evaluation included the following activities:

- Review of prior studies, including the 2011 and 2017 Brown IMP transportation elements and Around Brown, Brown's campus transportation management plan completed in 2022
- Inventory and field observations of existing streets, sidewalks, bicycle resources, and parking areas
- Intersection and roadway counts
- Consultation with City of Providence staff
- Analysis and documentation

Prior Transportation Analyses

Brown has prepared IMP transportation studies in 2006, 2011, and 2017. The 2017 study compared traffic data collected in 2017 with 2011 data and reported a 10% weighted average decrease in traffic volumes over the six-year period. These reductions preceded the relocation of approximately 400 employees from College Hill to the Jewelry District.

Key Transportation-Related Changes Since 2017

Several important changes since 2017 have altered travel patterns and parking demand. These include the following:

- In 2017, more than 400 Brown employees who previously worked in offices on College Hill campus relocated to offices at South Street Landing in the Jewelry District.
- Beginning with the COVID-19 pandemic in 2020, more Brown employees began working partly or fully remotely from off-campus locations. Some employees are now permanently remote while others have hybrid work arrangements.
- In 2022, Brown completed its campus transportation management plan, Around Brown.

STUDY AREA

Brown's College Hill campus is generally bounded by Lloyd Avenue to the north, Power Street to the south, Arlington Avenue/Hope Street to the east and Prospect Street/Benefit Street to the west. The School of Public Health is located near Downtown between South Water Street and South Main Street. The Warren Alpert Medical School and other Brown-owned or leased facilities are located within the Jewelry District in an area bounded by Clifford Street to the north, Point Street to the south, the Providence River to the east, and Chestnut Street to the West. See Figure 1.

Figure 1 Brown University Study Area (College Hill and Jewelry District)

Source: Around Brown Transportation Management Plan, 2022

TRANSPORTATION RESOURCES

Transportation resources for travel to and through Brown's campuses include facilities for walking, bicycling, using scooters, using public transportation and a campus shuttle, and driving. As described in Around Brown, the university's transportation management plan, "Because of the concentration of beds and classrooms on College Hill, most students can travel by walking, cycling, or transit."

Walking

Brown's campus includes a robust network of pathways that encourage walking. The adjacent street network includes sidewalks and street crossings, the majority of which is fully accessible. See Figure 2. As noted in Around Brown, "walking underpins all other transportation activities on Brown's College Hill campus. Many students, staff, and faculty walk to and from campus for their commutes, and affiliates primarily walk between buildings when attending meetings and classes."

Bicycling and Scooters

Bicycling is an essential transportation mode for the Brown community. A convenient, low-cost, and healthy transportation mode, bicycles offer easy connections on campus and in Providence. Brown provides resources and promotes programs related to biking to and around campus. This includes providing and maintaining pathways for bicycle circulation within campus, offering free parking resources (indoor and outdoor), support for bike share programs, and other activities.

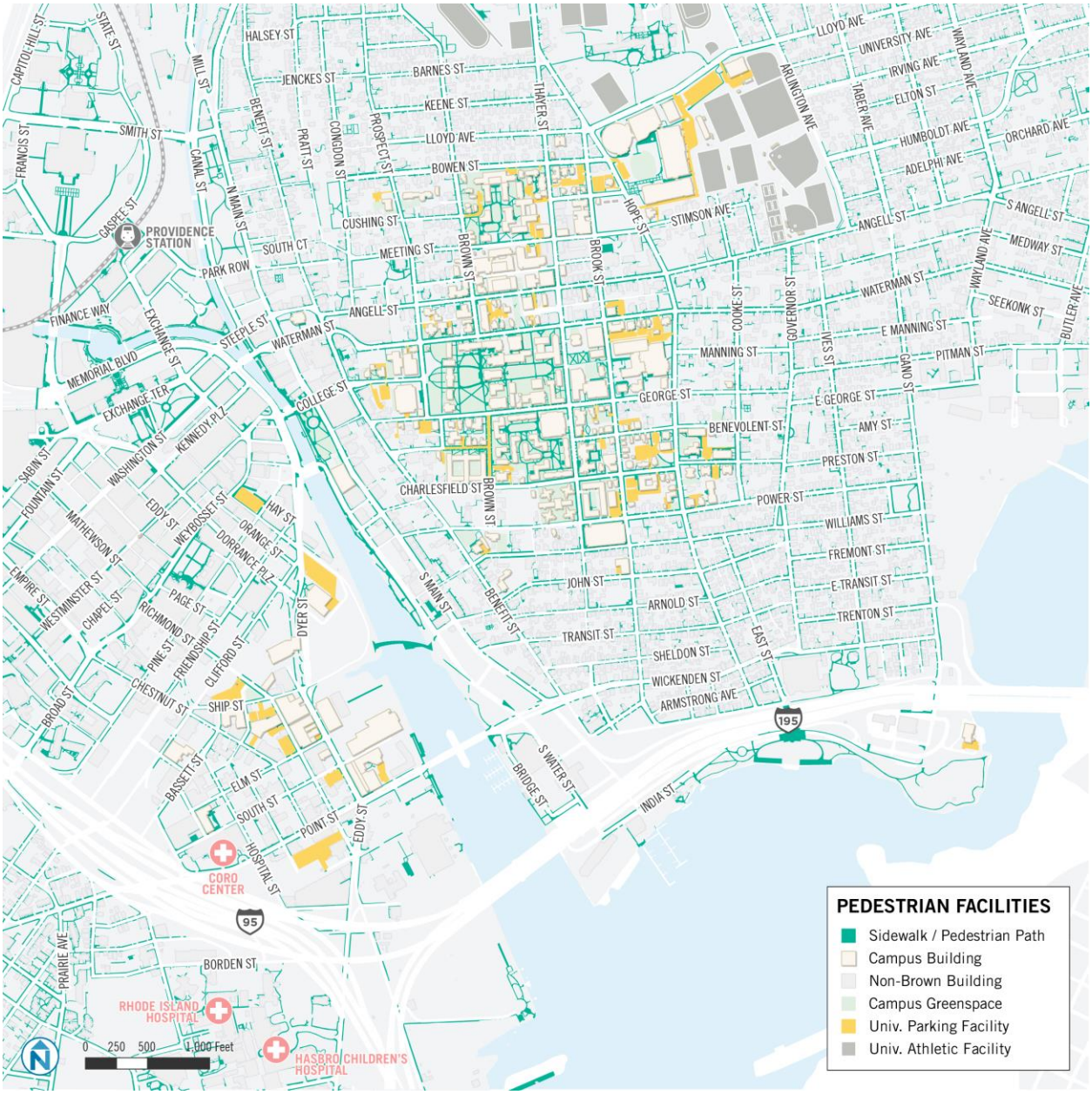
Bicycle Parking Inventory

As a follow-up to Around Brown, the university conducted a comprehensive inventory of bicycle parking resources in the summer of 2022. The inventory considered whether the spaces meet the standards outlined in Section 1405 of the City of Providence zoning ordinance, which specifies where parking should be located and how bicycle parking should be designed. Nelson\Nygaard visited each bicycle parking space, counted the number of racks (by type) and the number of spaces available, and determined whether the spaces meet the Section 1405 requirements. Some of the spaces included in the inventory do not fully meet the requirements but are viable parking facilities. This includes well-utilized bike racks that are situated on an unpaved surface. Figure 3 presents the locations of each bicycle parking facility and notes which racks fully meets the zoning requirements and which racks partially meet the requirements and are acceptable parking spaces.

Shared Bikes and Scooters

Spin operates shared electric scooter and bicycle programs in Providence and Bird and Veo operate shared scooter programs. These services require users to download a smartphone app, pay a fee to unlock the scooter or bike, and pay a per-mile charge. This resource is a popular option for the Brown community, particularly students.

Figure 2 Pedestrian Facilities



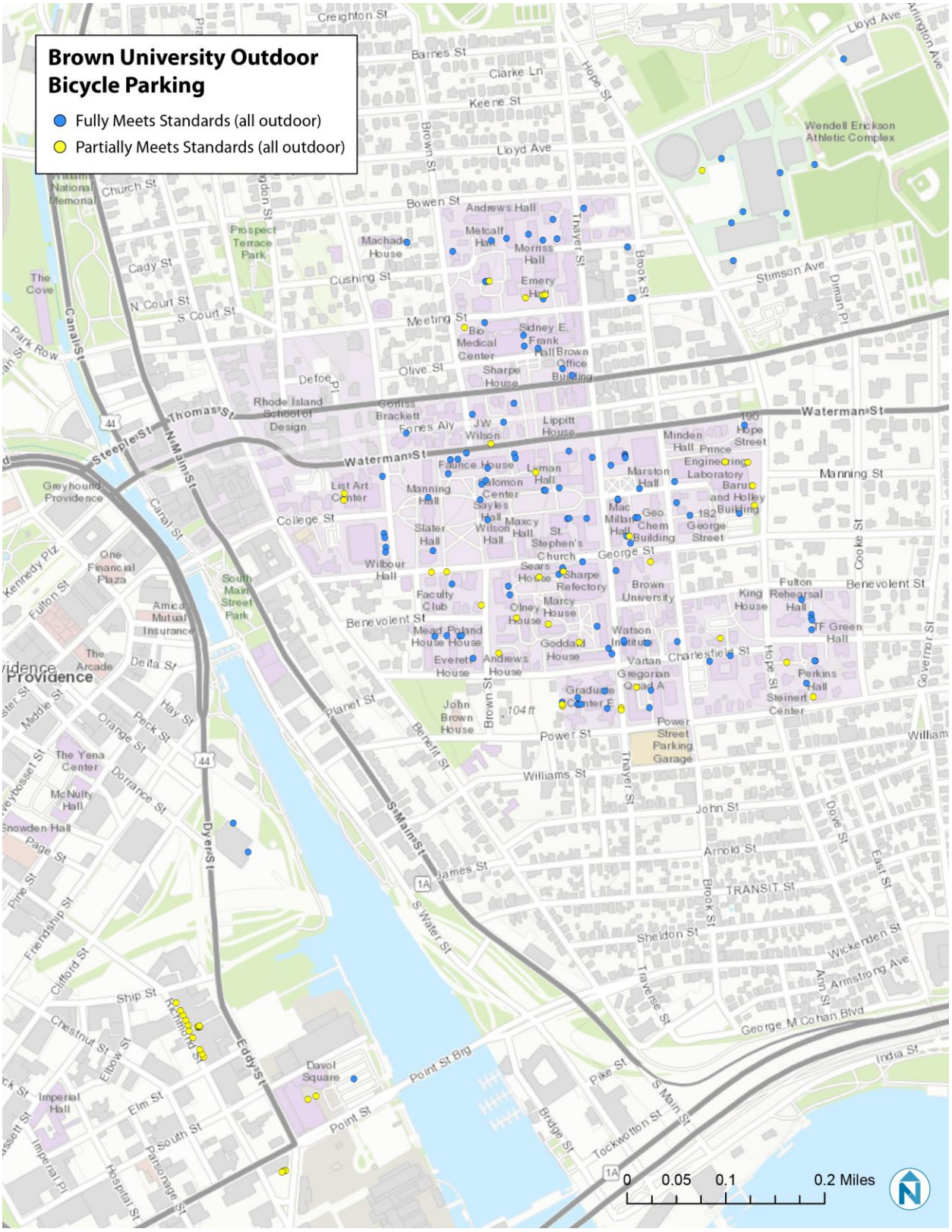
Source: Around Brown Transportation Management Plan, 2022

Other Bicycle Resources at Brown

The following are other activities at Brown that support bicycling

- The Department of Facilities Management has a fleet of 12-18 bicycles for shared use by department employees to travel while on campus.
- The Department of Public Safety uses bicycles for officers on campus patrols.
- Bikes at Brown is a student-run bicycle repair and rental shop for Brown affiliates.

Figure 3 Outdoor Bicycle Parking at Brown



Public Transportation Services

Transit services for the Brown community include the Brown University Shuttle (B.U.S) and services provided by the Rhode Island Public Transit Authority (RIPTA).

Brown University Shuttles

Brown operates three scheduled campus shuttle routes plus two on-demand services to anyone with a Brown ID or ID from the Rhode Island School of Design (RISD). Two daytime shuttles (Express and Connector) operate weekdays between 7 a.m. and 7 p.m. These routes connect College Hill, the Jewelry District, and the hospitals (Rhode Island Hospital and Hasbro Children's Hospital). See Figure 4. Brown operates the bi-directional Evening Shuttle (daily, beginning at 5 p.m.) on College Hill that operates during the academic year. For riders with disabilities, Brown operates Access Shuttle (also daily, with limited weekend hours) and riders must register for and request service. Finally, Brown operates Brown onCall throughout the year, available to Brown affiliates for point-to-point transportation to and from areas not accommodated by the Evening Shuttle (hours vary by time of year). See Figure 5.

RIPTA Services

RIPTA operates public transportation services throughout Rhode Island. This includes fixed-route bus service with connections to four MBTA commuter rail stations and to the Providence Amtrak station. RIPTA has numerous routes that provide service directly to locations in and around Brown's campus. RIPTA also has routes that provide shorter trip connections in and around College Hill and the Jewelry District.

Brown UPASS

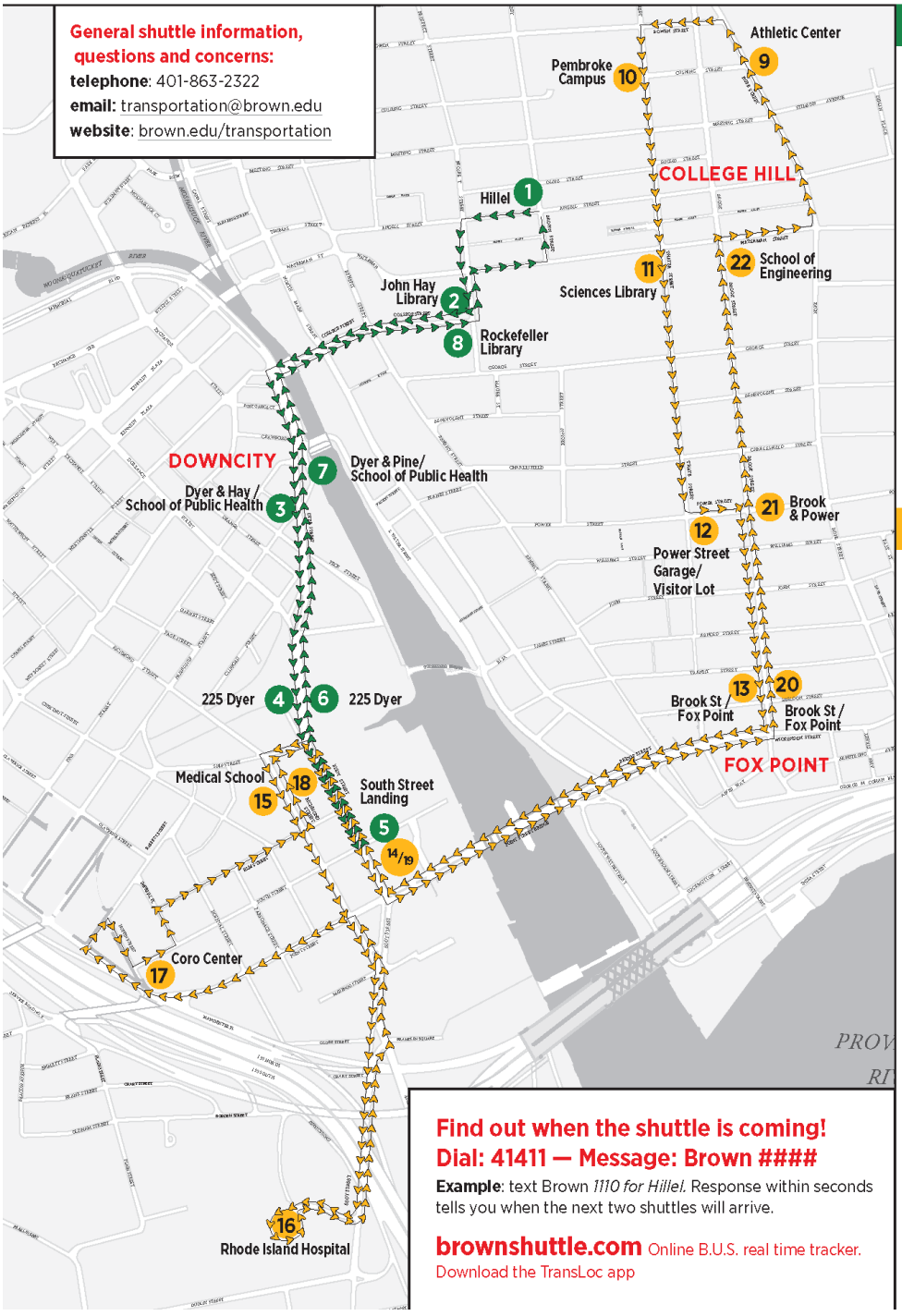
Through a partnership between Brown and RIPTA, faculty, staff, and students can ride RIPTA for free with a Brown ID. Brown reimburses RIPTA for each trip taken using UPASS. In 2022, RIPTA provided approximately 186,500 rides to Brown affiliates, and Brown reimbursed RIPTA more than $287,000 for these trips. As noted in Around Brown, staff and faculty consistently make up about half of total Brown UPASS riders.

Figure 4 B.U.S Daytime Connector and Express Shuttle Routes

Daytime Connector & Express Routes

Operates from Monday–Friday 7 a.m. to 7 p.m.

BUS Brown University Shuttle



Express Route

1. Hillel
   Text ID: 1110
2. John Hay Library
   Text ID: 1120
3. Dyer & Hay / School of Public Health
   Text ID: 2130
4. 225 Dyer
   Text ID: 2140
5. South Street Landing
   Text ID: 2150
6. 225 Dyer
   Text ID: 2160
7. Dyer & Pine / School of Public Health
   Text ID: 2170
8. Rockefeller Library
   Text ID: 1180

Connector Route

9. Athletic Center
   Text ID: 1310
10. Pembroke Campus
    Text ID: 1320
11. Sciences Library
    Text ID: 1330
12. Power Street Garage / Visitor Lot
    Text ID: 1340
13. Brook St - Fox Point
    Text ID: 1350
14. South Street Landing
    Text ID: 2150
15. Medical School
    Text ID: 2360
16. Rhode Island Hospital
    Text ID: 2370
17. Coro Center
    Text ID: 2380
18. Medical School
    Text ID: 2390
19. South Street Landing
    Text ID: 2150
20. Brook St / Fox Point
    Text ID: 1410
21. Brook & Power
    Text ID: 1420
22. School of Engineering
    Text ID: 1430

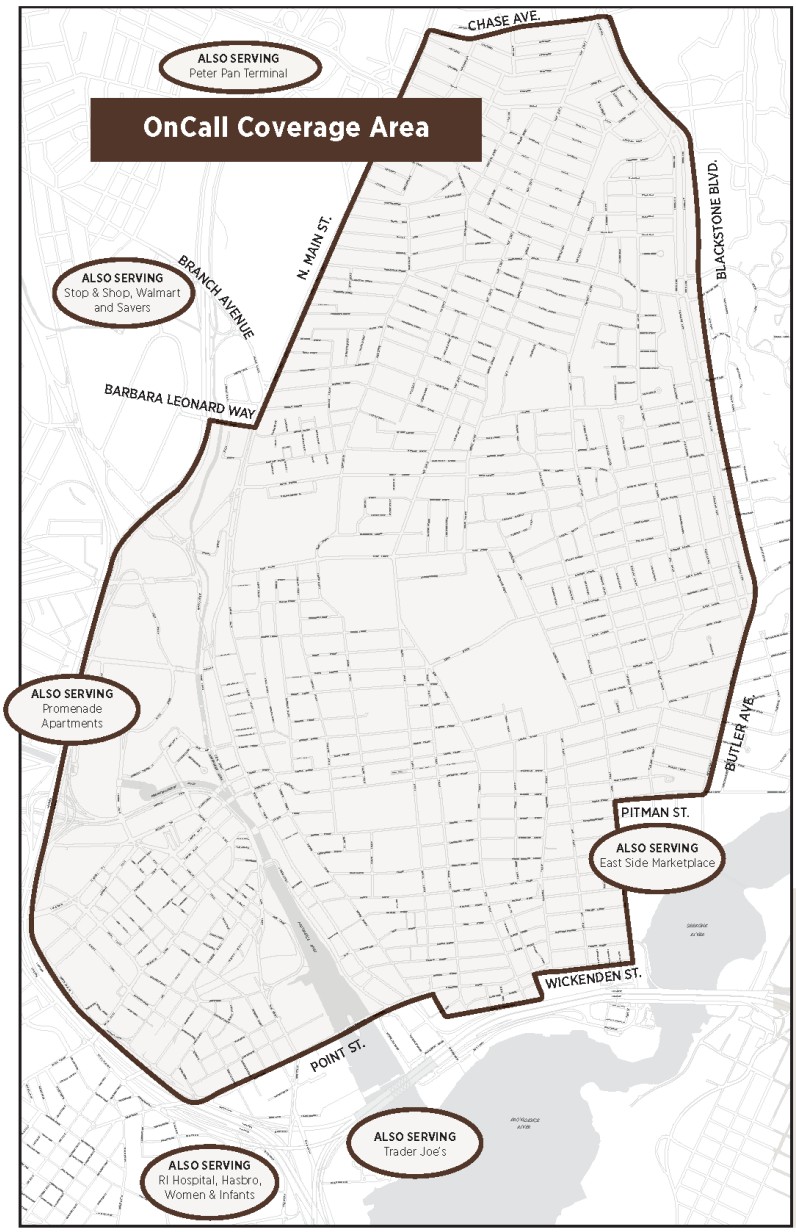
Figure 5 Brown onCall Shuttle Service

Brown OnCall

Transportation for the Brown Community

Brown ID required to ride

BUS Brown University Shuttle



The Brown **OnCall** shuttle provides a point to point ride service to and from areas not accommodated by the Brown Evening Shuttle Route. Only one guest is permitted per Brown ID holder, and that information must be included in your request. Riders can only board the vehicle with items that they can handle on their own, and will not take up any additional seating. Alcoholic beverages are not allowed in the vehicle, even if they are in sealed containers.

HOURS OF OPERATION

7 p.m.–2 a.m. *DST* Sun–Wed
Last call taken at 1:45 a.m.

7 p.m.–3 a.m. *DST* Thur–Sat
Last call taken at 2:45 a.m.

5 p.m.–2 a.m. *EST* Sun–Wed
Last call taken at 1:45 a.m.

5 p.m.–3 a.m. *EST* Thur–Sat
Last call taken at 2:45 a.m.

For more information
about the OnCall service, rules, and schedules, please visit **brown.edu/transportation.**

General shuttle information / questions and concerns:
telephone: 401-863-2322
email: transportation@brown.edu

Request a ride: shuttle.brown.edu

or call **401-863-1778.** Please have your Brown ID# ready before calling.

Vehicular Travel

This section describes the intersections studied for the IMP, traffic volumes collected, and analyses of traffic operations.

Study Area Intersections

For the 2023 IMP, the consultant team proposed to collect data and study fewer intersections on College Hill than in prior studies. The team also added data collection and analysis locations near the School of Public Health and near the Alpert Medical School campus for a total of 16 intersections. City of Providence staff approved this data collection and analysis plan.

Figure 6 lists the intersections studied for the IMP, including eight College Hill locations studied in prior IMP transportation elements, four locations near SPH and four locations near Brown Medical. The consultant team collected counts at each location, observed current operations, and conducted capacity analysis.

Figure 6 Brown University IMP Count and Analysis Locations

Intersection	Type
Lloyd Avenue/parking entrance next to central heat plant	Unsignalized
Lloyd Avenue/Brook Street/Hope Street	Signalized
Hope Street/Angell Street	Signalized
Brook Street/Angell Street	Signalized
Angell Street/Benefit Street/Thomas Street	Signalized
Waterman Street/Benefit Street	Signalized
Angell Street/Thayer Street	Signalized
Waterman Avenue/Thayer Street	Signalized
Ship Street/Eddy Street (new)	Unsignalized
Ship Street/Richmond Street (new)	Unsignalized
Elm Street/Richmond Street (new)	Unsignalized
Point Street/Eddy Street (new)	Signalized
South Main Street/Packett Street (new)	Unsignalized
South Main Street/College Street (new)	Signalized
Memorial Boulevard/Dyer Avenue/Crawford Bridge (new)	Signalized
Memorial Boulevard/College Street (new)	Signalized

Automated Traffic Counts

City staff provided recent counts collected for other studies, including counts for three of the 16 intersections included in this IMP. The consultant team then conducted morning and afternoon

turning movement counts at the 13 remaining locations. The counts included motor vehicles, bicycles, and pedestrians. In addition, the team conducted 24-hour automatic traffic recorder counts at the following six locations:

1. Waterman Street east of Governor Street
2. Thayer Street south of Meeting Street
3. South Water Street north of Packett Street (new)
4. South Main Street north of Packett Street (new)
5. Eddy Street south of Ship Street (new)
6. Ship Street west of Richmond Street (new)

Peak Hour Traffic Volumes

Figure 7 through Figure 10 present the existing morning and afternoon peak traffic volumes for both campus areas. Also shown are locations with traffic signals. Volumes shown include all motor vehicles. Brown provided a complete set of traffic volumes including cars, trucks, buses, bicycles, and pedestrians to City of Providence staff.

