PUBLIC NOTICE

The Boston Redevelopment Authority ("BRA"), pursuant to Article 80D-2 of the Boston Zoning Code ("Code"), hereby gives notice that an Institutional Master Plan ("IMP") was received by the BRA on October 10, 2002 for the Harvard University Longwood Campus. Harvard University is seeking an Adequacy Determination for its Institutional Master Plan pursuant to Article 80D-5.4 of the Code. The IMP for Harvard University's Longwood Campus establishes Harvard's long-range goals for the campus, setting forth Harvard's plans to construct one new 53,000-square-foot building, undertake four smaller additions to existing structures, and conduct several campus improvement projects during the term of the IMP, 2003 - 2007. The building projects are required to reduce overcrowding in existing Harvard Medical School (HMS) facilities and to meet the immediate need for state-of-the-art research space for the HSDM.

The IMP may be viewed at the following locations: **Office of the Secretary of the BRA**, Boston City Hall (Monday through Friday, 9am to 5pm); **MASCO**, 375 Longwood Avenue, 5th Floor (Monday through Friday, 9am to 5pm); **Boston Public Library, Copley Branch**, Government Documents Department (Monday through Thursday, 9am to 9pm; Friday and Saturday, 9am to 5pm); **Boston Public Library, Mission Hill Branch**, 1497 Tremont Street (Monday through Wednesday, 10am to 6pm; Thursday, 12pm to 8pm; Friday 9am to 5pm; and Saturday 10am to 2pm); and, **Emmanuel College, Cardinal Cushing Library**, 400 The Fenway (Monday and Tuesday, 8am to 6pm; Wednesday and Thursday, 8am to 9pm; Friday 8am to 5pm; and, Saturday, 9am to 5pm), except legal holidays. Public comments on the IMP, including the comments of public agencies, should be submitted in writing to Owen Donnelly, Deputy Director for Institutional Development, BRA, Room 921, Boston City Hall, Boston, MA 02201 within 60 days of this notice.

BOSTON REDEVELOPMENT AUTHORITY
Harry Collings, Executive Director / Secretary

Harvard University Longwood Campus

Institutional Master Plan

Submitted to:

BOSTON REDEVELOPMENT AUTHORITY

Submitted by:

HARVARD UNIVERSITY

Prepared by:

EPSILON ASSOCIATES, INC.

In association with:

ROTHMAN PARTNERS, INC.
VANASSE HANGEN BRUSTLIN, INC.

FEBRUARY 2003

Harvard University Longwood Campus

Institutional Master Plan

Submitted to:

BOSTON REDEVELOPMENT AUTHORITY
One City Hall Square
BOSTON, MA 02201

Submitted by:

HARVARD UNIVERSITY
Harvard Medical School
25 Shattuck Street
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VANASSE HANGEN BRUSTLIN, INC.

FEBRUARY 2003

PREFACE

This Institutional Master Plan for the Harvard University Longwood Campus has been prepared pursuant to Article 80 of the Boston Zoning Code and reflects consistency with *The Longwood Medical and Academic Area Interim Guidelines* adopted by the Boston Redevelopment Authority on February 6, 2003.

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1.0 Introduction/Mission & Goals

1.0 Introduction/Mission and Goals

1.1 Introduction

This Institutional Master Plan (IMP) for Harvard University's Longwood Campus has been prepared pursuant to Article 80 of the Boston Zoning Code and the Boston Redevelopment Authority (BRA) Scoping Determination dated May 3, 2002 issued in response to the Institutional Master Plan Notification Form (IMPNF) submitted by Harvard University in March 2002. The Scoping Determination is included as Appendix A.

Harvard University's existing facilities and proposed plans for the Longwood Campus are presented in this document, accompanied by the long-range master planning and urban design objectives that will inform future development on the campus. The IMP presents four modest building additions that will allow existing uses to expand and one new building that will allow a limited expansion by the Harvard School of Dental Medicine. In addition to the development projects, Harvard is proposing several campus improvement projects, including improvements to the pedestrian network and connections to the surrounding community, also described in the IMP. The IMP includes the following sections:

- 1.0 Introduction/Mission and Goals;
- 2.0 Existing Campus and Facilities;
- 3.0 Program Needs and Master Planning/Urban Design Objectives;
- 4.0 Proposed IMP Projects;
- 5.0 Transportation Access Plan;
- 6.0 Infrastructure; and
- 7.0 Community Benefits.

Section 1.0, Introduction/Mission and Goals, summarizes the IMP, briefly describes the campus and surroundings, presents the mission and goals of the Harvard University schools that occupy the Longwood Campus, describes coordination with the local community, and establishes the term of the IMP.

1.2 Institutional Master Plan Summary

The IMP for Harvard University's Longwood Campus establishes Harvard's long-range goals for the campus, setting forth Harvard's plans to construct one new 53,000-square-foot building, undertake four smaller additions to existing structures, and conduct several campus improvement projects during the term of the IMP, 2003 - 2007.

The building projects are required to reduce overcrowding in existing Harvard Medical School (HMS) facilities and to meet the immediate need for state-of-the-art research space for the HSDM. No new parking is proposed as part of any of the projects.

The projects described in the IMP include new construction of approximately 80,500 – 87,500 gross square feet (sf). In addition, demolition of one structure, containing approximately 11,050 sf, is proposed. Therefore, the net new space created would be approximately 69,450 – 76,450 sf. Most of the proposed new space is intended to house biomedical research use and related teaching and administrative functions; some research space for new research uses is proposed (16,000 sf). The projects will be constructed over the five-year timeframe of the IMP. Table 1-1 provides a summary of the proposed building projects.

The proposed additional research space will allow Harvard University to continue its ongoing, cutting-edge research initiatives that would otherwise be limited by overcrowded and outdated facilities.

Several campus improvements projects to improve the pedestrian network within the campus and to improve connections to the surrounding community are also proposed.

Table 1-1: Proposed Building Projects

Site No.	New Construction	Size (sf)	Height	
			stories	feet
Site 1	HSDM Research and Education Building*	53,000	5	75
	Additions			
Site 2	Goldenson Magnet Unit Addition	3,500 – 4,500	(below grade)	n/a
Site 3	Armenise Addition	8,000 – 10,000	2 – 3	30 – 55
Site 4	Goldenson Addition	8,000 – 10,000	2 – 3	30 – 55
Site 5	Building C Addition	8,000 – 10,000	2 – 3	30 – 55
	Total	80,500 – 87,500		

* Demolition of the existing Dental School Interim Building with approximately 11,050 sf will be required.

1.3 Campus Location and Surroundings

The Harvard University Longwood Campus is located within the Longwood Medical and Academic Area (LMA) of Boston, also known as the Longwood Institutional Area pursuant to Article 80, Appendix A, of the Boston Zoning Code. The LMA is a 210-acre area formed by the Riverway, Fenway, and Huntington Avenue containing one of the premier medical, research, and academic communities in the world.

The Harvard University Longwood Campus consists of five parcels of land (see Figure 1-1) containing approximately 21 acres and 26 buildings housing the Harvard Medical School (HMS), Harvard School of Dental Medicine (HSDM), and Harvard School of Public Health (HSPH).

In addition to the three Harvard University graduate and professional schools, the following academic and medical institutions are located within the LMA: Beth Israel Deaconess Medical Center, Brigham and Women's Hospital, Center for Blood Research, Children's Hospital, Dana Farber Cancer Institute, Emmanuel College, Joslin Diabetes Center, Judge Baker Children's Center, Massachusetts College of Art, Massachusetts College of Pharmacy and Health Sciences, Massachusetts Mental Health Center, Simmons College, Temple Israel, Wentworth Institute of Technology, Wheelock College, and The Winsor School.

1.4 Mission Statement and Objectives

Harvard College opened in Cambridge, Massachusetts, in 1636 with an enrollment of 12 students and one Master to teach all subjects. Its mission was to educate the religious and intellectual leaders of the newly settled New England colonies. Expanding its size and extending its geographical boundaries during the 19th century, the College added graduate and professional schools, which now number ten. Today, Harvard is one of the world's outstanding universities with a total graduate and undergraduate enrollment of approximately 18,500 degree candidates. Its mission, however, has remained essentially the same though considerably broadened in scope: "to educate the leaders of our complex international society."

Harvard University's enrollment includes 6,600 undergraduates and 11,900 graduate students. An additional 13,000 students from communities throughout New England are enrolled in one or more courses in the Harvard Extension School. Harvard has approximately 2,000 faculty and 12,000 staff who work in Cambridge and Boston; in addition, Harvard has approximately 8,666 faculty members at its affiliated hospitals.

The Harvard medical community is a complex group of schools, hospitals and research institutions in which the Harvard University Faculty of Medicine conduct research, educate future physicians and scientists, and provide state-of-the-art patient care. The Harvard Faculty of Medicine work at the 1906 marble quadrangle along Longwood Avenue that houses the administration of Harvard Medical School, six basic science departments, and two social science and policy departments. Members of the faculty also work at the HSDM and HSPH and in an additional 42 clinical departments based at the 17 affiliated hospitals and research institutions that are connected through the charter of the Harvard Medical Center.

The following comprise the Harvard-affiliated hospitals and research institutions: Beth Israel Deaconess Medical Center, Boston Veteran's Administration Medical Center, Brigham and Women's Hospital, Cambridge Hospital, Center for Blood Research, Children's Hospital, Dana-Farber Cancer Institute, Joslin Diabetes Center, Judge Baker Children's Center, McLean Hospital, Massachusetts Eye and Ear Infirmary, Massachusetts General Hospital, Massachusetts Mental Health Center, Mount Auburn Hospital, Schepens Eye Research Institute, and Spaulding Rehabilitation Hospital.

These research institutions are now linked through two large health care systems Partners and CareGroup, and all come together for the academic missions of teaching and research. This wide-ranging faculty produces an incredible depth and breadth in its ability to conduct cutting-edge research and to create innovations in medical education, with basic and clinical research and education occurring at most sites.

By far the largest generator of research funding in the Boston area, the three Harvard Longwood Campus schools – HMS, HSDM and HSPH – together with Harvard's affiliated hospitals attracted more than $760 million in federal research and development funding in 2001.

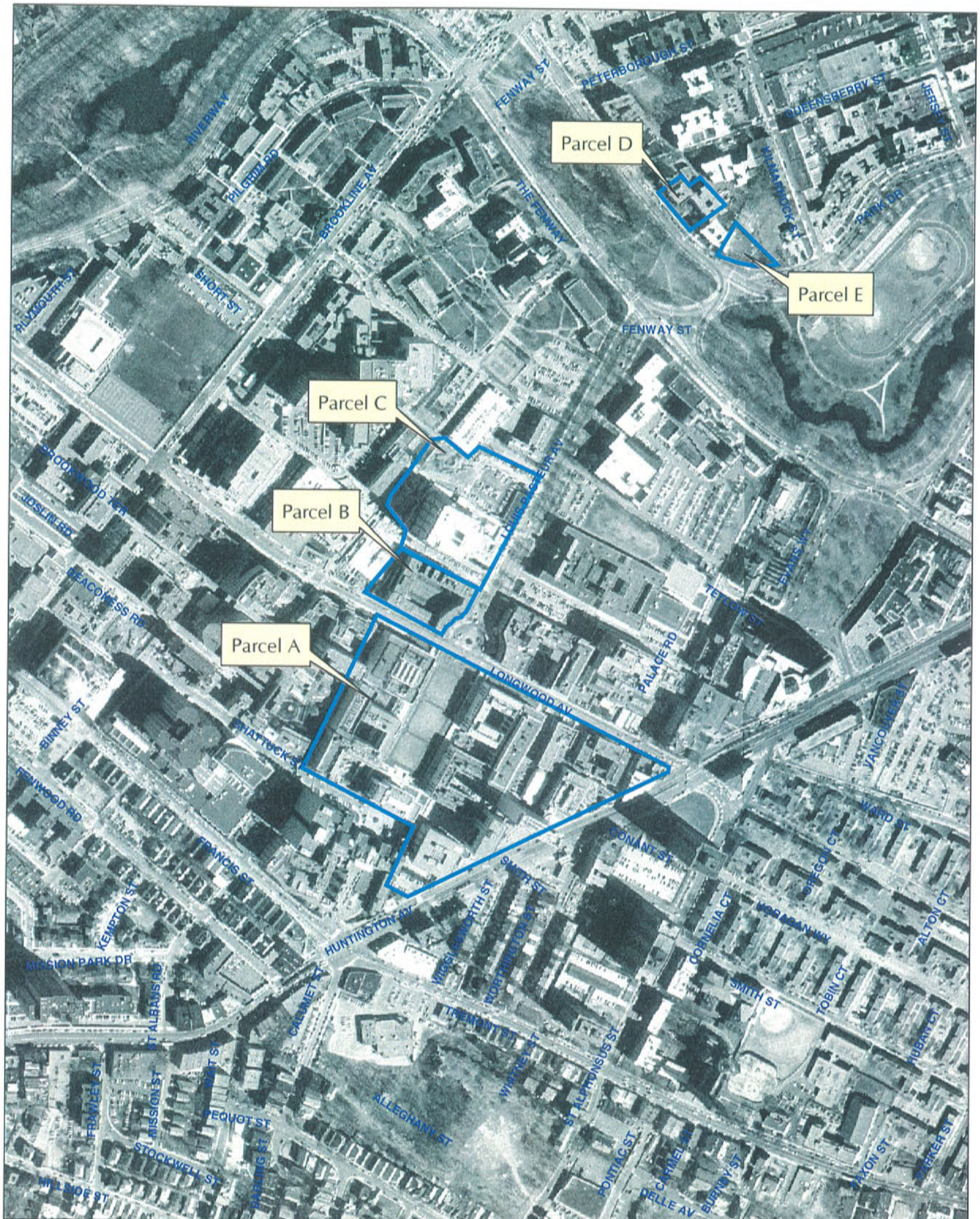
1.4.1 Harvard Medical School

HMS was founded in 1782 and for over two centuries has been a leader in the effort to understand life, to cure and prevent disease, and to reduce the burden of human suffering. The mission of HMS is:

> *To create and nurture a community of the best people committed to leadership in alleviating human suffering caused by disease.*

HMS has been a leader in collaborative research, including work in gene therapy, cancer treatments, and other biomedical areas that has had a transformative effect on health care treatment and outcomes worldwide. Through its collaborative work with affiliated organizations and institutions, HMS has generated substantial grant funding for biomedical research. In 2002 alone, HMS generated a total of $207 million in research and training funds.

HMS has been located at the Harvard University Longwood Campus since 1906. The school currently offers MD, PhD, and Joint MD-PhD programs.



Scale 1:6000
1 inch = 500 Feet

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Figure 1-1
Campus Location

Source: MassGIS Orthophotos 1995

Harvard University Longwood Campus
Institutional Master Plan

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HMS currently has 8,739 faculty members, including those based at affiliated teaching hospitals, 310 of which are based in the Harvard Longwood Campus. In addition to the faculty employed by Harvard, HMS currently employs 1,668 full-time equivalent staff and has 777 students (Fall 2001 statistics). Additional information on HMS student, faculty, and staff population is presented in Section 3.2 of this IMP.

1.4.2 Harvard School of Dental Medicine

The first university-based dental school in the country, Harvard Dental School was founded in 1867. It was also the first to be established in close affiliation with a medical school – HMS – and to make the full scholarly and scientific resources of a university available as part of a dental education program.

In 1940, the school was reorganized as the Harvard School of Dental Medicine to place stronger emphasis on the biological basis of oral medicine and to institute multidisciplinary programs of dental research. A pioneering feature of HSDM's curriculum placed dental students in joint classes with medical students for two years of basic science and pathophysiology and for an introduction to clinical medicine on the wards of Harvard teaching hospitals and in community health centers.

In addition to its Doctor of Medical Dentistry (DMD) program, HSDM has several postdoctoral programs, including a four-year Doctor of Medical Sciences in Oral Biology program; a five- and six-year Oral and Maxillofacial Surgery/MD/General Surgery program; and a group of three- and four-year, joint-degree programs combining advanced clinical training and research in health-care systems, health policy, or biomedical sciences. HSDM graduates include practitioners as well as researchers and academicians.

At HSDM, an enormous effort has been focused on expanding HSDM's strategic research plan. Last year, the HSDM received nearly $4 million in research funding, comprising 26 percent of its total budget.

Including faculty based in Harvard's affiliated teaching hospitals, HSDM has 347 faculty members, 110 of which are located on the Harvard Longwood Campus. In addition to the faculty employed by Harvard, HSDM employs 113 full-time equivalent staff and has 244 students (Fall 2001 statistics). Additional information on HSDM student, faculty, and staff population is presented in Section 3.2.

1.4.3 Harvard School of Public Health

Founded in 1922, the Harvard School of Public Health grew out of the Harvard-MIT School for Health Officers, the nation's first graduate training program in public health. Early pioneers at the school included Alice Hamilton, who demonstrated the health effects of lead and other toxins; Philip Drinker, whose iron lung sustained the lives of many people stricken with paralytic polio; Thomas Weller, whose Nobel Prize-winning research paved the way for the development of polio vaccines; and Bernard Lown, co-fonder of the Nobel Prize-winning organization International Physicians for the Prevention of Nuclear War.

The mission of HSPH is to advance the public's health through learning, discovery, and communication. In support of the school's mission, HSPH's goals are as follows:

- To provide the highest level of education for public health scientists, practitioners, and leaders;
- to foster new discoveries leading to the improved health of the nation's and world's populations;
- to inform policy debate, disseminate important health information, and increase awareness of public health; and,
- to strengthen health capacities and services for communities.

In their common aim to enhance health in human populations, all of the school's programs, whether their primary emphasis is education, research, or communication, reflect an ethos of service. This service component may be immediate and obvious, such as the direct involvement of those affiliated with the Division of Public Health Practice in the activities of the Mission Hill community, or more remote and indirect as in molecular research geared toward identifying the mechanism for preventing a particular disease. HSPH generates significant research funding each year. In 2000, direct and indirect research and training funds totaled approximately $108 million.

HSPH offers graduate degrees in public health, occupational health, and science. Students can obtain a Master of Science (SM), Master of Public Health (MPH), Doctor of Science (SD), or Doctor of Public Health (DPH).

HSPH currently has 202 faculty members, 921 full-time equivalent staff, and 808 students (Fall 2001 statistics). See Section 3.2 for additional information on HSPH student, faculty, and staff population.

1.5 Coordination with Abutters and Other Interested Parties

Harvard University has established a close relationship with its institutional neighbors and surrounding Boston communities and participates actively in the Medical Academic and Scientific Community Organization, Inc. (MASCO). To ensure that the University addresses the concerns of the community, Harvard has met with the LMA Forum and with the Impact Advisory Group appointed by the Mayor of Boston in the process of developing this IMP. Harvard has presented the IMP at the following meetings:

LMA Forum: March 25, 2002

IAG Meeting: April 9, 2002

Harvard will continue to meet with these groups, city and state agencies, as well as other interested parties as development projects proceed. Harvard is committed to maintaining its positive relationship with its neighbors and improving its campus in ways that are beneficial to Harvard and the city.

1.6 Term of the Institutional Master Plan

In accordance with the BRA Scoping Determination, the term of this IMP is limited to five years. Upon approval of the IMP by the Zoning Commission, the zoning of the Harvard University Longwood Campus will reflect the density and uses set forth in this IMP. The zoning will remain in effect for five years, at which time the IMP may be renewed.

2.0 Existing Campus & Facilities

2.0 Existing Campus and Facilities

2.1 Introduction

This section describes the existing Harvard University Longwood Campus and its facilities, including space leased by Harvard for the HMS, HSDM, and HSPH. Also described in this section are existing historic resources, both on the campus and within the campus vicinity, and existing student housing for HMS, HSDM, and HSPH students.

2.2 Harvard University Longwood Campus

2.2.1 Parcel Descriptions

Harvard University's Longwood Campus encompasses five parcels of land, described below and depicted on Figure 2-1, Campus and Facilities. Three of the parcels – A, B, and C – are located proximate to each other and comprise the main campus. The remaining two parcels – D and E – are located approximately 0.4 miles to the north of the main campus.

Parcel "A" contains approximately 14.4 acres and is bounded generally by Huntington Avenue, Longwood Avenue, property of Children's Hospital, and Shattuck Street. Parcel A contains 20 buildings with an aggregate gross floor area of 1,549,158 sf, that house HMS, HSDM, and HSPH.

Parcel "B" is the land occupied by Vanderbilt Hall at 107 Avenue Louis Pasteur, a 321-unit dormitory that houses HMS and HSDM students. Parcel B contains approximately 1.5 acres.

Parcel "C" contains approximately 4.1 acres and is bounded by Vanderbilt Hall, Avenue Louis Pasteur, land of Emmanuel College, and Blackfan Circle, a private way. Parcel C is occupied by the Harvard Institutes of Medicine, an approximately 239,180-square-foot building, and the New Research Building, an approximately 430,000-square-foot building currently under construction and expected to be completed in 2003.

Parcel "D" is a 0.6-acre parcel housing the Henry Lee Shattuck International House, a three-building complex located at 199, 203 and 207 Park Drive. The Shattuck House is a 70-apartment complex for graduate students at HSPH.

Parcel "E" is a 0.4-acre parcel of vacant land located along the northerly side of Park Drive across the street from the Fenway and approximately 100 yards southeast of Parcel D.

2.2.2 Land Use and Open Space

Existing land use and open space within the main portion of the Harvard University Longwood Campus (*i.e.*, Parcels A, B, and C) are shown on Figure 2-2, Existing Conditions.

Currently, the total area of the main campus, including Parcels A, B, and C, is approximately 867,200 sf. Of this total, about 225,000 sf are devoted to open space (26 percent) – either as pedestrian paths and plazas, or green space. The remainder of the main campus is devoted to building area and vehicular circulation and/or parking. Buildings on the campus are used principally for teaching, research, laboratory, and administrative use, as described in more detail in Section 2.3, below.

The traditional center of the campus is the Harvard Medical School Quadrangle, created by five white marble buildings built between 1903 and 1908 in the Classical Revival style. The buildings form a U-shaped plan around the monumentally-scaled, landscaped quadrangle. The buildings, which are connected to one another by a raised marble terrace, were designed by Shepley, Rutan and Coolidge who designed many of the buildings in the surrounding LMA.

The quadrangle is the major exterior gathering space within the campus, although smaller plaza spaces such as the Countway Plaza (see Figure 2-2) also draw significant numbers of visitors during the day.

2.2.3 Pedestrian and Vehicular Circulation

Existing pedestrian networks and vehicular circulation within the Longwood Campus are described in detail in Section 3.0, Program Needs and Master Planning/Urban Design Objectives, and Section 5.0, Transportation Access Plan. Existing pedestrian circulation routes are specifically identified in Figure 5-8, Primary Pedestrian Circulation Routes.

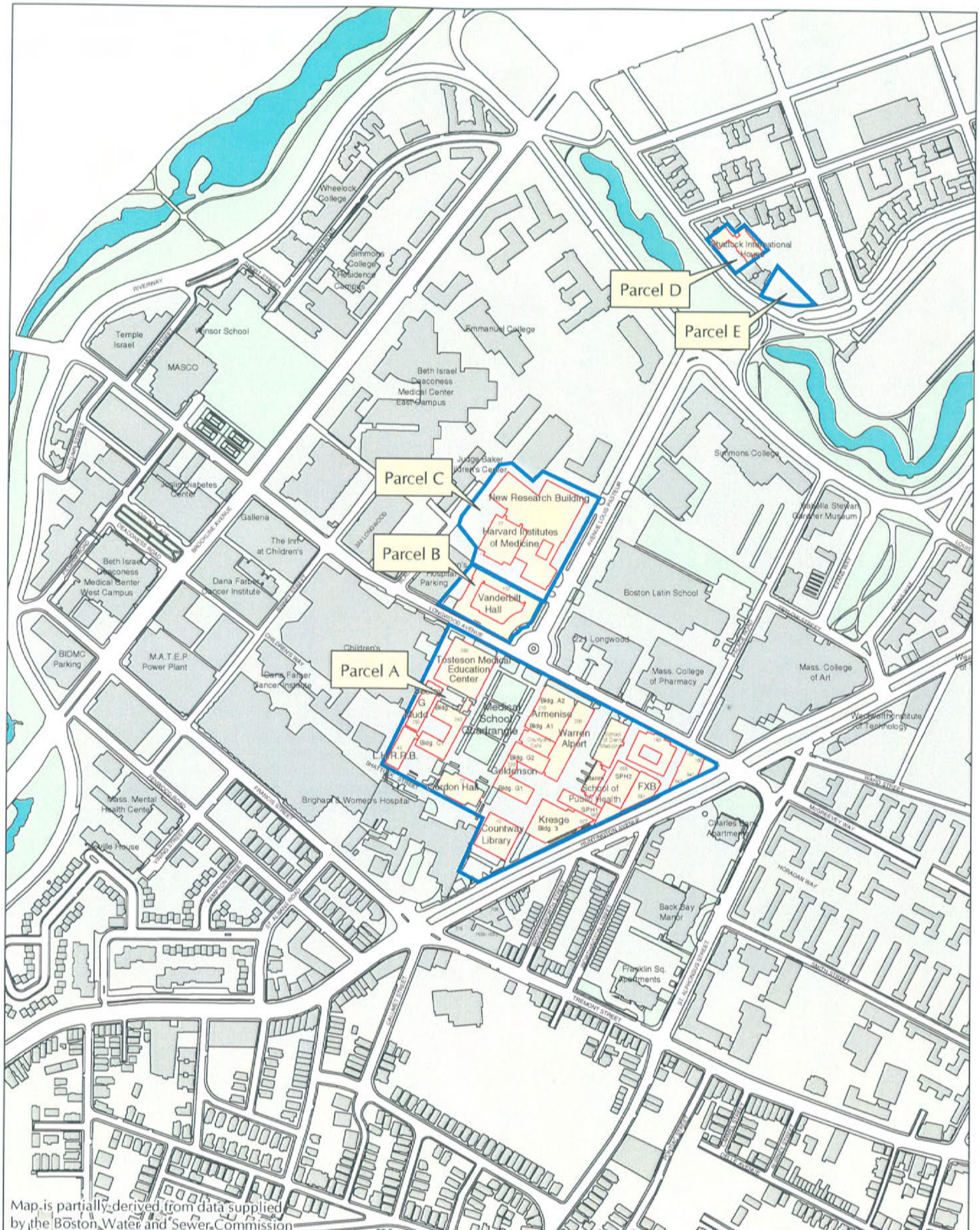
2.3 Harvard University Longwood Campus Facilities

2.3.1 Facilities

Altogether, the Harvard Longwood Campus comprises 20.8 acres and contains approximately 2.4 million sf of floor area in 26 buildings. Buildings and the current uses in those buildings on each of the parcels are listed in Table 2-1. Parcel E is vacant and therefore not included in Table 2-1.

2.3.2 Places of Assembly

Places of assembly that accommodate over 50 people are located in several Harvard buildings on the Longwood Campus, as shown below in Table 2-2.



Scale 1:6000
1 inch = 500 Feet

0 250 500 1,000 Feet

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Figure 2-1
Campus and Facilities

Harvard University Longwood Campus
Institutional Master Plan

Source: Harvard Planning and Real Estate

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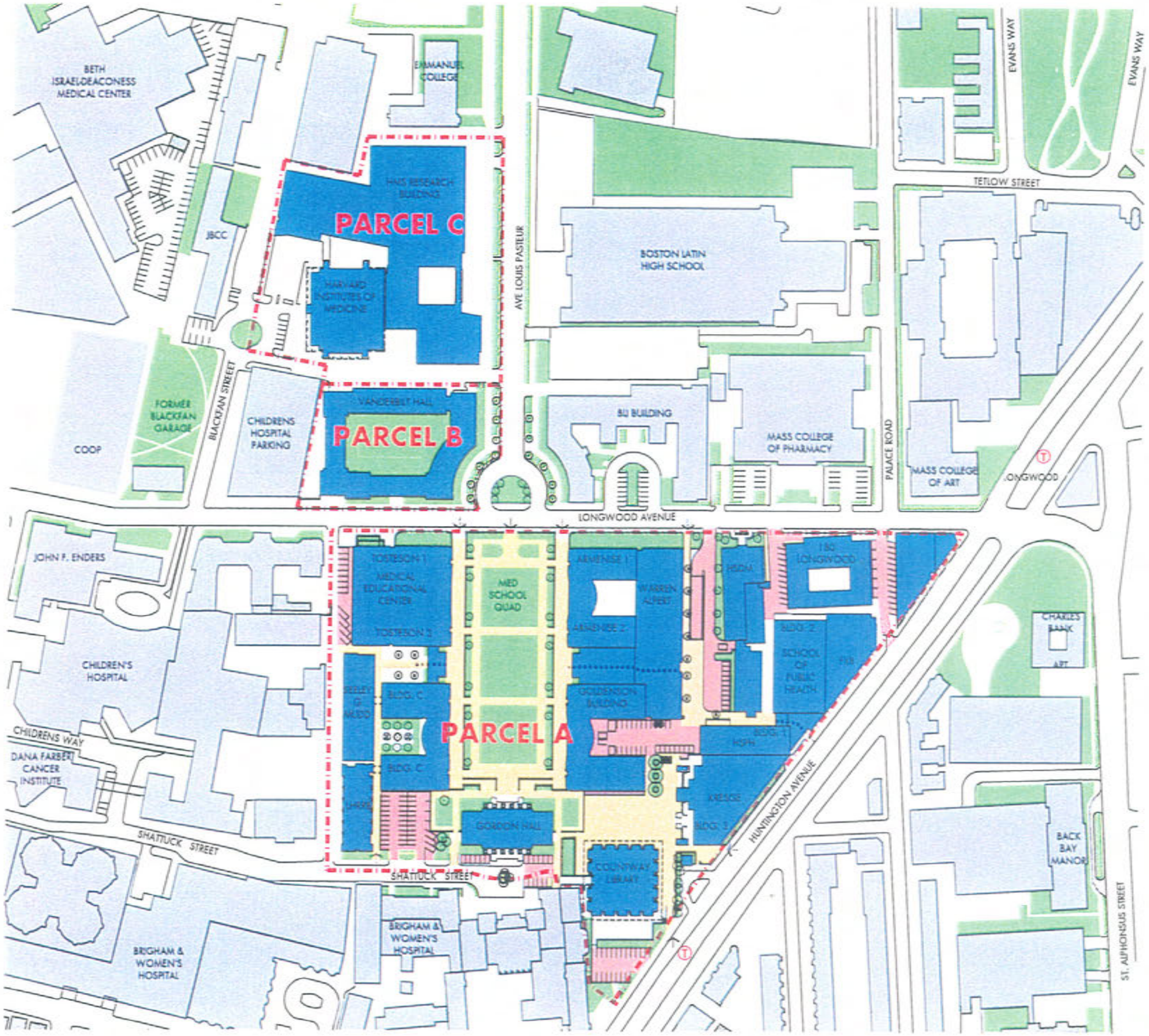

Legend
- Pedestrian Circulation
- Vehicular Circulation /Surface Parking
- Open/Green Space
- Existing Buildings
- Existing Harvard Buildings
- Entry to Campus
- Property Line

Parcel A = 626,600 SF
Parcel B = 62,965 SF
Parcel C = 177,605 SF
Total = 867,170 SF

Existing Open / Green Space & Pedestrian Circulation = 244,934 SF

0 40' 80' 160'

N

Figure 2-2: Existing Conditions

Table 2-1: Existing Harvard Longwood Campus Facilities

Parcel/ Affiliation	Building Name	Address	Use	Date of Construction	Number of Stories	Number of Stories Below grade	Building Height (approx)	Gross Floor Area (zoning gross sf)	Proposed Action	New Use
Parcel A										
HMS	160/164 Longwood Avenue	160/164 Longwood Avenue	Administrative	1892/1900	3	1	30	12,477	N/A	Same
HMS	180 Longwood Avenue	180 Longwood Avenue	Research/Administrative	1913	3	1	65	57,932	N/A	Same
HMS	641 Huntington Avenue	641 Huntington Avenue	Research/Administrative	1914	4	1	30	13,159	N/A	Same
HMS	643 Huntington Avenue	643 Huntington Avenue	Research/Administrative	1888	4	1	30	9,779	N/A	Same
HMS	158 Longwood Avenue/ 639 Huntington Avenue	158 Longwood Avenue/ 639 Huntington Avenue	Retail/Lunch Room/Administrative	unknown	2	1	28	3,401	N/A	Same
HMS	Armenise, Building D	210 Longwood Avenue	Research/Auditorium	1906	6	1	70	98,646	Addition	Research
HMS	Building C	240 Longwood Avenue	Research	1906	6	1	70	112,710	Addition	Research
HMS	Countway Library	10 Shattuck Street	Library/Administrative	1964	6	2	90	156,349	N/A	Same
HMS	Goldenson Building	220 Longwood Avenue	Research/Administrative	1906	5	1	60	99,907	Addition	Research
HMS	Gordon Hall, Building A	25 Shattuck Street	Administrative	1906	5	1	71	63,270	N/A	Same
HMS	Laboratory for Human Reproduction & Reproductive Biology	45 Shattuck Street	Research and Teaching Laboratories/ Administrative	1969	6	1	71	57,503	N/A	Same
HMS	Seeley G. Mudd	250 Longwood Avenue	Research and Teaching Laboratories	1975	6	1	71	83,269	N/A	Same
HMS	Tosteson Medical Education Center	260 Longwood Avenue	Research and Teaching Laboratories/ Administrative/Auditorium	1906	4	1	60	116,418	N/A	Same
HMS	Warren Alpert Building	200 Longwood Avenue	Research and Teaching Laboratories/ Parking Garage/Loading	1992	5	1	60	173,486	N/A	Same
HSDM	School of Dental Medicine	188 Longwood Avenue	Research and Teaching Laboratories/ Classrooms/Dental Clinic/Administrative	1909	2	1	40	37,174	N/A	Same
HSDM	School of Dental Medicine Interim Building	188 Longwood Avenue	Research	1971	2	0	25	11,045	Replace-ment	Research and Teaching Laboratories, Classrooms
HSPH	Francois-Xavier Bagnoud Building	651 Huntington Avenue	Administrative/Research and Teaching Laboratories/Classrooms	1996	7	2	120	80,491	N/A	Same
HSPH	HSPH New Research Building #1	665 Huntington Avenue	Administrative/Research and Teaching Laboratories	1960	14	2	172	136,828	N/A	Same
HSPH	HSPH New Research Building #2	655 Huntington Avenue	Administrative/Research and Teaching Laboratories	1963	4	2	60	90,709	N/A	Same
HSPH	Kresge Building, Building #3	677 Huntington Avenue	Administrative/Classrooms	1970	10	2	130	134,605	N/A	Same
Parcel B										
HMS/ HSDM	Vanderbilt Hall	107 Avenue Louis Pasteur	Dormitory/Administrative/Academic	1928	6	2	70	136,450	N/A	Same
Parcel C										
HMS	Harvard Institutes of Medicine	77 Avenue Louis Pasteur	Research and Teaching Laboratories	1970	10	1	170	239,180	N/A	Same
HMS	New Research Building*	77 Avenue Louis Pasteur	Research and Teaching Laboratories/ Auditorium and Conference Center /Classroom/Parking/Fitness Center/Café/Accessory Retail	est. 2003	10	4	170	430,000*	N/A	Same
Parcel D										
HSPH	Shattuck International House	199, 203, and 207 Park Drive	Graduate Student Housing (Apartments)	1922	4	1	60	49,586	N/A	Same

n/a = not applicable – no projects proposed for this property within this IMP * In construction

Table 2-2: Places of Assembly

School	Building	Room	Capacity
HMS	Gordon Hall	Faculty	100
	"	Alumni Lounge	150
HMS	Countway Library	Minot	50
	"	Auditorium	100
HMS	Goldenson	Room 122 & Seminar Room	90
HMS	Warren Alpert	Courtyard	200
HMS	Vanderbilt Hall	Common	80
HMS	Armenise	Amphitheater	214
HMS	Building C	Cannon	113
HMS	Tosteson Medical Education Center	Amphitheater	214
	"	Atrium	90
	"	227	80
	"	250	70
	"	209	80
	"	109	55
	"	126	55
	"	309	55
	"	324	55
HMS	New Research Building	24 – Auditorium/Conference Ctr.	404
		120 – Upper Cafe	100
		119 – Cafe	142
		124 – Balcony	80
		305 – Conference Center	120
		350 – Seminar Room	140
		457 – Seminar Room	80
HMS	Harvard Institutes of Medicine	138 – Lecture Room	130
		109 – Bray Seminar Room	74
		106 – Cafeteria/Lecture Hall	64
HSPH	Kresge Building, Building #3	G1	160
	"	G2	55
	"	G3	55
	"	502	80
	"	502	67
HSPH	Francois-Xavier Bagnoud Building	G12	73
	"	G13	70

2.3.3 Floor Area Ratio

The existing floor area ratio (FAR) of the parcels comprising the Harvard Longwood Campus is presented in Table 2-3 below.

Table 2-3: Existing Floor Area Ratios

Parcel	Land Area		Building Area	FAR
	(acres)	(sf)	(sf)	
Parcel A	14.38	626,596	1,549,158	2.47
Parcel B	1.45	62,965	136,450	2.17
Parcel C	4.08	177,605	669,180*	3.77*
Parcel D	0.56	24,346	49,586	2.04
Parcel E	0.36	15,546	0	N/A
Total	**20.83**	**907,058**	**2,404,374**	**2.65**

* Includes New Research Building under construction; approved FAR is 3.8.

2.3.4 Leased Property

In addition to the Harvard Longwood Campus facilities listed in Table 2-1, Harvard leases space in existing buildings located within or near the LMA for use by HMS, HSDM, and HSPH. The inventory of leased property, typically smaller office spaces on short-term leases, fluctuates in response to the University's space needs. Leased space in buildings located near the Longwood Campus is used to meet the short-term needs of the Longwood Campus schools, stemming in part from ongoing construction and renovation projects, or to house grant-funded programs or research efforts that are limited in time. Leased property ordinarily is occupied for office purposes to serve these short-term needs, and these uses are established in buildings in which office uses are permitted. The use of leased property to meet temporary expansion demands and to accommodate space needs for funded, discrete programs facilitates the long-term planning efforts for the campus as a whole. Table 2-4 below summarizes this leased space, which totals approximately 165,074 sf, and Figure 2-3 depicts the location of the leased space.

The current inventory of leased property is included in this IMP for informational purposes. Inclusion of an inventory list is not intended to result in the extension of the Institutional Master Plan Overlay area to such leased property.

Source: Harvard Planning and Real Estate

Scale 1:9000
1 inch = 750 feet

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750 375 0 750 Feet

Figure 2-3
Leased Facilities

Harvard University Longwood Campus
Institutional Master Plan

EPSILON ASSOCIATES INC.
Engineers Environmental Consultants

Table 2-4: Leased Space in Boston

Map Key	Address	Leased Area (sf)	Floor	School
1	35 Wigglesworth	650	1	HSPH
2	708 Huntington Avenue	824	1	HSPH
3	716 Huntington Avenue	1,300	1	HSPH
4	718 Huntington Avenue	5,400	2	HSPH
5	812 – 814 Huntington Avenue	3,000	1	HSPH
6	1552 – 1556 Tremont Street	3,000	1	HSPH
7	1613 Tremont Street	1,200	1	HSPH
8	1633 – 1639 Tremont Street	6,100	1	HSPH
9	841 Parker Street	2,300	Basement	HSPH
10	201 Brookline Avenue (Landmark Center)	36,582 49,550	4 3	HSPH HSPH
11	333 Longwood Avenue	2,107	5	HMS
12	Renaissance Park	11,770		HMS
13	201 Brookline Avenue (Landmark Center)	41,291	2	HMS
	Total	165,074		

As indicated in Table 2-4, HSPH leases space at ten locations. Of those ten locations, nine are modest-sized office locations in the immediate vicinity of HSPH, mainly on Huntington Avenue and Tremont Street. The HSPH users in those nine spaces include the HSPH Nigeria Project, the HSPH Public Health Practice and Community Services Department, offices for the Maternal and Child Health/Health and Social Behavior Department, the HSPH Human Rights Committee, and other similar administrative offices.

In addition to these nine HSPH spaces, both HSPH and HMS lease space at the Landmark Center. HMS leases space on the second floor for its Development Office. The HSPH Department of Environmental Health and Health and Social Behavior occupies space on the fourth floor at the Landmark Center. HSPH recently added space on the third floor of the Landmark Center and that space will be occupied by its Development Department, relocating from other LMA leased space and may accommodate some of the HSPH administrative offices currently occupying the leased space identified in Table 2-4.

The Landmark Center is a project authorized under c.121A and approved by the BRA. The approved project includes college and university uses (under Section 8-7 (Use Item 16A) of the Zoning Code), authorized by the BRA prior to commencing Harvard's use at the

Landmark Center. The Landmark Center includes an approved parking garage, and tenants in the building, including HSPH and HMS, use spaces in the garage in accordance with the building leases. The Harvard Landmark Center leases allow HSPH and HMS to meet critical, short-term needs to house HMS administrative offices and HSPH department and research programs in close proximity to the campus and in space that did not require construction of new campus facilities. Use of leased premises, by definition temporary occupancies, permits adequate consideration of long-range planning objectives for the development of campus facilities to meet long-term program needs.

In addition to the leases listed in Table 2-4, HSDM currently leases space at the Forsyth Institute for its Department of Oral Health Policy and Epidemiology. This department is expected to return to the Longwood Campus, to the new HSDM Research and Education Building, upon its completion. HSDM also has maintained a long-term presence at the Forsyth Institute in connection with the joint Harvard/Forsyth Department of Oral and Developmental Biology.

From time to time Harvard leases space in its campus facilities to third parties. Current tenants include the Center for Blood Research in the Warren Alpert Building, the New England Journal of Medicine in Countway Library, the Harvard University Employee Credit Union in Kresge, leases to affiliated institutions in the Harvard Institutes of Medicine and the New Research Building (upon its completion), and a lease to the operator of a restaurant at 639 Huntington Avenue (formerly Sparrs).

2.4 Transportation and Parking Facilities

Existing transportation and parking facilities at Harvard's Longwood Campus are discussed in detail in Section 5.0, Transportation Access Plan.

2.5 Historic Resources

The Harvard University Longwood Campus is composed of five mostly discontinuous parcels of land containing 26 buildings that house the HMS, HSDM, and HSPH. None of the properties owned by Harvard University within the campus are listed in the State or National Registers of Historic Places; however, the Harvard Medical School Quadrangle and two individual buildings are eligible for listing on the State and National Registers. Several historic districts and individual properties in the vicinity of the Harvard University Longwood Campus are listed in the State and National Registers. Properties listed in the State and National Registers are presented in Table 2-5. The building numbers are keyed to Figure 2-4.

Additionally, several properties owned by Harvard University are included in the *Inventory of Historic and Archaeological Resources of the Commonwealth* maintained by the Massachusetts Historical Commission (MHC). Other inventoried properties are in the vicinity of the Harvard University Longwood Campus. The name, address, and historic designation of properties included in the *Inventory* within an approximate quarter-mile radius of the Harvard University Longwood Campus are summarized in Table 2-6. Properties located within the campus are depicted in bold. The building numbers are keyed to Figure 2-4.

As required by city, state, and federal regulations for certain future development projects, Harvard University will file a Project Notification Form with the Boston Redevelopment Authority under Article 80 and/or a Project Notification Form with the MHC. Additionally, new construction will incorporate dated cornerstones, per the request of the Boston Landmarks Commission (BLC).

Table 2-5: Properties Listed in the State and National Registers of Historic Places in the Vicinity of the Harvard University Longwood Campus

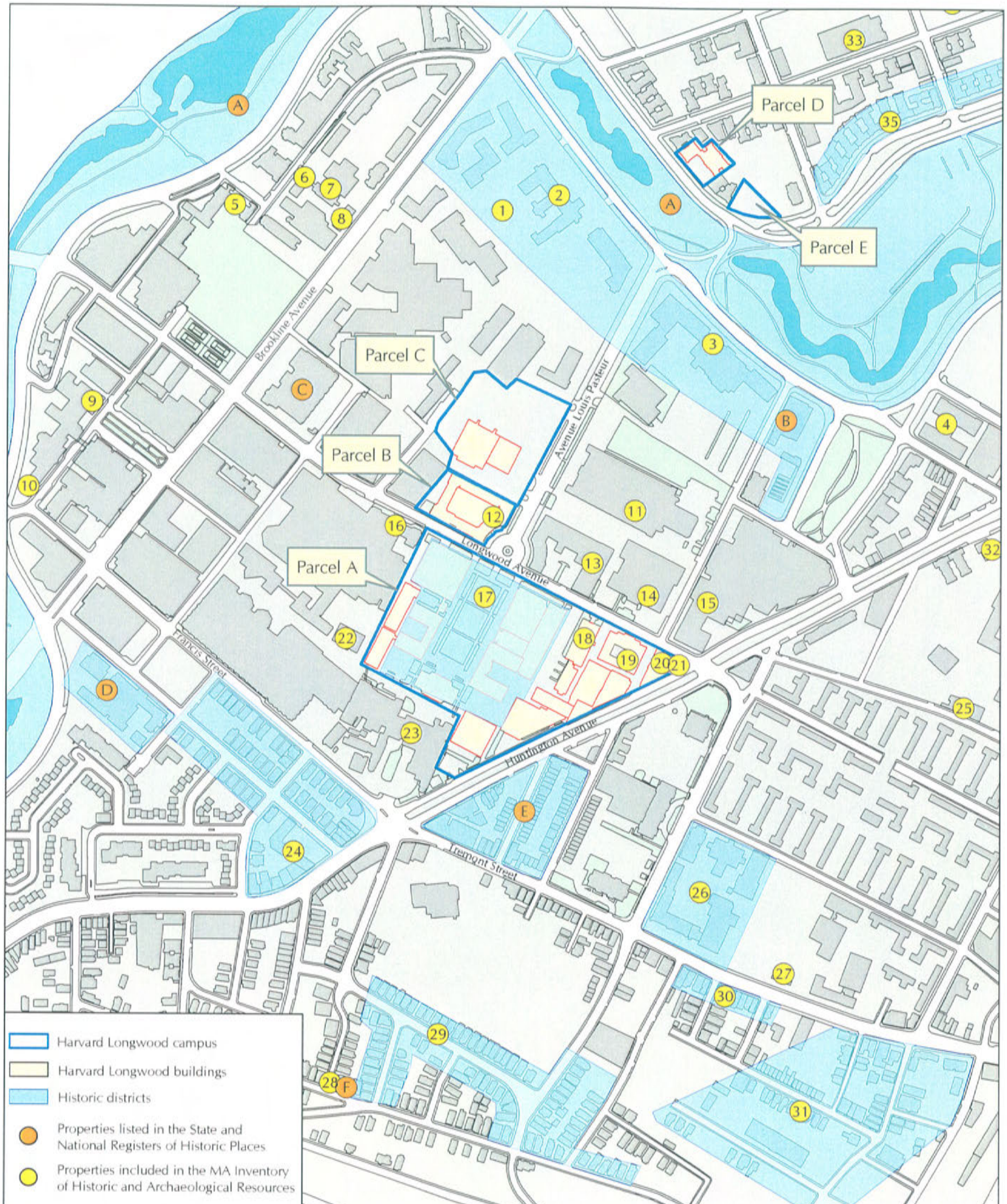
No.	Name	Address
A	Olmsted Park System	Back Bay Fens
B	Isabella Stewart Gardner Museum	280 The Fenway
C	Massachusetts School of Art	364 Brookline Avenue
D	Massachusetts Mental Health Center	74 Fenwood Road
E	Mission Hill Triangle District	Huntington Avenue, Smith, Worthington,
F	Timothy Hoxie House	135 Hillside Street

Table 2-6: Properties included in the *Inventory of Historic and Archaeological Resources of the Commonwealth* Within or in the Vicinity of Harvard University Longwood Campus

No.	Name	Address	Status
1	Southwest Fenway District		NR Eligible
2	Emmanuel College Main Building	400 The Fenway	NR Eligible
3	Simmons College Main Building	300 The Fenway	NR Eligible
4	School of the Museum of Fine Arts	230 The Fenway	NR Eligible
5	Winsor School	103 Pilgrim Road	Surveyed
6	Simmons College, North Hall	86 Pilgrim Road	Surveyed
7	Simmons College, Refectory	Behind Pilgrim Road	Surveyed
8	Simmons College, South Hall	321 Brookline Avenue	Surveyed
9	New England Deaconess Hospital	175 Pilgrim Road	Surveyed
10	New England Deaconess Hospital	195 Pilgrim Road	Surveyed
11	Boston Public Latin School	78 Avenue Louis Pasteur	NR Eligible
12	**Vanderbilt Hall**	**245 Longwood Avenue**	**Surveyed**
13	Boston Lying In Hospital	221 Longwood Avenue	NR Eligible
14	Massachusetts College of Pharmacy	179 Longwood Avenue	Surveyed
15	Girl's Latin School and Normal School	Palace Road, Tetlow Street, Huntington Avenue	Surveyed
16	Children's Hospital Administration Building	300 Longwood Avenue	NR Eligible
17	**Harvard Medical School District**	**210, 220, 230, 240, 260 Longwood Avenue and 25 Shattuck Street**	**NR Eligible**
18	**Harvard Dental School**	**188 Longwood Avenue**	**NR Eligible**
19	**Angell Memorial Hospital**	**180 Longwood Avenue**	**NR Eligible**
20	**Westcourt Apartment Block**	**164 Longwood Avenue**	**Surveyed**
21	**Carlton Apartment Block**	**160 Longwood Avenue**	**Surveyed**
22	Thomas M. Rotch Jr. Memorial Hospital For Infants	55 Shattuck Street	NR Eligible
23	Peter Bent Brigham Hospital	721 Huntington Avenue/ 15 Francis Street	NR Eligible
24	Farragut School	10 Fenwood Street	Surveyed
25	Isaac Cook Brewery (Hanley and Casey)	105 Ward Street	NR Eligible
26	Mission Church Complex	Tremont, St. Alphonsus, Smith streets	NR Eligible
27	Boston Public Library Parker Hill Branch	1497 Tremont Street	NR Eligible
28	Stone/Warren House	139 Hillside Street	NR Eligible
29	Parker Hill/Mission Hill Triple Decker District	Calumet, Sachem, Oswald, St. Alphonsus, Hillside, Iroquois streets	NR Eligible
30	Tremont Street District	Tremont Street	NR Eligible
31	Parker Hill/Mission Hill North Slope District	Parker Tremont, Burney, Delle, Allegheny, Hill-side, Terrace streets; Terrace Pl., Folsom Ave.	NR Eligible
32	Wentworth Institute of Technology	550 Huntington Avenue	NR Eligible
33	Church of the Disciples	105 Jersey Street	NR Eligible
34	The Pantry	37 Queensbury Street	Surveyed
35	Park Drive District	1 Queensbury Street, 51-55, 61-69, 73-79, 107, 111, 117-121, 125-151 Park Drive	NR Eligible

Bolded properties are located within the Harvard University Longwood Campus.

Key:	NR Eligible:	Determined eligible for listing on the National Register of Historic Places
	Surveyed:	Identified and recorded as part of the 1984 survey by the BLC



Scale 1:6600
1 inch = 550 Feet

550 275 0 550 Feet

N

Figure 2-4
Historic Resources

Harvard University Longwood Campus
Institutional Master Plan

Source: Map is partially derived from data supplied by the Boston Water and Sewer Commission.

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Engineers Environmental Consultants

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2.6 Student Housing

Article 80 of the Boston Zoning Code requires that an IMP include a discussion of the institution's existing student housing facilities, as well as its long range goals for improving on-campus housing and minimizing impacts on nearby neighborhoods.

2.6.1 Existing Conditions

The Harvard Longwood Campus provides two on-campus housing facilities for students at HMS, HSDM, and HSPH (described below). Students not housed on campus find housing either in units owned and operated by Harvard University or in private non-Harvard housing.

Harvard University recently conducted a study of where its Longwood Campus students live, the *2001 Housing Study* (May 2001). Table 2-7 provides a summary of the number of students living on and off campus based on the study. As shown in Table 2-7, the majority of Harvard Longwood Campus students live off campus in private housing units.

Table 2-7: Summary of Student Housing

Location of Student Housing*	HMS	HSDM	HSPH	Total
Students living in Harvard Longwood Campus housing				
Vanderbilt Hall	196	69	0	265
Shattuck International House	0	0	65	65
Students living in housing units owned/ operated by Harvard	11	3	36	50
Students living in private, non-Harvard housing	484	139	560	1,183
Students living outside Massachusetts / Invalid address	49	12	127	188
Total Students in Study**	740	223	788	1,751

Source: *2001 Housing Study*, Harvard Planning and Real Estate.
* Information from May 2001 receivables data.
** Student numbers differ at different times of the year due to student turnover and changes in student population, therefore, total number of students studied in May 2001 varies from student enrollment figures for Fall 2000 and Fall 2001.

On-campus Housing

Harvard currently houses students attending the three schools in the Longwood Campus in two facilities: Vanderbilt Hall and the Shattuck International House. Vanderbilt Hall, operated by HMS, provides 321 dormitory units for use by HMS and HSDM students; Shattuck International House, operated by HSPH, provides 70 apartment units for its students. A total of 391 on-campus units are available to Longwood Campus students. According to the *2001 Housing Study,* these facilities accommodated 330 Harvard Longwood Campus students, or approximately 20 percent of the student population, in May 2001. Units in these facilities are open to other enrolled Harvard students if they are not filled by Longwood Campus students.

Vanderbilt Hall

HMS manages the 321-room residence house, Vanderbilt Hall. Vanderbilt is the primary residence hall for HMS and HSDM. It also houses some students from HSPH and visiting students and scholars, although priority is given to students at HMS and HSDM.

HMS and HSDM assure housing at Vanderbilt Hall for all first-year students, provided they meet all application deadlines. Approximately 50 percent of incoming students at these two schools choose to reside on-campus and are housed at Vanderbilt.

The Henry Lee Shattuck International House

Housing for students at HSPH is provided in the Henry Lee Shattuck International House, a three-building complex located at 199, 203, and 207 Park Drive in Boston. The facility presently consists of 70 furnished apartment units and multiple recreation areas. It is HSPH's policy to fill at least 50 percent of the apartments with international students. There are two different types of apartments available at the Shattuck House: one bedroom units and two bedroom units.

The HSPH Office of Student Affairs provides consultation to students with housing needs who are not accommodated in Shattuck House.

Off-campus Housing

Off-campus housing consists of Harvard affiliated housing and private housing. According to Harvard's student housing study, approximately three percent of students at HMS, HSDM, and HSPH lived off campus in Harvard-affiliated apartments, located in Cambridge and Boston. Approximately 67 percent of students lived off campus in private housing. Table 2-8 shows the municipalities in which these off-campus students lived.

Table 2-8: Location of Off-campus Students by Municipality

Community	Number of Students	Percent of Students
Boston	493	42%
Brookline	348	29%
Cambridge	135	11%
Newton	35	3%
Somerville	28	2%
Belmont	12	1%
Quincy	11	1%
Arlington	9	1%
Lexington	9	1%
Framingham	6	1%
Watertown	6	1%
Other MA towns	91	8%
Total*	**1,183**	**100%**

2.6.2 Support Provided to Students

On-campus Housing

Harvard University provides information to prospective students during the application process that emphasizes the high demand for on-campus housing. Harvard's Admissions Office provides information regarding the available on-campus housing, as well as the housing application process.

Off-campus Housing

The Harvard Planning and Real Estate Office (HPRE) is responsible for the management and rental of Harvard's Affiliated Housing (open to students, faculty, and staff). HPRE serves as the Harvard community's central resource for off-campus housing information and also offers individual real estate counseling to relocating and current faculty members. They provide updated lists of available apartments and affiliated housing and dormitories in the Boston/Cambridge area for both graduate and undergraduate Harvard students.

Additionally, the Harvard Longwood Campus Off-Campus Housing Office provides information on apartment rentals in Boston and surrounding communities, rooms to lease, housing in exchange for services, and lists of other students who are seeking roommates for apartments. In addition to providing personal service by telephone appointment, this information can be accessed through a website and is also posted on bulletin boards in the Vanderbilt Hall lobby. Affiliates who wish to live in non-Harvard owned housing can go to the Harvard Housing Office to search for an apartment, house, or room for rent listed by local landlords and real estate agents.

2.6.3 Graduate Student Life

HSPH's Shattuck International House is managed by a full-time building manager and three student resident advisors who live at the house. The resident advisors act as liaisons for the school – enforcing policy, providing support and social programs. The residence staff works cooperatively with the departments of Student Activities, Career Services, Campus Ministry, Athletics, Health Services, and the Counseling Center to integrate the residential experience with the broad array of other campus life opportunities and activities.

The HMS Office of Student Affairs oversees student life matters at Vanderbilt Hall. A live-in Resident Counselor supports the personal and professional development of students living at the hall and is available to counsel and advise students, oversee student life at the hall, discuss urgent problems, and respond to emergencies. Twenty-five live-in student resident advisors, whose responsibility it is to promote community and safety and provide students with personal and professional support, are also located at Vanderbilt.

Graduate students enrolled at the Medical School and first-and second-year Dental School have access to three on-campus food service locations. These include the Atrium Cafe in the Tosteson Medical Education Center Atrium, the Courtyard Cafe in the Warren Alpert Building, and Sebastian's in the Kresge Cafeteria at the School of Public Health. Food service hours are posted at each location.

As noted above, almost 500 graduate students attending HMS, HSDM and HSPH live in off-campus housing in Boston. These students have already earned undergraduate degrees and, for the most part, are older than undergraduates attending other colleges and universities in the area. Many of these students are married, and some have families. No significant impact on the quality of residential life in the communities in which these students live would be expected. Table 2-9 lists the neighborhoods in which these students live and their percentage of total neighborhood population.

2.6.4 Impact on Supply and Rental Rates on Surrounding Neighborhoods

Harvard's recent student housing study found that HMS, HSDM, and HSPH students live in several different Boston neighborhoods with the highest percentages of students living in the Jamaica Plain and Fenway/Kenmore areas (see Table 2-9). This demographic is predictable given that these areas are located proximate to the Longwood Campus. Additionally, these areas have a high concentration of apartments traditionally rented to students and are easily accessible via public transit.

Table 2-9: Location of Off-campus Students by Boston Neighborhood

Neighborhood	Longwood Campus Students Living in Neighborhood		Neighborhood Population	
	Number	Percent	Total Population	Students as a Percent
Jamaica Plain	156	35%	38,196	0.41%
Fenway/Kenmore	122	27%	35,602	0.34%
Allston/Brighton	47	10%	69,648	0.07%
Back Bay/Beacon Hill	39	9%	26,721	0.15%
South End	34	8%	28,239	0.12%
Central	17	4%	25,173	0.07%
Roslindale	14	3%	34,618	0.04%
Roxbury	7	2%	56,658	0.01%
West Roxbury	5	1%	28,753	0.02%
South Dorchester	3	1%	63,340	0.00%
East Boston	2	0%	38,413	0.01%
Hyde Park	2	0%	31,598	0.01%
North Dorchester	2	0%	28,775	0.01%
Charlestown	0	0%	15,195	0.00%
Harbor Islands	0	0%	640	0.00%
Mattapan	0	0%	37,607	0.00%
South Boston	0	0%	29,965	0.00%
Total *	**450**	**100%**	**589,141**	**0.08%**

Source: Student data from Harvard Student Receivables database, May 2001. Mapping and analysis by HPRE CAD/GIS Services, August 2, 2002. Neighborhood population data, 2000 US Census, from: http://www.cityofboston.gov/bra/pdf/publications//pdr_554.pdf

* Total students located by neighborhood for GIS analysis purposes. Due to incomplete addresses, some students with Boston zip codes could not be identified by neighborhood; therefore, this number differs from the total in Table 2-8.

A recent policy report by the Massachusetts Executive Office for Administration and Finance, *Bringing Down the Barriers: Changing Housing Supply Dynamics in Massachusetts* (Policy Report Series, No. 4, October 2000) analyzed the impact of student housing on housing prices and availability in Boston. It concluded that neighborhoods with a 10 percent increase in the number of students not living in dorms tend to have higher rents and lower vacancy rates.

As shown in Table 2-9, in the neighborhoods where the graduate students enrolled in HMS, HSDM and HSPH live, these students represent only 0.01 to 0.41 percent of their neighborhood populations. As an example, in Jamaica Plain, where the number of students is the highest, the 156 HMS, HSDM, and HSPH students represent only 0.41 percent of the total neighborhood population of 38,196. Individually, therefore, these students would not significantly affect neighborhood housing rents or availability. Cumulatively, however, with students from other institutions, they may contribute to higher housing rents and lower vacancy rates in some neighborhoods.

2.6.5 Long-term Housing Plans

As described in Section 3.2, Harvard is not anticipating any significant growth in student enrollment in the schools within the Harvard University Longwood Campus during the five-year term of the IMP.

While there are no current proposals to provide additional housing for its Longwood Campus students, the University is exploring opportunities to provide additional student housing in the LMA vicinity. A recent housing-related survey of graduate and medical students revealed that close-in housing is vitally important to students' initial adaptation to school and that the availability of Harvard housing has an important influence on students' abilities to achieve their academic goals. In addition, the survey data show that in terms of the relative importance of locational features, housing that is located on an MBTA route or within walking distance of campus was rated highest. The provision of housing is key to institutional competitiveness as some students factor the cost and availability of housing into their decision about where to attend school.

Thus, Harvard's goal is to provide an additional 150 to 200 beds for its Longwood Campus graduate students and to house 33 percent of the LMA-based graduate and professional students in Harvard-owned housing within the five-year timeframe of the IMP. Harvard's university-wide housing goal is to add approximately 600 to 700 new beds for its Boston/Cambridge-based graduate students over the next five to seven years, including the beds for the Longwood Campus. Harvard will provide the BRA updates on their housing creation progress every six months.

In addition, Harvard will continue to provide assistance to students through its off-campus housing services, and will monitor the distribution and private housing preferences of its student body throughout the City.

2.7 Workforce Development

As the Greater Boston area's second largest private employer, Harvard University employs approximately 2,000 faculty and 12,000 staff. Historically, Boston residents have formed a major component of Harvard's workforce, with Harvard employing approximately 2,600 Boston residents who comprise 19 percent of Harvard's total workforce.

A wide variety of professional, administrative and support jobs are available at the Harvard University Longwood Campus, and Harvard makes a special effort to recruit people from Boston through citywide advertising and neighborhood and campus newspapers. Harvard also recruits through more than 100 community-based employment training programs and agencies.

In accordance with guidance provided in the BRA's recently released *Longwood Medical and Academic Area Interim Guidelines*, a *Workforce Development Plan* for the Harvard University Longwood Campus has been prepared and submitted separately to the BRA. This plan provides details on the number of Boston residents employed at the Longwood Campus and describes the university's commitment to workforce development for both its employees and for the Greater Boston community as a whole.

3.0 Program Needs and Master Planning/Urban Design Objectives

3.0 Program Needs and Master Planning/Urban Design Objectives

3.1 Introduction

This section describes the current and projected student, faculty, and staff populations of HMS, HSDM, and HSPH, sets forth anticipated program and space needs on the Longwood Campus, analyzes the context within which future campus development projects will occur, and establishes the master planning and urban design objectives that will inform future development on the campus.

3.2 Current and Future Population Trends

Existing and projected student populations of HMS, HSDM, and HSPH are shown in Table 3-1 below. As shown in the table, there has been little variation in the student populations over the last two years. In addition, Harvard anticipates no significant growth in the student populations of these schools over the next five years.

Tables 3-2 and 3-3 below present existing faculty and staff populations on the Longwood Campus.

Table 3-1: Existing and Projected Student Enrollment (Degree Students)

Academic Year	HMS Enrollment	HSDM Enrollment	HSPH Enrollment	Total
2000-2001	756	267	823	1,846
2001-2002	777	244	808*	1,829
2002-2003 to 2007-2008	780	265	848	1,893**

* Includes 209 part-time students.
** Approximately 500 additional students enrolled in Harvard's Cambridge-based biomedical graduate programs also complete coursework at the Longwood Campus.

Table 3-2: Existing Faculty*

School	Full-time Faculty	Part-time Faculty	Total
HMS	273	37	310
HSDM	51	59	110
HSPH	153	49	202
Total	477	145	622

* Includes Harvard Longwood Campus-based faculty only. Does not include the approximately 8,666 faculty members based in the affiliated teaching hospitals or in other locations.

Table 3-3: Existing Staff

School	Full-time Staff	Part-time Staff	Casuals	Total	Full-time Equivalents
HMS	1,415	474	125	2,014	1,668
HSDM	97	38	50	185	113
HSPH	837	203	75	1,115	921
Total	2,349	715	250	3,314	2,702

* Casual workers are temporary employees; this number changes on a regular basis.

Harvard does not anticipate any significant increase in staff or faculty at the Longwood Campus during the term of the IMP. Research programs are primarily funded by grants from the National Institutes of Health (NIH) and other sources. NIH grants are subject to federal appropriation and cannot be predicted. At this point Harvard does not anticipate any reduction in funding from these grant sources, nor, due to the nature of these grants, can they predict any significant increase in grant funds. Therefore, at this time, Harvard predicts no significant change in staffing or faculty related to research efforts or educational programs over the next five years.

3.3 Future Space Needs

HMS and HDSM have identified the need for additional space on the Longwood Campus. As described below, Harvard is proposing several small additions to reduce overcrowding (*i.e.*, decompression projects) and one new construction project to create limited new research space for the HSDM.

3.3.1 HMS

As described in Section 1.4, research is a major focus of activities at HMS. In 2001, direct and indirect research and training grants at HMS totaled $185 million; and recent figures for 2002 indicate that research and training funds at HMS total $207 million. Increases in research funding and activity like this have led to over-crowded conditions in some research departments. New space is needed to alleviate these overcrowded conditions.

In addition, HMS expects to launch three to six new academic initiatives in the next five years that will be housed in existing facilities. Harvard anticipates that these initiatives may require limited additional staff, but at this point cannot predict the number of staff that could be added. Other than what has been presented in the IMP, Harvard will not be expanding space nor building any new parking.

3.3.2 HSDM

The HSDM Building at 188 Longwood Avenue containing approximately 37,174 sf of classroom, research, and patient care space, has been HSDM's main building since 1909. The Interim Building, a two-story addition behind the HSDM Building, was constructed in 1971 as an interim facility intended to be a temporary solution for HSDM's expansion of its research and education programs. It contains approximately 11,050 sf.

HSDM has long indicated a need to replace the Interim Building with a state-of-the-art teaching and research facility. Research activities have grown at HSDM, and comprise 26 percent of the school's current budget. Current facilities in the Interim Building are outdated and no longer adequately serve the research activities being conducted. New space is also needed to provide modern classroom and meeting facilities.

3.3.3 Development Location

Harvard has reviewed alternative locations for the proposed new research space. While the facilities anticipated within this IMP must necessarily be located adjacent to existing campus facilities, in the long term, Harvard anticipates the need for continued growth of biomedical research, educational, and related facilities.

There are a number of alternative locations for such long-term growth, including the Crosstown corridor of Roxbury. The Crosstown area is located approximately 1 - 1.5 miles from the Longwood Campus and is being planned by the City of Boston as a future biomedical technology corridor linking the LMA with Northeastern University and Boston Medical Center. Harvard looks forward to working very closely with Mayor Menino, the BRA, and fellow MASCO institutions to evaluate future growth in the LMA and the potential for Harvard programs to take advantage of development opportunities in the Crosstown corridor. At such time, to the extent necessary, Harvard would submit an amendment or an update to its IMP.

3.4 Master Planning Objectives

The master planning objectives for the proposed future projects on the Harvard University Longwood Campus are:

- To maintain a sense of urban continuity between the city and the campus;
- To preserve and expand pedestrian networks and connections throughout the campus;
- To create a variety of new public spaces on campus; and
- To identify potential building sites for projects beyond the term of the IMP that help establish the definition of the campus edges and reinforce spatial order within the campus (building features as related to the streets and public domain).

These master planning objectives are based on campus planning principles that emphasize the defining of a campus identity through the creation of pedestrian networks and open spaces, clear campus edges and gateways, and consistency in building scale and height. The master planning objectives propose strategies for the future development of infill sites and the expansion of the campus pedestrian network. The long-term vision is informed by a broad urban context analysis of the whole LMA and abutting neighborhoods.