Figure 7 Existing Morning Peak Hour Traffic Volumes – College Hill

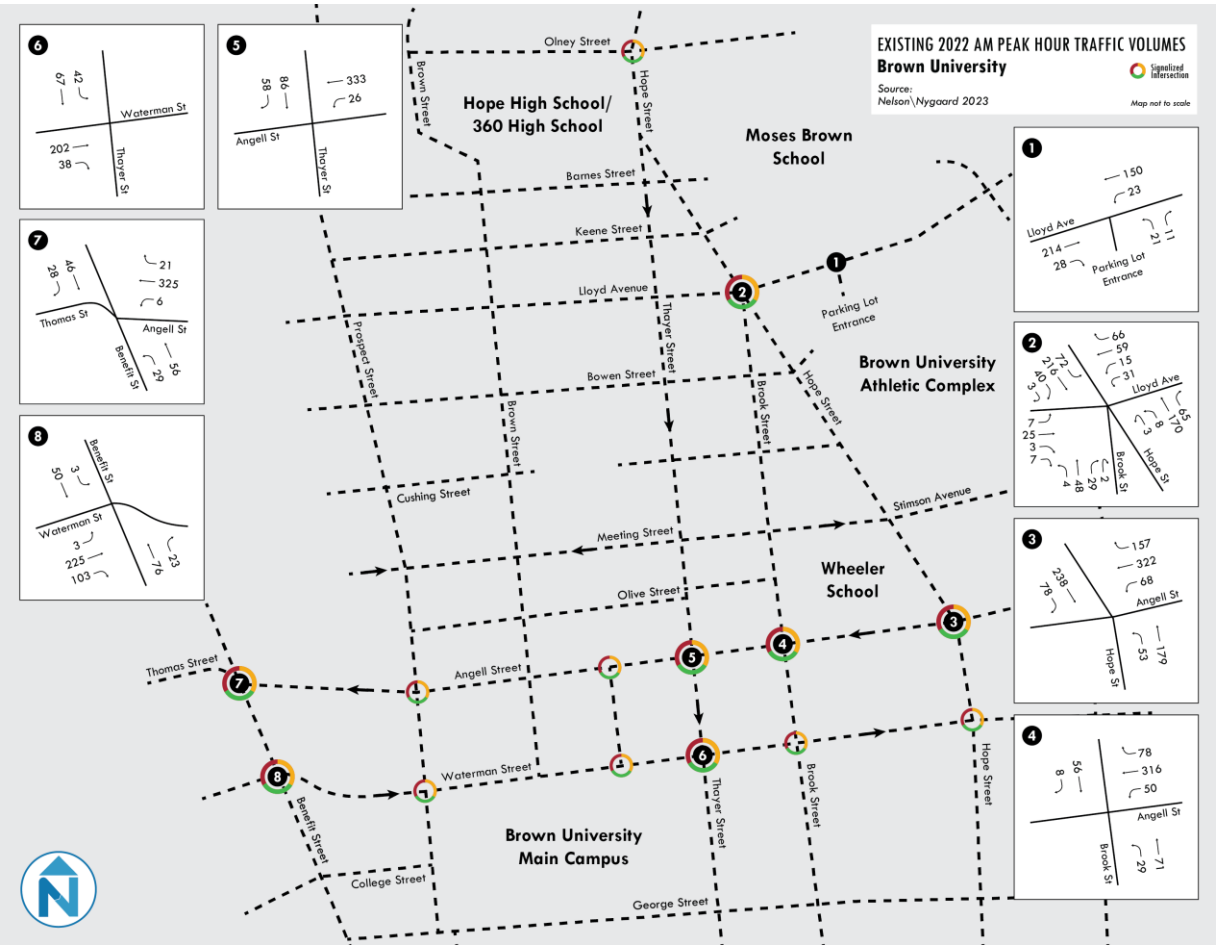


Figure 8 Existing Morning Peak Hour Traffic Volumes – Downtown & Jewelry District

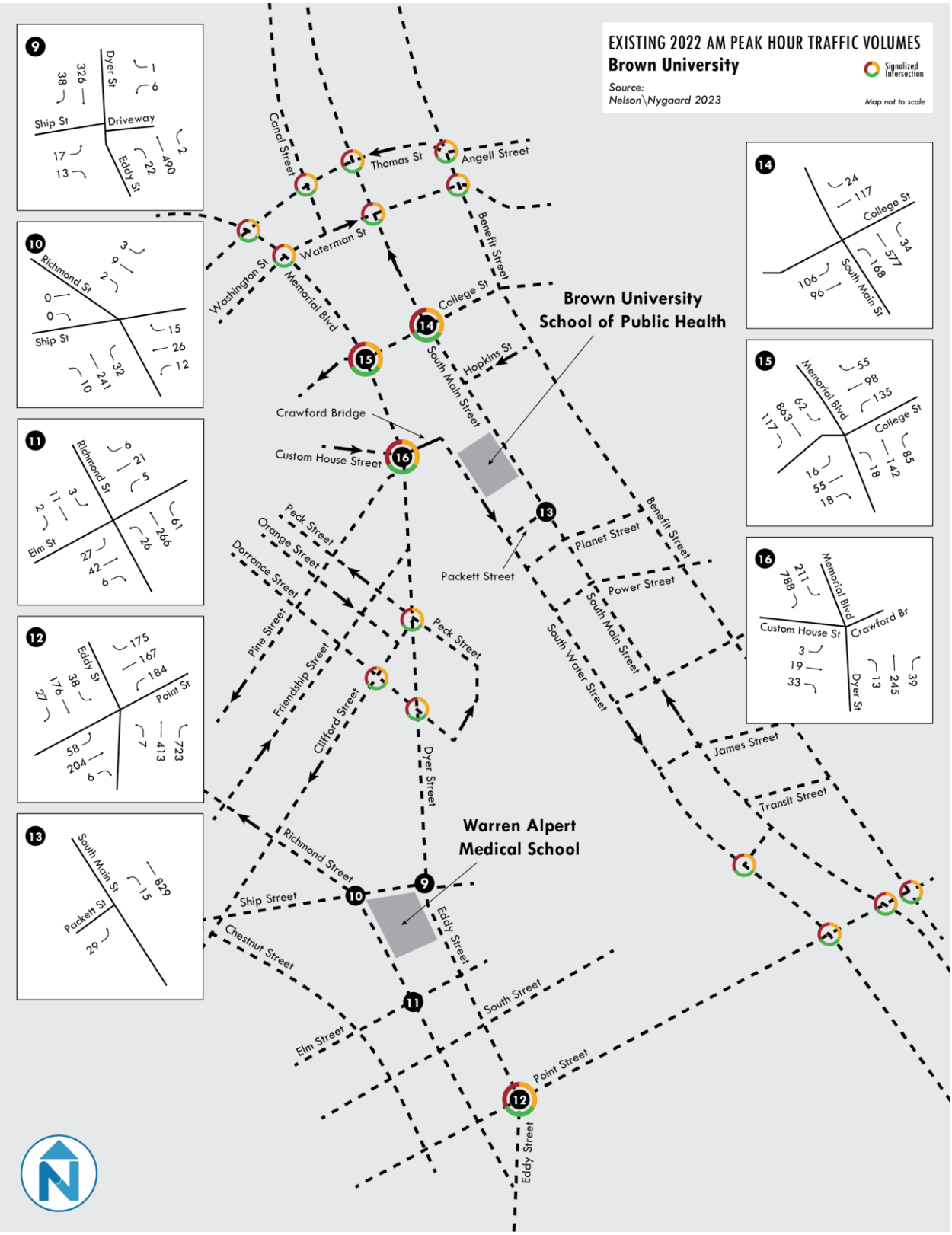
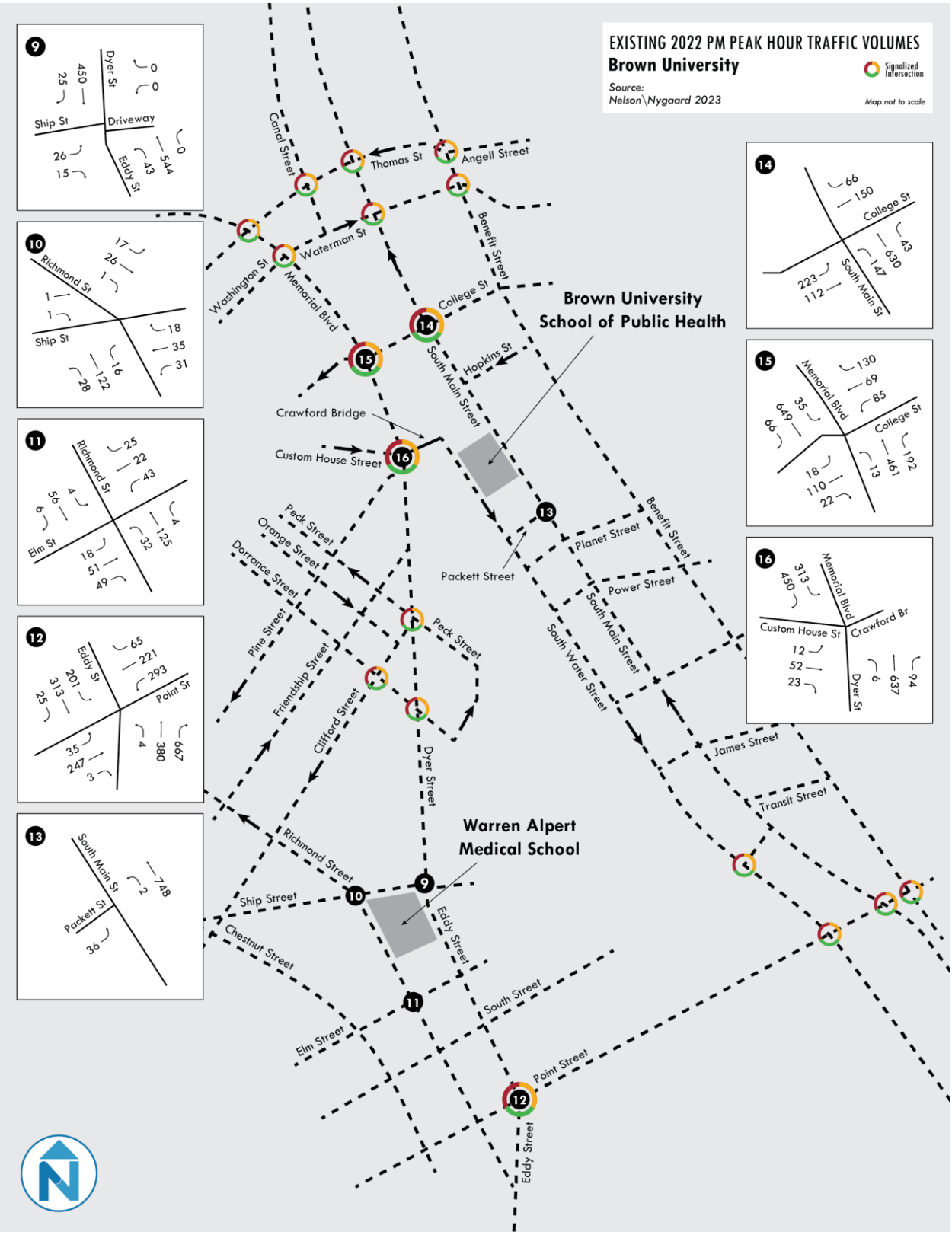


Figure 9 Existing Afternoon Peak Hour Traffic Volumes – College Hill

Figure 10 Existing Afternoon Peak Hour Traffic Volumes – Downtown & Jewelry District



Traffic Volume Comparisons

Traffic volumes compiled for the 2023 IMP include 16 intersections and six roadway segments including eight intersections and two roadway segments also counted in 2016 (for the 2017 IMP). Figure 11 compares total traffic entering the eight intersections and shows the two-way volumes for the two roadway segments for which prior data are available. A comparison shows that traffic volumes declined at all but one location, where traffic grew by 22 vehicles. During the morning peak hour, total volumes declined 22% between 2016 and 2022, while afternoon peak hour volumes declined 11%. Combined, the decline between 2016 and 2022 is about 16.5%. The overall decline continues a trend of declining volumes noted in the 2017 IMP Update, which showed a 10% decline from 2011 volumes.

These lower 2022 volumes reflect two significant changes on campus: 1) the relocation of Brown employees from College Hill to the Jewelry District and 2) the increase in the number of Brown employees working from home (or elsewhere) either permanently or part of the time.

Figure 11 Brown University IMP Traffic Count Comparisons (2016 vs. 2022)

Location	2016	2022	Change
Intersection	**AM/PM Totals**	**AM/PM Totals**	**AM/PM Totals**
Lloyd Avenue/parking entrance next to central heat plant	455/300	415/252	-40/-48
Lloyd Avenue/Brook Street/Hope Street	1,055/1,130	873/987	-182/-143
Hope Street/Angell Street	1,135/1,175	1,095/1,162	-40/-13
Brook Street/Angell Street	815/765	608/701	-207/-64
Angell Street/Benefit Street/Thomas Street	840/950	511/806	-329/-144
Waterman Street/Benefit Street	320/430	152/238	-168/-192
Angell Street/Thayer Street	710/640	503/662	-207/22
Waterman Avenue/Thayer Street	470/675	349/591	-121/-84
Roadway Segment	**24-hour volume**	**24-hour volume**	**24-hour volume**
Waterman Street east of Governor Street	8,860	5,589	-3,271
Thayer Street south of Meeting Street	4,130	3,729	-401

Traffic Operations Analysis

The consultant team analyzed each of the 16 study intersections to determine operating characteristics and identify any potential congestion issues. This analysis uses a grading system (A–F) and reports a level of service (LOS) at each location. LOS A represents free-flow conditions with virtually no delay while LOS F represents significant congestion with long delays. In most cities, LOS D or better is considered acceptable during peak hours.

LOS is reported differently depending on whether an intersection is signalized. At signalized intersections, the analysis considers the operation of each lane or lane group approaching the intersection. LOS is reported as an overall grade. At unsignalized intersections, delays can occur for motorists turning left from a main road into a side street or for motorists stopped on side streets waiting for a chance to enter the intersection. LOS is thus reported for left turns from the main street and all movements from the minor street. The overall LOS designation is linked to the most critical movement, often the left turn from the side street.

Signalized Intersections

The team analyzed the 11 signalized intersections using information obtained through field visits and in coordination with City of Providence staff.

Figure 12 shows the volume-to-capacity ratios (V/C), average seconds of delay, and the LOS grade for the morning and afternoon peak hours at each location. Except for one intersection during one time period, all signalized intersections analyzed are operating overall at LOS D or better during both the morning and afternoon peak hours. All individual movements are also operating at LOS D or better. The intersection of Eddy Street at Point Street operates at overall LOS E during the afternoon peak hour and the following movements are operating below LOS D:

- During the morning peak hour, the westbound left turn from Point Street to Eddy Street operates at LOS F.
- During the afternoon peak hour, the westbound left turn from Point Street to Eddy Street operates at LOS F.
- During the afternoon peak hour, the northbound right turn operates at LOS E.

Figure 12 Existing Signalized Intersection Analysis Results

Intersection	Morning Peak Hour			Afternoon Peak Hour		
	V/C	Delay	LOS	V/C	Delay	LOS
Lloyd Avenue/Brook Street/Hope Street	0.64	22.2	C	0.63	19.9	B
Hope Street/Angell Street	0.67	14.8	B	0.67	15.4	B
Brook Street/Angell Street	0.53	10.4	B	0.60	13.5	B
Angell Street/Benefit Street/Thomas Street	0.38	8.8	A	0.51	10.4	B
Waterman Street/Benefit Street	0.25	4.8	A	0.37	6.1	A
Angell Street/Thayer Street	0.45	12.9	B	0.67	18.2	B
Waterman Avenue/Thayer Street	0.38	9.5	A	0.51	10.8	B
Point Street/Eddy Street	0.99	37.3	D	1.43	65	E
S. Main Street/College Street	0.57	11.8	B	0.84	18.7	B
Memorial Boulevard/Dyer Avenue/Crawford Bridge	0.40	8.3	A	0.52	14.3	B
Memorial Boulevard/College Street	0.75	18.1	B	0.82	14.8	B

Source: Synchro 11 software using the procedures in the 2016 Highway Capacity Manual 6th Edition.
V/C: volume to capacity ratio, Delay: Vehicle delay expressed in seconds per vehicle, LOS: Level of service

Traffic Signal Operations Review

During field observations of signalized intersections, the team noted the following:

- The signal at the intersection of Lloyd Avenue with Hope and Brook Streets is outdated. According to the City of Providence's maintenance engineer, there are plans to upgrade this signal system.
- Although designed to work together, the signals along Angell and Waterman Streets are not operating as a coordinated system. According to the maintenance engineer, this is due to inoperative radio communications equipment. Repairing and upgrading this equipment would enable real-time traffic monitoring and signal coordination.

Unsignalized Intersections

The team analyzed operations at five unsignalized intersections. See Figure 13, which shows that all critical movements operate at LOS D or better during the morning peak hour. During the afternoon peak hour, all critical movements operate at LOS D or better except for Ship Street at Eddy Street where the Ship Street eastbound movement operates at LOS E

Figure 13 Existing Unsignalized Intersection Analysis Results

Intersection	Critical Movement	Demand	Delay	LOS
Morning Peak Hour				
Lloyd Avenue driveway	Northbound from driveway	32	13.8	B
Ship Street/Eddy Street	Eastbound from Ship	30	19.8	C
Ship Street/Richmond Street	Northbound from Richmond	283	9.3	A
Elm Street/Richmond Street	Northbound from Richmond	353	11.1	B
S. Main Street/Packett Street	Eastbound left turn from Packet	29	14	B
Afternoon Peak Hour				
Lloyd Avenue driveway	Northbound from driveway	57	11.3	B
Ship Street/Eddy Street	Eastbound from Ship	41	36	E
Ship Street/Richmond Street	Northbound from Richmond	166	8.7	A
Elm Street/Richmond Street	Northbound from Richmond	161	9.5	A
S. Main Street/Packett Street	Eastbound left turn from Packet	36	15.2	C

Source: Synchro 11 software using 2016 Highway Capacity Manual 6th Edition procedures
Demand: critical movement, expressed in vehicles per hour
Delay: vehicle delay expressed in seconds per vehicle
LOS: Level of service

Car Sharing/Zipcar

Brown provides resources for car sharing through an arrangement with Zipcar. Vehicles are open to anyone. Seventeen Zipcar parking spaces are provided at the following campus locations:

- Power Street Garage
- 217 Bowen Street (lot)
- 20 Olive Street (lot)
- Young Orchard Avenue (lot)
- Page-Robinson Hall on Brown Street (rear lot)
- 233 Richmond Street (lot)

Brown affiliates are eligible to apply for Zipcar directly through Brown by paying a $35 application fee. This is particularly helpful to undergraduates (18+) since students under age 21 would otherwise not be eligible to use Zipcar. The Around Brown TMP includes Zipcar usage data from 2019.

PARKING

Brown's parking resources for employees, students, and visitors include on-street spaces leased through an arrangement with the City of Providence, Brown-owned on-street spaces on streets the university fully controls, and off-street spaces (surface lots and garages).

Parking Facilities and Usage

Figure 14 presents a map of on-street parking (Brown-owned and leased) on the College Hill campus. The spaces leased from the City of Providence are limited to Brown permit holders during weekday mornings until 12 noon. Figure 15 presents a map of off-street parking facilities. Brown updates these maps when the parking supply changes and posts downloadable maps on the Transportation and Parking Services webpage. In total, 3,055 spaces are available to meet daily parking demand.

Consistent with the reduced traffic volumes observed for this IMP, parking demand at Brown has also declined considerably. For those eligible, having the opportunity to work remotely all or part of the time has reduced parking facility utilization. At present, any Brown employee who wishes to obtain a parking permit may do so. Prior to the COVID-19 pandemic, employees without assigned parking spaces often had to be placed on a waiting list.

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Figure 14 Brown University On-Street Parking Locations

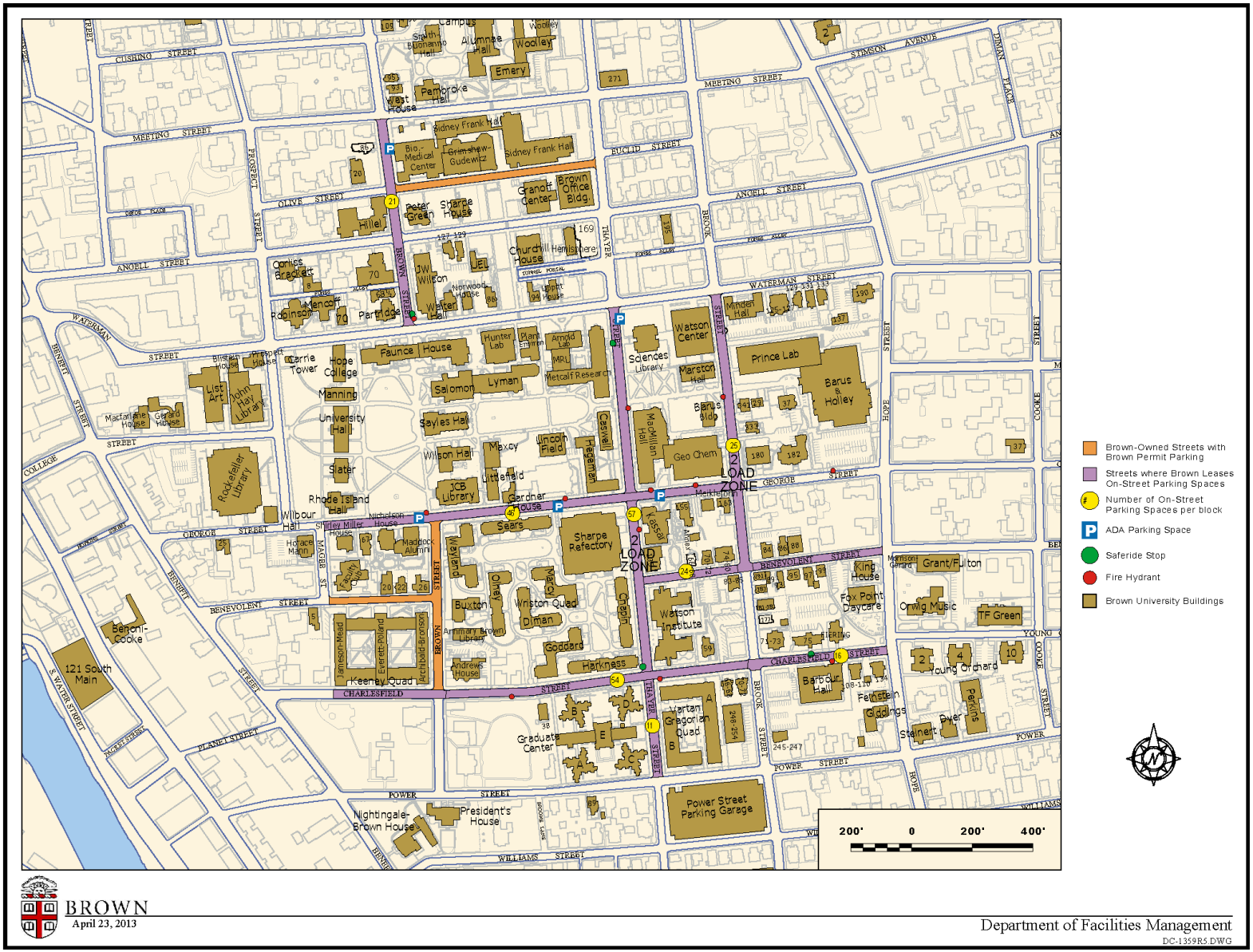
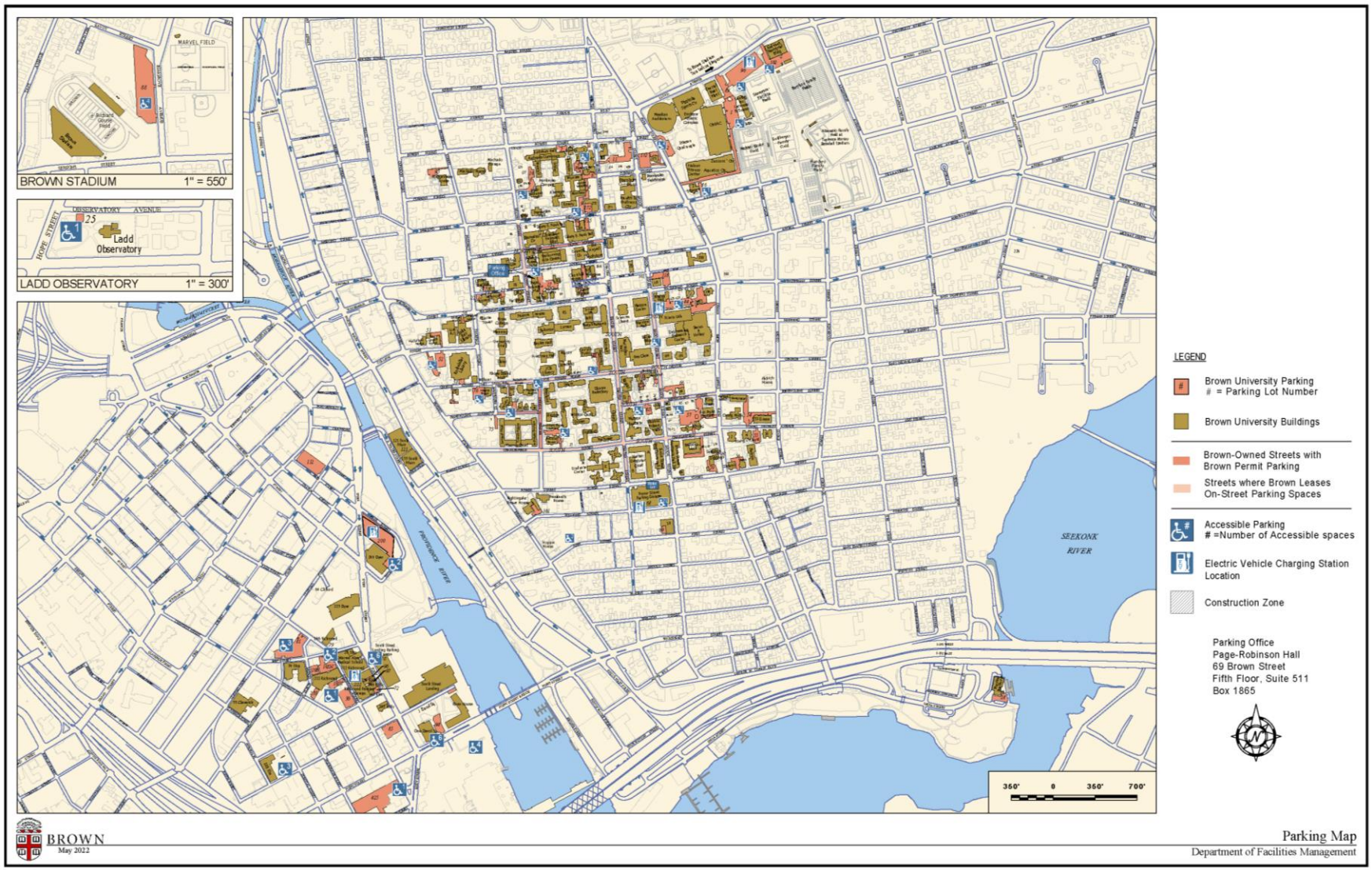


Figure 15 Brown University Off-Street Parking Locations (May 2022)



Parking Requirements

Article 14 of the City of Providence zoning ordinance requires Brown to provide one space for every three employees, one space for every eight residents students, one space for every two non-commuting students, and one space per every ten seats for all "auditoriums, skating rinks, stadiums, or other structures for exhibitions or athletic events." The ordinance allows "parking spaces provided for other purposes that are available at the time of the exhibition or athletic event" to count toward the requirement. In addition, the ordinance also allows for the grandfathered deficiency of vehicle and bicycle parking spaces of the immediate previous use. In other words, when the ordinance was enacted, because Brown's parking supply was lower than the calculated requirement by 931 spaces, Brown was and is permitted to carry that shortfall forward.

Figure 16 summarizes existing and future parking supply, including the grandfathered deficiency and the number of spaces required under the ordinance. Currently, the available supply exceeds the requirement by 442 spaces. By the IMP horizon year of 2027, the available supply will decline by 127 spaces. The estimated demand in 2027 will increase by 100 spaces resulting in a future surplus of 215 spaces.

Figure 16 Existing and Future Parking Requirements per Providence Zoning Ordinance

Parking Spaces	Existing (2023)	Future (2027)
Supply	3,055	2,928
Grandfathered deficiency	931	931
Total available supply	**3,986**	**3,859**
Required per zoning ordinance	3,544	3,644
Surplus	442	215

Source: Brown University

TRANSPORTATION DEMAND MANAGEMENT

Transportation demand management (TDM) is a suite of policies, programs, and strategies aimed at reducing the use of single-driver private automobiles and encouraging the use of alternatives to driving alone. Brown has supported TDM for many years through a variety of means including offering free shuttle services, fully subsidizing the use of RIPTA bus services, investing in projects and programs that support bicycling and walking, and offering a commuter flexible spending benefit to faculty and staff.

Around Brown

In 2020, Brown initiated a transportation management plan process, called Around Brown, which was completed in 2022. This plan had the following key objectives:

- Comprehensively evaluate transportation services and user needs.
- Plan for proactive management of parking resources.
- Evaluate how Brown manages and communicates its transportation programs.
- Develop incentives for changing travel behavior and suggest ways to monitor progress towards overall sustainability goals.

Around Brown documented student and employee travel behavior, incorporated input through surveys and other outreach activities, and recommended a suite of strategies, organized into priority strategies and additional strategies:

Priority Strategies

- Offer flexible parking options and invest in the technology to support such flexibility.
- Improve the Brown University Shuttle service to make routes more efficient and reliable.
- Encourage Brown affiliates to ride RIPTA services more often through information, incentives, travel training, and other promotions.
- Invest in additional staff resources for TDM and mobility management.

Additional Strategies

- Centralize transportation communications and messaging.
- Provide incentives to employees who walk and bike.
- Replace and/or upgrade bicycle parking facilities.
- Subsidize employee use of other transit services such as the MBTA
- Invest in new commuter management technology and improve user software
- Continue to invest in improving pedestrian infrastructure
- Monitor and track transportation system performance.
- Consider implementing additional parking policy changes such as higher pricing.

3 FUTURE CONDITIONS

INTRODUCTION

The analysis of future conditions covers the five-year time horizon of the IMP. This includes growth in traffic volumes that may occur over time, changes in parking, and changes in travel patterns resulting from new development projects.

FUTURE NO-BUILD CONDITIONS

The Nelson\Nygaard team consulted with City of Providence staff and collectively agreed to establish a five-year time horizon for future analysis. Since no other development projects that could increase traffic at study area intersections were in the city's project review process at the time of these consultations, the team proposed the use of a background growth factor to account for potential new traffic, which city staff accepted. This growth factor escalated traffic volumes at an annual rate of 0.5 percent. Given the year-over-year decline in traffic volumes observed through the count process, applying background growth is seen as a conservative approach to forecasting future traffic.

No-Build Traffic Volumes

Figure 17 through Figure 20 present the future no-build traffic volumes at both campus areas for the morning and afternoon peak hours. Also shown are locations with signal controls. The volumes shown include all motor vehicles.

Figure 17 Future No-Build Morning Peak Hour Traffic Volumes – College Hill

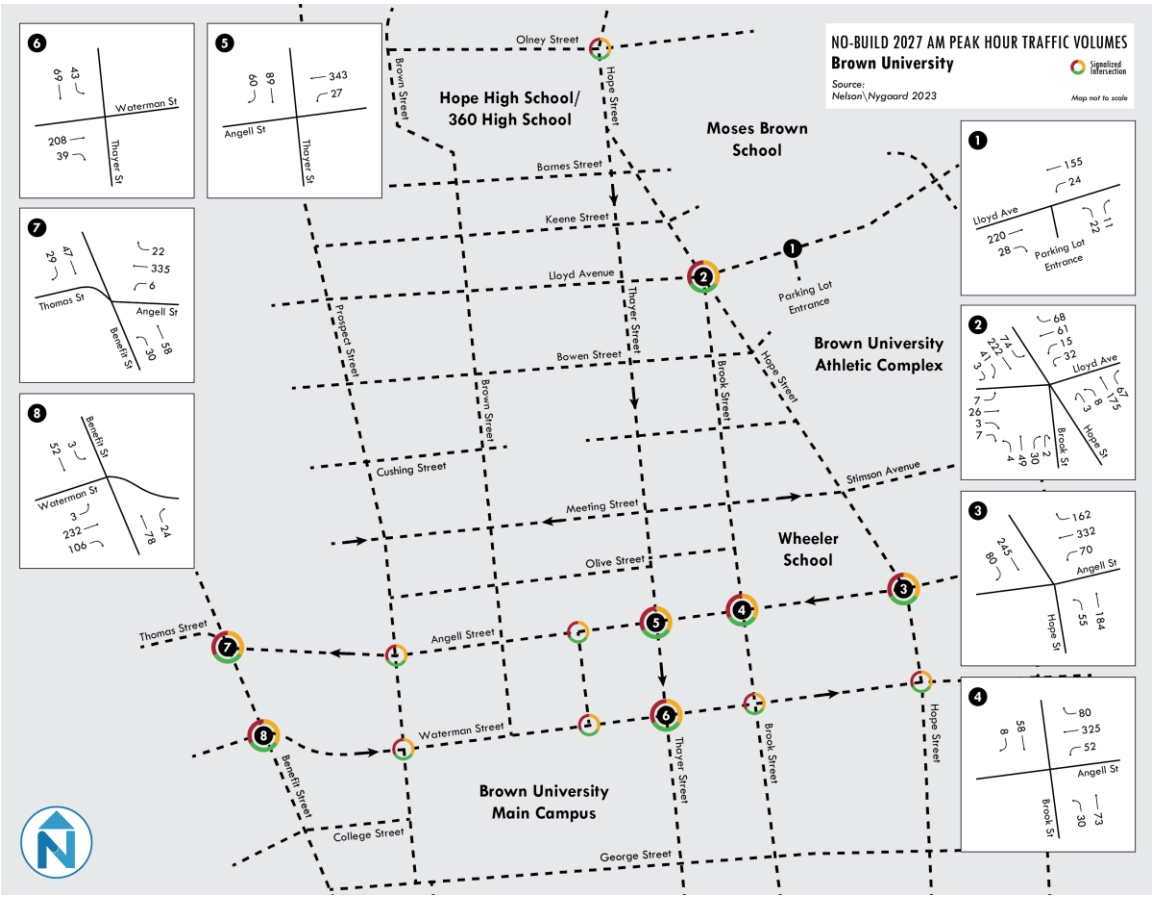


Figure 18 Future No-Build Morning Peak Hour Traffic Volumes – Downtown & Jewelry District

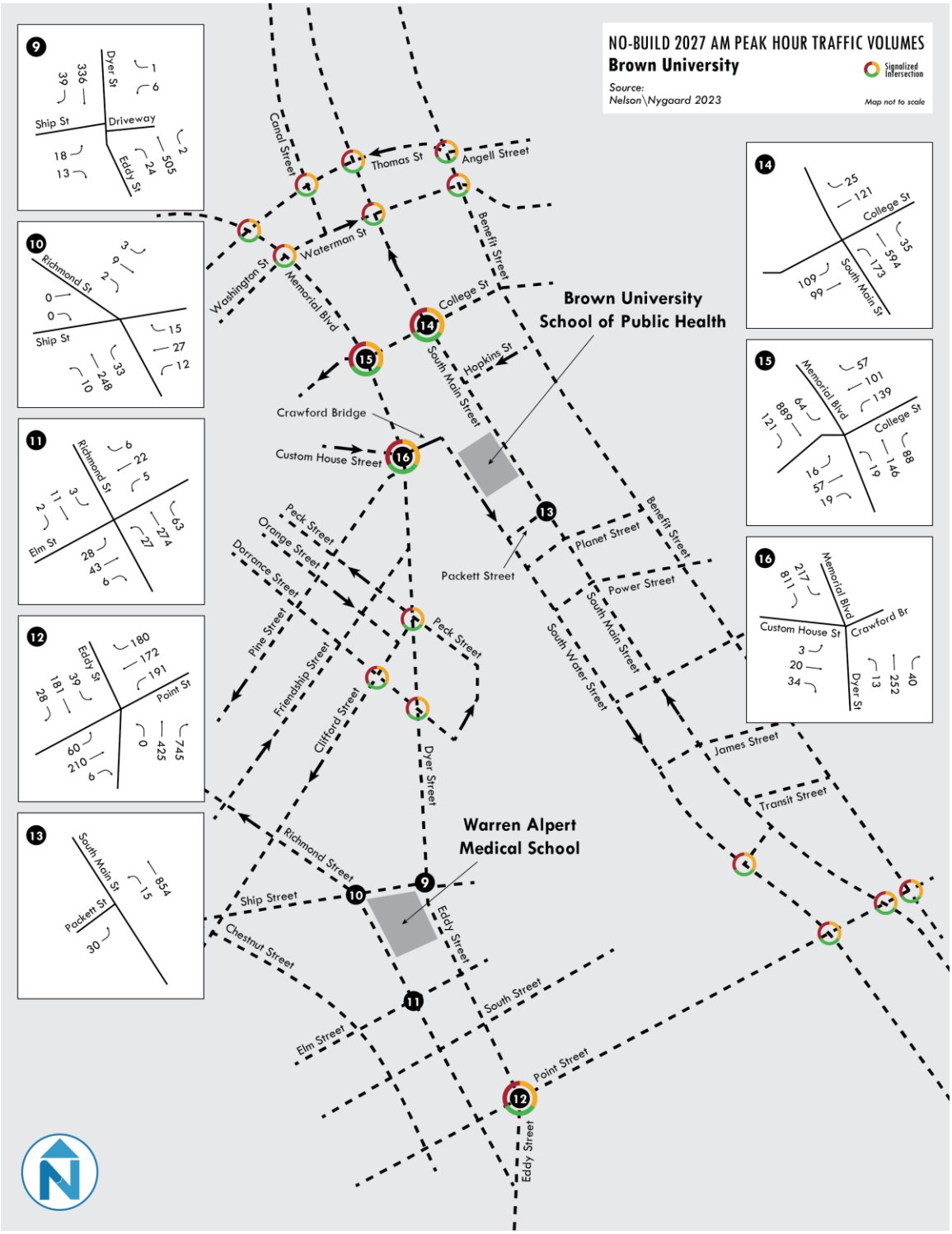


Figure 19 Future No-Build Afternoon Peak Hour Traffic Volumes – College Hill

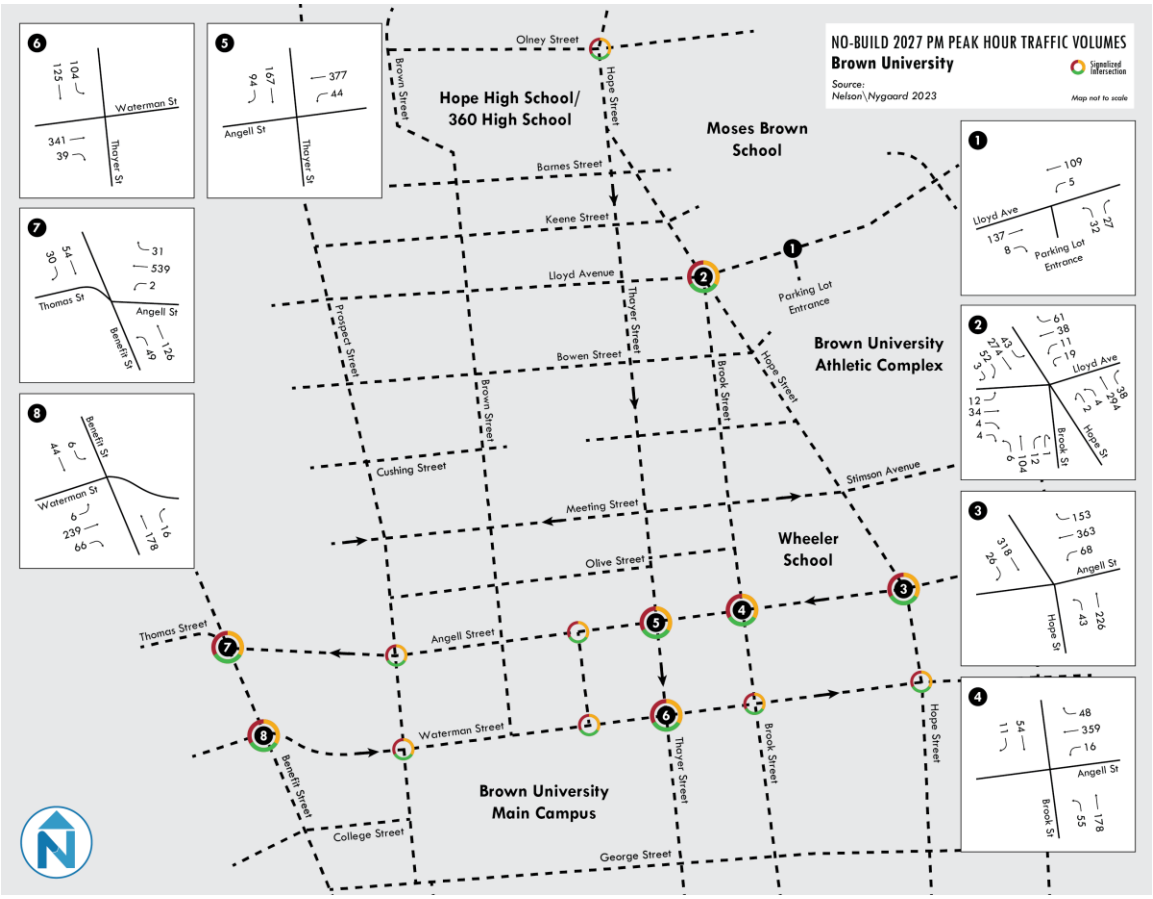
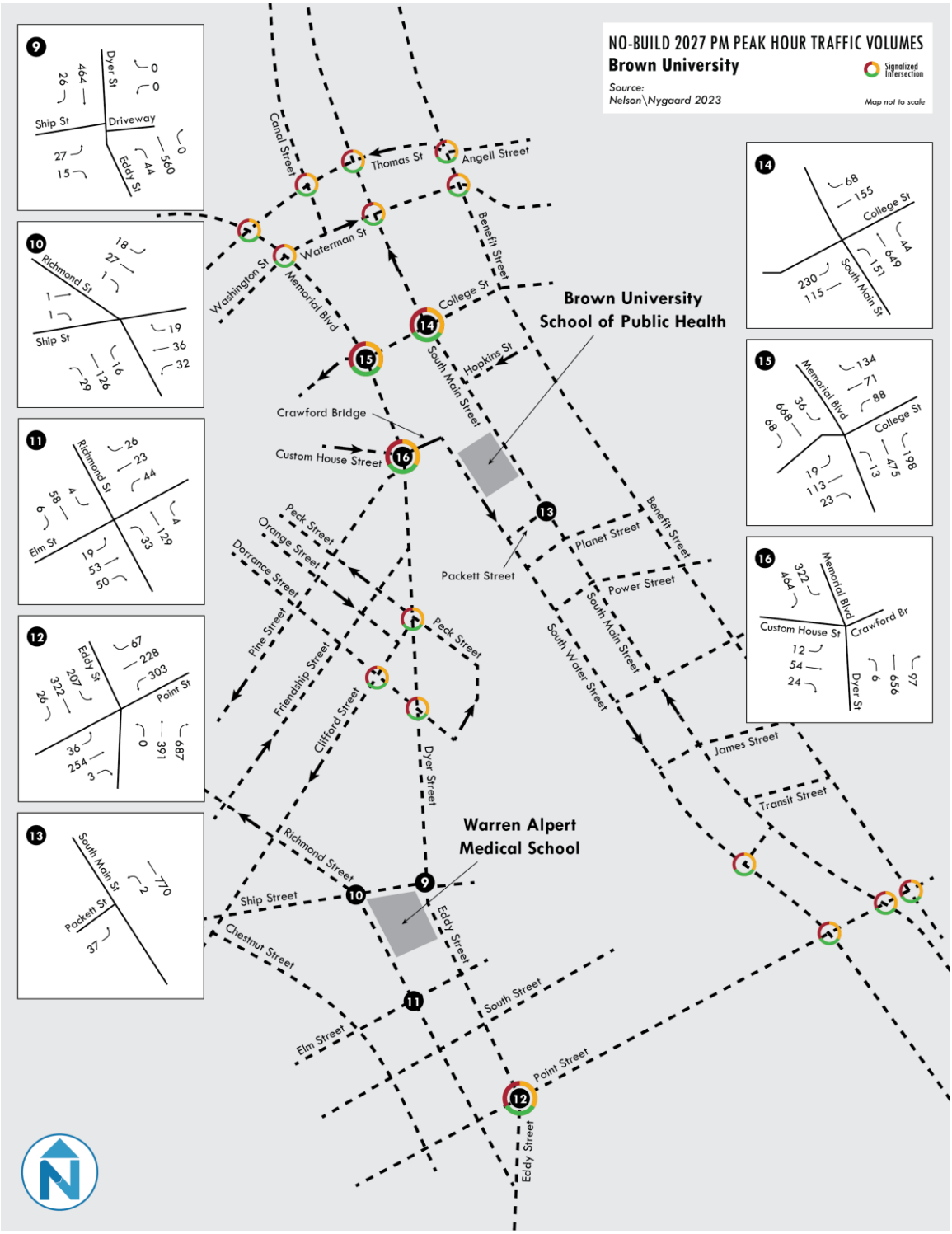


Figure 20 Future No-Build Afternoon Peak Hour Traffic Volumes – Downtown & Jewelry District



No-Build Traffic Analysis

The team analyzed future no-build traffic conditions at the 16 study area intersections.

Signalized Intersections

Figure 21 shows the intersection analysis results for the future no-build condition. In the morning peak hour, the LOS grades are not forecasted to change. In the afternoon peak hour, two intersections see a slight degradation in future level of service:

- The intersection of Lloyd Avenue with Brook and Hope Streets is projected to have a modest increase in delay (0.4 seconds), and the LOS is forecast to change from B to C.
- The intersection of South Main and College Streets is projected to have a modest increase in delay (1.6 seconds), and the LOS is forecast to change from B to C.

As it does today, the intersection of Eddy and Point Streets is projected to continue to operate at LOS E in the afternoon peak hour.

Figure 21 Future No-Build Signalized Intersection Analysis Results

	Morning Peak Hour			Afternoon Peak Hour		
Intersection	V/C	Delay	LOS	V/C	Delay	LOS
Lloyd Avenue/Brook Street/Hope Street	0.65	22.7	C	0.65	20.3	C
Hope Street/Angell Street	0.68	15.3	B	0.68	16	B
Brook Street/Angell Street	0.55	10.7	B	0.62	14	B
Angell Street/Benefit Street/Thomas Street	0.39	8.9	A	0.52	10.6	B
Waterman Street/Benefit Street	0.26	4.9	A	0.37	6.2	A
Angell Street/Thayer Street	0.46	13.2	B	0.69	19	B
Waterman Avenue/Thayer Street	0.39	9.6	A	0.52	10.9	B
Point Street/Eddy Street	1.03	41.9	D	1.49	72.6	E
S. Main Street/College Street	0.59	12.1	B	0.88	20.3	C
Memorial Boulevard/Dyer Avenue/Crawford Bridge	0.41	8.3	A	0.53	14.4	B
Memorial Boulevard/College Street	0.76	19	B	0.83	15.3	B

Source: Synchro 11 software using the procedures in the 2016 Highway Capacity Manual 6th Edition.
V/C: volume to capacity ratio, Delay: Vehicle delay expressed in seconds per vehicle, LOS: Level of service

Unsignalized Intersections

The team analyzed operations at five unsignalized intersections for the future no-build conditions. The results are shown in Figure 22, which indicates virtually no change between the existing and future condition. As with existing, the eastbound movement from Ship at Eddy Street operates at LOS E in the afternoon peak hour.

Figure 22 Future No-Build Unsignalized Intersection Analysis Results

Intersection	Critical Movement	Demand	Delay	LOS
Morning Peak Hour				
Lloyd Avenue driveway	Northbound from driveway	33	14.1	B
Ship Street/Eddy Street	Eastbound from Ship	31	20.6	C
Ship Street/Richmond Street	Northbound from Richmond	291	9.4	A
Elm Street/Richmond Street	Northbound from Richmond	364	11.4	B
S. Main Street/Packett Street	Eastbound left turn from Packet	30	14.2	B
Afternoon Peak Hour				
Lloyd Avenue driveway	Northbound from driveway	59	11.4	B
Ship Street/Eddy Street	Eastbound from Ship	42	39.3	E
Ship Street/Richmond Street	Northbound from Richmond	171	8.8	A
Elm Street/Richmond Street	Northbound from Richmond	166	9.7	A
S. Main Street/Packett Street	Eastbound left turn from Packet	37	15.4	C

Source: Synchro 11 software using 2016 Highway Capacity Manual 6th Edition procedures
Demand: demand of critical movement, expressed in vehicles per hour
Delay: vehicle delay expressed in seconds per vehicle. LOS: Level of service

FUTURE BUILD CONDITIONS

The "build" condition represents anticipated conditions following completion of three projects proposed by Brown for the current IMP. These include an indoor practice facility on the College Hill campus (Erickson Athletic Complex) and an integrated life sciences building (ILSB) in the Jewelry District. The indoor practice facility and the ILSB would result in some losses to parking supply, described in the parking section of this report. These projects are not anticipated to result in measurable traffic impacts.

Athletics Indoor Practice Facility

Brown is proposing to construct an approximately 76,000 square foot indoor practice facility on the existing Meister Kavan Field site. This facility is not expected to attract new vehicular

traffic or result in an increase of large athletic events since it is for practice. There will be no loss of parking with this proposed project.

Proposed Integrated Life Sciences Building (ILSB)

Brown is proposing to construct new research facilities on land south of Ship Street and between Richmond and Chestnut Street. This project is targeting completion by 2027 (IMP build year) and will displace 103 parking spaces in four Brown-owned lots (30, 105, 108, and 233). Future employees in the ILSB who drive to campus are expected to park in existing parking facilities in the Jewelry District.

Anticipated Traffic Impacts

When the ILSB is occupied by 2027, Brown estimates that an additional 195 employees will work in the Jewelry District due to the ILSB. Using this employment forecast, the consultant team projected peak-period traffic using the Around Brown employee survey (85% of the employees would travel by car and park nearby). The assumed parking location is the 222 Richmond Street garage (entrance on Elm Street).

The automatic traffic counter data from nearby counts indicates that peak hour traffic is approximately 30% of daily traffic. The team then assumed that 30% of the new employees who drive would travel during peak hours, meaning that 50 additional cars would enter the 222 Richmond Street garage in the morning peak hour and 50 cars would exit during the afternoon peak hour.

- The calculation is: 195 employees x 85% by car x 30% arriving/departing during peak hours, which equals 49.7, rounded to 50 vehicles.

Given the ILSB site's proximity to the regional highway network, no single study intersection is expected to see more than 25 cars related to ILSB during peak commuting times. See Figure 23.

Figure 23 Distribution of 50 Entering and Existing ILSB Trips (AM and PM Peak Hour)

From	Via	AM Cars	To	Via	PM Cars
North, West	Eddy/Richmond	25	North, West	Chestnut/Point	25
South, East	Point/Chestnut	25	South	Richmond/Clifford	12
			East	Eddy/Point	13

The intersection of Point and Eddy Streets, a location studied for this IMP, would see 13 additional vehicles during the afternoon peak hour, as motorists traveling east from ILSB would likely travel south on Eddy Street and turn left onto Point Street. While some increased

delays can be anticipated, the southbound left turn is not one of the most congested movements. Further, this signal can be retimed to improve all movements to LOS D or better.

As such, the ILSB project is not anticipated to result in any undue traffic burden.

CONSTRUCTION CONSIDERATIONS

Brown has policies and procedures in place to manage and limit the impact of construction activities. This includes parking restrictions, traffic management and truck routes, and site-safety and pedestrian access.

Construction Worker Parking

Brown requires its contractors to arrange for transportation of workers to job sites. Consistent with past practices and university policy, those working on major construction projects are contractually prohibited from parking on the street. Limited off-street parking is occasionally permitted within the confines of a job site and provisions are made for on-site secure storage for worker's tools and supplies.

Construction Vehicle Traffic Management/Truck Routes

Brown requires its contractors to adhere to City of Providence regulations and procedures. This includes preparing construction management for review by the Department of Public Works.

Brown works with its contractors to minimize noise and other disturbances associated with construction traffic. This includes requiring construction vehicles to avoid residential neighborhoods. In addition, contractors will be directed to time construction traffic and deliveries to minimize traffic impacts to the extent practical.

Pedestrian Access/Site Security

Brown directs its contractors to contain construction activities within the project site to minimize impacts. This includes providing protective fencing and barriers as needed to segregate construction activity from walkways and roadways and installing appropriate lighting, temporary sidewalks, and crosswalks to ensure pedestrian safety.

Appendix D

Woodard & Curran

STORMWATER MASTER PLAN 2023 UPDATE

Brown University
Providence, RI

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Brown University
May 2023

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COMMITMENT & INTEGRITY DRIVE RESULTS

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1. INTRODUCTION

The goal of Brown University's Stormwater Master Plan (Plan) is to achieve cleaner discharges to the surrounding surface waters by creating a mechanism to manage stormwater on a campus-wide basis rather than on a project by project basis. By providing the flexibility to construct stormwater treatment systems in locations remote from corresponding development projects, this Plan eliminates compromises to stormwater treatment imposed by the constraints of any particular parcel.

This Plan addresses the stormwater requirements of three regulatory agencies: The Rhode Island Department of Environmental Management (RIDEM), the City of Providence (the City), and the Narragansett Bay Commission (NBC). Aligned with the University's plans for future development, it provides a strategy for treating stormwater prior to discharge to separate storm sewers and for eliminating stormwater from the combined sewer system.

The Plan implements a credit and debit tracking system to assure that the stormwater management requirements imposed by the three agencies are met or exceeded at all times. The baseline date for the tracking system agreed upon by RIDEM, the City, and NBC is January 1, 2011, which coincides with the release of RIDEM's Stormwater Design and Installation Manual (RISDISM), and the current version of Brown University's Institutional Master Plan (IMP) on file with the City. Stormwater improvement measures installed after January 1, 2011 qualify as credits for tracking purposes.

In September and October of 2022, Woodard & Curran met with representatives from RIDEM, NBC, and the City to allow for the continued use of the Stormwater Master Plan. All three agencies indicated that it was acceptable for Brown University to continue using the Stormwater Master Plan. At the request of RIDEM, Woodard & Curran did look into how to approach properties which have been sold by Brown University. It was agreed that any sold properties are to be removed from the tracking tables, and the table values must be updated accordingly.

1.1 Stormwater Master Plan Success and Opportunities

Brown's Stormwater Master Plan has been implemented for several capital projects since 2017. The flexibility it has provided has allowed Brown to avoid implementing more costly stormwater management measures that would otherwise be imposed by regulators. For example, stormwater treatment credits were gained from three projects (85 Waterman Street, School of Engineering, and Wellness Center) and used for the Performing Arts Center, which is on a severely constrained site. This use of credits gained from previous projects avoided the need to install additional stormwater treatment systems at the Performing Arts Center.