3.5 Urban Context Analysis

3.5.1 Geographical Area Perimeters

The following geographical boundaries define the LMA: Back Bay Fens, to the north and west, a major landscape feature that is part of Olmsted's Emerald Necklace; Huntington Avenue, to the east, the major street that connects the area to downtown Boston, and is the principal public transportation corridor; Francis Street, to the south defines the border with the Mission Hill neighborhood. (See Figure 3-1, Geographical Area Perimeters.) The area is bisected by two important through streets, Brookline Avenue which runs north-south, linking the area to Kenmore Square and the Back Bay, and Longwood Avenue which runs east-west, connecting Huntington Avenue to Beacon Street in Brookline.

3.5.2 The Harvard Longwood Campus

The Harvard Longwood Campus occupies a central location of this area (see Figure 3-2, Aerial View) at the intersection of Longwood Avenue and Avenue Louis Pasteur. The original campus, built at the beginning of the 20th century is organized around the Medical School Quad, designed on formal Beaux-Arts planning principles. It is part of a larger urban composition that creates a north-south axis connecting it with the Back Bay Fens. The components of this planned "set-piece" include: Avenue Louis Pasteur, a broad tree-lined street connecting the Quad to the Back Bay Fens; Oscar Tugo Circle, which

Figure 3-1: Geographical Area Perimeters

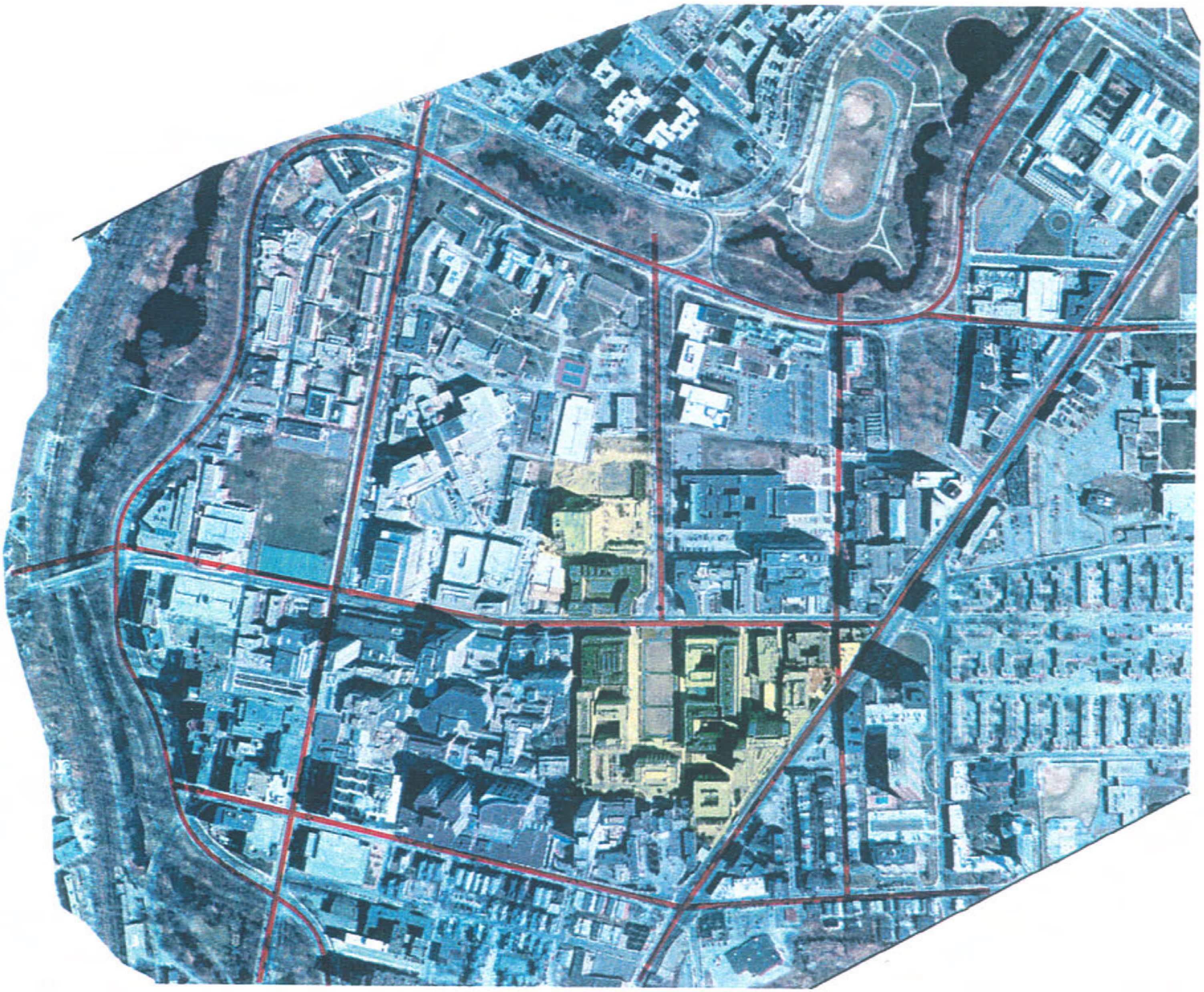

Figure 3-2: Aerial View

announces the entrance to the Quad at the intersection of Avenue Louis Pasteur with Longwood Avenue; and, the Quad itself, a broad green lawn flanked by marble clad Neo-classical academic buildings, culminating in Gordon Hall, which terminates the axis.

This powerful urban composition defines much of the architectural character of the area, creates a formal axis through the LMA, an important campus core, and gives specific identity to the campus.

3.5.3 Historical Development

The Quad was built in 1906 when the Harvard Medical School was relocated from Boylston Street in Copley Square. The area was reclaimed from open farmland and marshlands. The combination of a new school of medicine and open land stimulated the construction of hospitals in the area. A city map from 1954 (Figure 3-3, City Map, 1954) indicates that street patterns were made up of large-scale blocks, in contrast to the finer grained street patterns of surrounding residential neighborhoods. This facilitated the larger scale development of hospitals and teaching institutions in proximity to HMS.

3.5.4 Surrounding Land Use and Density

Today, the area reflects a unique concentration of medical and academic institutions. General patterns of land uses in the area are shown on Figure 3-4, Area Land Use, based on information provided by MASCO[1]. As shown on Figure 3-4, education, health care, and research uses are predominant in the core of the LMA, while residential and cultural uses are interspersed along the edges. While the area is densely developed, significant open spaces surround and permeate the area (see Figure 3-5, Area Open Space).

Existing building heights range from two to 20 stories, with most building heights at ten stories or under (see Figure 3-6, Building Heights). The density of land uses in the area, measured by FAR, ranges from 0.2 to 6.4 according to recent data prepared by MASCO (see Figure 3-7, Area FAR). The Harvard Longwood Campus falls in the middle of this range, with FARs on its parcels ranging from 2.0 to 3.8.

3.5.5 Urban Grids, Vistas, and View Corridors

There are two subtly shifting street grid systems that overlay the district and affect building patterns. One is orthogonal to Brookline Avenue, and the other to Avenue Louis Pasteur. This second grid is crossed diagonally by Huntington Avenue, creating triangular street blocks. Within this grid system, there are two important view corridors towards the Back Bay Fens. One is along Avenue Louis Pasteur and includes a vista terminating at the

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1 Figure 3-4 depicts generalized patterns of land use; various categories of land use are located within each building. Refer to Table 2-1 of this IMP for a description of the specific land uses within each building in the Longwood Campus.

Medical School Quad, with Gordon Hall as the focal point; the other is down Palace Road (see Figure 3-8, Grids and Important View Corridors), a street that begins at the Fens with the Isabella Stewart Gardner Museum.

3.5.6 Streets and Edges

Typical of urban development in the latter half of the twentieth century, much of the surrounding institutional development in the area was built in an incremental manner with additions responding to internal expansion needs, but with little regard for organizing principles that relate these complexes to the surrounding urban fabric. In contrast to the formal urban order demonstrated by the Medical School Quad, adjacent development patterns in the LMA reflect more inward focused super-blocks. In some cases, the result of this development is an urban condition characterized by eroded street edges that are relegated to "back door" status, often used for service access. In other cases, streets have been blocked or removed entirely to make way for building expansion. The large-scale city blocks to the north of Longwood Avenue limit the number of pedestrian or vehicular pathways across the district (see Figure 3-9, Streets and Edges).

3.6 Urban Design Objectives and Implementation

The urban design objectives that inform the master plan are to create continuity, both physical and perceptual, between the campus and the City, while simultaneously generating a recognizable and coherent campus identity. The urban design objectives described below are established in order to achieve these goals. In the case of a comprehensive list of objectives, such as this, it is assumed that each project may not be able to meet all of the objectives. With every potential project, however, Harvard will attempt to balance the needs of the program or users with the existing campus context and development framework to foster an outcome that adds to the campus in a positive way.

3.6.1 Urban Design Objectives

- **Urban Design Objective 1: Reinforce existing paths and create new paths, both pedestrian and vehicular, that traverse the Harvard Longwood Campus and provide connection between different parts of the LMA.**

  On the Harvard Longwood Campus, two north-south connections link Huntington Avenue to Longwood Avenue, and one east-west connection links Huntington Avenue to Shattuck Street. These should be made spatially legible.

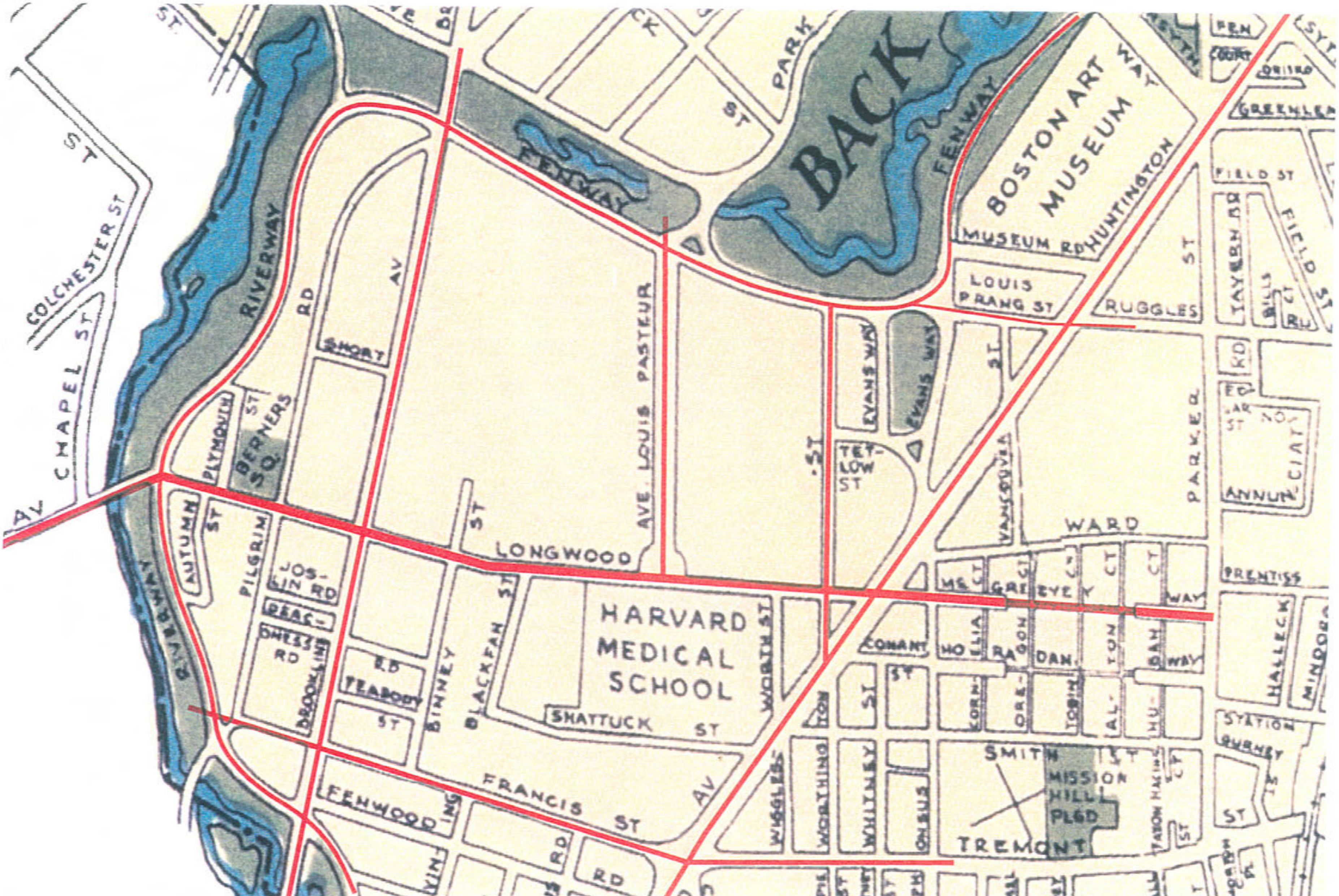


Figure 3-3: City Map - 1954

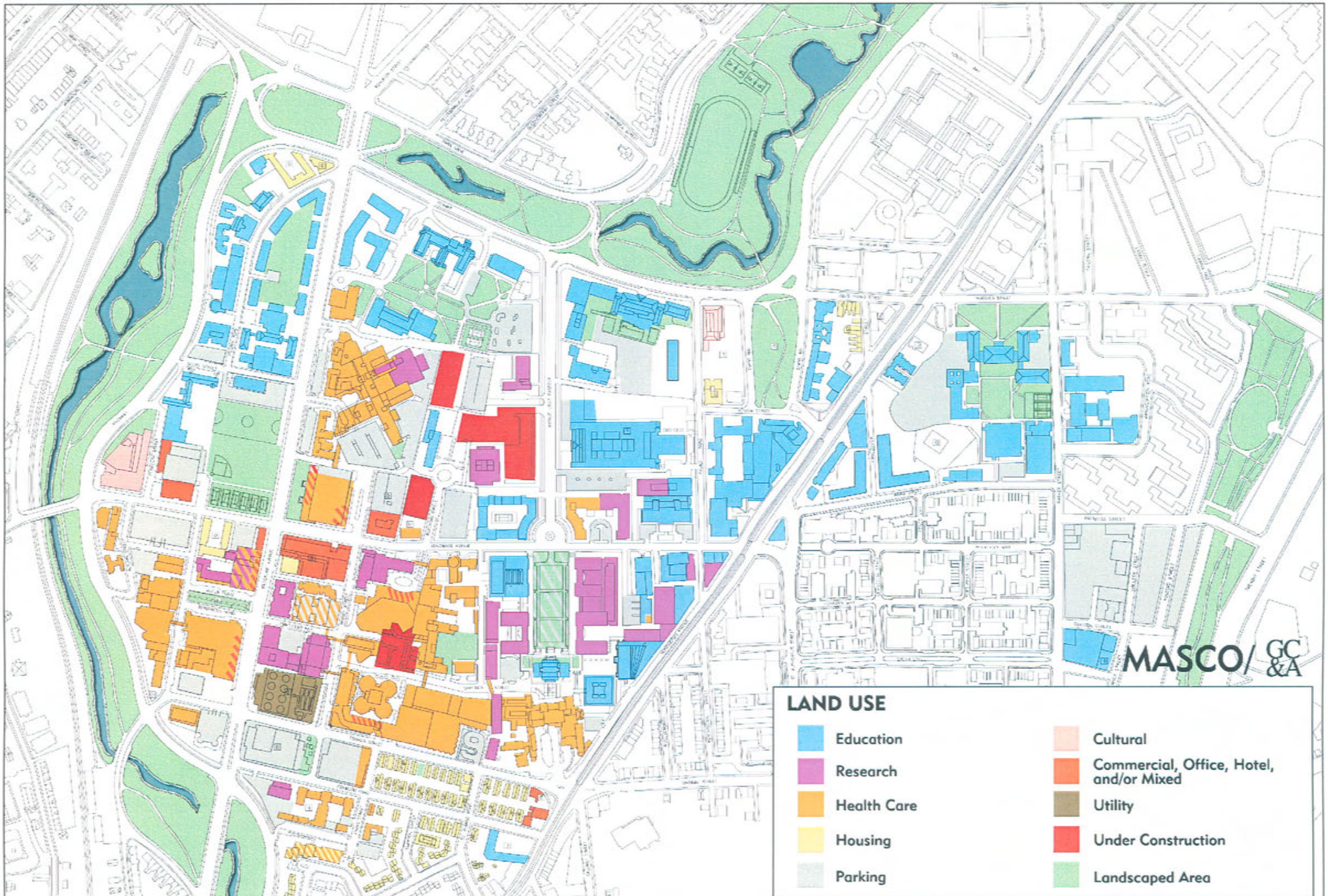


Figure 3-4
Area Land Use

Harvard University Longwood Campus
Institutional Master Plan

Source: MASCO/GCA

EPSILON ASSOCIATES INC.
Engineers Environmental Consultants

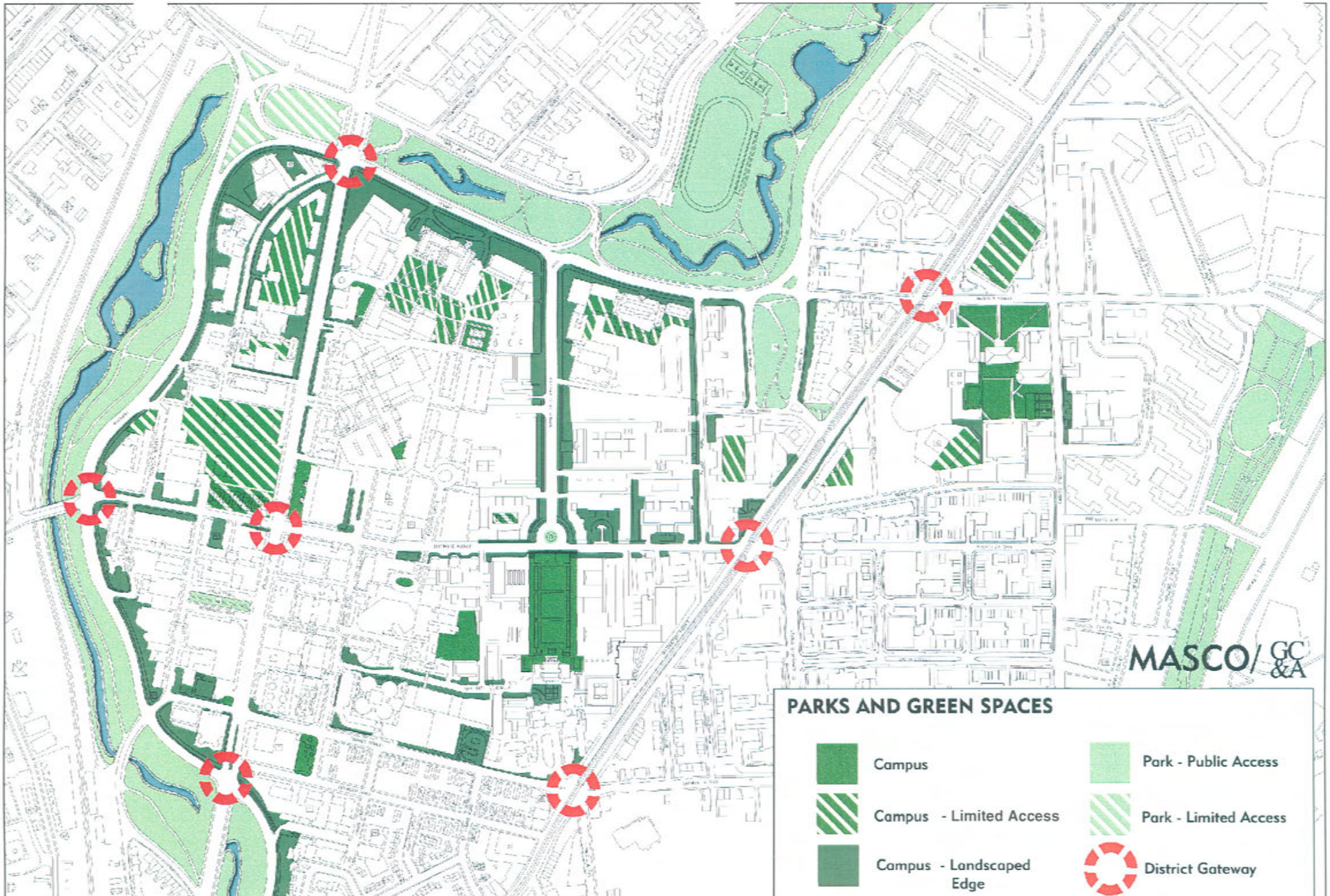


Figure 3-5
Area Open Space

Harvard University Longwood Campus
Institutional Master Plan

Source: MASCO/GCA

EPSILON ASSOCIATES INC.
Engineers & Environmental Consultants

boston/73301/open_space.mxd

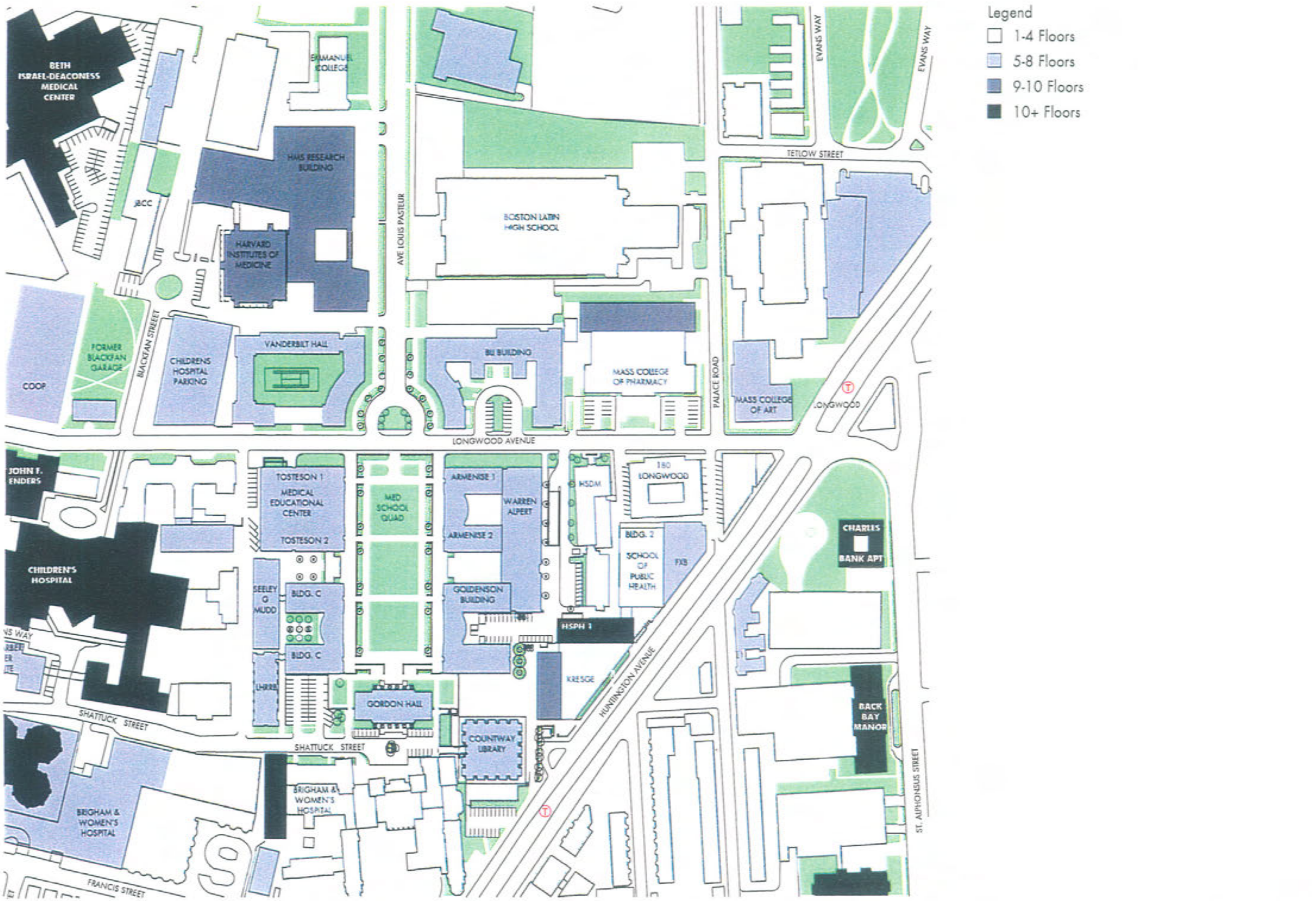
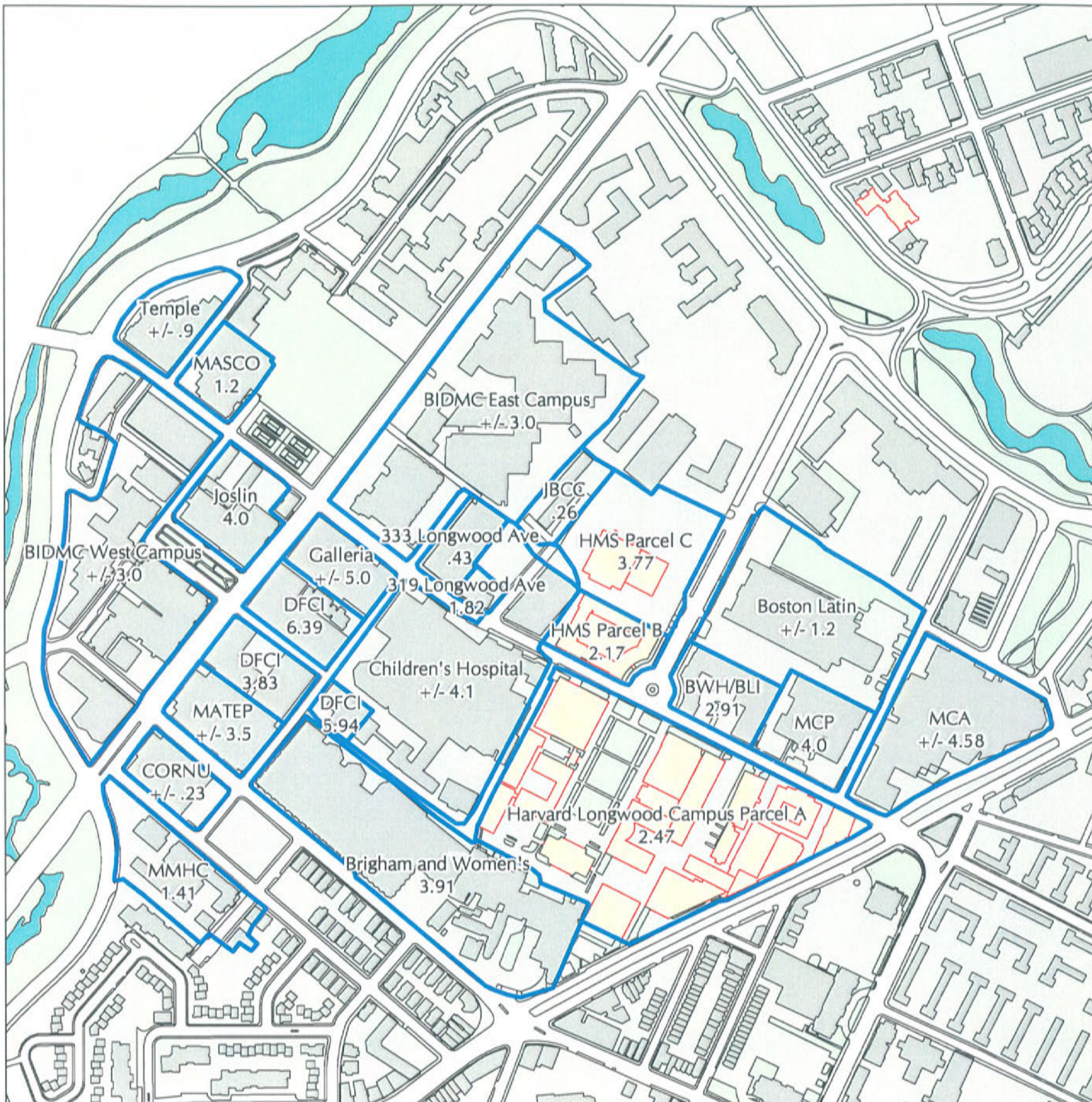


Figure 3-6: Area Building Heights



Building Acronyms

BIDMC - Beth Israel Deaconess Medical Center
BWH/BLI - Brigham & Women's Hospital/Boston Lying-In
CORNU - Cornu Management
DFCI - Dana Farber Cancer Institute
HMS - Harvard Medical School
JBCC - Judge Baker Children's Center
MASCO - Medical Academic and Scientific Community Organization
MATEP - Medical Area Total Energy Plant
MCA - Massachusetts College of Art
MCP - Massachusetts College of Pharmacy
MMHC - Massachusetts Mental Health Center

Scale 1:6000
1 inch = 500 Feet

N

500 250 0 500 Feet

Source: MASCO Area Planning Data

Figure 3-7
Area FAR

Harvard University Longwood Campus
Institutional Master Plan

EPSILON ASSOCIATES INC. Engineers Environmental Consultants

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Figure 3-8: Grids and Important View Corridors

Figure 3-9: Streets and Edges

- **Urban Design Objective 2: Create a strong continuous street edge along Huntington Avenue, to define the campus precinct and reinforce Huntington Avenue as a major city street, to be interrupted only by campus gateways and important view corridors.**

  A consistent building alignment should be maintained with a more perforated edge along Longwood Avenue and Avenue Louis Pasteur, in keeping with the original character of these important city streets.

- **Urban Design Objective 3: Expand and enhance the campus pedestrian network and green spaces, identify potential building sites that contribute to defining edge conditions that improve spatial legibility of these public spaces.**

  Pedestrian networks throughout the campus should be enhanced and made spatially legible through campus improvement projects and the location and design of potential building projects.

- **Urban Design Objective 4: Preserve existing view corridors down Avenue Louis Pasteur and Palace Road. Enhance view corridors that exist between the Warren Alpert Building and the HSDM Building, and the Countway Plaza and Kresge Building.**

  Future building projects and campus improvement projects should be responsive to and enhance existing view corridors.

- **Urban Design Objective 5: Provide a variety of open spaces within the campus composed of paved pathways and plazas that can have a mix of formal and informal spatial qualities.**

  A unifying theme that connects the variety of spaces by introducing lighting elements, street furniture, and paving patterns to create campus legibility should be developed.

- **Urban Design Objective 6: Reinforce the status of the Medical School Quad as a central feature and historical resource in the LMA.**

  An urban sequence should be developed connecting Brigham Circle to the Back Bay Fens, a “promenade” that traverses the Brigham and Women’s site, passes around Gordon Hall, into the Medical School Quad, across Oscar Tugo Circle, and down Avenue Louis Pasteur.

- **Urban Design Objective 7: Improve the life of the campus by enhancing street-level activity.**

  Ground-level uses and campus improvement projects should enhance the street-level pedestrian environment.

3.6.2 Implementation

Implementation of the campus plan improvements discussed generally below, and described in detail in Section 4.2.3 of this IMP, will realize these urban design objectives.

Defining Neighborhood Edges

Different types of edge conditions exist in the area surrounding the Harvard Longwood Campus. Along Huntington Avenue and Francis Street, buildings should define an uninterrupted street wall, broken only by primary lines of passage and view corridors. This edge should animate the street with main entrances. Within the Longwood Avenue area, street edges are more perforated. Maintenance of a consistent alignment and retaining more permeability between consistent building increments could reinforce the edges that define the interface between campus and city (see Figure 3-10, Edges).

Consistent with Urban Design Objectives 1 and 3, the New Research Building that is under construction by HMS along Avenue Louis Pasteur will improve the definition of edges within the Longwood Campus: it will re-establish Blackfan Street as a city street and give definition to Avenue Louis Pasteur at its southwest end, while creating a number of green spaces on both streets.

Pedestrian Network: Continuity between Campus and City

The pedestrian network that exists within the Harvard Longwood Campus creates the opportunity for important through-block connections linking Longwood Avenue to Huntington Avenue, and Huntington Avenue to the Quad and Shattuck Street. These connections tie in with the surrounding city streets, providing the potential for continuity and permeability between campus and city. Through the years, as the Harvard University Longwood Campus has expanded, the campus pedestrian network has grown in a circumstantial and incremental manner. Existing service access areas and steps with erratic level changes impede a smooth, continuous pedestrian flow through this network of paths.

Consistent with Urban Design Objectives 1 and 3, two potential north-south lines of passage through the campus linking Longwood Avenue to Huntington Avenue have been identified in this IMP. One will extend the major axis along Avenue Louis Pasteur to connect through to Brigham Circle, formalizing an urban sequence that links Brigham Circle to the Back Bay Fens. The other will be more informal, linking a series of discrete spaces that run along the existing HSDM Building and the future HSDM Research and Education Building to the Countway Plaza, and south to Huntington Avenue. Campus improvements proposed within this IMP (see Section 4.2.3) will define and enhance these north-south passageways. A third north-south pedestrian passage at Palace Road will be improved with development of the Harvard Longwood Campus beyond the five-year master plan. These enhanced north-south pedestrian pathways will improve the

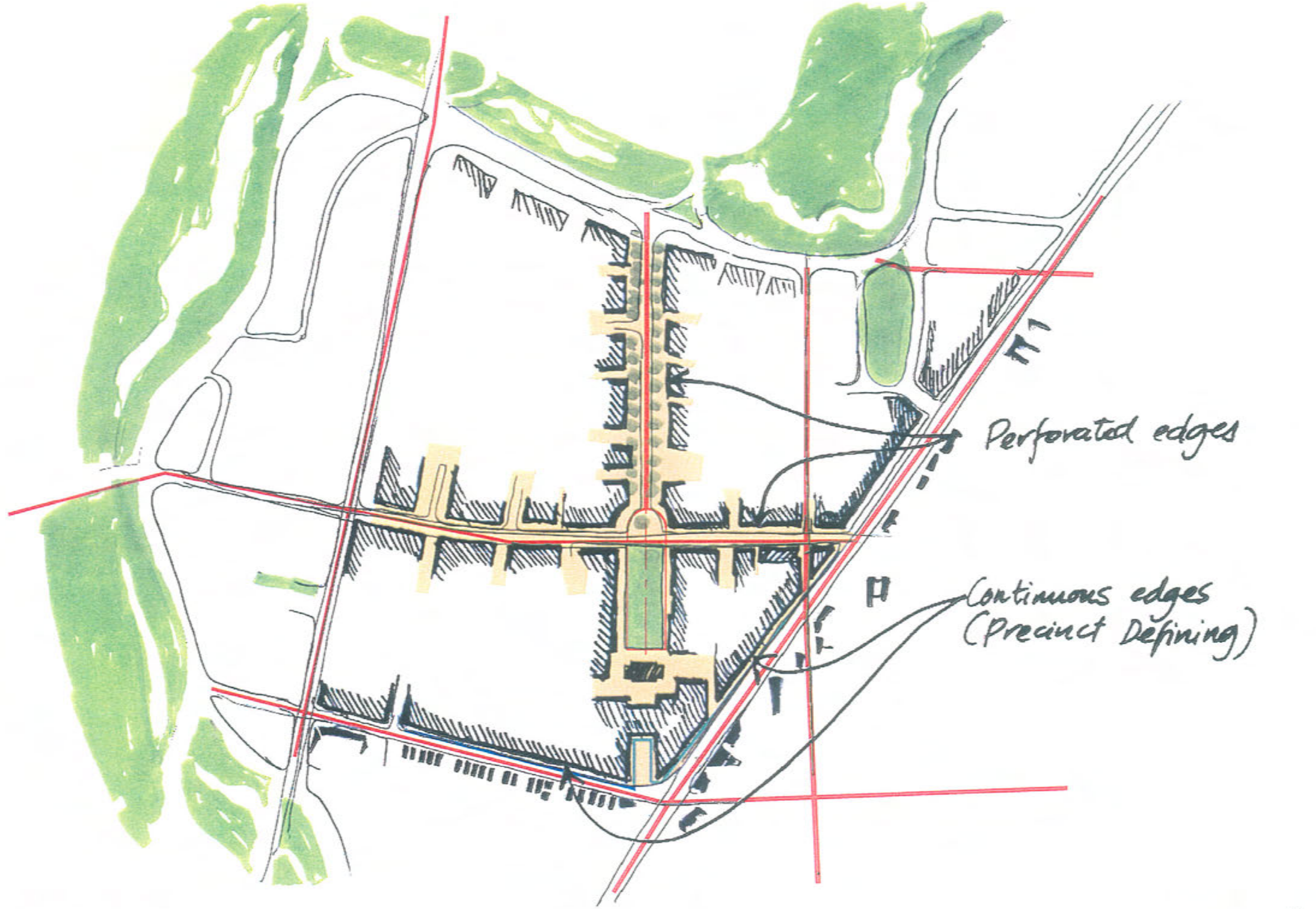


Figure 3-10: Edges

connections between the surrounding residential neighborhoods and the Harvard Longwood Campus.

An east-west connection exists through the Countway Plaza, linking Huntington Avenue and Shattuck Street. Improvements are proposed within this IMP that will further enhance pedestrian flow along this east-west connection.

At the New Research Building site currently under construction, a new east-west connection will link Avenue Louis Pasteur with Blackfan Street, which could be extended to the north and east. Additional internal east-west connections are provided through buildings, but with controlled access to campus users.

Within the blocks north of Longwood Avenue, pedestrian access would benefit from the creation of new pathways extending north of Blackfan Street and new east-west paths. Creation of these pathways is only possible with improvements that are not on Harvard property (see Figure 3-11, Major Pedestrian Paths).

Lines of Passage, Places of Convergence; Campus Walkways, Parks and Plazas

Furthering Urban Design Objectives 1, 3, 5, and 6, a continuous campus pedestrian network will be created, organizing existing paths into a legible and comprehensive whole. Composed of the existing informal labyrinth of paths that meander between buildings, it will create more relaxed and episodal sequences that contrast with the grand formality of the Medical School Quad. Where converging lines of passage within the campus cross, intimate plazas and green spaces for public gathering are created as essential informal meeting places that contribute to the quality of campus life (see Figure 3-12, Lines of Passage/Places of Convergence). A total of approximately 86,400 sf of green space and pedestrian network will be newly created to complete this goal.

The Life of the Campus

Furthering Urban Design Objectives 3 and 7, the design of new buildings will contribute to shaping exterior spaces not only through their massing, but also by encouraging the location of more program elements, such as lobbies, break-out spaces, cafes, etc., to provide animation at grade level. Buildings will be conceived to encourage movement, thus allowing for secondary paths of movement to traverse the campus. Pedestrians will be required to pass through controlled access points (Figure 3-13, Pedestrian Network).

Increased use of glass will permit more transparency and legibility of the activities within from the exterior spaces. Buildings can incorporate design elements that define sub-spaces of the campus and provide visual punctuation and spatial definition. The creative introduction of lighting elements, street furniture, canopies, and paving will provide a unifying theme to the pedestrian network, add human scale, and enhance the fluidity of movement.

Enhancing Pedestrian Access

To achieve the goals of the campus master plan, the ease of pedestrian access will be enhanced. The pedestrian network improvements are identified in Figure 3-14, Pedestrian Enhancements, and include: removal of surface parking and elevated parking structures located around the site of the proposed HSDM Research and Education Building, restriction of vehicular access lanes, and removal of bicycle shelters and concrete planters.

Modifications will need to be made to existing steps and stairways that impede upon or complicate pedestrian movement. The Countway Plaza represents a very visible open space of some magnitude within the campus. Improvements and corrections to the circulation network are proposed that will enhance access to the Countway Plaza.

A proposed connection that relates the Medical School Quad to Brigham Circle is only possible with changes that are not on Harvard property, including the important exterior space to the southeast of the Brigham and Women's Hospital building.

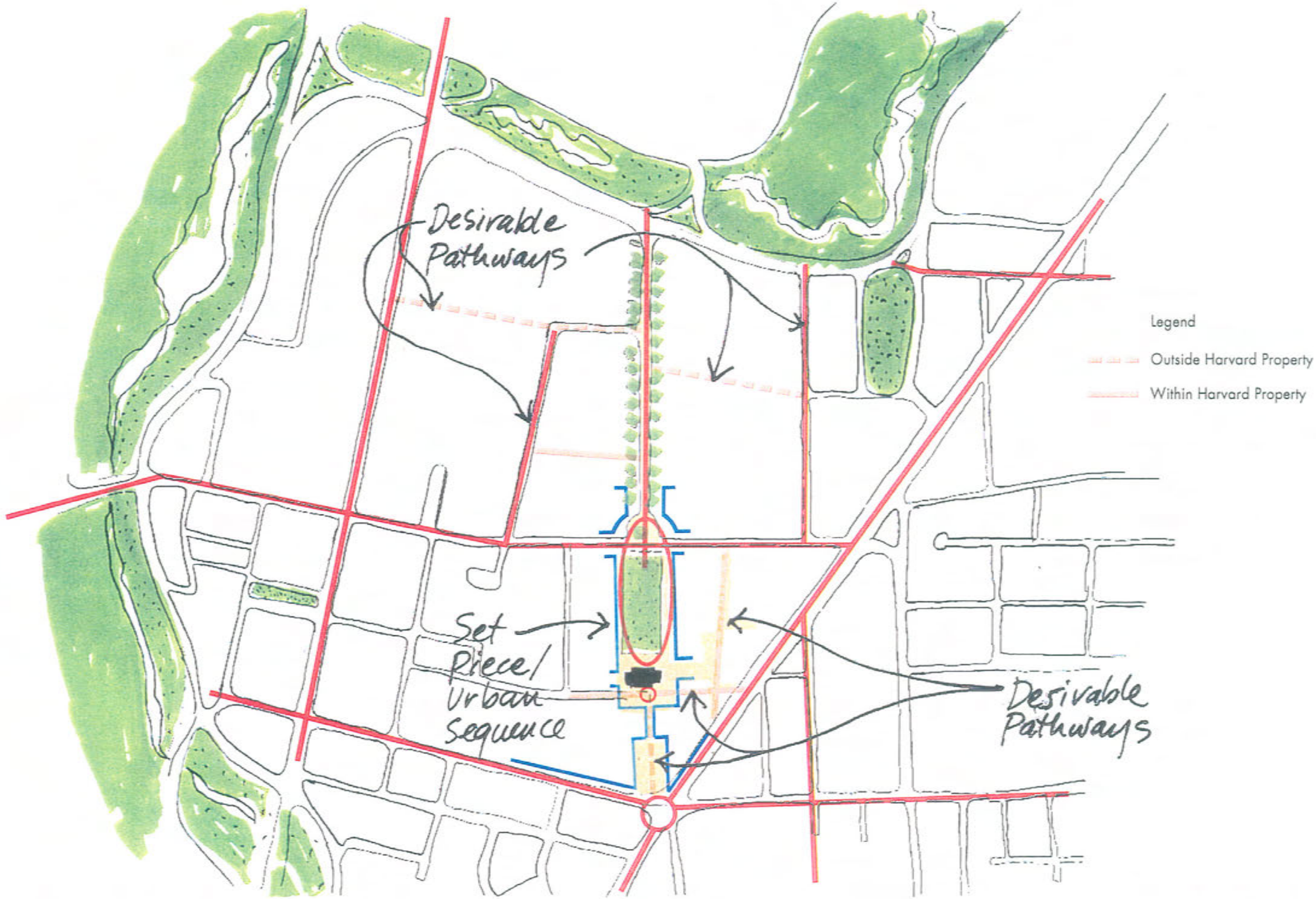


Figure 3-11: Major Pedestrian Paths

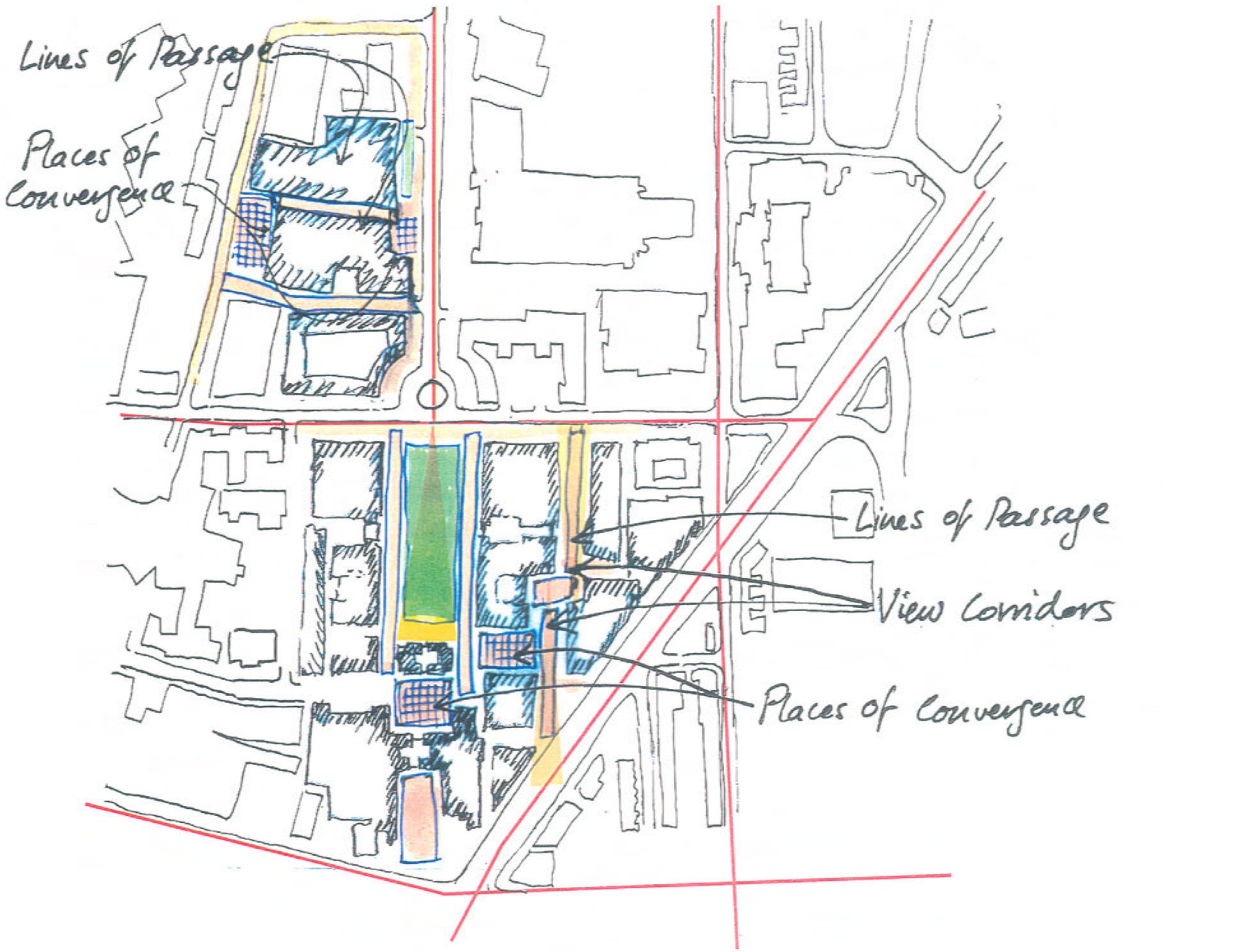


Figure 3-12: Lines of Passage/Places of Convergence

Figure 3-13: Pedestrian Network

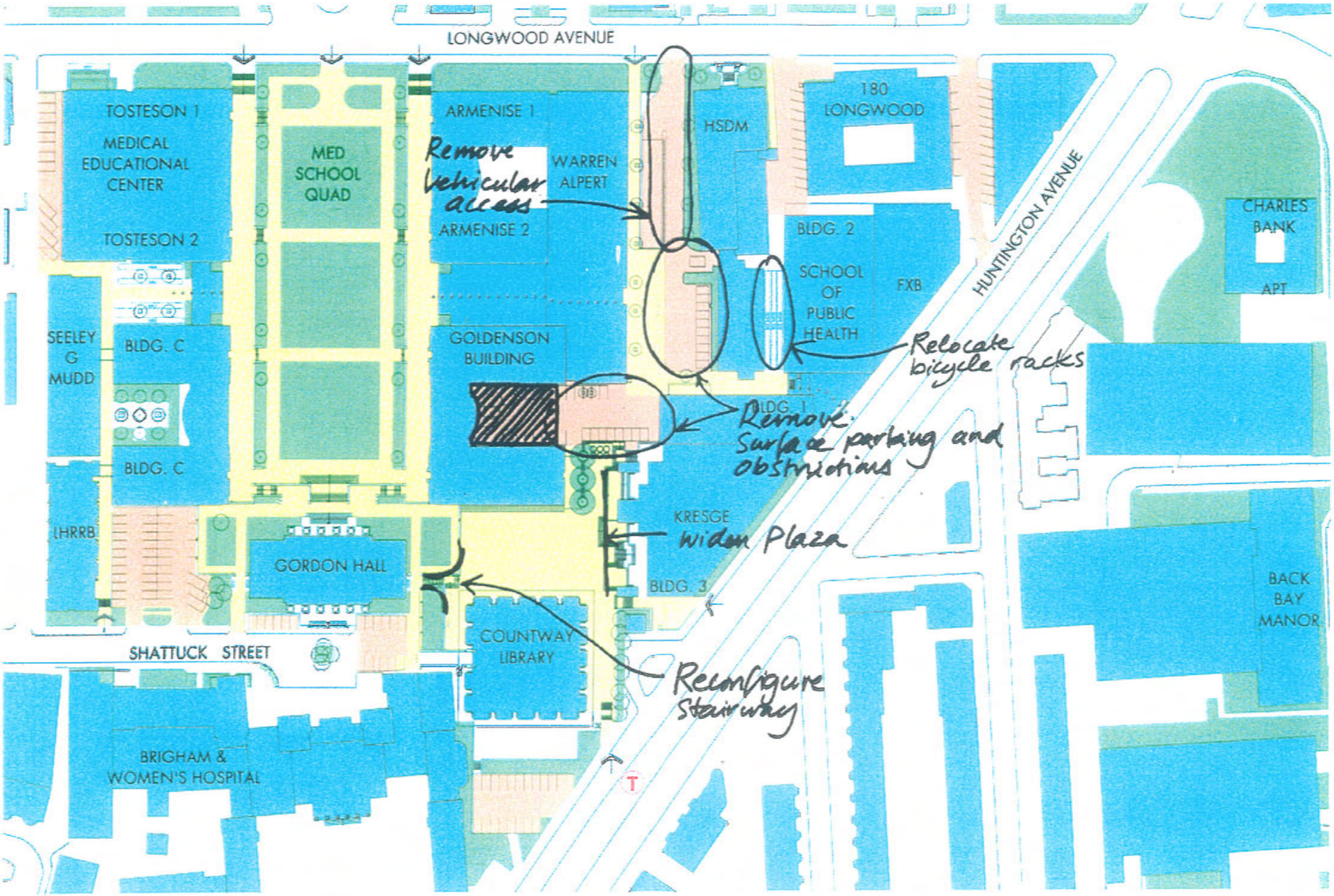


Figure 3-14: Pedestrian Enhancements

4.0 Proposed IMP Projects

4.0 PROPOSED IMP PROJECTS

4.1 Introduction

This section describes the proposed projects, including new construction and additions, and campus improvement projects, contemplated on the Harvard University Longwood Campus within the five-year timeframe of the IMP.

4.2 Proposed IMP Projects

Construction of the additional research space described in this section will allow Harvard University to continue its ongoing, cutting-edge research initiatives that would otherwise be limited by overcrowded and outdated facilities. Figure 4-1, Site Plan with Proposed Projects, identifies the location of the proposed building projects.

4.2.1 New Construction: HSDM Research and Education Building

Harvard proposes the demolition of the existing Interim Building at the HSDM and its replacement with an approximately 53,000-square-foot, five-story building in the same location. The HSDM Research and Education Building will replace the obsolete, 11,050-square-foot facility (originally constructed as a temporary structure) with a new building that will house research facilities, classrooms, and faculty offices. This project site is identified as Site 1 on Figure 4-1.

Most of the proposed new space at the HSDM Research and Education Building will allow for necessary decompression of existing overcrowded uses at the HSDM. The HSDM Research and Education Building will provide an opportunity to create permanent state-of-the-art space for existing uses at the Interim Building; will allow existing research functions located elsewhere to be relocated to the new building; and will provide growth space for research and staff. Only 16,000 sf of the total proposed 53,000 sf are intended for new research uses and staff.

The creation of a new building at the HSDM is critical to the continued development and growth of the dental research program, which has been successfully launched over the last few years, and to the recruitment of leading faculty investigators. Replacement of the "Interim Building" has been a priority of the HSDM for several decades. Opportunities for expansion afforded by this project will significantly enhance the teaching environment and experience for students.

Below is a brief description of the proposed HSDM Research and Education Building. See Figure 4-2 for a depiction of the proposed building.

Building Program

The HSDM Research and Education Building will contain a basement level, with 2,500 sf of usable space, that will primarily house mechanical and storage space. The basement will include a designated loading dock next to the existing basement loading docks that service the adjacent HSPH buildings and Warren Alpert Building, with shared ramp access from Longwood Avenue. The ground floor level of 9,200 sf will house teaching space, including an 80-seat lecture hall, and associated lobby and break-out spaces. The main entrance to the building is located opposite the entrance to the Warren Alpert Building. A second floor of 9,650 sf will house office space and three additional floors, each with 10,550 sf, will house research laboratories and offices. The laboratories will be dedicated to research in oral biology, oral medicine, and epidemiology.

Urban Design

The site of the HSDM Research and Education Building, the building massing, program organization, and façade treatment have all been carefully studied to respond to and contribute towards the master planning goals and urban design objectives established within this IMP. The new HSDM Research and Education Building will reinforce spatial order within the campus and, by its program and design, animate the adjoining public spaces.

With a new north-south primary axis, the new building will be attached to the existing HSDM Building, which also has a north-south orientation; thus it will reinforce the idea of physical continuity from Longwood Avenue to the campus. Its massing will complement the Warren Alpert Building to the west, and together they will generate perceptual and visual continuity from Longwood Avenue toward Countway Plaza and vice versa. Rather than "hiding" behind the existing HSDM Building, the proposed HSDM Research and Education Building presents a frontal elevation toward the street (Longwood Avenue), thus energizing the space to the north of it and giving definition to a range of existing spaces. The street façade acts at the same time as a gateway to this part of the campus.

The new building responds, with its geometry and faceted envelope, to the spatial complexities of the site and generates a series of open spaces, primarily at the southwest corner, that give coherence to the campus pedestrian network and have the potential of becoming vibrant places of informal gathering.

All of the newly formed spaces around the building replace asphalt roads and parked cars with colorful brick pavings and benches. Cars are being totally relocated from the Longwood-Huntington Avenue corridor (except emergency vehicles), and a truly pedestrian campus is being created. New lighting and street furniture in the vicinity of the building will enliven the spaces and visually alleviate some of the past conditions, especially at the lower levels of the HSPH Building 1.

The first floor of the HSDM Research and Education Building is set at the same elevation as these newly created public spaces as well as the first floor of the Warren Alpert Building. This floor contains the most active and most social elements of the program. The transparent clear glass enclosure will give further vitality to the public domain around it, and it will strengthen the perception of permeability and openness.

The gently faceted glass envelope along the west and south and the detailed articulation of these sides will give new focus to the pedestrian experience, especially moving from Countway Plaza toward Longwood Avenue or from the Warren Alpert Building to HSPH Building 2. In general, the new building is intended as a contrasting and invigorating foil to conditions around it.

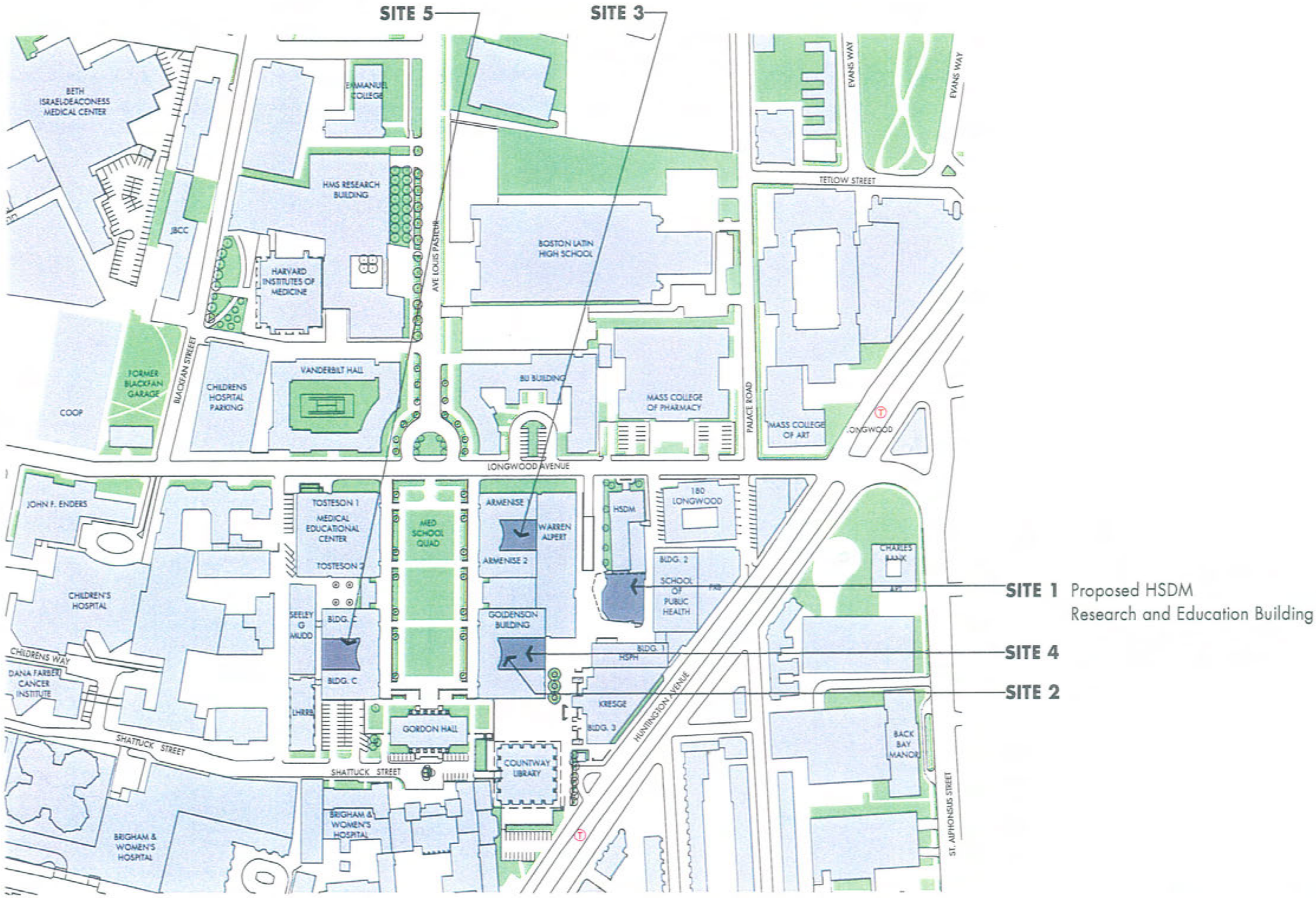


Figure 4-1: Site Plan with Proposed Projects

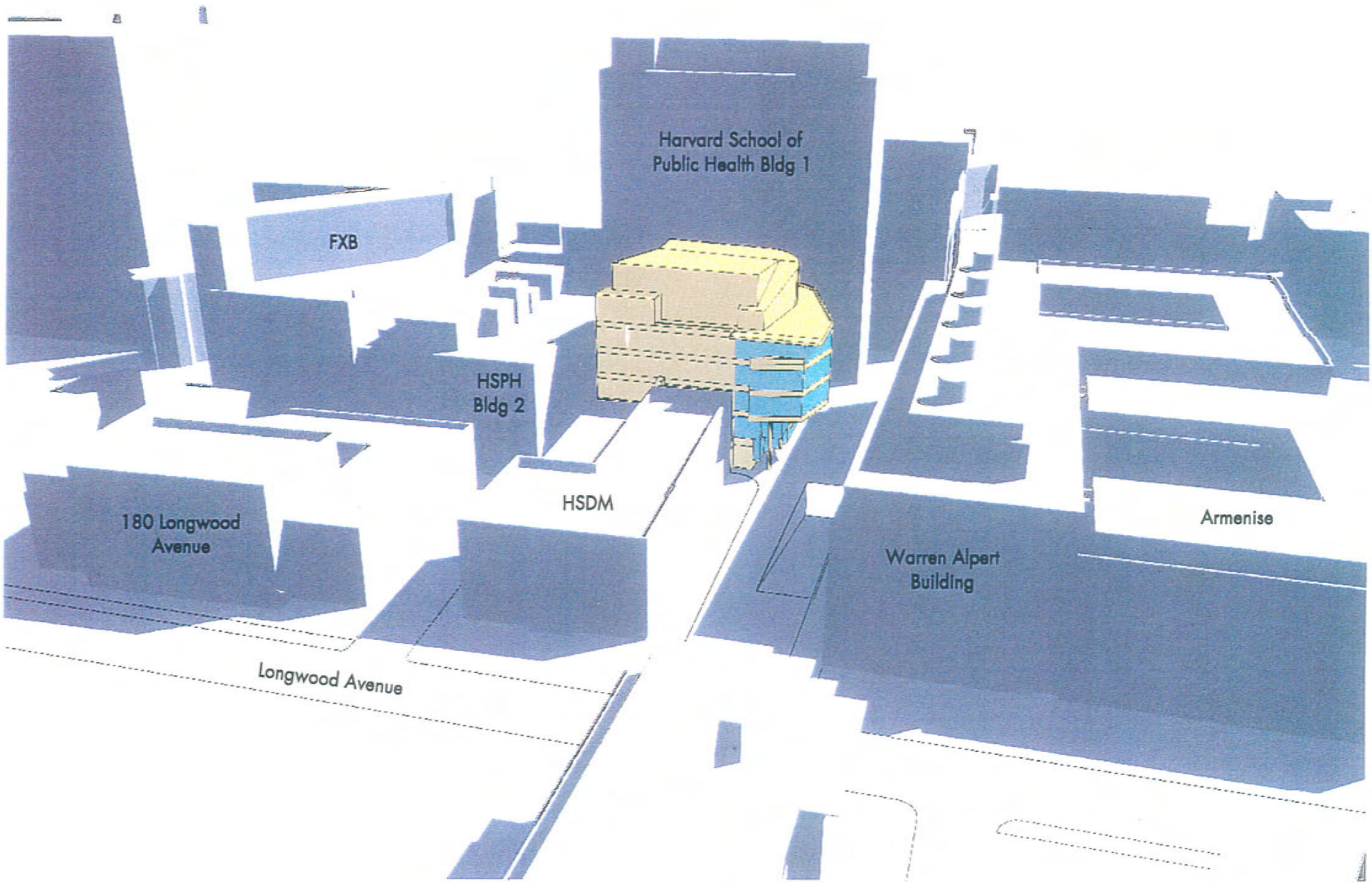


Figure 4-2: Proposed HSDM Research and Education Building

Site Improvements

As part of the project, three campus improvement projects (described below) are proposed that will create an enhanced pedestrian pathway and new pedestrian plaza (the Dental School Plaza) adjacent to the proposed building. These improvements will enliven activity at the ground floor and improve pedestrian movement through the campus.

Alternative Designs

Alternative designs were considered for the project, including an alternative design that was included in the Project Notification Form (PNF) submitted to the BRA in March 2002. The PNF project proposed a building massing that was less conducive to the free flow of pedestrians around the building and created a smaller pedestrian plaza. In response to comments by the BRA and other interested parties, the HSDM Research and Education Building design was changed to maximize open space at the southwest corner of the building and improve pedestrian spaces surrounding the building. The total area of the building also increased modestly from 50,000 sf to 53,000 sf.

A Draft Project Impact Report (DPIR) is being submitted to the BRA simultaneously with this IMP that presents the proposed building design and changes since the PNF in more detail. The DPIR also presents a detailed analysis of the potential environmental impacts of the proposed HDSM Research and Education Building.

4.2.2 Additions

Below are descriptions of the four small building additions expected to occur during the term of the IMP.

Goldenson Magnet Unit

The Goldenson Magnet Unit, a proposed addition of 3,500 - 4,000 sf, will be located below-grade in the courtyard of the Goldenson Medical Research Building at 220 Longwood Avenue. The unit will conduct Magnetic Resonance Imaging (MRI) research. This project is part of the existing Harvard Medical School's Core Facility for Imaging. Research at HMS in deciphering the inner working of the brain has already led to advances in neurodegenerative diseases such as Alzheimer's and Huntington's. Brain imaging provides a new set of technical tools that allows researchers to visualize the working brain with greater resolution providing for a better understanding of fundamental units of cerebral cortex processing. This project site is identified as Site 2 on Figure 4-1.

Armenise Addition

The Armenise Medical Research Building located at 210 Longwood Avenue (formerly known as Building D) currently houses the Center for Blood Research, HMS Pathology and Microbiology Departments, and HMS administrative offices. This building is proposed to be expanded by adding approximately 8,000-10,000 sf within the building's courtyard to house additional biomedical research facilities. This infill structure will be two to three stories in height. The project site is identified as Site 3 on Figure 4-1.

Goldenson Addition

The Goldenson Medical Research Building located at 220 Longwood Avenue, currently houses a number of HMS research departments, including Genetics, Neurobiology, Pathology, and the Laboratory for Membrane Transport. HMS administrative offices also are located in this building.

This building is proposed to be expanded by means of an approximately 8,000-10,000-square-foot addition within the courtyard of the building above the previously described Goldenson Magnet Unit (Site 2), to house additional biomedical research facilities. The proposed structure would be two to three stories in height. This project site is identified as Site 4 on Figure 4-1.

Building C Addition

Building C, located at 240 Longwood Avenue, currently houses HMS research departments and laboratories. Space in this building may be increased by means of an approximately 8,000-10,000-square-foot addition within the courtyard of the building, to house additional biomedical research facilities. The addition would be two to three stories in height. This project site is identified as Site 5 on Figure 4-1.

Table 4-1 below summarizes the building projects proposed within the five-year timeframe of this IMP.

Table 4-1: Proposed Building Projects

Site No.	New Construction	Footprint Size (sf)	Building Area (sf)	Height	
				stories	feet
Site 1	HSDM Research and Education Building*	10,550	53,000	5	75
	Additions				
Site 2	Goldenson Magnet Unit Addition	3,500 – 4,500	3,500 – 4,500	(below grade)	n/a
Site 3	Armenise Addition	4,200	8,000 – 10,000	2 – 3	30 – 55
Site 4	Goldenson Addition	4,200	8,000 – 10,000	2 – 3	30 – 55
Site 5	Building C Addition	4,200	8,000 – 10,000	2 – 3	30 – 55
	Total		80,500 – 87,500		

* Demolition of the existing Dental School Interim Building with approximately 11,050 sf will be required.

4.2.3 Campus Improvement Projects

One of the principal goals of the campus master plan is to expand and improve the existing pedestrian circulation system. Campus improvements contemplated within the five-year IMP that will enhance the pedestrian system are described below (see Figure 4-3, Campus Improvement Projects, and Figure 4-4, Campus Improvements – Legibility of Circulation).

- **Campus Improvement Project 1 -- Expand existing pedestrian pathways from Huntington to Longwood Avenue.**

  The existing vehicular roadway adjacent to the garage entrance and HSDM Building will be transformed into a brick-paved pedestrian way, and all surface vehicular traffic will be diverted directly into the existing underground parking garage.

  The new HSDM Research and Education Building will form a gateway to the campus walkway (Figure 4-5, Expanded Pedestrian Path at HSDM Research and Education Building). The existing view corridor towards Longwood Avenue will be preserved and enhanced, with the new building framing the perspective (Figures 4-6 and 4-7, Dental School Plaza Looking North).

- **Campus Improvement Project 2 -- Relocate grade-level parking currently located at the site of the proposed HSDM Research and Education Building and in the area south of the Warren Alpert Building. Create new pedestrian plaza.**

  Surface parking areas currently located behind and adjacent to the Interim Building will be transformed into pedestrian plazas. Lighting will be introduced throughout the area, both as a theme of visual interest and as a way to direct pedestrian movement.

  Lighting fixtures, treated as sculptural elements of differing scales, will enliven the corner created by HSPH Building 1 and provide continuity of north-south pedestrian flow as it bends towards the Countway Plaza (Figure 4-8, Dental School Plaza and Lighting Elements). The new Dental School Plaza created between the new HSDM Research and Education Building and HSPH Building 1 will respond to east-west movement that traverses between the main entrance lobby of the School of Public Health and the Warren Alpert Building, with the introduction of playful canopies that provide places for informal gathering and act as light reflectors at night (Figure 4-9, Dental School Plaza Looking East).