As another example, the stormwater management system for the Brook Street Residence Halls was designed to accommodate the future development of the parcel at 126 Power Street. Accordingly, the redevelopment of 126 Power Street will not need to include stormwater treatment or detention, thus avoiding those costs.

A future expansion of the Stormwater Master Plan could include establishing stormwater goals under Brown's Sustainability Program. The Stormwater Master Plan might also be a vehicle for Brown to implement stormwater improvements on parcels owned by others, which Brown might lease or have other interests.

1.2 Implementation

1.2.1 RIDEM

RIDEM is responsible for protecting Rhode Island surface waters from stormwater pollutants. Accordingly, they issue permits for land development projects as the means to implement stormwater treatment prior to discharge. As each development project is undertaken, Brown University (Brown) will apply for coverage under the Rhode Island Pollutant Discharge Elimination System (RIPDES) Stormwater General Permit for Construction Activity (CGP). An updated

stormwater tracking table will be submitted with the Notice of Intent (NOI) for coverage under the RIPDES CGP to demonstrate that the RISDISM stormwater management requirements are being met campus wide. Projects disturbing one acre or less will be exempt from requiring coverage under the RIPDES CGP, but will be required to implement the soil erosion and sedimentation control practices set forth in the Rhode Island Soil Erosion and Sediment Control Handbook, Revised 2014.

1.2.2 City of Providence

The City is responsible for complying with their Municipal Separate Storm Sewer Systems (MS4) permit and maintaining their streets, sewers, and drains. Accordingly, their building permitting process incorporates approvals for stormwater management. As each development project is undertaken, a stormwater report specific to the project with an updated stormwater tracking table is submitted to the Department of Public Works to demonstrate that the City's stormwater management requirements are being met campus wide.

1.2.3 NBC

NBC is responsible for complying with the terms of their Consent Agreement with RIDEM, which requires they implement a CSO Abatement Program. One of the components of the CSO Abatement Program is to reduce the amount of stormwater entering the combined sewer. NBC achieves this mandate by requiring developers to redirect stormwater away from the combined sewers as a criterion for securing approval to: 1) tie into the sewer, 2) change the use of a building that is the source of the wastewater, or 3) increase the wastewater flow to the sewer by more than 20%. NBC implements this Stormwater Master Plan through their existing rules and regulations.

In coordination with NBC, Brown shall comply with the following process: for any Brown development projects within the NBC district subject to permitting requirements, NBC will consider "stormwater credits" from other Brown projects that are within the combined sewerage system for attaining stormwater reduction target measures. Stormwater credits will be based on the stormwater discharges (gallons and peak rate of runoff) removed from the combined sewerage system during storms greater than the three-month storm. NBC will maintain the list of "stormwater credits" transferred to other properties to avoid double counting. NBC will continue to strive to remove all stormwater contributions into the combined sewerage system and will review all applications on a case by case basis. To allow for the appropriate tracking of credits, Brown University shall provide the NBC with details of all Brown projects with a drainage component for consideration.

1.3 Plan Organization

The elements of this plan are introduced in the following three sections:

- Section 2 describes the baseline conditions associated with this plan from which the amount of stormwater treatment will be measured;
- Section 3 describes the potential locations for future stormwater treatment opportunities; and
- Section 4 describes how this Stormwater Management Plan addresses the Minimum Stormwater Standards set forth in the RISDISM.

2. BASELINE CONDITIONS

2.1 District Description

Brown University's Stormwater Master Plan applies to most of the campus on College Hill and in the former Jewelry District, as well as Brown Stadium and the Ladd Observatory. Because Brown owns only a few properties within Coastal Resources Management Council (CRMC) jurisdiction, these are excluded from the Stormwater Master Plan to simplify the coordination among the regulatory agencies. Brown will manage the stormwater on those parcels individually as is standard practice. Brown-owned properties are shown in Figure 1.

There are 192 parcels in the Stormwater Master Plan District (District) totaling approximately 148 acres. The parcels and their respective areas are listed in Appendix B. Eighteen of the parcels within the District are listed in RIDEM's site remediation database (reference Appendix C).

2.2 Watersheds

Stormwater runoff from much of the campus enters the City's combined sewer system, which conveys flow to NBC's Field's Point Wastewater Treatment Facility. NBC has been implementing combined sewer overflow abatement measures since 2001 such that most of the stormwater entering the combined sewer is treated at the plant.

The portion of the District where stormwater enters a separate storm drain system falls within two watersheds. The majority of the campus that is served by separate storm sewers is within the Providence River Sub-basin, Waterbody Identification No. RI0007020E-01B. The Erickson Athletic Complex, Brown Stadium, and the Ladd Observatory are in the Seekonk River Sub-basin, Waterbody Identification No. RI0007019E-01.

Figures 1 and 2 show the portions of the campus that discharge to a separate storm system and the limits of the watersheds associated with the two sub-basins. This information is based on record plans and base plans provided by Brown University. Record sewer plans from the City of Providence and Google Street View were also used to assist in the analysis.

Both the Providence River and Seekonk River Sub-basins are classified by RIDEM as SB1{a}. SB1 seawaters are defined as: "waters designated for primary and secondary contact recreation activities and fish and wildlife habitat. They shall be suitable for aquacultural uses, navigation, and industrial cooling. These waters shall have good aesthetic value. Primary contact recreational activities may be impacted due to pathogens from approved wastewater discharges. However, all Class SB criteria must be met." The {a} indicates "a partial use designation due to impacts from CSOs."

Both the Providence River and Seekonk River are on the State of Rhode Island 2022 303(d) List of Impaired Waters for nitrogen, dissolved oxygen, and fecal coliform as noted in the excerpt provided in Appendix D. Total Daily Maximum Loads (TMDLs) have not been developed to address these impairments. The list notes that TMDLs for nitrogen and dissolved oxygen and are scheduled to be established in 2026, and a TMDL for fecal coliform is scheduled to be established in 2025. However, RIDEM is expecting that ongoing wastewater treatment facility improvements and CSO abatement measures are anticipated to significantly improve the quality of these surface waters such that TMDLs might not be warranted.

2.3 Soil and Groundwater Data

According to the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Soil Survey of Rhode Island, most of the soils within the District are Paxton-Urban land complex (PD), which is a mix of predominantly Paxton soils and urban land. Paxton soils typically consist of fine sandy loam with a shallow depth to the water table. The other soil types in the District mapped by NRCS consist of Urban Land (Ur), which is characterized

as areas consisting mostly of sites for buildings, paved roads, and parking lots, and Udorthents-Urban land complex (UD), which is characterized as moderately drained to excessively drained soils that have been disturbed by buildings and pavement. Refer to Appendix F for the NRCS map and legends.

The groundwater beneath the District is classified by RIDEM as GB, which means it may not be suitable for public or private drinking water use without treatment due to known or presumed degradation. The depth to groundwater varies throughout the District and will be field verified as necessary for proposed land development projects.

2.4 Flood Hazard

The National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRMs) for Providence County, Rhode Island (Map Panels 308J and 309K Revised October 2, 2015) depict most of the District outside the Federal Emergency Management Agency (FEMA) Flood Zone. Several parcels in the former Jewelry District, however are within FEMA designated Flood Zone X associated with the Providence River because they are protected from flooding by the Fox Point Hurricane Barrier. Failure of overtopping of the hurricane barrier is possible. Flood Zone X is defined as areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from the 1% annual chance flood. The Marston Boathouse parcel is the only parcel within the District that is within the FEMA designated Flood Zone X associated with the Seekonk River. Excerpts of the respective FIRMs showing the flood zone limits in the vicinity of the former Jewelry District are provided in Appendix F.

2.5 Best Management Practices

Existing stormwater treatment measures (BMPs) are listed in Table 1 and their locations are shown on Figure 1. BMPs installed prior to the baseline date of January 1, 2011 are designated by letter, and BMPs installed after the baseline date are numbered. The credits associated with the baseline condition are calculated separately for the combined sewered areas and each of the watersheds.

2.5.1 Baseline Credits for Separate Storm Sewered Areas

The entire Stormwater Master Plan District qualifies as a “Redevelopment” under the RISDISM. By definition, 100% of the increased impervious area requires stormwater treatment, except for impervious area that is redeveloped, which requires stormwater treatment for only 50% of the redeveloped area. Also, stormwater that is redirected from a combined sewer to a separate storm sewer requires treatment for 75% of the redeveloped area to compensate in part for the loss of treatment previously provided by the Fields Point WWTF. Reducing the amount of impervious area qualifies as treatment.

Projects completed since the baseline date and the original implementation of this Stormwater Management Plan in 2017 are summarized in Tables 2A and 2B for the Providence and Seekonk River watersheds respectively. Since the 2017 implementation of this Plan, Tables 2A and 2B have been updated for each Brown University development Project. Credit for stormwater treated prior to entering the separate storm drain was measured by the amount of impervious area treated beyond the amount required for Redevelopment, these credits are recorded in Tables 2A and 2B. A summary of the nitrogen removed by the same projects is recorded in Tables 3A and 3B for the Providence and Seekonk River watersheds respectively. Since the 2017 implementation of this Plan, Tables 3A and 3B have been updated for each Brown University development Project. Future stormwater treatment and nitrogen removal credits and debits will be incorporated into Tables 2A, 2B, 3A, and 3B, and these tables will continue as the tracking mechanisms for future stormwater treatment projects in the Providence and Seekonk River watersheds.

Because the Providence and Seekonk Rivers are impaired waters for nitrogen and bacteria without an assigned TMDL, RIDEM directs that with respect to nitrogen, “there shall be no further degradation of a low quality water”. RISDISM Appendix H.3: Water Quality Goals and Pollutant Loading Analysis Guidance for Discharges to Impaired Waters

guidance states that for impairments that include nitrogen, the offset for nitrogen supersedes all other requirements because it is so much harder to achieve and therefore tracking tables for bacteria are not included. Increases in impervious cover add nitrogen to the impairment that cannot be fully removed through water quality BMP's. Therefore, treating stormwater from redeveloped impervious areas reduces nitrogen, thus compensating for new development and achieving the goal to not increase nitrogen loadings to the waterbody. The amount of nitrogen removed by the Table 2 projects is summarized in Tables 3A and 3B. Nitrogen removed was calculated on a percentage basis and a weight basis. Refer to Appendix H for the nitrogen removal calculations.

2.5.2 Baseline Credits for Combined Sewered Areas

The amount of stormwater diverted from the combined sewer system was estimated by calculating the runoff volume associated with the theoretical 2-, 10-, 50- and 100-year storm events. The volume of diverted stormwater associated with the four projects installed after the baseline date and the original implementation of this Stormwater Management Plan in 2017 are documented in Table 4A. The calculated peak flows associated with those projects are presented in Table 4B. These tables will continue as the tracking mechanisms for future stormwater removal projects in the combined sewered areas of the Brown campus.

3. STORMWATER TREATMENT OPPORTUNITIES

The stormwater treatment requirements described in Section 2.5.1 for a "Redevelopment" apply to Brown's proposed projects within their Stormwater Master Plan District. Locations for potential stormwater projects are listed in Table 5 and shown in Figure 2. BMPs will be selected to meet the following goals to the extent practical:

- Meet or exceed the stormwater treatment requirements within each watershed at all times;
- Reduce the amount of stormwater entering the combined sewer; and
- Maintain or reduce peak storm flows discharged to the separate and combined sewers.

The Tables and Figures in this Stormwater Master Plan will be updated as new BMPs are constructed.

4. STORMWATER MANAGEMENT CRITERIA

The RISDISM establishes eleven Minimum Stormwater Standards for development projects. Because the District qualifies as a Redevelopment under Minimum Standard 6, only Minimum Standards, 2, 3, and 7 through 11 apply. This Stormwater Master Plan complies with each of these minimum standards as described below.

Minimum Standard 2 – Groundwater Recharge

Stormwater must be recharged within the same subwatershed to maintain baseflow at pre-development recharge levels to the maximum extent practicable.

The Plan separately identifies and tracks projects within the Providence River watershed and Seekonk River watershed so that the designs for the proposed site improvements will maintain groundwater recharge systems within the same watersheds as pre-development conditions to the extent practical.

Minimum Standard 3 – Water Quality

Stormwater runoff must be treated before discharge.

Prior to discharge to surface waters, stormwater runoff from new development projects will either be directed to a combined sewer and treated at NBC's Fields Point Wastewater Treatment Facility or directed to a BMP designed to treat the water quality volume required for Redevelopment projects.

Minimum Standard 7 – Pollution Protection

All development sites require the use of source control and pollution prevention measures to minimize the impact that the land use may have on stormwater runoff quality.

A Soil Erosion and Sedimentation Control (SESC) Plan will be prepared in accordance with the RIPDES CGP for projects with greater than one acre of land disturbance, or that require a building permit. The SESC plans will address source control and pollution prevention measures. Appendix A describes source control and pollution prevention measures for use by Brown's maintenance staff and other contractors as part of small projects that disturb less than one acre and do not require a building permit.

Minimum Standard 8 – Land Uses with Higher Potential Pollutant Loads

Stormwater discharges from land uses with higher potential pollutant loads (LUHPPLs) require the use of specific source control and pollution prevention measures and the specific stormwater BMPs approved for such use.

The proposed locations for BMPs are not within LUHPPL designated areas.

Minimum Standard 9 – Illicit Discharges

All illicit discharges to stormwater management systems are prohibited.

There are no known illicit discharges to the stormwater management systems and none are proposed.

Minimum Standard 10 – Construction Erosion & Sedimentation Control

Erosion and sedimentation control (ESC) practices must be utilized during the construction phase as well as during any land disturbing activities.

The erosion and sedimentation control practices for projects that require a building permit or that disturb greater than one acre will be specified in the construction documents for that project, and an SESC Plan will be prepared in accordance with the RIPDES Construction General Permit (CGP). The SESC plans will be submitted to the City and/or RIDEM as appropriate as part of the building permit applications or Notices of Intent for coverage under the RIPDES CGP. Erosion and sedimentation control practices described in Appendix A will be used by Brown's maintenance staff and construction contractors for small projects that disturb less than one acre and do not require a building permit.

Minimum Standard 11 – Stormwater Management System Operation & Maintenance

The stormwater management system, including all structural stormwater controls and conveyances, must have an operation and maintenance plan to ensure it continues to function as designed.

Stormwater Management System Operation & Maintenance (O&M) Plans will be prepared with each new development's stormwater design. The Stormwater Management System O&M plans will be provided to Brown.

TABLES

Table 1: Existing Best Management Practices (BMPs)

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TABLES

Table 1: Existing Best Management Practices (BMPs)

Designation	Location	BMP	Year Constructed	Receiving System
A	Benevolent St. Parking Lot #65	Underground Infiltration 1	Before 2000	Combined Sewer
B	Benevolent St. Parking Lot #65	Underground Infiltration 2	Before 2000	Combined Sewer
~~C~~	~~Charlesfield St. Parking Lot #64~~	~~Underground Infiltration~~	~~Before 2000~~	~~Combined Sewer~~
D	Starr Plaza at Watson Institute	Drywell 1	2001	Combined Sewer
E	Starr Plaza at Watson Institute	Drywell 2	2001	Combined Sewer
F	Starr Plaza at Watson Institute	Drywell 3	2001	Combined Sewer
G	Starr Plaza at Watson Institute	Green Roof	2001	Combined Sewer
H	Starr Plaza at Watson Institute	Underground Infiltration 1	2001	Combined Sewer
~~I~~	~~Starr Plaza at Watson Institute~~	~~Underground Infiltration 2~~	~~2001~~	~~Combined Sewer~~
J	Starr Plaza at Watson Institute	Underground Infiltration 3	2001	Combined Sewer
K	Starr Plaza at Watson Institute	Underground Infiltration 4	2001	Combined Sewer
L	Sidney Frank Hall 185 Meeting Street	Water Reuse	2005	Providence River
M	Sciences Library 201 Thayer St.	Green Roof	2007	Providence River
N	Granoff Creative Arts Center 154 Angell Street	Green Roof	2010	Providence River
O	Granoff Creative Arts Center 154 Angell Street	Rain Garden (Infiltration)	2010	Providence River
P	Alpert Medical School 222 Richmond St.	Redirect Stormwater from CS to Separate Storm	2010	Providence River
Q	Alpert Medical School 222 Richmond St.	Green Roof	2012	Providence River
1	85 Waterman St.	Greening	2014	Providence River
2	85 Waterman St.	Water Reuse	2014	Providence River
~~3~~	~~450 Brook St. Parking Lot~~	~~Sand Filter 1 (with 2 Sediment Forebays and Grass Swale)~~	~~2016~~	~~Providence River~~
~~4~~	~~450 Brook St. Parking Lot~~	~~Sand Filter 2 (with Sediment Forebay)~~	~~2016~~	~~Providence River~~
5	School of Engineering 345 Brook St.	Rain Garden (with Grass Swale)	2016	Providence River
6	School of Engineering 345 Brook St.	Sand Filter	2016	Providence River
7	Ittleson Quad	Greening	2012	Seekonk River
~~8~~	~~Tockwotten~~	~~Greening~~	~~2013~~	~~Combined Sewer~~
9	Watson Institute	Underground Infiltration, Jellyfish Filter, Stormceptor Unit	2017	N/A - Groundwater
10	Performing Arts Center 130-132 Angell St	Jellyfish Filter, Underground Detention	2021	Providence River

11	450 Brook St. Wellness Center	Jellyfish Filter	2021	Providence River
12	Brook St. Housing	Enhanced Biofiltration	2022	Providence River
13	Applied Math 170 Hope Street	Sand Filter, Rain Garden (2)	2015	Providence River
14	Lacrosse & Soccer 235 Hope Street	Sand Filter Trench	2020	Seekonk River
15	Nelson Fitness Center	Hydrodynamic Separator	2012	Providence River

Table 2A: Stormwater Treatment Summary – Providence River Watershed

Table 2B: Stormwater Treatment Summary – Seekonk River Watershed

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Table 2A: Stormwater Treatment Summary – Providence River Watershed

Designation	Location	BMP	Year Constructed	Disturbed* Impervious Area (ac)	New** Impervious Area (ac)	Redirected*** Impervious Area (ac)	Required Treatment Area (ac)	Area Treated (ac)	Treatment Credit (ac)
1	85 Waterman St.	Greening	2014	0.26	0	N/A	0.13	0.13	0.00
2		Water Reuse		0.24	0	N/A	0.12	0.24	+0.12
~~3~~	~~450 Brook St. Parking Lot~~	~~Sand Filter 1 (with 2 Sediment Forebays and Grass Swale)~~	~~2016~~	~~0.46~~	~~0.06~~	~~N/A~~	~~0.30~~	~~0.32~~	~~+0.02~~
~~4~~		~~Sand Filter 2 (with Sediment Forebay)~~				~~N/A~~			
5	School of *** Engineering 345 Brook St.	Rain Garden (with Grass Swale)	2016	0.46	0.16	N/A	0.39	0.53	+0.13
6		Sand Filter				N/A			
10	Performing Arts Center 130-132 Angell St	Jellyfish Filter, Underground Detention	2021	0.18	0.54	0.47	0.98	0.74	-0.24
11	450 Brook St. Wellness Center	Jellyfish Filter	2021	0.52	0.17	N/A	0.42	0.58	+0.16
12	Brook St. Housing	Enhanced Biofiltration	2022	0.98	0.33	0.16	0.94	0.92	-0.02
								TOTAL	**+0.15**

Table 2B: Stormwater Treatment Summary – Seekonk River Watershed

Designation	Location	BMP	Year Constructed	Disturbed* Impervious Area (ac)	New** Impervious Area (ac)	Required Treatment Area (ac)	Area Treated (ac)	Treatment Credit (ac)
7	Ittleson Quad	Greening	2012	0	0	0	1.98	+1.98
							TOTAL	**+1.98**

Note:
*Disturbed Impervious Area requires 50% treatment
**New Impervious Area requires 100% treatment
***Redirected Impervious Area from combined sewer to separate storm requires 75% treatment

The sand filters listed as Designation 3 and 4 were replaced by the Wellness Center jellyfish filter, Designation 11. Therefore, their credit has been removed.

Tockwotten (Designation 8) has been removed from the tables, as it is no longer a Brown University owned parcel.

Table 3A: Nitrogen Removal Summary – Providence River Watershed

Table 3B: Nitrogen Removal Summary – Seekonk River Watershed

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Table 3A: Nitrogen Removal Summary – Providence River Watershed

Designation	Location	BMP	Year Constructed	Nitrogen Loading (lbs/yr)			
				Pre	Post	Δ	% Removed
1	85 Waterman St.	Greening	2014	7.27	5.00	-2.27	31%
2		Water Reuse		4.58	0.00	-4.58	100%
~~3~~	~~450 Brook St. Parking Lot~~	~~Sand Filter 1 (with 2 Sediment Forebays and Grass Swale)~~	~~2016~~	~~9.09~~	~~6.94~~	~~-2.15~~	~~24%~~
~~4~~		~~Sand Filter 2 (with Sediment Forebay)~~					
5	School of Engineering 345 Brook St.	Rain Garden (with Grass Swale)	2016	15.63	15.54	-0.09	0.6%
6		Sand Filter					
10	Performing Arts Center 130-132 Angell St	Jellyfish Filter, Underground Detention	2021	11.19	18.27	+7.08	-63%
11	450 Brook St. Wellness Center	Jellyfish Filter	2021	9.09	6.57	-2.52	27%
12	Brook St. Housing	Enhanced Biofiltration (2)	2022	22.27	21.21	-1.07	4%
			Total Nitrogen Removed (lbs/yr):			**3.45**	

Note:

The sand filters listed as Designation 3 and 4 were replaced by the Wellness Center jellyfish filter, Designation 11. Therefore, their credit has been removed.

Table 3B: Nitrogen Removal Summary – Seekonk River Watershed

Designation	Location	BMP	Year Constructed	Nitrogen Loading (lbs/yr)			
				Pre	Post	Δ	% Removed
7	Ittleson Quad	Greening	2012	173.27	137.39	-35.88	21%
			Total Nitrogen Removed (lbs/yr):			**35.9**	

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Tables 4A.A - 4A.E:Stormwater Diverted from the Combined Sewer – Volume Summary

Table 4A.A: Stormwater Diverted from the Combined Sewer: NBC Sewer Basin A- Volume Summary

Table 4A.B: Stormwater Diverted from the Combined Sewer: NBC Sewer Basin B- Volume Summary

Table 4A.C: Stormwater Diverted from the Combined Sewer: NBC Sewer Basin C- Volume Summary

Table 4A.D: Stormwater Diverted from the Combined Sewer: NBC Sewer Basin D- Volume Summary

Table 4A.E: Stormwater Diverted from the Combined Sewer: NBC Sewer Basin E- Volume Summary

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Table 4A.A: Stormwater Diverted from the Combined Sewer: NBC Sewer Basin A – Volume Summary

Designation	Location	BMP	Year Constructed	Runoff Volume (ac-ft)														
				3-month[1]			2-year			10-year			50-year			100-year		
				Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
Total Stormwater Volume Removed (ac-ft):																		
Total Stormwater Volume Removed (gallons):																		

Notes:
1. April 2023 revision: NBC 3 month rain event added to tracking tables.
2. April 2023 revision: New projects to be added and tracked in table per correct NBC sewer basin.

Table 4A.B: Stormwater Diverted from the Combined Sewer: NBC Sewer Basin B – Volume Summary

Designation	Location	BMP	Year Constructed	Runoff Volume (ac-ft)														
				3-month[1]			2-year			10-year			50-year			100-year		
				Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
Total Stormwater Volume Removed (ac-ft):																		
Total Stormwater Volume Removed (gallons):																		

Notes:
1. April 2023 revision: NBC 3 Month rain event added to tracking tables.
2. April 2023 revision: New projects to be added and tracked in table per correct NBC sewer basin.

Table 4A.C: Stormwater Diverted from the Combined Sewer: NBC Sewer Basin C – Volume Summary

Designation	Location	BMP	Year Constructed	Runoff Volume (ac-ft)														
				3-month[1]			2-year			10-year			50-year			100-year		
				Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
9	Watson Institute	Underground Infiltration	2017	0.01	0.00	-0.01	0.02	0.00	-0.02	0.03	0.00	-0.03	0.06	0.00	-0.06	0.07	0.00	-0.07
10	Performing Arts Center	Jellyfish Filter, Underground Detention	2021	0.06	0.00	-0.06	0.12	0.00	-0.12	0.18	0.00	-0.18	0.27	0.21	-0.06	0.33	0.26	-0.07
11	Brook Street Housing	Enhanced Biofiltration with ISR (2)	2022	0.02	0.00	-0.02	0.04	0.00	-0.04	0.06	0.00	-0.06	0.09	0.00	-0.09	0.11	0.00	-0.11
Total Stormwater Volume Removed (ac-ft):						**0.09**			**0.18**			**0.27**			**0.21**			**0.25**
Total Stormwater Volume Removed (gallons):						**29,330**			**58,650**			**87,980**			**68,400**			**81,500**

Notes:

1. April 2023 revision: NBC 3 Month rain event added to tracking tables.
2. April 2023 revision: New projects to be added and tracked in table per correct NBC sewer basin.

Table 4A.D: Stormwater Diverted from the Combined Sewer: NBC Sewer Basin D – Volume Summary

Designation	Location	BMP	Year Constructed	Runoff Volume (ac-ft)														
				3-month[2]			2-year			10-year			50-year			100-year		
				Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
~~8~~[1]	~~Tockwotten~~[1]	~~Greening~~	~~2014~~	-	-	-	~~0.06~~	~~0.03~~	~~-0.03~~	~~0.10~~	~~0.06~~	~~-0.04~~	~~0.14~~	~~0.10~~	~~-0.04~~	~~0.17~~	~~0.13~~	~~-0.04~~
Total Stormwater Volume Removed (ac-ft):																		
Total Stormwater Volume Removed (gallons):																		

Notes:
1. Tockwotten property location no longer owned or associated with Brown University.
2. April 2023 revision: NBC 3 Month rain event added to tracking tables.
3. April 2023 revision: New projects to be added and tracked in table per correct NBC sewer basin.

Table 4A.E: Stormwater Diverted from the Combined Sewer: NBC Sewer Basin E – Volume Summary

Designation	Location	BMP	Year Constructed	Runoff Volume (ac-ft)														
				3-month[1]			2-year			10-year			50-year			100-year		
				Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
Total Stormwater Volume Removed (ac-ft):																		
Total Stormwater Volume Removed (gallons):																		

Notes:
1. April 2023 revision: NBC 3 Month rain event added to tracking tables.
2. April 2023 revision: New projects to be added and tracked in table per correct NBC sewer basin.

Appendix D

Tables 4B.A - 4B.E:Stormwater Diverted from the Combined Sewer – Peak Flow Summary

Table 4B.A: Stormwater Diverted from the Combined Sewer: NBC Sewer Basin A- Peak Flow Summary

Table 4B.B: Stormwater Diverted from the Combined Sewer: NBC Sewer Basin B- Peak Flow Summary

Table 4B.C: Stormwater Diverted from the Combined Sewer: NBC Sewer Basin C- Peak Flow Summary

Table 4B.D: Stormwater Diverted from the Combined Sewer: NBC Sewer Basin D- Peak Flow Summary

Table 4B.E: Stormwater Diverted from the Combined Sewer: NBC Sewer Basin E- Peak Flow Summary

Appendix D

Table 4B.A: Stormwater Diverted from the Combined Sewer: NBC Sewer Basin A – Peak Flow Summary

Designation	Location	BMP	Year Constructed	Peak Flow																			
				3-month[1]				2-year				10-year				50-year				100-year			
				Pre (cfs)	Post (cfs)	Δ (cfs)	**Δ (gpm)**	Pre (cfs)	Post (cfs)	Δ (cfs)	**Δ (gpm)**	Pre (cfs)	Post (cfs)	Δ (cfs)	**Δ (gpm)**	Pre (cfs)	Post (cfs)	Δ (cfs)	**Δ (gpm)**	Pre (cfs)	Post (cfs)	Δ (cfs)	**Δ (gpm)**
Total Stormwater Peak Flow Diverted																							

Notes:
1. April 2023 revision: NBC 3 Month rain event added to tracking tables.
2. April 2023 revision: New projects to be added and tracked in table per correct NBC sewer basin.

Table 4B.B: Stormwater Diverted from the Combined Sewer: NBC Sewer Basin B – Peak Flow Summary

Designation	Location	BMP	Year Constructed	Peak Flow																			
				3-month[1]				2-year				10-year				50-year				100-year			
				Pre (cfs)	Post (cfs)	Δ (cfs)	**Δ (gpm)**	Pre (cfs)	Post (cfs)	Δ (cfs)	**Δ (gpm)**	Pre (cfs)	Post (cfs)	Δ (cfs)	**Δ (gpm)**	Pre (cfs)	Post (cfs)	Δ (cfs)	**Δ (gpm)**	Pre (cfs)	Post (cfs)	Δ (cfs)	**Δ (gpm)**
Total Stormwater Peak Flow Diverted																							

Notes:

1. April 2023 revision: NBC 3 Month rain event added to tracking tables.
2. April 2023 revision: New projects to be added and tracked in table per correct NBC sewer basin.

Table 4B.C: Stormwater Diverted from the Combined Sewer: NBC Sewer Basin C – Peak Flow Summary

Designation	Location	BMP	Year Constructed	Peak Flow																			
				3-month[1]				2-year				10-year				50-year				100-year			
				Pre (cfs)	Post (cfs)	Δ (cfs)	**Δ (gpm)**	Pre (cfs)	Post (cfs)	Δ (cfs)	**Δ (gpm)**	Pre (cfs)	Post (cfs)	Δ (cfs)	**Δ (gpm)**	Pre (cfs)	Post (cfs)	Δ (cfs)	**Δ (gpm)**	Pre (cfs)	Post (cfs)	Δ (cfs)	**Δ (gpm)**
9	Watson Institute	Underground Infiltration	2017	0.04	0.00	-0.04	**-18**	0.27	0.00	-0.27	**-121**	0.46	0.00	-0.46	**-206**	0.75	0.00	-0.75	**-336**	0.92	0.00	-0.92	**-412**
10	Performing Arts Center	Jellyfish Filter, Underground Detention	2021	0.29	0.00	-0.29	**-130**	0.91	0.00	-0.91	**-408**	1.42	0.00	-1.42	**-637**	2.18	1.5	-0.68	**-305**	2.62	1.81	-0.81	**-364**
11	Brook Street Housing	Enhanced Biofiltration with ISR (2)	2022	0.09	0.00	-0.09	**-40**	0.51	0.00	-0.51	**-228**	0.76	0.00	-0.76	**-341**	1.13	0.00	-1.13	**-507**	1.35	0.00	-1.35	**-605**
Total Stormwater Peak Flow Diverted						-0.42	**188**			1.69	**757**			2.64	**1,184**			2.56	**1,148**			3.08	**1,381**

Notes:
1. April 2023 revision: NBC 3 Month rain event added to tracking tables.
2. April 2023 revision: New projects to be added and tracked in table per correct NBC sewer basin.

Table 4B.D: Stormwater Diverted from the Combined Sewer: NBC Sewer Basin D – Peak Flow Summary

Designation	Location	BMP	Year Constructed	Peak Flow																			
				3-month[2]				2-year				10-year				50-year				100-year			
				Pre (cfs)	Post (cfs)	Δ (cfs)	**Δ (gpm)**	Pre (cfs)	Post (cfs)	Δ (cfs)	**Δ (gpm)**	Pre (cfs)	Post (cfs)	Δ (cfs)	**Δ (gpm)**	Pre (cfs)	Post (cfs)	Δ (cfs)	**Δ (gpm)**	Pre (cfs)	Post (cfs)	Δ (cfs)	**Δ (gpm)**
~~**8**~~	~~Tockwotten[1]~~	~~Greening~~	~~2014~~	~~-~~	~~-~~	~~-~~	~~-~~	~~0.85~~	~~0.40~~	~~-0.45~~	~~**-202**~~	~~1.27~~	~~0.76~~	~~-0.51~~	~~**-229**~~	~~1.90~~	~~1.33~~	~~-0.57~~	~~**-256**~~	~~2.27~~	~~1.67~~	~~-0.60~~	~~**-269**~~
Total Stormwater Peak Flow Diverted																							

Notes:

1. Tockwotten property location no longer owned by or associated with Brown University.
2. April 2023 revision: NBC 3 Month rain event added to tracking tables.
3. April 2023 revision: New projects to be added and tracked in table per correct NBC sewer basin.

Table 4B.E: Stormwater Diverted from the Combined Sewer: NBC Sewer Basin E – Peak Flow Summary

Designation	Location	BMP	Year Constructed	Peak Flow																			
				3-month[1]				2-year				10-year				50-year				100-year			
				Pre (cfs)	Post (cfs)	Δ (cfs)	**Δ (gpm)**	Pre (cfs)	Post (cfs)	Δ (cfs)	**Δ (gpm)**	Pre (cfs)	Post (cfs)	Δ (cfs)	**Δ (gpm)**	Pre (cfs)	Post (cfs)	Δ (cfs)	**Δ (gpm)**	Pre (cfs)	Post (cfs)	Δ (cfs)	**Δ (gpm)**
Total Stormwater Peak Flow Diverted																							

Notes:

1. April 2023 revision: NBC 3 Month rain event added to tracking tables.
2. April 2023 revision: New projects to be added and tracked in table per correct NBC sewer basin.

Appendix D

Table 5: Potential Stormwater Project Locations

Appendix D

Table 5: Potential Stormwater Project Locations

Designation	Address (Location)	Existing Surface	Receiving System	Potential BMP Type
12	84 Prospect Street (Northwest of Rochambeau House)	Parking Lot	Combined Sewer	A, D
13	87 Prospect Street (South of Machado House)	Green Space	Combined Sewer	A
14	131-133 Brown Street (East of Building)	Parking Lot	Combined Sewer/ Providence River	A, B, C, D, E
15	211 Bowen Street (West of Andrews Common)	Green Space	Combined Sewer/ Providence River	A, B, E
16	211 Bowen Street (West of Metcalf Hall)	Parking Lot	Providence River	A, C, D, E
17	187 Cushing Street (New Pembroke)	Parking Lot	Providence River	A, C, D, E
18	Ittleson Quad	Green Space	Seekonk River	A, E
19	194 Meeting Street (South of Alumnae Hall)	Green Space	Providence River	A, E
~~**20**~~	~~79 Brown Street (North of Peter Green House)~~	~~Green Space~~	~~Providence River~~	~~A, E~~
21	21 Prospect Street (West of Manning Hall)	Green Space	Combined Sewer/ Providence River	A, E
22	21 Prospect Street (East of Manning Hall)	Green Space	Combined Sewer/ Providence River	A, E
23	Simmons Quadrangle (South of Lyman Hall)	Green Space	Providence River	A, E
24	Sciences Park & RI Granite (West and South of Marston Hall)	Green Space	Providence River	A, E
25	150 Hope Street (West of Fox Point Day Care Center)	Parking Lot	Providence River	A, B, C, D, E
26	1 Young Orchard Avenue (East of Orwig Music Hall)	Parking Lot	Combined Sewer/ Providence River	A, B, C, D, E
27	10 Young Orchard Avenue (West Parking Lot)	Parking Lot	Combined Sewer/ Providence River	A, B, C, D, E
28	2 Young Orchard Avenue (South Community Garden)	Green Space	Combined Sewer/ Providence River	A, B, E
29	103 Thayer Street (Vartan Gregorian Quad)	Green Space	Providence River	A, B, C, E
30	101 Power Street (West and East of Power Street Parking Garage)	Gravel Area	Providence River	B, E
~~**31**~~	~~383 Benefit Street (East of Hoppin House)~~	~~Parking Lot~~	~~Combined Sewer~~	~~A, E~~
32	64 College Street (West of List Art Building)	Green Space	Combined Sewer	A
33*	200 Meeting Street (South of Emery Hall)	Green Space	Providence River	A, E
34*	200 Meeting Street (East of Emery Hall)	Parking Lot	Providence River	A, C, D, E
35*	315 Thayer Street (Parking Lot)	Parking Lot	Providence River	A, C, D, E
36	Integrated Life Sciences Building	Buildings & Parking Lot	Combined Sewer	A, B, C, E
37	Athletics Field & Complex	Green Space	Seekonk River	A, B, C, E

*Secondary Location

Potential BMP Type Legend:
A – Subsurface Infiltration
B – Bioretention Basin / Rain Garden
C – Tree Box Filter
D – Porous Pavement
E – Subsurface Proprietary Structure

Appendix D

FIGURES

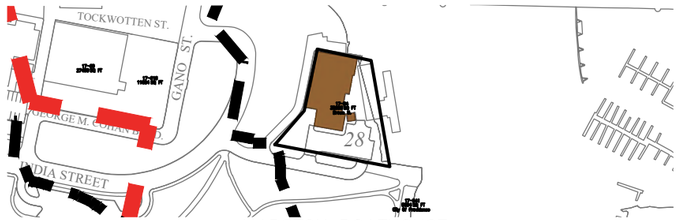
Figure 1: Existing BMPs

Appendix D

PLOT SCALE: 10::

LEGEND:

- WATERSHED BOUNDARY
- 200' CRMC JURISDICTION
- SEPARATE STORMWATER
- BROWN UNIVERSITY OWNED BUILDINGS
- BROWN UNIVERSITY GREEN SPACE
- BUS TUNNEL
- RAILROAD TUNNEL
- BROWN OWNED PARCELS
- EXISTING BMPS (SEE TABLE 1)



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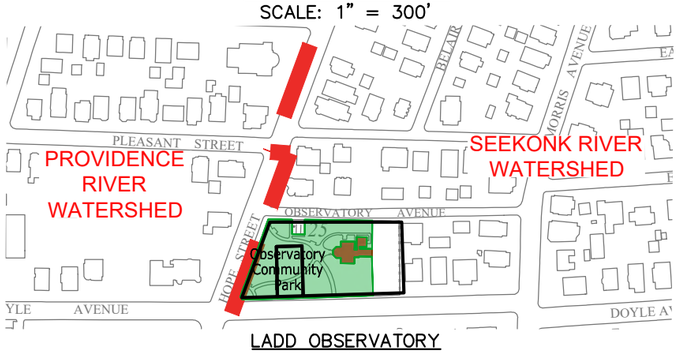

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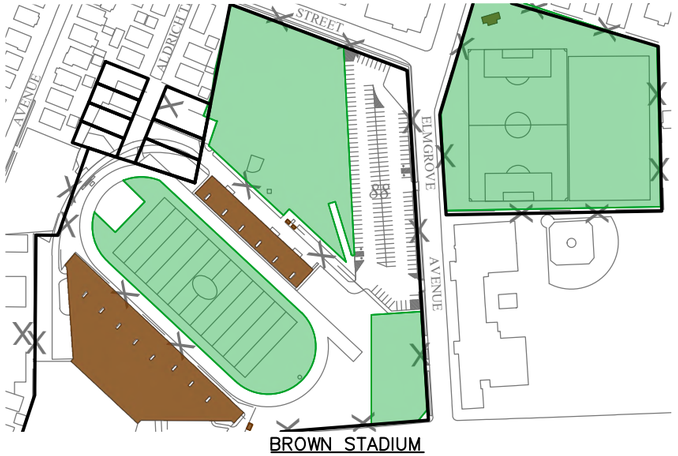

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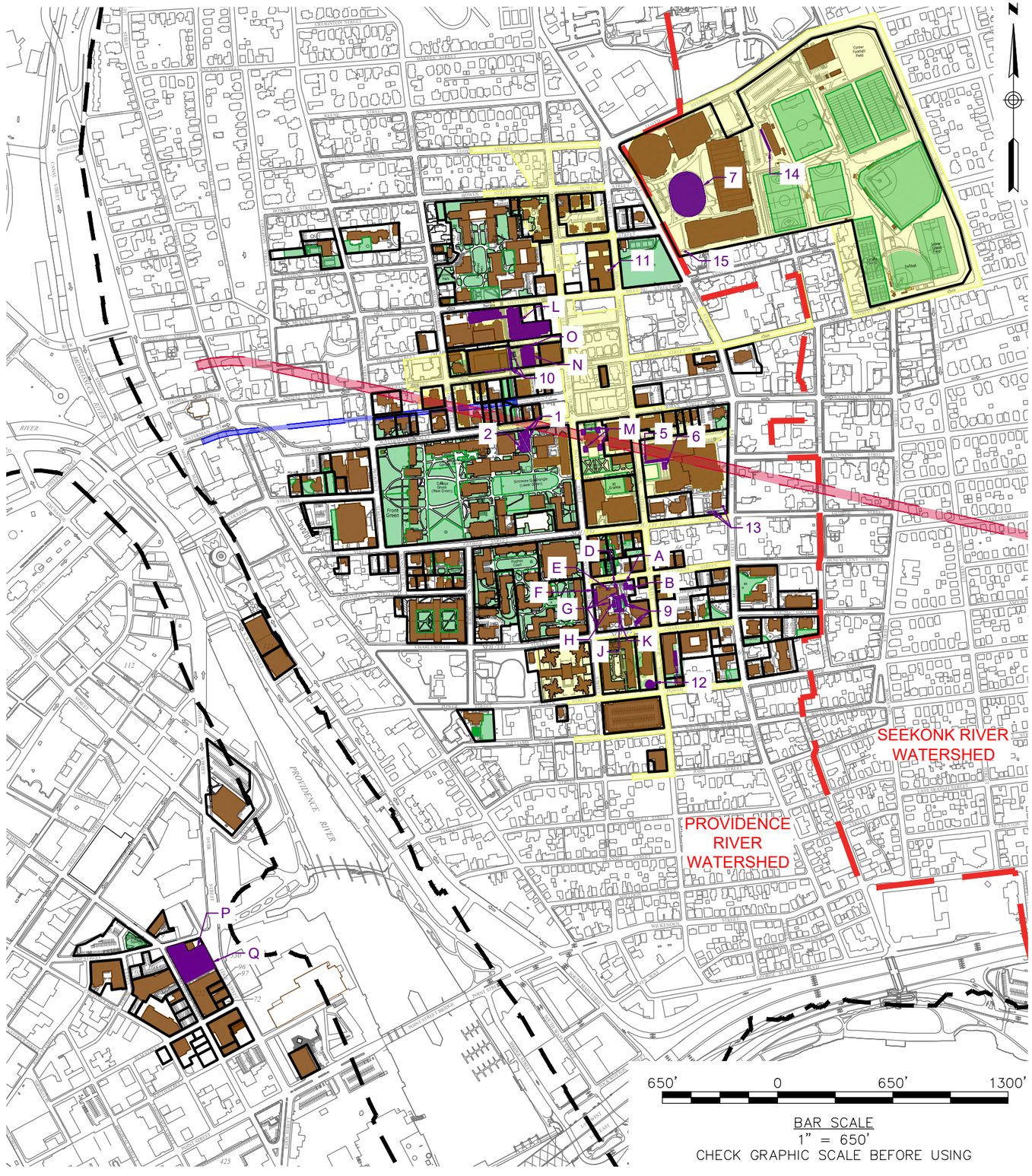

650' 0 650' 1300'

BAR SCALE
1" = 650'
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PE SEAL:

STORMWATER MASTER PLAN

CLIENT INFO:

BROWN UNIVERSITY
PROVIDENCE, RHODE ISLAND
02912

JOB NO:	0230053.01
DATE:	MAY 2023
SCALE:	1"=650'
DESIGNED BY:	MC
DRAWN BY:	CQ
CHECKED BY:	BH/JG
FILENAME:	2022.08.26 - C-FIG.1-2.dwg

DRAWING TITLE:

EXISTING BMPS

DRAWING NO:

FIGURE 1

SHEET: 1 OF 2

I:\Woodard&Curran\projects\0230053.01 Brown Stormwater Master Plan Update\Figures\2022.08.26 - C-FIG.1-2.dwg

Appendix D

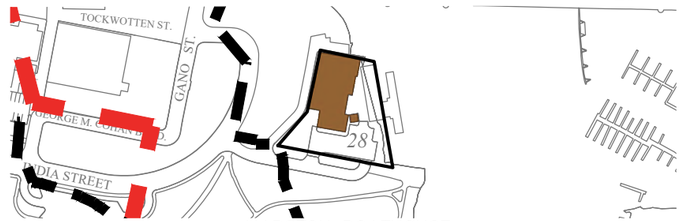
Figure 2: Existing and Potential BMPs

Appendix D

PLOT SCALE: 10::

LEGEND:

- WATERSHED BOUNDARY
- 200' CRMC JURISDICTION
- SEPARATE STORMWATER
- BROWN UNIVERSITY OWNED BUILDINGS
- BROWN UNIVERSITY GREEN SPACE
- BUS TUNNEL
- RAILROAD TUNNEL
- BROWN OWNED PARCELS
- EXISTING BMPS (SEE TABLE 1)
- POTENTIAL BMPS



MARSTON BOATHOUSE
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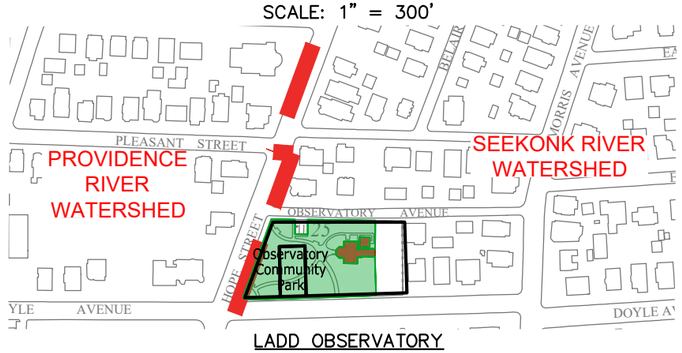

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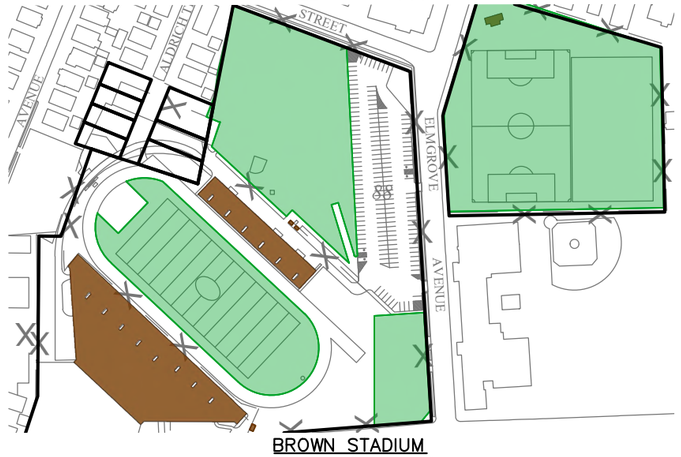

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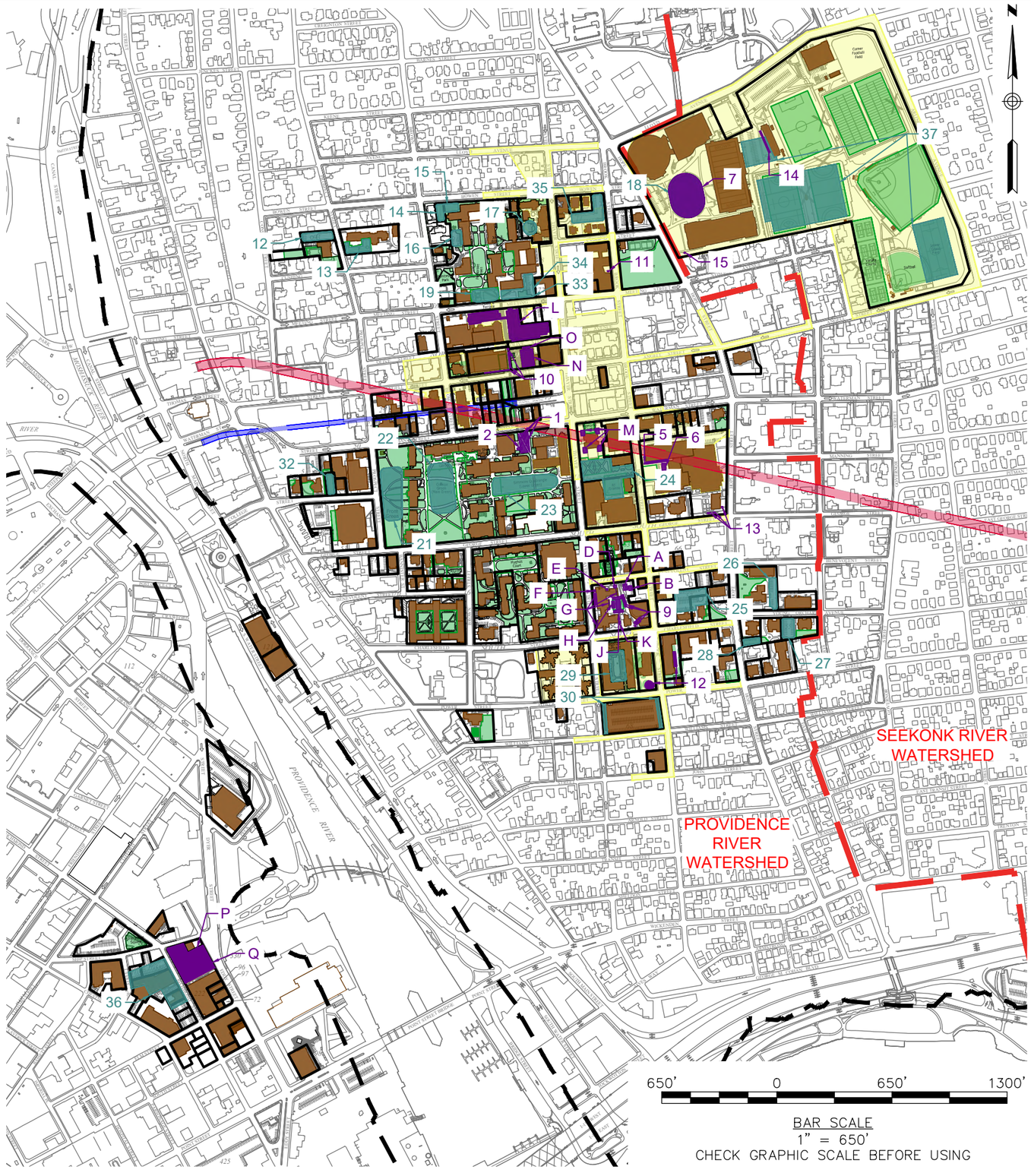

BAR SCALE
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CLIENT INFO:

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JOB NO:	0230053.01
DATE:	MAY 2023
SCALE:	1"=650'
DESIGNED BY:	MC
DRAWN BY:	CQ
CHECKED BY:	BH/JG
FILENAME:	2022.08.26 - C-FIG.1-2.dwg

DRAWING TITLE:

EXISTING AND POTENTIAL BMPS

DRAWING NO:

FIGURE 2

SHEET: 2 OF 2

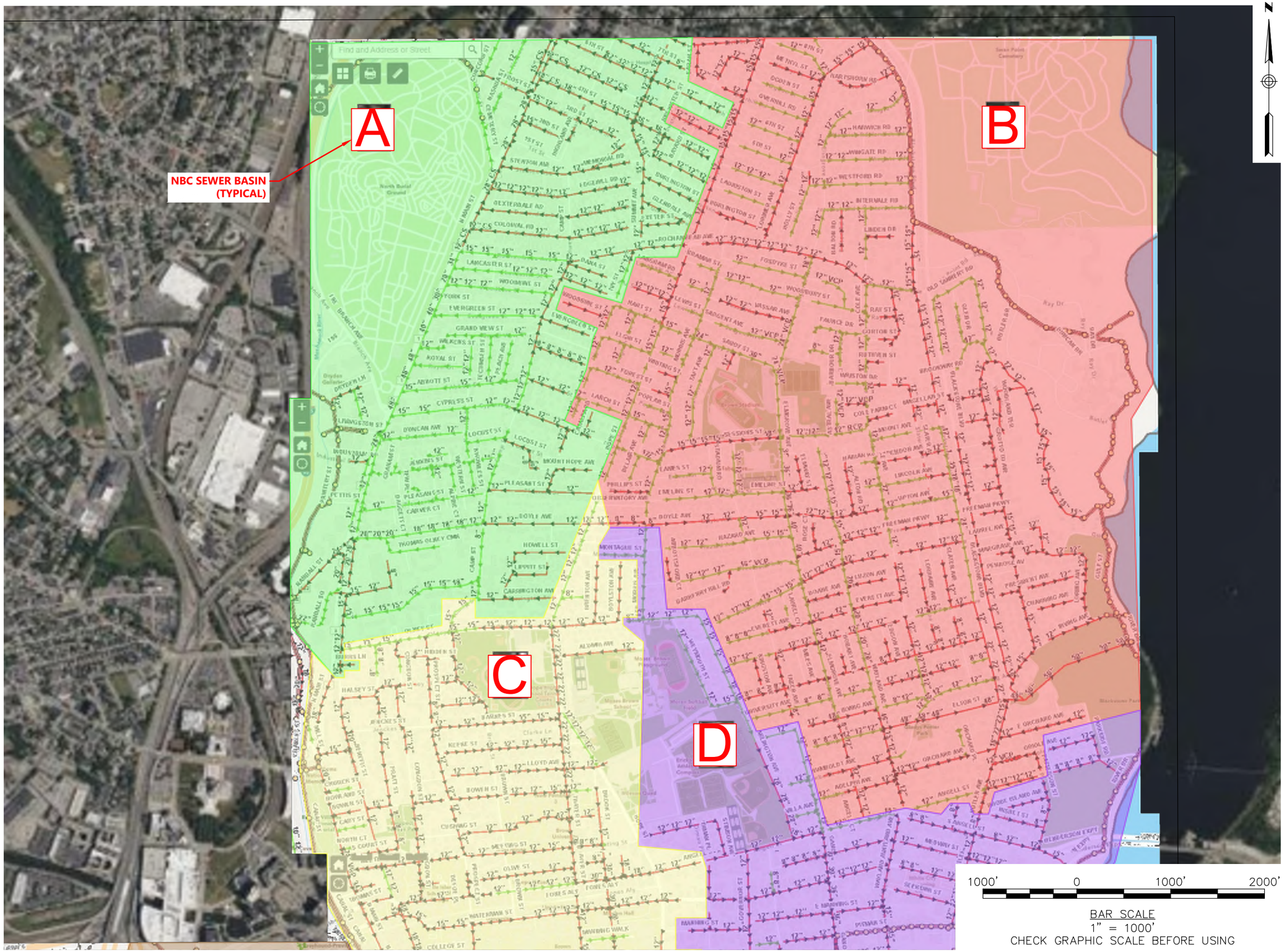
\\woodardcurran.net\plans\Projects\0230053.01 Brown Stormwater Master Plan Update\Mapping\Working\2022.08.26 - C-FIG.1-2.dwg