- **Campus Improvement Project 3 – Extend the paved pedestrian pathway between the new HSDM Research and Education Building and the HSPH buildings to the existing HSDM parking area.**

  Existing bicycle sheds will be removed and bicycle racks will be relocated to a nearby location.

- **Campus Improvement Project 4 – Improve north-south pedestrian connection.**

  Existing potted trees that hinder passage will be removed. The new infill building at the Goldenson Building, treated with a glass façade in contrast to the surrounding stone and concrete, will also help direct pedestrian movement by filling in the deep dead-end pocket of space that currently exists. The reflective nature of the glass will maintain the sense of expanded space, and the overhang of the upper floor can provide a sheltered area for bike racks (Figure 4-10, Goldenson Addition Study Sketch).

- **Campus Improvement Project 5 – Realign steps at Countway Plaza in order to circulate more easily along the east side.**

  Lighting bollards will be introduced to emphasize north-south linear movement and to improve pedestrian safety (Figure 4-11, Widened Pedestrian Path).

- **Campus Improvement Project 6 – Improve east-west pedestrian connection through Countway Plaza.**

  The Countway Plaza will be animated with lighting elements along the north and south sides that will also provide human scale to the space. On the north side of the plaza, a lighting support structure will integrate an overhanging trellis that provides a shady space to harbor groupings of terrace furniture (Figure 4-12, Countway Plaza). On the south side, additional lighting elements are shown suspended off the Countway Library (Figure 4-13, Countway Plaza).

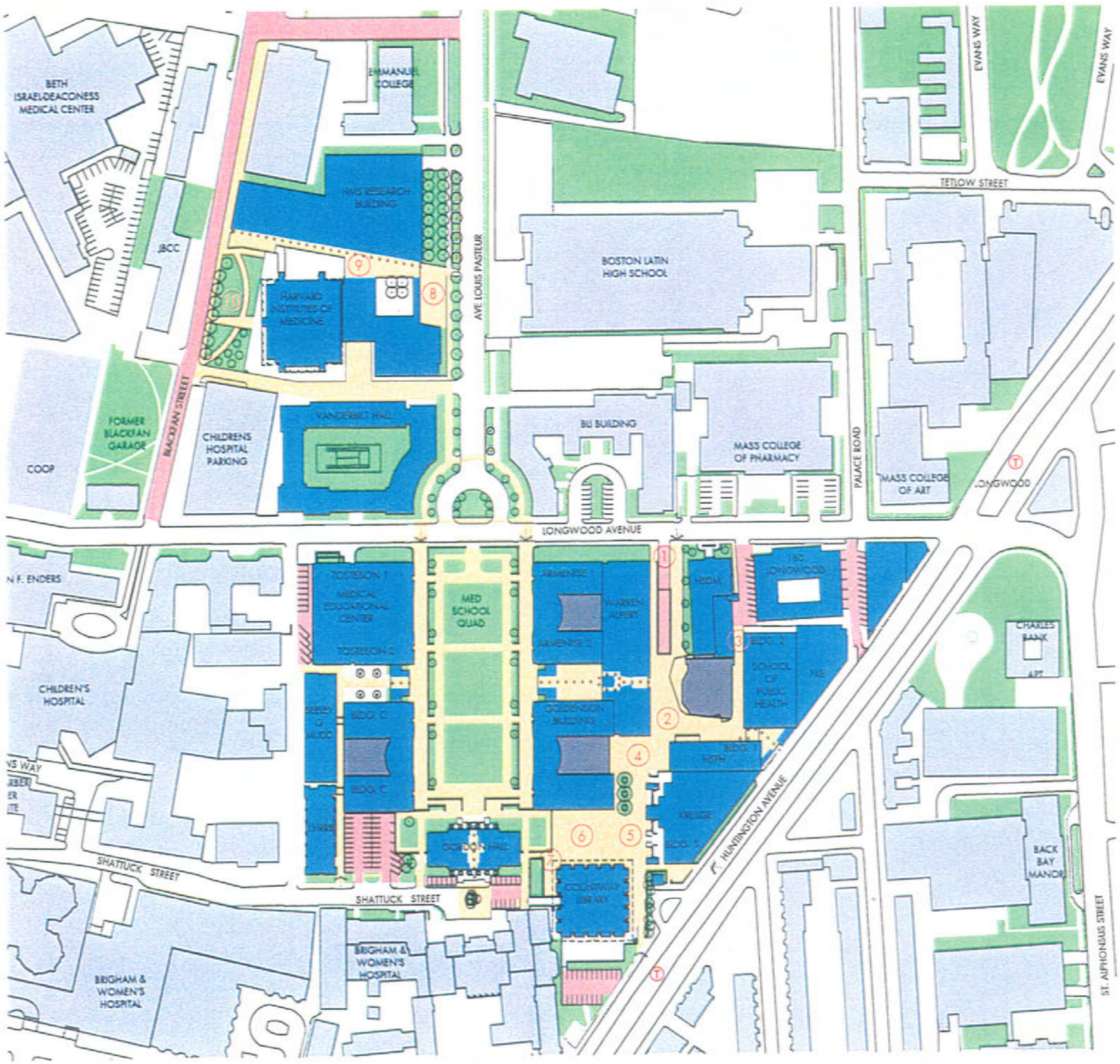
- **Campus Improvement Project 7 – Reconfigure existing steps from the plaza leading up to Gordon Hall to improve east-west movement toward Shattuck Street.**

  The stairs currently step down to a sunken landing, providing access to a basement door. This access has been determined no longer necessary, and the landing will be raised to meet grade. Additional lighting will be added for nighttime security and safety (Figure 4-14, Steps up to Gordon Hall from Countway Plaza).

Further campus improvements currently in progress are described below and depicted in Figure 4-15, Projects in Progress.

- **Campus Improvement Project 8 – Creation of a new pedestrian plaza at the east entrance to the New Research Building.**

  The design of the lower element of the New Research Building on Avenue Louis Pasteur incorporates scale and materials in keeping with the context of the building. The façade and massing of this portion of the building will form a backdrop for the pedestrian plaza in front of the building, which will provide an accessible, inviting urban open space at grade.



Legend

- Pedestrian Circulation
- Internal Pedestrian Circulation (Controlled Access)
- Vehicular Circulation /Parking
- Open/Green Space
- Existing Buildings
- Existing Harvard Buildings
- New Construction
- Entry to Campus
- Areas of Intervention

CAMPUS IMPROVEMENTS

1. Expand paved pedestrian pathways up to Longwood Avenue. Redirect vehicular traffic for direct access to underground parking.

2. Relocate parking. Create new pedestrian plaza. Introduce site lighting as a theme through the project.

3. Extend paved pedestrian pathway up to existing HSDM parking area.

4. Improve north-south pedestrian connection.

5. Realign steps at Countway Plaza.

6. Improve east-west pedestrian connection, through Countway plaza. Introduce lighting elements.

7. Reconfigure steps to Gordon Hall.

8. Create new pedestrian plaza at east entrance of the new HMS New Research Building.

9. Create internal east-west pedestrian connection through HMS New Research Building.

10. Create new pedestrian green space at west entrance to HMS New Research Building. (2 Phases)

Figure 4-3: Campus Improvement Projects

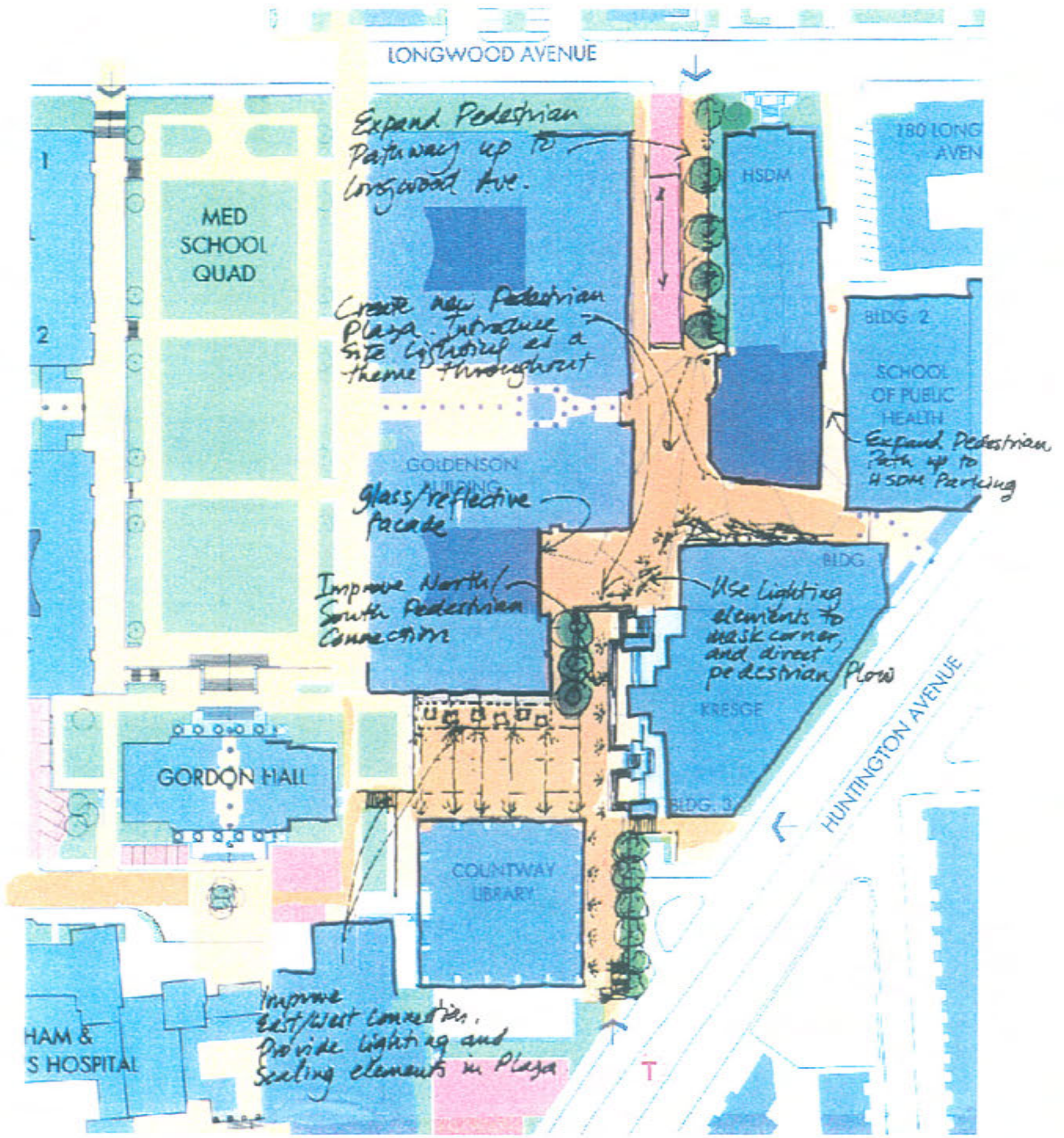
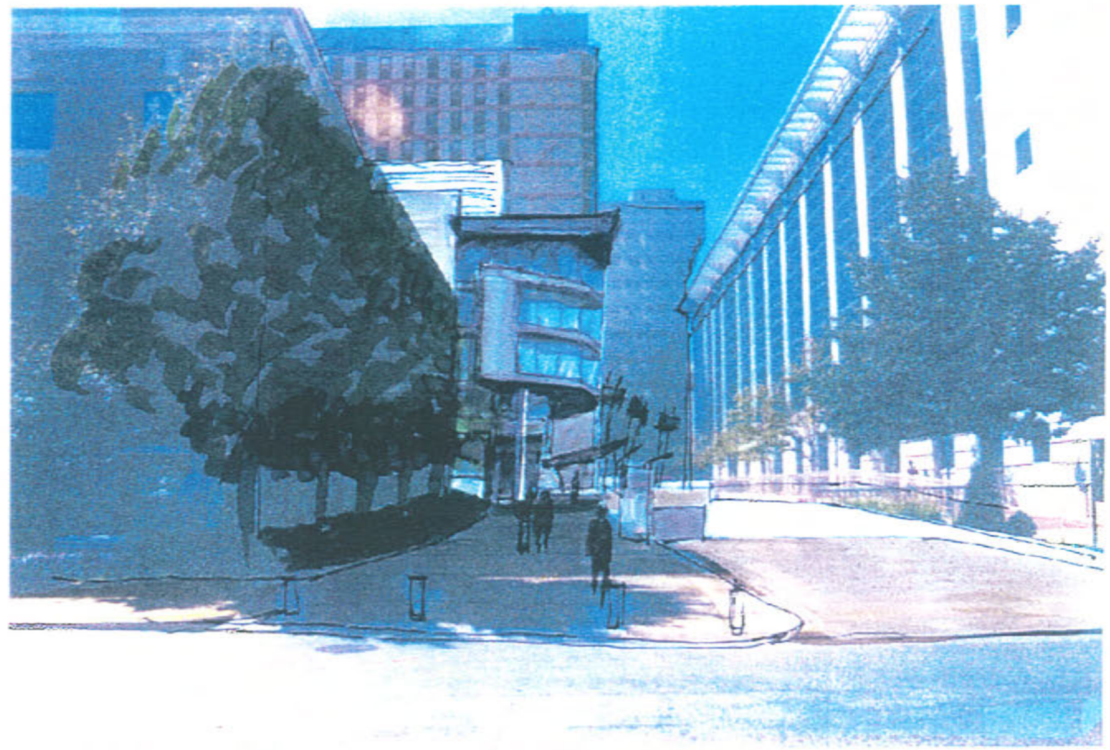


Figure 4-4: Campus Improvements - Legibility of Circulation

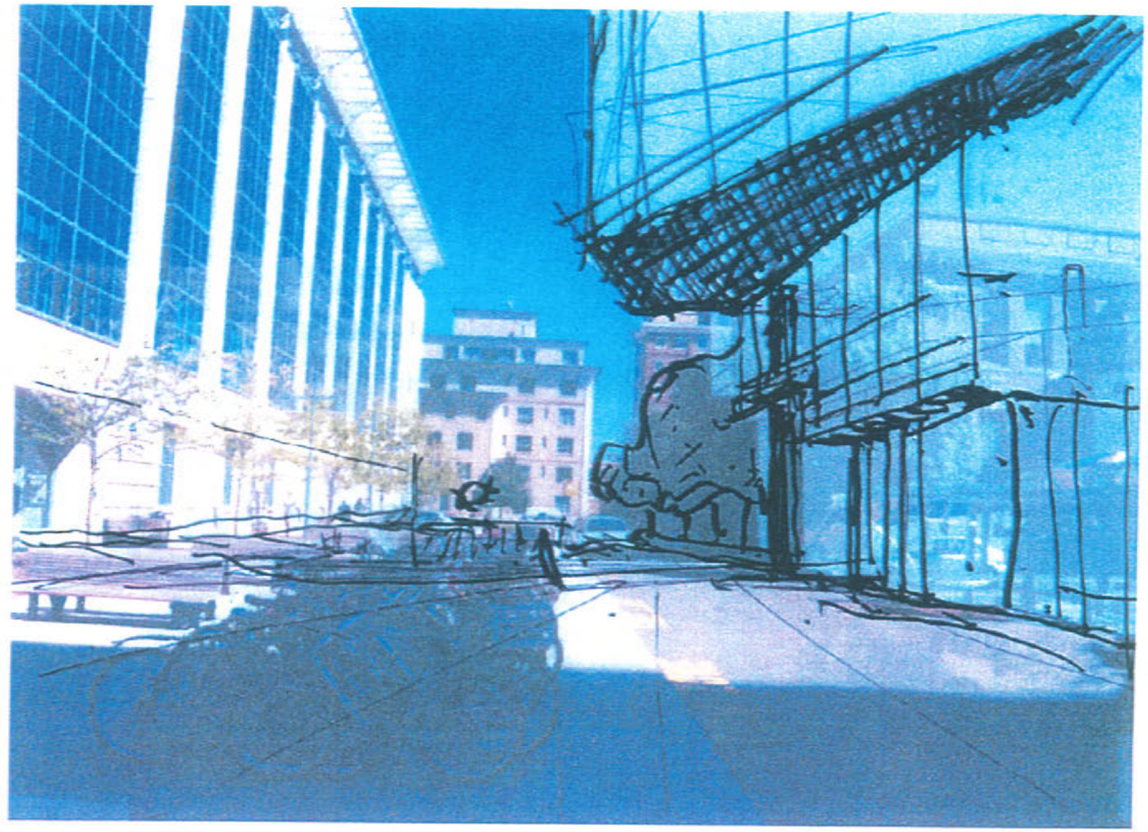
Existing



Proposed New Pedestrian Walkway showing the New Building

Figure 4-5: Expanded Pedestrian Path at HSDM Research and Education Building

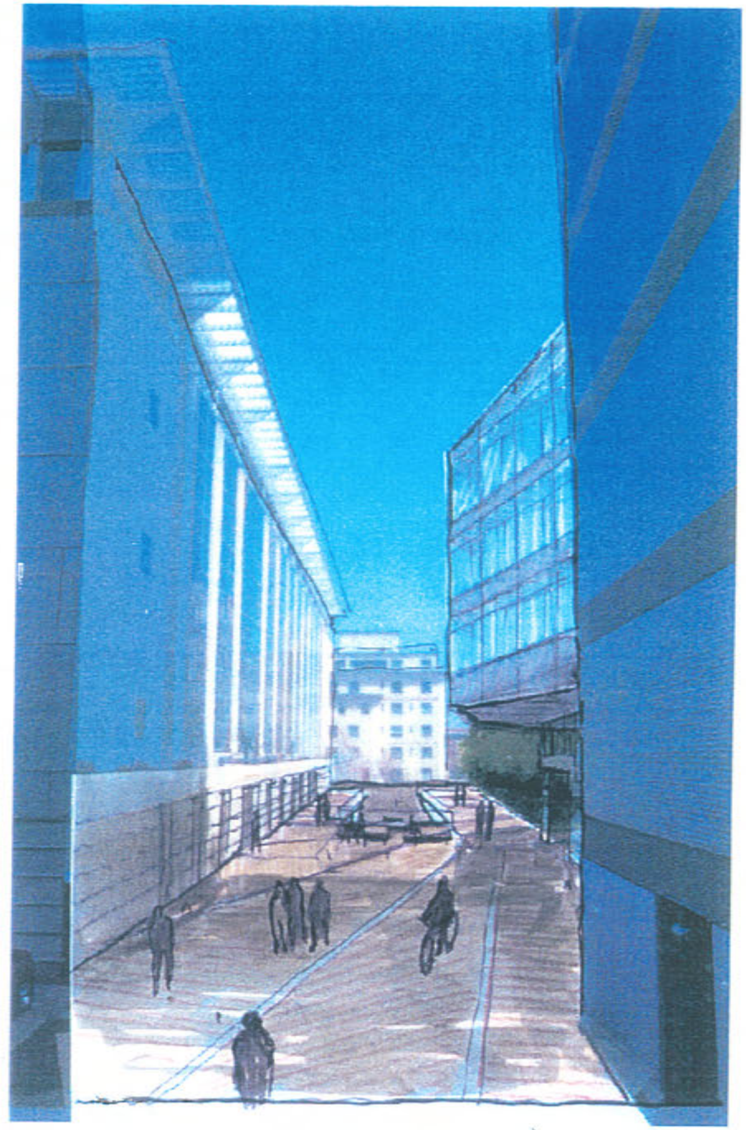
Existing



Proposed Plaza & Walkway at the New Building Entrance

Figure 4-6: Dental School Plaza Looking North

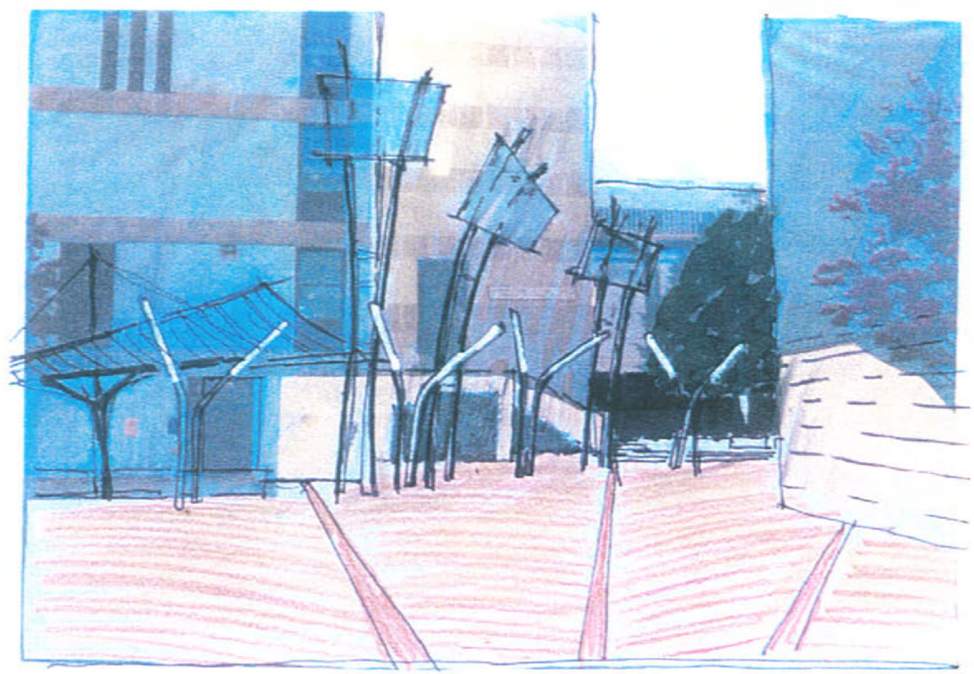
Existing



Proposed

Figure 4-7: Dental School Plaza Looking North

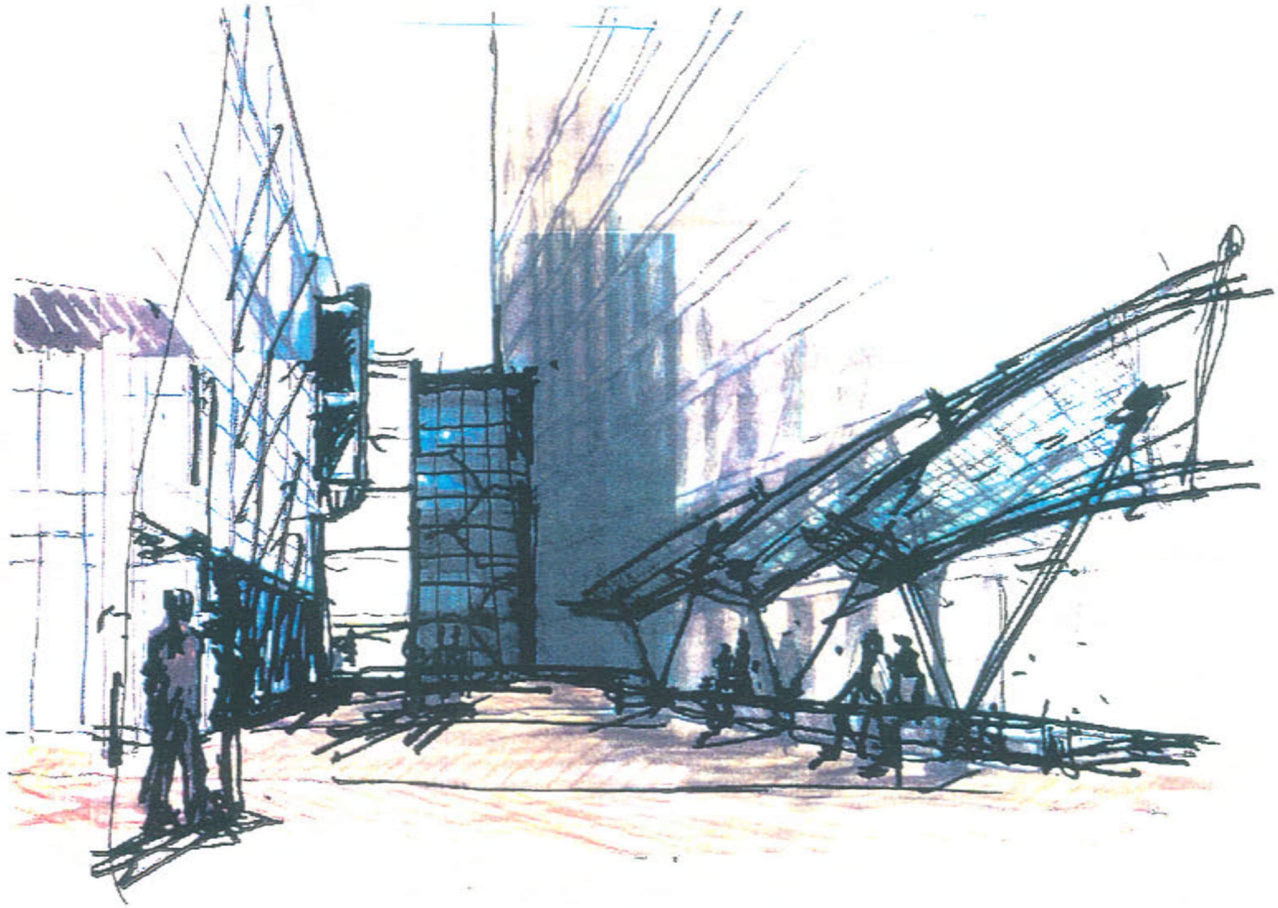
Existing



Proposed New Plaza with Lighting Elements

Figure 4-8: Dental School Plaza and Lighting Elements

Existing



Proposed New Plaza Showing the entrance to the Harvard School of Public Health

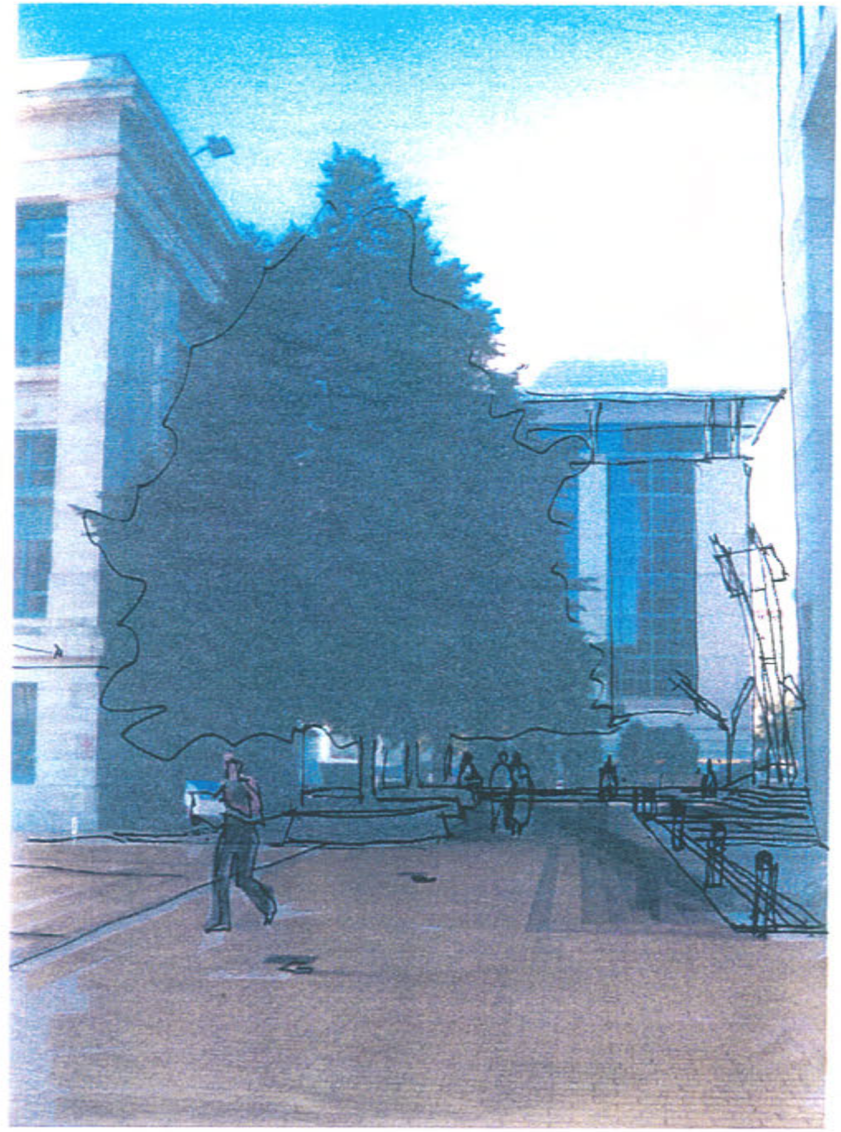
Figure 4-9: Dental School Plaza Looking East

Existing

Study Sketch

Figure 4-10: Goldenson Addition Study Sketch

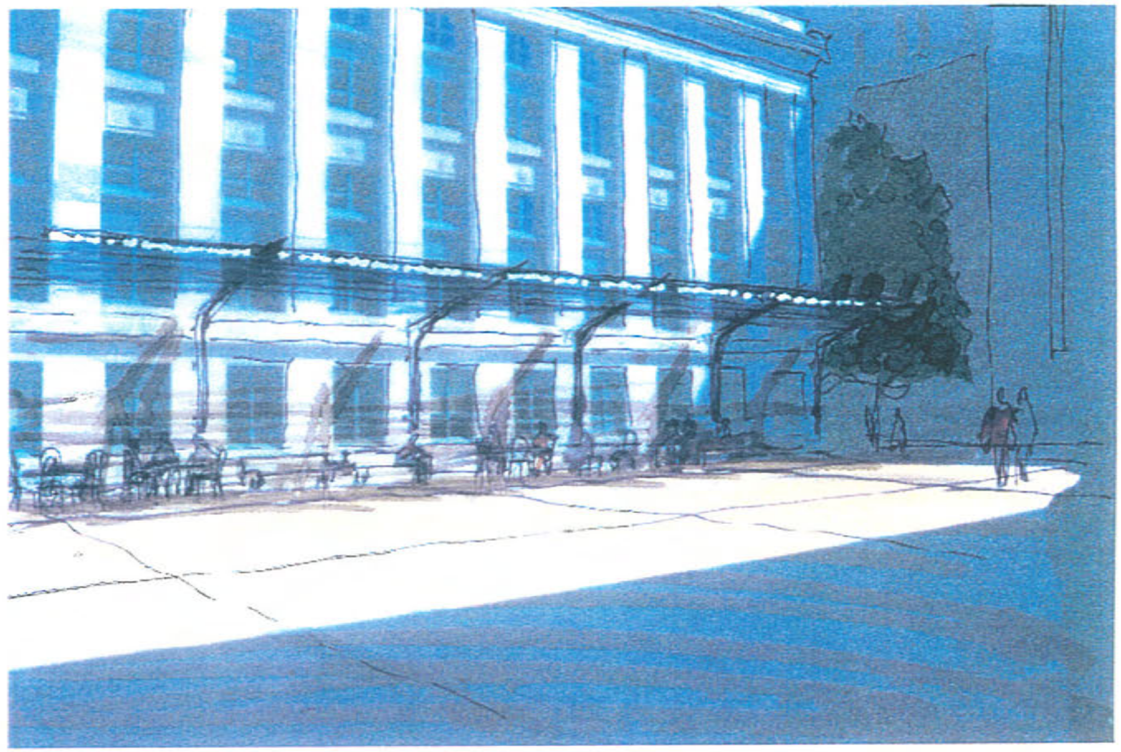
Existing



Proposed

Figure 4-11: Widened Pedestrian Path

Existing



Proposed

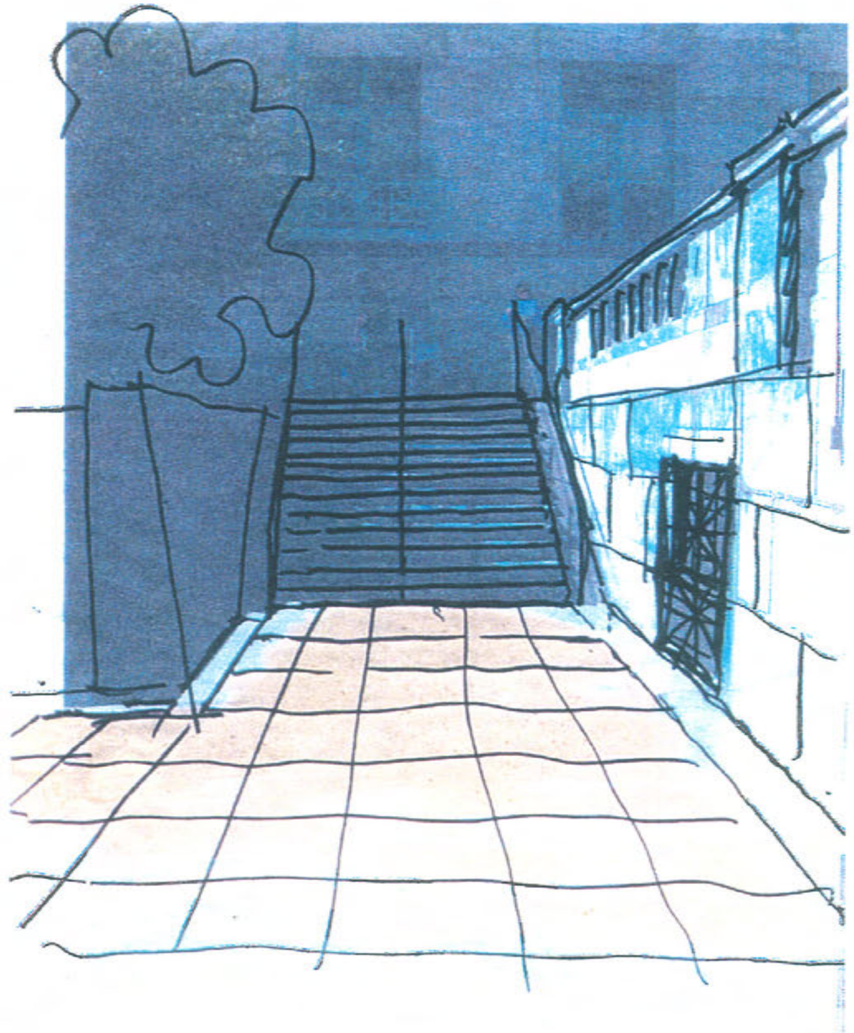
Figure 4-12: Countway Plaza

Existing

Proposed

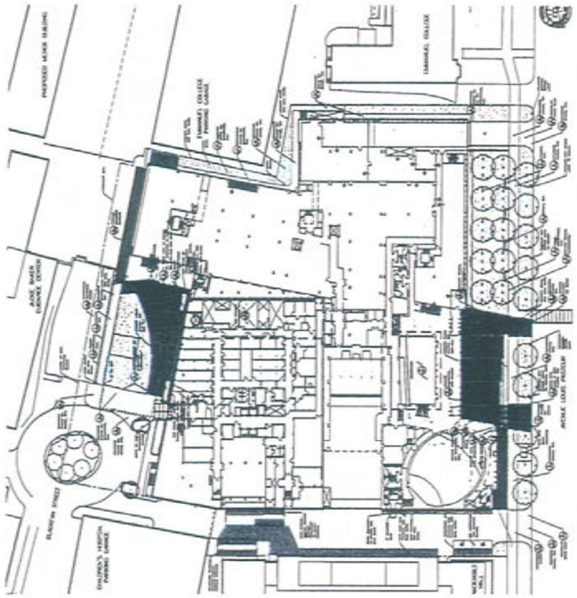
Figure 4-13: Countway Plaza

Existing

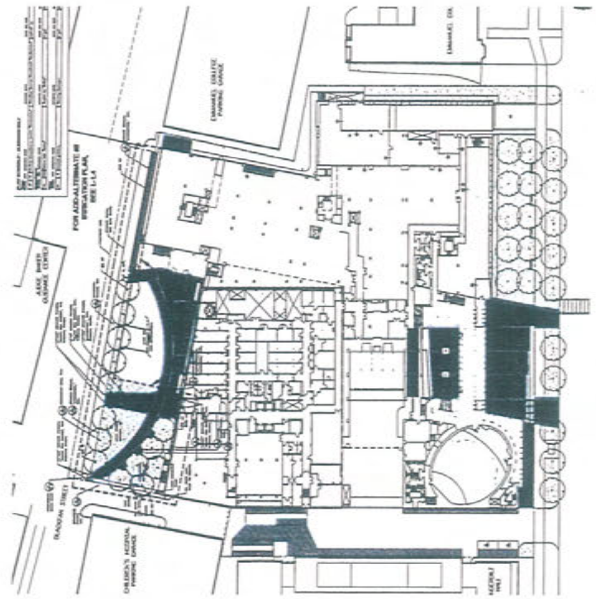


Proposed

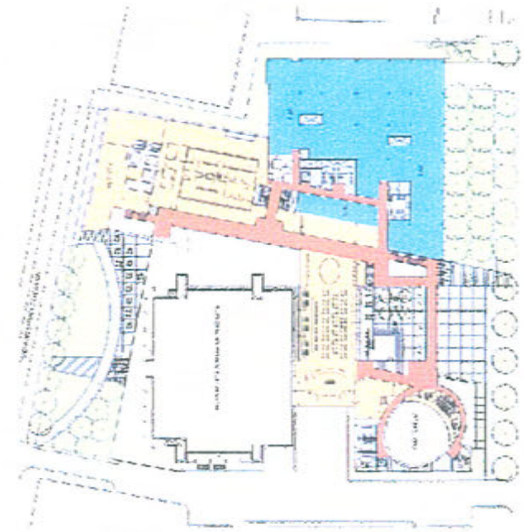
Figure 4-14: Steps Up To Gordon Hall from Countway Plaza



HMS Research Building
Landscape Plan Phase 1



HMS Research Building
Landscape Plan Phase 2



HMS Research Building
Upper Level

Figure 4-15: Campus Improvements · Projects In Progress

The main entrance to the New Research Building will be off of the pedestrian plaza at the front of the building. This space will be landscaped and will provide an improvement over the existing concrete stairs at the site, making it an attractive entrance to the New Research Building and to connections to the Harvard Institutes of Medicine Building and other LMA institutions on the other side of the building. Additionally, the plaza will improve visual connections between the New Research Building and the Medical School Quad.

- **Campus Improvement Project 9 – Creation of an internal east-west pedestrian connection through the New Research Building.**

  The New Research Building was designed to respond to two primary streets, Avenue Louis Pasteur and Blackfan Street, each with an entirely different urban character. The internal east-west pedestrian concourse at the first floor level, in which a number of amenities for building occupants and the LMA community will be located, will serve as a pedestrian connection between Avenue Louis Pasteur and Blackfan Street and will tie the complex together while maintaining appropriately scaled elements on Blackfan Street and Avenue Louis Pasteur. This pedestrian connection will also be important in providing connections from Harvard Institutes of Medicine and the New Research Building to the rest of the Harvard Longwood Campus as well as to other institutions within the LMA.

- **Campus Improvement Project 10 – Creation of a new pedestrian green space at the west entrance to the New Research Building.**

  The portion of the New Research Building on Blackfan Street was designed to be consistent with typical Boston streets, with an active streetscape, open space, and a main entrance on Blackfan Street. This design of HMS's New Research Building strengthens the Blackfan Street edge in accordance with the objectives of the BRA and helps to enliven the street edge. Creation of the pedestrian green space at this entrance that enhances the street edge will reinforce these goals and reinforce pedestrian connections between Harvard Institutes of Medicine and the New Research Building to the rest of the LMA.

4.2.4 Development Context, Phasing, and Schedule

The proposed new construction is depicted within the context of the larger campus in Figures 4-16 and 4-17. The first phase of construction proposed within this IMP, the HSDM Research and Education Building, is shown in Figure 4-16; Figure 4-17 depicts the remaining addition/infill projects. Building heights in the area following development of the IMP projects are presented in Figure 4-18.

The estimated schedules for the various IMP projects are described below in Table 4-2. These schedules are subject to revision or change in response to changes in the University's space needs.

Table 4-2: Development Schedule

Project	Construction Start	Construction Complete
HSDM Research & Education Building	Q1 2003	Q2 2004
Goldenson Magnet Unit	2003	2004
Goldenson Addition	2005	2006
Armenise Addition	2004	2005
Building C Addition	2006	2007
Campus Improvement Project 1	2003	2004
Campus Improvement Project 2	2003	2004
Campus Improvement Project 3	2003	2004
Campus Improvement Project 4	TBD	TBD
Campus Improvement Project 5	TBD	TBD
Campus Improvement Project 6	TBD	TBD
Campus Improvement Project 7	TBD	TBD
Campus Improvement Project 8	In progress	In progress
Campus Improvement Project 9	In progress	In progress
Campus Improvement Project 10	In progress	In progress

TBD = To Be Determined, but would be conducted during five-year timeframe of IMP.

4.2.5 Project Costs

The total cost for all the new construction, additions, and campus improvement projects has been estimated at approximately $41 million.

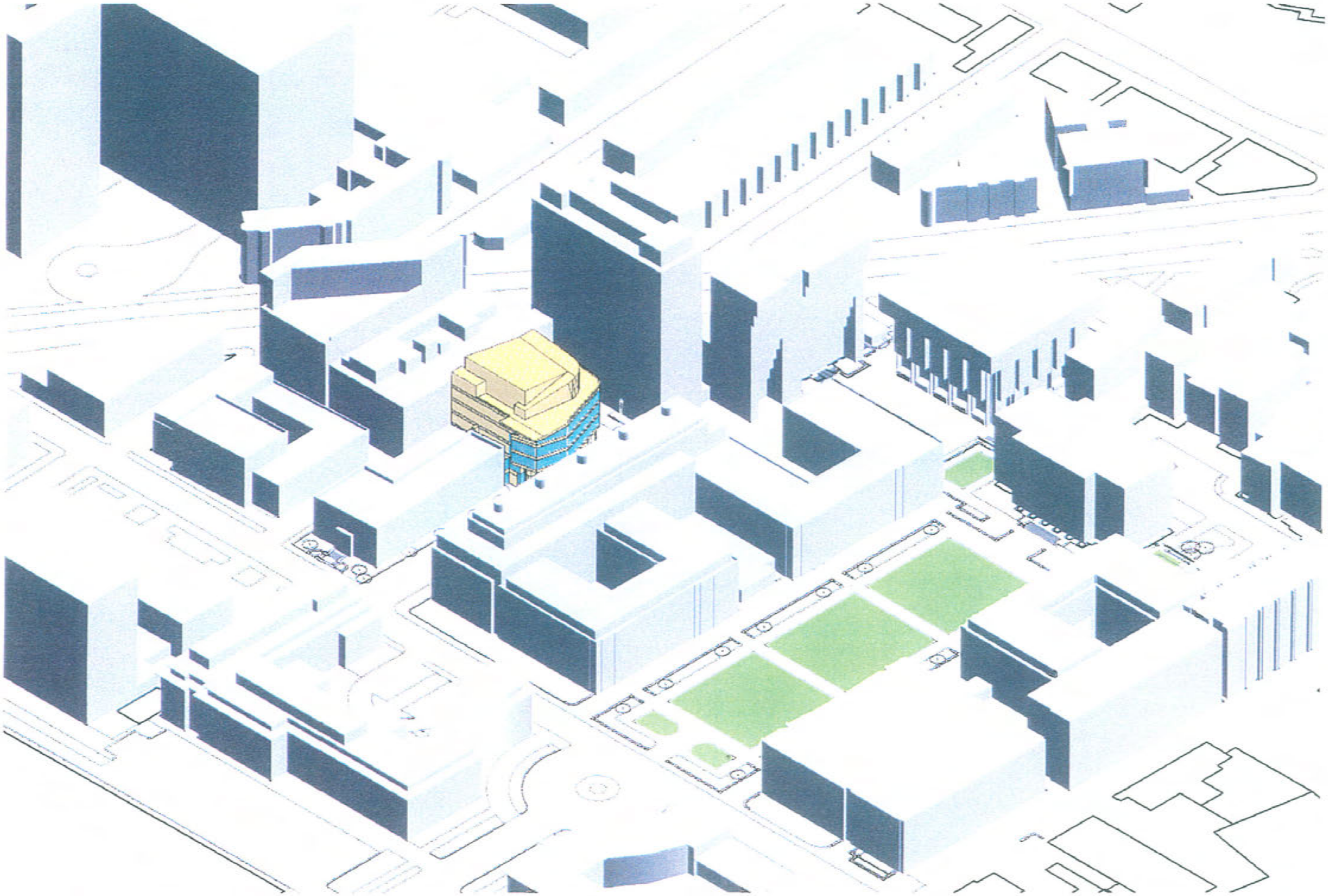


Figure 4-16: Isometric View Looking South East - Phase I

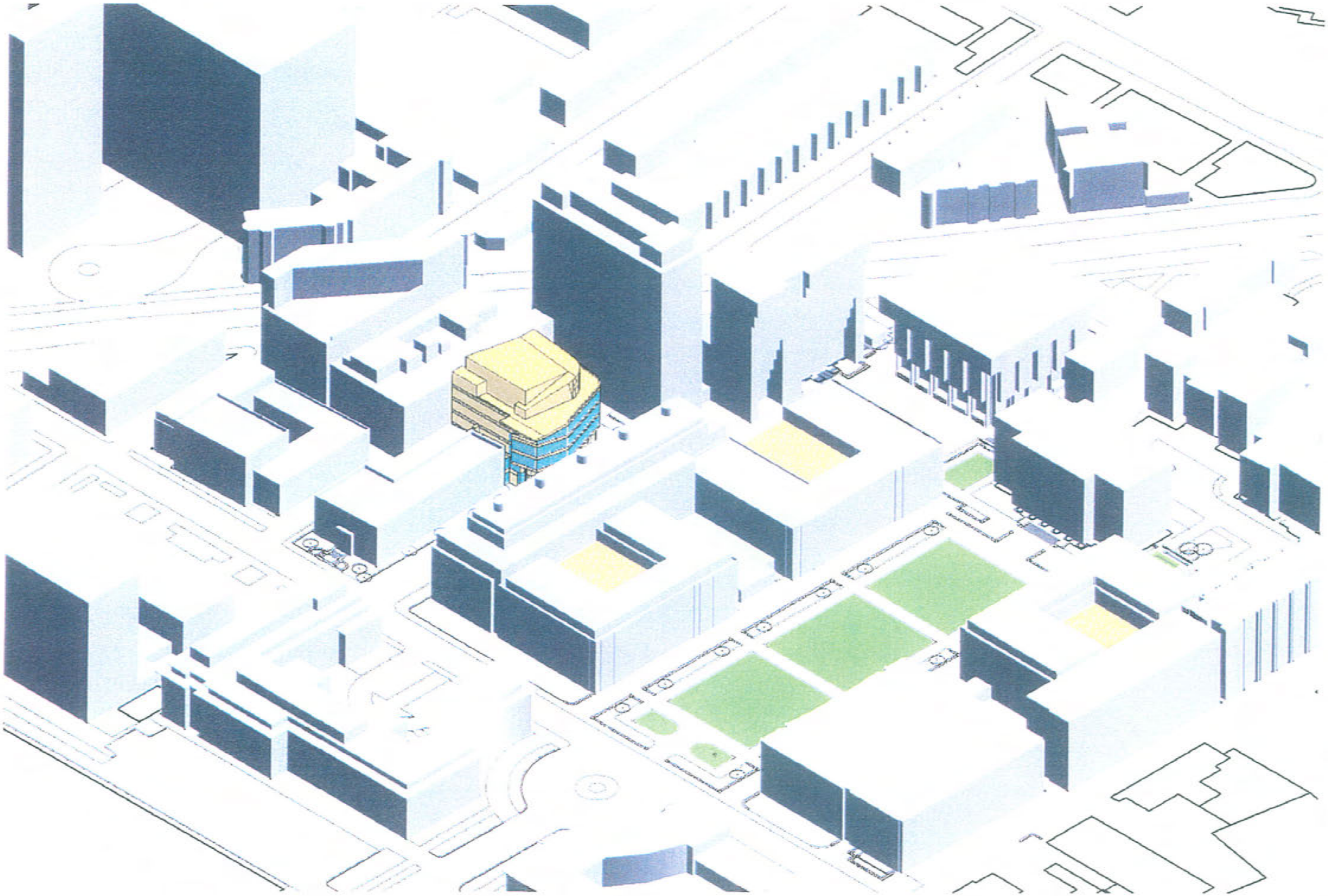


Figure 4-17: Isometric View Looking South East - Phase II

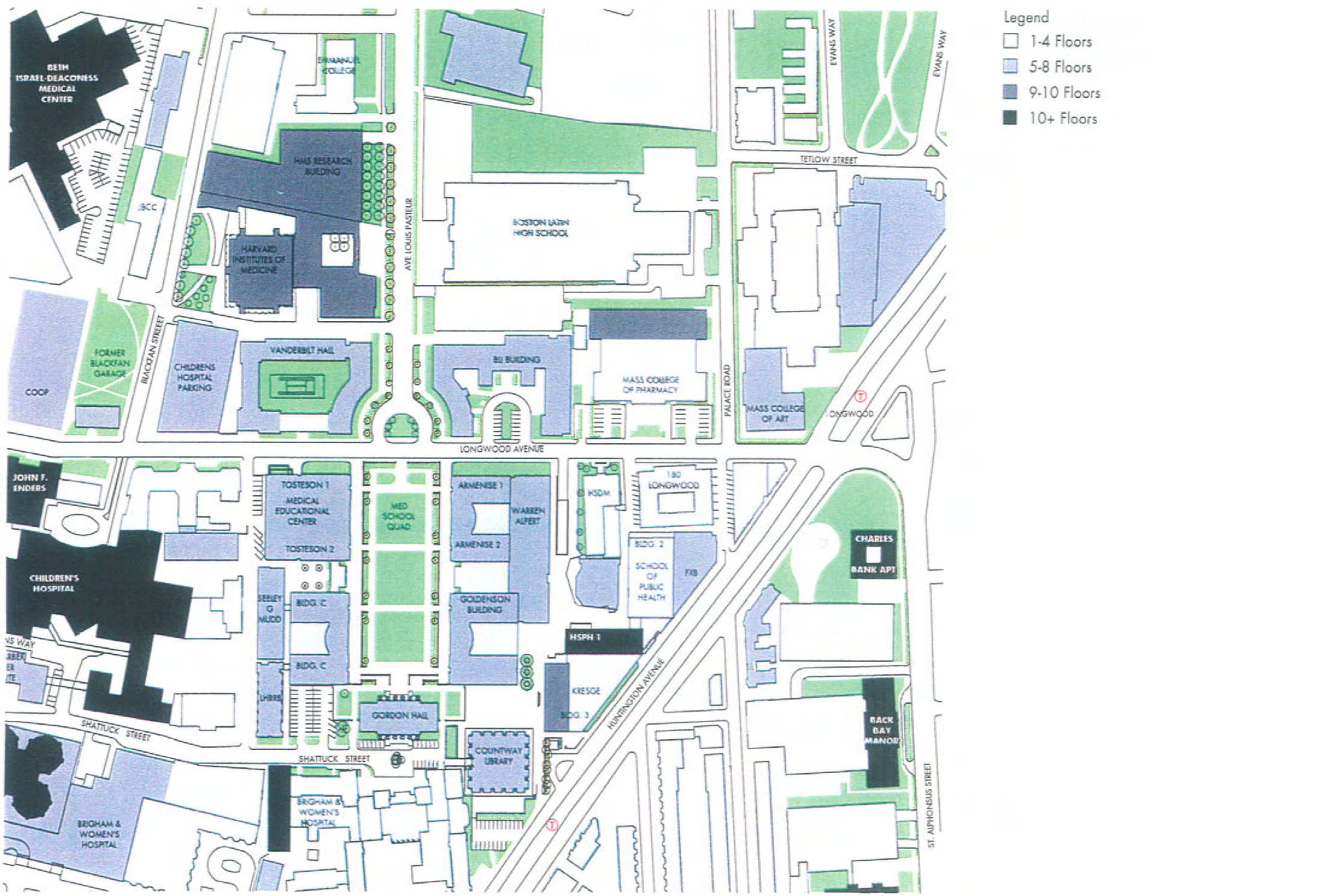


Figure 4-18: Future Building Heights

4.3 Zoning

4.3.1 Existing Uses and Structures

The uses and structures existing as of the date of the approval of this IMP by the Boston Zoning Commission (including uses to be commenced in facilities under construction) shall be deemed to be in compliance with the provisions of the Boston Zoning Code (the "Zoning Code").

4.3.2 Zoning Controls

Parcels A, B, D, and E

The zoning controls for the Institutional Master Plan Overlay District for Parcels A, B, D, and E of the Harvard Longwood Campus, as described in this IMP, shall be established on an overlay basis in accordance with the provisions of Section 80D-3. The Permitted Uses, Floor Area Ratio, and Parking and Loading Requirements for Parcels A, B, D, and E shall be as set forth below:

- Permitted Uses: College or University Uses, as defined in Article 2A of the Boston Zoning Code and including, without limitation, commercial uses such as a food store, restaurant or café, bank or credit union, automatic teller machine, bookstore, or drug store, when such commercial uses are intended primarily for the convenience of students and employees of Harvard University and its affiliated institutions and other nearby educational, medical, cultural or other institutions, or to serve the surrounding community. The permitted uses shall also include dental clinic accessory to the Harvard School of Dental Medicine, scientific research or teaching laboratories, administrative and professional offices, whether for-profit or non-profit, and all uses accessory to the foregoing.

- Floor Area Ratio: 3.0 for Parcels A and B;

  2.0 for Parcels D and E.

- Parking and Loading: The maximum number of parking spaces and loading areas shall be as set forth in this IMP, or as otherwise determined pursuant to the provisions of Article 80 of the Zoning Code.

The underlying zoning for parcels A, B, D, and E is as follows: Parcel A and Parcel B are located within the H-3 zoning district; Parcel D and Parcel E are located within the Residential H-2 Zoning District. Parcels A, B, D and E are located within the Restricted Parking District.

Parcel C

The zoning controls for the Institutional Master Plan Overlay District for Parcel C of the Harvard Longwood Campus, as described in this IMP, shall be established on an overlay basis in accordance with the provisions of Section 80D-3. The Permitted Uses, Floor Area Ratio, and Parking and Loading Requirements for Parcel C shall be as set forth below:

- Permitted Uses: College or University Uses, as defined in Article 2A of the Boston Zoning Code and including, without limitation, commercial uses such as a food store, restaurant or café, bank or credit union, automatic teller machine, bookstore, or drug store, when such commercial uses are intended primarily for the convenience of students, building occupants, employees of Harvard University and its affiliated institutions and other nearby educational, medical, cultural or other institutions, or to serve the surrounding community. The permitted uses shall also include conference center and function rooms, fitness center, scientific research or teaching laboratories, administrative and professional offices, whether for-profit or non-profit, and all uses accessory to the foregoing.

- Floor Area Ratio: 3.8.

- Parking and Loading: The maximum number of parking spaces and loading areas shall be as set forth in this IMP, or as otherwise determined pursuant to the provisions of Article 80 of the Zoning Code.

The underlying zoning controls for Parcel C of the Harvard Longwood Campus were established by Map Amendment No. 296 to the Boston Zoning Map, effective on June 16, 1993, which established Parcel C as a "U*" urban renewal overlay district pursuant to Article 3 of the Code. Within this district, the use and dimensional controls shall be as set forth in (i) the Fenway Urban Renewal Plan, as amended, and (ii) the Land Disposition Agreement between Harvard University and the Boston Redevelopment Authority with respect to Parcel C. The permitted uses under the U-District zoning and Land Disposition Agreement include medical or institutionally-related uses, including scientific and research teaching laboratories, college and university uses, accessory café, health/sports/fitness club, parking uses, and other uses, some of which may be commercial uses. The maximum Floor Area Ratio at this site is 3.8. This existing underlying U-District zoning designation shall not be altered in any way by the approval of this IMP.

4.4 Campus Expansion

The size of the Harvard Longwood Campus was recently increased by the purchase of 158 Longwood Avenue/639 Huntington Avenue (the Sparrs property). There are no plans for the development of the site within the term of the IMP. Any future development will be responsive to the University's research needs and will be incorporated into future IMP documents.

4.5 Urban Design Objectives Beyond the 5-Year Master Plan

Future improvement projects beyond the scope of the five-year plan intend to adhere to the Urban Design Objectives stated in the IMP Chapter 3.6. The improvements include expanding the pedestrian network further east, creating additional campus open space, and identifying potential sites for intervention that would further reinforce urban edges and street alignments. In accordance with the BRA Scoping Determination, potential sites are identified in Figure 4-19, which reflects revisions made in accordance with discussions with the BCDC Subcommittee and to achieve consistency with the LMA Interim Guidelines. These sites occupy land that is on the perimeter of the Harvard Longwood Campus (Parcel A); designs proposed for these

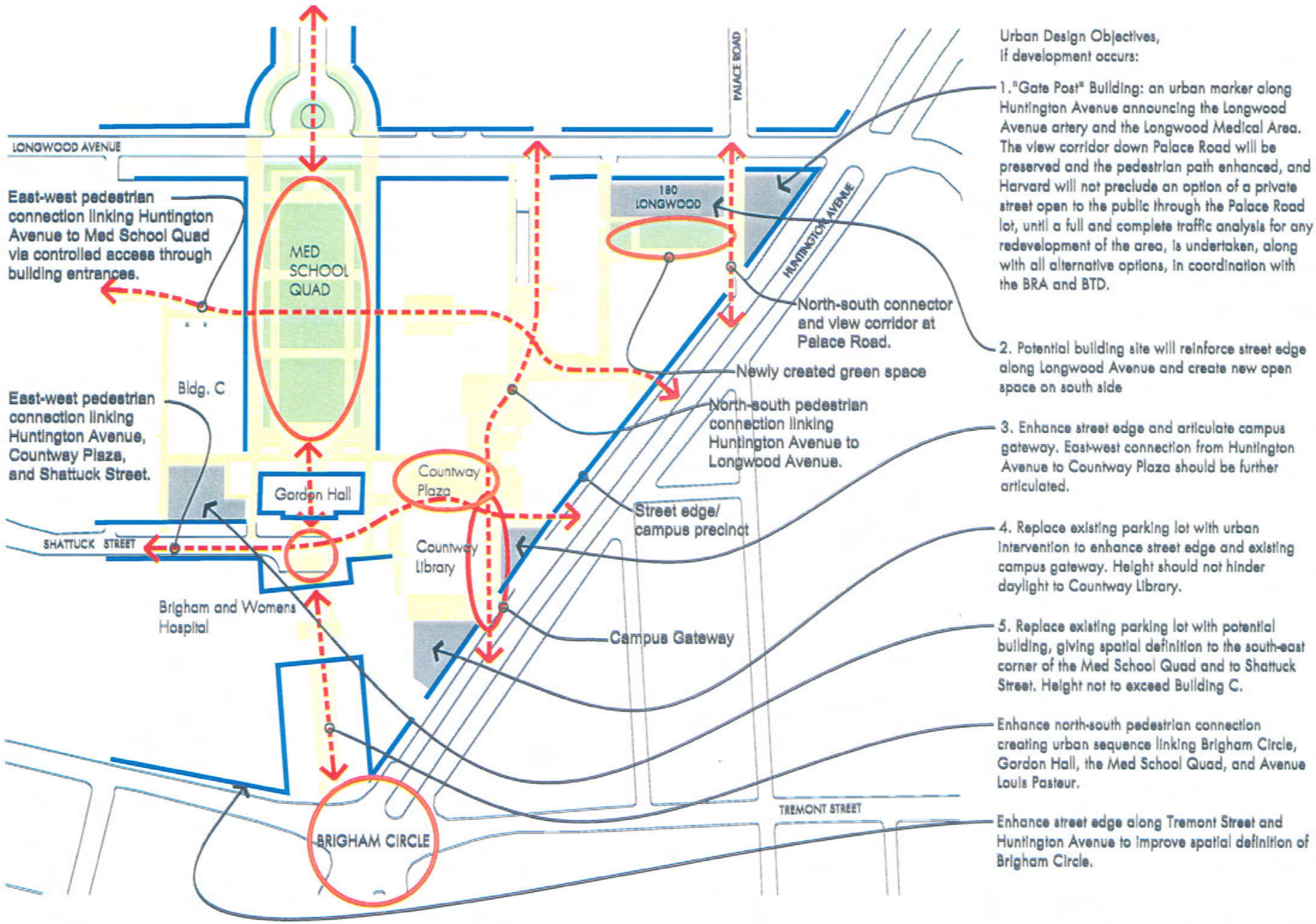


Figure 4-19: Urban Design Objectives beyond 5 Year Master Plan

February 2003

sites will be consistent with the Master Planning Goals and Urban Design Objectives outlined within this IMP. At the present time, Harvard has no specific plans to develop these sites, and other sites may emerge as LMA development progresses.

On one hand, campus buildings must relate to how the campus functions; on the other hand, any development will be an integral part of the larger context of the city district and thus, truly is part of the city's network of arteries. By and large, the approach suggested is to define a campus perimeter edge of building "fabric" that works hand-in-hand with the city streets bordering the campus and creates at the same time legible connections – literal and symbolic – that relate the campus to the city and the city to the campus.

A description of the urban design goals for the potential sites, identified by number in Figure 4-19, follows:

1) At the former Sparr property (south corner of Longwood Avenue and Huntington Avenue), if new development were to take place, it should fully occupy the footprint of the site in its triangular configuration. A new building on this site has the potential to become a "gate post" to Longwood Avenue from the east and a highly recognizable symbol of the LMA along Huntington Avenue.

   Furthermore, if and when new development were to take place at this location, the north-south view corridor represented by Palace Road (linking the Fens to Mission Hill) will be maintained and Harvard will not preclude an option of a private street open to the public through the Palace Road lot until a full and complete traffic analysis for any redevelopment of the area is undertaken, along with all alternative options, in coordination with the BRA and BTD. The pedestrian walk along the west edge of the property should also be maintained and recognized as such by the elimination of vehicle parking there. The pedestrian path should be similar in width to Palace Road in order to maintain the view corridor.

2) A potential development scenario can be envisioned at the 180 Longwood Avenue site. By demolishing the current building at 180 Longwood, the opportunity would be created to build instead a building in alignment with the Warren Alpert and HSDM buildings. To the south of the new building, a new landscaped space should then be created as an expansion of the campus pedestrian network. Protected from street noise and traffic, this green quad should be a place for casual gatherings and also a conduit within the campus between the HSDM, the corner site, and the HSPH. This development should require the relocation of existing parking along the east side of the HSDM and re-routing of service infrastructure, currently in open trenches.

3) A structure or landscape element on this site south of the Kresge Building offers potential urban design implications. First, it should infill a gap at Huntington Avenue and reinforce the continuity of the street edge. Second, it should give a more substantial definition to the primary entrance into the Harvard Longwood Campus from Huntington Avenue and strengthen the pedestrian experience of entering the campus from the south; and third, it

should clarify the connection from Countway Plaza to the Huntington Avenue along the south edge of the Kresge Building. This connection should be equal in width to the Huntington Avenue sidewalk.

4) An urban intervention on this site, currently a parking lot, has the potential, together with Site 2, to strengthen the Huntington Avenue street edge and to give legibility to the Harvard Longwood Campus precinct. It should also contribute to the formal definition of Brigham Circle in whose vicinity it lies. The height of this intervention should be carefully considered, as it abuts the Countway Library.

5) This site, also currently a parking lot, holds many important opportunities. A new building here should help define the north boundary of Shattuck Street as it approaches its end in front of Gordon Hall, while also relating in mass and scale to the western side of the Quad made up of Tosteson and Building C. Views from the quadrangle should be preserved and paths strengthened at the west side of the quadrangle from Longwood Avenue to Shattuck Street. A new building at this site does not need to compete with or imitate the design of Gordon Hall, which must remain the protagonist of the original Beaux Arts composition. The site design should provide for pedestrian connections from the Quad along the north side of the site, down to the east walkway connecting Longwood Avenue and Shattuck Street.

Future master plan projects will be developed in response to Harvard's research and education program needs and be incorporated into future IMP documents. Harvard looks forward to working with the City of Boston on any future projects and on the City's strategic planning initiative for the LMA.

5.0 Transportation Access Plan

5.0 Transportation Access Plan

5.1 Introduction

This section presents an evaluation and summary of the transportation aspects of Harvard's Longwood Campus. The Transportation Access Plan Component includes an analysis of the following:

- Vehicle traffic on study area roadways, intersections, and at all Harvard Longwood Campus driveways;
- Parking conditions;
- Loading and service activities;
- Pedestrian and bicycle activities and connections; and
- Public transportation and private shuttle bus services.

In addition, this section quantifies and assesses the transportation impacts that are expected on the Harvard Longwood Campus under future conditions with the projects proposed within this IMP. The purposes of these analyses are to:

- Define and quantify existing transportation conditions in the project study area as defined by the Boston Transportation Department (BTD) within the BRA's issued Scoping Determination for the project, as included within Appendix A;
- Estimate the transportation impacts that will be generated under future conditions based on anticipated employment and student growth, and with the proposed Harvard Longwood Campus projects completed; and
- Develop a set of mitigation strategies and improvement measures that will help to lessen the transportation effects of future growth and to provide improvements to the transportation infrastructure in the LMA.

This section provides a brief summary of the findings of this transportation analysis, including anticipated impacts and mitigation, a discussion of the study methodology, and a description of the study area. Subsequent sections provide detailed discussions of existing and future conditions expected both with and without the proposed IMP projects. The final section of the chapter presents transportation mitigation and improvements proposed by Harvard.

5.1.1 Summary of Findings & Proposed Mitigation

The primary finding from this analysis is that, independently, the projects proposed by Harvard within this IMP will have only a very small effect on future transportation conditions in the LMA. Harvard currently contemplates five relatively small and discrete projects as part of this IMP. Four of these five projects are additions to existing facilities (each less than 10,000 sf of new space) that will result in no increases in faculty, staff, student, or patient growth under future conditions. Only the proposed HSDM Research and Education Building will result in increases in employment and future trips. The following highlights the transportation impacts and improvements that are anticipated with future implementation of the proposed projects:

- It is anticipated that the HSDM Research and Education Building will generate 24 entering and exiting person-trips during the weekday morning peak hour and 22 person-trips during the weekday evening peak hour. The project is projected to generate approximately 155 person-trips per day for a typical weekday. Because of the limited amount of parking available and heavy reliance on public transportation, this level of activity equates to only six new vehicle trips during the morning peak hour and six new vehicle trips during the evening peak hour. Overall, the proposed project is estimated to generate only about 40 new vehicle-trips on an average weekday. The four building addition projects that are proposed are not anticipated to generate new vehicle trips.

- As described in Section 5.2.1.1, Harvard Parking System, Harvard does not propose development of new on-campus parking in conjunction with the proposed projects. Harvard intends to relocate parking spaces from the Longwood Lot and the Vanderbilt Lot (75 total parking spaces) to the New Research Building parking garage when it is complete in 2003. Under 2007 Future Conditions, the Harvard Longwood Campus will have 1,217 total on-campus parking spaces, which equates to a parking ratio[1] of 0.48 for the entire campus. This amount of on-campus parking is substantially lower than the BTD's guideline that parking ratios for new development not exceed 0.75 spaces per 1000 square feet for all new construction in the LMA.

- Harvard intends to simplify and consolidate its loading activities by relocating existing loading and service activities for the HSDM to its below-grade loading and service facility within the HMS Quad Garage.

- The pedestrian access analysis concludes that adequate capacity exists to accommodate anticipated increases in pedestrian activity along the sidewalks and crosswalks within the project study area. Pedestrian mitigation planned as part of the proposed IMP will improve the pedestrian infrastructure on Harvard's Longwood Campus by providing

1 Parking spaces per 1,000 gross square feet (sf) of building space.

better-defined connections between Longwood Avenue, Shattuck Street, Huntington Avenue, and Avenue Louis Pasteur.

- Harvard is committed to continuing to offer a wide array of TDM incentives as a means to reduce single occupant driving and increase use of alternative forms of transportation in accessing its Longwood Campus.

- It is anticipated that the HSDM project will have only a very small incremental impact on transit operations in the area.