Appendix D

Figure 3: NBC Sewer Basins -1

Appendix D

PLOT SCALE: 10::



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BAR SCALE
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JOB NO:	0230053.01
DATE:	MAY 2023
SCALE:	1"=1000'
DESIGNED BY:	MC
DRAWN BY:	MC
CHECKED BY:	BH/JG
FILENAME:	2022.08.26 - C-FIG. 3-5*.dwg

DRAWING TITLE:

NBC SEWER BASINS - 1

DRAWING NO:

FIGURE 3

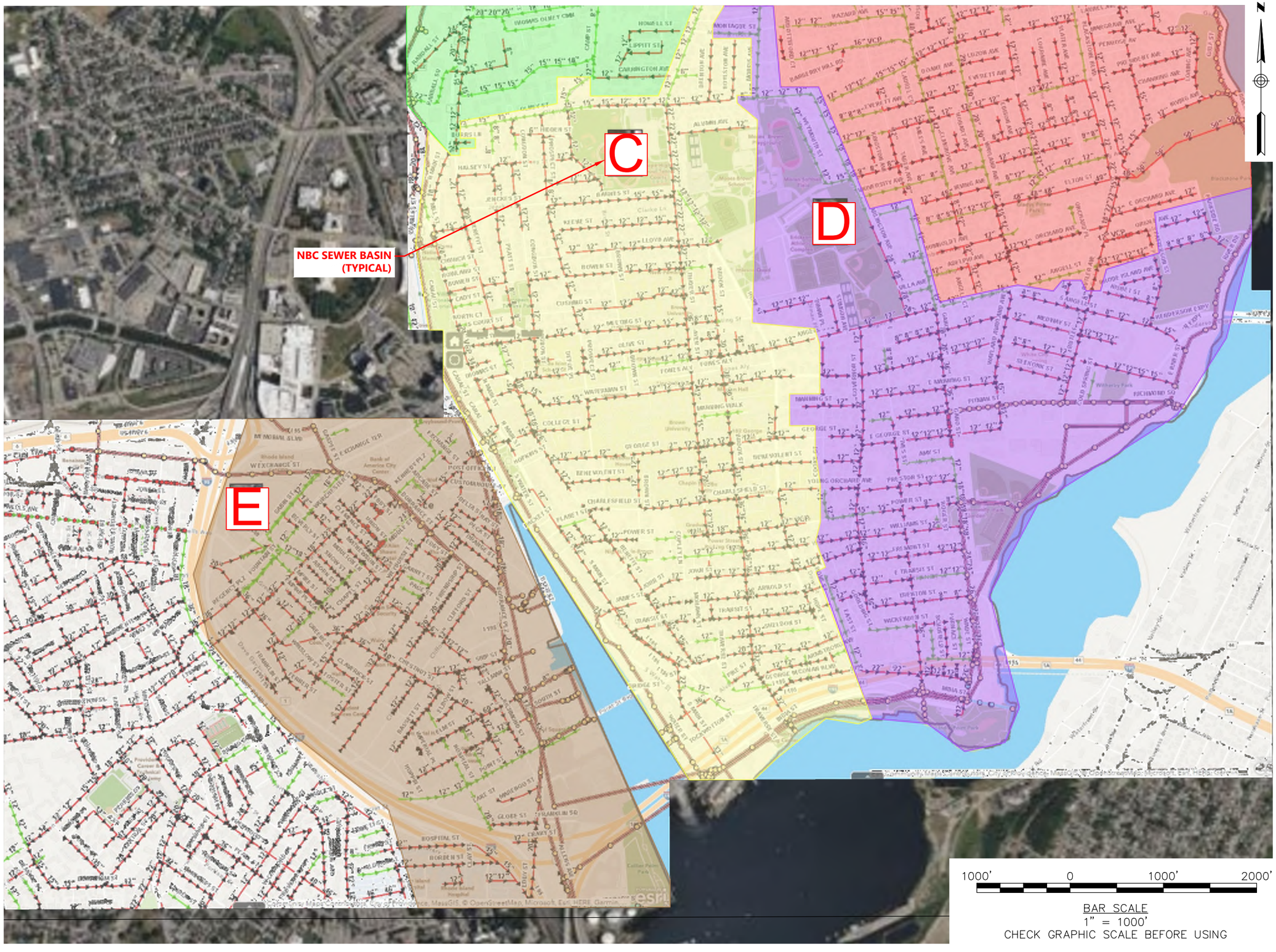
SHEET: 1 OF 2

Appendix D

Figure 4: NBC Sewer Basins - 2

Appendix D

PLOT SCALE: 10::



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CLIENT INFO:

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JOB NO:	0230053.01
DATE:	APRIL 2023
SCALE:	1"=1000'
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DRAWN BY:	MC
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FILENAME:	2022.08.26 - C-FIG. 3-5*.dwg

DRAWING TITLE:

NBC SEWER BASINS - 2

DRAWING NO:

FIGURE 4

SHEET: 2 OF 2

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Appendix D

APPENDIX A: SOURCE CONTROL AND POLLUTION PREVENTION STANDARDS

Appendix D

Appendix D

COMMITMENT & INTEGRITY
DRIVE RESULTS

33 Broad Street | Floor 7
Providence, Rhode Island 02903
www.woodardcurran.com

T 800.985.7897
T 401.273.1007
F 401.273.5087

MEMORANDUM

TO: Brown University Department of Facilities Management

FROM: Woodard & Curran

DATE: December 13, 2016

RE: Source Control and Pollution Prevention Standards for Projects Disturbing one Acre or Less

---

BACKGROUND

The Rhode Island Department of Environmental Management (RIDEM) requires erosion and sedimentation control best management practices to be implemented on all land disturbance projects undertaken at Brown University. While the Rhode Island Pollutant Discharge and Elimination System (RIPDES) Stormwater General Permit for Construction Activity (CGP) does not generally apply to projects disturbing up to one acre of land, projects on the campus are considered part of a larger common plan and therefore are subject to permitting. Brown's Stormwater Master Plan simplifies the permitting for projects disturbing up to one acre by exempting them from requiring coverage under the RIPDES CGP if the soil erosion and sedimentation control practices set forth in this memorandum are implemented for those smaller projects. Small projects that require a building permit, however, will need to meet the City of Providence permitting requirements for stormwater management.

APPLICABILITY

The purpose of implementing erosion and sedimentation control measures is to prevent pollutants, including suspended solids from leaving construction sites and entering waterways or environmentally sensitive areas during and immediately following construction. Specifically, this memorandum describes the erosion and sediment prevention control measures that should be employed during an active construction project.

Small site improvement projects that are addressed by this memorandum include, but not limited to:

- Sidewalk repairs;
- Parking lot improvements; and
- Projects that involves clearing and grubbing, grading, or excavation.

GENERAL EROSION AND SEDIMENTATION CONTROL MEASURES

The following control measures listed below are best management practices that should be utilized to reduce impacts associated with construction activity. Not every control measure applies to all projects.

1. Minimize the areas of disturbance to the maximum extent practicable.

2. Avoid and protect sensitive areas, natural features, and stormwater treatment systems (e.g., bioretention areas, sand filters, rain gardens, etc.) to the extent practicable to minimize compaction of soils and prevent sediment transport. Mark sensitive areas to be protected within the site, so that workers can clearly identify the area to be protected. Temporary sediment control techniques include silt fence and haybales, silt socks, or other suitable means of sediment control.

3. Minimize the disturbance of steep slopes.

4. Preserve topsoil to the maximum extent feasible.

5. Stabilize disturbed soils:

    a. Temporary control measures include the use of temporary seeding with native vegetation or hydro-seeding prior to October 15 of any calendar year or erosion control blanket, or other suitable means of slope stabilization.

    b. Permanent vegetative soil stabilization techniques include installation of seeded or sodded lawn.

6. Protect storm drain outlets to prevent scour and erosion at discharge points through the protection of the soil surface and reduction in discharge velocities. Protect stormwater outlets with the potential to discharge sediment-laden stormwater flow from the construction site using suitable sediment control practices such as sediments traps or basins, diversions, etc.

7. Retain sediment on site through structural and non-structural practices. Sediment control practices include temporary sedimentation basins, sediment barriers such as silt fence and haybales, silt socks, or other suitable sediment control devices.

8. Protect existing catch basins and stormdrain inlets that are operational during construction activities to prevent soil and debris from entering. Inlet protection can be accomplished using hay bales, silt sacks or other suitable device.

9. Reduce the amount of sediment tracking off the project site to the maximum extent practicable.

10. Protect soil stockpiles from run-on with the use of temporary sediment barriers such as silt fence and haybales, silt socks, or other suitable sediment control measures. Cover, temporarily vegetate, or structurally stabilize soil stockpiles using erosion control blankets, mulch, tarps, or similar controls to avoid direct contact with precipitation and to minimize sediment transport by wind.

11. Inspect and clean or remove and replace the erosion and sediment control measures as sediment accumulates, filters become clogged, damaged, and/or the performance is compromised. Properly dispose of construction site waste in a manner consistent with State Law and/or regulations and only at authorized disposal sites.

APPENDIX B: BROWN PARCEL LIST

Appendix D

Appendix D

Assessors Map and Lot	Address/Description	Total Area (Acres)
7-8	Marvel Field (425 Elmgrove)	3.677
10-284	84 Brown	0.268
10-296	205 Meeting	0.183
10-298	215 Meeting	0.088
10-333	91 Brown	0.079
10-580	219 Bowen	0.124
10-722	Pembroke Campus (187 Bowen)	6.390
10-704	185 Meeting	2.250
10-717	154 Angell	0.455
10-718-EX	164 Angell	0.348
10-720	111 Brown	0.155
10-732	144 Angell	0.751
10-733	252 Thayer	0.270
10-734	79-81 Brown	0.325
10-735	85 Brown	0.215
11-110	219 Hope	0.373
11-133	Athletic Complex (295 Lloyd)	38.030
12-73	155 South Main	0.462
12-154	Corliss Brackett (45 Prospect)	0.428
12-159	J. Walter Wilson (121 Angell)	0.802
12-161	129 Angell	0.116
12-162	135 Angell	0.232
12-164	143 Angell	0.124
12-165	147 Angell	0.123
12-167	155 Angell	0.320
12-169	165 Angell	0.109
12-170	167 Angell	0.104
12-191	96 Waterman	0.079
12-192	94 Waterman	0.119
12-194	90 Waterman	0.127
12-196	86 Waterman	0.116
12-197	84 Waterman	0.116
12-198	82 Waterman	0.116
12-219	58 College	0.147
12-222	John Hay/List (72 College)	1.028
12-234	Strip behind Rockefeller Library (51 College)	0.088
12-235	127 Angell	0.108
12-249	Main Green and Quiet Green [Half east of Brown St.] (21 Prospect)	13.840
12-271	Watson Center	0.662
12-272	Sciences Library/Marston Hall (197 Thayer)	1.380
12-262	Meiklejohn House (159 George)	0.162
12-306	141 Thayer	0.106
12-319	Kassar House (151 Thayer)	0.235
12-370	155 George	0.277
12-373	74 Benevolent	0.160
12-374	135 Thayer	0.170
12-389	62 Benevolent	0.093
12-452	88 Waterman	0.099
13-17	172 Cushing	0.276
13-18	190 Cushing	0.091
13-19	459 Brook	0.200
13-30	271 Thayer	0.112
13-145	Orwig Music Building (105 Benevolent)	1.270
13-147	TF Green (5 Young Orchard)	0.512
13-185	199 Hope - Unit 3	0.063
13-250	251 Bowen	0.131

Appendix D

Assessors Map and Lot	Address/Description	Total Area (Acres)
13-251	247 Bowen	0.152
13-297	315 Thayer	1.080
13-307	170 Hope	4.210
13-314	450 Brook	0.814
13-315	240 Meeting	0.005
13-40	Pembroke Field (449 Brook)	1.760
13-77	200 Hope	0.178
13-81	129 Waterman	0.127
13-82	131 Waterman	0.135
16-253	50 John	0.240
16-519	130 Hope	0.151
18-190	249-251 Brook	0.068
16-534	126 Power	0.115
16-538	Giddings (128 Hope St.)	0.438
16-541	44 John	0.045
16-568	108-110 Charlesfield	0.115
16-597	Grad Center (36 Charlesfield)	2.200
16-598	Barbour (82 Charlesfield)	0.606
16-633	101 Power	1.320
16-642	Vartan Gregorian Quad (101 Thayer)	1.440
16-672	250 Brook	0.671
16-673	259 Brook	0.590
17-54	250 India	0.712
17-169	4 Young Orchard	0.367
17-260	129 Hope	0.102
17-261	Steinert (123 Hope)	0.204
17-262	150-154 Power	0.714
17-604	2 Young Orchard (131 Hope)	0.418
17-605	8-10 Young Orchard	0.541
21-105	70 Ship	0.679
21-110	6 Elbow	0.110
21-120	200 Chestnut	0.754
21-121	289-295 Richmond	0.111
21-122	279 Richmond	0.097
21-124	261 Richmond	0.132
21-127	233 Richmond (parking)	0.831
21-132	222 Richmond	1.456
21-141	349 Eddy	0.131
21-146	26 Ship	0.107
21-147	297 Richmond	0.056
21-165	324 Richmond	0.109
21-166	61 South	0.176
21-168	317 Richmond	0.088
21-169	307 Richmond	0.088
21-183	72 Elm	0.096
21-446	71 Ship (parking)	0.977
21-340	365 Eddy	0.304
21-391	43 Elm (parking)	0.038
21-398	339 Eddy	0.088
21-400	300 Richmond	0.466
21-67	221 Richmond	0.289
7-88	Lot Behind Brown Stadium	0.159
7-89	Lot Behind Brown Stadium	0.102
7-90	Lot Behind Brown Stadium	0.130
7-91	Lot Behind Brown Stadium	0.091
7-92	Lot Behind Brown Stadium	0.083
7-93	Lot Behind Brown Stadium	0.083

Appendix D

Assessors Map and Lot	Address/Description	Total Area (Acres)
7-94	Lot Behind Brown Stadium	0.095
8-265	Ladd Observatory	0.859
8-267	206 Doyle	0.115
7-3	Brown Stadium (346 Elmgrove)	9.561
10-227	61 Congdon	0.219
10-229	80-84 Prospect	0.584
10-347	85-87 Prospect	1.070
10-542	88 Prospect	0.236
12-154	83 Angell	0.428
12-158	107 Angell	0.327
12-177	195 Angell	0.107
12-201	76 Waterman	0.234
12-203	70 Waterman	0.107
12-204	68 Waterman	0.214
12-205	64 Waterman	0.321
12-217	MacFarlane House (48 College)	0.183
12-218	Gerard House (54 College)	0.386
12-220	South end of List (62 College)	0.121
12-228	51 Waterman	0.141
12-241	Rockefeller Library (22 George)	2.010
12-326	Faculty Club (14 Benevolent)	0.093
12-327	Faculty Club (16 Benevolent)	0.091
12-333	Horace Mann (45 George)	0.146
12-334	Lot 76 (43 George)	0.128
12-335	Lot 76 (41 George)	0.127
12-337	7 Bannis	0.095
12-340	59 George	0.169
12-341	67 George	0.171
12-344	26 Benevolent	0.123
12-378	5 Benevolent	0.108
12-389	62 Benevolent	0.093
12-408	83 Benevolent	0.047
12-415	163 George	0.112
12-436	310 Brook	0.092
12-455	Keeney Quadrangle (15 Charlesfield)	2.070
12-456	Wayland, Buxton, Sears, Marcy, Diman, Chappin, Goddard, Harkness	4.876
12-457	137-139 George (Ratty)	1.300
12-458	Health Services, Annmary Library, Olney (27 Charlesfield)	1.400
12-469	71 and 77 George	0.549
12-474	Macmillan Hall (167 Thayer)	2.010
12-481	Swearer Center (25 George)	0.159
12-490	Taubman Center (111 Thayer)	1.665
12-491	20-22 Benevolent	0.269
13-110	315 Brook	0.800
13-129	88 Benevolent	0.105
13-130	86 Benevolent	0.104
13-132	287-291 Brook	0.077
13-133	89-93 Benevolent	0.035
13-136	101 Benevolent	0.162
13-137	281-283 Brook	0.115
13-138	King House (154 Hope)	0.204
13-139	277 Brook	0.109
13-140	71-73 Charlesfield	0.207
13-142	75 Charlesfield	0.500
13-144	Fiering (79 Charlesfield)	0.341
13-169	Fox Point Daycare (148 Hope)	0.250
13-223	84 Benevolent	0.151

Appendix D

Assessors Map and Lot	Address/Description	Total Area (Acres)
13-259	89 Charlesfield	0.271
13-271	126 Waterman	0.147
13-272	Lot 44 Staff and Faculty Parking (357 Brook)	0.096
13-75	118 Waterman	0.421
13-76	Minden Hall (361 Brook)	0.449
13-82	131 Waterman	0.135
13-83	133 Waterman	0.135
13-85	190 Hope (137 Waterman)	0.528
16-198	89 Power	0.117
16-437	President's House (55 Power)	0.672
20-353	194 Richmond	0.206
21-123	269 Richmond	0.120
21-140	355 Eddy	0.047
21-407	1 Davol Square (7 Point)	0.421
21-417	202 Chestnut	0.320
10-302	272 Thayer	0.284
13-314	450 Brook	0.814
10-577	New Pembroke (300 Thayer)	0.876
Total Properties		**148**

Other Brown Owned Properties	Address/Description	Total Area (Acres)
12-50	121 South Main (104 South Water)	0.682
50-719	10 Park Lane (40)	1.810
50-721	10 Park Lane	1.510
20-205	200 Dyer (198)	2.185

APPENDIX C: RIDEM SITE REMEDIATION DATABASE

Appendix D

Appendix D

TOWN_NME	PROJCT_NME	PROJCT_ADS	PROJCT_CDE	STATUS_CDE	PROJCT_DTE	SITEREM SITE NUMBER	LND SZE [ACRES]
PORTSMOUTH	STRUCTURE 214	WEST OF STATE HIGHWAY 114	S214-SFA	A	03-Mar-95	SR-27-0979 G	
PORTSMOUTH	TANK FARM 1 (CERCLIS-DFSP TANK FARM 1)	ROUTE 114	TF1-DOD	A		SR-19-0979 B	
PORTSMOUTH	TANK FARM 2	OFF DEFENSE HIGHWAY-BURMA RD	TF2-DOD	A		SR-19-0979 C	
PORTSMOUTH	TANK FARM 3	OFF DEFENSE HIGHWAY-BURMA RD	TF3-DOD	A		SR-19-0979 D	
PORTSMOUTH	TANK FARM 4	OFF DEFENSE HIGHWAY-BURMA RD	TF4-DOD	A		SR-27-0979 E	
PORTSMOUTH	TOWN POND	ANTHONY ROAD	TPON-HWM	M	13-May-04	SR-27-1571	
PROVIDENCE	1 CHARLES STREET	1 CHARLES STREET	1CLL-HWM	A	21-Apr-22	SR-28-2084	0.26
PROVIDENCE	110 ELM STREET PROPERTY	110 ELM STREET/100 SOUTH ST-33-35 HOSPITAL STREET	110E-HWM	I	10-Oct-06	SR-07-0455	1.22
PROVIDENCE	131 CANAL STREET PROPERTY	131 CANAL STREET	CSP-HWM	A	05-Feb-18	SR-28-1873	0.47
PROVIDENCE	138 FRIENDSHIP LLC - VACANT LAND	138 FRIENDSHIP STREET	FLVL-HWM	A	03-Mar-21	SR-28-2023	0.25
PROVIDENCE	200 GORDON AVENUE - NORTH VACANT LOT	200 GORDON AVENUE	200GA-HWM	I	01-Feb-21	SR-28-2015	0.5
PROVIDENCE	206 ELMWOOD AVENUE - PROPOSED SCHOOL	206 ELMWOOD AVENUE	206EA-HWM	A	21-Oct-21	SR-28-2055	3.99
PROVIDENCE	21 GORDON AVENUE	21 GORDON AVENUE	21GA-HWM	M	21-May-21	SR-28-2035	0.39
PROVIDENCE	25 BOUGH STREET	25 BOUGH STREET	25BS-SUBC	A	31-Jan-20	SR-28-1985	0.28
PROVIDENCE	260 WESTMINSTER STREET	260 WESTMINSTER STREET	260W-HWM	A	05-Dec-18	SR-28-1923	0.08
PROVIDENCE	345 HARRIS SELF-STORAGE	345 HARRIS AVENUE	FRYS2-HWM	I	07-Sep-06	SR-28-0504 B	1.35
PROVIDENCE	373 PROMENADE STREET	373 PROMENADE STREET	373PS-HWM	A	19-Jul-22	SR-28-2101	0.15
PROVIDENCE	400 SOUTH MAIN STREET, LLC	400 SOUTH MAIN STREET	SOUM-HWM	I	29-Mar-05	SR-28-0004	0.25
PROVIDENCE	468 WEST FOUNTAIN STREET, LLC	468 WEST FOUNTAIN STREET	WFSL-HWM	A	04-Jan-19	SR-28-1928	0.095
PROVIDENCE	61 & 115 DUPONT DRIVE	61 & 115 DUPONT DRIVE	DUPO-HWM	I	18-Jul-19	SR-28-1957	3.66
PROVIDENCE	80 SOUTH STREET	66,70,80 SOUTH ST, 218 CHESTNUT ST, 345, 349 RICHMOND ST	80SS-HWM	I	05-Oct-18	SR-28-1914	0.5
PROVIDENCE	94 SUMMER STREET	94 SUMMER STREET	94SU-HWM	A	22-Dec-21	SR-28-2063	1.16
PROVIDENCE	AAA - SILVER SPRING INDUSTRIAL PARK	301 SILVER SPRING STREET	AAA-HWM	I	01-Aug-98	SR-28-0015	6.17
PROVIDENCE	ADJACENT PARCELS TO I-195 RD LOT 403	60 CLIFFORD STREET & 216 EDDY STREET	AP403-HWM	A	13-Feb-19	SR-28-1300 (Lot 403) B	0.47
PROVIDENCE	ADLER'S HARDWARE STORE PARCEL (EASTSIDE MARKET)	131-133 PITMAN STREET (1 WAYLAND AVENUE)	ADLE-HWM	I	26-Jan-06	SR-28-0026	3.3
PROVIDENCE	ALEPPO STREET PROPERTY # 1	69 - 81 ALEPPO STREET	ALPO-HWM	I	20-Feb-04	SR-28-0036	
PROVIDENCE	ALEPPO STREET PROPERTY # 2	47 - 49 ALEPPO STREET	4APO-HWM	I	20-Feb-04	SR-28-0035	
PROVIDENCE	ALGONQUIN GAS TRANSMISSION	4 CRARY STREET	AGT-HWM	I	27-Jun-16	SR-28-1814	
PROVIDENCE	ALGONQUIN LNG LINE	ALLENS AVENUE	ALGO-HWM	A	02-May-05	SR-28-0039	
PROVIDENCE	ALUMINUM & COPPER RECYCLING, LLC (SEE NJD-28-00XX)	52 WALDO STREET	NEJT-HWM	I	15-Oct-04	SR-28-0949	1
PROVIDENCE	AMERICAN CHEMICAL WORKS	365 CHARLES STREET	ACWI-HWM	I	21-Feb-00	SR-28-0047	1
PROVIDENCE	AMERICAN LOCOMOTIVE (FORMER MICROFIN)	411 - 555 VALLEY STREET	AMLW-HWM	I	31-Jan-06	SR-28-0813	17
PROVIDENCE	AMERICAN TOURISTER- SCHOOL	70 HOUGHTON STREET	AMER-HWM	A	22-Dec-03	SR-28-0054	24.3
PROVIDENCE	AMI LEASING (FORMER)	895 ELMWOOD AVENUE	AMIL-NJD	I	04-Aug-97	NJD-28-0002	
PROVIDENCE	ARMED FORCES RESERVE CENTER	FIELDS POINT	AFRC-DOD	A		SR-28-1592	
PROVIDENCE	ARMED FORCES RESERVE CENTER	NARRAGANSETT ST-FIELDS POINT	ASRC-HWM	I	01-Feb-88	SR-28-0071	
PROVIDENCE	ARTIMUS SHIP	PORT OF PROVIDENCE	ARTI-HWM	I	07-Dec-92	SR-28-1123	
PROVIDENCE	ASA MESSER ELEMENTARY SCHOOL	1655 WESTMINSTER STREET	ASAM-HWM	A	06-Aug-21	SR-28-2048	0.5
PROVIDENCE	ASTRO PLATING	165 RHODES STREET	ASP-HWM	I		SR-28-0078	2.93
PROVIDENCE	ATWELLS AVENUE FIRE STATION PARKING LOT	630 ATWELLS AVENUE	AAFS-HWM	A	08-Feb-21	SR-28-2016	0.5
PROVIDENCE	ATWELLS AVENUE FIRE STATION PARKING LOT	630 ATWELLS AVENUE	AAFS-HWM	A	08-Feb-21	SR-28-2016	
PROVIDENCE	AUDET (E.W.) AND SONS	169 BAY STREET	EAAS-SFA	I	05-Feb-87	SR-28-0082 A	
PROVIDENCE	AUDET (E.W.) AND SONS	169 BAY STREET	EAAS-HWM	I		SR-28-0082 A	
PROVIDENCE	AUTO FLUFF/PROMET CORPORATION	242 ALLENS AVENUE	AFPR-HWM	I		SR-28-1141	
PROVIDENCE	AUTO VALET IRVING	36 PLEASANT VALLEY PARKWAY	AVI-HWM	A	26-Dec-19	SR-28-1981	0.91
PROVIDENCE	B B GREENBERG	333 WEST RIVER AVENUE	BBGB-HWM	M	22-Mar-95	SR-28-0092	6.33
PROVIDENCE	B. S. INTERNATIONAL LTD. PROPERTY	250 NIANTIC AVENUE	BSIL-HWM	I	11-Jun-04	SR-28-0093	1
PROVIDENCE	BADWAY PROPERTIES	116 & 170 PRINTERY STREET	BADWY-HWM	I	26-Sep-18	SR-28-1913	0.83
PROVIDENCE	BAILEY SCHOOL & BAXTER ST PLAYGROUND	57-60,62,64&66 BAXTER ST (5 & 9 NORWICH AVE)	BS&BP-HWM	A	09-Apr-20	SR-28-0548 B	0.3
PROVIDENCE	BANANAGRAMS	845 ALLENS AVENUE	BANA-HWM	I	19-Jun-17	SR-28-1843 A	0.23
PROVIDENCE	BANANAGRAMS WAREHOUSE	145 CAROLINA AVENUE	BANA2-HWM	I	19-Jun-17	SR-28-1843 B	0.56
PROVIDENCE	BATH STREET REALTY (re: FOUNDRY SHAFT SITE)	30 ARLINE STREET	BATH-HWM	I	30-Nov-06	SR-28-0496 C	1.02
PROVIDENCE	BAYVIEW DRIVE PROPOSAL	BAYVIEW DRIVE OFF HARBORSIDE BLVD.	BAYV-HWM	I	08-Oct-04	SR-28-0110	0.4
PROVIDENCE	BELVOIR PROPERTIES	162 & 166 CLIFFORD STREET	BELP-HWM	I	01-Dec-97	SR-28-0120	2
PROVIDENCE	BERGERE	33 BASSETT STREET	BERG-SFA	I	01-Jun-81	SR-28-0123	
PROVIDENCE	BLACKSTONE RIVER BIKEWAY - SEGMENT 1A	EAST TRANSIT STREET TO PITMAN STREET	BRB1A-DOT	A	29-May-15	SR-28-1774	0.75
PROVIDENCE	BOLIDEN METECH	434 ALLENS AVENUE	BOL-SFA	I	05-Feb-87	SR-28-0143	5.3
PROVIDENCE	BOLIDEN METECH	434 ALLENS AVENUE	BOLI-HWM	I		SR-28-0143	5.3
PROVIDENCE	BOSCO TRUCKING	RUGBY AND PAVILLION STREET	BOTR-SFA	I	01-Apr-78	SR-28-0147	
PROVIDENCE	BOYD STREET PROPERTY	38 BOYD STREET	BOYD-NJD	I	06-Oct-97	NJD-28-0077	0.136
PROVIDENCE	BREITENSTEIN, C.B.	91 MINER STREET	BCB-HWM	I		SR-28-0156	
PROVIDENCE	BROOKWOOD INVEST. (WILD CAT EQUITIES)	669 ELMWOOD AVENUE	BRKI-HWM	I	10-Jan-97	SR-28-0171	2
PROVIDENCE	BROOMFIELD J & SONS	473 ALLENS AVENUE	BJS-HWM	I	17-Jan-18	SR-28-1870	3.91
PROVIDENCE	BROWN CHURCHILL HOUSE BUILDING ADDITION	155 ANGELL STREET	BUCHB-HWM	A	11-Apr-22	SR-28-2081	0.32
PROVIDENCE	BROWN GRAD CENTER HTHW IMPROVEMENT PROJECT	47 CHARLESFIELD STREET (APPROX)	BUGCI-HWM	I	15-Jun-15	SR-28-1778	0.25
PROVIDENCE	BROWN U BROOK STREET B	252 &258 BROOK STREET / 66 CHARLESFIELD STREET	BUBS2-HWM	A	07-Jun-21	SR-28-1998 B	1.3
PROVIDENCE	BROWN U BROOK STREET PARKING LOT	253 BROOK STREET	BUBSP-HWM	A	08-Jul-20	SR-28-1998	0.12
PROVIDENCE	BROWN UNIVERSITY	THAYER AND GEORGE STREET	BRUN-HWM	A	06-Sep-96	SR-28-0177	1
PROVIDENCE	BROWN UNIVERSITY - 271 TOCKWOTTON STREET	271 TOCKWOTTON STREET (230 INDIA STREET)	BUTK-HWM	I	08-Jun-18	SR-28-1892	0.88
PROVIDENCE	BROWN UNIVERSITY - SOUTH WALK	ANGELL STREET & WATERMAN AVENUE	BUSW-HWM	I	02-Aug-07	SR-28-0176	2
PROVIDENCE	BROWN UNIVERSITY - UTILITY UPGRADE	CUSHING, HOPE STS. & LLOYD AVE.	BUUU-HWM	I	22-Dec-08	SR-28-0179	0.25
PROVIDENCE	BROWN UNIVERSITY AQUATIC & FITNESS CENTER	235 HOPE STREET	BUFA-HWM	I	01-Apr-10	SR-28-1763	4
PROVIDENCE	BROWN UNIVERSITY DYER STREET (FORMER DOWNING CORP)	198-200 DYER STREET	BROD-HWM	I	20-Apr-11	SR-28-0386 A	2.19
PROVIDENCE	BROWN UNIVERSITY FACILITIES MANAGEMENT	295 LLOYD AVENUE	BUFM-HWM	I	21-Mar-03	SR-28-0173	0.56
PROVIDENCE	BROWN UNIVERSITY LIFE SCIENCE	MEETING ST. & OLIVER ST.	BULS-HWM	A	29-May-01	SR-28-0181	8.2
PROVIDENCE	BROWN UNIVERSITY MAIN GREEN	GEORGE STREET	BUMG-HWM	A	11-Sep-01	SR-28-0175	
PROVIDENCE	BROWN UNIVERSITY PERFORMING ARTS CENTER	130-132 ANGELL STREET	BUPA-HWM	A	23-Mar-18	SR-28-1876	0.33
PROVIDENCE	BROWN UNIVERSITY -PETER GREEN HOUSE	118 ANGELL STREET	BUPG-HWM	I	24-Jan-06	SR-28-0180	0.25
PROVIDENCE	BROWN UNIVERSITY SCHOOL OF ENGINEERING (REAR)	170 -182 HOPE STREET	BUSE-HWM	I	28-Apr-15	SR-28-1770	3.8
PROVIDENCE	BROWN UNIVERSITY SHELL GAS STATION	152 ANGELL STREET	BUSH-HWM	I	13-Jan-06	SR-28-0182	0.4
PROVIDENCE	BROWN UNIVERSITY VAULTNO.# 9	89 WATERMAN STREET	BUV9-HWM	I	04-Jan-07	SR-28-0178	
PROVIDENCE	BROWN UNIVERSITY WATSON INSTITUTE	THAYER STREET & CHARLESFIELD STREET	BUWI-HWM	A	08-Feb-00	SR-28-0183	
PROVIDENCE	BROWN UNIVERSITY WATSON NEW CONSTRUCTION	63-65 CHARLESFIELD STREET	BUWI2-HWM	I	21-Feb-17	SR-28-0183 B	0.35
PROVIDENCE	BUSINESS SURPLUS, INC. (COOKSON AMERICA)	204 HARTFORD AVENUE	COOK-HWM	I	17-Apr-18	SR-28-0290	3.13
PROVIDENCE	BUTTON HOLE GOLF COURSE	KING PHILLIP ROAD	BUTT-BRF	I		SR-28-0197 B	
PROVIDENCE	BUTTON HOLE GOLF COURSE	KING PHILLIP ROAD	BUTT-HWM	I	02-Jul-99	SR-28-0197 B	25
PROVIDENCE	CANAL PROPERTIES - LUST SITE (SEE LS-2808)	189 CANAL STREET	CPUST-HWM	A		LS-2808	
PROVIDENCE	CAPCO STEEL - ACORN REALTY INC (PLAT 27, LOT 254)	33-37 ACORN STREET	CAPCO-HWM	A	24-Mar-10	SR-28-0868 A	2.38
PROVIDENCE	CAPCO STEEL 2 - ACORN REALTY INC - Plat 27/Lot 283	45 ACORN STREET	CAPC2-HWM	A	24-Mar-10	SR-28-0868 B	0.4
PROVIDENCE	CAPITAL CENTER PROJECT (SEE PARCEL 9)	WEST EXCHANGE STREET	CAPC-HWM	I		SR-28-0214	
PROVIDENCE	CAPITAL CENTER PROJECT PARCEL 9	FRANCIS STREET & MEMORIAL BLVD.	CAP9-HWM	I	20-Sep-01	SR-28-0214	1.7
PROVIDENCE	CAPITAL CTR PROJ PARCEL 9 (SEE SR-28-0214)	FRANCIS ST & MEMORIAL BLVD.	CAP9-NJD	I	21-May-99	SR-28-0214	
PROVIDENCE	CAPOBIANCO TRUST (VERIZON FACILITY FORMERLY BELL)	288 ALLENS AVENUE	CAPO-HWM	I	13-Apr-09	SR-28-0117	8.38
PROVIDENCE	CAPTAIN JONATHAN A HARWOOD JR. USAR CENTER	385 NIAGARA STREET	CJHU-HWM	I	20-Jul-10	SR-28-0215	2.76
PROVIDENCE	CAR PLAZA (FORMER)	411-425 WEST FOUNTAIN STREET	CAPL-HWM	I	23-Dec-08	SR-28-0216	0.96
PROVIDENCE	CATHEDRAL METAL, INC. (FORMER IMPERIAL PEARL)	25 MANTON AVENUE	CAMI-NJD	I	22-Jan-98	NJD-28-0006	1.47
PROVIDENCE	CENTRAL HIGH SCHOOL - PHYS. ED PROJECT	FRICKER STREET	CHPE-HWM	I	14-May-07	SR-28-0234	
PROVIDENCE	CHILD AND FAMILY SERVICES	1268 EDDY STREET	CAFS-HWM	I	14-Oct-15	SR-28-1786	0.84
PROVIDENCE	CITGO PETROLEUM CORPORATION	25 ERNEST STREET	CITG-HWM	A		SR-28-0259	

Appendix D

APPENDIX D: 2022 303(D) LIST OF IMPAIRED WATERS

Appendix D

Seekonk River

RI0007019E-01 | 1.01 Square Miles | CLASS SB1{A}

Seekonk River from the Slater Mill Dam at Main Street in Pawtucket to India Point in Providence. Pawtucket, Providence and East Providence.

Use Description	Use Attainment Status	Cause/Impairment	TMDL Schedule	TMDL Approval	Comment
Fish and Wildlife habitat	Not Supporting	DISSOLVED OXYGEN	2026	None	Determine need for TMDL post WWTF upgrades.
	Not Supporting	NITROGEN, TOTAL	2026	None	Determine need for TMDL post WWTF upgrades.
Fish Consumption	Insufficient Information				
Primary Contact Recreation	Not Supporting	FECAL COLIFORM	2025	None	Compliance with Consent Agreement for CSO abatement and TMDLs on major tributaries expected to negate need for TMDL.
Secondary Contact Recreation	Not Supporting	FECAL COLIFORM	2025	None	Compliance with Consent Agreement for CSO abatement and TMDLs on major tributaries expected to negate need for TMDL.

Providence River

RI0007020E-01A | 4.73 Square Miles | CLASS SB{A}

Providence River south of a line from a point on shore due east of Naushon Avenue in Warwick to the western terminus of Beach Road in East Providence and north of a line from Conimicut Point in Warwick to Old Tower at Nayatt Point in Barrington. East Providence, Warwick, Barrington

Use Description	Use Attainment Status	Cause/Impairment	TMDL Schedule	TMDL Approval	Comment
Fish and Wildlife habitat	Not Supporting	DISSOLVED OXYGEN	2026	None	Determine need for TMDL post WWTF upgrades.
	Not Supporting	NITROGEN, TOTAL	2026	None	Determine need for TMDL post WWTF upgrades.
Fish Consumption	Insufficient Information				
Primary Contact Recreation	Not Supporting	FECAL COLIFORM	2025	None	Compliance with Consent Agreement for CSO abatement and TMDLs on major tributaries expected to negate need for TMDL.
Secondary Contact Recreation	Not Supporting	FECAL COLIFORM	2025	None	Compliance with Consent Agreement for CSO abatement and TMDLs on major tributaries expected to negate need for TMDL.
Shellfish Controlled Relay and Depur	Fully Supporting				

Narragansett Basin

Providence River

RI0007020E-01B | 3.61 Square Miles | CLASS SB1{A}

Providence River from its confluence with the Moshassuck and Woonasquatucket Rivers in Providence south and south of a line from India Point to Bold Point (across the mouth of the Seekonk River), to a line extending from a point on shore due east of Naushon Avenue in Warwick to the western terminus of Beach Road in East Providence, including Watchemoket Cove. East Providence, Providence, Cranston and Warwick

Use Description	Use Attainment Status	Cause/Impairment	TMDL Schedule	TMDL Approval	Comment
Fish and Wildlife habitat	Not Supporting	DISSOLVED OXYGEN	2026	None	Determine need for TMDL post WWTF upgrades.
	Not Supporting	NITROGEN, TOTAL	2026	None	Determine need for TMDL post WWTF upgrades.
Fish Consumption	Insufficient Information				
Primary Contact Recreation	Not Supporting	FECAL COLIFORM	2025	None	Compliance with Consent Agreement for CSO abatement and TMDLs on major tributaries expected to negate need for TMDL.
Secondary Contact Recreation	Not Supporting	FECAL COLIFORM	2025	None	Compliance with Consent Agreement for CSO abatement and TMDLs on major tributaries expected to negate need for TMDL.

Prince's Pond (Tiffany Pond)

RI0007020E-02 | 0.01 Square Miles | CLASS SA

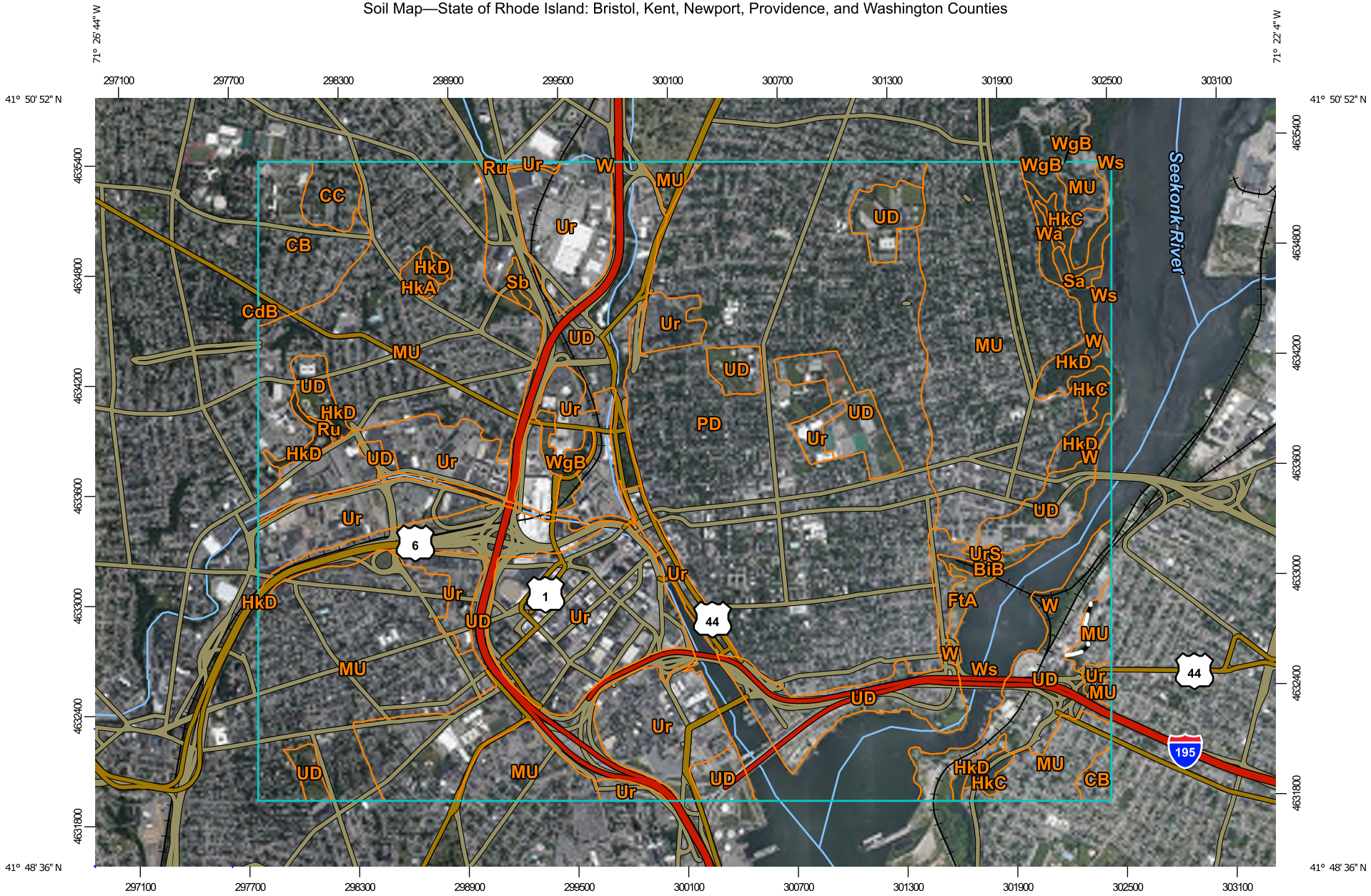
Prince's Pond (Tiffany Pond). Barrington

Use Description	Use Attainment Status	Cause/Impairment	TMDL Schedule	TMDL Approval	Comment
Fish and Wildlife habitat	Not Supporting	DISSOLVED OXYGEN	2028	None	
	Not Supporting	PHOSPHORUS, TOTAL	2028	None	
Fish Consumption	Insufficient Information				
Primary Contact Recreation	Fully Supporting				
Secondary Contact Recreation	Fully Supporting				
Shellfish Consumption	Not Assessed				

APPENDIX E: NRCS WEB SOIL SURVEY MAP

Appendix D

Soil Map—State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Political Features

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 1:12,000.

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: State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties
Survey Area Data: Version 21, Sep 3, 2021

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

Date(s) aerial images were photographed: Jul 3, 2019—Jul 18, 2020

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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BiB	Bigapple sand, 0 to 8 percent slopes	8.6	0.2%
CB	Canton-Urban land complex	92.0	2.3%
CC	Canton-Urban land complex, very rocky	24.6	0.6%
CdB	Canton and Charlton fine sandy loams, 3 to 8 percent slopes	0.4	0.0%
FtA	Fortress sand, 0 to 3 percent slopes	10.0	0.2%
HkA	Hinckley loamy sand, 0 to 3 percent slopes	6.8	0.2%
HkC	Hinckley loamy sand, 8 to 15 percent slopes	38.5	1.0%
HkD	Hinckley loamy sand, 15 to 25 percent slopes	82.2	2.0%
MU	Merrimac-Urban land complex, 0 to 8 percent slopes	1,126.5	27.9%
PD	Paxton-Urban land complex, 3 to 15 percent slopes	889.1	22.0%
Ru	Rippowam fine sandy loam	2.6	0.1%
Sa	Sandyhook mucky fine sand, 0 to 2 percent slopes, very frequently flooded	5.6	0.1%
Sb	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	3.5	0.1%
UD	Udorthents-Urban land complex	771.2	19.1%
Ur	Urban land	691.7	17.2%
UrS	Urban land, 0 to 3 percent slopes, sandy substratum	3.1	0.1%
W	Water	5.3	0.1%
Wa	Walpole sandy loam, 0 to 3 percent slopes	2.0	0.0%
WgB	Windsor loamy sand, 3 to 8 percent slopes	16.4	0.4%
Ws	Water, saline	252.0	6.3%
Totals for Area of Interest		**4,032.3**	**100.0%**

Appendix D

APPENDIX F: FLOOD INSURANCE RATE MAPS

Appendix D

National Flood Hazard Layer FIRMette

FEMA

71°24'54"W 41°48'25"N

71°24'17"W 41°48'58"N

0 250 500 1,000 1,500 2,000 Feet 1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) Zone A, V, A99
- With BFE or Depth Zone AE, AO, AH, VE, AR
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
- Future Conditions 1% Annual Chance Flood Hazard Zone X
- Area with Reduced Flood Risk due to Levee. See Notes. Zone X
- Area with Flood Risk due to Levee Zone D

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard Zone X
- Effective LOMRs
- Area of Undetermined Flood Hazard Zone D

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

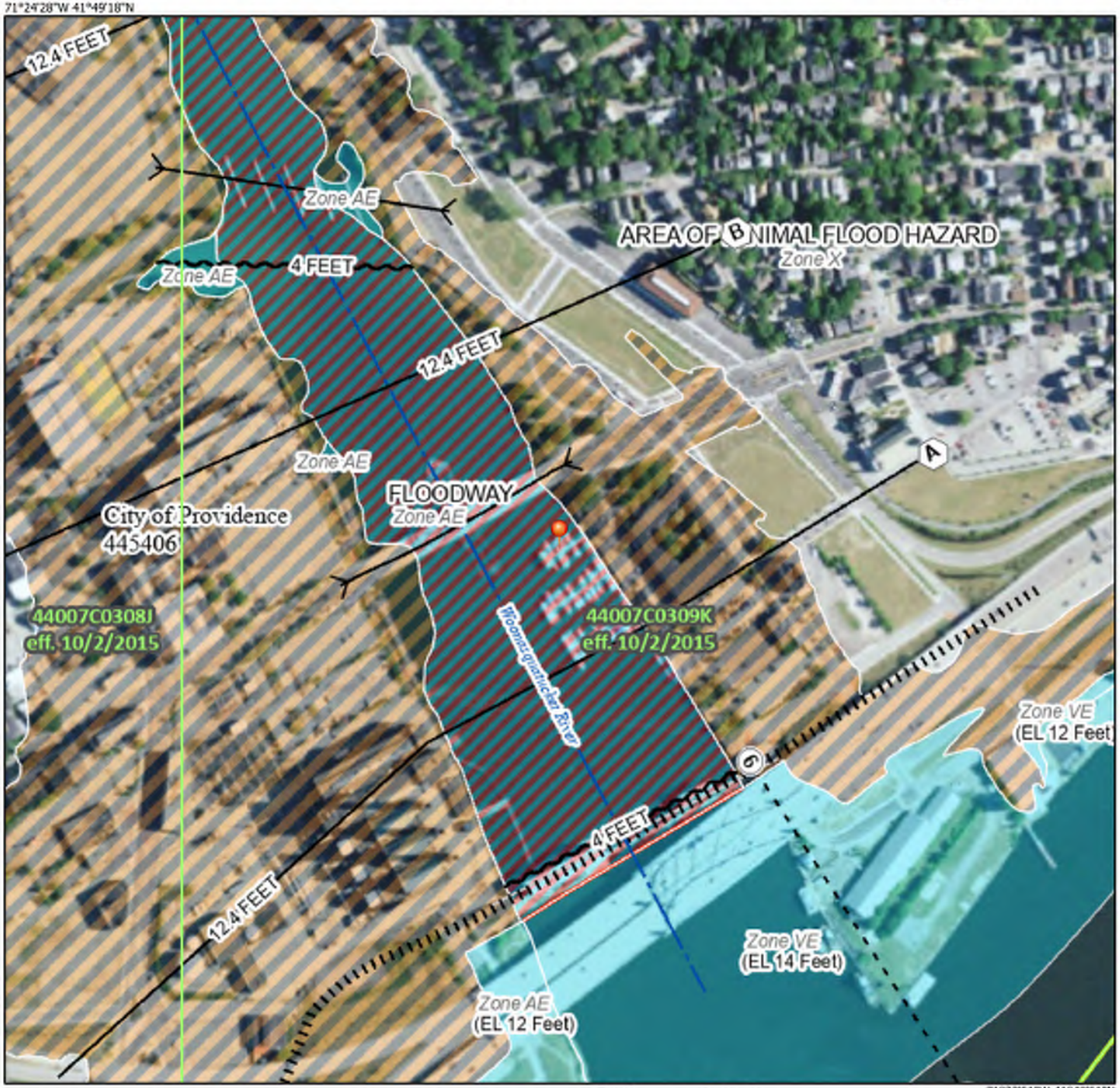
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 8/18/2022 at 3:39 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

National Flood Hazard Layer FIRMette

FEMA

71°24'28"W 41°49'18"N



0 250 500 1,000 1,500 2,000 Feet

1:6,000

71°23'51"W 41°48'51"N

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) Zone A, V, A99
- With BFE or Depth Zone AE, AO, AH, VE, AR
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
- Future Conditions 1% Annual Chance Flood Hazard Zone X
- Area with Reduced Flood Risk due to Levee. See Notes. Zone X
- Area with Flood Risk due to Levee Zone D

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard Zone X
- Effective LOMRs
- Area of Undetermined Flood Hazard Zone D

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 8/18/2022 at 3:46 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

National Flood Hazard Layer FIRMette

FEMA

71°23'39"W 41°49'22"N

71°23'1"W 41°48'56"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 8/18/2022 at 3:50 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Appendix D

APPENDIX G: NITROGEN LOADING CALCULATIONS

Appendix D

Appendix G: Nitrogen Loading Calculations

Total Nitrogen load calculations are based on guidance from RISDISM (Amended March 2015)

Assumptions:

Stormwater pollutant export load (L, in pounds) from the development sites was calculated using Equation 1 in Section H.3.2.

Term	Definition	Value	Reference
L	Pollutant Load (lbs.)	$L = \frac{P * Pj * Rv}{12} * C * A * 2.72$	Eq. 1 in Section H.3.2
P	rainfall depth (inches)	47	Figure H-8, Providence
Pj	rainfall correction factor	0.9	Page H-14
Rv	runoff coefficient expressing the fraction of rainfall converted to runoff	$Rv = 0.05 + 0.009(\%I)$	Eq. 3 in Section H.3.2
%I	the percent of site imperviousness	Variable	
C	flow-weighted mean concentration of the pollutant in urban runoff (mg/L)	2.1	Table H-2: for Total Nitrogen, Commercial use
A	contributing drainage area of development site (acres)	Variable	

$$Total\ Nitrogen\ Load = \frac{47 * 0.9 * Rv}{12} * 2.1 * A * 2.72$$

$$Total\ Nitrogen\ Load = 20.1348 * Rv * A$$

Separate Storm Existing BMPs - Nitrogen Loading

Designation	Location	BMP	Year Constructed	Site Catchment Area (ac)	Pre			BMP					Post			Total Nitrogen Load Summary	
					Impervious Area (ac)	Impervious Area (%)	Nitrogen Load (lbs)	BMP Catchment Area (ac)	Impervious Area (ac)	Impervious Area (%)	Removal Efficiency* (Per Table H-3)	Nitrogen Load (lbs)	Impervious Area (ac)	Impervious Area (%)	Nitrogen Load (lbs)	Net Change in Nitrogen Load (lbs)	% Reduction in Nitrogen
1	85 Waterman St.	Greening	2014	0.38	0.38	100	7.27	NA	NA	NA	NA	NA	0.26	67	5.00	-2.27	31%
2		Water Reuse		0.24	0.24	100	4.58	0.24	0.24	100	100%	-4.58	0.24	100	0.00	-4.58	100%
~~3~~	~~450 Brook St. Parking Lot~~	~~Sand Filter 1 (with 2 Sediment Forebays and Grass Swale)~~	~~2016~~	~~0.75~~	~~0.46~~	~~61~~	~~9.09~~	~~0.70~~	~~0.52~~	~~74~~	~~32%~~	~~-3.24~~	~~0.52~~	~~69~~	~~6.94~~	~~-2.15~~	~~24%~~
~~4~~		~~Sand Filter 2 (with Sediment Forebay)~~															
5	School of Engineering 345 Brook St.	Rain Garden (with Grass Swale)	2016	1.49	0.78	52	15.63	0.06	0.02	33	55%	-0.23	0.96	64	15.54	-0.09	0.6%
6		Sand Filter						0.51	0.51	100	32%	-3.12					
7	Ittleson Quad	Greening	2012	9.39	9.04	96	173.27	NA	NA	NA	NA	NA	7.06	75	137.39	-35.88	21%

NA = Not Applicable

***Notes:**

Pollutant Removal Efficiency for BMPs is obtained from Table H-3 of the RIDISM. Table H-3 is provided on the following page.