5.1.2 Methodology

The transportation analysis presented in this section conforms to the BTD's "Transportation Access Plans Guidelines," and conforms to the Scoping Determination issued by the BRA. The study was conducted in three distinct stages. The first stage, Existing Conditions, involved a survey and compilation of existing transportation conditions within the study area including:

- An inventory of the transportation infrastructure within the project study area as defined by the BTD;

- Transportation characteristics of the Harvard Longwood Campus, including access, egress, parking for faculty, staff, Dental School patients, and students, loading activities, and shuttle bus activities;

- Geometric and operational characteristics of roadways, intersections, and Harvard driveways;

- Existing traffic control at intersections (*i.e.*, traffic signalization, stop signs, one-way streets, etc.);

- Area off-street and on-street parking supply, demands, turnover, and availability;

- An inventory of sidewalks and crosswalks;

- Pedestrian activity on the Harvard Longwood Campus, along roadways, at intersections, and along primary corridors through the campus;

- Bicycle activity and accommodations both on-campus and within the IMP study area;

- Public transportation options within the study area, including bus, trolley, commuter rail, and private shuttle bus options, existing peak hour demands, and existing capacity by specific transit service type;

- Loading and service activities; and

- Helicopter operations of nearby hospitals.

In the second stage of the study, Evaluation of Long-Term Transportation Impacts, future transportation conditions were projected within the study area. Analysis of the future No-Build Condition addresses future transportation impacts related to background growth on area roadways and public transportation services, planned transportation infrastructure improvements, and growth related to other proposed projects within the study area (without the projects proposed by Harvard). The future Build Condition analysis addresses the No-Build Condition plus Harvard IMP projects and any supporting transportation infrastructure improvements or modifications proposed to support those projects. Roadway, sidewalk/crosswalk, and transit level of service (LOS) analyses for morning and evening peak commuter periods were studied and are summarized for the following conditions:

- 2002 Existing Condition;
- 2007 No-Build Condition; and
- 2007 Build Condition.

As requested by the BRA, a five-year time horizon was selected for analysis for this IMP (2007).

The final stage of the study, Transportation Mitigation, presents measures to address any identified project-related pedestrian, parking, traffic, and public transportation impacts. The proposed improvements serve as the basis for the forthcoming preparation of a Transportation Access Plan Agreement (TAPA) to be developed and executed by both Harvard and the BTD. Harvard is currently committed to the following transportation improvements:

- Removal of the Longwood Lot by relocation of the 66 total parking spaces in that lot (by returning spaces to the New Research Building Garage and elsewhere) and driveway modifications at 200 Longwood Avenue;
- Consolidation of Dental School loading activities to the existing below-grade loading facility located within the Quad Garage;
- Pedestrian access improvements on the Longwood Campus (as described in Section 3.0, Program Needs and Master Planning/Urban Design Objectives and Section 4.0, Proposed IMP Projects);
- Bicycle access and security improvements on the Longwood Campus (as described in Section 3.0, Program Needs and Master Planning/Urban Design Objectives and Section 4.0, Proposed IMP Projects); and

- ♦ Continued strong and proactive commitment to encouraging the use of other alternative forms of transportation through monetary incentives and other transportation demand management (TDM) actions.

5.1.3 Study Area

The project study area includes 28 intersections and site driveways that have been specifically defined within the BRA's Scoping Determination for the project. These intersections are illustrated in Figure 5-1 and are listed below.

1. Palace Lot Driveway/Longwood Avenue/Palace Road
2. Shattuck Lot Driveway/Shattuck Street
3. Longwood Lot Driveway/Quad Garage Driveway/Longwood Avenue
4. Denteast Lot Driveway/Longwood Avenue
5. Tosteson Medical Education Center (TMEC) Lot Driveway/Longwood Avenue
6. Courtyard Lot Driveway/Longwood Avenue
7. Courtyard Lot Driveway/Longwood Avenue
8. Countway Lot Driveway/Huntington Avenue
9. Longwood Avenue/Brookline Avenue
10. Longwood Avenue/Binney Street
11. Longwood Avenue/Blackfan Street/Children's Hospital Driveway
12. Longwood Avenue/Avenue Louis Pasteur
13. Longwood Avenue/Huntington Avenue
14. Fenway/Avenue Louis Pasteur
15. Fenway/Park Drive Crossover Road
16. Fenway/Palace Road
17. Louis Prang Street/Huntington Avenue/Ruggles Street
18. Brookline Avenue/Fenway
19. Brookline Avenue/Boylston Street/Park Drive
20. Beacon Street/Park Drive (Audubon Circle)
21. Longwood Avenue/Riverway
22. Riverway/Netherlands Road/Francis Street
23. Brookline Avenue/Francis Street

24. Francis Street/Binney Street
25. Francis Street/Huntington Avenue/Tremont Street/Calumet Street (Brigham Circle)
26. St. Alphonsus Street/Tremont Street
27. Fenwood Road/Huntington Avenue
28. St. Albans Road/Huntington Avenue/Mission Street

These study area intersections and driveways were evaluated in detail using standard traffic engineering analysis techniques following BTD guidelines to identify incremental impacts of future traffic growth and site-generated traffic.

5.2 Existing Conditions

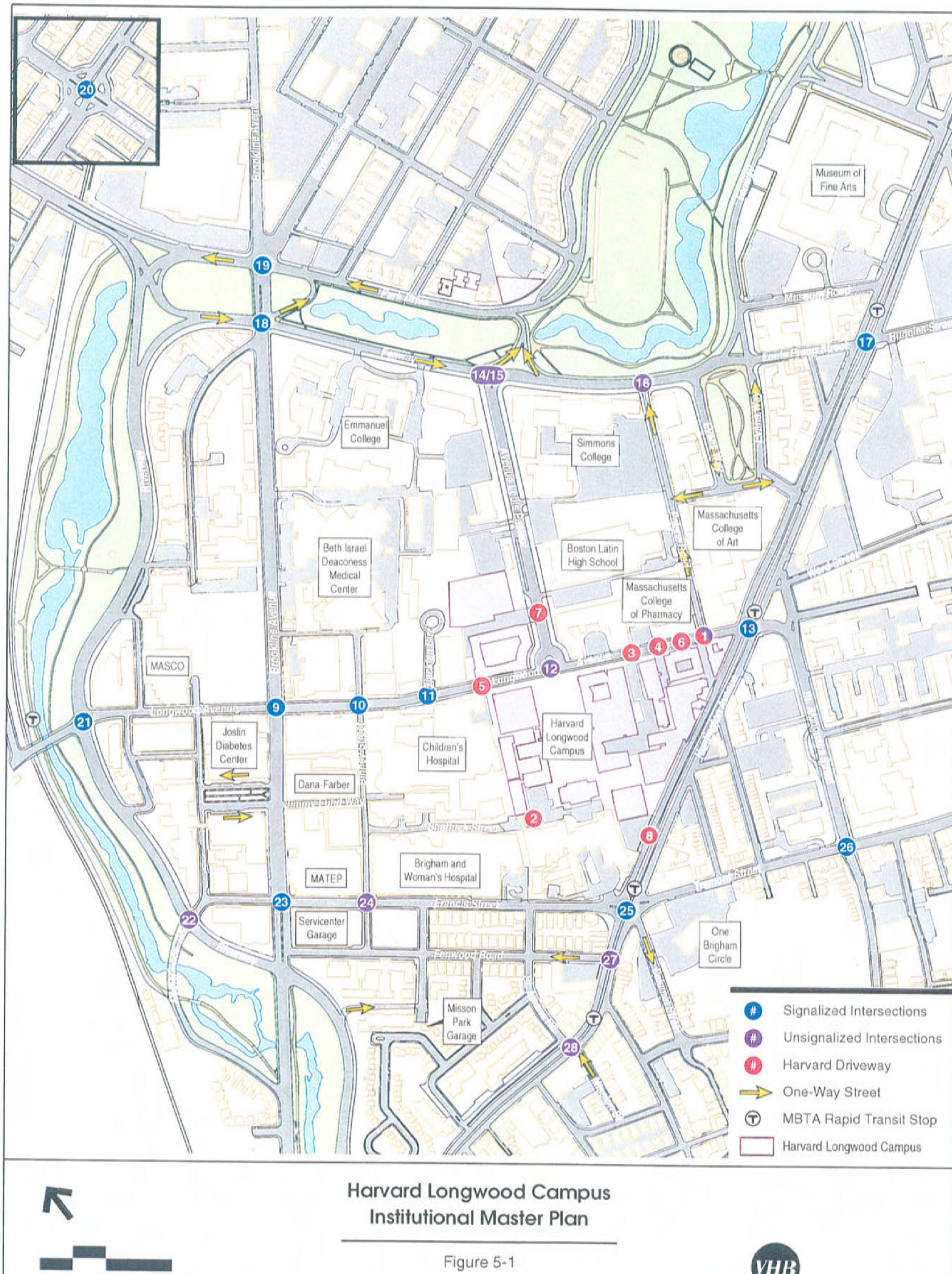
Existing transportation conditions on the campus and in the study area, including roadway geometry, traffic controls, peak hour traffic and pedestrian flows, transit availability, parking supply and utilization, loading and service activities, and LMA helicopter operations, are described within this section.

5.2.1 Summary of Existing Harvard Transportation Infrastructure and Services

Harvard actively manages its transportation infrastructure to provide safe and efficient access to and from its Longwood Campus for its faculty, staff, students, dental clinic patients, and visitors. The Harvard Longwood Campus transportation infrastructure includes:

- An extensive Transportation Demand Management (TDM) program for its employees and students to encourage commuting to campus by transit and other alternative forms of transportation;
- An extensive pedestrian infrastructure that interconnects its various Longwood Campus facilities;
- Bicycle amenities including racks and lockers for cyclists;
- A limited supply of on-campus self-parking primarily for faculty and staff;
- Shuttle bus service connecting the Longwood Campus with its other campuses in Cambridge and Allston, and with other transit services; and
- A sophisticated loading and service operation.

Figure 5-2, Campus Transportation Infrastructure, identifies the specific locations of these various services on the Harvard Longwood Campus. Each of these components of the Harvard transportation infrastructure is described in detail in this IMP.



Harvard Longwood Campus
Institutional Master Plan

Figure 5-1

Project Study Area and Intersections

Vanasse Hangen Brustlin, Inc

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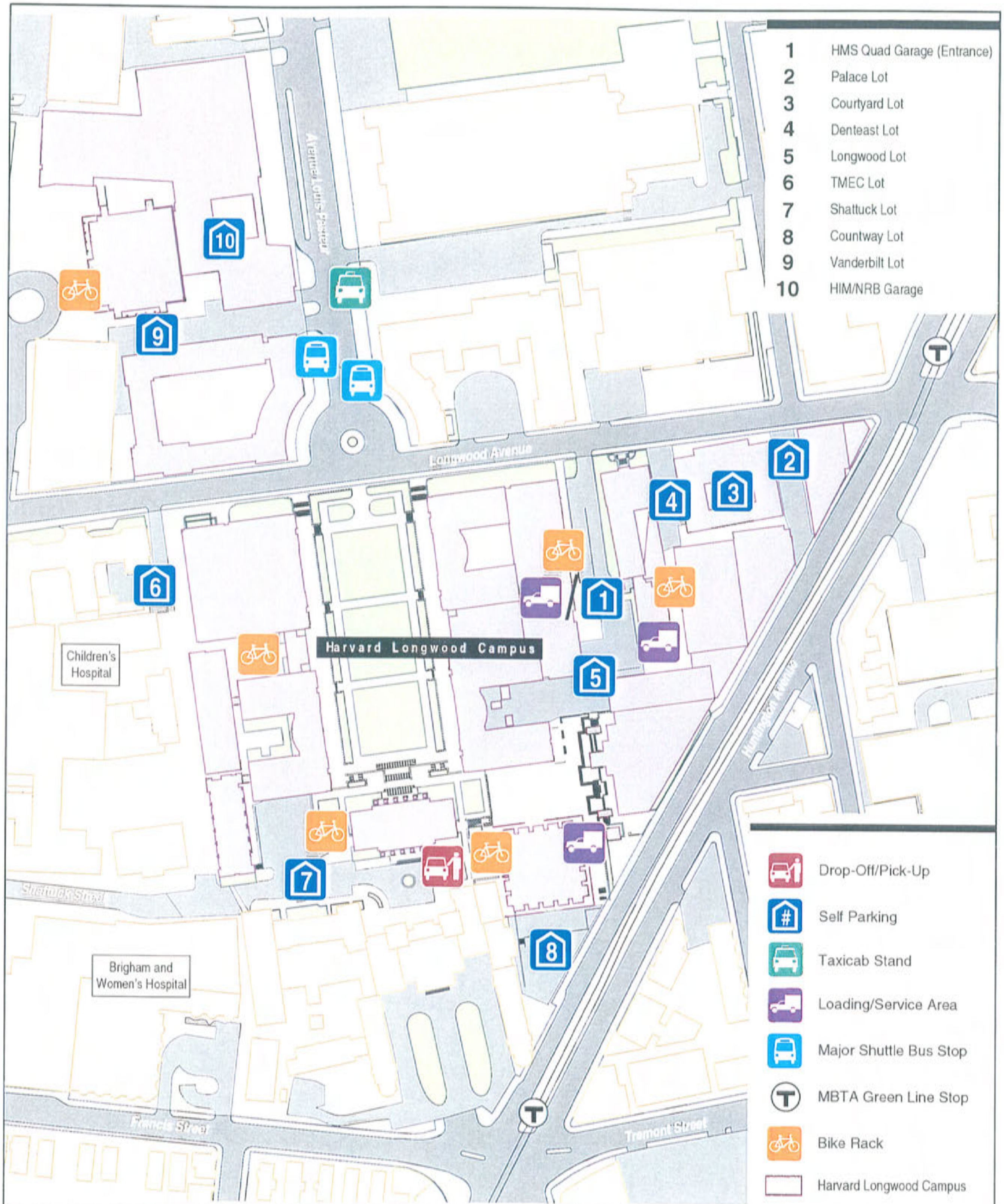

Harvard Longwood Campus
Institutional Master Plan

Figure 5-2

Campus Transportation Infrastructure

Vanasse Hangen Brustlin, Inc

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5.2.1.1 Harvard Parking System

Harvard University's Longwood Campus includes eight surface parking lots with 223 parking spaces and one below-grade garage with 508 parking spaces, for a total of 731 on-campus parking spaces (Table 5-1). Currently, Harvard's New Research Building is under construction. It is anticipated that below-grade parking being constructed in conjunction with the New Research Building will be available in early 2003. When the 561-space New Research Building garage is opened, Harvard has committed to relocating existing surface parking spaces from its Longwood Lot and Vanderbilt Lot (75 total surface parking spaces) to the garage. By 2007, on-campus parking will contain 1,217 spaces in six surface lots and the two garages.

Of the existing 731 spaces, 680, or over 90 percent, are reserved for faculty and staff. Only 20 spaces (under three percent of the total supply) are for students. In addition, the HSDM Dental Clinic has 22 spaces set aside for patient use in the Denteast Lot. Table 5-1 provides a summary of parking locations and user groups.

Under 2007 Future Conditions, new construction, including the already approved New Research Building, will bring the parking ratio[2] to 0.48 for the entire campus. As noted before, this amount of on-campus parking is substantially lower than the BTD's guideline that parking ratios within be capped at 0.75 spaces per 1000 square feet for all new construction in the LMA.

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2 Parking supply per 1,000 gross square feet (sf) of building space.

Table 5-1: Harvard Longwood Campus Parking Space Inventory

Parking Facility	Action	Faculty/Staff	Student	Patient	Total Spaces
Existing Parking Facilities (June 2002)					
HMS Quad Garage 200 Longwood Avenue		488	20		508
Palace Lot 164 Longwood Avenue		21			21
Courtyard Lot 180 Longwood Avenue		8			8
Denteast Lot 188 Longwood Ave				22	22
Longwood Lot 200 Longwood Ave		66			66
TMEC Lot 260 Longwood Ave		11			11
Shattuck Lot 25-45 Shattuck Street		66			66
Countway Lot 777 Huntington Ave		20			20
Vanderbilt Lot 107 Avenue Louis Pasteur		9			9
2002 Existing Condition		689	20	22	731
Anticipated Parking Supply Modifications					
Harvard Institutes of Medicine/ New Research Building Garage [1] Avenue Louis Pasteur	Add back	+ 561			+ 561
Longwood Lot 200 Longwood Ave	Relocate	- 66			- 66
Vanderbilt Lot 107 Avenue Louis Pasteur	Relocate	- 9			- 9
Net Change		+ 486	0	0	+ 486
2007 Future Condition		1,175	20	22	1,217

Source: Compiled from Harvard Medical School Parking and Security, June 2002.

1/ The New Research Building Garage received approval previously. Its spaces are temporarily unavailable due to ongoing construction.

5.2.1.2 Harvard Transportation Demand Management Program

Harvard proactively supports many efforts to reduce auto trips to and from the campus in order to reduce traffic congestion and parking demands within the LMA. Harvard offers information and incentives to its faculty, staff and students to facilitate their use of alternative forms of transportation. These include the following:

- Harvard employs two Employee Transportation Advisors (ETAs) at its Longwood campus. One serves HMS and HSDM and the other serves HSPH.
- Harvard has been an active member of the CommuteWorks Transportation Management Association (TMA) since its 1989 founding. CommuteWorks, operated by MASCO, offers an array of ongoing programs (discussed further below) and periodically offers special limited-time incentive programs for employees and students of member institutions to try new modes. Harvard's role includes implementing and monitoring CommuteWorks programs; posting and distributing announcements; holding promotional events for both employees and students to encourage alternative modes of transportation; and providing transit schedules and other information to facilitate alternative transportation.
- Harvard distributes discounted transit passes on-site for its faculty and staff. Harvard subsidizes transit passes by 40 percent, four times the 10 percent subsidy provided only three years ago. By quadrupling the transit pass subsidy offered, Harvard contributed to a 70 percent increase in transit pass sales on the Harvard Longwood Campus between 1999 and 2001, as shown in Table 5-2.
- Harvard Longwood Campus faculty, staff and students can show their Harvard identification to ride for free on MASCO's M2 Cambridge-Longwood route, or any other MASCO shuttle bus. These buses, discussed in detail in Section 5.2.8.2, MASCO Transit Services, connect the Harvard Longwood Campus to subway and commuter rail lines and to the Harvard Cambridge Campus.

Table 5-2: Harvard Transit Subsidies and Monthly Transit Pass Sales

Year	Subsidy	MBTA Pass Sales [1]	Transit Mode Share [2]
1999	10%	1,039	45.6%
2001	40%	1,778	68.6%

Source: Harvard University Ridesharing Update Report submitted to the Department of Environmental Protection on December 31, 1999 and Harvard University 2001 Rideshare Program Update Report submitted to the Massachusetts Department of Environmental Protection on November 15, 2001.

1/ MBTA pass sales include only passes purchased by faculty and staff through payroll deductions. Summary does not include employees who purchase their passes independently, nor does it include students.

2/ Transit mode share includes both MBTA riders and MASCO shuttle bus riders. It includes employees and students on campus for a minimum of 17 hours a week during the daytime, per Massachusetts Department of Environmental Protection rideshare reporting regulations.

- Harvard provides ridematching services through CommuteWorks for employees interested in carpooling/vanpooling. Harvard also provides preferential carpool/vanpool matching, with on-site spaces going to carpools of three or more and nearby off-site spaces going to two-person carpools. The same subsidy (40 percent) is provided to vanpool riders as to MBTA riders. To encourage employees to try switching from driving alone, Harvard will hold spaces for up to four months while employees try carpooling. Employees with infrequent or unexpected schedule changes can still carpool or vanpool using CommuteWorks' Guaranteed Ride Home (GRH) and Pool-Aide programs. (GRH pays for taxi service in an emergency and Pool-Aide allows the purchase of up to five parking vouchers per month.)

- Facilities on-campus for bicyclists and walkers include bicycle racks throughout the campus and lockers.

- Harvard has an informal policy of encouraging telecommuting and compressed workweeks (CWW) for employees and students at its Longwood Campus.

- Harvard promotes all forms of alternative transportation through a variety of employee newsletters, information kiosks, websites, e-mail, and special events including new student and employee orientations.

Harvard will continue to promote and improve its TDM program to benefit its employees and students and to reduce traffic impacts to roadways and parking facilities within the LMA and nearby neighborhoods.

5.2.1.3 Loading and Service Operations

Harvard's primary loading and service area for the Longwood Campus is located below grade within the HMS Quad Garage. This facility serves both HMS and HSPH and is open from 7:00 AM to 4:00 PM. On a typical weekday, this facility handles approximately 60 to 70 trucks. The majority of activities at the Quad Garage loading dock occur in the middle of the day, between 10:00 AM and 2:00 PM. An early morning peak in trips to and from the dock also occurs between 8:00 AM and 9:00 AM.

In addition, HSDM has its own loading dock and dumpster bay that generally handles two to six deliveries per day. These activities will be relocated and consolidated within the Quad Garage loading dock as part of the proposed HSDM Research and Education Building project.

There will also be a new loading and service facility constructed at the Harvard Institutes of Medicine as part of the ongoing New Research Building project. This dock will serve Harvard facilities located on Avenue Louis Pasteur and is expected to handle approximately 30 to 40 truck trips per day.

Some smaller, support loading and service areas are also located at the Countway Library (10 Shattuck Street) and the Tosteson Medical Education Center (260 Longwood Avenue). These facilities handle only deliveries made by smaller vehicles such as the U.S. Mail and UPS.

5.2.2 Harvard Driveways

The project study area includes eight Harvard driveways collectively defined within the BRA's Scoping Determination for the project. These intersections are described below and illustrated in Figure 5-1. The descriptions of the driveways below include physical characteristics, geometric conditions, pedestrian facilities, and traffic control measures. Table 5-3, which follows the driveway descriptions, provides a summary of peak hour traffic at each Harvard parking facility.

1. Harvard Palace Lot Driveway/Longwood Avenue/Palace Road

The entrance to the Palace Lot is located at the intersection of Longwood Avenue and Palace Road creating a four-legged unsignalized intersection. Palace Road is a one-way departure from the intersection. Longwood Avenue provides one travel lane eastbound and two travel lanes westbound. Metered parking is provided along the western side of Palace Road at this intersection. No parking is allowed along either side of Longwood Avenue. Sidewalks are provided along all intersection approaches, but a crosswalk is provided only across Palace Road. The Palace Lot, extending from Longwood Avenue to Huntington Avenue, has 21 parking spaces, all of which are used by Harvard employees.

2. Shattuck Lot Driveway/Shattuck Street

The Shattuck Lot is a cluster of three parking areas and a turnaround loop at the terminus of Shattuck Street. These spaces are accessed from Binney Street. Cumulatively, the Shattuck Lot has 66 parking spaces, all used by faculty and staff. In addition to parking, it also serves as a pick-up/drop-off area.

3. Longwood Lot Driveway/Quad Garage Driveway/Longwood Avenue

The 200 Longwood Avenue driveway forms a three-way unsignalized intersection with Longwood Avenue. This driveway provides access to the Longwood Lot, the Quad Garage, and the HSDM Interim Building. Longwood Avenue provides one travel lane eastbound and two travel lanes westbound at this point. This driveway provides one lane in each direction separated by a double yellow centerline. Using stackers, the Longwood Lot parks 66 cars. This lot will be taken out of service when the new HIM/NRB Parking Garage is opened in 2003. The below-grade Quad Garage, which also uses stackers, parks 508 cars. The Quad Garage is used by faculty, staff, and a few students. The Longwood Lot is used by faculty and staff. Parking is not permitted along any of the intersection approaches.

Sidewalks are provided along the west side of the lot entrance and along both sides of Longwood Avenue.

4. Denteast Lot Driveway/Longwood Avenue

The Denteast Lot driveway, located at 188 Longwood Avenue, forms a three-way unsignalized intersection with Longwood Avenue. Again, Longwood Avenue provides one travel lane eastbound and two travel lanes westbound. It serves patients of the dental clinic with parking for 22 cars. Sidewalks are provided along the west side of the lot entrance and along both sides of Longwood Avenue.

5. TMEC Lot Driveway/Longwood Avenue

The Tosteson Medical Education Center Lot entrance, located at 260 Longwood Avenue, forms a three-way unsignalized intersection with Longwood Avenue. Similar to the other locations, Longwood Avenue provides one travel lane eastbound and two travel lanes westbound. The TMEC Lot has two lanes and shares access with the adjacent Children's Hospital main loading facility. This driveway (also known as Meadow Road) provides one-way cut-through access from Longwood Avenue to Shattuck Street. This accessway is an important emergency route for ambulances destined to Brigham and Women's Hospital. This parking lot serves Harvard faculty and staff with parking for 11 cars. Sidewalks are provided along both sides of Longwood Avenue near the TMEC Lot.

6. Courtyard Lot Driveway/Longwood Avenue

The Courtyard Lot entrance, located at 180 Longwood Avenue, forms a three-way unsignalized intersection with Longwood Avenue. The Courtyard Lot has a single bi-directional lane with eight parking spaces.

7. Vanderbilt Lot Driveway/Avenue Louis Pasteur

The Vanderbilt Lot entrance is located on Avenue Louis Pasteur between Vanderbilt Hall and the Harvard Institutes of Medicine. This lot currently has nine parking spaces, but these spaces will be relocated when the New Research Building parking garage is opened in 2003.

8. Countway Lot Driveway/ Huntington Avenue

The Countway Lot entrance and exit forms a three-way unsignalized intersection with Huntington Avenue. Since there is a median on Huntington Avenue, the Countway Lot is restricted right-in/right-out turns. Huntington Avenue provides two travel lanes in each direction. The Countway

Table 5-3: Harvard Longwood Campus Peak Hour[1] Parking Activity

Peak Hour	Palace Lot	Shattuck Lot [2]	Longwood Lot [3]	Denteast Lot	TMEC Lot [4]	Courtyard Lot	Vanderbilt Lot [5]	Countway Lot	Total
Morning Peak Hour									
In	7	35	122	15	2	2	1	3	187
Out	0	23	14	4	1	2	0	2	46
Total	7	58	136	19	3	4	1	5	233
Evening Peak Hour									
In	2	32	25	7	3	3	1	4	77
Out	9	53	120	10	2	4	2	5	205
Total	11	85	145	17	5	7	3	9	282

Source: Counts conducted by Vanasse Hangen Brustlin, Inc. on Tuesday June 4, 2002 and Thursday July 11, 2002.

1/ Morning peak hour is 8:00 to 9:00 AM. Evening peak hour is 5:00 to 6:00 PM.

2/ Includes drop-off/pick-up activity.

3/ Includes access to the Longwood Lot, HSDM Loading Dock, and Quad Garage.

4/ Does not include Children's Hospital traffic or other traffic not using Harvard parking.

5/ Does not include temporary construction traffic related to the New Research Building.

Lot has a pair of driveways, one for entering vehicles and one for exiting. It provides parking for 20 cars of Harvard faculty and staff.

As shown in Table 5-3, Harvard Longwood Campus parking facilities collectively generate approximately 233 vehicle trips during the morning peak hour and 282 vehicle trips during the evening peak hour. This level of peak hour traffic activity is very low relative to the overall size of the Longwood Campus and is indicative of the dispersed travel patterns of Harvard faculty, staff, researchers, and students.

5.2.3 Intersection Conditions

As listed in Section 5.1.3, Study Area, the project study area includes 20 intersections individually defined within the BRA's Scoping Determination for the project (plus eight Harvard driveways, resulting in 28 distinct locations that were studied). These locations are illustrated in Figure 5-2. The descriptions of the intersections below include physical characteristics, geometric conditions, pedestrian facilities, and traffic control measures.

9. Longwood Avenue/Brookline Avenue

The intersection of Longwood Avenue and Brookline Avenue is a four-legged intersection that operates under four-phase traffic signal control, including an exclusive pedestrian phase. The Longwood Avenue westbound approach provides an exclusive left-turn lane, a through lane, and an exclusive right-turn lane. The Longwood Avenue eastbound approach provides an exclusive left-turn lane and a shared through/right-turn lane. Brookline Avenue in both the northbound and southbound directions provides an exclusive left-turn lane, a through lane and a shared through/right-turn lane. There is no on-street parking permitted along any of the approaches, however, loading and delivery vehicles occasionally stop along the both sides of Brookline Avenue south of Longwood Avenue. The signal's actuated pedestrian phase provides for exclusive pedestrian movement at the intersection. Sidewalks and crosswalks are provided at all four intersection approaches.

10. Longwood Avenue/Binney Street

The intersection of Longwood Avenue and Binney Street is a four-legged, signalized intersection that operates under three-phase traffic signal control, including an exclusive pedestrian phase. The Longwood Avenue eastbound and westbound approaches each provide two general-purpose lanes. The Binney Street northbound and southbound approaches each have a single general-purpose lane. Sidewalks and crosswalks are provided at all four intersection approaches. On-street parking is not permitted at any of the approaches; however, there is an MBTA bus stop located at the northeast corner of the intersection in front of 333 Longwood Avenue.

11. Longwood Avenue/Blackfan Street/Children's Hospital Driveway

Blackfan Street north of Longwood Avenue provides access to the Harvard Institutes of Medicine, the Children's Hospital Patient and Family Garage, the Harvard Blackfan parking lot, and the Judge Baker Children's Center (site of the proposed Blackfan Research Center). South of Longwood Avenue, Blackfan Street provides access to the main entrance to Children's Hospital. This four-legged intersection operates under three-phase traffic signal control, including an exclusive pedestrian phase. Longwood Avenue provides two general-purpose travel lanes eastbound and a single travel lane westbound. Blackfan Street northbound (which is the Children's Hospital main driveway exit) provides a single general-purpose lane. Traveling southbound, Blackfan Street provides an exclusive left-turn lane and a shared through/right-turn lane. Sidewalks and crosswalks are provided along all four intersection approaches. There is a bus stop on the south side of Longwood Avenue east of the intersection and valet parking along the eastern Blackfan Street curb south of the intersection (in front of Children's Hospital).

12. Longwood Avenue/Avenue Louis Pasteur

The intersection of Longwood Avenue and Avenue Louis Pasteur is a three-legged, unsignalized intersection with stop-sign control on the Avenue Louis Pasteur approach. Longwood Avenue eastbound provides two travel lanes. Traveling westbound, Longwood Avenue provides one shared through/right-turn lane. The Avenue Louis Pasteur approach (southbound) provides exclusive left- and right-turn lanes on the west side of the existing traffic island (known as Oscar Tugo Circle). Sidewalks and crosswalks are provided along all three intersection approaches. Pedestrian access improvements planned to this intersection are discussed in Section 5.3.1, Area Transportation Improvements.

13. Longwood Avenue/Huntington Avenue

The intersection of Longwood Avenue and Huntington Avenue is a four-legged intersection that operates under three-phase traffic signal control, which includes a lead phase for Huntington Avenue southbound, and some concurrent pedestrian phasing. Huntington Avenue provides two travel lanes northbound and two travel lanes southbound. The MBTA's Green Line (E Line) also operates within the median of Huntington Avenue. Longwood Avenue provides one general-purpose lane westbound. Eastbound, it provides an exclusive left-turn lane and a shared through/right-turn lane. Curbside parking is provided on the northbound approach and the southbound departure lane (just south of Longwood Avenue), but has been temporarily removed due to construction of improvements currently being undertaken by the City, the MBTA, and MassHighway. A bus stop is located on the southbound approach of Huntington Avenue, just north of Longwood Avenue. Sidewalks and crosswalks are provided along all four intersection approaches. Huntington Avenue improvements are discussed in Section 5.3.1.2, City/State-Sponsored Traffic Improvements.

14/15. Avenue Louis Pasteur /Fenway/Park Drive Crossover Road

The intersection of Avenue Louis Pasteur, the Fenway, and the Park Drive crossover road is a three-legged, unsignalized intersection with stop-sign control on the Avenue Louis Pasteur approach. The Fenway eastbound approach is one-way with a left-turn lane diverge to the Park Drive crossover, a through lane, and a right-turn lane to Avenue Louis Pasteur. The Fenway east of Avenue Louis Pasteur is two-way, with the westbound approach consisting of an exclusive left-turn lane onto Avenue Louis Pasteur and a right-turn lane diverge to the Park Drive crossover. The Avenue Louis Pasteur approach consists of an exclusive right-turn lane, which allows traffic only onto the two-way section of the Fenway to the east. Crosswalks are provided across all approaches, including both Park Drive Crossover approaches. Sidewalks are provided along each of the intersection approaches. A commitment by Merck for this intersection will modify the channelization island, making it substantially more difficult for motorists to turn illegally from Avenue Louis Pasteur onto the Park Drive Crossover.

16. Fenway/Palace Road

The intersection of the Fenway and Palace Road is a three-legged, unsignalized intersection with stop-sign control on the Palace Road approach. Palace Road is one-way northbound with a single lane provided for both left- and right-turns. Fenway is two-way at this location, with two through lanes traveling westbound and a single through lane traveling eastbound. On-street parking is permitted along both sides of Palace Road, and along the south side of the Fenway to the west of the intersection. Sidewalks are provided along all intersection approaches. Crosswalks are provided across Fenway east of the intersection and across Palace Road.

17. Louis Prang Street/Huntington Avenue/Ruggles Street

The intersection of Louis Prang Street and Ruggles Street with Huntington Avenue is a four-legged intersection that operates under three-phase traffic signal control, including concurrent pedestrian phasing. Eastbound and westbound movements from Louis Prang Street and Ruggles Street have separate (split) phases. Ruggles Street provides a single approach lane westbound, but because of its width and heavy traffic volumes, it often operates as two narrow lanes. Louis Prang Street provides a single approach lane eastbound. Huntington Avenue provides two travel lanes northbound and two southbound. In each direction, there is an exclusive through lane and a shared through/right-turn lane. Left turns are prohibited from Huntington Avenue at this intersection. The MBTA's Green Line (E Line) also operates within the median of Huntington Avenue. Pedestrian sidewalks and crosswalks are provided for all four intersection approaches. The intersection is currently being rebuilt as part of the Huntington Avenue reconstruction project.

18. Brookline Avenue/Fenway

The intersection of Brookline Avenue and the Fenway is a complex five-legged intersection (when the left turn loop to Park Drive is considered). It is under two-phase traffic signal control, coordinated with the adjacent intersection of Brookline Avenue, Park Drive and Boylston Street. The signal phasing includes concurrent pedestrian movements. Brookline Avenue approaches from the north with two exclusive through lanes. These continue as two lanes departing the south side of the intersection. From the south, it approaches with an exclusive through and a shared through/right-turn lane. These expand to four lanes on the north side of the intersection, to provide queue storage for the adjacent intersection at Park Drive and Boylston Street. The Riverway from the west consists of an exclusive left-turn lane, a shared through/left-turn lane, an exclusive through lane, and an exclusive right-turn lane. On the far side of the intersection, they continue as three lanes eastbound on the Fenway and one diverge lane looping left to Park Drive. Sidewalks are provided along Brookline Avenue and the south side of the Fenway, and pathways are provided within the Fens north of the Fenway. Crosswalks are provided across all legs except the north leg of Brookline Avenue.

19. Brookline Avenue/Boylston Street/Park Drive

The intersection of Brookline Avenue, Park Drive, and Boylston Street is a five-legged intersection under three-phase traffic signal control, coordinated with the adjacent intersection of Brookline Avenue and the Fenway. The signal includes concurrent pedestrian movements. Brookline Avenue from the south consists of a shared through/left-turn lane, an exclusive through lane (to continue on Brookline Avenue) and two exclusive right-turn lanes (to Boylston Street). Brookline Avenue from the north approaches with an exclusive right-turn lane and two through lanes. Boylston Street from the northeast approach consists of two approach lanes, however, the right lane is wide enough that many motorists treat it as two lanes. Behind the stop line there is a diverge for vehicles turning right onto Brookline Avenue. Park Drive from the east has three marked lanes but the right lane is wide enough that many motorists treat it as two lanes. Effectively there is a shared through/left-turn lane, two exclusive through lanes, and an exclusive right-turn lane on Park Drive westbound. To the west of the intersection, Park Drive consists of four departure lanes. Sidewalks are provided along Brookline Avenue, Boylston Street, and the north side of Park Drive, and pedestrian paths are provided within the Fens south of Park Drive. Crosswalks are provided across all legs except the south leg of Brookline Avenue. On-street parking is prohibited at this intersection.

20. Beacon Street/Park Drive (Audubon Circle)

The intersection of Beacon Street and Park Drive (also called Audubon Circle) is a four-way intersection under four-phase traffic signal control, including an exclusive pedestrian phase. There are channelized, unsignalized right turns from all intersection approaches and all four approaches are divided by medians. The MBTA Green Line (C Line) runs within the median of Beacon Street south of the intersection, going underground immediately to the south of Park Drive. In addition to the channelized right turns, each approach consists of two general-purpose lanes, effectively a shared left-turn/through lane and an exclusive through lane. Sidewalks are provided along all intersection approaches. Crosswalks are provided in all directions, crossing by way of the medians and the islands separating the channelized rights.

21. Longwood Avenue/Riverway

The intersection of Longwood Avenue and the Riverway is a four-legged intersection that operates under three-phase traffic signal control. In addition to phases for all Riverway traffic and for all Longwood Avenue traffic, a phase allows for protected left turns from Riverway northbound and right turns from Longwood Avenue eastbound. Pedestrian movements across Longwood Avenue are concurrent with the Riverway traffic phase. Pedestrian movements across the Riverway are concurrent with the protected left turn phase and are made via a diagonal crosswalk. The Longwood Avenue westbound approach provides an exclusive left-turn lane and a shared through/right-turn lane. The Longwood Avenue eastbound approach provides a shared left-turn/through lane an exclusive right-turn lane. The Riverway northbound approach provides an exclusive left-turn lane, a through lane, and a shared through/right-turn lane. The Riverway southbound approach provides two through lanes (left turns from this approach are prohibited) and an exclusive right-turn lane. There is no on-street parking permitted along any of the intersection approaches. Sidewalks are provided along all intersection approaches except along the west side of the Riverway. Crosswalks run across the west, north and east legs of the intersection. A fourth crosswalk runs diagonally from the northwest corner to the southeast corner of the intersection.

22. Riverway/Netherlands Road/Francis Street

The intersection of the Riverway and Netherlands Road/Francis Street is a four-legged intersection controlled by stop signs on the Netherlands Road and Francis Street approaches. The Netherlands Road eastbound approach provides a single general-purpose travel lane in each direction. Instead of a double yellow centerline, a yellow diamond two-way traffic sign has been posted. The Francis Street westbound approach also provides a single general-purpose travel lane in each direction, separated by a double yellow centerline. The Riverway provides two general-purpose travel lanes in both the northbound and southbound directions. Left-turn prohibitions are posted on the westbound and southbound approaches. Sidewalks are provided along all intersection approaches except along the west side of the Riverway. No crosswalks are provided at this intersection.

23. Brookline Avenue/Francis Street

The intersection of Francis Street and Brookline Avenue is a four-legged intersection that operates under four-phase traffic signal control, including a southbound lead phase and an exclusive pedestrian phase. The Francis Street westbound approach provides an exclusive left-turn lane and a shared through/right-turn lane. The Francis Street eastbound approach provides a single general-purpose travel lane. The Brookline Avenue northbound approach provides a shared left-turn/through lane, an exclusive through lane, and a shared through/right-turn lane. The Brookline Avenue southbound approach provides an exclusive left-turn lane, an exclusive through lane, and a shared through/right-turn lane. There is no on-street parking permitted along any of the approaches during the day, although metered parking is permitted at night along the east side Brookline Avenue south of the intersection. MBTA bus stops are located on Brookline Avenue on both the northbound and southbound departures from the intersection. The traffic signal's actuated pedestrian phase provides for exclusive pedestrian movement at the intersection. Sidewalks and crosswalks are provided at all four intersection approaches.

24. Francis Street/Binney Street

The intersection of Francis Street and Binney Street is a four-legged intersection controlled by stop signs on both Binney Street approaches. Each of the four approaches provides a single general-purpose travel lane. On-street resident permit parking is designated along the south side of Francis Street east of the intersection. A major MASCO/Partners shuttle bus stop is located on the south side of the Francis Street eastbound approach. A loading dock that serves the adjacent MATEP facility is located on the north side of Francis Street just west of the intersection. Sidewalks and crosswalks are provided at all four intersection approaches.

25. Francis Street/Huntington Avenue/Tremont Street/Calumet Street (Brigham Circle)

The intersection of Francis Street, Huntington Avenue, Tremont Street and Calumet Street, also known as Brigham Circle, is a five-legged intersection that operates under three-phase traffic signal control with concurrent pedestrian movements. A fourth signal phase, exclusive pedestrian movements, may be actuated using a push button. Except for Calumet Street, which is a one-way departure from the intersection, each approach provides a shared left-turn/through lane and a shared through/right-turn lane. On-street parking is permitted on all intersection approaches except along the north side of Francis Street west of the intersection and where it has been temporarily removed to allow for construction of Huntington Avenue improvements north of the intersection. The traffic signal's actuated pedestrian phase provides for exclusive pedestrian movement at the intersection. Sidewalks and crosswalks are provided at all five intersection approaches. Huntington Avenue improvements are discussed in Section 5.3.1.2, City/State-Sponsored Traffic Improvements.

26. St. Alphonsus Street/Tremont Street

The intersection of St. Alphonsus Street and Tremont Street is a four-legged intersection under three-phase traffic signal control, including a push-button activated exclusive pedestrian phase. A single general-purpose travel lane is provided on each of the four approaches. Parking, a mixture of resident permit, metered, and time restricted, and unrestricted, is provided along all intersection approaches. Sidewalks and crosswalks are provided at all four intersection approaches.

27. Fenwood Road/Huntington Avenue

The intersection of Fenwood Road and Huntington Avenue is a three-legged unsignalized intersection. Fenwood Road is a one-way departure from the intersection. Huntington Avenue provides two general-purpose travel lanes in each direction. At this location, Huntington Avenue has no median. Parking is provided along all intersection approaches except adjacent to the school on the southwest corner of the intersection. Sidewalks are provided at all intersection approaches.

28. St. Albans Road/Huntington Avenue/Mission Street

St. Albans Road intersects Huntington Avenue opposite Mission Street, forming a four-way unsignalized intersection. Mission Street runs one-way westbound (toward Huntington Avenue) with a single general-purpose travel lane. One general-purpose travel lane in each direction is provided on St. Albans Road. On Huntington Avenue, there are two general-purpose travel lanes in each direction. At this location, Huntington Avenue has no median. On-street parking is permitted along all intersection approaches. Sidewalks and crosswalks are provided at all four intersection approaches.

5.2.4 Traffic

An extensive transportation data collection program was conducted as directed by the BRA's Scoping Determination. This effort included conducting morning and evening peak hour turning movement counts (TMCs) from 7:00 to 9:00 AM and from 4:00 to 6:00 PM at all identified study area intersections. In addition, automatic traffic recorders (ATRs) were installed to collect daily traffic volumes (in 15-minute increments) for a period of seven consecutive days in May 2002.[3] All traffic data are included in Appendix B and are summarized below.

5.2.4.1 Average Daily Traffic Counts

Hourly traffic activity along major or important roadways in the study area was counted via the use of automatic traffic recorders (ATRs). ATRs were installed for a period of seven consecutive days along Longwood Avenue, Brookline Avenue, Avenue Louis Pasteur, Francis Street and Fenwood Road. Weekday average ATR count summaries for these five roadways are presented in Tables 5-4 through 5-8. Seven-day ATR counts are presented in Appendix B. The following sections summarize average weekday daily traffic (AWDT), by hour, based on data collected at these five locations. These data, representing the averages of data collected over multiple weekdays, illustrate the daily variations of traffic demands and the directional flow of traffic in and through the study area over the course of an average weekday.

Longwood Avenue

On Longwood Avenue west of Avenue Louis Pasteur, the average weekly daily traffic (AWDT) is approximately 12,500 vehicles, with more traffic traveling eastbound most hours. Hourly traffic volumes are generally highest (over 800 vehicles per hour (VPH)) between 3:00 and 6:00 PM.

Brookline Avenue

On Brookline Avenue north of Longwood Avenue, ATR counts showed 29,900 AWDT. Hourly volumes are highest (over 1,900 VPH) between 3:00 and 6:00 PM. During the day, the majority of vehicles travel northbound, while overnight the majority of vehicles travel southbound.

Avenue Louis Pasteur

Avenue Louis Pasteur carries approximately 6,900 AWDT at the count location north of Longwood Avenue. Nearly 65 percent of that traffic is in the southbound direction. Volumes are highest (over 700 VPH) between 7:00 and 8:00 AM.

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3 Due to difficulties with data collection in May, a count from January 2002 was used for the Fenwood Road location.

Francis Street

West of St. Albans Road, Francis Street carries approximately 11,600 AWDT, almost 60 percent of that in the eastbound direction. Hourly traffic peaks at approximately 830 VPH between 2:00 and 3:00 PM.

Fenwood Road

East of Binney Street, Fenwood Road carries approximately 3,500 AWDT. Hourly traffic peaks at approximately 340 VPH between 7:00 and 8:00 AM. In general, more traffic travels eastbound during the morning and westbound during the evening.

Table 5-4: Average Weekday Daily Traffic Summary Longwood Avenue west of Avenue Louis Pasteur

Hour Beginning	Westbound Volume	Eastbound Volume	Total for Both Directions	Peak Direction	Percent in Peak Direction
Midnight	87	75	162	WB	54%
1:00 AM	53	45	98	WB	54%
2:00 AM	44	36	80	WB	55%
3:00 AM	28	28	56	WB	51%
4:00 AM	22	22	44	EB	50%
5:00 AM	76	105	181	EB	58%
6:00 AM	183	232	415	EB	56%
7:00 AM	305	441	746	EB	59%
8:00 AM	256	357	613	EB	58%
9:00 AM	269	388	656	EB	59%
10:00 AM	285	373	659	EB	57%
11:00 AM	324	413	737	EB	56%
Noon	336	423	759	EB	56%
1:00 PM	320	400	720	EB	56%
2:00 PM	355	442	797	EB	55%
3:00 PM	387	508	895	EB	57%
4:00 PM	388	513	901	EB	57%
5:00 PM	361	501	862	EB	58%
6:00 PM	331	410	741	EB	55%
7:00 PM	275	344	619	EB	56%
8:00 PM	220	289	510	EB	57%
9:00 PM	201	257	458	EB	56%
10:00 PM	198	248	445	EB	56%
11:00 PM	161	167	328	EB	51%
Daily Total	**5,465**	**7,017**	**12,482**	**EB**	**56%**

Source: ATR counts conducted by Vanasse Hangen Brustlin, Inc. from Wednesday May 22 through Tuesday May 28, 2002.

Table 5-5 Average Weekday Daily Traffic Summary Brookline Avenue north of Longwood Avenue

Hour Beginning	Southbound Volume	Northbound Volume	Total for Both Directions	Peak Direction	Percent in Peak Direction
Midnight	303	205	508	SB	60%
1:00 AM	185	111	296	SB	63%
2:00 AM	179	79	258	SB	69%
3:00 AM	108	72	180	SB	60%
4:00 AM	113	132	244	NB	54%
5:00 AM	245	414	659	NB	63%
6:00 AM	523	784	1,307	NB	60%
7:00 AM	713	1,049	1,762	NB	60%
8:00 AM	659	1,013	1,672	NB	61%
9:00 AM	630	855	1,484	NB	58%
10:00 AM	693	914	1,606	NB	57%
11:00 AM	752	930	1,682	NB	55%
Noon	721	890	1,611	NB	55%
1:00 PM	764	893	1,657	NB	54%
2:00 PM	858	1,017	1,875	NB	54%
3:00 PM	865	1,065	1,930	NB	55%
4:00 PM	906	1,070	1,976	NB	54%
5:00 PM	869	1,055	1,924	NB	55%
6:00 PM	800	943	1,743	NB	54%
7:00 PM	663	785	1,448	NB	54%
8:00 PM	563	637	1,200	NB	53%
9:00 PM	520	578	1,098	NB	53%
10:00 PM	484	472	956	SB	51%
11:00 PM	462	393	854	SB	54%
Daily Total	**13579**	**16,353**	**29,931**	**NB**	**55%**

Source: ATR counts conducted by Vanasse Hangen Brustlin, Inc. from Wednesday May 22 through Tuesday May 28, 2002.

Table 5-6: Average Weekday Daily Traffic Summary Avenue Louis Pasteur north of Longwood Avenue

Hour Beginning	Southbound Volume	Northbound Volume	Total for Both Directions	Peak Direction	Percent in Peak Direction
Midnight	19	13	32	SB	59%
1:00 AM	9	6	15	SB	61%
2:00 AM	8	2	10	SB	81%
3:00 AM	7	3	10	SB	71%
4:00 AM	12	4	16	SB	77%
5:00 AM	101	28	129	SB	78%
6:00 AM	211	93	304	SB	69%
7:00 AM	438	328	766	SB	57%
8:00 AM	373	109	481	SB	77%
9:00 AM	340	143	483	SB	70%
10:00 AM	232	109	341	SB	68%
11:00 AM	203	127	329	SB	62%
Noon	232	140	372	SB	62%
1:00 PM	195	125	320	SB	61%
2:00 PM	331	215	546	SB	61%
3:00 PM	392	188	579	SB	68%
4:00 PM	331	179	510	SB	65%
5:00 PM	269	166	435	SB	62%
6:00 PM	210	166	376	SB	56%
7:00 PM	168	116	284	SB	59%
8:00 PM	111	128	239	NB	53%
9:00 PM	97	65	162	SB	60%
10:00 PM	80	58	138	SB	58%
11:00 PM	46	26	72	SB	64%
Daily Total	**4,417**	**2,533**	**6,949**	**SB**	**64%**

Source: ATR counts conducted by Vanasse Hangen Brustlin, Inc. from Wednesday May 22 through Tuesday May 28, 2002.

Table 5-7: Average Weekday Daily Traffic Summary Francis Street west of St. Albans Road

Hour Beginning	Westbound Volume	Eastbound Volume	Total for Both Directions	Peak Direction	Percent in Peak Direction
Midnight	72	60	132	WB	55%
1:00 AM	49	42	91	WB	54%
2:00 AM	42	30	73	WB	58%
3:00 AM	31	25	57	WB	55%
4:00 AM	27	29	56	EB	52%
5:00 AM	77	112	188	EB	59%
6:00 AM	164	231	395	EB	58%
7:00 AM	239	353	592	EB	60%
8:00 AM	269	456	725	EB	63%
9:00 AM	281	483	764	EB	63%
10:00 AM	293	460	753	EB	61%
11:00 AM	328	480	808	EB	59%
Noon	331	460	790	EB	58%
1:00 PM	311	432	743	EB	58%
2:00 PM	353	478	832	EB	58%
3:00 PM	352	463	815	EB	57%
4:00 PM	308	432	740	EB	58%
5:00 PM	281	389	670	EB	58%
6:00 PM	257	341	598	EB	57%
7:00 PM	222	265	487	EB	54%
8:00 PM	164	196	360	EB	54%
9:00 PM	151	161	312	EB	52%
10:00 PM	159	174	333	EB	52%
11:00 PM	123	134	257	EB	52%
Daily Total	**4,884**	**6,687**	**11,570**	**EB**	**58%**

Source: ATR counts conducted by Vanasse Hangen Brustlin, Inc. from Wednesday May 22 through Tuesday May 28, 2002.

Table 5-8: Average Weekday Daily Traffic Summary Fenwood Road east of Binney Street

Hour Beginning	Westbound Volume	Eastbound Volume	Total for Both Directions	Peak Direction	Percent in Peak Direction
Midnight	18	14	33	WB	56%
1:00 AM	9	10	19	EB	53%
2:00 AM	5	8	12	EB	62%
3:00 AM	3	5	8	EB	64%
4:00 AM	4	7	11	EB	60%
5:00 AM	20	26	47	EB	56%
6:00 AM	42	134	176	EB	76%
7:00 AM	149	188	337	EB	56%
8:00 AM	115	158	273	EB	58%
9:00 AM	85	128	213	EB	60%
10:00 AM	74	134	209	EB	64%
11:00 AM	83	108	191	EB	57%
Noon	87	118	205	EB	57%
1:00 PM	84	117	201	EB	58%
2:00 PM	87	144	231	EB	62%
3:00 PM	97	110	208	EB	53%
4:00 PM	96	94	190	WB	50%
5:00 PM	112	104	215	WB	52%
6:00 PM	91	132	223	EB	59%
7:00 PM	99	61	160	WB	62%
8:00 PM	55	34	88	WB	62%
9:00 PM	33	29	63	WB	53%
10:00 PM	29	42	71	EB	60%
11:00 PM	47	27	74	WB	64%
Daily Total	**1,525**	**1,934**	**3,459**	**EB**	**56%**

Source: ATR counts conducted by Vanasse Hangen Brustlin, Inc. from Tuesday, January 29 through Thursday, January 31, 2002.

5.2.4.2 Peak Hour Traffic Volumes

Manual turning movement/classification counts (TMCs) were conducted in June 2002 at each of the 25 study area intersections and Harvard driveways. As required within the BRA Scoping Determination, TMCs were conducted from 7:00 to 9:00 AM and from 4:00 to 6:00 PM, to capture the morning and evening peaks of traffic volumes in the study area. The study area's overall morning peak hour was determined to occur between 8:00 AM and 9:00 AM, and the study area's overall evening peak hour was determined to occur between 5:00 PM and 6:00 PM.

Intersection turning movement counts were used to establish traffic networks for the 2002 Existing Condition for the morning and evening peak hours. Comparisons of data from adjacent intersections, and of counts done on different days, are used to balance the networks and to adjust for day-to-day variation. Existing Condition (2002) morning and evening peak hour traffic volumes are shown in Figures 5-3 and 5-4.

5.2.4.3 Truck Traffic Volumes

Truck traffic on Francis Street and Fenwood Road was examined as required by the BRA Scoping Determination. A thorough classification count of commercial truck vehicles was conducted at the following two locations:

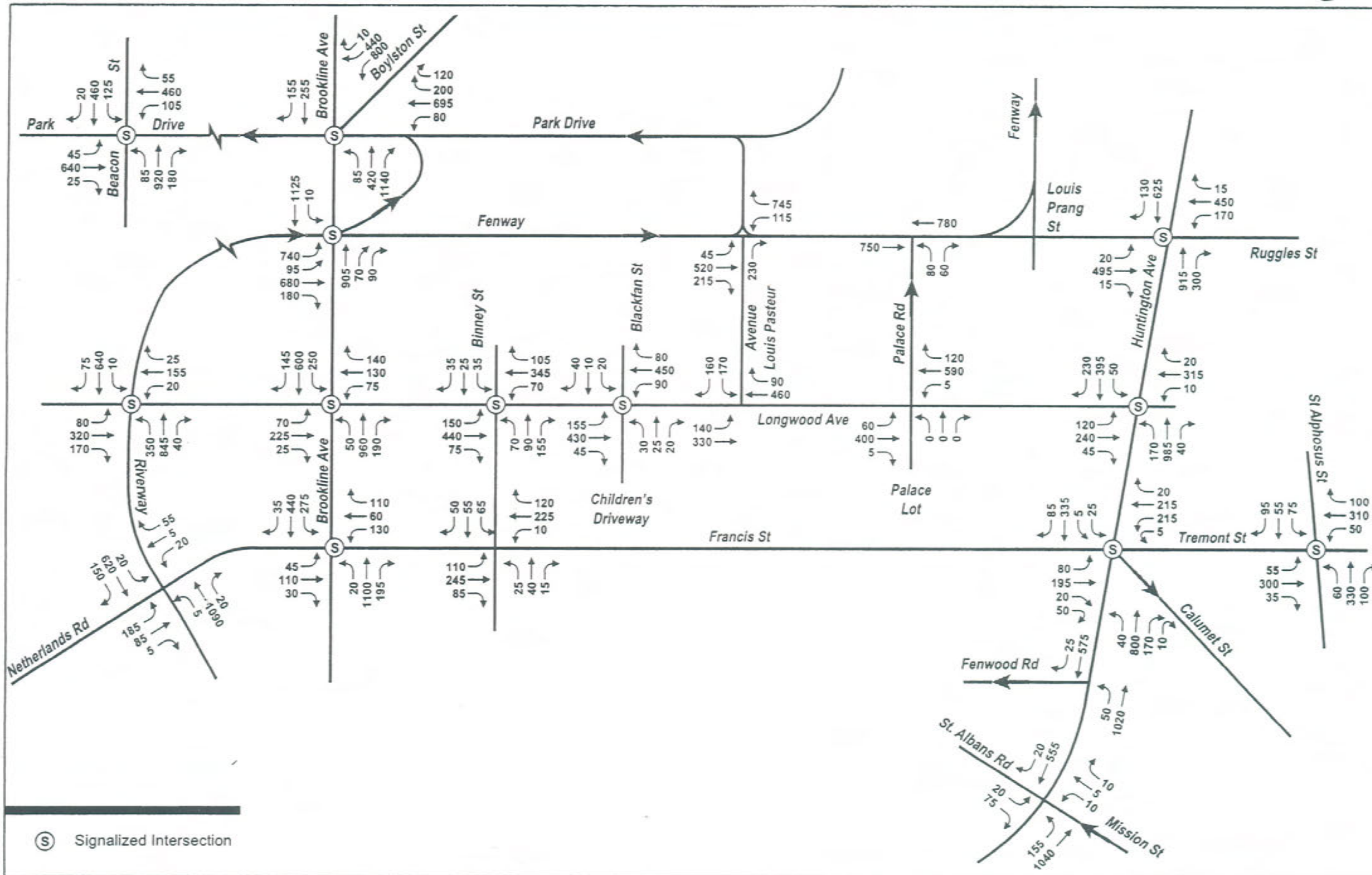
- Fenwood Road between Vining Street and Kempton Street.
- Francis Street between Binney Street and Vining Street.

The counts indicate that pick-up trucks and vans are the main types of trucks traveling on Fenwood Road and Francis Street and that tractor-trailer trucks constitute only one percent of truck traffic on each street. More than twice as many trucks use Francis Street as use Fenwood Road. Truck observations made for each street are discussed in more detail in the following section. Classification summaries are presented in Tables 5-9 and 5-10.

Fenwood Road Truck Traffic Summary

As shown in Table 5-9, traffic counts from 7:00 AM to 6:00 PM on Wednesday May 29, 2002 showed the following:

- Fenwood Road carried 144 trucks during the 11-hour count period, or 5.8 percent of total traffic.
- Hourly truck volumes ranged from a high of 25 vehicles between 8:00 and 9:00 AM to a low of six vehicles between 5:00 and 6:00 PM, the last hour of the count.
- Only three tractor-trailers traveled Fenwood Road during the 11-hour period.
- For the entire 11-hour period, pick-up trucks/vans comprised approximately two-thirds of truck traffic (95 out of 144 vehicles).



Source: Vanasse Hangen Brustlin, Inc.

Harvard Longwood Campus
Institutional Master Plan

Figure 5-3

2002 Existing Condition Morning Peak Hour Traffic Volumes

Vanasse Hangen Brustlin, Inc

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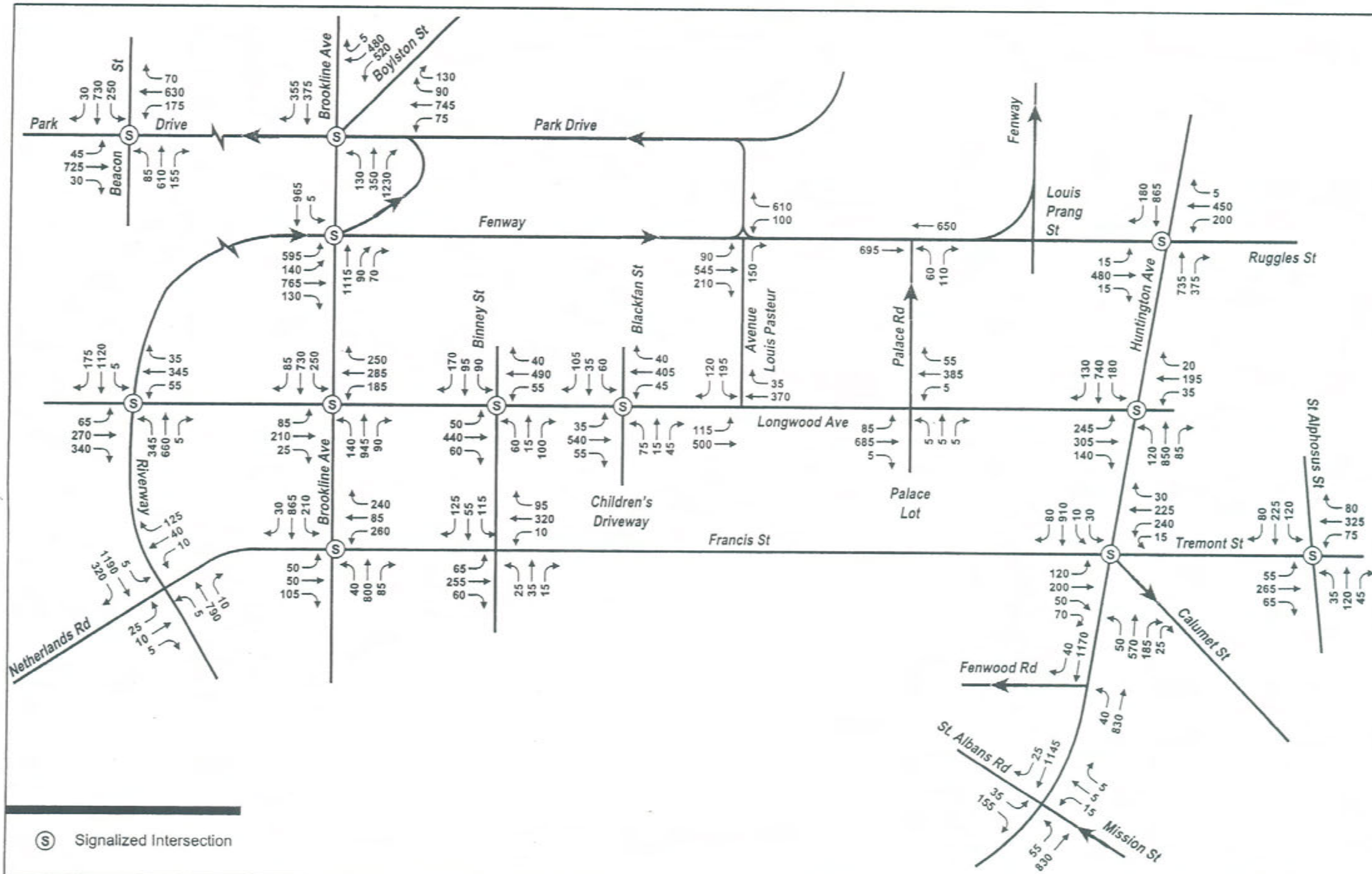

Not to Scale

Source: Vanasse Hangen Brustlin, Inc.

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Figure 5-4

2002 Existing Condition Evening Peak Hour Traffic Volumes

Vanasse Hangen Brustlin, Inc

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Table 5-9: Fenwood Road Commercial Vehicle Classification

Beginning Time	Pickup/Van	Small Box	Large Box	Tractor Trailer	Total Trucks	Hourly Traffic [1]	Percent Trucks
7:00 AM	10	1	0	0	11	337	3.3%
8:00 AM	17	3	5	0	25	273	9.2%
9:00 AM	16	3	0	0	19	213	8.9%
10:00 AM	10	4	1	2	17	209	8.1%
11:00 AM	2	6	1	0	9	191	4.7%
12:00 PM	8	1	2	0	11	205	5.4%
1:00 PM	10	7	1	0	18	201	9.0%
2:00 PM	6	6	0	0	12	231	5.2%
3:00 PM	5	1	1	0	7	208	3.4%
4:00 PM	5	1	2	1	9	190	4.7%
5:00 PM	6	0	0	0	6	215	2.8%
11-Hour Total	95	33	13	3	144	2,473	5.8%
Percent of Total Traffic	3.8%	1.3%	0.5%	0.1%	5.8%	100%	

Source: Counts conducted by Vanasse Hangen Brustlin, Inc. on Wednesday, May 29, 2002.

1/ Daily traffic counts for Fenwood Road are presented in Table 5-8.

Francis Street Truck Traffic Summary

As shown in Table 5-10, traffic counts from 7:00 AM to 6:00 PM on Wednesday May 29, 2002 showed the following:

- Francis Street carried 327 trucks during the 11-hour count period, or 4.0 percent of total traffic.
- Hourly truck volumes ranged from a high of 49 vehicles between 11:00 AM and 12:00 noon to a low of 17 vehicles between 9:00 and 10:00 AM.
- Eight tractor-trailers traveled Francis Street during the 11-hour period.
- For the entire 11-hour period, pick-up trucks/vans comprised approximately two-thirds of truck traffic (222 out of 327 vehicles).

Table 5-10: Francis Street Commercial Vehicle Classification

Beginning Time	Pickup/Van	Small Box	Large Box	Tractor Trailer	Total Trucks	Hourly Traffic [1]	Percent Trucks
7:00 AM	9	10	3	1	23	592	3.9%
8:00 AM	12	7	8	2	29	725	4.0%
9:00 AM	9	6	2	0	17	764	2.2%
10:00 AM	9	2	4	3	18	753	2.4%
11:00 AM	31	12	6	0	49	808	6.1%
12:00 PM	33	8	2	1	44	790	5.6%
1:00 PM	26	5	7	1	39	743	5.2%
2:00 PM	25	3	4	0	32	832	3.8%
3:00 PM	27	1	1	0	29	815	3.6%
4:00 PM	25	2	1	0	28	740	3.8%
5:00 PM	16	2	1	0	19	670	2.8%
11-Hour Total	222	58	39	8	327	8,232	4.0%
Percent of Total Traffic	2.7%	0.7%	0.5%	0.1%	4.0%	100%	

Source: Counts conducted by Vanasse Hangen Brustlin, Inc. on Wednesday, May 29, 2002.

1/ Daily traffic counts for Francis Street are presented in Table 5-7.

5.2.5 Areawide Parking

This section identifies the existing parking supply and demand for the study area, including both off-street and on-street parking.

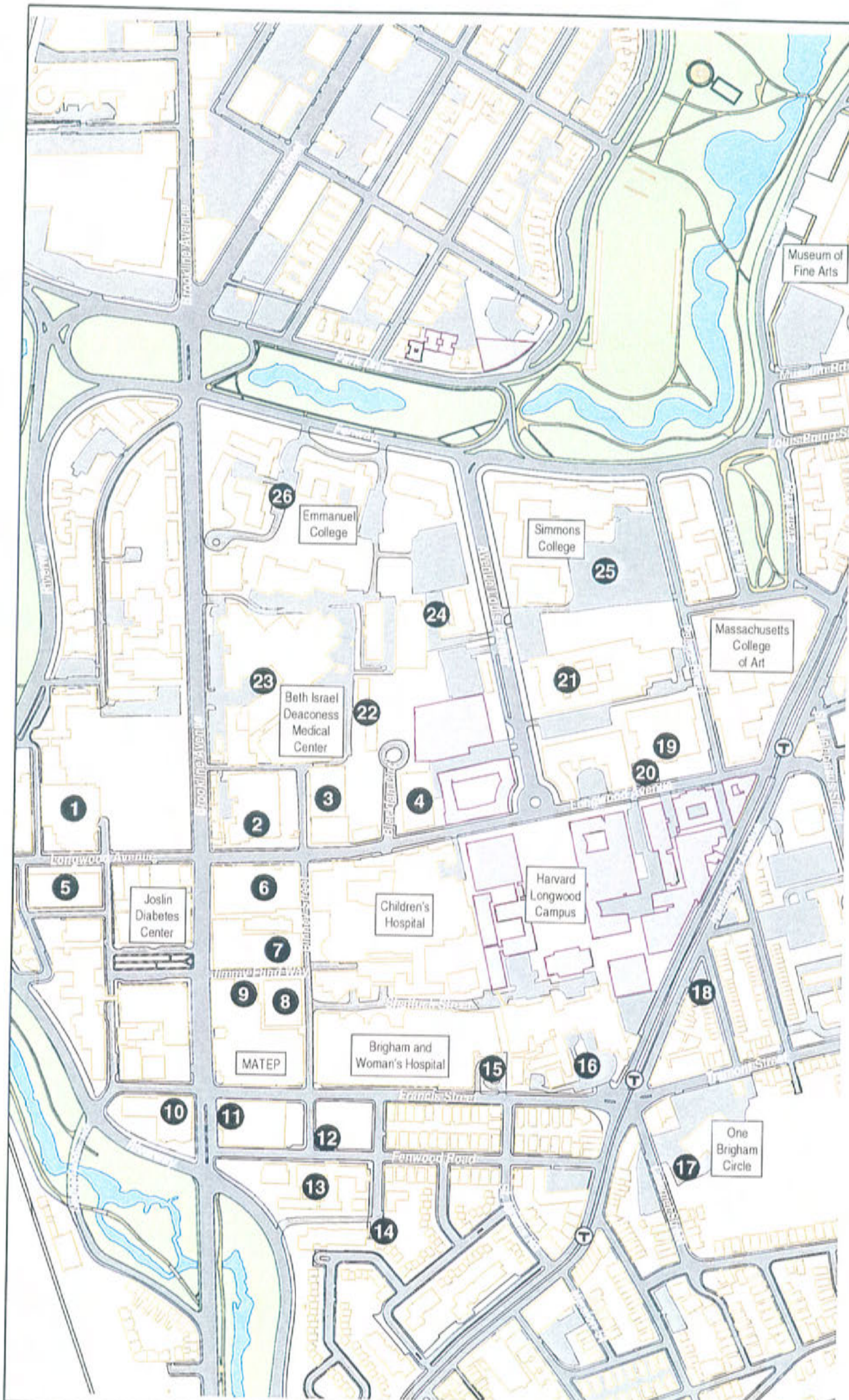
Several off-street public parking facilities and a relatively small number of on-street parking spaces are located within the project study area. Parking space summaries presented in this section were initially compiled in the West Fenway/Longwood Transportation Management Strategies Report[4] and have been supplemented with new field observations of current conditions.