Greening only involves a change in impervious area. Therefore, BMP pollutant removal calcuations are not applicable.

For BMP #2, stormwater used in building toilet system, then directed to Combined Sewer. Removal efficiency is assumed to be 100%.

Appendix G: Nitrogen Loading Calculations

Total Nitrogen load calculations are based on guidance from RISDISM (Amended March 2015)

Assumptions:

Stormwater pollutant export load (L, in pounds) from the development sites was calculated using Equation 1 in Section H.3.2.

Term	Definition	Value	Reference
L	Pollutant Load (lbs.)	$L = \frac{P * Pj * Rv}{12} * C * A * 2.72$	Eq. 1 in Section H.3.2
P	rainfall depth (inches)	47	Figure H-8, Providence
Pj	rainfall correction factor	0.9	Page H-14
Rv	runoff coefficient expressing the fraction of rainfall converted to runoff	$Rv = 0.05 + 0.009(\%I)$	Eq. 3 in Section H.3.2
%I	the percent of site imperviousness	Variable	
C	flow-weighted mean concentration of the pollutant in urban runoff (mg/L)	2.1	Table H-2: for Total Nitrogen, Commercial use
A	contributing drainage area of development site (acres)	Variable	

$$Total\ Nitrogen\ Load = \frac{47 * 0.9 * Rv}{12} * 2.1 * A * 2.72$$

$$Total\ Nitrogen\ Load = 20.1348 * Rv * A$$

Separate Storm Existing BMPs - Nitrogen Loading

Designation	Location	Post BMP	Year Constructed	Pre Generated Load				Pre BMP					Post Generated Load				Post BMP					Total Nitrogen Load Summar	
				Site Area	Impervious Area (ac)	Impervious Area (%)	Generated TN Load (lbs)	BMP Catchment Area (ac)	Impervious Area (ac)	Impervious Area (%)	Removal Efficiency	Reduced TN Load (lbs)	Site Area	Impervious Area (ac)	Impervious Area (%)	Generated TN Load (lbs)	BMP Catchment Area (ac)	Impervious Area (ac)	Impervious Area (%)	Removal Efficiency	Reduced TN Load (lbs)	Net Change in Nitrogen	% Reduction in Nitrogen
10	130-132 Angell St. Performing Arts Center	Jellyfish Filter	2021	1.18	0.43	36	8.90	NA	NA	NA	NA	NA	1.64	1.34	114	25.55	0.80	0.74	92	50%	-7.06	+8.90	-100%
		Underground Detention															0.53	0.34	63	5%	-0.68		
11	450 Brook St. Wellness Center	Jellyfish Filter	2021	0.75	0.46	61	9.09	NA	NA	NA	NA	NA	0.82	0.68	83	13.15	0.82	0.68	83	50%	-6.57	-2.52	28%
12	249-250 Brook St. Housing	Enhanced Biofiltration 1	2022	1.94	1.56	81	31.55	0.50	0.47	94	98%	-9.28	2.09	1.58	76	32.07	0.73	0.53	73	58%	-6.29	-1.07	3%
		Enhanced Biofiltration 2	2022														0.47	0.39	84	58%	-4.57		

NA = Not Applicable

***Notes:**

Pollutant Removal Efficiency for BMPs is obtained from the following sources:

Jellyfish Filter: RIDEM Alternative Stormwater Technology Certification (Issued November 23, 2015)

Underground Detention: Table H-3 of the RIDISM

Enhanced Biofiltration: University of New Hampshire Stormwater Center (UNHSC) Performance Curves

Performing Arts Center project has a treatment train with the Jellyfish filter and underground detention. The reduced load from the Jellyfish filter is further reduced by the underground detention.

Wellness Center project: pre generated loads reflect pre-2016 conditions. This site was developed in 2016 with two sand filter systems, and redeveloped in 2021 when the Jellyfish filter replaced the sand filter systems.

Brook St. Housing calculations use a corrected annual rainfall depth of 49 inches

Appendix I: Nitrogen Loading Calculations

Table H-3 Pollutant Removal Efficiency Rating Values for Water Quality BMPs

Water Quality BMPs (those meeting Min. Std 3)		Median Pollutant Removal Efficiency (%)			
		TSS	TP	TN	Bacteria
WVTS	Shallow WVTS	85%[2]	48%[3]	30%[2]	60%[2]
	Gravel WVTS	86%[3]	53%[1]	55%[3]	85%[2]
Infiltration Practices	Infiltration Basin	90%[2]	65%[3]	65%[2]	95%[2]
	Infiltration Trench	90%[2]	65%[3]	65%[2]	95%[2]
	Subsurface Chambers	90%[2]	55%[2]	40%[2]	90%[2]
	Dry Well	90%[2]	55%[2]	40%[2]	90%[2]
	Permeable Paving	90%[1]	40%[1]	40%[2]	95%[2]
Filters	Sand Filter	86%[3]	59%[3]	32%[3]	70%[2]
	Organic Filter	90%[2]	65%[2]	50%[2]	70%[2]
	Bioretention	90%[1]	30%[2]	55%[2]	70%[2]
	Tree Filter	90%[1]	30%[2]	55%[2]	70%[2]
Green Roofs	Extensive	90%[4]	30%[4]	55%[4]	70%[4]
	Intensive	90%[4]	30%[4]	55%[4]	70%[4]
Open Channels	Dry Swale	90%[1]	30%[2]	55%[2]	70%[2,6]
	Wet Swale	85%[3]	48%[3]	30%[2]	60%[2]

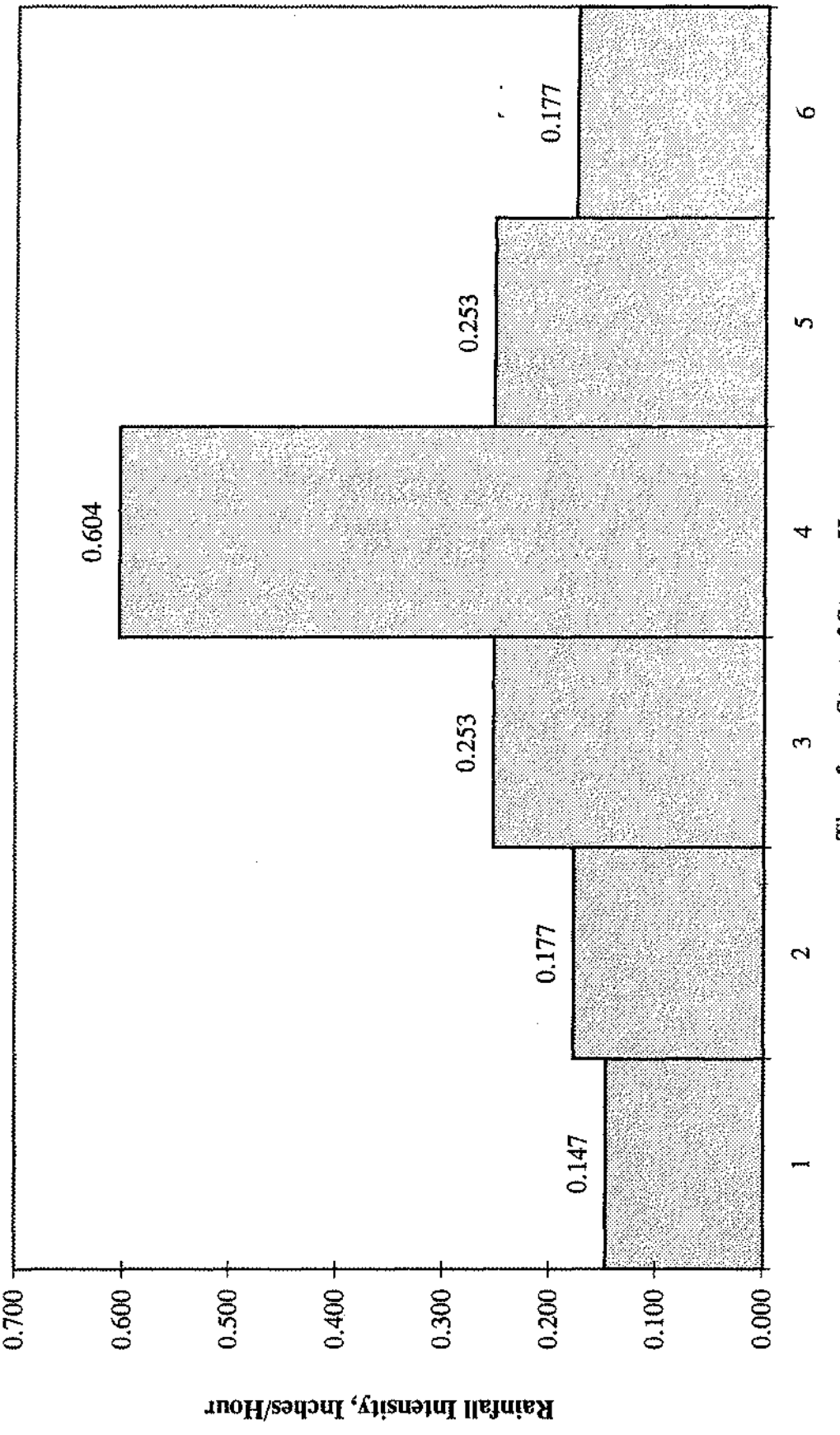
Appendix D

APPENDIX H: NBC 3 MONTH RAIN EVENT HYETOGRAPH

Appendix D

Narragansett Bay Commission

Rainfall Hyetograph for 3 Month, 6 Hour Synthetic Design Storm
Total Rainfall = 1.61 Inches



Appendix D

Appendix D

Woodard & Curran

woodardcurran.com

COMMITMENT & INTEGRITY DRIVE RESULTS

Memorandum

To: Ms. Lichen Grewer, AIA, LEED AP
Director of Planning
Brown University
295 Lloyd Avenue
Providence, RI 02903

Date: June 6, 2023

Project #: 73417.00

From: Robert J. Clinton, PE
Project Manager - Transportation

Re: Athletics' Event Parking Management Plan
Brown University
Providence, Rhode Island

VHB has prepared an assessment of existing parking conditions at the Wendell R. Erickson Athletics Complex during major events and overlapping events and presents an Athletics' Event Parking Management Plan to improve operations. This memorandum includes the following:

- Parking inventory of existing on-street parking spaces and off-street parking spaces (in Brown owned lots)
- Parking occupancy study of on-street and off-street parking spaces during major events and multiple overlapping events to look at peak Saturday demands
- Total parking and transportation demand based on athletics event attendance (provided by the Brown University)

This memorandum also assesses the potential parking impacts/issues associated with the proposed construction of a new indoor practice facility and planned changes to off-street parking facilities. Recommendations to improve conditions during events are also discussed. This memorandum is a separate document from the 2023 Brown University's Institutional Master Plan being prepared for submission to City of Providence Department of Planning and Development.

Erickson Complex

Existing Conditions and Inventory

The Erickson Complex is a 39-acre facility that includes the Katherine Moran Coleman Aquatics Center, the Nelson Fitness Center and the David J. Zucconi '55 Varsity Strength and Conditioning Center along with the George V. Meehan Auditorium, Olney-Margolies Athletic Center (OMAC), Paul Bailey Pizzitola Memorial Sports Center and a number of outdoor playing fields. There are four Brown owned parking lots located within the Erickson Complex with a total of 230 parking spaces. These lots include the following:

- Lot 1 – 57 spaces
- Lot 2 – 26 spaces
- Lot 89 – 25 spaces
- Lot 90 – 122 spaces

Many parking spaces in Lot 89 (25 spaces) are currently occupied by generators and other equipment which limits available parking during events. Lot 90 is occupied by Brown vehicles during the week that are relocated during weekend events to provide spaces for patrons.

Parking Inventory and Occupancy

An inventory of the available on-street parking spaces and off-street parking spaces in Brown University owned lots was performed to determine the total number of parking spaces that currently exist within a 3-minute walk and within a 3 to 8-minute walk from the core of the Erickson Complex. The study area included in this inventory and occupancy counts is shown in Figure 1. It should be noted that there is a stone wall that restricts entry to the complex from the northeast, east, and south. This makes it a longer walk when parking in these directions and less desirable for event parking.

In addition to the 230 parking spaces located within the Erickson Complex discussed in the Existing Conditions section above, there are also an additional 49 spaces located in Lot 11 which is located within the 3-minute walk from the complex. This brings the total number of available spaces in Brown University parking lots within 3 minutes of the complex to a total of 279 off-street parking spaces. There are also 246 on-street parking spaces located within a 3-minute walk of the complex and 1,485 spaces located within a 3 to 8-minute walk.

Observations and parking occupancy counts were performed on three dates to determine the parking occupancy within a 3-minute walk and a 3 to 8-minute walk from the core of the Erickson Complex. These observations were made on Saturdays when there were major events and multiple events overlapping to look at peak Saturday demands. The following is a list of dates, times, and events when the observations/counts were performed:

- 02/25/2023 (10:00 AM – 12:00 PM) – Ivy League Swimming & Diving Championships (11:00 AM) and Women's Lacrosse (12:00 PM)
- 03/18/2023 (1:30 AM – 3:30 PM) – baseball (2:30 PM), tennis (3:00 PM), and men's lacrosse (3:30 PM)
- 04/22/2023 (10:30 AM -12:30 PM) – baseball (11:30 AM), women's water polo (12:00 PM), men's lacrosse (12:00 PM), and women's tennis (1:00 PM)

The following is a summary of our preliminary findings:

During the February events (Saturday 2/25/2023), the parking lots and the on-street parking located within a 3-minute walk were relatively full. Up to 81% of the on-street parking spaces and up to 76% of the parking lots spaces were occupied. It should be noted that the parking lots spaces located within the complex (Lots, 1, 2, 89, and 90) were up to 91% occupied during the peak, while the spaces in Lot 11 were only 12% occupied. The on-street parking spaces located within a 3 to 8-minute walk were up to 33% occupied. The spaces west of the Erickson Complex in the Thayer Street area were more occupied than the east side of the complex, in the Arlington Avenue area. The parking spaces in the Thayer Street area were 48% occupied with more available at the far western limits of the study area. The parking spaces in the Arlington Avenue area were only 23% occupied with the primary concentration of occupied parking located along Weymouth Street and Arlington Avenue. Other parking in this area appeared to be associated with the residential uses along the side streets and the businesses along Elmgrove Avenue. The inventory of parking and occupancy counts during the February events are summarized in **Table 1**.

During the March events (Saturday 3/18/2023), the results were similar; however, the occupancy was slightly higher. This is likely due to the fact that there were more events and total higher attendance (1,137 people vs 613 people),

The parking lots and the on-street parking located within a 3-minute walk were relatively full. Up to 85% of the on-street parking spaces and up to 86% of the parking lots spaces were occupied. Similar to the February observations, Lot 11 was underutilized. The parking lots spaces located within the complex (Lots 1, 2, 89, and 90) were fully occupied during the peak periods, while the spaces in Lot 11 were only 22% occupied. The on-street parking spaces located within a 3 to 8-minute walk were up to 44% occupied. The spaces west of the Erickson Complex in the Thayer Street area were more occupied than the east side of the complex, in the Arlington Avenue area. The parking spaces in the Thayer Street area were 55% occupied with more available at the far western limits of the study area. The parking spaces in the Arlington Avenue area were only 35% occupied with the primary concentration of occupied parking located along Weymouth Street and Arlington Avenue. Other parking in this area appeared to be associated with the residential uses along the side streets and the businesses along Elmgrove Avenue. The inventory of parking and occupancy counts during the March events are summarized in **Table 2**.

During the April events (Saturday 4/22/2023), the results were similar to the March events; however, the occupancy was slightly higher. This is likely due to the fact that there were more events and total higher attendance (1,862 people compared with 1,137 people and 613 people), The parking lots and the on-street parking located within a 3-minute walk were relatively full. The on-street parking spaces were at capacity (99% occupied), with a few cars parked illegally, and up to 79% of the parking lots spaces were occupied. Similar to the February and March observations, Lot 11 was underutilized. The parking lots spaces located within the complex (Lots 1, 2, 89, and 90) were 90% occupied during the peak periods, while the spaces in Lot 11 were only 27% occupied. The on-street parking spaces located within a 3 to 8-minute walk were up to 54% occupied. The spaces west of the Erickson Complex in the Thayer Street area were more occupied than the east side of the complex, in the Arlington Avenue area. The parking spaces in the Thayer Street area were 59% occupied with more available at the far western limits of the study area. The parking spaces in the Arlington Avenue area were only 49% occupied with the primary concentration of occupied parking located along Weymouth Street and Arlington Avenue. Other parking in this area appeared to be associated with the residential uses along the side streets and the businesses along Elmgrove Avenue. The inventory of parking and occupancy counts during the April events are summarized in **Table 3**.

Even during the highest occupancy observed on Saturday 3/18/2023, there were at least 65 available parking spaces located within a 3-minute walk (in lots and on-street spaces) and 695 spaces within a 3 to 8-minute walk of the Erickson Complex. This shows that there is adequate parking within the immediate vicinity of the complex to accommodate peak parking demands for typical weekend athletic events.

Many of the attendees to events at the Erickson Complex are students, faculty, and staff, many of whom walk, bike, or take the bus (RIPTA or Brown shuttle) as they currently do for other events across campus. Approximately 75 percent of undergraduate students live on campus (with a University goal of reaching 80%) and the students who live off campus are primarily within walking distance. Some of the locals arrive early to tailgate while others wait until the last minute to arrive. Both of these groups result in a last-minute surge in pedestrian activity on surrounding streets and through parking lots adjacent to the venues Visiting team fans attending events are often unfamiliar with their parking options. It was noted that many of the visiting team fans arrive early to the events and do not always take the most direct travel routes to get to their destination. It should be noted that major events typically occur on Saturdays or after 5:00 PM when demand for on-street parking are lower. It should also be noted that when there are major

events, such as the Ivy League Swimming an& Diving Championships, Brown Athletics tries not to schedule other major events. Parking demand under future conditions will be comparable to existing conditions and will continue to utilize available on-street parking and parking lots. VHB understands Brown University will continue to monitor and adjust its traffic management plan to accommodate overlapping events and anticipated major/full house events.

The available on-street and off-street parking inventory and observations during the two days of observations are summarized in **Tables 1, 2, and 3**.

Table 1 Brown Parking Occupancy Study - Saturday (2/25/23)

3-Minute Walk	Time	On-Street Parking	On-Street % Occupied	Parking Lots[1]	Lots[1] % Occupied	Total	Total % Occupied
Vehicle Capacity		**267**		**279**		**546**	
Observed Occupancy	10:00 AM	161	60%	177	63%	338	62%
	10:30 AM	195	73%	198	71%	393	72%
	11:00 AM	202	76%	208	75%	410	75%
	11:30 AM	207	81%	212	76%	429	79%
3 to 8 Minute Walk	**Time**	**On-Street Parking Thayer St Area**	**On-Street % Occupied**	**On-Street Parking Arlington Ave. Area**	**% Occupied**	**Total**	**Total % Occupied**
Vehicle Capacity		679		819		**1498**	
Observed Occupancy	10:00 AM	289	43%	162	20%	451	30%
	10:30 AM	308	45%	189	23%	497	33%
	11:00 AM	318	47%	168	21%	486	32%
	11:30 AM	329	48%	161	20%	490	33%

1 Brown University owned parking lots (Lot Nos. 1, 2, 11, 89, 90)

Table 2 Brown Parking Occupancy Study - Saturday (3/18/23)

3-Minute Walk	Time	On-Street Parking	On-Street % Occupied	Parking Lots[1]	Lots[1] % Occupied	Total	Total % Occupied
Vehicle Capacity		267		279		546	

Observed Occupancy	10:00 AM	226	85%	231	83%	457	84%
	10:30 AM	224	84%	222	80%	446	82%
	11:00 AM	220	82%	230	82%	450	82%
	11:30 AM	216	81%	241	86%	457	84%
3 to 8 Minute Walk	**Time**	**On-Street Parking Thayer St Area**	**On-Street % Occupied**	**On-Street Parking Arlington Ave. Area**	**% Occupied**	**Total**	**Total % Occupied**
Vehicle Capacity		**679**		819		**1498**	
Observed Occupancy	10:00 AM	371	54%	281	34%	652	44%
	10:30 AM	368	54%	290	35%	658	44%
	11:00 AM	370	54%	284	35%	654	44%
	11:30 AM	367	54%	270	33%	637	43%

1 Brown University owned parking lots (Lot Nos. 1, 2, 11, 89, 90)

Table 3 Brown Parking Occupancy Study - Saturday (4/22/23)

3-Minute Walk	Time	On-Street Parking	On-Street % Occupied	Parking Lots[1]	Lots[1] % Occupied	Total	Total % Occupied
Vehicle Capacity		**267**		**279**		**546**	
Observed Occupancy	10:30 AM	225	84%	187	67%	412	75%
	11:00 AM	261	98%	197	71%	458	84%
	11:30 AM	264	99%	215	77%	479	88%
	12:00 AM	261	98%	220	79%	481	88%
3 to 8 Minute Walk	**Time**	**On-Street Parking Thayer St Area**	**On-Street % Occupied**	**On-Street Parking Arlington Ave. Area**	**% Occupied**	**Total**	**Total % Occupied**
Vehicle Capacity		**679**		**819**		**1485**	
Observed Occupancy	10:30 AM	325	48%	256	31%	581	39%
	11:00 AM	364	54%	321	39%	685	46%
	11:30 AM	387	57%	379	46%	766	51%
	12:00 AM	399	59%	404	49%	803	54%

1 Brown University owned parking lots (Lot Nos. 1, 2, 11, 89, 90)

Observed Attendance

VHB obtained the recorded attendance at each event from the Brown Athletic Department. The following is a summary of the attendance at each of the events:

Saturday 02/25/2023:

Events	Attendance
Ivy League Swimming & Diving Championships	440
Women's Lacrosse	173
Total	613

Saturday 03/18/2023:

Event	Attendance
Baseball	241
Tennis	50
Men's Lacrosse	846
Total	1,137

Saturday 04/22/2023

Event	Attendance
Baseball	155
Women's Water Polo	300
Men's Lacrosse	1,357
Women's Tennis	50
Total	1,862

Based on attendance at the events provided by Brown University Athletics Department, there were a total of 613 patrons at the February events, 1,137 patrons at the March events and 1,862 patrons at the March events.

As stated previously, many of the attendees to events at the Erickson Complex are students, faculty, and staff, many of whom walk, bike, or take the bus (RIPTA or Brown shuttle) as they currently do for other events across campus. Non- campus patrons attending events typically represent between 60% and 80% of the total patrons. Eighty percent (80%) of the non-campus patrons arrive by car with an average occupancy of 3 passengers per vehicle.

Based on a worst-case scenario assuming all 80% of non-campus patrons arrive by car and only 2.5 passengers per vehicle, there would be a maximum parking demand of 596 parking spaces for the highest day observed (Saturday, April 22, 2023. There are a total of 546 parking spaces within a 3-minute walk (279 parking lot spaces and 267 on-street spaces). There are also 1,498 on-street spaces within a 3 to 8-minute walk. As noted during the observations, the on-street parking spaces within a 3-minute walk from the complex were relatively full (98% occupied); however, there were some spaces (65 spaces) available in the parking lots within a 3-minute walk (mainly due to the underutilization of Lot 11). This would indicate that there is adequate parking within a 3-minute walk to accommodate peak demand.

Traffic and Parking Impacts of Proposed Project

The new indoor turf practice field is not projected to result in any new demand for parking. In order to provide more spectator / event parking at Lots 89 and 90, Brown service vehicles will be temporarily relocated to the area east of 295 Lloyd on game and event days. It should be noted that there are available spaces in the underutilized parking Lot 11.

Event Management

Brown University has prepared this Athletics' Event Management Plan for the Erickson Complex. The Plan will include additional shuttles, as needed for major events. On rare occasions, locations where security details may be necessary to assist pedestrians and potential on-street parking restrictions may be necessary to accommodate any drop-off or pick-up activity that may occur.

The proposed new indoor practice facility is anticipated to generate little to no demand for new parking, given the fact that the facility is proposed as be a practice facility only.

Many attendees to events at the Erickson Complex are students, faculty, and staff, many of whom are anticipated to walk, bike, or take the bus (RIPTA or Brown shuttle) as they currently do for other events across campus. Approximately 75 percent of undergraduate students live on campus (with a University goal of reaching 80%) and the students who live off campus are primarily within walking distance. Brown University continues to implement measures to reach their on-campus goal, which will result in a reduction of traffic and parking at events.

The following is a list of potential improvements that could be implemented to improve traffic and parking conditions during events and non-events:

- The existing on-street parking signage is old and not clearly delineated. The City should reevaluate their parking policy and install new signs to clearly delineate where and when parking is allowed. The University could contribute to the implementation of improved signage.
- Improve striping along adjacent streets surrounding the sports complex. Consider striping parking lanes. The University could consider contributing to restriping roadways immediately adjacent to the Erickson Complex.
- Consider improved signage and event attendee awareness of available off-street parking (particularly in the underutilized Lot 11). Brown University could also install wayfinding signage which would require City of Providence approvals.

- Install speed lumps, speed feedback signs, enhanced crosswalks (RRFBs, lighting, etc.) to reduce speeds in critical locations. This may likely require review with neighbors on the affected streets prior to any implementation.
- Shuttle ridership to events is minimal because there is available parking within the 3- and 8-minute walking radius from the event venues. The University has tried increasing the number of shuttles during large events but has not seen a significant number of patrons using the additional shuttles provided. The University will continue to provide these services and market them more robustly.
- Increase off-street parking by using Lot 172 at 172 Cushing Street (35 Spaces) for athletic events.
- Increase off-street parking by working with Moses Brown, Wheeler School, and others in the vicinity of the complex.
- Many pedestrians currently walk through parking lots to access the various fields. Consider creating a new, separate pedestrian access route in order to reduce the pedestrian/vehicle conflicts.