5.2.5.1 Off-Street Parking Facilities

The 26 off-street parking areas closest to the project site are listed below and are shown in Figure 5-5. Table 5-11 also presents information about the size and midday occupancy of these facilities. In total, there are 9,318 spaces provided in these facilities in addition to the on-campus spaces listed previously in Table 5-1. Mid-day there is generally little available

4 Prepared by Howard/Stein-Hudson Associates, Inc., for the City of Boston Transportation Department, November 1998.

parking in any of these facilities. The apparent supply is further reduced by the number of



Location	Facility/Location Name	Total Spaces
1	375 Longwood Ave Garage (MASCO Building)	750
2	BIDMC/Carl J. Shapiro Clinic Center Garage	750
3	333 Longwood Ave Garage	495
4	Children's Hospital Patient and Family Garage	643
5	BIDMC/Pilgram Garage	750
6	Longwood Galleria Garage	103
7	DFCI/Dana Building	160
8	DFCI/Smith Building	229
9	DFCI/454 Brookline Ave	29
10	BIDMC/LMOB Garage	294
11	Servicenter Garage	643
12	BWH/Binney/Vining Site	62*
13	Mass Mental Health	212
14	Mission Park Garage	1,373
15	BWH/ASB II Garage	247
16	BWH/15 Francis Street Lot	57
17	One Brigham Circle (Ledge Site)	385**
18	Stanhope Garage	41
19	MCP Iorio/Fennell Garage	96
20	Massachusetts College of Pharmacy Lot	28
21	Boston Latin School	158
22	Judge Baker Children's Center	49****
23	BIDMC East Campus	604
24	Emmanuel College: Endowment Campus Parking	404
25	Simmons College Campus Parking	473
26	Emmanuel College: Academic Campus Parking	283

* Temporary parking area. Replaces former Vin-Fen lot.

** Under Construction.

*** All of these parking spaces are temporarily out-of-service due to ongoing construction of the Harvard New Research Building

**** 16 of these 49 total parking spaces are temporarily out-of-service due to ongoing construction of the Children's Hospital Blackfan Research Building

Harvard Longwood Campus

0 300 600 Feet

Harvard Longwood Campus
Institutional Master Plan

Figure 5-5

Summary of Nearby Off-Street Parking Facilities
(Not Including Harvard-Controlled Spaces)

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Vanasse Hangen Brustlin, Inc

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Table 5-11: Off-Street Parking Facilities[1]

	Facility/Location Name	Total Spaces	Spaces Occupied	Percent Occupancy
1	375 Longwood Avenue Garage (MASCO Building)	750	748	99%
2	BIDMC/Carl J. Shapiro Clinical Center Garage	750	749	100%
3	333 Longwood Avenue Garage	495	446	90%
4	Children's Hospital Patient & Family Garage	643	610	95%
5	BIDMC/Pilgrim Road Garage	750	750	100%
6	Longwood Galleria Garage	103	95	92%
7	DFCI/Dana Building	160	162	100%
8	DFCI/Smith Building	229	222	97%
9	DFCI/454 Brookline Avenue Lot	29	29	100%
10	BIDMC/Lowery Garage	294	294	100%
11	Servicenter Garage	643	643	100%
12	BWH/CAM Site [2]	62	62	100%
13	Mass Mental Health	212	180	85%
14	Mission Park Garage	1,373	1,350	98%
15	BWH/ASB II Garage	247	247	100%
16	BWH/15 Francis Street Lot	57	57	100%
17	One Brigham Circle (Ledge Site) [3]	385	NA	NA
18	Stanhope Garage	41	41	100%
19	MCP Iorio/Fennell Garage	96	96	100%
20	Mass. College of Pharmacy Lot	28	28	100%
21	Boston Latin School	158	158	100%
22	Judge Baker Children's Center [4]	49	32	97%
23	BIDMC East Campus	604	601	99%
24	Emmanuel college: Endowment Campus Parking	404	384	95%
25	Simmons College Campus Parking	473	464	98%
26	Emmanuel College: Academic Campus Parking	283	238	84%
	Total	**9,318**	**8,686**	**93%**

Sources: Emmanuel College Draft Project Impact Report/Environmental Impact Report, prepared by Corcoran Jennison Companies and Goody Clancy & Associates, November, 1999.

Children's Hospital Clinical and Research Building Final Project Impact Report, prepared by Epsilon Associates, October 26, 1999.

Simmons College Draft Institutional Master Plan, prepared by Epsilon Associates, July 2000.

1/ Tally does not include any newly approved parking spaces.

2/ Temporary parking area. Replaces former Vin-Fen lot.

3/ Currently under construction. Spaces are not yet in service.

4/ 16 of these 49 total parking spaces are temporarily out-of-service due to ongoing construction of the Children's Hospital Blackfan Research Building.

spaces reserved for specific institutions or specific users within those institutions. Most of the hospital-controlled spaces are for each institution's employees, patients and visitors. Many LMA institutions maintain long waiting lists of employees seeking reserved off-street parking.

5.2.5.2 On-Street Parking

On-street parking located in the area around the project site is listed in Table 5-12 and illustrated in Figure 5-6. There are approximately 520 on-street spaces in the area. Approximately 185 of those spaces are restricted to residents in the Mission Hill neighborhood and are not available for public parking. Of the remaining 335 spaces, there are approximately 250 metered spaces and 85 time-restricted but unmetered spaces. Although no counts were taken, informal observations of on-street parking revealed that non-resident spaces were generally fully utilized during the day, and typically one or two resident permit spaces were available on each block.

Table 5-12: On-Street Parking Spaces

Street	Location	Metered	Timed	Resident
Fenway	Avenue Louis Pasteur to Palace Road	-	26	
Louis Prang Street	Evans Way to Vancouver Street	-	8	
Tetlow Street	Palace Road to Huntington Avenue	6	-	8
Francis Street	Binney Street to Huntington Avenue	-	2	29
Fenwood Road	Brookline Avenue to Huntington Avenue	14	4	57
Pilgrim Road	Longwood Avenue to Joslin Place	5	-	-
Joslin Place	Pilgrim Road to Brookline Avenue	4	-	-
Deaconess Road	Pilgrim Road to Brookline Avenue	4	-	-
Brookline Avenue	Fenway to Francis Street	83	-	
Palace Road	Fenway to Longwood Avenue	38	3	24
Evans Way	Fenway to Tetlow Street	80	-	-
Vancouver Street	Louis Prang Street to Huntington Avenue	-	15	
Vining Street	Francis Street to Mission Park Garage	-	-	26
Saint Albans Road	Francis Street to Huntington Avenue	-	-	41
Huntington Avenue	Francis Street to St. Albans Road	16	27	-
Total		**250**	**85**	**185**

Source: Vanasse Hangen Brustlin, Inc. field surveys conducted from January through March 2002.

5.2.6 Accident History

In order to identify accident trends in the study area, accident data for the study area intersections were obtained from the Massachusetts Highway Department (MassHighway) for the most recent three-year period available (1998-2000). Accident data are presented in Table 5-13 and summarized below.

- A total of 517 accidents occurred at the 20 study area intersections over the three-year period.[5]
- These accidents equate to approximately 172 accidents per year. The actual number of accidents has decreased by over 5 percent each year during the three-year period.
- Accident rates were low at the intersections immediately surrounding the Harvard Longwood Campus. An average of 1.3 accidents per year were reported at the intersection of Longwood Avenue and Avenue Louis Pasteur, and an average of 1.0 was reported at Longwood Avenue and Palace Road.
- Nearly two-thirds of all accidents reported at study area intersections during the three years resulted in property damage only with no personal injury claims.
- More accidents occurred at the intersection of Park Drive, Brookline Avenue, and Boylston Street (31 accidents per year) than at any other study area intersection.
- The Park Drive, Brookline Avenue and Boylston Street intersection was also the location of the only identified fatal accident, a collision of a motor vehicle with a pedestrian in May 1999.
- The second-highest accident rate in the study area occurred at Park Drive and Beacon Street (Audubon Circle), with 21 accidents per year.

5 Accidents at site driveways were not analyzed because accident locations are rarely reported with a high enough level of precision to identify accidents at specific driveways.

5.2.7 Pedestrians and Bicycles

In accordance with the BRA Scoping Determination, pedestrian and bicycle activities were observed and recorded at each of the study area intersections during morning and evening peak hours. The following section discusses pedestrian facilities and peak hour pedestrian flows in the study area.

5.2.7.1 Existing Pedestrian Facilities

Pedestrian facilities in the study area include sidewalks that vary in width from six feet to 15 feet, crosswalks at major intersections, and access ramps for the disabled. The high level of pedestrian activity in the area has prompted changes in traffic signal design and operation in recent years to include exclusive pedestrian phasing, and all area signalized intersections now are equipped with pedestrian push-buttons. MASCO and its member institutions recognize the importance of providing safe and efficient pedestrian facilities, and continue to study and re-evaluate pedestrian needs in the area. Figure 5-7 provides an inventory of existing sidewalks and their widths, as well as marked crosswalks in the area.

A number of pedestrian connections pass through the Harvard Longwood Campus. The Palace Lot forms a pedestrian continuation of Palace Road through to Huntington Avenue. A campus gateway next to the Countway Lot also provides access between Huntington Avenue and Longwood Avenue by way of the Longwood Lot and the walkway next to the Warren Alpert Building, or by way of the Quad. The Quad also connects Longwood Avenue and Avenue Louis Pasteur to Shattuck Street by way of pathways on the west side of Gordon Hall. Primary pedestrian flow paths in and around the Harvard Longwood Campus are depicted on Figure 5-8.

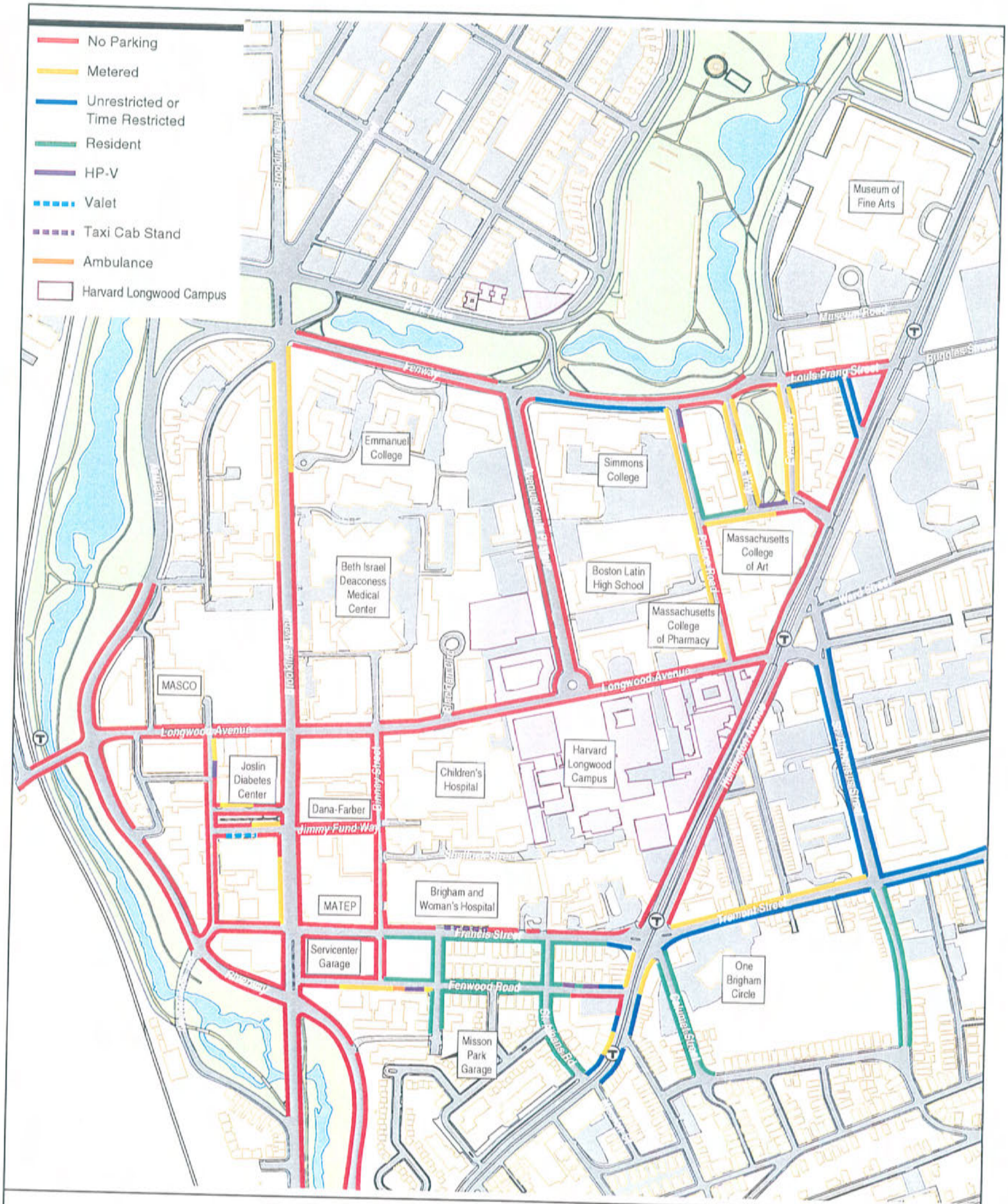
5.2.7.2 Bicycle Racks and Accommodations

Bicycling is a popular travel mode in the LMA, which many commuters use even during the winter. Paths through the Emerald Necklace Greenway accommodate bicyclists who prefer not to ride on streets, and bicycle parking is plentiful. Bicycle racks are located at eight outdoor locations on the Harvard Longwood Campus south of Longwood Avenue. Additional bicycle racks are located throughout the LMA. Bicycle parking locations both on and off-campus, as well as some common bicycling routes, are depicted in Figure 5-9. Total rack capacity at the eight on-campus locations is approximately 240 bicycles. On a very hot day in the middle of the summer, half of the bike racks were full and nearly 30 bicycles were locked to railings or signposts. Table 5-14 enumerates locations, capacity, and utilization of bicycle racks on campus.

Table 5-13: Vehicular Crash Summary (1998 – 2000)

	Longwood Avenue at:							Fenway at:				Park Drive at:			Francis Street at:		Tremont Street at:		Huntington Avenue at:		
	Riverway	Brookline Avenue	Binney Street	Blackfan Circle	Avenue Louis Pasteur	Palace Road	Huntington Avenue	Brookline Avenue	Avenue Louis Pasteur & Park Drive Crossover Road	Palace Road	Louis Prang Street & Ruggles Street at Huntington Avenue	Beacon Street	Brookline Avenue & Boylston Street	Netherlands Road at Riverway	Brookline Avenue	Binney Street	Francis Street & Huntington Avenue	St. Alphonsus Street	Fenwood Road	St. Albans Road	Total
Year																					
1998	11	13	2	0	2	0	11	14	7	3	22	25	37	6	5	3	11	6	2	3	183
1999	13	11	1	2	1	3	13	9	2	3	21	24	29	7	8	1	17	5	1	2	173
2000	14	5	5	2	1	0	17	14	4	4	8	15	28	13	8	2	15	4	1	1	161
Total	38	29	8	4	4	3	41	37	13	10	51	64	94	26	21	6	43	15	4	6	517
Average Year	12.7	9.7	2.7	1.3	1.3	1.0	13.7	12.3	4.3	3.3	17.0	21.3	31.3	8.7	7.0	2.0	14.3	5.0	1.3	2.0	172.3
Collision Type																					
Angle	27	14	5	1	1	1	27	18	7	6	21	33	49	21	12	4	16	5	1	4	273
Head-on	0	0	0	0	0	0	0	0	1	0	1	0	2	0	2	0	0	1	0	1	8
Rear-end	8	10	2	1	1	1	5	10	1	2	18	16	22	3	5	1	10	5	0	1	122
Unknown	3	5	1	2	2	1	9	9	4	2	11	15	21	2	2	1	17	4	3	0	114
Total	38	29	8	4	4	3	41	37	13	10	51	64	94	26	21	6	43	15	4	6	517
Severity																					
Fatal Accident	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Hit-and-Run	2	1	0	0	1	0	2	2	0	0	4	2	4	0	1	0	2	0	0	0	21
Injury Accident	15	10	2	3	2	2	12	10	2	4	17	13	23	10	7	3	15	7	2	3	162
Property Only	21	18	6	1	1	1	27	25	11	6	30	49	66	16	13	3	26	8	2	3	333
Total	38	29	8	4	4	3	41	37	13	10	51	64	94	26	21	6	43	15	4	6	517
Time of Day																					
7:00 AM – 9:00 AM	5	7	3	2	1	0	4	5	1	2	7	15	13	7	4	1	5	3	0	0	85
9:00 AM – 4:00 PM	14	8	3	1	1	1	21	14	7	4	24	23	29	12	7	4	19	7	0	4	203
4:00 PM – 6:00 PM	5	3	1	1	1	2	4	10	1	2	7	10	17	7	5	0	7	1	1	2	87
6:00 PM – 7:00 AM	14	11	1	0	1	0	12	8	4	2	13	16	35	0	5	1	12	4	3	0	142
Total	38	29	8	4	4	3	41	37	13	10	51	64	94	26	21	6	43	15	4	6	517
Day of Week																					
Monday-Friday	33	25	8	3	4	3	35	28	11	9	42	54	67	23	19	5	38	12	2	6	427
Saturday-Sunday	5	4	0	1	0	0	6	9	2	1	9	10	27	3	2	1	5	3	2	0	90
Total	38	29	8	4	4	3	41	37	13	10	51	64	94	26	21	6	43	15	4	6	517
Pavement Conditions																					
Dry	24	17	6	4	3	3	25	31	9	5	34	48	61	14	16	5	32	11	3	6	357
Icy	0	0	0	0	0	0	1	0	0	0	0	1	2	0	0	0	0	0	1	0	5
Other	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Snowy	1	0	0	0	0	0	1	0	0	0	3	0	1	0	0	0	0	1	0	0	7
Unknown	12	6	1	0	1	0	11	4	3	4	13	12	23	12	4	0	7	2	0	0	115
Wet	1	5	1	0	0	0	3	2	1	1	1	3	7	0	1	1	4	1	0	0	32
Total	38	29	8	4	4	3	41	37	13	10	51	64	94	26	21	6	43	15	4	6	517

Source: Massachusetts Highway Department



Harvard Longwood Campus
Institutional Master Plan

Figure 5-6

Summary of On-Street Parking in the Study Area

Vanasse Hangen Brustlin, Inc

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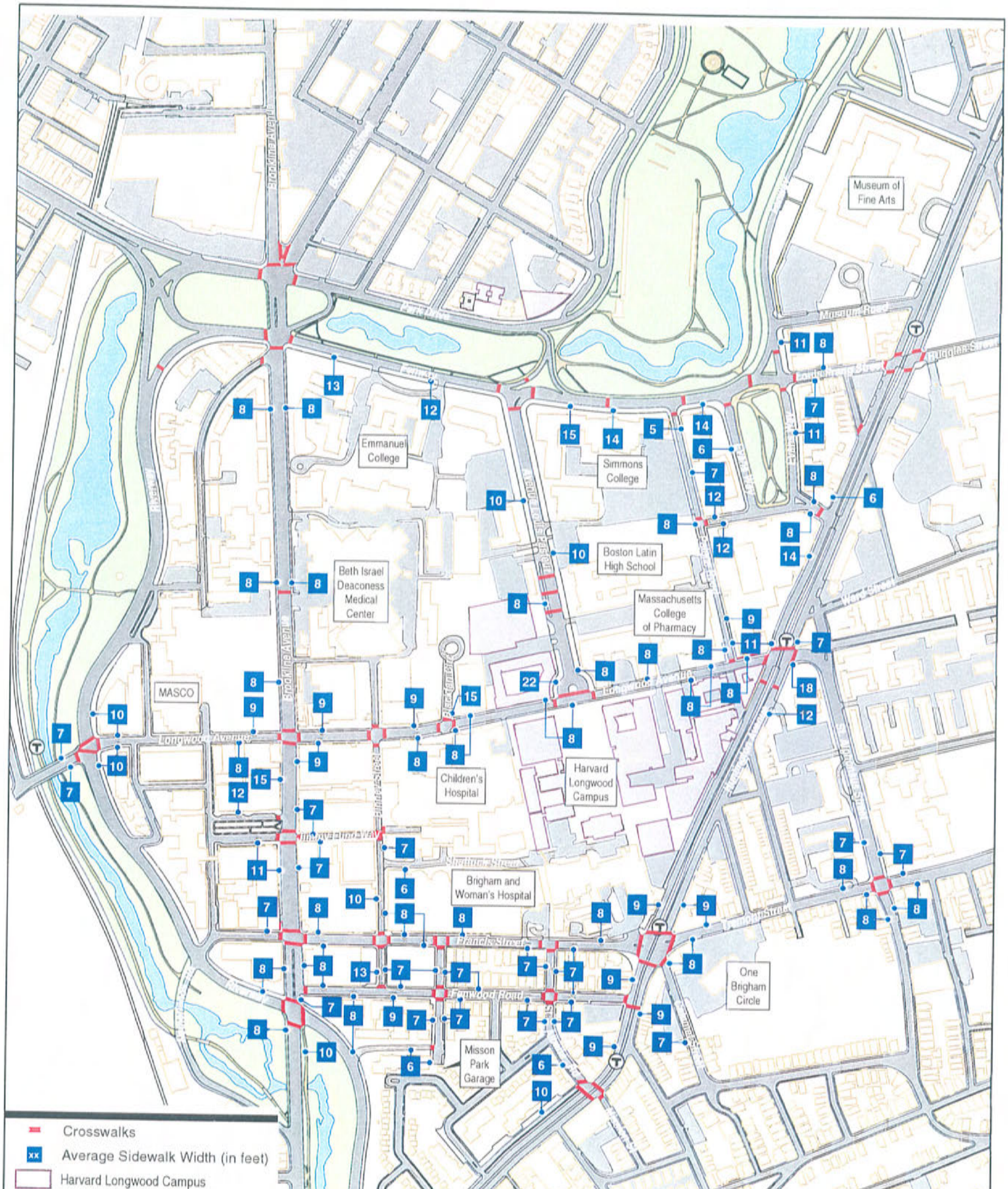

0 300 600 Feet

Harvard Longwood Campus
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Figure 5-7

Sidewalk and Crosswalk Inventory

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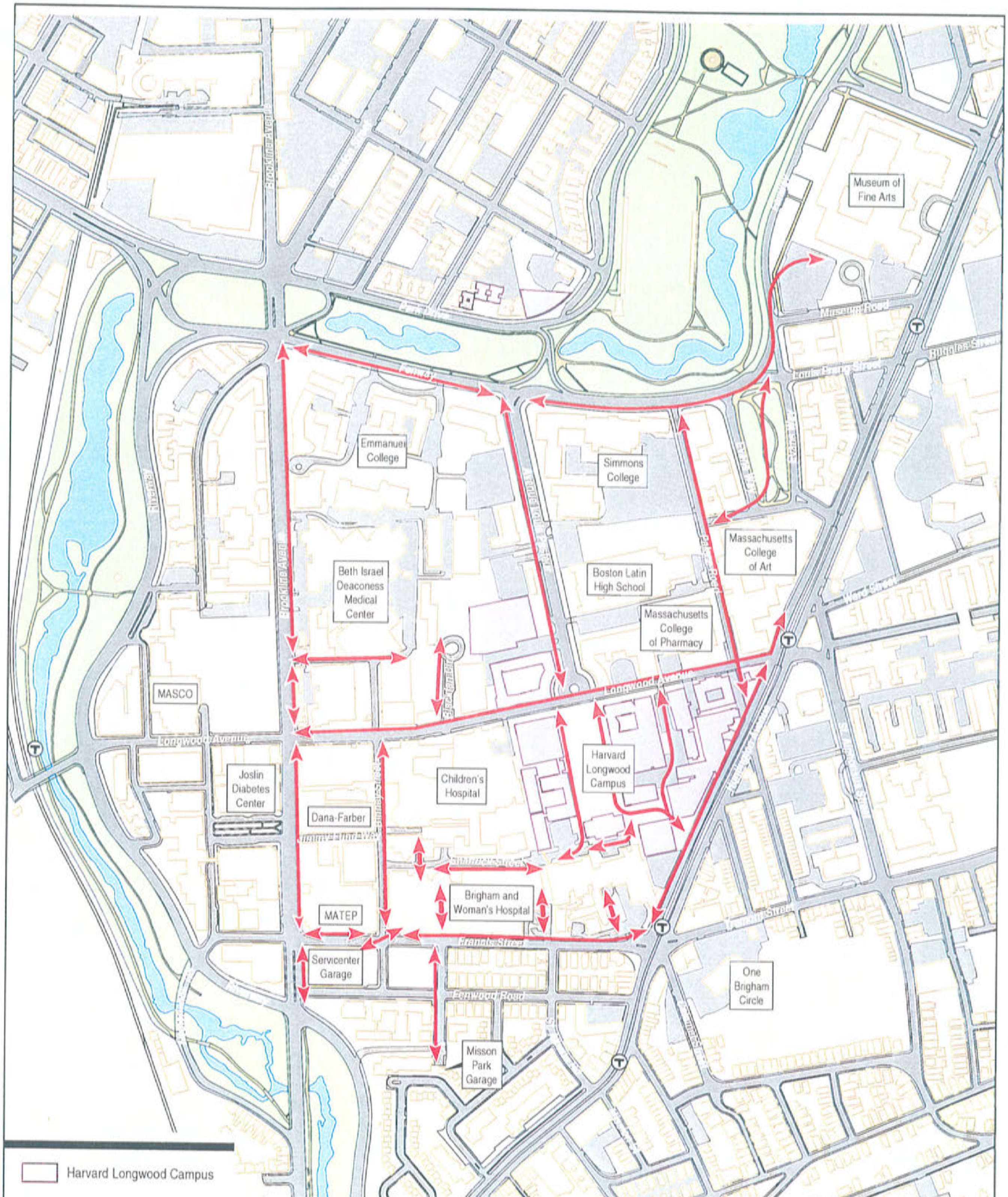

Harvard Longwood Campus
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0 300 600 Feet

Figure 5-8

Primary Pedestrian Circulation Routes

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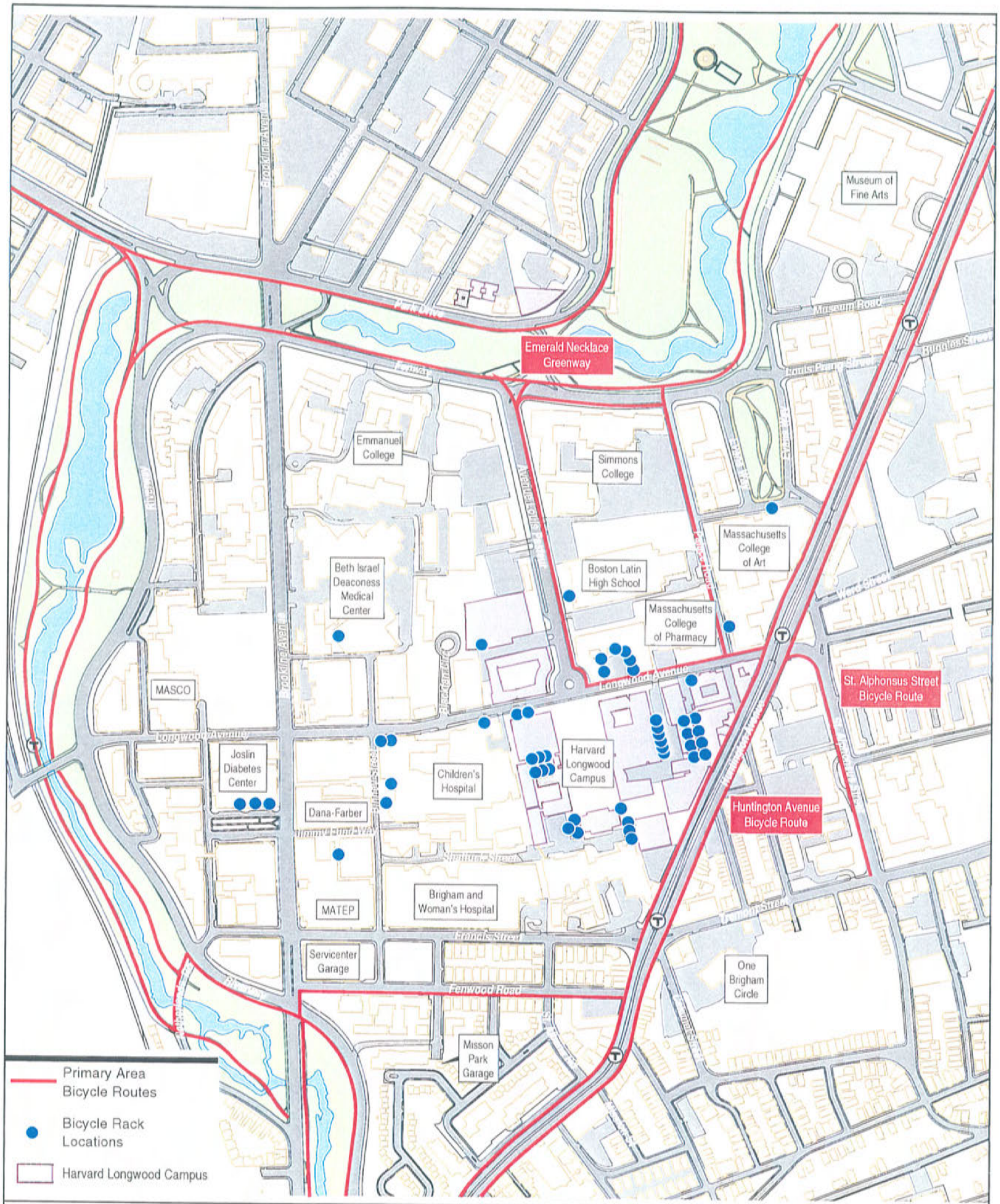

Harvard Longwood Campus
Institutional Master Plan

Figure 5-9

Bicycle Circulation and Accommodations

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Table 5-14: On-Campus Bicycle Racks and Utilization

Location	Type	Capacity [1]	Locked on Rack	Locked Nearby
West side of Countway Library	ribbons	21	10	0
East side of Countway Library	(none)	-	-	1
East side of Gordon Hall	ribbons	10	14	0
West side of Gordon Hall	ribbons, loops	23	26	9
Shattuck Street at LHRRB	(none)	-	-	3
Courtyard south of TMEC	ribbons	38	46	1
East side of Warren Alpert	loops	60	56	13
Cages between HSDM and HSPH	ribbons, traditional	68	58	0
Longwood Avenue at TMEC	ribbons	10	9	0
Longwood Avenue at 180 Longwood	ribbons	9	6	0
Total		**239**	**225**	**27**

Source: Counts conducted by Vanasse Hangen Brustlin, Inc. on Tuesday July 23, 2003.

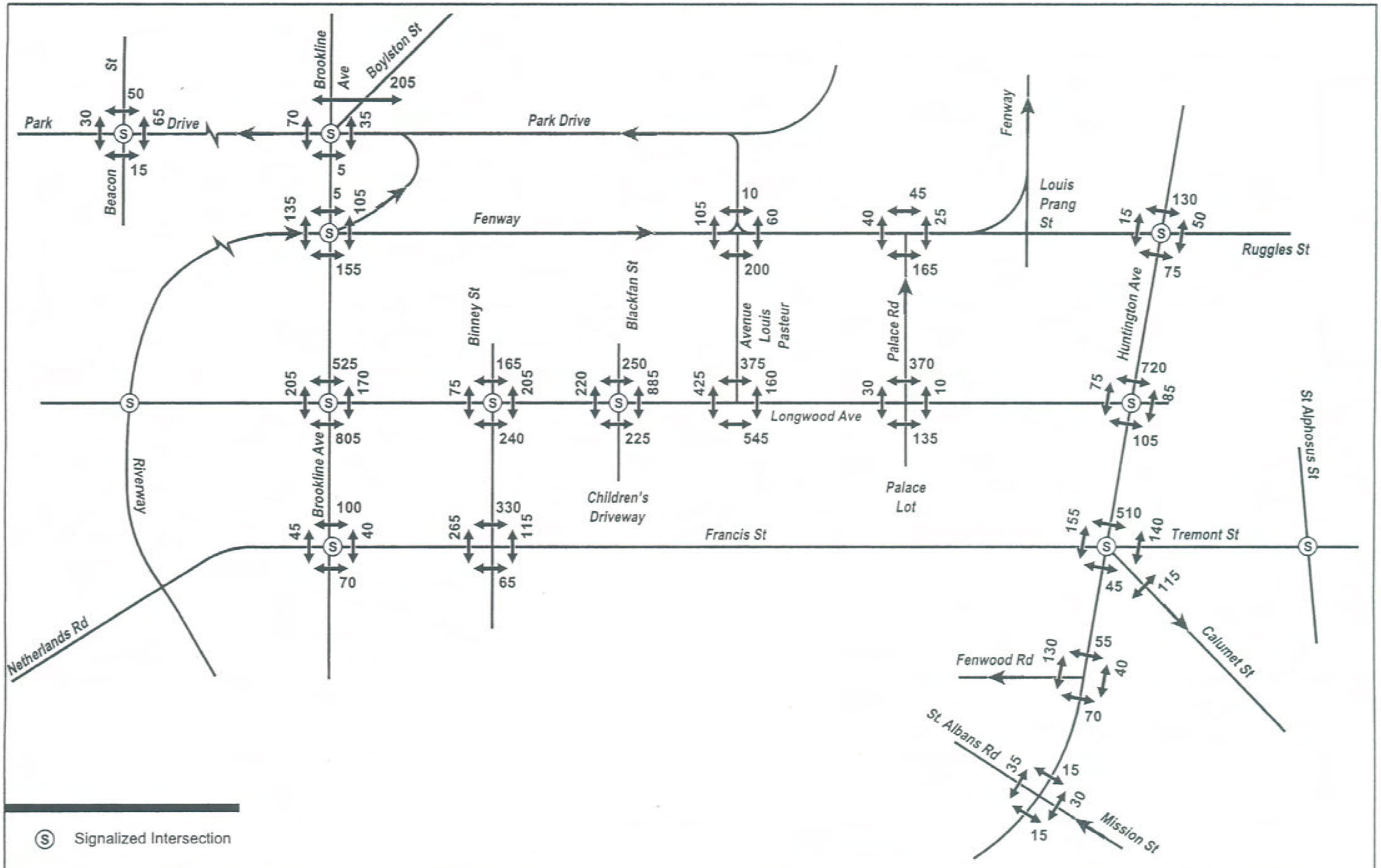
1/ This is the comfortable capacity, not crush capacity. It takes into consideration whether a rack can be accessed from both sides or only from one.

5.2.7.3 Pedestrian Volumes

Morning and evening peak hour pedestrian counts conducted at each of the study area intersections are graphically represented in Figures 5-10 and 5-11, respectively. The following list highlights observed pedestrian activities in the project study area.

- The highest pedestrian volumes in the area were observed along Longwood Avenue during both morning and evening peaks.

- The individual location with the highest pedestrian volume was along Longwood Avenue in front of the Medical School Quad, opposite Avenue Louis Pasteur during the evening peak hour.



Not to Scale

Source: Vanasse Hangen Brustlin, Inc.

Harvard Longwood Campus
Institutional Master Plan

Figure 5-10

2002 Existing Condition Morning Peak Hour Pedestrian Volumes

Vanasse Hangen Brustlin, Inc

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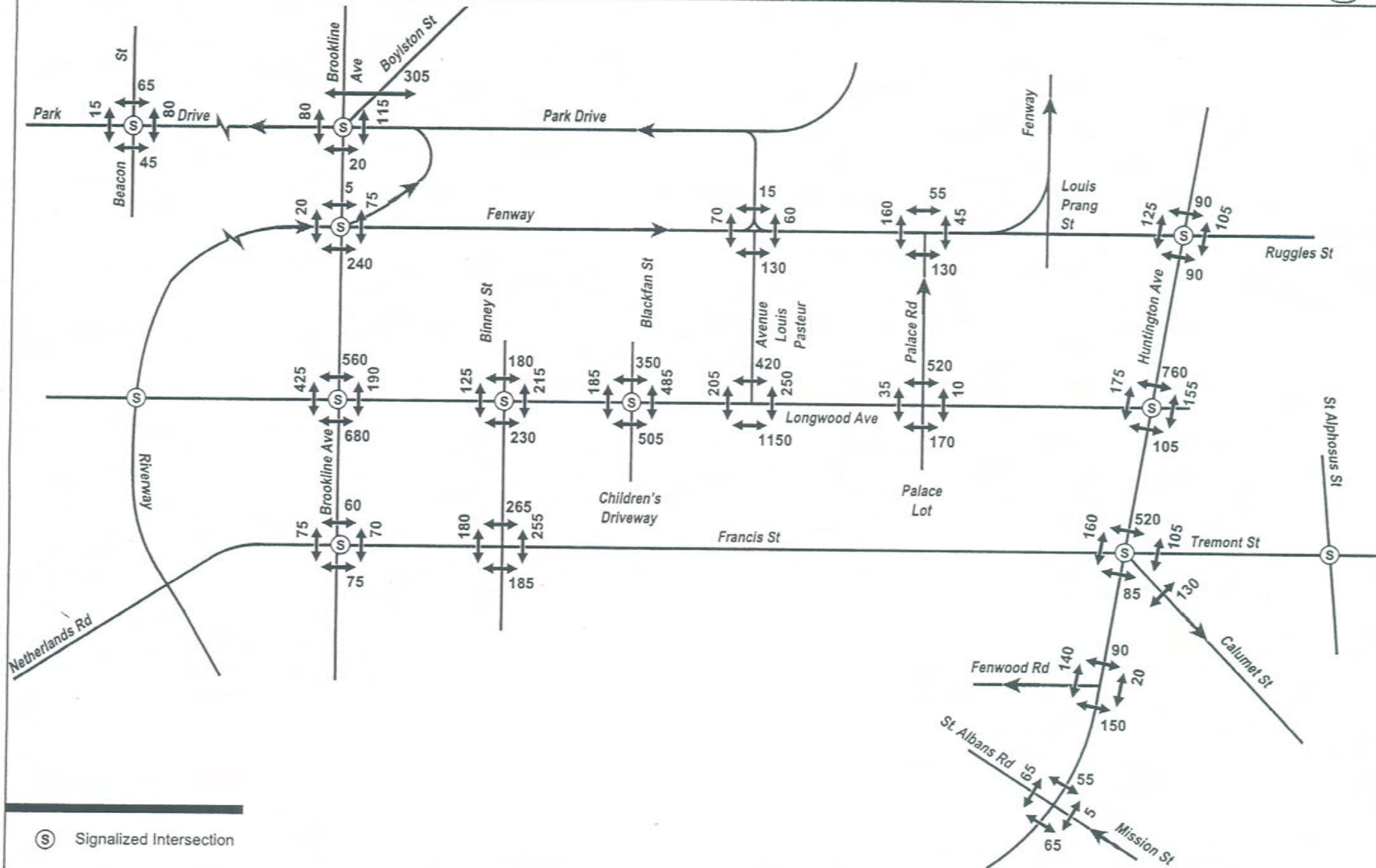

Not to Scale

Source: Vanasse Hangen Brustlin, Inc.

Harvard Longwood Campus
Institutional Master Plan

Figure 5-11

2002 Existing Condition Evening Peak Hour Pedestrian Volumes

Vanasse Hangen Brustlin, Inc

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- At the intersection of Longwood Avenue and Brookline Avenue (the intersection with the highest observed pedestrian volumes), over 1,300 pedestrians cross Brookline Avenue and nearly 400 cross Longwood Avenue during the morning peak hour. During the evening peak hour, over 1,200 pedestrians cross Brookline Avenue and over 600 cross Longwood Avenue.

- Over 1,100 pedestrians cross Longwood Avenue at the intersection of Longwood Avenue and Blackfan Street during the morning peak hour, while over 600 cross the same location during the evening peak hour. Approximately 500 pedestrians cross Blackfan Street/Children's Hospital Driveway during the morning peak hour and over 800 pedestrians cross the same location during the evening peak hour.

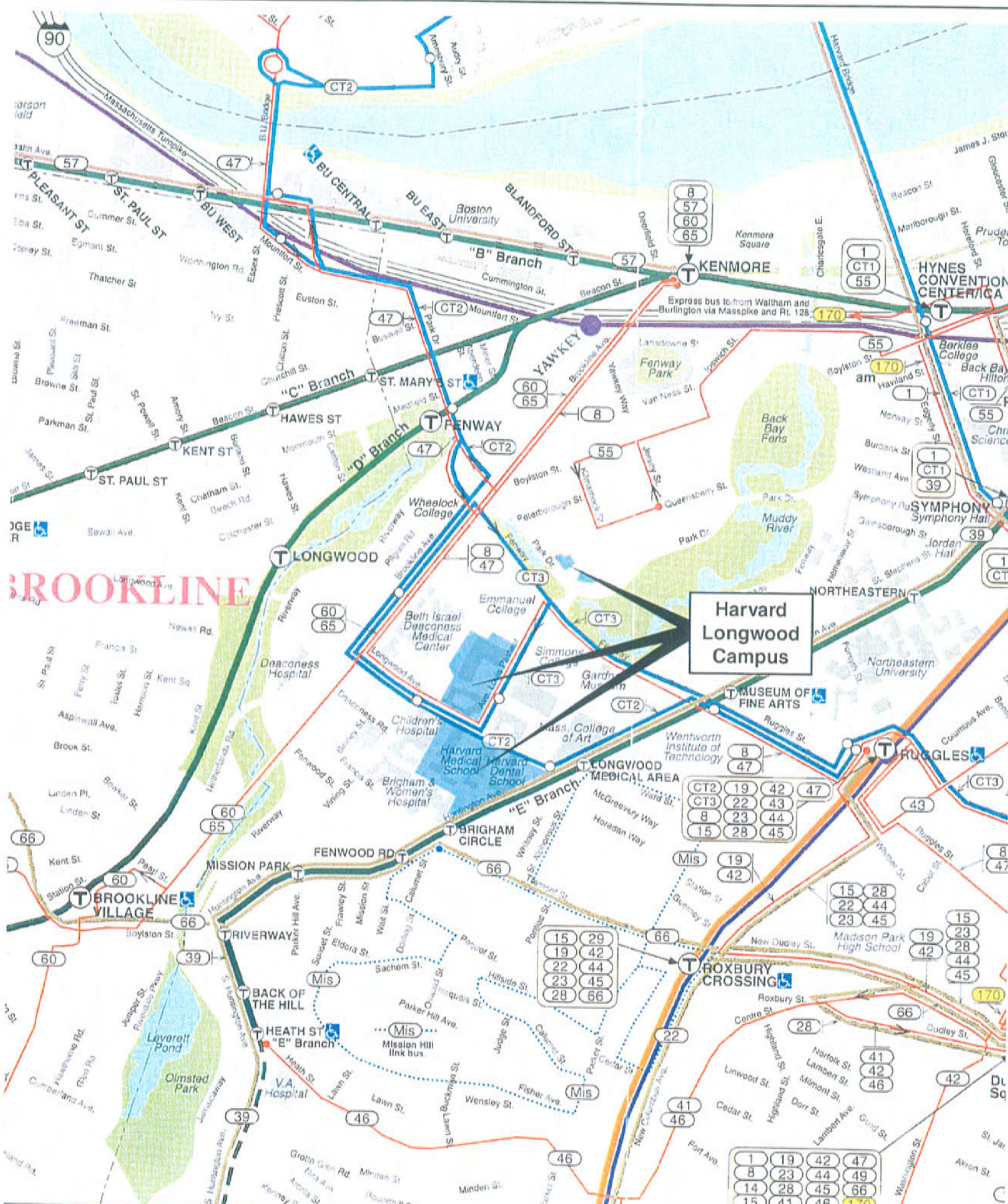
- At the intersection of Longwood Avenue and Huntington Avenue, over 800 pedestrians cross Huntington Avenue during both morning and evening peak hours. Over 300 pedestrians cross Longwood Avenue during the evening peak hour.

5.2.8 Public Transportation

Harvard is well-served by the MBTA's existing public transportation system as well as MASCO's private system of shuttle buses, both of which serve Boston's LMA. Eighteen bus routes, nine shuttle routes, three subway lines, and five commuter rail lines currently serve Harvard's Longwood Campus and the surrounding area.

Existing transit conditions in the study area, including available public and private services, headways and capacity, and utilization are described in the following section. Figure 5-12 shows public transit routes in and around the LMA. MASCO's private shuttle bus services are depicted in Figure 5-13.

The MBTA and MASCO operate transit and shuttle bus routes in the vicinity of the project site. MBTA transit services are available to the public for a fee. MASCO operates several private shuttle routes connecting the LMA to off-site parking facilities and nearby transit hubs. LMA employees can register for off-site parking at MASCO-managed facilities through their institutional parking/commuting office. MASCO shuttle buses are free to off-site parkers.



Source: MBTA

Harvard Longwood Campus
Institutional Master Plan

Figure 5-12

Public Transportation

Vanasse Hangen Brustlin, Inc.

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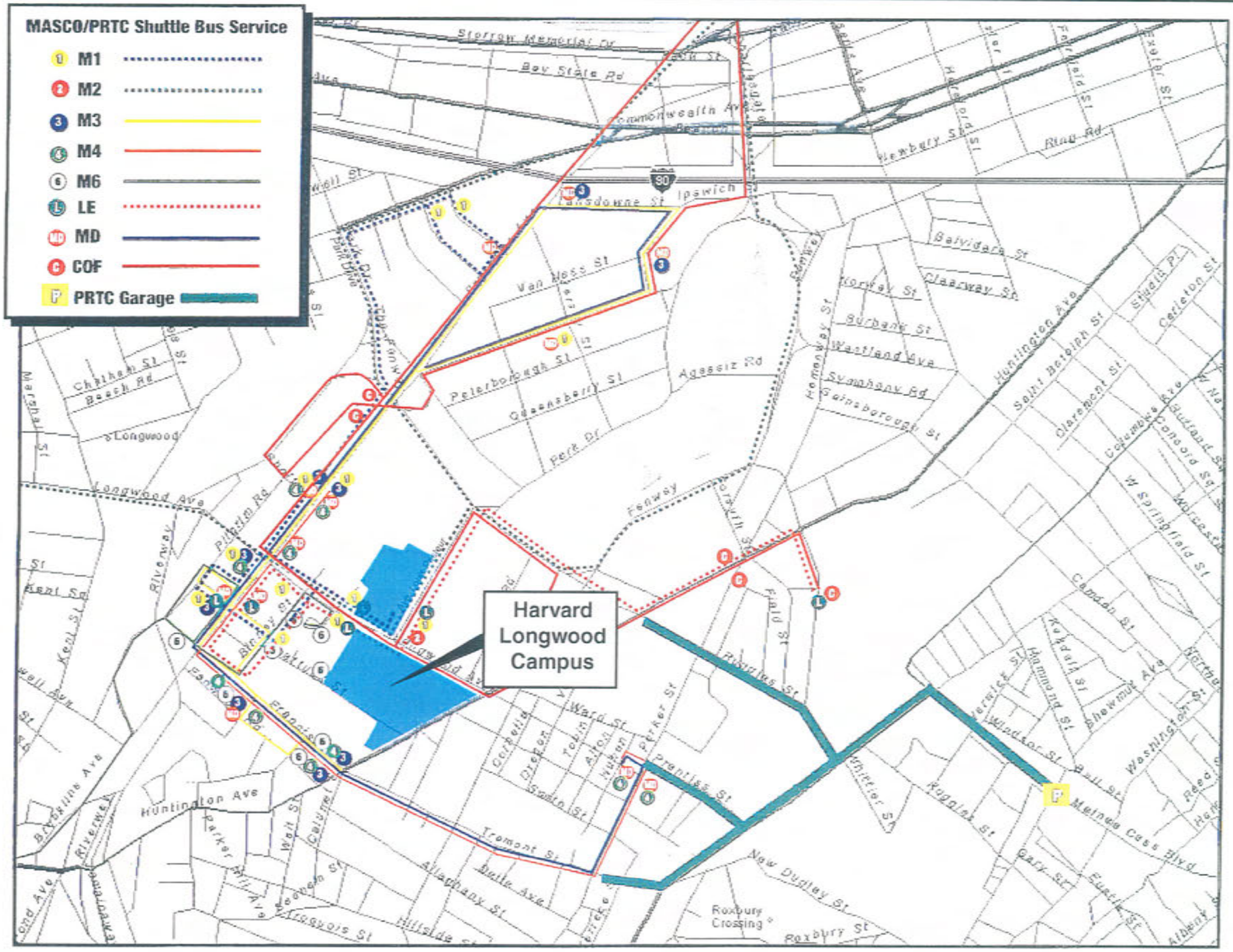


Source: MASCO

Harvard Longwood Campus
Institutional Master Plan

Figure 5-13

MASCO Shuttle Bus Service

Vanasse Hangen Brustlin, Inc.

5.2.8.1 MBTA Transit Services

Bus Routes

Route CT2 – The Crosstown 2 (CT2) route operates on 20-minute headways during peak hours, utilizing standard 40-foot MBTA buses. The route runs south from Sullivan Square in East Cambridge through Union and Kendall Squares, crossing the Charles River via the BU Bridge. From there, the route continues south on Mountfort Street and Park Drive, passing through the LMA before terminating at Ruggles Station. The CT2 makes two stops on Longwood Avenue, one at Children's Hospital and the other at Huntington Avenue, both of which are near the Harvard campus. The route runs Monday to Friday, from 6:35 AM to 7:38 PM.

Route CT3 – The Crosstown 3 (CT3) route operates on 20-minute headways during peak hours, utilizing standard 40-foot MBTA buses. This route loops around the LMA on Avenue Louis Pasteur, Longwood Avenue, Brookline Avenue, and Fenway before continuing southeast to the South End Medical Area. From there, the route continues to Andrew Station in South Boston. In the morning, the closest CT3 stop to Harvard is at Beth Israel Deaconess Medical Center East Campus. In the evenings, the CT3 also makes stops at Children's Hospital on Longwood Avenue and on Avenue Louis Pasteur near Boston Latin School. The route operates Monday to Friday from 6:45 AM until 9:37 PM.

Route 8 – Route 8 operates on 6-minute headways during the morning peak and 10-minute headways during the evening peak, utilizing standard 40-foot MBTA buses. The route runs from Kenmore Square to the LMA along Brookline Avenue, east to Dudley Square and the Boston University Medical Center, then south along Massachusetts Avenue to UMass Boston. The Route 8 stop closest to Harvard is at Oscar Tugo Circle. The route runs Monday to Friday from 5:15 AM to 1:36 AM.

Route 15 – Route 15 operates on 5-minute headways during the morning peak and 10-minute headways during the evening peak. The route runs from Kane Square in Dorchester to Ruggles Station by way of Uphams Corner, Dudley Square, and Roxbury Crossing. Route 15 passengers traveling to Harvard would either walk from Roxbury Crossing or walk or take the MASCO Ruggles Express shuttle service from Ruggles Station.

Route 19 – Route 19 operates on 15-minute headways during the morning peak and 25-minute headways during the evening peak. The route runs from Fields Corner station on the red line through Grove Hall and Dudley Square to Roxbury Crossing and then Ruggles Station. Route 19 passengers traveling to Harvard would either walk from Roxbury Crossing or walk or take the MASCO Ruggles Express shuttle service from Ruggles Station.

Route 22 – Route 22 operates on 6-minute headways during the morning peak and 8-minute headways during the evening peak. The route begins at Ashmont Station on the red line, then jobs west and north along Talbot Avenue, Blue Hill Avenue, and Seaver Street to Jackson Square. It then parallels the Orange Line to Roxbury Crossing and Ruggles Station. Route 22 passengers traveling to Harvard would either walk from Roxbury Crossing or walk or take the MASCO Ruggles Express shuttle service from Ruggles Station.

Route 23 – Route 23 operates on 4-minute headways during the morning peak and 7-minute headways during the evening peak. The route begins at Ashmont Station on the red line, then serves Codman Square, Grove Hall, Dudley Square and Roxbury Crossing before terminating at Ruggles Station. Route 23 passengers traveling to Harvard would either walk from Roxbury Crossing or walk or take the MASCO Ruggles Express shuttle service from Ruggles Station.

Route 28 – Route 28 operates on 6-minute headways during the morning peak and 8-minute headways during the evening peak. The route starts at Mattapan Station and runs north through Dorchester along Blue Hill Avenue and Warren Street. It stops at Dudley Square and Roxbury Crossing before terminating at Ruggles Station. Route 28 passengers traveling to Harvard would either walk from Roxbury Crossing or walk or take the MASCO Ruggles Express shuttle service from Ruggles Station.

Route 39 – Route 39 operates on 4-minute headways during the morning peak and 10-minute headways during the evening peak, utilizing standard 40-foot MBTA buses. The route runs north from Forest Hills along Centre Street and South Huntington Avenue, then turns northeast, running along Huntington Avenue south of the LMA. The route then serves the Back Bay and terminates at Back Bay Station. The stops closest to Harvard are on Huntington Avenue at Brigham Circle (Harvard's Countway gateway) and Longwood Avenue. The route runs Monday to Friday from 4:42 AM to 1:28 AM.

Route 42 – Route 42 operates on 20-minute headways during both the morning and evening peaks. The route runs along Washington Street from Forest Hills Station to Dudley Square, and then to Roxbury Crossing and Ruggles Station. Route 42 passengers traveling to Harvard would either walk from Roxbury Crossing or walk or take the MASCO Ruggles Express shuttle service from Ruggles Station.

Route 43 – Route 43 operates on 10-minute headways during both the morning and evening peaks. The route links Boston Common with Ruggles Station via Tremont Street. Route 43 passengers traveling to Harvard would walk or take the MASCO Ruggles Express shuttle service from Ruggles Station.

Route 44 – Route 44 operates on 11-minute headways during both the morning and evening peaks. The route runs southeast from Jackson Square, passes through Egleston

Square on Seaver Street, then turns north on Humboldt Avenue and stops at Dudley Square and Roxbury Crossing before terminating at Ruggles Station. Route 44 passengers traveling to Harvard would either walk from Roxbury Crossing or walk or take the MASCO Ruggles Express shuttle service from Ruggles Station.

Route 45 – Route 45 operates on 8-minute headways during both the morning and evening peaks. The route connects Franklin Park and Ruggles Station via Blue Hill Avenue and Dudley Street. En route, it serves Grove Hall, Dudley Square, and Roxbury Crossing. Route 45 passengers traveling to Harvard would either walk from Roxbury Crossing or walk or take the MASCO Ruggles Express shuttle service from Ruggles Station.

Route 47 – Route 47 operates on 20-minute headways during the morning peak and 17-minute headways during the evening peak, utilizing standard 40-foot MBTA buses. The route runs south from Central Square in Cambridge, crosses the Charles River on the BU Bridge, and passes through the LMA (on Brookline Avenue, Longwood Avenue, and Avenue Louis Pasteur), before continuing east to the South End Medical Area and terminating at Broadway Station in South Boston. The route 47 stop closest to Harvard is at Oscar Tugo Circle. The route runs Monday to Friday from 6:00 AM to 1:40 AM.

Route 60 – Route 60 operates on 22-minute headways during the morning peak and 24-minute headways during the evening peak, utilizing standard 40-foot MBTA buses. The route runs east from Chestnut Hill along Boylston Street (Route 9), makes several stops along Brookline Avenue in the LMA, and continues to its terminus at Kenmore Square. Route 60 stops on Brookline Avenue at Longwood Avenue, only a few blocks from the Harvard Longwood Campus. The route runs Monday to Friday from 5:00 AM to 12:05 AM.

Route 65 – Route 65 operates on 15-minute headways inbound and 20-minute headways outbound during the morning peak and 24-minute headways during the evening peak, utilizing standard 40-foot MBTA buses. The route runs east from Brighton Center along Washington Street, including a stops at the Washington Street stop on the Green line B branch, the Washington Square stop on the Green Line C branch, and the Brookline Village stop on the Green Line D branch. It then travels north on Brookline Avenue past the LMA to its terminus at Kenmore Square. Route 65 stops on Brookline Avenue at Longwood Avenue, only a few blocks from the Harvard Longwood Campus. The route runs Monday to Friday from 6:30 AM to 9:01 PM.

Route 66 – Route 66 operates on 10-minute headways during peak hours, utilizing standard 40-foot MBTA buses. The route runs south from Harvard Square, crosses the Charles River on the Larz Anderson Bridge, passes through Allston and Brighton on North Harvard Street, passes through Coolidge Corner in Brookline and continues south to Brookline Village. There, the route turns east along Huntington Avenue. In the vicinity of the LMA, the route bears off onto Tremont Street to its terminus at Dudley Square. The route stops at Brigham Circle in the LMA, a few hundred feet from the Countway gateway. The route runs Monday to Friday from 5:02 AM to 1:26 AM.

Rapid Transit Lines

Green Line D Branch – The D (or Riverside) Branch of the Green Line runs on 5-minute headways during peak hours. During peak periods, the service employs trainsets consisting variously of Boeing Light Rail Vehicles (LRVs), Kinki Sharyo Type 7 cars, and newer Breda Type 8 cars. The new Breda cars have been removed from service for additional testing, but will eventually replace many of the older cars. The LRV and Type 7 cars have 110-passenger capacities, and are run in two-car trainsets. The line runs above ground on a dedicated right-of-way from Riverside Station in Newton through multiple stations in Newton, Brookline, and Boston before turning north along the Riverway and joining the main below-grade Green Line east of Fenway Station. The main line continues through the Back Bay, Government Center, and North Station to its terminus at Lechmere Station. The LMA is served by the line's Longwood and Brookline Village stops, both located west of the fens. Passengers traveling to Harvard would walk half a mile from the Longwood stop. The D Branch runs from 4:56 AM to 12:05 AM weekdays.

Green Line E Branch – The E (or Heath Street) Branch of the Green Line runs on 9-minute headways during peak hours. During peak periods, the service employs two-car trainsets consisting variously of Boeing Light Rail Vehicles (LRVs), Kinki Sharyo Type 7 cars, and newer Breda Type 8 cars. The new Breda cars have been removed from service for additional testing, but will eventually replace many of the older cars. The LRV and Type 7 cars have 110-passenger capacities, and are run in two-car trainsets. The line originates at Heath Street Station and runs east at grade within the median of Huntington Avenue. South of Massachusetts Avenue, the line descends below grade to serve Symphony and Prudential stations before joining the main Green Line at Copley. The main line continues through the Back Bay, Government Center, and North Station to its terminus at Lechmere Station. Harvard is served by the line's Brigham Circle stop, located on Huntington Avenue opposite the Countway gateway, and by the Longwood Medical Area stop, located on Huntington Avenue just north of Longwood Avenue. The E Branch runs from 5:01 AM to 12:45 AM weekdays.

Orange Line – The Orange Line subway line runs on 5-minute headways during peak hours, using 6-car trains. From north to south, the line runs from Oak Grove Station in Malden through Medford, Charlestown, downtown Boston, the South End, and Roxbury, before reaching Forest Hills Station in Jamaica Plain. The

Orange Line connects with the Green Line and with all northern commuter rail lines at North Station, with the Green Line at Haymarket, with the Blue Line at State Street, and with the Red Line at Downtown Crossing. It connects with all northern commuter rail lines at North Station. Orange Line passengers traveling to Harvard would either walk approximately two-thirds of a mile from either Roxbury Crossing Station or from Ruggles Station, or would take the MASCO Ruggles Express shuttle service from Ruggles Station.

Commuter Rail Lines

Framingham/Worcester Commuter Rail Line – This commuter rail line runs from Boston's western suburbs, making stops in Natick, Wellesley, and Newton. Approximately half of the 40 daily trains originate or terminate at Worcester; the other half originates or terminates at Framingham. The line utilizes six- and seven-car trainsets with seated capacities ranging from 650 to 1,130 passengers, depending on whether single- or double-level cars are employed. The line makes Boston stops at Yawkey Station, Back Bay Station, and South Station. The LMA is served by the line's Yawkey Station, located east of Fenway Park, approximately two-thirds of a mile from the LMA. Currently, only two inbound trains stop at Yawkey Station in the morning (at 6:52 AM and 7:37 AM). Four outbound trains stop at the station in the late afternoon and early evening (4:38 PM, 5:13 PM, 5:38 PM, and 7:23 PM).

Needham Commuter Rail Line – This commuter rail line serves the Boston suburb of Needham, making four stops there, before serving the Boston neighborhoods of West Roxbury, Roslindale, and Jamaica Plain en route to its downtown terminus at South Station. Needham Line passengers traveling to Harvard would walk or take the MASCO Ruggles Express shuttle service from Ruggles Station.

Franklin Commuter Rail Line – This commuter rail line serves suburbs southwest of Boston including Franklin, Norwood, and Dedham en route to its downtown terminus at South Station. Franklin Line passengers traveling to Harvard would walk or take the MASCO Ruggles Express shuttle service from Ruggles Station.

Attleboro/Providence Commuter Rail Line – This commuter rail line serves communities south of Boston including Providence (RI), Attleboro, and Sharon en route to its downtown terminus at South Station. The Attleboro Line merges with the Franklin Line at Readville Station in the Hyde Park neighborhood of Boston. Attleboro Line passengers traveling to Harvard would walk or take the MASCO Ruggles Express shuttle service from Ruggles Station.

Stoughton Commuter Rail Line – This commuter rail line serves southern suburbs of Boston including Stoughton and Canton en route to its downtown terminus at South Station. The Stoughton Line merges with the Attleboro Line at Canton Junction

Station. Attleboro Line passengers traveling to Harvard would walk or take the MASCO Ruggles Express shuttle service from Ruggles Station.

5.2.8.2 MASCO Transit Services

M1 Shuttle – MASCO's M1 route operates on 7- to 8-minute headways during the morning peak hour and every 10 minutes during the evening peak hour. The route connects the LMA with the Boylston Street Lot and the Kenmore Lot. The route connects to the Red Sox Garage and the Lansdowne Garage in the afternoon and evening only. The stop closest to Harvard is at Oscar Tugo Circle. In the evening, an additional stop at Dana-Farber Cancer Institute is also convenient. The shuttle runs Monday to Friday from 5:30 AM to 10:00 AM (to the LMA) and from 2:30 PM to 8:10 PM (to Boylston Street).

M2 Shuttle – MASCO operates the M2 Shuttle for Harvard University. The shuttle operates on approximately 10-minute headways during peak hours. The route connects the LMA to Harvard Square, with interim stops along Mass Ave at Putnam Street, Bay Street, Central Square, MIT, and Beacon Street, as well as the Fenway MBTA station. The stop closest to Harvard is at Oscar Tugo Circle. The service runs Monday to Saturday, from 7:00 AM to 11:30 PM.

M3 Shuttle – MASCO's M3 Shuttle operates on 10-minute headways during peak hours. The route connects the LMA with the Lansdowne Garage, Red Sox Garage, the Kenmore Lot, and the Boylston Street Parking Lot (evenings only). The stop closest to Harvard is on Francis Street at Brigham Circle, only a few hundred feet from the Countway gateway. The shuttle runs Monday to Friday, from 5:30 AM to 10:00 AM (to the LMA) and from 2:30 PM to 8:10 PM (to Boylston Street).

M4 Shuttle – MASCO's M4 Shuttle operates on 10-minute headways during peak hours. The route connects the LMA with the Halleck Street Lot. The stop closest to Harvard is on Francis Street at Brigham Circle, only a few hundred feet from the Countway gateway. The shuttle runs Monday to Friday from 5:30 AM to 9:45 AM (to the LMA) and from 2:45 PM to 8:30 PM (to the Halleck Street Lot).

M6 Shuttle – MASCO's M6 Shuttle operates on approximately 10- to 15-minute headways during peak hours. The route connects the LMA with the Mishkan Tefila Parking Lot in Chestnut Hill (Newton), making an interim stop at 850 Boylston. The stop closest to Harvard is at Children's Hospital. The shuttle runs Monday to Friday from 5:40 AM to 9:00 AM (to the LMA) and from 2:30 PM to 8:30 PM (to Chestnut Hill).

Ruggles Express – MASCO's Ruggles Express provides continuous service between the MBTA's Ruggles Station and the LMA throughout the day, on 8-minute headways during peak hours and 30-minute headways midday. At Ruggles Station, passengers can connect to the Orange Line subway and the Needham, Franklin, Attleboro/Providence and Stoughton Commuter Rail Lines in addition to other buses. The stop closest to Harvard is at Oscar Tugo Circle. The shuttle runs Monday to Friday from 5:30 AM to 9:00 PM.

Renaissance Shuttle – MASCO's Renaissance Shuttle operates on 15-minute headways during peak hours. The stop closest to Harvard is on Francis Street at Brigham Circle, only a few hundred feet from the Countway gateway. The shuttle runs Monday to Friday from 5:30 AM to 9:30 AM (to the LMA) and from 2:30 PM to 6:30 PM (to the Renaissance Garage).

JFK/UMass Shuttle – MASCO initiated the new JFK/UMass Shuttle service on February 19, 2002. The service will run through October 2002 on a trial basis, connecting the LMA and the JFK/UMass Station on the MBTA's Red Line. The stop closest to Harvard is at Oscar Tugo Circle. The JFK/UMass Shuttle runs Monday to Friday from 5:55 AM to 9:30 AM and from 3:15 PM to 8:10 PM.

Midday Shuttle – MASCO operates a mid-day shuttle on 40-minute headways, connecting the LMA to all of its satellite parking facilities between 10:12 AM and 2:43 PM, when most other MASCO shuttle services are not running. The stop closest to Harvard is on Francis Street at Brigham Circle, only a few hundred feet from the Countway gateway.

5.2.8.3 Other Transit Services

Mission Hill Loop (MIS) – The Mission Hill Link is a community-operated shuttle bus route serving the Mission Hill neighborhood. The route operates on 15- to 30-minute headways during peak hours, utilizing small shuttle bus vehicles that accommodate approximately 15 riders. Adult fare is one dollar. The fare for senior citizens, the handicapped, and children between 12 and 18 years old is fifty cents. Children under 12 and New England Baptist employees (with identification) ride for free.

As depicted in Figure 5-12 (discussed previously), the Mission Hill Link bus follows a circuitous route through the Mission Hill neighborhood. The area served by the route is loosely bounded by Huntington Avenue and Ruggles Street to the north, the Orange Line to the east, Heath Street to the south, and South Huntington Avenue to the west. Important stops include Brigham Circle, the Longwood Medical Area Green Line stop, the Roxbury Crossing Orange Line station, and New England Baptist Hospital. The route runs from Monday to Friday, from 6:45 AM to 8:30 PM, and on Saturday, from 9 AM to 1:30 PM.

5.2.8.4 Planned Public Transportation Improvements

Silver Line – The Silver Line, a bus rapid transit (BRT) line, will ultimately connect Dudley Square and the Washington Street corridor with Downtown, South Boston and East Boston (Logan Airport). Phase 1, from Dudley Square to Downtown Crossing via Washington Street, just opened in July 2002. Phase 2, from South Station to the South Boston waterfront, is currently under construction and service is planned to start in 2003. Construction is slated to start in 2008 for Phase 3, which will link the pieces constructed in Phase 1 and Phase 2.

Arborway Extension – The MBTA is currently in the initial planning phase of reinstating streetcar service from Heath Street to Arborway on the Green Line E Branch. The Green Line E Branch runs along Huntington Avenue adjacent to the Harvard Longwood Campus and currently terminates at Heath Street.

Urban Ring – The MBTA is evaluating a new transit service that will connect the radial transit lines into a "ring" alignment outside the downtown Boston core. Two of the routes, known as CT2 and CT3, are currently provided as bus service. These existing bus routes are fully described in the previous section. Additional discussion of the Urban Ring project is provided in Section 5.3.1.3, MBTA-Sponsored Transit Improvements.

5.2.8.5 Transit System Capacity

The first step in analyzing the impact of the proposed Harvard projects on the public transit system in the vicinity of the LMA is to quantify the capacity of existing transit services. The following section presents the capacities of the various MBTA transit services in the area.

Bus Routes

Bus route capacity is a function of vehicle size and the frequency of service. The calculated capacities of the bus routes serving the LMA are presented in Table 5-15.

The peak hour capacities estimated in this table are based on a bus capacity of 60 passengers for a standard 40-foot MBTA bus, except in the instance of the Mission Hill Link shuttle service, which utilizes smaller, 15-person capacity vehicles. The service frequencies presented in Table 5-15 are based on the most current schedules (as of May, 2002) published by the MBTA. As peak hour headways vary for some routes between the morning and evening peak hours, morning and evening peak hour capacity vary accordingly as well.

As Table 5-15 shows, the existing route with the highest capacity is Route 39, which connects the LMA to the Back Bay and Forest Hills. Route 39 has a peak hour capacity of 900 riders during the morning peak hour and 360 riders during the evening peak hour.

Table 5-15: Bus Route Peak Hour Capacity

Route and Direction		Headway (minutes)		Frequency (vehicles/hour)		Capacity (passengers)	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
CT2	Inbound	20	20	3	3	180	180
	Outbound	20	20	3	3	180	180
CT3	Inbound	20	20	3	3	180	180
	Outbound	20	20	3	3	180	180
8	Inbound	6	10	10	6	600	360
	Outbound	6	10	10	6	600	360
15	Inbound	5	10	12	6	720	360
	Outbound	5	10	12	6	720	360
19	Inbound	15	25	4	2.4	240	144
	Outbound	15	25	4	2.4	240	144
22	Inbound	10	10	6	6	360	360
	Outbound	10	10	6	6	360	360
23	Inbound	10	10	6	6	360	360
	Outbound	10	10	6	6	360	360
28	Inbound	10	10	6	6	360	360
	Outbound	10	10	6	6	360	360
39	Inbound	4	10	15	6	900	360
	Outbound	4	10	15	6	900	360
42	Inbound	20	20	3	3	180	180
	Outbound	20	20	3	3	180	180
43	Inbound	10	10	6	6	360	360
	Outbound	10	10	6	6	360	360
44	Inbound	11	11	5.5	5.5	327	327
	Outbound	11	11	5.5	5.5	327	327
45	Inbound	10	10	6	6	360	360
	Outbound	10	10	6	6	360	360
47	Inbound	20	17	3	3.5	180	210
	Outbound	20	17	3	3.5	180	210
60	Inbound	22	24	2.7	2.5	180	150
	Outbound	22	24	2.7	2.5	180	150
65	Inbound	15	24	4	2.5	240	150
	Outbound	20	24	3	2.5	180	150
66	Inbound	10	10	6	6	360	360
	Outbound	10	10	6	6	360	360

Source: MBTA Bus Route schedules and Comprehensive Ridecheck Program, Winter 2000.

Other high capacity routes include Route 15, with a peak capacity of 720 riders during the morning peak hour and 360 riders during the evening peak hour and Route 8, with a peak capacity of 600 riders during the morning peak hour and 360 riders during the evening peak hour. Routes 22, 23, 28, 43, 45, and 66 all have peak capacities of 360 riders during both the morning and evening peak hours.

Subway Routes

Subway route capacity is a function of vehicle size and the frequency of service. The calculated capacities of the two Green Line branches serving the LMA are presented in Table 5-16.

The Green Line peak hour capacities estimated in this table are based on a vehicle capacity of 110 passengers and two-car trainsets. The Orange Line peak hour capacities are based on a trainset capacity of 780 passengers. The service frequencies presented in Table 5-16 are based on current 2002 schedules published by the MBTA. As Table 5-16 demonstrates, the heavy rail Orange Line has a substantially higher capacity than either of the light rail Green Line branches.

Table 5-16: Subway Peak Hour Capacity

	Headway (minutes)		Frequency (vehicles/hour)		Capacity (passengers)	
Route and Direction	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Green Line D Branch						
Inbound	5	5	12	12	2,640[1]	2,640[1]
Outbound	5	5	12	12	2,640[1]	2,640[1]
Green Line E Branch						
Inbound	9	9	6.7	6.7	1,474[1]	1,474[1]
Outbound	9	9	6.7	6.7	1,474[1]	1,474[1]
Orange Line						
Inbound	5	5	12	12	9,360[2]	9,360[2]
Outbound	5	5	12	12	9,360[2]	9,360[2]
Net Service						
Inbound					13,474	13,474
Outbound					13,474	13,474

Source: MBTA Green and Orange Line Subway Service timetables (most recent) and MBTA Green and Orange Line 15-Minute Total Boardings, Alightings, and Line Volumes, Spring, 1995.

1/ Assumes two-car trainsets of Type 7 cars (220 passengers per trainset).

2/ Assumes 780-passenger trainsets.

Commuter Rail Routes

Commuter rail capacity is a function of the size and number of train cars in each trainset and the frequency of service. The calculated capacities of the four commuter rail lines serving Yawkey and Ruggles stations are presented in Table 5-17.

The peak hour capacities estimated in this table represent an average of the capacities of the various trains serving Yawkey and Ruggles Stations during the morning and evening peak hours. Typical trainsets are comprised of six or seven cars, with a seating capacity of between 96 and 185 passengers per car. The service frequencies presented in Table 5-17 are based on current 2002 schedules published by the MBTA.

Table 5-17: Commuter Rail Peak Hour Capacity

Route and Direction	Headway (in minutes)		Frequency (vehicles/hour)		Capacity (passengers)	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Worcester/Framingham Line						
Inbound	60	NA[1]	1	NA[1]	918	NA[1]
Outbound	NA[1]	60	NA[1]	1	NA[1]	885
Needham Line						
Inbound	28	NA[1]	2.1	NA[1]	1,742	NA[1]
Outbound	NA[1]	26	NA[1]	2.3	NA[1]	2,125
Attleboro/Stoughton Line						
Inbound	37	NA[1]	1.6	NA[1]	1,734	NA[1]
Outbound	NA[1]	15	NA[1]	4.0	NA[1]	3,824
Franklin Line						
Inbound	26	NA[1]	2.3	NA[1]	2,418	NA[1]
Outbound	NA[1]	21	NA[1]	2.9	NA[1]	3,394
Net Service						
Inbound					6,812	NA[1]
Outbound					NA[1]	10,246

Source: MBTA Commuter Rail Schedules, October 29, 2001, and MBTA Commuter Rail Peak Load Counts, Spring, 2000.

1/ Inbound PM peak and outbound AM peak commuter rail ("reverse commute" trains) were not analyzed because of a lack of capacity and ridership data for these periods and the presumption that no capacity constraints exist or are likely to exist by 2007.

Transit System Demand

The second step in analyzing the impact of the Harvard on study area transit services is determining existing ridership on each transit line. Ridership information is available from the MBTA for bus routes, subway routes, and commuter rail. Where necessary, ridership data has been adjusted to compensate for background growth to 2002. Tables 5-18 through 5-20 present ridership and utilization (percent occupancy) data for MBTA bus, subway, and commuter rail lines serving the LMA.

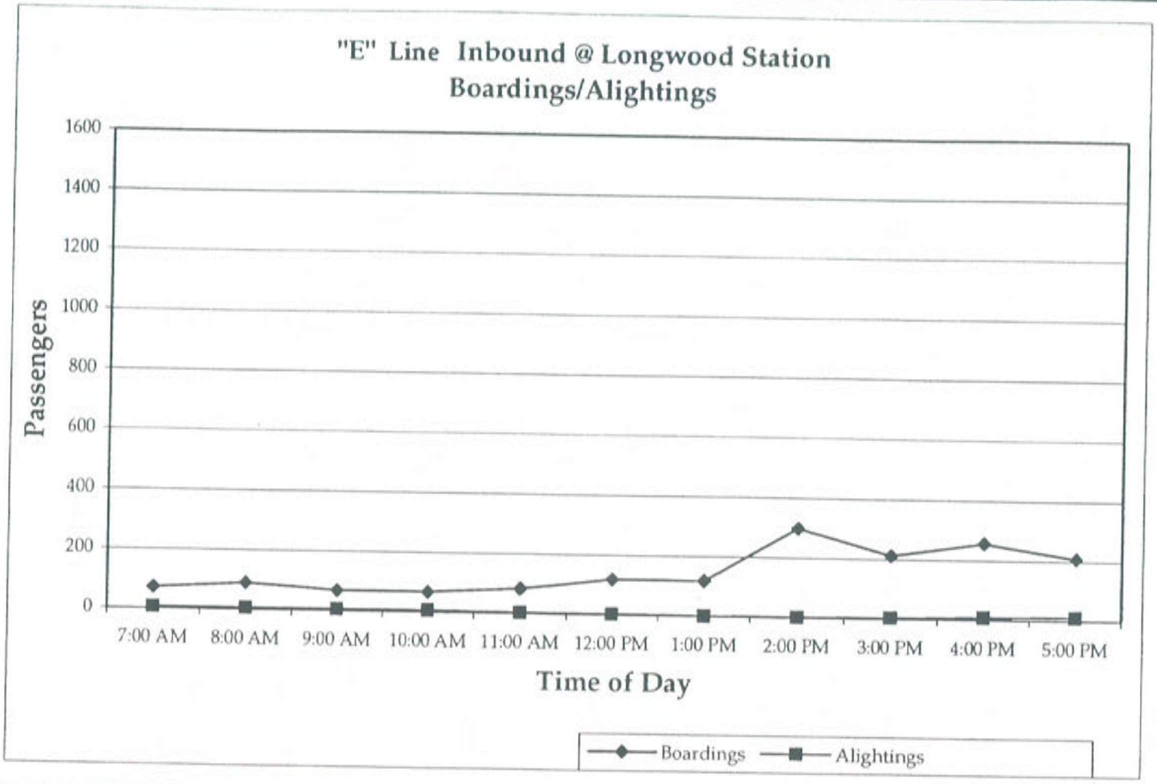
As shown in these three tables, utilization of existing services varies dramatically by service type and by specific route. For example MBTA bus routes 39, 65, and 66 appear to be highly utilized during commuter peaks, but the CT routes appear to have opportunity to carry additional passengers during the peaks. The MBTA Orange and Green Lines as well as commuter rail lines appear to be highly utilized.

5.2.8.6 Green Line – Longwood Medical Area Station

As required by the BRA Scoping Determination, a detailed review was conducted of the Longwood Medical Area Station on the Green Line E Branch. Observations of the station were conducted on Thursday, May 30, 2002 between 7:00 AM and 6:00 PM.

Figure 5-14 and Table 5-21 indicate that most patrons of the Longwood Medical Area station travel to and from points inbound. Boarding on the inbound trains peaked between 2:00 PM and 3:00 PM. It appears that the majority of the approximately 300 passengers boarding during the hour were high school students at Boston Latin School. The peak hour of alighting occurred between 7:00 AM and 8:00 AM on the outbound trains. Approximately half of the 285 passengers alighting during the hour appeared to be LMA employees heading towards Longwood Avenue and the other half consisted of Boston Latin School students heading towards Tetlow Street.

As shown in Table 5-21, the average headway between trains was approximately seven minutes in the peak direction during rush hours and nine minutes midday. During the evening peak, inbound headways were lengthened when express trains skipped this stop. Passenger volumes peaked at 50 percent of capacity on inbound trains during the morning and at 54 percent of capacity on outbound trains during the evening.



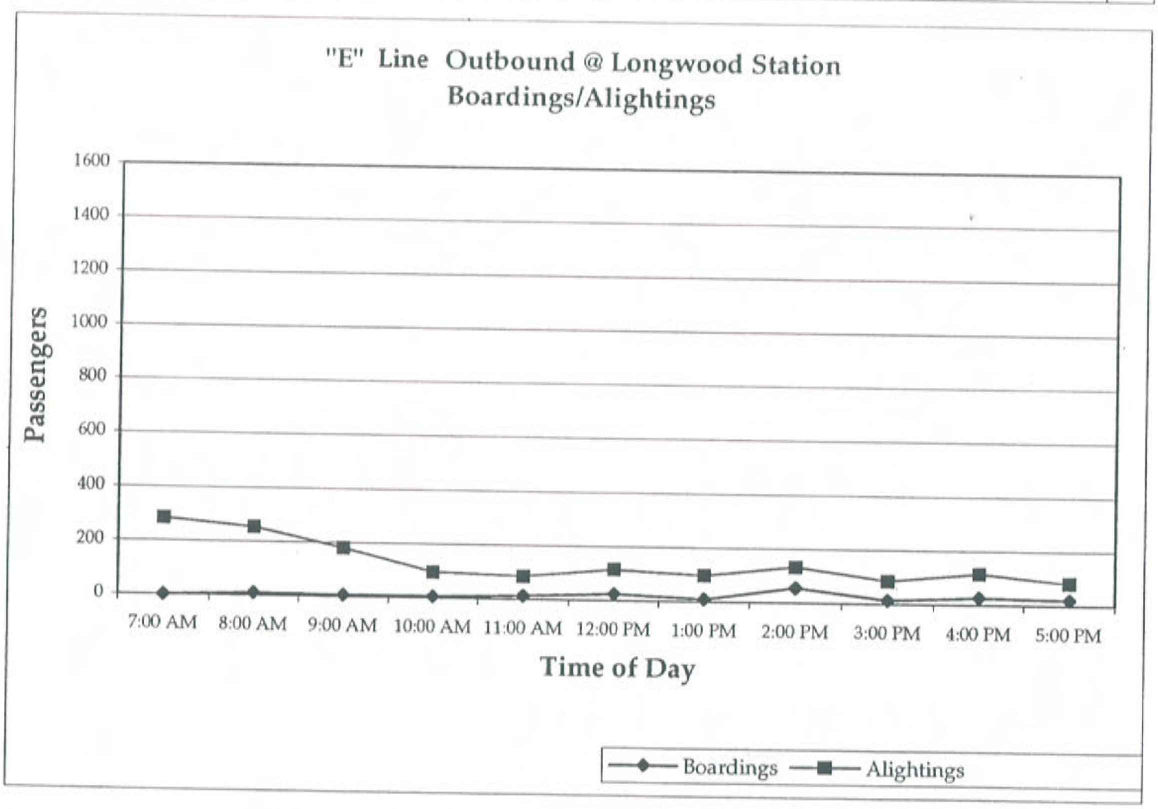


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Figure 5-14

Green Line E Branch - Longwood Medical Area Station
Boardings and Alightings

Vanasse Hangen Brustlin, Inc.

Table 5-18: 2002 Existing Peak Hour Bus Ridership

Route and Direction		Ridership		Utilization (%)	
		AM Peak	PM Peak	AM Peak	PM Peak
CT2	Inbound	60	83	33%	46%
	Outbound	36	43	20%	24%
CT3	Inbound	20	69	11%	39%
	Outbound	122	26	68%	15%
8	Inbound	452	159	75%	44%
	Outbound	187	225	31%	62%
15	Inbound	468	120	65%	33%
	Outbound	132	282	18%	78%
19	Inbound	156	41	65%	28%
	Outbound	72	103	30%	72%
22	Inbound	204	132	57%	37%
	Outbound	132	210	37%	58%
23	Inbound	222	150	62%	42%
	Outbound	120	252	33%	70%
28	Inbound	228	186	63%	52%
	Outbound	108	288	30%	80%
39	Inbound	761	225	85%	62%
	Outbound	380	258	42%	72%
42	Inbound	87	63	48%	35%
	Outbound	87	93	48%	52%
43	Inbound	210	90	58%	25%
	Outbound	30	186	8%	52%
44	Inbound	196	93	60%	28%
	Outbound	98	153	30%	47%
45	Inbound	192	78	53%	22%
	Outbound	48	174	13%	48%
47	Inbound	106	143	59%	68%
	Outbound	99	143	55%	68%
60	Inbound	46	83	28%	55%
	Outbound	46	61	28%	40%
65	Inbound	238	39	99%	26%
	Outbound	33	88	18%	59%
66	Inbound	251	278	70%	77%
	Outbound	317	172	88%	48%

Source: MBTA Comprehensive Ridecheck Program, Winter 2000. Data adjusted by 2.82% to account for background growth to 2002.

Table 5-19: Existing Subway Ridership

Route and Direction	Ridership		Utilization (%)	
	AM Peak	PM Peak	AM Peak	PM Peak
Green Line D Branch				
Inbound	2,210	1,164	84%	44%
Outbound	559	1,983	21%	75%
Green Line E Branch				
Inbound	869	1,392	59%	94%
Outbound	355	387	24%	26%
Orange Line				
Inbound	13,218	9,611	141%	103%
Outbound	11,752	13,118	126%	140%

Source: MBTA Weekday Hourly Total Boardings, Alightings, and Line Volumes, Spring, 1995. Volumes were increased by 10% to account for background growth since 1995.

Table 5-20: Existing Commuter Rail Ridership

Route and Direction	Ridership		Utilization (%)	
	AM Peak	PM Peak	AM Peak	PM Peak
Worcester/Framingham Line				
Inbound	653	NA[1]	71%	NA[1]
Outbound	NA[1]	718	NA[1]	81%
Needham Line				
Inbound	1,386	NA[1]	80%	NA[1]
Outbound	NA[1]	1,250	NA[1]	59%
Attleboro/Stoughton Line				
Inbound	1,474	NA[1]	85%	NA[1]
Outbound	NA[1]	3,586	NA[1]	94%
Franklin Line				
Inbound	2,166	NA[1]	90%	NA[1]
Outbound	NA[1]	2,465	NA[1]	73%

Source: MBTA Commuter Rail Peak Load Counts, Spring, 2000. Data adjusted up by 2.82% to account for background growth since 2000.

1/ Inbound PM peak and outbound AM peak commuter rail ("reverse commute" trains) were not analyzed because of a lack of capacity and ridership data for these periods and the presumption that no capacity constraints exist or are likely to exist by 2007.

Table 5-21: MBTA Green Line E Branch Longwood Medical Area Station Weekday Service and Ridership

Hour Beginning	Boarding		Alighting		V/C		Headway	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
7:00 AM	72	0	6	283	31%	46%	7 minutes	6
8:00 AM	90	9	6	252	50%	39%	6	7
9:00 AM	68	6	6	180	29%	42%	6	7
10:00 AM	68	5	7	95	25%	25%	9	9
11:00 AM	83	12	3	85	21%	13%	9	8
12:00 PM	119	24	3	114	19%	18%	8	9
1:00 PM	118	9	0	97	23%	31%	9	9
2:00 PM	298	55	1	132	42%	27%	9	9
3:00 PM	212	13	4	85	42%	18%	8	9
4:00 PM	257	27	8	115	32%	39%	7	9
5:00 PM	208	20	11	82	29%	54%	8	8
Total	1,593	180	55	1,520	31%	33%	8	9

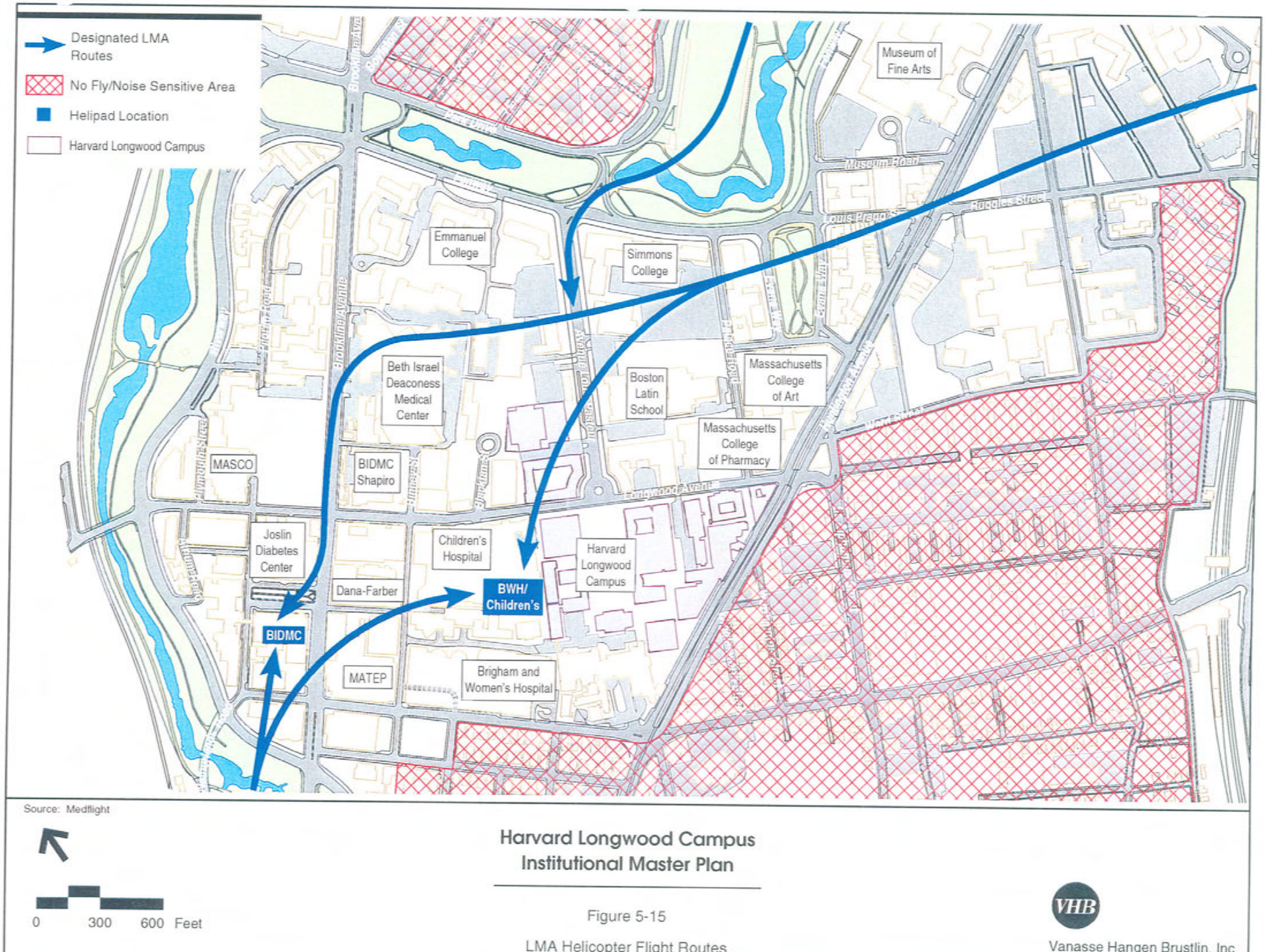
Source: Data collected by Vanasse Hangen Brustlin, Inc. on Thursday, May 30, 2002.

5.2.9 LMA Helicopter Operations

The BRA's Scoping Determination requested documentation of existing helicopter routes and number of missions within the LMA. The purpose of this evaluation is to clearly understand the extent and nature of helicopter activities in the LMA and to assess the location and proposed height of the Harvard projects on existing helicopter operations in the LMA.

Nearly all helicopter operations in the LMA are carried out by Medflight–Boston, which provides transport for patients who require specialized and immediate emergency care services at a facility with a Level I trauma center. Facilities in the LMA that provide these services include Beth Israel Deaconess Medical Center, Brigham and Women's Hospital, and Children's Hospital. Table 5-22 provides a summary of Medflight helicopter operations that were made to LMA hospitals during the 2001 calendar year. Harvard University does not generate helicopter trips.

Figure 5-15 identifies the location of recommended helicopter routes to and from the LMA as well as the location of existing helipad locations, and designated "No Fly Zones."



Harvard Longwood Campus
Institutional Master Plan

Figure 5-15

LMA Helicopter Flight Routes

Vanasse Hangen Brustlin, Inc

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Table 5-22: 2001 LMA Helicopter Operations

Location	Total Reported Missions
Beth Israel Deaconess Medical Center	254
Brigham and Women's Hospital	262
Children's Hospital	118
Total 2001 Medflight Missions	634

Source: Medflight

During the 2001 calendar year, Medflight carried out 634 helicopter missions to the LMA. This level of activity equates to approximately 12 flight missions per week (or approximately 1.7 missions per day) in the LMA in 2001.

Note from Figure 5-15 that the LMA has two helipads. Brigham and Women's Hospital and Children's Hospital share a helipad, which is located off of Shattuck Street. Beth Israel Deaconess Medical Center relocated their helipad in 2001 from their East Campus to their West Campus with the opening of the new Berenson Emergency Department at the corner of Francis Street and Pilgrim Road. Flight routes recommended by the Federal Aviation Administration (FAA) suggest that pilots should utilize the Emerald Necklace, Avenue Louis Pasteur, and/or Brookline Avenue to access LMA helipads. "No Fly Zones" have also been specifically designated in the area to direct helicopter missions away from residential areas to the greatest extent possible as a means to reduce unnecessary noise generation in these areas. Specific routes that are actually utilized are subject to the discretion of the Medflight pilot to ensure that safe conditions are maintained during the flight mission considering factors such as wind, solar glare, and precipitation.

5.3 Evaluation of Long-Term Transportation Impacts

This section describes the future transportation infrastructure that will serve the Harvard Longwood Campus. The first parts of this section provide a summary of area transportation infrastructure improvements that are currently planned, are under design, or are under construction by the City of Boston, the MBTA, MASCO, or other project proponents in the area. Subsequent sections provide a detailed summary of the development of both the future 2007 No-Build and 2007 Build Conditions, including morning and evening peak hour traffic activity, parking supply and demand, loading and service activities, future pedestrian and bicycle activities, future transit options, and helicopter operations. The future 2007 No-Build and Build Conditions were developed and evaluated to identify additional roadway, pedestrian, and transit improvements that may be needed to mitigate identified transportation impacts generated by future Harvard Longwood Campus growth, and in particular, the HSDM Research and Education Building.

5.3.1 Area Transportation Improvements

The LMA is a thriving district of the City with unique pressures to serve a high concentration of both pedestrian and vehicular traffic. MASCO was formed in 1972 to enhance the LMA, and to create and implement programs that assist member institutions and individuals in the area. To place the LMA and the transportation infrastructure that serves it in proper context, it is important to summarize recent, ongoing, and proposed area improvements developed by MASCO, the City and other institutions. The following section summarizes major MASCO initiatives in the LMA that are aimed at providing a diverse and comprehensive array of alternative transportation services and programs for LMA employees. Subsequent sections provide summaries of ongoing improvement projects in the LMA that are being initiated either by the City of Boston, Commonwealth of Massachusetts, or the MBTA.

5.3.1.1 MASCO Initiatives

MASCO is a leader in developing and promoting transportation and pedestrian improvements for the LMA. In 1995, MASCO developed "Access LMA", an action plan to improve access in and around the LMA. MASCO's objectives are to sustain and grow the delivery of high-quality education, patient care and research activities. Transportation-related initiatives that have been implemented under this plan include the following:

- **Parking Meter Removal Program** along major LMA streets to facilitate more efficient vehicular flow. MASCO has successfully removed meters, added turn lanes, and reduced congestion along Longwood Avenue, as well as portions of Brookline Avenue and Francis Street.

- **Thermoplastic Pavement Marking Program** of key pedestrian crossings and of travel lanes. Thermoplastic marking have a much longer life cycle than normal painted markings, and are more clearly visible during the evening and during inclement weather conditions.

- **Roadway Improvement Program**, including the installation of a new traffic signal at the intersection of Riverway/Short Street; timing and phasing improvements at the Riverway/Longwood Avenue intersection; and signal timing and management adjustments throughout the LMA, including most recently at the Longwood Avenue/Brookline Avenue intersection. MASCO recently completed the implementation of roadway improvements at the intersection of Longwood Avenue and Avenue Louis Pasteur (Oscar Tugo Circle).

- **LMA Sign Program**, which updates signs to clearly highlight institutional destinations. This program is targeted at improving circulation in and around the LMA for patients, students and visitors, and reinforces the use of primary area roadways over local (often residential) streets.

- **Patient/Visitor Access Program**, which provides MBTA tokens free or at a discount to patients who are able to use MBTA services.

- **Targeted Ticket and Towing Program**, under which a Boston Police officer is dispatched to ticket and tow illegally parked vehicles during peak traffic hours.

- **Pedestrian/Biking Incentive Program**, under which MASCO provides bike racks at strategic locations throughout the LMA.

- **MASCO Bus Shelters**, provided at the Francis Street/Binney Street intersection to better serve area employees and reduce congestion on Francis Street.

- **JFK/UMass Shuttle**, still in its trial period as the newest MASCO shuttle bus, improves red line connections for LMA commuters. MASCO continues to add shuttle bus routes to its already extensive network.

CommuteWorks TMA

In addition to programs specified above, MASCO's CommuteWorks TMA helps member institutions, including Harvard, to publicize commute options, coordinate carpools, provide incentives for pedestrians and bicyclists, provide a guaranteed ride home) for carpool members, and help employees and students experience alternate commute modes. CommuteWorks runs both ongoing and short-term programs.

Longwood Avenue at Avenue Louis Pasteur (Oscar Tugo Circle)

Currently, MASCO and Harvard recently completed the implementation of pedestrian access improvements at the Longwood Avenue and Avenue Louis Pasteur intersection (also known as Oscar Tugo Circle). This intersection experiences high pedestrian volumes and has been the focus of planning studies by MASCO for several years.

Improvements at this intersection include a larger traffic island that will reduce pedestrian crossing times in the intersection and two wide crosswalks marked with thermoplastic that span Longwood Avenue east and west of Avenue Louis Pasteur. Figure 5-16 depicts roadway and pedestrian safety improvements that have been implemented at Oscar Tugo Circle.

5.3.1.2 City/State-Sponsored Traffic Improvements

The City of Boston has several mitigation programs in the works that will positively impact the LMA, each of which is in varying states of implementation. These include the Huntington Avenue Improvement Project and various signal timing/phasing enhancements within the LMA. These improvements are described below.

Huntington Avenue Improvements

The City and the MBTA are jointly sponsoring reconstruction of the Huntington Avenue corridor as part of a major safety improvement/revitalization project. The reconstruction will greatly improve operations at the Longwood Avenue/Huntington Avenue intersection, which serves as a primary gateway to the LMA from points south. Designed improvements at this intersection include removal of parking along Huntington Avenue to provide exclusive left-turn lanes, and a coordinated signal system design that will improve vehicle progression and reduce congestion on Huntington Avenue. The project is currently under construction and is expected to be complete by late 2002.

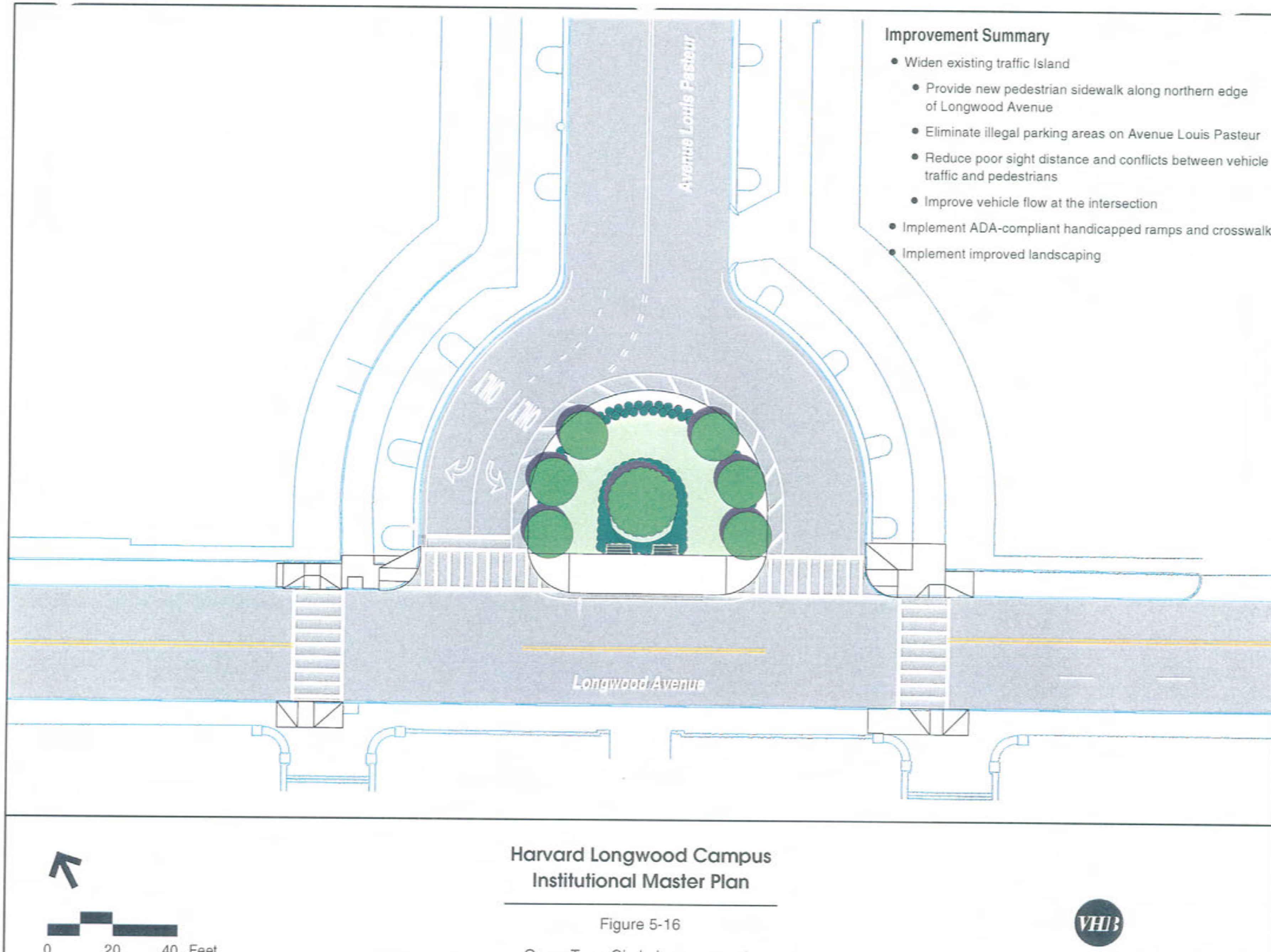
LMA Signal and Intersection Improvements

As part of an overall program to update traffic signal equipment and operations, the BTD has contracted with a consultant to evaluate and update approximately 120 intersections in the City. Within the project study area, targeted improvements include:

- Signal improvements at Longwood Avenue at Blackfan Street;
- Signal improvements at Brookline Avenue and Longwood Avenue; and
- Island barrier extension at the Avenue Louis Pasteur/Fenway intersection. Merck has committed, as mitigation for its project, to funding this and other off-site improvements.

Improvement Summary

- Widen existing traffic Island
    - Provide new pedestrian sidewalk along northern edge of Longwood Avenue
    - Eliminate illegal parking areas on Avenue Louis Pasteur
    - Reduce poor sight distance and conflicts between vehicle traffic and pedestrians
    - Improve vehicle flow at the intersection
- Implement ADA-compliant handicapped ramps and crosswalks
- Implement improved landscaping



Harvard Longwood Campus
Institutional Master Plan

Figure 5-16

Oscar Tugo Circle Improvements

Vanasse Hangen Brustlin, Inc

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5.3.1.3 MBTA-Sponsored Transit Improvements

Currently, the MBTA provides circumferential transit services in the area via its existing crosstown bus routes (CT2 and CT3). These existing routes are characterized as elements of Urban Ring Phase 1. Figure 5-12 (presented previously) illustrates the routes for these two bus services in the LMA.

The MBTA is currently conducting long-term transit planning relative to improved circumferential transportation improvements in the Urban Ring corridor. Phase 2 of the Urban Ring project would include the replacement of existing crosstown bus routes with Urban Ring Bus Rapid Transit (BRT) services, much like the newly opened Silver Line. Within the LMA, the proposed BRT would provide priority access between the Sears Rotary, Oscar Tugo Circle, and onward to Ruggles Station. The BRT would reduce trip times, offer better schedule reliability than conventional buses, and facilitate transfers between bus and rail.[6]

It is envisioned that over the long-term, the proposed BRT could eventually be replaced with light rail transit (LRT) under Phase 3 of the Urban Ring project. It is estimated that by 2025, the Urban Ring could potentially carry over 14,000 passengers to and from the LMA on a typical weekday.

Figure 5-17 identifies possible BRT and LRT alignment options that are currently being considered by the MBTA. Harvard Longwood Campus would benefit greatly from the proposed light rail alignment, as it locates a station at Oscar Tugo Circle.

5.3.2 Traffic

The 2007 No-Build Condition was developed to allow an evaluation of future transportation conditions in the study area without consideration of any Harvard Longwood Campus growth. This year 2007 represents the IMP horizon year (five years from the existing condition).[7] Under the 2007 No-Build Condition, increased traffic activity is expected on study area roadways due to continued general area-wide traffic growth; approved developments in the area that are currently under construction; and other ongoing projects that have had, at a minimum, either a Project Notification Form (PNF) or an Institutional Master Plan Notification Form (IMPNF) filed on their behalf with the BRA at the time the Scoping Determination for this IMP was issued, formally initiating the City of Boston Article 80 Development Review process for their respective project(s).

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6 Major Investment Study of Circumferential Transportation Improvements in the Urban Ring corridor, Location 14 – LMA/BRT Route and Station, prepared for the Massachusetts Bay Transportation Authority by Earth Tech, Inc, March 2001.

7 Harvard projects proposed as part of this IMP are planned to be completed and fully opened by 2007.

Vehicular and pedestrian traffic growth within a defined area is a function of expected land development, economic activity, and changes in demographics. A two-step process has been employed to estimate future traffic activity in the project study area under the 2007 No-Build Condition. In Step 1, general area-wide traffic growth was estimated from regional traffic growth trends along major study area roadways. The focus of this part of the analysis was to develop an annualized growth rate and apply it to existing condition peak hour traffic volumes. This is to reasonably account for future through traffic growth in the area. In Step 2, peak hour traffic generation estimates for specific nearby developments were added to the resultant volumes produced in Step 1 to generate peak hour traffic volume estimates for the 2007 No-Build Condition. A more detailed discussion of the process employed to develop peak hour traffic volume estimates for the 2007 No-Build Condition is presented below.

5.3.2.1 Step 1 - Account for General Background Traffic Growth

As mentioned previously, Step 1 of this process was to estimate general area-wide traffic growth and apply an annualized growth rate to existing condition peak hour traffic volumes in order to reasonably account for future through traffic growth in the project study area. Historical traffic count data collected along major corridors within the project study area were reviewed to understand how traffic volumes have changed over the past two decades within the LMA. In 1999, MASCO completed the *Longwood Medical and Academic Area 1999 Transportation Study Update*.[8] One of the many goals of this report was to gain a better understanding of the trends and changes that have occurred within the LMA relative to traffic patterns and growth, development, and the area transportation system. Table 5-23 provides a summary of traffic volume trends within the study area on major LMA roadways between 1986 and 2002.

As shown in Table 5-23, traffic along the major roadways that serve the LMA has grown fairly steadily since the mid-1980s. Traffic along Longwood Avenue and Brookline Avenue has grown at a rate of 1.3 percent per year between 1986 and 2002. During this same period, traffic along Francis Street has grown at 2.1 percent per year in the evening, but has declined by 0.4 percent per year in the morning. During this same period, approximately 2.2 million sf of office, academic, research, laboratory, clinical, and ambulatory care space have been developed throughout the LMA.

8 Longwood Medical and Academic Area 1999 Transportation Study Update, prepared for MASCO by Vanasse Hangen Brustlin, Inc., September 1999.

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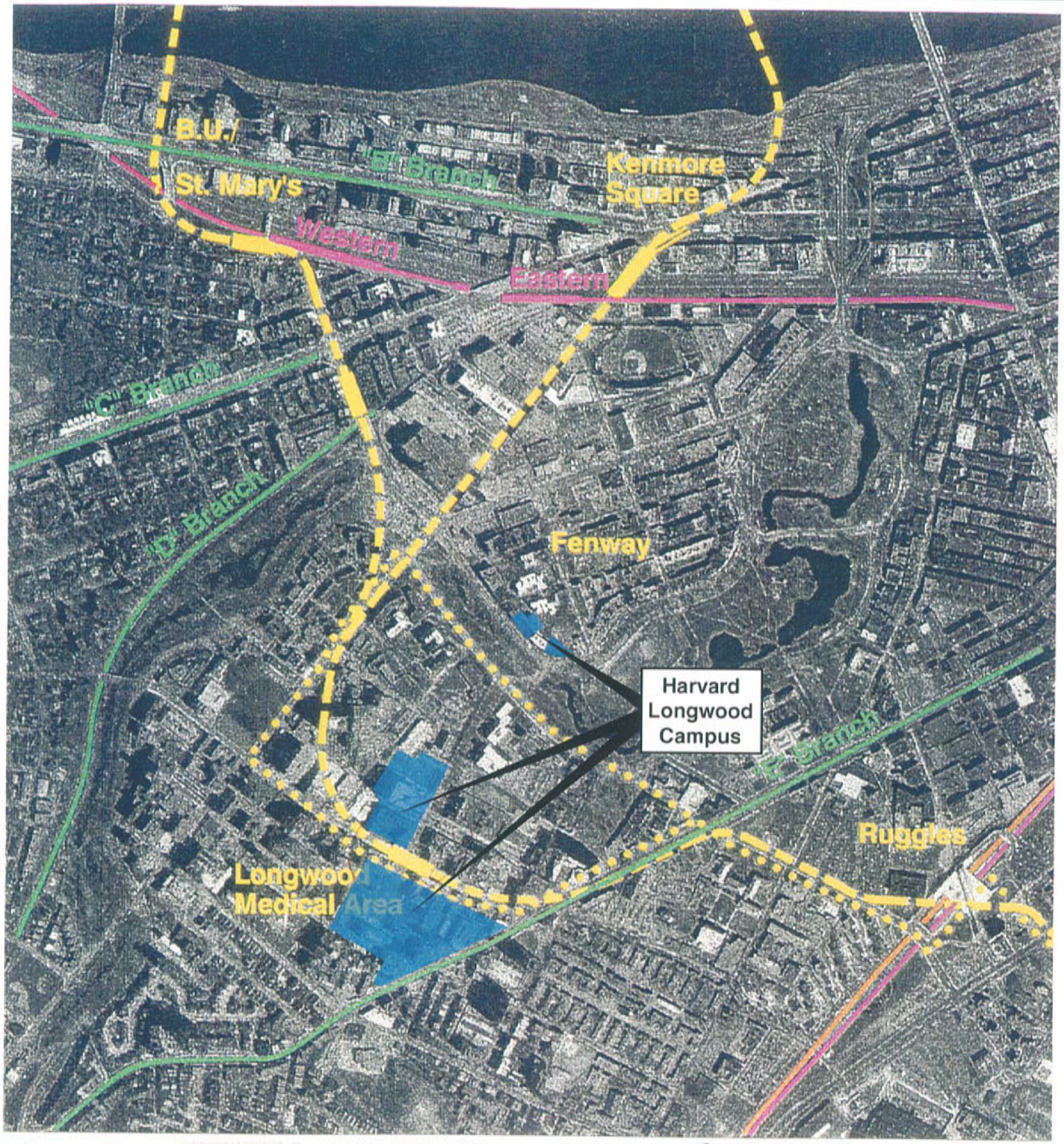


Legend:

Urban Ring LRT

Urban Ring BRT

Planned Station Location

Commuter Rail

Green Line

Orange Line

Source: MBTA

Harvard Longwood Campus
Institutional Master Plan

Figure 5-17

Possible Future Urban Ring Alignment Options

Vanasse Hangen Brustlin, Inc.

Table 5-23: LMA Traffic Growth Trends- 1986 through 2002

Roadway Location	Peak Hour	Measured Volumes 1986 [1]	2002 [2]	Annualized % Increase
Longwood Avenue	AM Peak	920	1,115	1.2%
(east of Brookline Avenue)	PM Peak	980	1,270	1.6%
Brookline Avenue	AM Peak	1,565	1,920	1.3%
(south of Longwood Avenue)	PM Peak	1,745	2,115	1.2%
Francis Street	AM Peak	935	880	-0.4%
(east of Brookline Avenue)	PM Peak	665	930	2.1%

1/ Source: Longwood Medical and Academic Area 1999 Transportation Study Update, prepared for MASCO by Vanasse Hangen Brustlin, Inc., September 1999. Page 14-15, Tables 7 and 8.

2/ Based on manual turning movement counts conducted by Vanasse Hangen Brustlin, Inc. for Brigham & Women's Hospital, January 2002.

A portion of the traffic growth within the LMA is directly attributable to development within the LMA. However, there is also traffic growth due to vehicles traveling through, but not destined to, the LMA. The *LMA 1999 Transportation Study Update* included a comprehensive survey of motorists traveling LMA roadways to understand their origins, destinations, trip purposes, and vehicle occupancies. This study concluded that, depending upon the particular roadway, traffic traveling through (but not generated by) the LMA accounted for 40 to over 90 percent of peak hour traffic. In addition, the share of "through traffic" was determined to have increased on almost every roadway that was studied.[9] Related excerpts from the Transportation Study Update have been included within Appendix B for reference purposes.

Based on the share of through traffic and the historical rate of traffic growth on LMA roadways, background traffic growth has been incorporated in the 2007 No-Build Condition using a growth rate of 0.5 percent per year between 2002 and 2007. This rate has been used in support of several recently approved LMA development projects.

5.3.2.2 Step 2 - Incorporate Site-Specific Background Traffic Growth

There are currently 12 approved or planned development projects that are expected to have an influence on future year peak hour traffic volumes on study area roadways and intersections. These projects were identified within the Scoping Determination that was issued for the project as well as during subsequent consultation with the BTD. Except where specifically noted, their anticipated transportation impacts have been included within

9 Longwood Medical and Academic Area 1999 Transportation Study Update, prepared for MASCO by Vanasse Hangen Brustlin, Inc., September 1999. Page 8, Table 4.

the analyses of the 2007 No-Build Condition. A description of each planned project or master plan is provided below (see Figure 5-18).

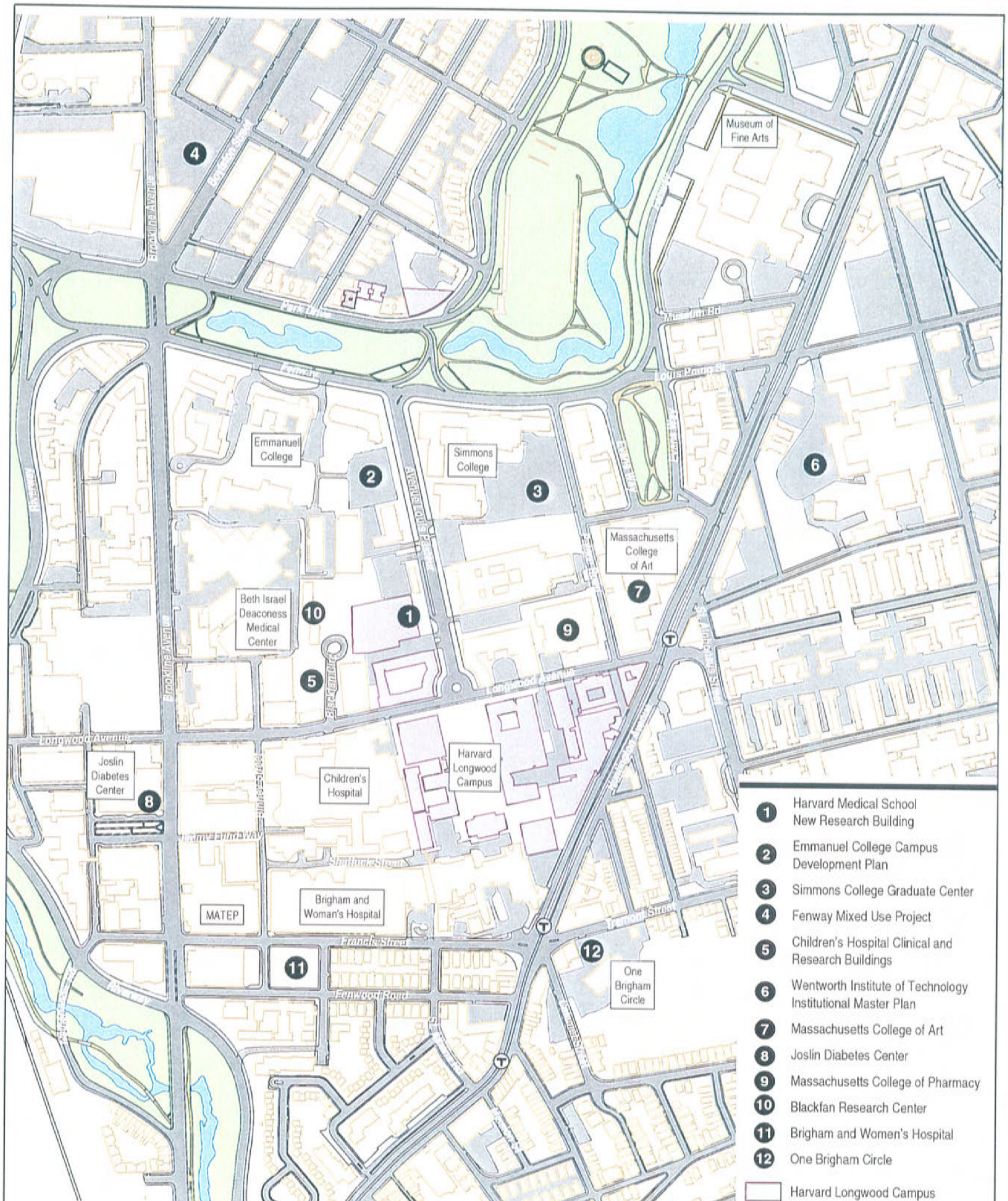
- **HMS New Research Building.** MHS is constructing a state-of-the-art 430,000-square-foot research and laboratory facility within its existing Longwood Campus. The project is being built adjacent to the existing Harvard Institutes of Medicine facility at 77 Avenue Louis Pasteur and includes the replacement of 561 existing parking spaces (including some previous surface spaces) to a new, below-grade parking facility. This project has been approved by the BRA and is currently under construction. No new parking spaces were added to the Harvard Longwood Campus as part of the New Research Building project.

- **Emmanuel College Campus Development Plan.** The Emmanuel College Campus Development Plan includes development of two research buildings (approximately 500,000 sf and 474 new parking spaces) on the college's endowment campus, and construction of new dormitory space and student activity space on its academic campus (approximately 163,000 sf of space and 14 new parking spaces). The first of these two buildings, Building B, is currently under construction and will be occupied by Merck Research Laboratories. For this study, it is assumed that the entire Emmanuel Campus expansion will be completed by 2007.

- **Simmons College Graduate Center.** Simmons College is constructing a 60,000-square-foot graduate center addition to their existing campus along Avenue Louis Pasteur and the Fenway. The project will add fewer than 30 new vehicle trips to the LMA roadways during peak traffic hours. Construction is expected to be complete by 2003.

- **Fenway Mixed Use Project.** Located on a site between Boylston Street and Brookline Avenue in the nearby Fenway neighborhood, the Fenway Mixed-Use project will include approximately 646,200 sf of space, including 442 residential units, a hotel with about 200 extended-stay rooms, 62,000 sf of retail space, and 445 below-grade parking spaces. It is expected that this project will be completed and fully occupied by 2007.

- **Children's Hospital Clinical and Research Buildings.** Children's Hospital is currently constructing two new facilities in the LMA. The hospital is constructing a new 245,000-square-foot Research Building on the corner of Longwood Avenue and Blackfan Street, including the construction of 300 below-grade parking spaces. In addition, the Clinical Building will be a 194,000 sf ambulatory facility on Shattuck Street.



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Harvard Longwood Campus
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Figure 5-18

Approved or Planned Development Projects
(Not Including Proposed IMP Projects)

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- **Wentworth Institute of Technology Institutional Master Plan.** The Wentworth Institute of Technology IMP includes construction of a 600-bed residential dormitory on its existing Boston campus. The purpose of the project is to provide quality on-campus housing for some of its existing students who currently must secure their own off-campus housing. With completion of this project, Wentworth would possess 1,500 on-campus beds for its daytime student population of approximately 3,000 (or half of its total daytime students). No new parking will be constructed as part of this project. It is anticipated that this project will not have a noticeable impact on future peak hour traffic activity within the LMA.

- **Massachusetts College of Art.** The Massachusetts College of Art is constructing a new 182,000-square-foot dormitory on its LMA campus. This 306-bed facility will provide quality on-campus housing for its existing students whom currently must secure their own off-campus housing. The college expects minimal student growth as a result of this project. No new parking spaces are proposed. It is anticipated that this project will not have a noticeable impact on future peak hour traffic activity within the LMA.

- **Joslin Diabetes Center.** In October 2001, the Joslin Diabetes Center submitted an IMPNF to the BRA, initiating preparation of an Institutional Master Plan for its campus in the LMA. As initially proposed, projects to be included within its forthcoming IMP include the development of 1.25 million sf of new space on the campus as well as construction of 714 new below-grade parking spaces. Phase I of the IMP includes the construction of a 7-story, 172,000-square-foot research building, an 11-story, 300,000-square-foot research building, and a 30-story, 327,000-square-foot residential building with 300 units and 434 total below grade parking spaces. Phase II of the IMP includes future development of an additional 440,000-square-foot research facility and 278 additional below-grade parking spaces. As directed by the BTD, the No-Build Condition assumes that only Phase I of the IMP will be complete by 2007. For this analysis, it is assumed that Phase II would be developed sometime thereafter. In July 2002, the Joslin Diabetes Center filed a Draft PIR that considers a considerable reduction in building program versus what was proposed previously in its initial October 2001 IMPNF filing. The revised project includes a reduction of gross floor area from approximately 1 million gsf to approximately 518,000 gsf. In addition, the project now contemplates a parking supply of 357 parking spaces versus the 714 parking spaces proposed in the IMPNF (or a reduction of 347 parking spaces). It is expected that this revised building program will generate less person-trips and vehicle trips than what was previously proposed in the IMPNF. However, the Harvard IMP has based its transportation analyses on the building program and trip generation estimates presented in the initial October 2001 filing. The initial October 2001 trip generation estimates were considered because they were the most accurate information available at the time that analyses were conducted and completed. Consequently, transportation analyses and related impacts presented within this IMP are conservative.

- **Massachusetts College of Pharmacy** has submitted an Institutional Master Plan Renewal to the BRA for its proposed White Building Addition. The proposed project is located at 179 Longwood Avenue and includes construction of 93,300 square feet of academic, administrative, and support space as well as a 270-bed dormitory. The project also includes construction of a single-level below grade parking facility with 85 parking spaces (of which 67 are new spaces). The college also intends to expand its existing parking garage's capacity by 38 spaces. In addition, the college has purchased 670 Huntington Avenue, a 7,636-square-foot parcel that is currently operated as a gas station. The College intends to develop this parcel as an academic and/or administrative building in the future. However, no specific development plans have been made at this time. This future Huntington parcel project has not been included within the 2007 No-Build Condition peak hour traffic networks for the Harvard project. Note that recent modifications (February 2002) to downsize this project's parking plan have not been included within this evaluation.

- **Blackfan Research Center** is a 400,000-square-foot biomedical research building proposed for Blackfan Circle by Lyme Properties, LLC. The project will include approximately 300 below-grade parking spaces (approximately 250 net new spaces). Proposed traffic mitigation for this project includes the extension of Blackfan Street through to Avenue Louis Pasteur, relieving pressure on Longwood Avenue.

- **Brigham and Women's Hospital** has submitted an IMPNF to the BRA, initiating the preparation of a renewed Institutional Master Plan for its LMA campus. As part of its forthcoming IMP, the Brigham described plans to construct a 350,000-square-foot Center for Advanced Medicine (CAM) on Francis Street across from its existing main entrance to the hospital. The CAM project will also include construction of a 300-space below-grade parking facility (of which 238 parking spaces would be new).

- **One Brigham Circle** includes the construction (underway) of a mixed-use development abutting Tremont, Calumet, and St. Alphonsus streets. As approved, this project will include development of 61,000 sf of retail space, 115,000 sf of office space, 130 surface parking spaces to support retail uses, and an additional 255 structured parking spaces to support proposed office uses (for 385 total parking spaces). This project is currently under construction.

Site-generated traffic volumes for each of these developments have been included within Appendix B. A bibliography of published references that were used to compile these estimates is also included for reference purposes.

5.3.2.3 2007 No-Build Condition Peak Hour Traffic Volumes

The 2007 No-Build Condition weekday morning and evening peak hour traffic volumes were developed by increasing the 2002 Existing Condition volumes to include general background traffic growth as previously described, and adding traffic volumes associated with the site-specific projects listed in the previous section. Figures 5-19 and 5-20 present the 2007 No-Build Condition traffic volume networks for the morning and evening peak hours.

5.3.2.4 Project-Generated Trips

To assess the impact of the projects proposed in this IMP, travel demand was projected for proposed Harvard Longwood Campus IMP projects. Projected trip generation for the IMP was developed based on a review of several relevant sources, including:

- BTD-approved person-trip rates;
- Institute of Transportation Engineers, *Trip Generation;* and
- Trip rates for other recently approved development projects in the LMA with similar proposed uses.

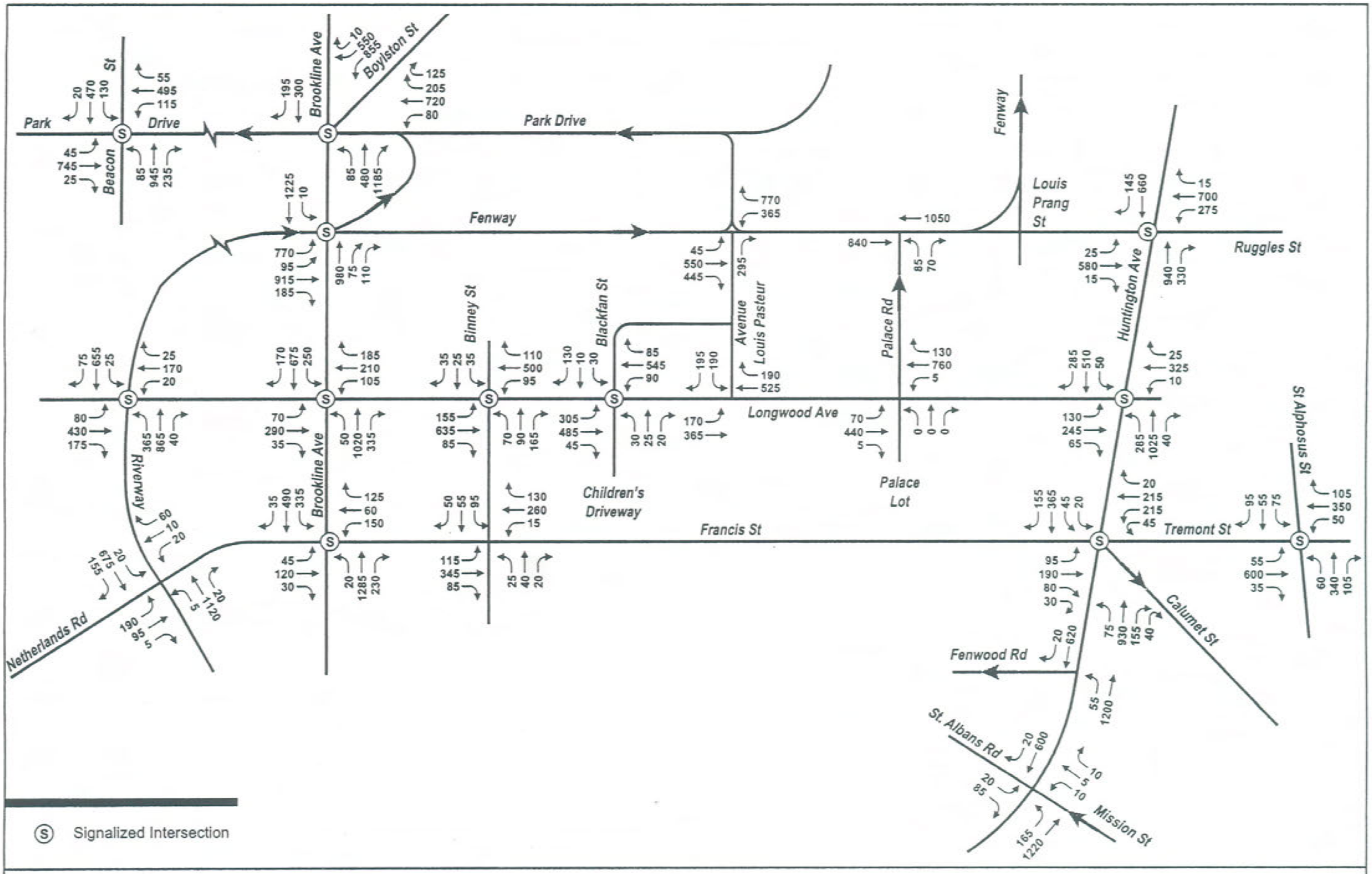
Of the development projects proposed within this IMP for the Harvard Longwood Campus, only the new HSDM Research and Education Building is expected to generate any new trips, as the other four projects will allow for the future decompression of existing uses. Table 5-24 lists all five proposed IMP projects.

Table 5-24: Proposed Harvard IMP Development Projects

Project	Use	New Trips
HSDM Research and Education Building	Research and Education	Yes
Goldenson Magnet Unit Addition	Research – Expansion	No
Armenise Addition	Research – Expansion	No
Goldenson Addition	Research – Expansion	No
Building C Addition	Research – Expansion	No

Source: Harvard University Institutional Master Plan Notification Form, March 2002.

Trip generation estimates for the HSDM Research and Education Building project are based on development of approximately 16,000 sf of space for new research uses. Planners for the HSDM have determined that most of the proposed new space will be devoted to better accommodating and modernizing existing classroom, laboratory and research, and clinical functions (*i.e.*, decompression), and that only 16,000 sf of the total proposed space in the building will be utilized to accommodate new research and laboratory uses. Long-term planning forecasts for the HSDM with future implementation of the HSDM Research and Education Building indicate the following:



Source: Vanasse Hangen Brustlin, Inc.

Harvard Longwood Campus
Institutional Master Plan

Figure 5-19

2007 No-Build Condition Morning Peak Hour Traffic Volumes

Vanasse Hangen Brustlin, Inc

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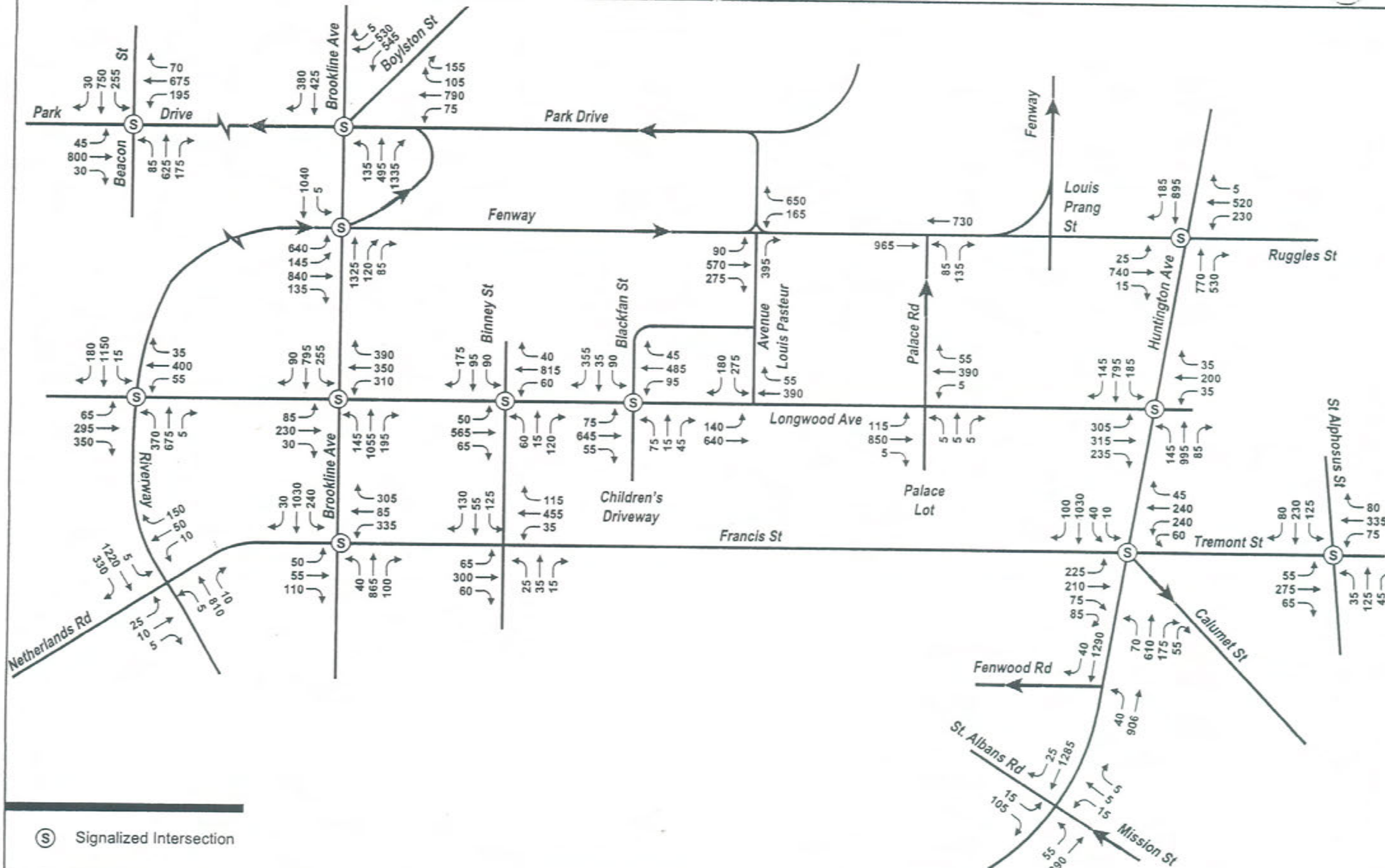

Not to Scale

Source: Vanasse Hangen Brustlin, Inc.

Harvard Longwood Campus
Institutional Master Plan

Figure 5-20

2007 No-Build Condition Evening Peak Hour Traffic Volumes

Vanasse Hangen Brustlin, Inc

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- Despite the new building construction, HSDM student enrollment will stay constant at about 265 students per year over the next five years.
- Total HSDM faculty and staff will increase by 25 full-time employees between 2002 and 2007 with implementation of the project.
- No material increase in annual HSDM dental clinic visits is anticipated between 2002 and 2007.

5.3.2.5 Person Trip Generation

The first step in projecting site-generated trips is to quantify the total number of person-trips generated by the project for typical weekday peak hours. The person-trips are calculated based on ITE Trip Generation Land Use Code (LUC) #760, Research and Development Center.[10]

Table 5-25 summarizes the total number of person-trips forecast to be generated for an average weekday. The numbers of person-trips are shown for the morning and evening peak hours, and for a typical weekday.

Table 5-25: Person-Trip Generation Summary HSDM Research and Education Building

Period/Direction	Trip Rate[1]	Person-Trips[2]
Morning Peak Hour		
Enter	1.22	19
Exit	0.26	5
Total	1.48	24
Evening Peak Hour		
Enter	0.23	3
Exit	1.09	19
Total	1.32	22
Daily	9.65	155

1/ ITE Trip Generation, Sixth Edition Institute of Transportation Engineers, 1997. These vehicle trip rates were appropriately modified to generate person-trip rates for this proposed use.

.2/ Person-trips based on Trip Generation Land Use Code (LUC) #760 and applied to the 16,000 sf of the net new space to be constructed that will be available to accommodate future growth in research and laboratory functions.

10 ITE Trip Generation, Sixth Edition Institute of Transportation Engineers, 1997.

As shown in Table 5-25, the proposed HSDM Research and Education Building is anticipated to generate a total entering and exiting person-trip volume of 24 person-trips during the weekday morning peak hour and a total volume of 22 person-trips during the weekday evening peak hour. It is projected to generate only 155 additional person-trips per day for a typical weekday.

5.3.2.6 Trip Generation Rate Comparison

Table 5-26 provides a comparative summary of the trip rates employed in support of the HSDM Research and Education Building with other recently approved projects in the LMA with similarly proposed land uses. Included are other research and laboratory facilities that are either approved or currently under construction, including the Children's Hospital Research Building, the Harvard New Research Building and the Emmanuel Endowment Campus Building B (Merck). For each listed project, peak hour and daily person-trip generation rates are presented.

Note from Table 5-26 that the ITE rates employed to estimate future HSDM Research and Education Building person trips are comparable to, but also higher than, those rates used to estimate person-trips for both the Children's Hospital Research Building and the Harvard New Research Building. The rates used to estimate person-trips for the other recently approved research and laboratory projects were based on either specific observations and surveys conducted at the respective institutions, or in the case of Emmanuel Building B, were based on detailed employee/space programming estimates for the prospective tenant of that particular facility (Merck Laboratories). Based on this comparative review of trip rates for other similar LMA projects, ITE Land Use Code (LUC) #760, Research and Development Center, is believed to offer a reasonable and conservative rate for estimating person-trips for the HSDM Research and Education Building project.

Table 5-26: Trip Generation Rate Comparison Recently Approved LMA Research and Laboratory Projects

Period/Direction	HSDM Building [1]	Children's Research Building [2]	Harvard New Research Building [3]	Emmanuel Building B (Merck) [4]
Morning Peak Hour				
Enter	1.22	1.36	0.87	0.45
Exit	0.26	0.14	0.18	0.01
Total	1.48	1.50	1.05	0.46
Evening Peak Hour				
Enter	0.23	0.26	0.22	0.03
Exit	1.09	1.31	0.58	0.50
Total	1.32	1.57	0.80	0.53
Daily	9.65	10.00	4.37	3.88

1/ ITE Trip Generation, Sixth Edition Institute of Transportation Engineers, 1997, Land Use Code (LUC) #760.

2/ Children's Hospital Clinical and Research Buildings Draft Project Impact Report, prepared for Children's Hospital by Epsilon Associates and Vanasse Hangen Brustlin, Inc., June 1999.

3/ Harvard Medical School New Research Building Draft Project Impact Report, prepared for Harvard Medical School by Epsilon Associates and Vanasse Hangen Brustlin, Inc.,, April 2000.

4/ Campus Development Plan for Emmanuel College Draft Project Impact Report/Environmental Impact Report, prepared for Emmanuel College by Corcoran Jennison Companies and Goody Clancy & Associates, October 1999.

5.3.2.7 Mode Shares and Vehicle Occupancy Rates

The next step in the trip generation process is estimating mode shares that will be applied to the person-trip estimates to determine the demand for travel among various transportation modes (transit, walk/bike, and auto). DEP Rideshare Reports that were filed by Harvard in 1999 and 2001 were used to estimate the anticipated mode shares of new HSDM staff. Mode shares for the HSDM Research and Education Building project are anticipated to be 30 percent auto, 50 percent transit, and 20 percent walk/bicycle (work trips and non-work trips combined).

5.3.2.8 Trip Generation Summary

Table 5-27 presents a summary of expected new vehicle-trip generation for the proposed HSDM Research and Education Building. Included are estimates for total daily vehicle-trips for an average weekday and peak hour vehicle trips that would be generated by the proposed HSDM Research and Education Building during morning and evening commuter peaks in the LMA.

Table 5-27: 2007 Future Condition, Vehicle Trip Generation Estimate [1]

Time Period	Person-Trips [2]				Vehicle Trips [4]
	Auto [3]	Transit [3]	Walk/Bicycle [3]	Total	
Morning Peak Hour					
Enter	6	9	4	19	5
Exit	1	3	1	5	1
Total	7	12	5	24	6
Evening Peak Hour					
Enter	1	2	0	3	1
Exit	6	9	4	19	5
Total	7	11	4	22	6
Average Weekday	46	78	31	155	40

1/ Assumes that only 16,000 sf. will accommodate new research and laboratory functions.

2/ Based on ITE *Trip Generation, 6th Edition,* Land Use Code (LUC) #760, Research and Development Center.

3/ Assumes mode shares of 30 percent auto, 50 percent transit, and 20 percent walk/bicycle (work trips and non-work trips combined). Based on review of Harvard University 2001 Rideshare Program Update Report, submitted to the Massachusetts DEP and prepared by TransAction Associates, Inc., November 2001.

4/ Assumes average vehicle occupancy rate of 1.18 people per vehicle. Based on review of HMS New Research Building Draft Project Impact Report, submitted to the BRA and prepared by Epsilon Associates, Inc., April 2000.

When completed, it is estimated that the proposed HSDM Research and Education Building project will generate approximately six new vehicle trips during the morning peak hour and six new vehicle trips during the evening peak hour. Overall, the proposed HSDM Research and Education Building is estimated to generate only about 40 new vehicle trips on an average weekday.

5.3.2.9 Auto Trip Distribution

2007 Build Condition peak hour traffic volumes for the study area roadways were based on vehicle-trip generation estimates previously summarized. Having estimated project-generated vehicle trips, the next step is to determine the trip distribution of project-related traffic and assign these trips to the local roadway network.

The distribution of traffic approaching and departing the site was previously calculated for the Harvard Institutes of Medicine Draft Project Impact Report (DPIR) submitted in 1993 and was also reported in the New Research Building DPIR submitted in 2000. The trip distribution patterns are consistent with the pattern recorded in the DPIR for Emmanuel College as well as the Children's Hospital DPIR. Table 5-28 shows how future vehicle trips have been distributed through the study area intersections.

Table 5-28: Harvard Trip Distribution [1]

Origin/Destination	Arriving	Departing
The Fenway to/from Northeast	10%	10%
The Fenway to/from Northwest	40%	0%
Longwood Avenue to/from West	25%	65%
Huntington Avenue to/from South	25%	25%
Total	**100%**	**100%**

1/ Arriving and departing distributions differ due to various one way streets and circulation restrictions in the area.

5.3.2.10 2007 Build Condition Peak Hour Traffic Volumes

The site-generated traffic volumes were assigned to the roadway network and combined with the 2007 No-Build Condition traffic volumes to develop the 2007 Build Condition peak hour traffic volume networks. The 2007 Build Condition networks include the proposed Harvard IMP projects, plus planned background projects identified previously, plus a half percent annual growth from 2002 to 2007.

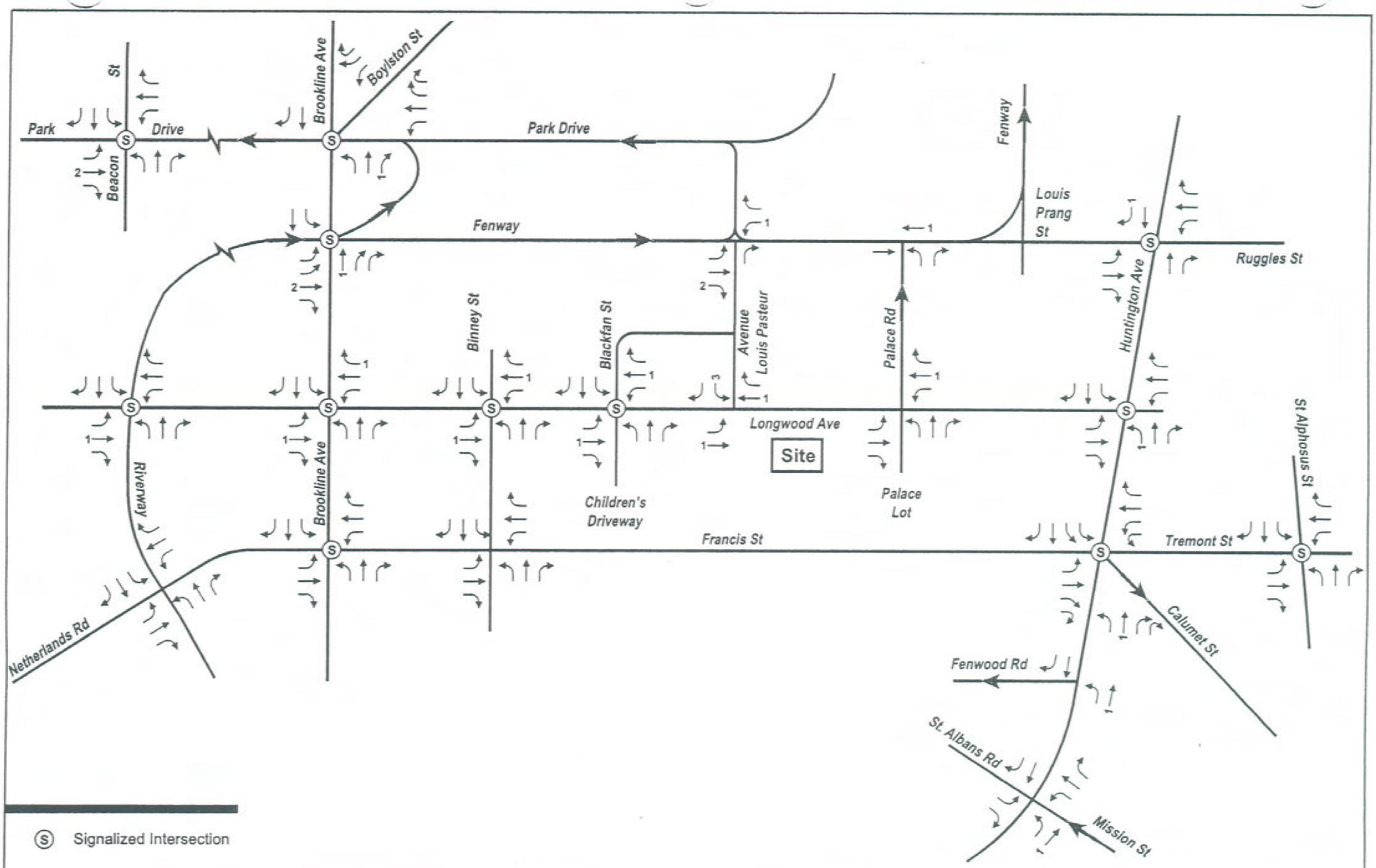
Figures 5-21 and 5-22 present morning and evening peak hour traffic generation for the HSDM Research and Education Building at study area intersections.[11] Figures 5-23 and 5-24 present the 2007 Build Condition morning and evening peak hour traffic volume networks.

5.3.2.11 Signalized Intersection Level of Service Analyses

Level of service (LOS) is the term used to denote the different operating conditions that occur on a given roadway or intersection under various volume loads. It is a qualitative measure of the effect of a number of factors, including roadway/intersection geometry, speed, travel delay, freedom to maneuver, and safety. LOS provides an index to the operational qualities of a roadway or intersection. LOS designations range from A to F, with LOS A representing the best operating conditions and LOS F representing the worst operating conditions. The evaluation criteria used to analyze study area intersections is included in Appendix B.

Capacity analyses were conducted for the signalized intersections within the study area for 2002 Existing, 2007 No-Build, and 2007 Build Conditions. Results of these analyses are presented in Tables 5-29 and 5-30 for morning and evening peak hours. Corresponding average and 95th percentile queue information is presented in Appendix B.

11 Net new vehicle trips are depicted.



Not to Scale

Source: Vanasse Hangen Brustlin, Inc.

Harvard Longwood Campus
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Figure 5-21

Project Trip Generation Morning Peak Hour Traffic Volumes

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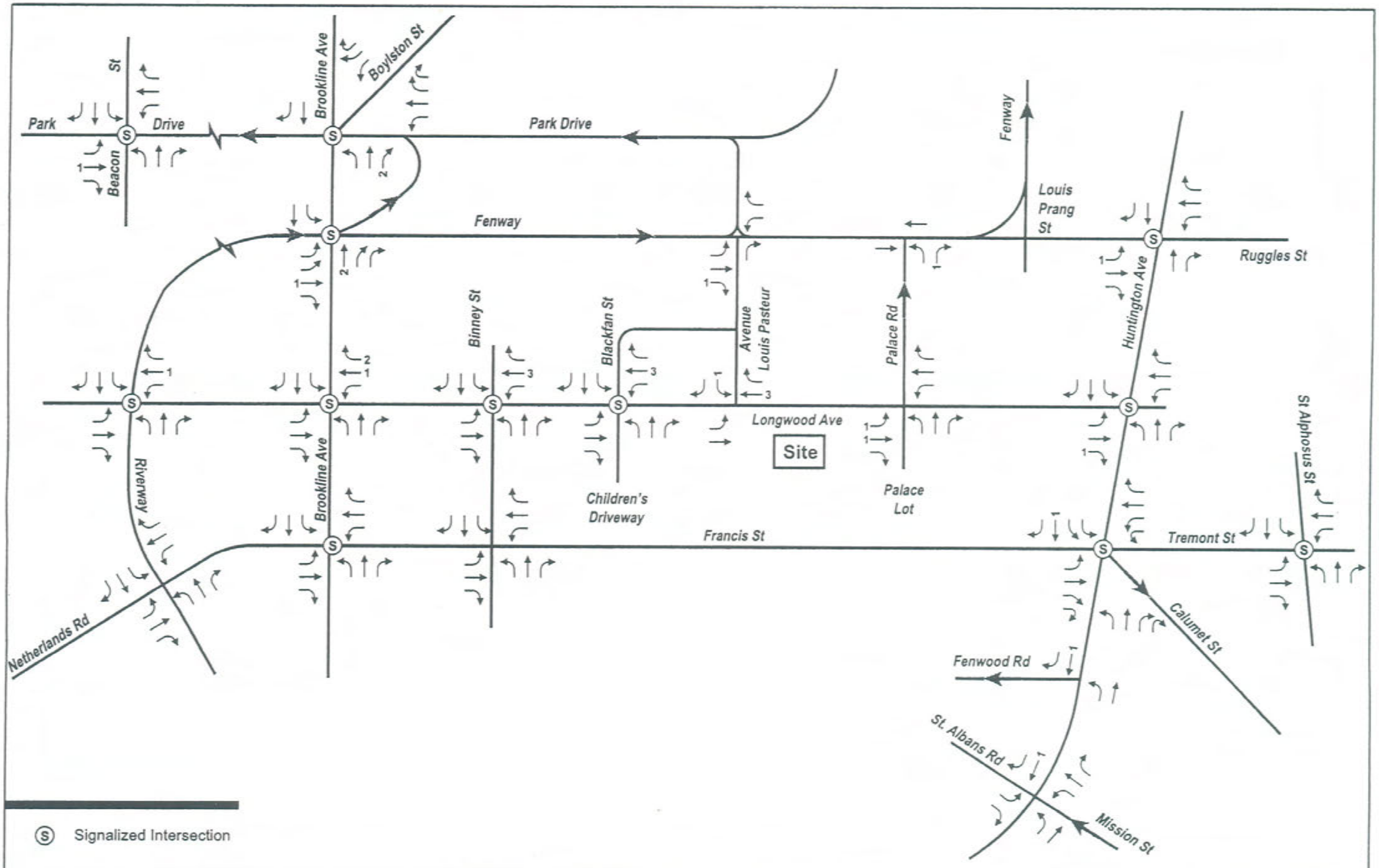

Harvard Longwood Campus
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Figure 5-22

Project Trip Generation Evening Peak Hour Traffic Volumes

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Source: Vanasse Hangen Brustlin, Inc.

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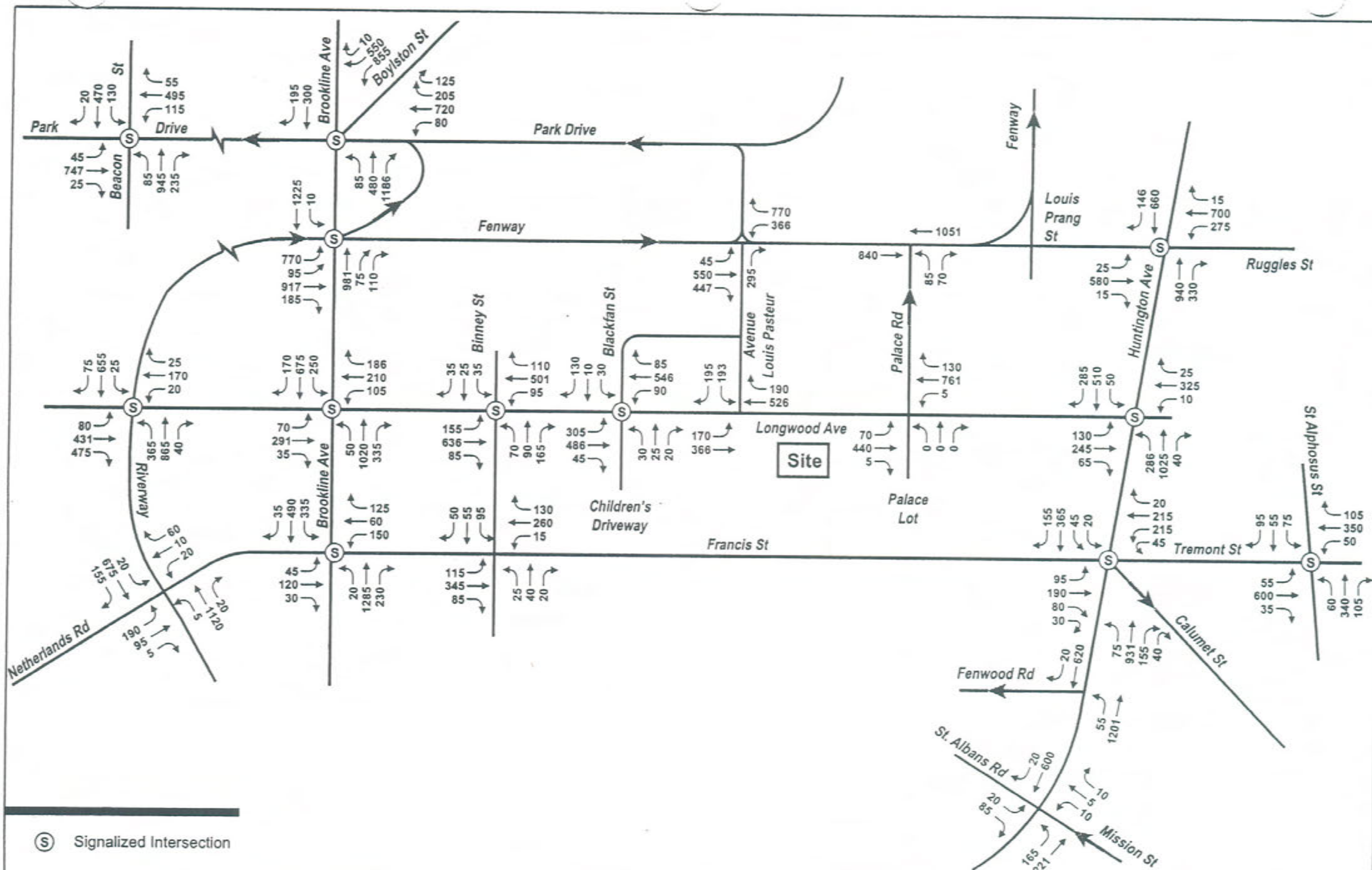

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Source: Vanasse Hangen Brustlin, Inc.

Harvard Longwood Campus Institutional Master Plan

Figure 5-23

2007 Build Condition Morning Peak Hour Traffic Volumes

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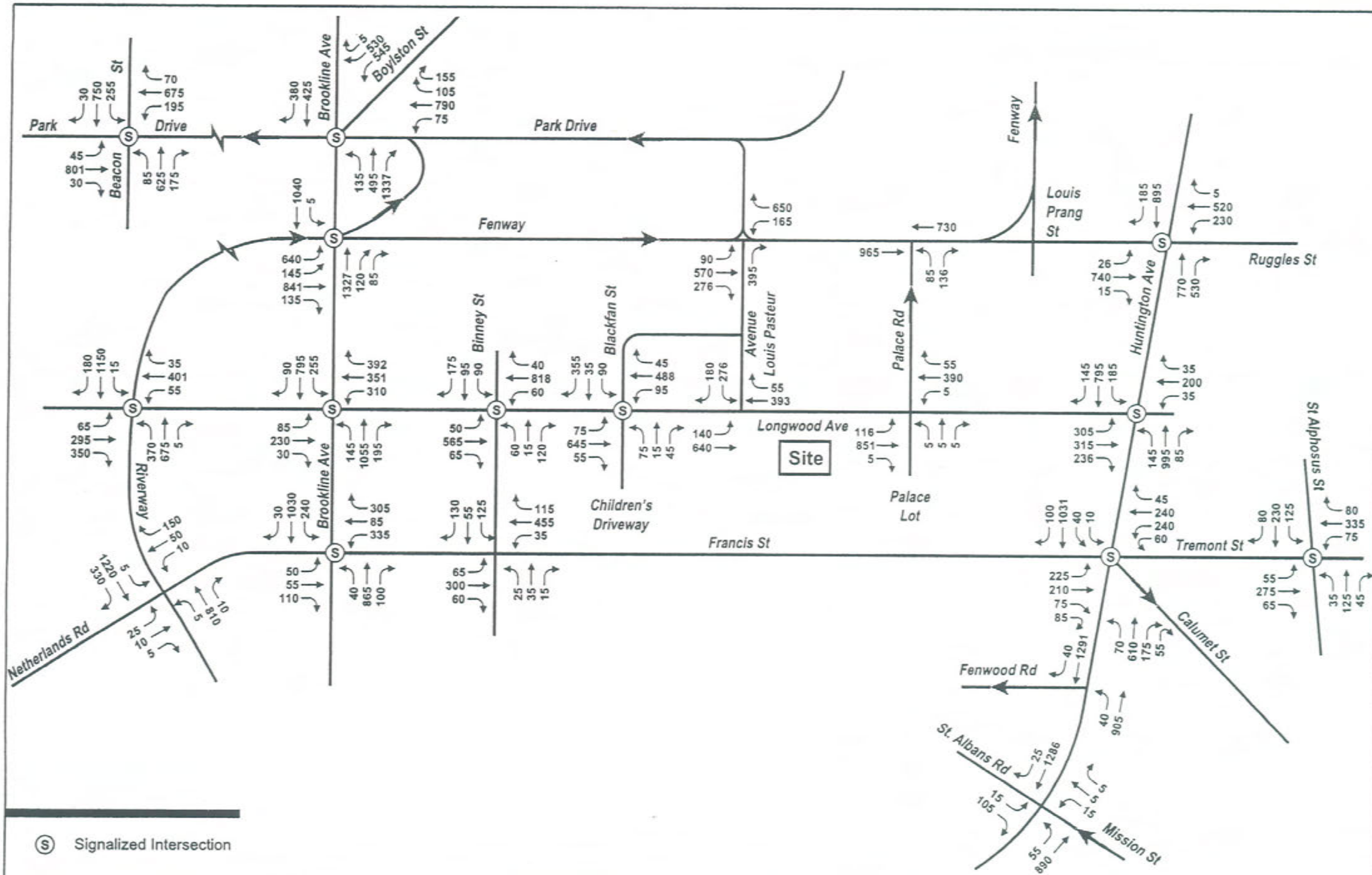

Source: Vanasse Hangen Brustlin, Inc.

Harvard Longwood Campus
Institutional Master Plan

Figure 5-24

2007 Build Condition Evening Peak Hour Traffic Volumes

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As shown in Tables 5-29 and 5-30, several signalized intersections in the study area currently experience long delays on one or more approaches during peak traffic periods. This results in overall intersection operations that are classified as LOS F. However, many individual intersection approaches operate well below capacity with only minor to moderate delays.

It should be noted that, without exception, no changes in intersection level of service are expected due to the proposed Harvard IMP projects.

Planned signal coordination improvements at signalized intersections along Longwood Avenue, along with construction of the proposed Blackfan Street Extension help to improve peak hour traffic flow along the Longwood Avenue corridor under future conditions. Planned roadway, intersection, and signal improvements along Huntington Avenue help to improve peak hour traffic flows along the Huntington Avenue corridor under future conditions.

5.3.2.12 Unsignalized Intersection Level of Service Analyses

Capacity analyses were also conducted for the 12 unsignalized intersections within the study area. The results of these analyses for 2002 Existing, 2007 No-Build, and 2007 Build Conditions are presented in Tables 5-31 and 5-32.

As noted earlier, peak hour traffic increases created by the HSDM Research and Education Building are extremely small. The analysis indicates that Harvard's IMP project-related traffic increases will have virtually no effect on nearly all of the intersections studied. In no case will peak hour delays be increased by more than one second. Tables 5-31 and 5-32 indicate that from the 2007 No-Build Condition to the 2007 Build Condition, there is no change in LOS due to the HSDM Research and Education Building project.

Table 5-29: Signalized Intersection Capacity Analysis Summary Weekday Morning Peak Hour

		2002 Existing Condition			2007 No-Build Condition			2007 Build Condition		
Location	Approach	V/C[1]	Delay[2]	LOS[3]	V/C[1]	Delay[2]	LOS[3]	V/C[1]	Delay[2]	LOS[3]
Park Drive at	Northbound	1.15	87	F	1.15	85	F	1.15	85	F
Beacon Street	Southbound	1.20	15	B	1.22	15	B	1.22	15	B
	Eastbound	0.78	24	D	0.88	30	C	0.88	30	C
	Westbound	0.91	36	C	1.07	62	E	1.07	63	E
	Intersection	**1.01**	**49**	**D**	**1.06**	**54**	**D**	**1.06**	**54**	**D**
Park Drive at Brookline	Northbound	0.71	16	B	0.74	17	B	0.74	17	B
Avenue and Boylston Street	Southbound	0.37	20	C	0.46	21	C	0.46	21	C
	S-Westbound	1.11	61	E	1.38	112	F	1.38	112	F
	Westbound	0.92	37	D	0.95	39	D	0.95	39	D
	Intersection	**0.88**	**34**	**C**	**0.99**	**50**	**D**	**0.99**	**50**	**D**
Fenway at	Northbound	0.76	19	B	0.83	22	C	0.83	22	C
Brookline Avenue	Southbound	0.83	26	C	0.90	29	C	0.90	29	C
	Eastbound	1.15	55	D	1.19	60	E	1.19	60	E
	Intersection	**0.98**	**36**	**D**	**1.04**	**41**	**D**	**1.04**	**41**	**D**
Huntington Avenue at Louis	Northbound	1.24	>120	F	1.28	>120	F	1.28	>120	F
Prang Street/ Ruggles Street	Southbound	0.79	33	C	0.83	35	D	0.83	35	D
	Eastbound	0.75	27	C	0.90	38	D	0.90	38	D
	Westbound	1.16	108	F	2.00	>120	F	2.00	>120	F
	Intersection	**1.18**	**90**	**F**	**1.71**	**>120**	**F**	**1.71**	**>120**	**F**
Longwood Avenue at	Northbound	0.93	42	D	0.90	40	D	0.90	40	D
Riverway	Southbound	0.78	39	D	0.89	47	D	0.89	47	D
	Eastbound	1.17	101	F	1.40	>120	F	1.40	>120	F
	Westbound	0.42	36	D	0.43	36	D	0.43	36	D
	Intersection	**0.92**	**53**	**D**	**0.98**	**74**	**E**	**0.98**	**74**	**E**
Longwood Avenue at	Northbound	0.94	39	D	1.10	83	F	1.10	83	F
Brookline Avenue	Southbound	1.85	>120	F	1.07	35	C	1.07	35	C
	Eastbound	>2.00	>120	F	1.58	>120	F	1.58	>120	F
	Westbound	>2.00	>120	F	1.68	>120	F	1.68	>120	F
	Intersection	**>2.00**	**>120**	**F**	**1.17**	**99**	**F**	**1.17**	**99**	**F**
Longwood Avenue at	Northbound	0.95	44	D	0.83	48	D	0.83	48	D
Binney Street	Southbound	1.11	41	D	0.28	29	C	0.28	29	C
	Eastbound	1.28	>120	F	1.07	58	E	1.07	58	E
	Westbound	1.20	83	F	1.06	29	C	1.06	29	C
	Intersection	**1.12**	**62**	**E**	**0.97**	**44**	**D**	**0.98**	**44**	**D**
Longwood Avenue at	Northbound	0.17	23	C	0.40	40	D	0.40	40	D
Blackfan Street/ Children's	Southbound	0.11	22	C	0.65	45	D	0.65	45	D
Hospital Driveway	Eastbound	1.05	47	D	1.44	14	B	1.44	14	B
	Westbound	0.93	51	D	0.61	17	B	0.61	17	B
	Intersection	**0.62**	**46**	**D**	**0.82**	**19**	**B**	**0.82**	**19**	**B**
Francis Street at Brookline	Northbound	0.94	39	D	1.09	79	E	1.09	79	E
Avenue	Southbound	1.85	>120	F	>2.00	>120	F	>2.00	>120	F
	Eastbound	1.42	>120	F	1.59	>120	F	1.59	>120	F
	Westbound	1.57	>120	F	1.84	>120	F	1.84	>120	F
	Intersection	**1.75**	**110**	**F**	**>2.00**	**>120**	**F**	**>2.00**	**>120**	**F**
Francis Street/ Tremont	Northbound	0.93	44	D	1.26	>120	F	1.26	>120	F
Street at Huntington	Southbound	0.53	26	C	1.26	52	D	1.26	52	D
Avenue and Calumet Street	Eastbound	1.27	>120	F	0.86	64	E	0.86	64	E
(Brigham Circle)	Westbound	1.66	60	E	1.26	116	F	1.26	116	F
	Intersection	**1.04**	**62**	**E**	**1.25**	**115**	**F**	**1.25**	**115**	**F**
Tremont Street at	Northbound	1.26	>120	F	1.30	>120	F	1.30	>120	F
St. Alphonsus Street	Southbound	1.15	>120	F	1.19	>120	F	1.19	>120	F
	Eastbound	0.69	29	C	1.17	>120	D	1.17	>120	D
	Westbound	0.79	33	C	0.95	53	F	0.95	53	F
	Intersection	**0.97**	**91**	**F**	**1.22**	**>120**	**F**	**1.22**	**>120**	**F**

1/ Volume-to-capacity ratio reported for critical movement.
2/ Average delay to all vehicles entering intersection, expressed in seconds per vehicle.
3/ Level of Service.
> Greater than.

Table 5-30: Signalized Intersection Capacity Analysis Summary Weekday Evening Peak Hour

		2002 Existing Condition			2007 No-Build Condition			2007 Build Condition		
Location	Approach	V/C[1]	Delay[2]	LOS[3]	V/C[1]	Delay[2]	LOS[3]	V/C[1]	Delay[2]	LOS[3]
Park Drive at Beacon Street	Northbound	0.90	30	C	0.91	31	C	0.91	31	C
	Southbound	1.79	97	F	1.84	103	F	1.84	103	F
	Eastbound	0.98	45	D	1.09	77	E	1.09	77	E
	Westbound	1.65	>120	F	1.81	>120	F	1.81	>120	F
	Intersection	**1.27**	**96**	**F**	**1.32**	**120**	**F**	**1.32**	**120**	**F**
Park Drive at Brookline Avenue and Boylston Street	Northbound	0.76	20	B	0.93	22	C	0.93	22	C
	Southbound	0.83	30	C	0.89	33	C	0.89	33	C
	S-Westbound	1.19	77	E	1.32	103	F	1.32	103	F
	Westbound	0.74	30	C	0.78	32	C	0.78	32	C
	Intersection	**0.88**	**36**	**D**	**1.02**	**44**	**D**	**1.02**	**44**	**D**
Fenway at Brookline Avenue	Northbound	0.91	27	C	1.07	64	E	1.07	64	E
	Southbound	0.72	21	C	0.83	24	C	0.83	24	C
	Eastbound	0.95	29	C	1.00	34	C	1.00	34	C
	Intersection	**0.93**	**26**	**C**	**1.04**	**42**	**D**	**1.04**	**42**	**D**
Huntington Avenue at Louis Prang Street/ Ruggles Street	Northbound	1.11	93	F	1.31	>120	F	1.31	>120	F
	Southbound	1.04	68	E	1.07	79	E	1.07	79	E
	Eastbound	0.70	25	C	1.12	95	F	1.12	96	F
	Westbound	1.21	>120	F	1.72	>120	F	1.72	>120	F
	Intersection	**1.16**	**82**	**F**	**1.55**	**>120**	**F**	**1.55**	**>120**	**F**
Longwood Avenue at Riverway	Northbound	0.74	40	D	0.75	39	D	0.75	39	D
	Southbound	1.23	>120	F	1.23	>120	F	1.23	>120	F
	Eastbound	1.86	>120	F	>2.00	>120	F	>2.00	>120	F
	Westbound	0.89	57	E	0.96	69	E	0.96	69	E
	Intersection	**1.27**	**115**	**F**	**1.44**	**>120**	**F**	**1.44**	**>120**	**F**
Longwood Avenue at Brookline Avenue	Northbound	0.83	34	C	0.99	48	D	0.99	48	D
	Southbound	1.06	35	D	1.09	35	D	1.09	35	D
	Eastbound	1.35	>120	F	1.31	>120	F	1.31	>120	F
	Westbound	1.17	>120	F	>2.00	>120	F	>2.00	>120	F
	Intersection	**1.38**	**>120**	**F**	**1.67**	**>120**	**F**	**1.67**	**>120**	**F**
Longwood Avenue at Binney Street	Northbound	0.37	23	C	0.56	31	C	0.56	31	C
	Southbound	0.67	30	C	0.89	52	D	0.89	52	D
	Eastbound	0.84	44	D	0.73	22	C	0.73	22	C
	Westbound	0.89	38	D	0.89	32	C	0.89	34	C
	Intersection	**0.76**	**37**	**D**	**0.89**	**32**	**C**	**0.89**	**34**	**C**
Longwood Avenue at Blackfan Street/ Children's Hospital Driveway	Northbound	0.34	26	C	0.67	38	D	0.67	38	D
	Southbound	0.29	25	C	0.89	47	D	0.89	47	D
	Eastbound	0.65	18	B	0.76	20	C	0.78	21	C
	Westbound	0.56	27	C	0.56	25	C	0.77	31	C
	Intersection	**0.50**	**23**	**C**	**0.82**	**29**	**C**	**0.83**	**31**	**C**
Francis Street at Brookline Avenue	Northbound	0.64	23	C	0.69	25	C	0.69	25	C
	Southbound	0.90	23	C	1.12	26	D	1.12	26	D
	Eastbound	>2.00	>120	F	>2.00	>120	F	>2.00	>120	F
	Westbound	>2.00	>120	F	>2.00	>120	F	>2.00	>120	F
	Intersection	**1.88**	**>120**	**F**	**>2.00**	**>120**	**F**	**>2.00**	**>120**	**F**
Francis Street/ Tremont Street at Huntington Avenue and Calumet Street (Brigham Circle)	Northbound	0.96	53	D	1.38	>120	F	1.38	>120	F
	Southbound	0.99	58	E	0.84	38	D	0.84	38	D
	Eastbound	1.33	>120	F	1.59	>120	F	1.59	>120	F
	Westbound	1.80	>120	F	1.77	>120	F	1.77	>120	F
	Intersection	**1.29**	**105**	**F**	**1.48**	**>120**	**F**	**1.48**	**>120**	**F**
Tremont Street at St. Alphonsus Street	Northbound	0.60	37	D	0.57	36	D	0.57	36	D
	Southbound	1.21	>120	F	1.36	>120	F	1.36	>120	F
	Eastbound	0.69	28	C	0.69	28	C	0.69	28	C
	Westbound	0.85	38	D	0.84	37	D	0.84	37	D
	Intersection	**0.99**	**67**	**E**	**1.05**	**86**	**F**	**1.05**	**86**	**F**

1/ Volume-to-capacity ratio reported for critical movement.
2/ Average delay to all vehicles entering intersection, expressed in seconds per vehicle.
3/ Level of Service.
\> Greater than.

Table 5-31: Unsignalized Intersection Capacity Analysis Summary Weekday Morning Peak Hour

Location	Approach	2002 Existing Condition Demand[1]	Delay[2]	LOS[3]	2007 No-Build Condition Demand[1]	Delay[2]	LOS[3]	2007 Build Condition Demand[1]	Delay[2]	LOS[3]
Fenway at Park Drive Crossover	Northbound Left	45	16	C	45	16	C	45	16	C
	Eastbound Right	745	0	A	770	0	A	770	0	A
	Westbound Left	45	7	A	45	7	A	45	7	A
Fenway at Avenue Louis Pasteur	Northbound Right	230	11	B	295	15	C	295	16	C
	Eastbound Thru	520	22	C	550	30	D	550	34	D
	Westbound Left	115	10	A	365	19	C	366	20	C
Fenway at Palace Road	Northbound All	140	43	E	155	96	F	155	96	F
	Eastbound All	780	0	A	840	0	A	840	0	A
	Westbound All	750	0	A	1050	0	A	1051	0	A
Longwood Avenue at Avenue Louis Pasteur	Southbound Left	170	81	F	190	>120	F	193	>120	F
	Eastbound Left	140	9	A	170	10	B	170	10	B
	Westbound All	550	0	A	715	0	A	716	0	A
Longwood Avenue at Quad Garage	Northbound All	15	15	B	15	18	C	16	19	C
	Eastbound All	500	0	A	555	0	A	559	0	A
	Westbound All	605	2	A	755	2	A	756	2	A
Longwood Avenue at Denteast Lot	Northbound All	5	21	C	5	28	D	5	28	D
	Eastbound All	450	0	A	505	0	A	505	0	A
	Westbound All	605	0	A	760	0	A	761	0	A
Longwood Avenue at Palace Road	Northbound All	0	0	A	0	0	A	0	0	A
	Eastbound All	465	3	A	515	4	A	515	4	A
	Westbound All	680	0	A	895	0	A	896	0	A
Countway Lot at Huntington Avenue	Southbound All	570	0	A	585	0	A	585	0	A
	Eastbound Right	5	10	B	5	10	B	5	10	B
Netherlands Road at Riverway	Northbound All	1130	0	A	1160	0	A	1160	0	A
	Southbound All	790	1	A	810	1	A	810	1	A
	Eastbound All	285	>120	F	300	>120	F	300	>120	F
	Westbound All	70	19	C	80	26	D	80	26	D
Francis Street at Binney Street	Northbound All	80	24	C	85	33	D	85	33	D
	Southbound All	170	31	D	200	84	F	200	84	F
	Eastbound All	440	3	A	545	3	A	545	3	A
	Westbound All	355	1	A	405	1	A	405	1	A
Fenwood Road at Huntington Avenue	Northbound All	1070	2	A	1255	2	A	1256	2	A
	Southbound All	600	0	A	640	0	A	640	0	A
St. Albans Road at Huntington Avenue	Northbound All	1195	4	A	1385	4	A	1386	4	A
	Southbound All	575	0	A	620	0	A	620	0	A
	Eastbound All	95	25	D	105	34	D	105	34	D
	Westbound All	25	70	F	25	>120	F	25	>120	F

1/ Demand of critical movements from the minor street or left-turn movement from the major street, expressed in vehicles per hour.

2/ Average delay of critical movements, expressed in seconds per vehicle.

3/ Level of Service.

Table 5-32: Unsignalized Intersection Capacity Analysis Summary Weekday Evening Peak Hour

Location	Approach	2002 Existing Condition			2007 No-Build Condition			2007 Build Condition		
		Demand[1]	Delay[2]	LOS[3]	Demand[1]	Delay[2]	LOS[3]	Demand[1]	Delay[2]	LOS[3]
Fenway at Park Drive Crossover	Northbound Left	90	15	B	90	15	C	90	15	C
	Eastbound Right	610	0	A	650	0	A	650	0	A
	Westbound Left	90	7	A	90	7	A	90	7	A
Fenway at Avenue Louis Pasteur	Northbound Right	150	10	A	395	18	C	395	18	C
	Eastbound Thru	545	17	C	570	46	D	570	46	D
	Westbound Left	100	9	A	165	12	B	165	12	B
Fenway at Palace Road	Northbound All	170	29	D	220	>120	F	221	>120	F
	Eastbound All	695	0	A	965	0	A	965	0	A
	Westbound All	650	0	A	730	0	A	730	0	A
Longwood Avenue at Avenue Louis Pasteur	Southbound Left	195	96	F	275	>120	F	276	>120	F
	Eastbound Left	115	8	A	140	9	A	140	9	A
	Westbound All	405	0	A	445	0	A	448	0	A
Longwood Avenue at Quad Garage	Northbound All	125	17	C	130	21	C	135	22	C
	Eastbound All	695	0	A	890	0	A	891	0	A
	Westbound All	385	0	A	405	0	A	405	0	A
Longwood Avenue at Denteast Lot	Northbound All	10	18	C	10	22	C	10	22	C
	Eastbound All	780	0	A	975	0	A	977	0	A
	Westbound All	390	0	A	395	0	A	395	0	A
Longwood Avenue at Palace Road	Northbound All	15	27	D	15	38	E	15	38	E
	Eastbound All	775	2	A	970	3	A	972	3	A
	Westbound All	445	0	A	450	0	A	450	0	A
Countway Lot at Huntington Avenue	Southbound All	1035	0	A	1185	0	A	1186	0	A
	Eastbound Right	5	12	B	5	13	B	5	13	B
Netherlands Road at Riverway	Northbound All	800	0	A	820	0	A	820	0	A
	Southbound All	1530	0	A	1570	0	A	1570	0	A
	Eastbound All	35	>120	F	35	>120	F	35	>120	F
	Westbound All	175	>120	F	215	>120	F	215	>120	F
Francis Street at Binney Street	Northbound All	75	26	D	75	46	E	75	46	E
	Southbound All	295	52	F	310	>120	F	310	>120	F
	Eastbound All	380	2	A	425	2	A	425	2	A
	Westbound All	425	0	A	605	1	A	605	1	A
Fenwood Road at Huntington Avenue	Northbound All	870	2	A	945	3	A	945	3	A
	Southbound All	1210	0	A	1330	0	A	1331	0	A
St. Albans Road at Huntington Avenue	Northbound All	885	3	A	945	3	A	945	3	A
	Southbound All	1170	0	A	1310	0	A	1311	0	A
	Eastbound All	190	118	F	120	56	F	120	56	F
	Westbound All	25	>120	F	25	>120	F	25	>120	F

1/ Demand of critical movements from the minor street or left-turn movement from the major street, expressed in vehicles per hour.

2/ Average delay of critical movements, expressed in seconds per vehicle.

3/ Level of Service.

5.3.3 Pedestrian Access

This section provides a summary of future pedestrian volumes and crosswalk and sidewalk level of service analyses in the study area. The first section describes pedestrian volumes at study area intersections under weekday morning and evening peak hours for both 2007 No-Build and 2007 Build Conditions. The next section provides a quantitative analysis of pedestrian level of service for both crosswalks and sidewalks within the project study area under the 2002 Existing Condition, 2007 No-Build Condition, and 2007 Build Condition.

5.3.3.1 Future Condition Peak Hour Pedestrian Volumes

The 2007 No-Build Condition weekday morning and evening peak hour pedestrian volumes were developed by growing the 2002 Existing Condition volumes to include general background pedestrian growth as well as by adding pedestrian volumes associated with the proposed HSDM Research and Education Building. Figures 5-25 and 5-26 present the 2007 No-Build Condition pedestrian volume networks for the morning and evening peak hours, respectively. Figures 5-27 and 5-28 present morning and evening peak hour pedestrian volume generation for the HSDM Research and Education Building at the study area intersections and Figures 5-29 and 5-30 present the 2007 Build Condition morning and evening peak hour pedestrian volume networks. Conservatively assuming that all transit users walk the final portion of their commute (as opposed to boarding and alighting adjacent to campus), the Harvard IMP projects will add only 17 pedestrians to the morning peak hour and 15 to the evening peak hour.

5.3.3.2 Pedestrian Level of Service Analyses

A quantitative assessment of pedestrian level of service was conducted for crosswalks at all study area intersections as well as along all sidewalks located within the project study area. The methods of analysis that were employed for this study are based on the average amount of walkway space that is available to a pedestrian under average conditions. Within the most recent release of the Highway Capacity Manual[12], this method has been modified to be based more on pedestrian delay, as opposed to available space per pedestrian. However, the BTD requested that the analysis of pedestrian level of service be completed via the prior method, as it provides for a more meaningful comparison with other recently completed transportation studies in the LMA.[13]

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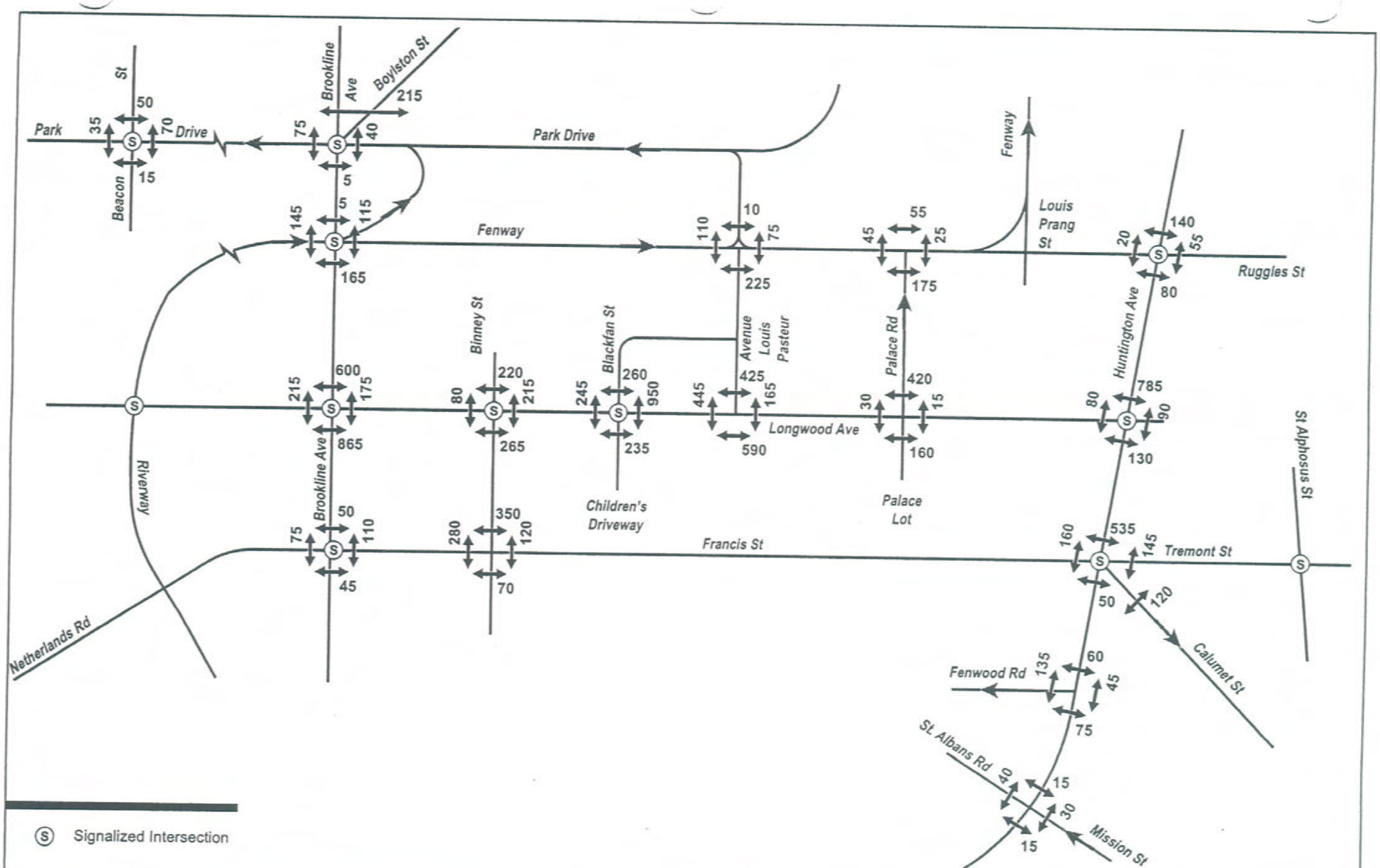
12 Highway Capacity Manual, issued by the Transportation Research Board, National Research Council, Washington D.C., 2000.

13 Vanasse Hangen Brustlin, Inc. received clarification regarding pedestrian LOS methodology via a telephone conversation with the BTD on February 19, 2002.



Source: Vanasse Hangen Brustlin, Inc.

Harvard Longwood Campus
Institutional Master Plan

Figure 5-25

2007 No-Build Condition Morning Peak Hour Pedestrian Volumes

Vanasse Hangen Brustlin, Inc

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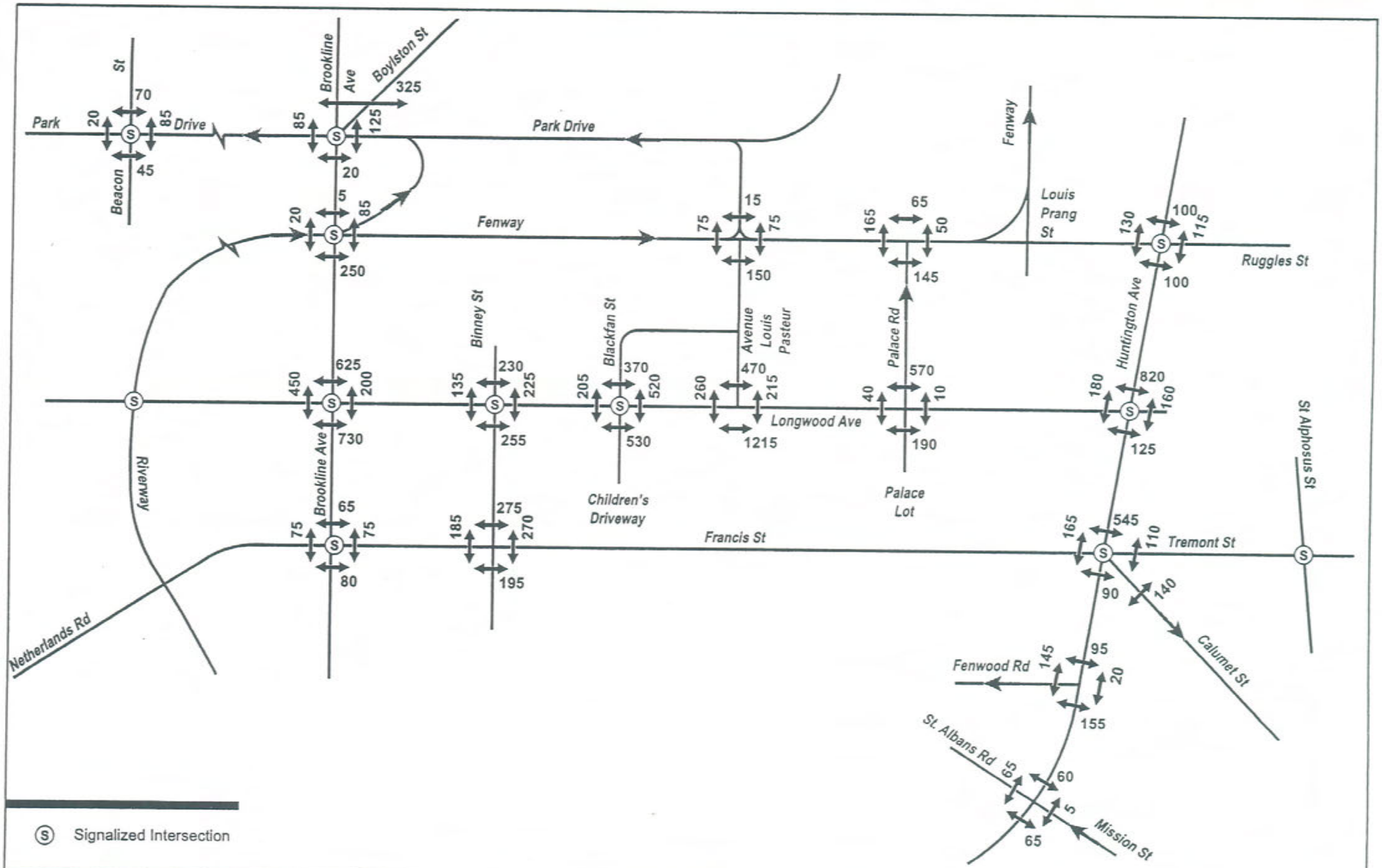

Not to Scale

Source: Vanasse Hangen Brustlin, Inc.

Harvard Longwood Campus
Institutional Master Plan

Figure 5-26

2007 No-Build Condition Evening Peak Hour Pedestrian Volumes

Vanasse Hangen Brustlin, Inc

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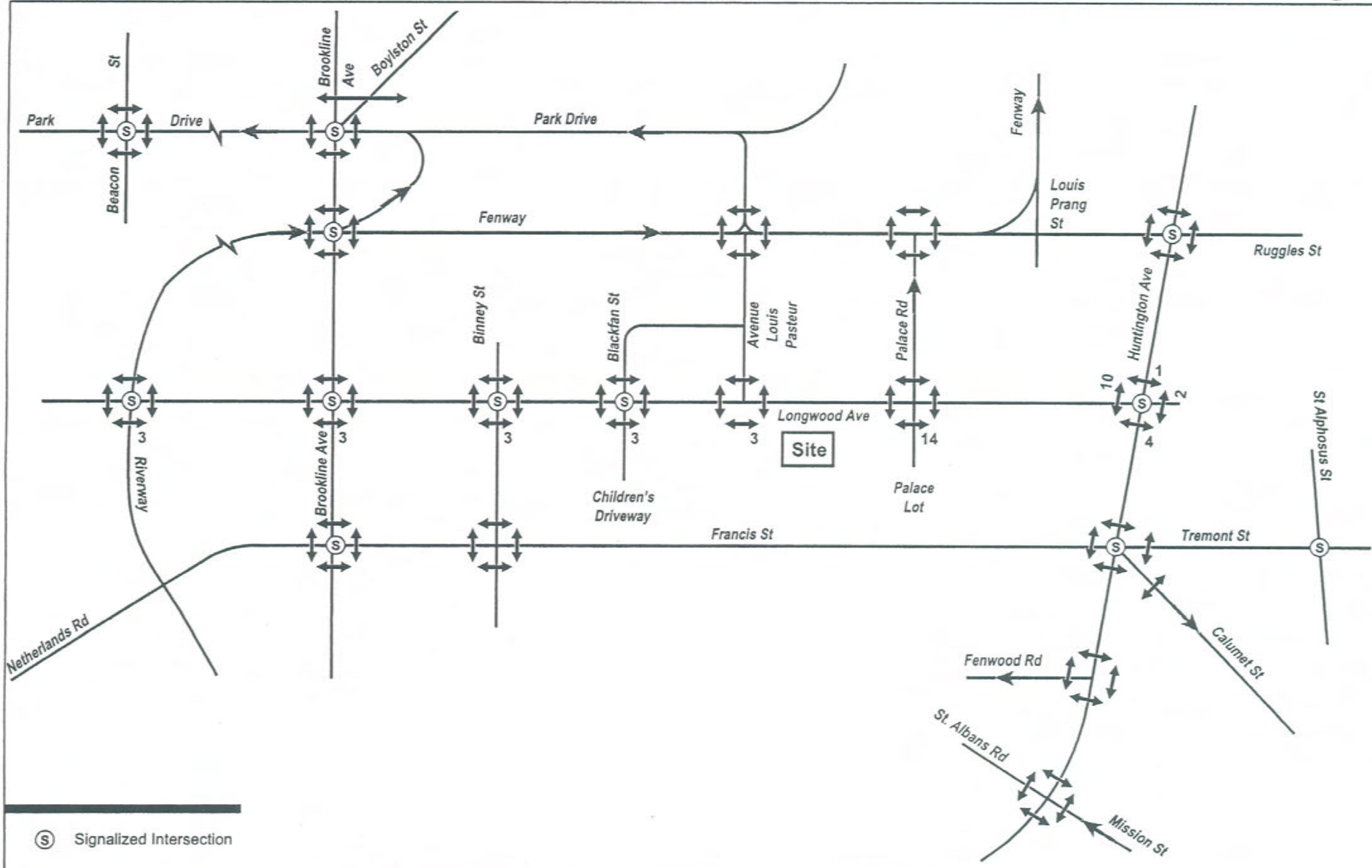

Source: Vanasse Hangen Brustlin, Inc.

Harvard Longwood Campus
Institutional Master Plan

Figure 5-27

Project Trip Generation Morning Peak Hour Pedestrian Volumes

Vanasse Hangen Brustlin, Inc

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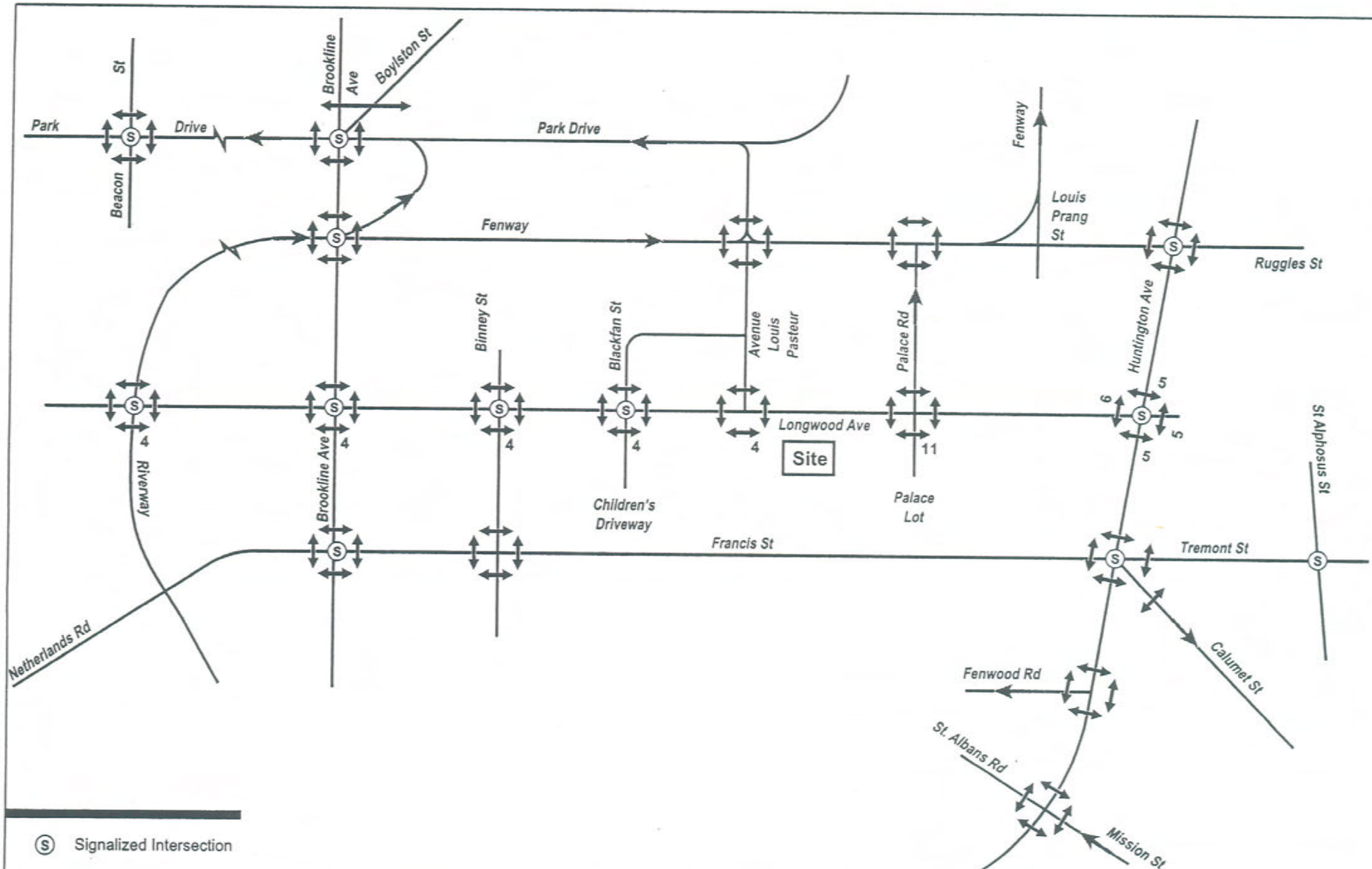

Not to Scale

Source: Vanasse Hangen Brustlin, Inc.

Harvard Longwood Campus
Institutional Master Plan

Figure 5-28

Project Trip Generation Evening Peak Hour Pedestrian Volumes

Vanasse Hangen Brustlin, Inc

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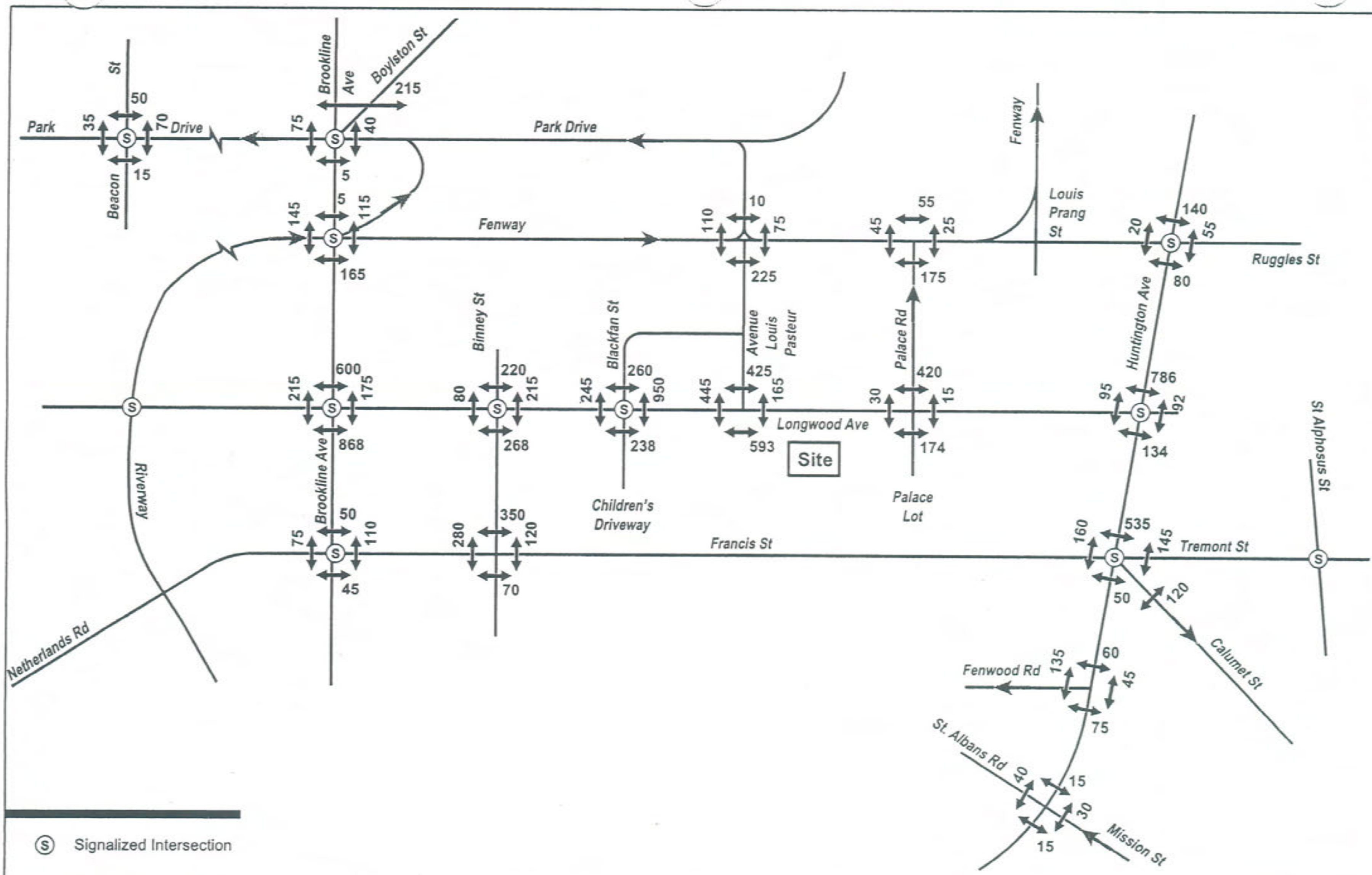

Not to Scale

Source: Vanasse Hangen Brustlin, Inc.

Harvard Longwood Campus
Institutional Master Plan

Figure 5-29

2007 Build Condition Morning Peak Hour Pedestrian Volumes

Vanasse Hangen Brustlin, Inc

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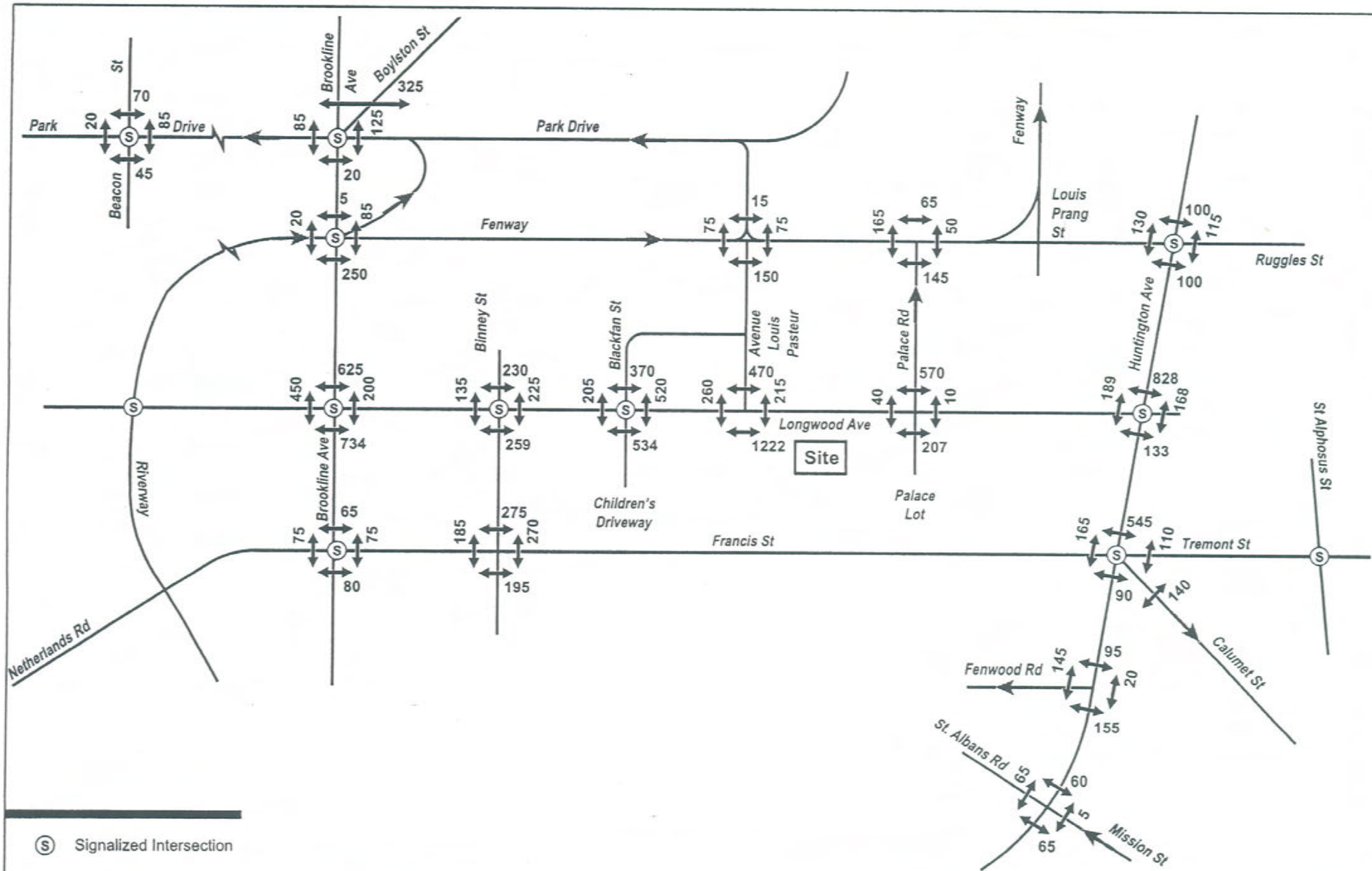

Not to Scale

Source: Vanasse Hangen Brustlin, Inc.

Harvard Longwood Campus
Institutional Master Plan

Figure 5-30

2007 Build Condition Evening Peak Hour Pedestrian Volumes

Vanasse Hangen Brustlin, Inc

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Crosswalk Capacity Analysis

Table 5-33 outlines the criteria for pedestrian LOS at crosswalks presented in the 1994 *Highway Capacity Manual*. Capacity analyses were conducted for all crosswalks within the project study area. Tables 5-34 and 5-35 provide a summary of the findings for the 2002 Existing Condition and 2007 No-Build Condition. Crosswalk analysis for the 2007 Build Condition was not conducted because the new pedestrian volumes generated by Harvard's IMP projects are so low that they are not expected to result in any changes to the analysis.

Table 5-33: Pedestrian Crosswalk Capacity Analysis Criteria [1]

Level of Service	Crosswalk Space [2]	Walkway Flow Rate [3]
A	>130	< 2
B	> 40	< 7
C	> 24	< 10
D	> 15	< 15
E	> 6	< 25
F	< 6	Variable

1/ Based on Table 13-3 of the Highway Capacity Manual, Special Report 209, Transportation Research Board, Washington, DC, 1994.
2/ Expressed in square feet per pedestrian.
3/ Expressed in pedestrians per minute per foot.

As shown in Tables 3-34 and 3-35, nearly all of the crosswalks operate at LOS A or B under all conditions studied. Only three locations were determined to operate at conditions worse than LOS B. They were:

- The south crosswalk at the intersection of Longwood Avenue/Blackfan Street/Children's Hospital Driveway (the main crossing between the Patient and Family Garage and the Hospital) was determined to operate at LOS C under both Existing and Future Conditions during the morning peak hour.

- Similarly, the west crosswalk at the intersection of Longwood Avenue/Blackfan Street/Children's Hospital Driveway (the crosswalk across the Children's Hospital Driveway) was determined to operate at LOS C under both Existing and 2007 Future Conditions during the evening peak hour.

- The ten-foot wide crosswalk across Palace Road at its intersection with Longwood Avenue was determined to operate at LOS C during the morning peak hour under the Existing and 2007 Future Conditions, and operates at LOS D during the evening peak hour under both conditions.

Table 5-34: Crosswalk Capacity Analysis Summary Weekday Morning Peak Hour

Intersection	Crosswalk	2002 Existing Condition			2007 No-Build Condition		
		Peds	Space [1]	LOS [2]	Peds	Space [1]	LOS [2]
Beacon Street at Park Drive	East	50	648	A	50	648	A
	West	15	2,160	A	15	2,160	A
	North	30	1,080	A	35	926	A
	South	65	498	A	70	463	A
Park Drive/Boylston Street at Brookline Avenue	East	205	176	A	215	167	A
	West	5	4,320	A	5	4,320	A
	North	70	514	A	75	480	A
	South	35	823	A	40	720	A
	Southeast	205	176	A	215	167	A
Fenway at Brookline Avenue	East	5	5,760	A	5	5,760	A
	West	155	186	A	165	175	A
	North	135	213	A	145	199	A
	South	105	206	A	115	188	A
Fenway at Avenue Louis Pasteur	West	200	144	A	225	128	B
	North	105	206	A	110	196	A
	South	60	480	A	75	384	A
Park Drive Crossover		10	1,440	A	10	1,440	A
Fenway at Palace Road	West	165	87	B	175	82	B
	North	40	720	A	45	640	A
	South	25	1,152	A	25	1,152	A
Louis Prang Street/Ruggles Street at Huntington Avenue	East	130	554	A	140	514	A
	West	75	480	A	80	450	A
	North	15	1,600	A	20	1,200	A
	South	50	1,320	A	55	1,200	A
Longwood Avenue at Brookline Avenue	East	525	69	B	600	60	B
	West	805	45	B	865	42	B
	North	205	176	A	215	167	A
	South	170	169	A	175	165	A
Longwood Avenue at Binney Street	East	165	87	B	220	65	B
	West	240	60	B	265	54	B
	North	75	384	A	80	360	A
	South	205	140	A	215	134	A
Longwood Avenue at Blackfan Street/Children's Hospital Driveway	East	250	86	B	260	83	B
	West	225	85	B	235	82	B
	North	220	131	A	245	118	B
	South	885	33	C	950	30	C
Longwood Avenue at Avenue Louis Pasteur	East	375	115	B	425	102	B
	North	425	48	B	445	46	B
	South	160	128	B	165	124	B

1/ Average crosswalk space per pedestrian, in square feet.

2/ Level of Service.

Table 5-34: Crosswalk Capacity Analysis Summary Weekday Morning Peak Hour (continued)

Intersection	Crosswalk	2002 Existing Condition Peds	2002 Existing Condition Space [1]	2002 Existing Condition LOS [2]	2007 No-Build Condition Peds	2007 No-Build Condition Space [1]	2007 No-Build Condition LOS [2]
Longwood Avenue at Palace Road	East	370	29	C	420	26	C
	North	30	640	A	30	640	A
	South	10	1,920	A	15	1,280	A
Longwood Avenue at Huntington Avenue	East	720	83	B	785	76	B
	West	105	514	A	130	415	A
	North	75	256	A	80	240	A
	South	85	282	A	90	267	A
Francis Street at Brookline Avenue	East	100	360	A	50	720	A
	West	70	617	A	45	960	A
	North	45	373	A	75	224	A
	South	40	540	A	110	196	A
Francis Street at Binney Street	East	330	47	B	350	45	B
	West	65	249	A	70	231	A
	North	265	97	B	280	92	B
	South	115	177	A	120	170	A
Francis Street/Tremont Street at Huntington Avenue/Calumet Street	East	510	110	B	535	105	B
	West	45	1,133	A	50	1,020	A
	North	155	234	A	160	227	A
	South	140	236	A	145	228	A
	Southwest	115	209	A	120	200	A
Fenwood Road at Huntington Avenue	East	55	927	A	60	850	A
	West	70	1,166	A	75	1,088	A
	North	130	220	A	135	212	A
St. Albans Road/Mission Street at Huntington Avenue	East	15	3,400	A	15	3,400	A
	West	15	3,740	A	15	3,740	A
	North	35	847	A	40	741	A
	South	30	680	A	30	680	A

1/ Average crosswalk space per pedestrian, in square feet.

2/ Level of Service.

Table 5-35: Crosswalk Capacity Analysis Summary Weekday Evening Peak Hour

Intersection	Crosswalk	2002 Existing Condition			2007 No-Build Condition		
		Peds	Space [1]	LOS [2]	Peds	Space [1]	LOS [2]
Beacon Street at Park Drive	East	65	498	A	70	463	A
	West	45	720	A	45	720	A
	North	15	2,160	A	20	1,620	A
	South	80	405	A	85	381	A
Park Drive/Boylston Street at Brookline Avenue	East	305	118	B	325	111	B
	West	20	1,080	A	20	1,080	A
	North	80	450	A	85	424	A
	South	115	250	A	125	230	A
	Southeast	305	118	B	325	111	B
Fenway at Brookline Avenue	East	5	5,760	A	5	5,760	A
	West	240	120	B	250	115	B
	North	20	1,440	A	20	1,440	A
	South	75	288	A	85	254	A
Fenway at Avenue Louis Pasteur	West	130	222	A	150	192	A
	North	70	309	A	75	288	A
	South	60	480	A	75	384	A
Park Drive Crossover		15	960	A	15	960	A
Fenway at Palace Road	West	130	111	B	145	99	B
	North	160	180	A	165	175	A
	South	45	640	A	50	576	A
Louis Prang Street/Ruggles Street at Huntington Avenue	East	90	800	A	100	720	A
	West	90	400	A	100	360	A
	North	125	192	A	130	185	A
	South	105	629	A	115	574	A
Longwood Avenue at Brookline Avenue	East	560	64	B	625	58	B
	West	680	53	B	730	49	B
	North	425	85	B	450	80	B
	South	190	152	A	200	144	A
Longwood Avenue at Binney Street	East	180	80	B	230	63	B
	West	230	63	B	255	56	B
	North	125	230	A	135	213	A
	South	215	134	A	225	128	B
Longwood Avenue at Blackfan Street/Children's Hospital Driveway	East	350	62	B	370	58	B
	West	505	38	C	530	36	C
	North	185	156	A	205	140	A
	South	485	59	B	520	55	B
Longwood Avenue at Avenue Louis Pasteur	East	420	103	B	470	92	B
	North	205	100	B	260	78	B
	South	250	82	B	215	95	B

1/ Average crosswalk space per pedestrian, in square feet.

2/ Level of Service.

Table 5-35 Crosswalk Capacity Analysis Summary Weekday Evening Peak Hour (continued)

		2002 Existing Condition			2007 No-Build Condition		
Intersection	Crosswalk	Peds	Space [1]	LOS [2]	Peds	Space [1]	LOS [2]
Longwood Avenue at Palace Road	East	520	21	D	570	19	D
	North	35	549	A	40	480	A
	South	10	1,920	A	10	1,920	A
Longwood Avenue at Huntington Avenue	East	760	79	B	820	73	B
	West	105	514	A	125	432	A
	North	175	110	B	180	107	B
	South	155	155	A	160	150	A
Francis Street at Brookline Avenue	East	60	600	A	65	554	A
	West	75	576	A	80	540	A
	North	75	224	A	75	224	A
	South	70	309	A	75	288	A
Francis Street at Binney Street	East	265	59	B	275	57	B
	West	185	88	B	195	83	B
	North	180	143	A	185	139	A
	South	255	80	B	270	76	B
Francis Street/Tremont Street at Huntington Avenue/Calumet Street	East	520	108	B	545	103	B
	West	85	600	A	90	567	A
	North	160	227	A	165	220	A
	South	05	314	A	110	300	A
	Southwest	130	185	A	140	171	A
Fenwood Road at Huntington Avenue	East	90	567	A	95	537	A
	West	150	544	A	155	526	A
	North	140	204	A	145	197	A
St. Albans Road/Mission Street at Huntington Avenue	East	55	927	A	60	850	A
	West	65	863	A	65	863	A
	North	65	456	A	65	456	A
	South	5	4,080	A	5	4,080	A

1/ Average crosswalk space per pedestrian, in square feet.

2/ Level of Service.

Sidewalk Capacity Analysis

Capacity analyses were also conducted for all nine major sidewalks segments within the project study area. Table 5-36 provides a summary of findings for all conditions during the morning peak hour. Table 5-37 provides a summary of findings for all conditions during the evening peak hour.

For a seven-foot sidewalk, typical in the LMA area, over 1,600 pedestrians must use a sidewalk during an hour for that sidewalk to degrade to LOS C or worse. The highest volumes recorded were below 1,000 pedestrians per hour.

As shown in Tables 5-36 and 5-37, all of the sidewalks were determined to operate at LOS B or better under all conditions analyzed. These analyses were very conservative in that for each segment, the narrowest segment and highest pedestrian volume were used as input to the analysis. Actual pedestrian sidewalk level of service throughout most of the area is actually better than that reported in the tables.

5.3.4 Public Transportation

As noted in Section 5.2.8, Existing Conditions: Public Transportation, Harvard is well served by the MBTA's existing public transportation system as well as MASCO's private system of shuttle buses. Eighteen bus routes, nine shuttle routes, three subway lines, and four commuter rail lines currently make stops either inside the LMA or within a reasonable walking distance of the district. This section provides information on projected future capacity and utilization of these available transit services, and the anticipated impact that the HSDM Research and Education Building and other proposed and approved projects within the LMA will have on transit services under future conditions.

5.3.4.1 2007 No-Build Condition Transit Trips

The 2007 No-Build Condition assumes that other projects identified in the area are built but that the HSDM Research and Education Building is not built. It also assumes that ridership in general has increased annually. This process is the same process used project vehicular traffic in Section 5.3.2, Evaluation of Long-Term Transportation Impacts: Traffic.

Transit ridership was increased from 2002 Existing Condition volumes by 0.5 percent per year to find 2007 background transit ridership. This 0.5 percent growth rate is consistent with rates used in other area studies and was selected in consultation with the BTD.[14] Transit ridership associated with each of the projects previously listed in Section 5.3.2, Site Specific Background Growth, was added to 2007 background transit ridership to arrive at 2007 No-Build Condition volumes. These volumes are presented in Table 5-38.

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14 See also discussion of background growth rate relative to traffic in Section 5.3.2.1, General Background Traffic Growth.

Table 5-36 Sidewalk Pedestrian Analysis Results Morning Peak Hour

Corridor & Side of Street	Minimum Sidewalk Width	2002 Existing Condition			2007 No-Build Condition			2007 Build Condition		
		Peds[1]	Flow[2]	LOS[3]	Peds[1]	Flow[2]	LOS[3]	Peds[1]	Flow[2]	LOS[3]
Fenway										
East sidewalk	12	45	0.1	A	55	0.1	A	55	0.1	A
West sidewalk	6	200	1.1	A	225	1.3	A	225	1.3	A
Longwood Avenue										
East sidewalk	9	525	1.5	A	600	1.7	A	600	1.7	A
West sidewalk	8	805	2.7	A	865	2.9	A	866	2.9	A
Francis Street										
East sidewalk	7	75	0.3	A	75	0.3	A	75	0.3	A
West sidewalk	7 ½	510	1.9	A	535	2.0	A	535	2.0	A
Brookline Avenue										
North sidewalk	8	205	0.7	A	215	0.7	A	215	0.7	A
South sidewalk	6 ½	200	1.0	A	210	1.0	A	210	1.0	A
Binney Street										
North sidewalk	7	205	0.9	A	215	0.9	A	215	0.9	A
South sidewalk	10	265	0.6	A	280	0.7	A	280	0.7	A
Blackfan Street										
North sidewalk	6	220	1.2	A	245	1.4	A	245	1.4	A
South sidewalk	6	885	4.9	B	950	5.3	B	950	5.3	B
Avenue Louis Pasteur										
North sidewalk	7	425	1.8	A	445	1.9	A	445	1.9	A
South sidewalk	7	160	0.7	A	165	0.7	A	165	0.7	A
Palace Road										
North sidewalk	5	40	0.3	A	45	0.4	A	45	0.4	A
South sidewalk	7	25	0.1	A	25	0.1	A	25	0.1	A
Huntington Avenue										
North sidewalk	9	155	0.4	A	160	0.4	A	160	0.4	A
South sidewalk	9	140	0.4	A	145	0.4	A	145	0.4	A

1/ Pedestrians per hour

2/ Pedestrian flow rate given as persons per minute per foot of effective sidewalk width

3/ Level of Service

Table 5-37: Sidewalk Pedestrian Analysis Results Evening Peak Hour

Corridor & Side of Street	Minimum Sidewalk Width	2002 Existing Condition			2007 No-Build Condition			2007 No-Build Condition		
		Peds[1]	Flow[2]	LOS[3]	Peds[1]	Flow[2]	LOS[3]	Peds[1]	Flow[2]	LOS[3]
Fenway										
East sidewalk	12	55	0.1	A	65	0.1	A	65	0.1	A
West sidewalk	6	240	1.3	A	250	1.4	A	250	1.4	A
Longwood Avenue										
East sidewalk	8	680	2.3	A	730	2.4	A	733	2.4	A
West sidewalk	9	560	1.6	A	625	1.7	A	625	1.7	A
Francis Street										
East sidewalk	7	185	0.8	A	195	0.8	A	195	0.8	A
West sidewalk	7 ½	520	1.9	A	545	2.0	A	545	2.0	A
Brookline Avenue										
North sidewalk	8	425	1.4	A	450	1.5	A	450	1.5	A
South sidewalk	6 ½	190	0.9	A	200	1.0	A	200	1.0	A
Binney Street										
North sidewalk	10	180	0.4	A	185	0.4	A	185	0.4	A
South sidewalk	7	255	1.1	A	270	1.1	A	270	1.1	A
Blackfan Street										
North sidewalk	6	185	1.0	A	205	1.1	A	205	1.1	A
South sidewalk	6	485	2.7	B	520	2.9	B	520	2.9	B
Avenue Louis Pasteur										
North sidewalk	7	205	0.9	A	260	1.1	A	260	1.1	A
South sidewalk	7	250	1.0	A	215	0.9	A	215	0.9	A
Palace Road										
North sidewalk	5	35	0.3	A	165	1.4	A	165	1.4	A
South sidewalk	7	10	0.0	A	50	0.2	A	50	0.2	A
Huntington Avenue										
North sidewalk	9	175	1.0	A	180	1.0	A	183	1.0	A
South sidewalk	9	155	0.9	A	160	0.9	A	163	0.9	A

1/ Pedestrians per hour.

2/ Pedestrian flow rate given as persons per minute per foot of effective sidewalk width.

3/ Level of Service.

Table 5-38: 2007 No-Build Condition Peak Hour Transit Trips

Route	Direction	2002 Existing Condition AM Peak	2002 Existing Condition PM Peak	Background Growth AM Peak	Background Growth PM Peak	Other LMA Projects AM Peak	Other LMA Projects PM Peak	2007 No-Build Condition AM Peak	2007 No-Build Condition PM Peak
Worcester/Framingham Commuter Rail	Inbound	653	NA[1]	23	NA[1]	49	NA[1]	725	NA[1]
	Outbound	NA[1]	718	NA[1]	25	NA[1]	51	NA[1]	794
Needham Commuter Rail	Inbound	1,386	NA[1]	49	NA[1]	32	NA[1]	1,467	NA[1]
	Outbound	NA[1]	1,250	NA[1]	44	NA[1]	33	NA[1]	1,328
Attleboro/Stoughton Commuter Rail	Inbound	1,474	NA[1]	52	NA[1]	28	NA[1]	1,554	NA[1]
	Outbound	NA[1]	3,586	NA[1]	127	NA[1]	29	NA[1]	3,742
Franklin Commuter Rail	Inbound	2,166	NA[1]	77	NA[1]	21	NA[1]	2,264	NA[1]
	Outbound	NA[1]	2,465	NA[1]	87	NA[1]	21	NA[1]	2,574
Green Line D Branch	Inbound	2,210	1,164	78	41	57	39	2,346	1,244
	Outbound	559	1,983	20	70	34	60	613	2,114
Green Line E Branch	Inbound	869	1,392	31	49	100	200	999	1,641
	Outbound	355	387	13	14	191	114	559	515
Orange Line	Inbound	13,218	9,611	467	339	67	43	13,752	9,993
	Outbound	11,752	13,118	415	463	38	70	12,205	13,651
Bus Route CT2	Inbound	60	83	2	3	38	18	99	104
	Outbound	36	43	1	2	15	39	53	84
Bus Route CT3	Inbound	20	69	1	2	13	6	34	78
	Outbound	122	26	4	1	5	14	132	41
Bus Route 8	Inbound	452	159	16	6	18	9	486	173
	Outbound	187	225	7	8	7	19	201	252
Bus Route 15	Inbound	468	120	17	4	13	6	498	131
	Outbound	132	282	5	10	5	14	142	306
Bus Route 19	Inbound	156	41	6	1	18	9	180	51
	Outbound	72	103	3	4	7	19	82	126
Bus Route 22	Inbound	204	132	7	5	13	6	224	143
	Outbound	132	210	5	7	5	14	142	231
Bus Route 23	Inbound	222	150	8	5	30	14	260	170
	Outbound	120	252	4	9	12	31	136	292
Bus Route 28	Inbound	228	186	8	7	13	6	249	199
	Outbound	108	288	4	10	5	14	117	312
Bus Route 39	Inbound	761	225	27	8	22	14	810	247
	Outbound	380	258	13	9	13	24	406	291

1/ Inbound PM peak and outbound AM peak commuter rail ("reverse commute" trains) were not analyzed because of a lack of capacity and ridership data for these periods and the presumption that no capacity constraints exist or are likely to exist by 2007.

Table 5-38: 2007 No-Build Condition Peak Hour Transit Trips (continued)

Route	Direction	2002 Existing Condition		Background Growth		Other LMA Projects		2007 No-Build Condition	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Bus Route 42	Inbound	87	63	3	2	13	6	103	72
	Outbound	87	93	3	3	5	14	95	110
Bus Route 43	Inbound	210	90	7	3	13	6	231	100
	Outbound	30	186	1	7	5	14	36	206
Bus Route 44	Inbound	196	93	7	3	13	6	217	102
	Outbound	98	153	3	5	5	14	107	172
Bus Route 45	Inbound	192	78	7	3	13	6	212	87
	Outbound	48	174	2	6	5	14	55	194
Bus Route 47	Inbound	106	143	4	5	26	24	136	172
	Outbound	99	143	4	5	22	28	124	176
Bus Route 60	Inbound	46	83	2	3	31	26	78	111
	Outbound	46	61	2	2	23	33	71	95
Bus Route 65	Inbound	238	39	8	1	31	26	278	66
	Outbound	33	88	1	3	24	33	58	125
Bus Route 66	Inbound	251	278	9	10	54	37	314	325
	Outbound	317	172	11	6	33	57	362	235
Mission Hill Loop Bus	Inbound	14	NA	0	NA	13	6	28	NA
	Outbound	NA	21	NA	1	5	14	NA	35

1/ Inbound PM peak and outbound AM peak commuter rail ("reverse commute" trains) were not analyzed because of a lack of capacity and ridership data for these periods and the presumption that no capacity constraints exist or are likely to exist by 2007.

5.3.4.2 2007 Build Condition Transit Trips

The 2007 Build Condition represents the transit trips generated by the proposed HSDM Research and Education Building. Under the 2007 Build Condition, as shown in Table 5-39, approximately 78 daily transit trips will be generated by the proposed facility. During the morning peak hour, 12 transit trips are expected to be generated by the project. During the evening peak hour, the project is expected to generate 11 transit trips. With the relatively low transit trips generated by the proposed HSDM Research and Education Building, it is expected that the proposed project will have no material impact on the existing transit system.

Table 5-39: HSDM Research and Education Building Project Peak Hour and Daily Transit-Trip Generation Summary

Period/Direction	Total Transit Trips
Morning Peak Hour	
Enter	9
Exit	3
Total	12
Evening Peak Hour	
Enter	2
Exit	9
Total	11
Weekday Daily Trips	78

Project-Specific Transit Trip Generation

As shown previously in Table 5-39, it is estimated that the HSDM Research and Education Building project will result in 12 morning peak hour transit trips and 11 evening peak hour transit trips. Table 5-40 presents estimated HSDM Research and Education Building transit trips distributed over the area transit system (as described in the previous section). The project-generated transit trips were added to the 2007 No-Build Condition transit trips, resulting in 2007 Build Condition transit trips.

Table 5-40: 2007 Build Condition Transit Trips

Route	Direction	2007 No-Build Condition		HSDM Transit Trips		2007 Build Condition	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Worcester/Framingham Commuter Rail	Inbound	725	NA[1]	-	NA	725	NA[1]
	Outbound	NA[1]	794	NA1	-	NA[1]	794
Needham Commuter Rail	Inbound	1,467	NA[1]	-	NA1	1,467	NA[1]
	Outbound	NA[1]	1,328	NA1	-	NA[1]	1,328
Attleboro Commuter Rail	Inbound	1,554	NA[1]	-	NA1	1,554	NA[1]
	Outbound	NA[1]	3,742	NA1	-	NA[1]	3,742
Franklin Commuter Rail	Inbound	2,264	NA[1]	1	NA1	2,265	NA[1]
	Outbound	NA[1]	2,574	NA1	1	NA[1]	2,575
Green Line D Branch	Inbound	2,346	1,244	1	-	2,347	1,244
	Outbound	613	2,114	-	1	613	2,115
Green Line E Branch	Inbound	999	1,641	-	2	999	1,643
	Outbound	559	515	2	-	561	515
Orange Line	Inbound	13,752	9,993	-	1	13,752	9,994
	Outbound	12,205	13,651	1	-	12,206	13,651
Bus Route CT2	Inbound	99	104	-	-	99	104
	Outbound	53	84	-	-	53	84
Bus Route CT3	Inbound	34	78	-	-	34	78
	Outbound	132	41	-	-	132	41
Bus Route 8	Inbound	486	173	-	-	486	173
	Outbound	201	252	-	-	201	252
Bus Route 15	Inbound	498	131	-	-	498	131
	Outbound	142	306	-	-	142	306
Bus Route 19	Inbound	180	51	-	-	180	51
	Outbound	82	126	-	-	82	126
Bus Route 22	Inbound	224	143	-	-	224	143
	Outbound	142	231	-	-	142	231
Bus Route 23	Inbound	260	170	-	-	260	170
	Outbound	136	292	-	-	136	292
Bus Route 28	Inbound	249	199	-	-	249	199
	Outbound	117	312	-	-	117	312
Bus Route 39	Inbound	810	247	-	-	810	247
	Outbound	406	291	-	-	406	291

1/ Inbound PM peak and outbound AM peak commuter rail ("reverse commute" trains) were not analyzed because of a lack of capacity and ridership data for these periods and the presumption that no capacity constraints exist or are likely to exist by 2007.

Table 5-40: 2007 Build Condition Transit Trips (continued)

Route	Direction	2007 No-Build Condition AM Peak	2007 No-Build Condition PM Peak	HSDM Transit Trips AM Peak	HSDM Transit Trips PM Peak	2007 Build Condition AM Peak	2007 Build Condition PM Peak
Bus Route 42	Inbound	103	72	-	-	103	72
	Outbound	95	110	-	-	95	110
Bus Route 43	Inbound	231	100	-	-	231	100
	Outbound	36	206	-	-	36	206
Bus Route 44	Inbound	217	102	-	-	217	102
	Outbound	107	172	-	-	107	172
Bus Route 45	Inbound	212	87	-	-	212	87
	Outbound	55	194	-	-	55	194
Bus Route 47	Inbound	136	172	-	-	136	172
	Outbound	124	176	-	-	124	176
Bus Route 60	Inbound	78	111	-	-	78	111
	Outbound	71	95	-	-	71	95
Bus Route 65	Inbound	278	66	-	-	278	66
	Outbound	58	125	-	-	58	125
Bus Route 66	Inbound	314	325	-	-	314	325
	Outbound	362	235	-	-	362	235
Mission Hill Loop Bus	Inbound	28	NA	-	-	28	NA
	Outbound	NA	35	-	-	NA	35

1/ Inbound PM peak and outbound AM peak commuter rail ("reverse commute" trains) were not analyzed because of a lack of capacity and ridership data for these periods and the presumption that no capacity constraints exist or are likely to exist by 2007.

5.3.4.3 2007 Build Condition Transit Capacity Analysis

Table 5-41 compares 2007 Build Condition transit trips to available transit capacity and presents the resulting surplus or deficit in transit capacity. Available transit capacity is assumed to be the same as 2002 transit capacity, discussed previously in Section 5.2.8, Existing Conditions: Public Transportation.

It is conservatively assumed for the purposes of this analysis that all transit trips generated by the IMP projects will use MBTA-provided services, as opposed to using only MASCO-provided services.

The 2007 No-Build and Build Conditions exceed projected transit capacity in peak periods on some subway and bus routes. The total peak hour transit trips generated by the proposed Harvard Longwood Campus projects would have no discernable impact on any of these services.

Table 5-41: 2007 Build Condition Transit Capacity Analysis

Route	Direction	2007 Build Condition Transit Trips AM	2007 Build Condition Transit Trips PM	Estimated Peak Hour Transit Capacity AM	Estimated Peak Hour Transit Capacity PM	Net Result Surplus/(Deficit) AM	Net Result Surplus/(Deficit) PM
Worcester/Framingham Commuter Rail	Inbound	725	NA[1]	918	NA[1]	193	NA[1]
	Outbound	NA[1]	794	NA[1]	885	NA[1]	91
Needham Commuter Rail	Inbound	1,467	NA[1]	1,742	NA[1]	275	NA[1]
	Outbound	NA[1]	1,328	NA[1]	2,125	NA[1]	797
Attleboro/Stoughton Commuter Rail	Inbound	1,554	NA[1]	1,734	NA[1]	180	NA[1]
	Outbound	NA[1]	3,742	NA[1]	3,394	NA[1]	(348)
Franklin Commuter Rail	Inbound	2,265	NA[1]	2,418	NA[1]	153	NA[1]
	Outbound	NA[1]	2,575	NA[1]	3,349	NA[1]	774
Green Line D Branch	Inbound	2,347	1,244	2,640	2,640	293	1,396
	Outbound	613	2,115	2,640	2,640	2,027	525
Green Line E Branch	Inbound	999	1,643	1,474	1,474	475	(169)
	Outbound	561	515	1,474	1,474	913	959
Orange Line	Inbound	13,752	9,994	9,360	9,360	(4,392)	(634)
	Outbound	12,206	13,651	9,360	9,360	(2,846)	(4,291)
Bus Route CT2	Inbound	99	104	180	180	81	76
	Outbound	53	84	180	180	127	96
Bus Route CT3	Inbound	34	78	180	180	146	102
	Outbound	132	41	180	180	48	139
Bus Route 8	Inbound	486	173	600	600	114	427
	Outbound	201	252	600	600	399	348
Bus Route 15	Inbound	498	131	720	720	222	589
	Outbound	142	306	720	720	578	414
Bus Route 19	Inbound	180	51	240	144	60	93
	Outbound	82	126	240	144	158	18
Bus Route 22	Inbound	224	143	360	360	136	217
	Outbound	142	231	360	360	218	129
Bus Route 23	Inbound	260	170	360	360	100	190
	Outbound	136	292	360	360	224	68
Bus Route 28	Inbound	249	199	360	360	111	161
	Outbound	117	312	360	360	243	48
Bus Route 39	Inbound	810	247	360	360	(450)	113
	Outbound	406	291	360	360	(46)	69

1/ Inbound PM peak and outbound AM peak commuter rail ("reverse commute" trains) were not analyzed because of a lack of capacity and ridership data for these periods and the presumption that no capacity constraints exist or are likely to exist by 2007.

Table 5-41: 2007 Build Condition Transit Capacity Analysis (continued)

Route	Direction	2007 Build Condition Transit Trips		Estimated Peak Hour Transit Capacity		Net Result Surplus/(Deficit)	
		AM	PM	AM	PM	AM	PM
Bus Route 42	Inbound	103	72	180	180	77	108
	Outbound	95	110	180	180	85	70
Bus Route 43	Inbound	231	100	360	360	129	260
	Outbound	36	206	360	360	324	154
Bus Route 44	Inbound	217	102	327	327	110	225
	Outbound	107	172	327	327	220	155
Bus Route 45	Inbound	212	87	360	360	148	273
	Outbound	55	194	360	360	305	166
Bus Route 47	Inbound	136	172	180	210	44	38
	Outbound	124	176	180	210	56	34
Bus Route 60	Inbound	78	111	180	150	102	39
	Outbound	71	95	180	150	109	55
Bus Route 65	Inbound	278	66	240	150	(38)	84
	Outbound	58	125	180	150	122	25
Bus Route 66	Inbound	314	325	360	360	46	35
	Outbound	362	235	360	360	(2)	125

1/ Inbound PM peak and outbound AM peak commuter rail ("reverse commute" trains) were not analyzed because of a lack of capacity and ridership data for these periods and the presumption that no capacity constraints exist or are likely to exist by 2007.

- Only on Bus Route 66 (connecting the LMA to Harvard Square) would a difference be noticeable from trips generated by the proposed Harvard Longwood Campus projects, even if all peak hour trips took the same route. Pressure on this route is relieved by MASCO's M2 shuttle, which also connects the LMA to Harvard Square. It is unlikely that Harvard faculty, staff, or students would ride the MBTA route 66 bus when they can ride the MASCO M2 bus for free, and from a stop closer to campus.

- The 2007 Build Condition exceeds both morning and evening peak hour capacity in both inbound and outbound directions. At 107 percent of capacity, inbound service in the evening will be the least crowded peak hour service, while inbound service in the morning will be the most crowded, at 147 percent of capacity. Proposed Orange Line signal improvements could reduce headways from five minutes to four, increasing capacity by over 2,300 passengers per hour. It is estimated that the Harvard IMP projects would contribute only one passenger to the Orange Line during each peak hour, outbound in the morning and inbound in the evening.

- The 2007 Build Condition exceeds evening peak hour capacity on the E Branch of the Green Line inbound by approximately 170 trips (or by approximately 11 percent assuming that the frequency of services is not changed from current conditions). It is estimated that the Harvard IMP projects would contribute only two passengers to the Green Line E Branch inbound during the evening peak hour.

- The 2007 Build Condition exceeds evening peak hour capacity on the Attleboro/Stoughton Commuter Rail Line outbound by approximately 350 trips (or approximately 10 percent assuming that the frequency of services is not changed from current conditions). It is estimated that the Harvard IMP projects would contribute only one passenger to the Attleboro/Stoughton Commuter Rail Line outbound during the evening peak hour.

It should be noted that these analyses assume that no additional peak hour transit capacity would be made available by 2007 over the frequency of transit services that are currently provided in 2002. Additionally, the per vehicle capacities used in this analysis reflect "design load" conditions and not the more realistic "crush load" conditions common on many Boston-area transit lines during peak conditions. If crush load capacities were employed in this analysis, it is unlikely that any transit lines would be projected to be over capacity in 2007.

5.4 Transportation Mitigation

This section of the Transportation Access Plan describes the transportation mitigation and improvements that are currently being considered by Harvard. The first section describes improvements that have been committed to as part of the recently completed Article 80 permitting process for the HMS New Research Building project, which is currently under construction. The following sections define actions and improvements that are currently being considered relative to traffic, transportation demand management (TDM), pedestrian and bicycle access, and other campus-specific amenities as part of the IMP.

5.4.1 Recent NRB Mitigation Commitments

The following list highlights commitments that Harvard has made as transportation mitigation for its New Research Building project, which is currently under construction:

- Harvard has been an active participant in ongoing planning and design of roadway and pedestrian safety improvements to Oscar Tugo Circle, shown previously in Figure 5-16 (intersection of Longwood Avenue and Avenue Louis Pasteur). This project was recently approved by the Boston Department of Public Works and the Boston Public Improvement Commission and construction of this project is close to completion.

- Harvard has committed its fair share of required land and monetary funding related to the future design and construction of the Blackfan Street extension project. This transportation improvement project will extend the existing Blackfan Circle (a dead end street), resulting in a through street connection between Longwood Avenue and Avenue

Louis Pasteur. It should be noted that the design and construction of this roadway was not needed to serve the NRB project.

- Harvard increased its transit pass subsidy to 40 percent as a mitigation commitment for the NRB project. Since provision of this increase, T Pass sales have increased from an average of 1,039 monthly passes sold in 1999 to 1,778 in 2001 (a 71 percent increase).

5.4.2 Traffic Access Improvements

As described in Section 5.3, Evaluation of Long-Term Transportation Impacts, Harvard is expected to generate only six additional vehicle trips during the morning peak hour and six additional vehicle trips during the evening peak hour under the 2007 Build Condition (when compared to 2002 Existing Conditions). As described in the analysis of study area intersection capacity, proposed Harvard projects are not expected to have a perceptible effect on traffic operations at signalized or unsignalized intersections in the project study area. However, to help mitigate traffic impacts in the LMA, Harvard is currently committed to implementing the following traffic-related improvements within the LMA, including the following:

- Harvard proposes the relocation of 75 existing parking spaces from the existing Longwood Lot and Vanderbilt Lot. Once relocated this space will be redesigned as campus open space, providing improved pedestrian connections in the LMA between Huntington Avenue, Shattuck Street, and Longwood Avenue.

5.4.3 Transportation Demand Management Actions

Harvard proactively supports many efforts to reduce auto trips to and from campus in order to reduce traffic congestion and parking demands within the LMA and the entire Metropolitan Boston area. Harvard offers information and incentives to its faculty, staff and students to facilitate their use of alternative forms of transportation.

Harvard will continue to promote and improve its TDM program to benefit its employees and students and to reduce traffic impacts to roadways and parking facilities within the LMA and nearby neighborhoods. Harvard will also continue to be an active participant in MASCO's CommuteWorks TMA, which focuses on a wide array of options aimed at encouraging LMA employees, students, patients, and visitors to use alternative forms of transportation. Harvard will continue to strongly encourage the following:

- Active Participation in CommuteWorks – Harvard is committed to continued active participation in MASCO's CommuteWorks TMA.

- Transportation Coordinator – Harvard's transportation coordinators will continue to oversee all transportation issues, including managing vehicular operations, service, and loading, parking, and TDM programs. The transportation coordinator will continue to be responsible for a regular monitoring program and will serve as the contact and liaison for the BTD, CommuteWorks Transportation Management Association (TMA), and other area Employee Transportation Coordinators.

- Ridesharing and Carpooling – Harvard will continue to encourage ridesharing through geographic ride matching and preferential parking assignments for carpools and vanpools.

- Guaranteed Ride Home Program – Harvard will continue to offer a "guaranteed ride home" to transit commuters.

- Transit Pass Programs – Harvard will continue to provide on-site transit pass sales to its faculty and staff. T Pass sales have increased from an average of 1,039 monthly passes sold in 1999 to 1,778 in 2001 (a 71 percent increase).

- Transit Pass Subsidies – Harvard will continue to subsidize the cost of MBTA passes for its faculty and staff. Harvard currently offers a 40 percent transit pass subsidy to its faculty and staff.

- Bicycle Facilities and Promotion – Harvard will continue to provide publicly accessible bicycle storage on its Longwood Campus. Harvard's Transportation Coordinators will also continue to make available promotional material on bicycle commuting and bicycle safety.

- Parking Management – Harvard is prepared to continue to evaluate the potential need for charging facilities for electric vehicles. Harvard Parking and Security will continue to enforce a five-minute limit on vehicle idling, in accordance with state law. Harvard will also continue to charge market-rate parking fees, to offer preferential parking and/or reduced parking rates to carpools and vanpools.

- Trip Reduction Strategies – Harvard will continue to provide telecommuting options to reduce overall trip demand and flexible work schedule options to reduce peak hour and/or overall trip demand.

- Transportation Monitoring and Annual Reporting – Harvard will continue to monitor transportation conditions, conduct transportation and mode share surveys, and provide BTD with an annual report on findings. To the extent that this function may better be performed through MASCO and CommuteWorks, Harvard's Transportation Coordinators will help facilitate the administration of regular transportation surveys.

- Internet Transportation Information – Harvard also provides transportation information electronically on its Medical School website. The site includes maps and directions to its Longwood Campus, fare and schedule information for MBTA transportation services that serve its campus and the LMA, and schedule information for the MASCO M2

Shuttle, which provides connections from the LMA to Back Bay, MIT, Central Square in Cambridge, and onward to Harvard Yard.

5.4.4 Project-Related Design Enhancements

Harvard will work closely with the BTD to develop a design for the HSDM Research and Education Building that improves access to the Quad Garage from Longwood Avenue, relocates loading and service activities to its below grade HMS Quad Garage, and improves pedestrian circulation in the area:

- Access Improvements to Quad Garage Driveway. Harvard proposes to relocate the existing driveway to the Quad Garage by moving it approximately 25 feet to the south along Longwood Avenue. This modification will result in improved driveway access to the Quad Garage that lines-up with the existing ramp system to this below-grade facility. This relocation will provide for more efficient access to this facility, particularly by trucks that currently have to make a serpentine-like turn when maneuvering from the Quad Garage ramp to and from Longwood Avenue. This access modification will also allow for the creation of a wide and continuous pedestrian corridor along the southern edge of the existing HSDM Building (188 Longwood Avenue) and past the proposed HSDM Research and Education Building.

- Loading and Service Activities. Loading and service for the proposed HSDM Research and Education Building will be accommodated at new service bays that will be added to the existing consolidated loading facility located within the below-grade HMS Quad Garage. Relocation of existing loading HSDM facilities (located in the existing Longwood Lot) is necessary to support the proposed HSDM Research and Education Building project. This relocation will also help to provide additional open space for campus and pedestrian access improvements that are proposed. It is anticipated that all truck turning movements into and out of the loading facility will be accommodated off-street within the HMS Quad Garage.

- Pedestrian/Bicycle Infrastructure and Circulation. The HSDM Research and Education Building project also includes relocation of the existing Longwood Lot (including 66 surface parking spaces) and their replacement with campus open space improvements. It is anticipated that planned improvements will include the provision of landscaping, benches, and new bicycle racks.

5.4.5 Local Street Network Improvements

As noted above, Harvard has committed to a local street network improvement project that will improve traffic conditions and the pedestrian environment:

- **Blackfan Circle Extension:** Harvard has committed the land requirements and its fair share allocation of design and construction costs related to the future construction of the Blackfan Circle extension to Avenue Louis Pasteur. When completed this roadway improvement will help to better disperse traffic flow through the LMA, resulting in more access choices for those motorists destined for land uses located along this new roadway.

5.4.6 System-wide Improvements

Harvard is involved in ongoing efforts to implement system-wide improvements to the LMA's transportation infrastructure that will help to improve regional transportation access in the area. Some ongoing or recently completed initiatives are described below.

- **M2 Shuttle Bus Procurement:** Harvard has committed to replacing its entire M2 shuttle bus fleet with Ultra-Low-Sulfur Diesel (USLD) buses. It is expected that these new buses will contribute to improving air quality conditions both in the LMA, as well as other areas of Boston and Cambridge. In addition, Harvard has increased the frequency of service on the M2 shuttle bus service to meet increasing demands and to help reduce employees' propensity to travel between Harvard's Longwood, Allston, and Cambridge campuses via automobile use.

  The capital cost to procure and deploy this new fleet of M2 shuttle buses is estimated to be approximately $2.5 million. The annual operating costs of the fleet are $1.2 million, as described in Section 5.4.7 below.

- **Oscar Tugo Circle:** As described above, in September 2002, Harvard and MASCO completed the implementation of pedestrian access improvements at the intersection of Longwood Avenue and Avenue Louis Pasteur (also known as Oscar Tugo Circle). This intersection experiences high pedestrian volumes and has been the focus of planning studies by Harvard for many years to better understand transportation and pedestrian access deficiencies and to devise improvement concepts.

  Improvements that have been made to the intersection include construction of a larger traffic island that has resulted in the reduction of pedestrian crossing times at the intersection, implementation of two wide thermoplastic crosswalks that span Longwood Avenue east and west of Avenue Louis Pasteur, and landscape improvements to the reconstructed traffic island. Figure 5-16 provides an illustration of this pedestrian access improvement. Harvard expended approximately $350,000 on the planning, design, and construction of this effort.

5.4.7 Consistency with Interim Guidelines

Harvard University is firmly committed to reducing single occupancy vehicle use on their campus and has demonstrated their commitment through their approach to limiting parking (and providing no additional parking) and their extensive TDM program. Taken as a whole, Harvard in spirit achieves the Transportation goals of the Interim Guidelines.

Harvard's TDM program includes many components such as: limiting parking, numerous programs designed to make it easier for people to get to the campus without cars, provision of shuttle buses, and campus improvements that promote better pedestrian access.

Limited Parking - One of the most important elements underlying Harvard's TDM program is their approach to parking. Harvard actively constrains the parking supply and charges market rate fees for parking privileges. Harvard's parking ratio on the Longwood Campus is 0.48, substantially below the 0.75 per 1000 s.f. goal of the Interim Guidelines for all new construction in the LMA. As a result, Harvard overachieves by having one of the highest transit mode shares in the area – 69 percent of employees and students traveling to the Longwood Campus utilize mass transit.

Harvard has planned *no new parking* for the 87,500 square feet of proposed future development in this Institutional Master Plan. In addition, Harvard is eliminating surface parking on the Longwood Lot and the Vanderbilt Lot as part of several campus improvement projects that they have proposed and will replace those lots with landscaped pedestrian areas.

Harvard significantly overachieves the parking goals established in the Interim Guidelines on the Longwood Campus.

General TDM - The many amenities and services included in Harvard's TDM program reflect their commitment to reducing single-occupancy vehicle use and encouraging alternative modes of transportation. Their membership in MASCO includes participation in one of the most extensive TDM programs in the city. These services are complemented by University-wide TDM programs (see: http://www.commuterchoice.harvard.edu/). Elements of Harvard's TDM program for the Longwood Campus include:

- Membership in MASCO and CommuteWorks – the LMA's Transportation Management Association;
- Services on-site (health care, wellness programs, other services);
- MASCO/Harvard services (M2 Shuttle and recent expansion, see below);
- Bicycle storage and registration;
- On-site showers/lockers for people who bike/walk to work;

- Rideshare and carpool matches;
- Guaranteed ride home program;
- Enhanced pedestrian circulation;
- On-site Employee Transportation Advisors;
- Zip car corporate membership;
- Promotion of alternative transportation through MASCO and Harvard's Commuter Choice web site; and
- SafeRide.

Detailed descriptions of each of these measures, with the exception of SafeRide, have been provided previously in this chapter. SafeRide is a program operated by Harvard to provide Longwood Campus employees with a taxi escort service after typical business hours within a one-mile radius of the campus. The program provides employees with a taxi escort from 6:00 pm to 6:00 am. The annual cost of operating and maintaining this service is approximately $210,000.

Shuttle Buses - In addition to the TDM elements noted above, Harvard recently increased afternoon and evening M2 service from five to seven buses, thereby adding eight additional trips between 3:30 pm and 8:00 pm. These changes will eliminate approximately 70 percent of the late trips in the afternoon and increase evening capacity by providing over 320 additional seats. The data collected since the implementation of these changes supports the conclusion that these service improvements have dramatically increased their schedule adherence and seating capacity.

Harvard currently spends approximately $1.2 million annually on the operational costs of deploying this fleet. Additional capital improvements to the M2 shuttle services are described above in Section 5.4.6, System-wide Improvements.

Campus Improvement Projects - As part of this IMP, Harvard has proposed several campus improvement initiatives that are aimed at enhancing primary pedestrian connections within the LMA that traverse through the Longwood Campus. These initiatives include the replacement of existing surface parking near the current Dental School Interim Building (Longwood Lot) with a pedestrian plaza and the establishment of new and/or improved pedestrian connections at other locations on the Longwood Campus. In total, it is estimated that the cost to design and implement these improvements will exceed $700,000. Harvard is committed to completing these improvements within the term of the five-year IMP period. Section 4.2.3 of this IMP provides a detailed discussion and presentation of the pedestrian access and open space improvements that are proposed.

Transit Pass Subsidy – Transit pass subsidies are a University benefit and, as such, changes to that benefit must be reviewed on a University-wide basis, in the context of overall benefits reviews. Harvard's current total transit pass subsidy at the 40 percent rate for the employees in the Longwood Medical Area amounts to $413,000 annually.

Harvard looks forward to participating in the long-range LMA planning study that will be led by the BRA, and during that process it will consider raising the transit subsidy to 50 percent and/or implementing such other transportation improvements as the study recommends.

Overall, Harvard's extensive TDM program and its documented successes in spirit achieve the Transportation goals of the Interim Guidelines.

6.0 Infrastructure

6.0 Infrastructure

6.1 Introduction

This section describes the existing infrastructure systems utilized by the main portion of the Harvard University Longwood Campus (*i.e.*, Parcels A, B, and C), as well as future demands and proposed improvements planned over the next five years. The infrastructure systems addressed include sanitary sewer, water supply, stormwater drainage, electrical service, chilled water, natural gas, steam, and telecommunications.

Future demands are based on projects proposed during the IMP period of 2003-2007. As described in Section 4.2, there are five proposed IMP projects, including the new HSDM Research and Education Building and four smaller additions. In the following sections, these projects are evaluated for potential impacts to each infrastructure system.

6.2 Sanitary Sewer

6.2.1 Existing System Conditions

The existing sewer system is shown on Figure 6-1. The Boston Water and Sewer Commission (BWSC) owns and maintains the sewer lines that service the Harvard University Longwood Campus. BWSC has recently videotaped and replaced, as necessary, all of the sewer lines in Longwood Avenue. Existing sewer lines within the Longwood Campus are owned and maintained by Harvard.

Both on-site and off-site sanitary sewer systems are separate from stormwater collection systems. This separation maintains the hydraulic capacity of the sanitary sewer system during intense periods of rainfall, thereby preventing backups and reducing the amount of clean water sent to the Deer Island Treatment Plant. All flows travel by gravity through the collection system in this area. There are currently no problems relating to the hydraulic capacity of sewer lines in this area.

There are three BWSC sanitary sewer lines that transport wastewater north from the Longwood Campus to the Massachusetts Water Resources Authority (MWRA) Charles River Valley sewer, a major relief sewer running west along the Fenway. These lines run along Blackfan Street (39″ x 41-1/4″), Avenue Louis Pasteur (10″ to 12″) and Huntington Avenue (24″ x 36″). The Longwood Campus utilizes upstream branches located along Longwood Avenue, along the west side of Parcel A, through the east side of Parcel A, and along Shattuck Street.

6.2.2 Future Sewer Demand

As discussed in Section 3.0, Harvard does not anticipate growth in faculty, staff or student population over the next five years at the Longwood Campus. Future increased sewage generation will be the result of new space created by the IMP projects. The wastewater generation rates outlined in Table 6-1 are based on the proposed new space, minus the space to be demolished for the new HSDM Research and Education Building.

Table 6-1 Future Water/Sewer Demand

Site Description	Maximum Building Area (gross sf)	Water/Sewer Design Flow* (gallons per day [gpd])
HSDM Research and Education Building**	53,000	10,600
Dental School Interim Building (to be removed)	-11,045	-2,209
Goldenson Magnet Unit Addition	4,500	900
Armenise Addition	10,000	2,000
Goldenson Addition	10,000	2,000
Building C Addition	10,000	2,000
Total	76,455	15,291

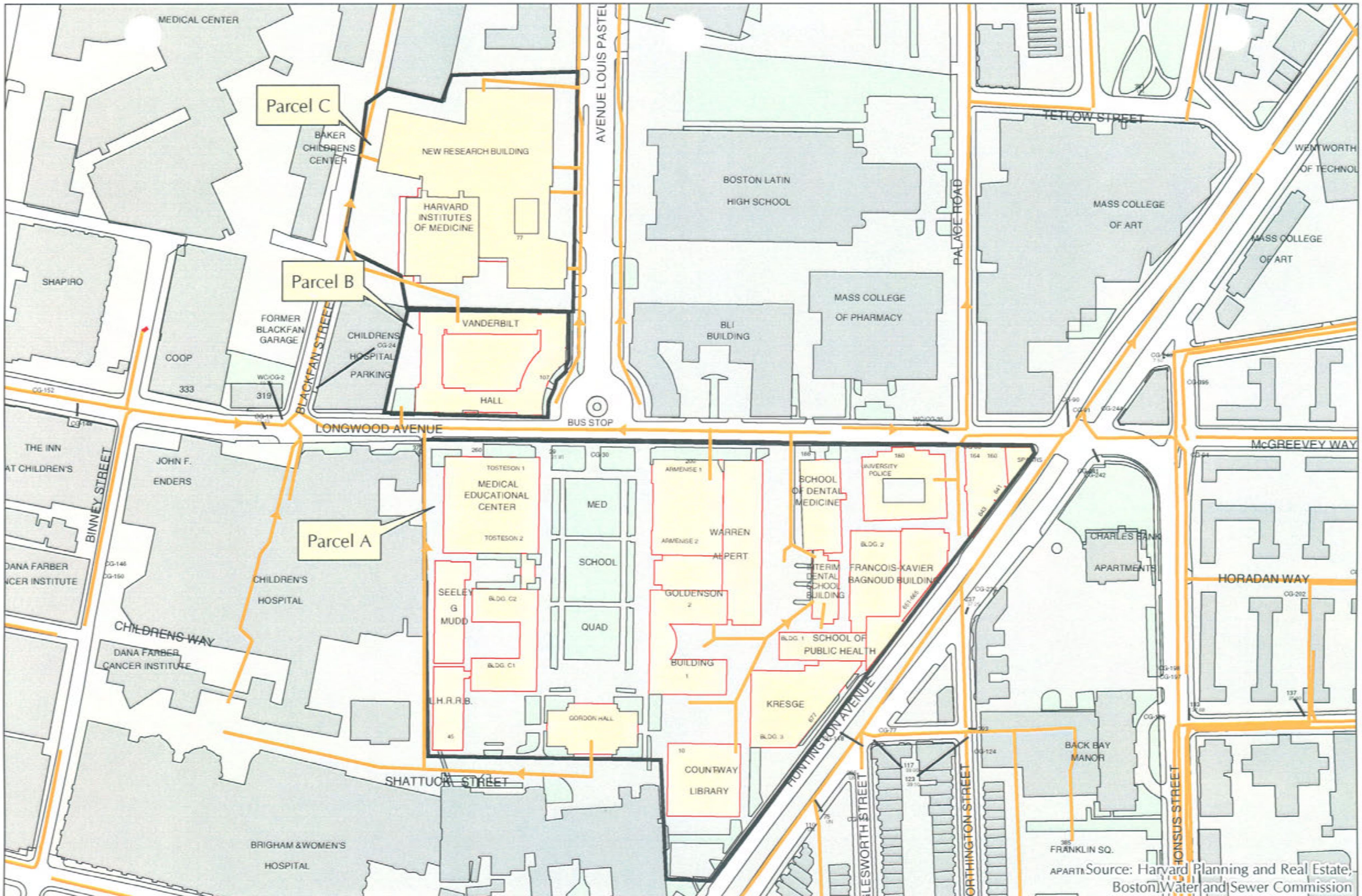
* Based on a rate of 200 gpd/1,000 SF, which was derived from actual water usage rates at the existing Harvard Institutes of Medicine Building.

** BWSC has indicated there is currently adequate capacity to support the proposed HSDM Research and Education Building.

Typically, sewage generation estimates are based on water use estimates decreased by ten percent to account for water consumption. In this case, sewage generation rates were conservatively estimated to equal water generation rates since a higher proportion of water used in laboratory space is used for research and eventually becomes wastewater, rather than being consumed. Based on these assumptions, it is estimated that the average daily sewage flow increase from all of the proposed projects would be 15,291 gpd.

However, it is anticipated that only 16,000 sf of the above maximum building area will be "new" space that will not be used for decompression. Therefore, the IMP projects proposed for the Harvard Longwood Campus would likely only increase future sewer demand by an estimated 3,200 gpd (16,000 sf x 200 gpd/1,000 SF).

The new sewage flow from the Building C Addition would pass through the sewer system that runs toward Longwood Avenue along the west side of Parcel A, then north on Blackfan Street. The remainder of new sewage would either connect to one of the sewer lines in Longwood Avenue or to the 24" x 36" line in Huntington Avenue. The overall contribution of the proposed projects would be negligible.



Scale 1:3000
1 inch = 250 Feet
250 125 0 250 Feet

Figure 6-1
Wastewater Collection System

Harvard University Longwood Campus
Institutional Master Plan

Campus
Sanitary sewer

EPSILON ASSOCIATES INC.
Engineers Environmental Consultants

6.2.3 Proposed Sanitary Sewer System Improvements

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

6.3 Water Supply

6.3.1 Existing System Conditions

The existing water service for domestic use and fire protection to the Longwood Campus is supplied from water systems owned and maintained by the BWSC. Existing water supply lines within the Harvard University Longwood Campus are owned and maintained by Harvard. Both on-site and off-site water supply systems are shown on Figure 6-2.

BWSC delivers water to this area through interconnected network water distribution systems, designated as Southern Low Service (SLS) Systems and Southern High Service (SHS) Systems. SLS systems are generally used to meet domestic water needs and street hydrant demand. SHS systems are generally used as the main supply to the low pressure service system, and supply water for building fire protection systems.

The SLS and SHS systems are integrally connected to form loops that allow major water demands to be fed from more than one direction. Looping allows each distribution system to function at optimum efficiency and provides a measure of safety and redundancy in the event of a water main break. Hydrant test data in the vicinity of the Longwood Campus indicates there is currently ample capacity in the system (see *HSDM Research and Education Building DPIR*, October 2002, submitted simultaneously with this IMP).

6.3.2 Future Water Demand

Water use calculations for the future IMP projects are presented above in Table 6-1. The water supply rates outlined in Table 6-1 are based on the proposed new space, minus the space to be demolished for the HSDM Research and Education Building.

However, it is anticipated that only 16,000 sf of the proposed maximum area will be "new" space that will not be used for decompression. Therefore, the Harvard Longwood Campus as a whole will likely only increase future water demand by 3,200 gpd (16,000 sf x 200 gpd/1,000 sf).

6.3.3 Proposed Water Supply System Improvements

Water system improvements will be proposed to provide necessary connection points for the new projects. The design of new facilities contributing additional flows, or necessitating connection to the municipal system main, will require review by BWSC, under its Site Plan Review process, on a project-by-project basis.

Within the next year, the Vanderbilt Hall will undergo minor renovations on kitchen and bathroom fixtures. Some toilets have been leaking periodically. All faucets and toilets will be installed in accordance with local code. These renovations will result in minor reductions in water usage.

Parcel A has approximately 1,800 fan coil units, most of which are 15-20 years old. These units are being replaced in increments over the upcoming years. This will result in more efficient use of water.

Over the next four years, additional fire protection (*i.e.*, sprinklers) will be added in the LHRRB Building, the Goldenson Building and the Seeley G. Mudd Building. This project will not increase daily water usage rates.

6.4 Stormwater Drainage

6.4.1 Existing System Conditions

The existing stormwater drainage system that services the Longwood Campus is owned and maintained by the BWSC. BWSC has recently videotaped and replaced, as necessary, all of the stormwater lines in Longwood Avenue. The system in this area ultimately discharges into the Charles River Basin via the Muddy River Diversion Conduit. Existing stormwater drainage lines within the Harvard University Longwood Campus are owned and maintained by Harvard. Harvard has developed a Stormwater Management Plan for the Longwood Campus that minimizes the potential for stormwater runoff to carry pollutants to local water bodies. Both on-site and off-site stormwater drainage systems are shown on Figure 6-3.

Under the existing drainage pattern around the Interim Building, stormwater runoff is directed to a 15-inch BWSC storm drain in Longwood Avenue via several connections within the campus. Currently, stormwater drainage from this area is collected by an existing system comprised of a series of catch basins and drainage lines routed by gravity. Sites 2-5 are currently courtyards that contain mostly impervious surface (*i.e.*, concrete and brick pavers).

6.4.2 Future Stormwater Flows

The proposed HSDM Research and Education Building will result in minimal, if any, change in runoff from the site. Currently, the project sites are mostly impervious. For the small areas currently landscaped, the post-construction project site will include landscaping similar to existing conditions (*e.g.*, along the edge of the HSDM Building). Therefore, projects will not result in a significant increase in impervious area and will have little change on the patterns or quantity of runoff. Stormwater runoff from the brick/concrete courtyards would now originate from rooftops, with minor increases in runoff quantity.

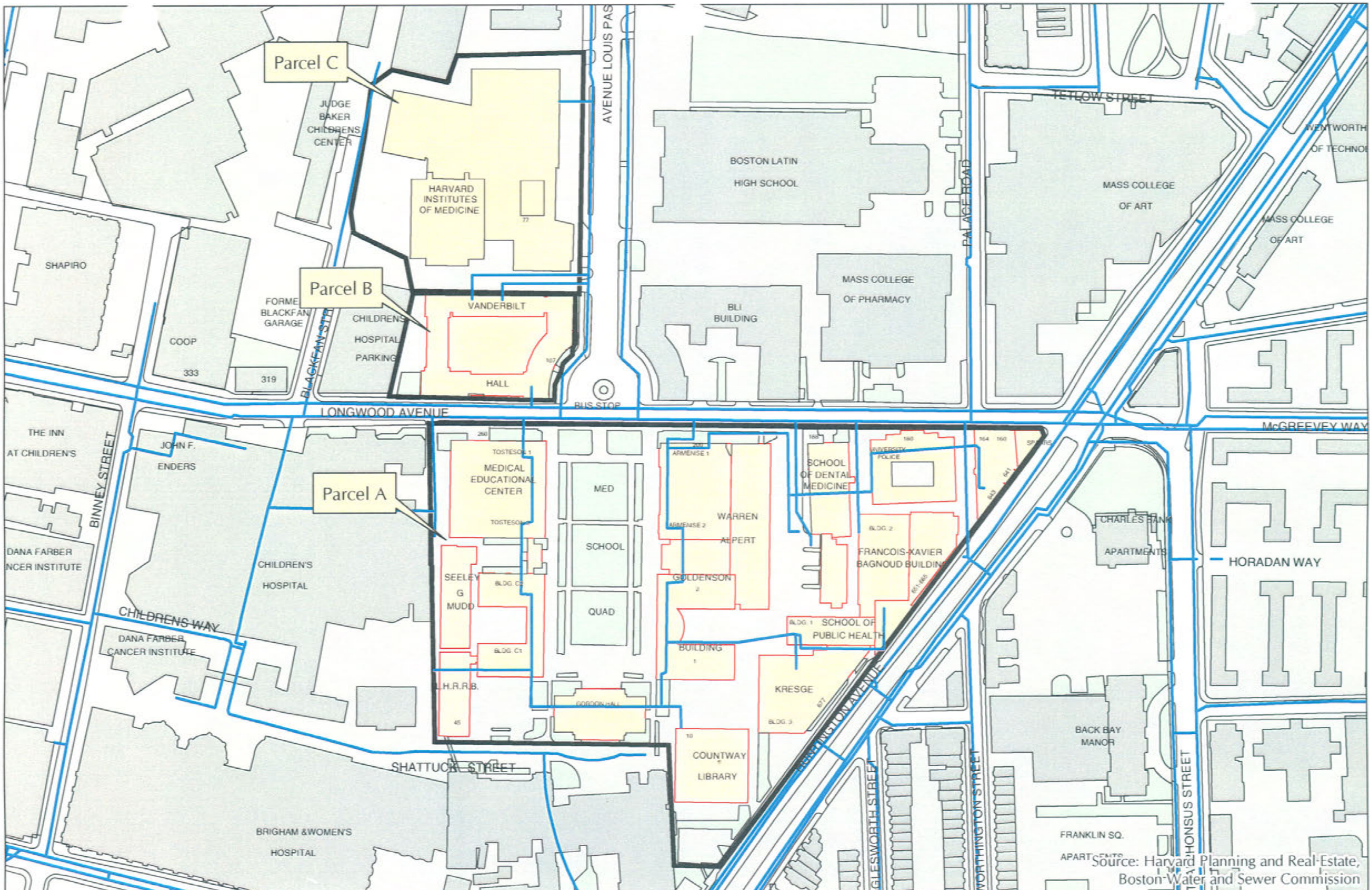


Figure 6-2
Water Supply System

Harvard University Longwood Campus
Institutional Master Plan

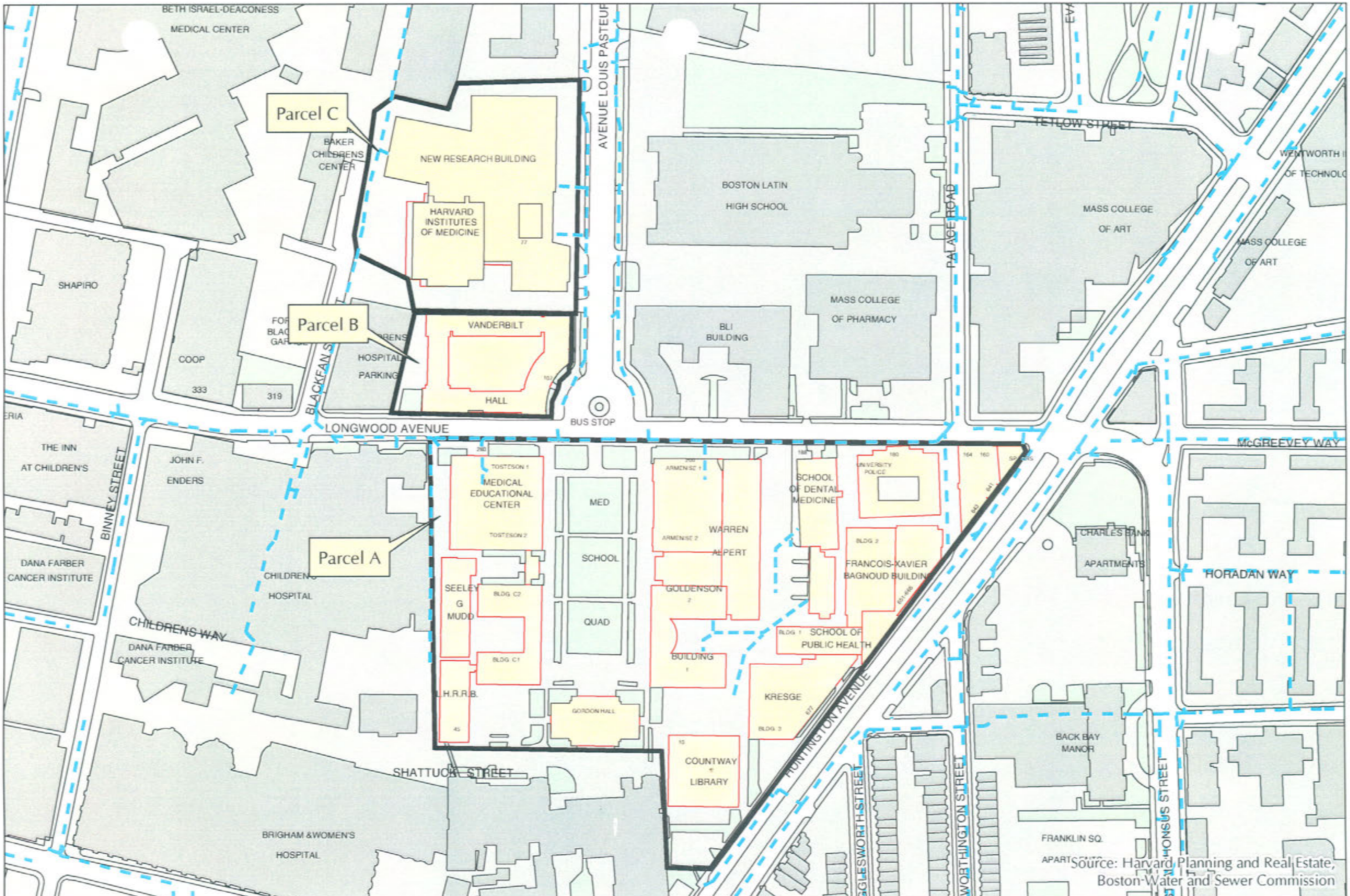


Figure 6-3
Storm Water Drainage System

Harvard University Longwood Campus
Institutional Master Plan

Stormwater runoff quality will be improved through upgrades to the existing stormwater management system. BWSC has indicated there is currently adequate capacity to support the HDSM Research and Education Building.

6.4.3 Proposed Stormwater Drainage System Improvements

Stormwater drainage system improvements will be proposed primarily to provide necessary connection points for the new projects. If required, drainage systems will be equipped with pretreatment systems such as oil/water or solid settlers. The majority of stormwater runoff from new projects will be collected from the roof, which is considered clean water. The design of new facilities contributing additional flows, or necessitating connection to the municipal system main, will require review by BWSC, under its Site Plan Review process, on a project-by-project basis.

Stormwater runoff generated from the proposed projects will be conveyed through the existing on-site stormwater drainage controls to the BWSC drainage system in Longwood Avenue. The lateral drain connections and surface drain structures required by the projects will meet the latest city and state codes and standards.

6.5 Electrical Service

6.5.1 Existing System Conditions

The Harvard Longwood Campus is supplied with electricity from NSTAR, as shown in Figure 6-4. The majority of electricity for the Longwood Campus is routed through a distribution system originating from the Medical Area Total Energy Plant (MATEP). MATEP is owned by Advanced Energy Systems (AES), a subsidiary of NSTAR. NSTAR also provides backup redundancy with separate distribution lines.

The campus is fed from one 13.8-kV switchgear located near the Tosteson Medical Education Center Building. The switchgear is thirty years old and is in need of replacement. Each building has a step-down transformer that provides the building with electricity ranging from 110 to 480 volts.

6.5.2 Future Electrical Requirements

Future electrical requirements are expected to be proportional to the net new space developed as shown in Table 6-2. The overall requirements of the proposed projects are anticipated to be negligible.

Table 6-2: Future Electrical Demand

Site Description	Maximum Area (gross sf)	Usage Rate* (MW-hr)
HSDM Research and Education Building	53,000	0.53
Dental School Interim Building (to be removed)	-11,045	-0.11
Goldenson Magnet Unit Addition	4,500	0.05
Armenise Addition	10,000	0.10
Goldenson Addition	10,000	0.10
Building C Addition	10,000	0.10
Net New Total	76,455	0.76

*Based on a factor of 10Whr/ft^2.

6.5.3 Proposed Electrical Service Improvements

NSTAR will provide electric power to the proposed projects from the existing infrastructure in Longwood Avenue. Harvard will coordinate the final design and connection with NSTAR.

A two- to three-year project has recently been initiated to replace the old switchgear. The new switchgear will likely be a waterproof double-ended switch. The design provides a level of redundancy in that one side of the switch can be isolated for preventative maintenance while the other is operable. This new equipment will increase system reliability.

6.6 Chilled Water

6.6.1 Existing System Conditions

MATEP supplies chilled water to the majority of the Longwood Campus through an extensive underground distribution network, as shown in Figure 6-5.

Chilled water lines extend from MATEP to the Longwood Campus through two main branches. The first branch runs along Shattuck Street and supplies the buildings in Parcels A and B. A second branch travels northeast along Blackfan Street. This branch passes through an underground chiller vault owned by MATEP before supplying the Harvard Institute of Medicine Building. The chiller vault acts as a booster to the supply lines from that location.

The New Research Building has its own chilled water system and, therefore, is not connected to the MATEP distribution system.

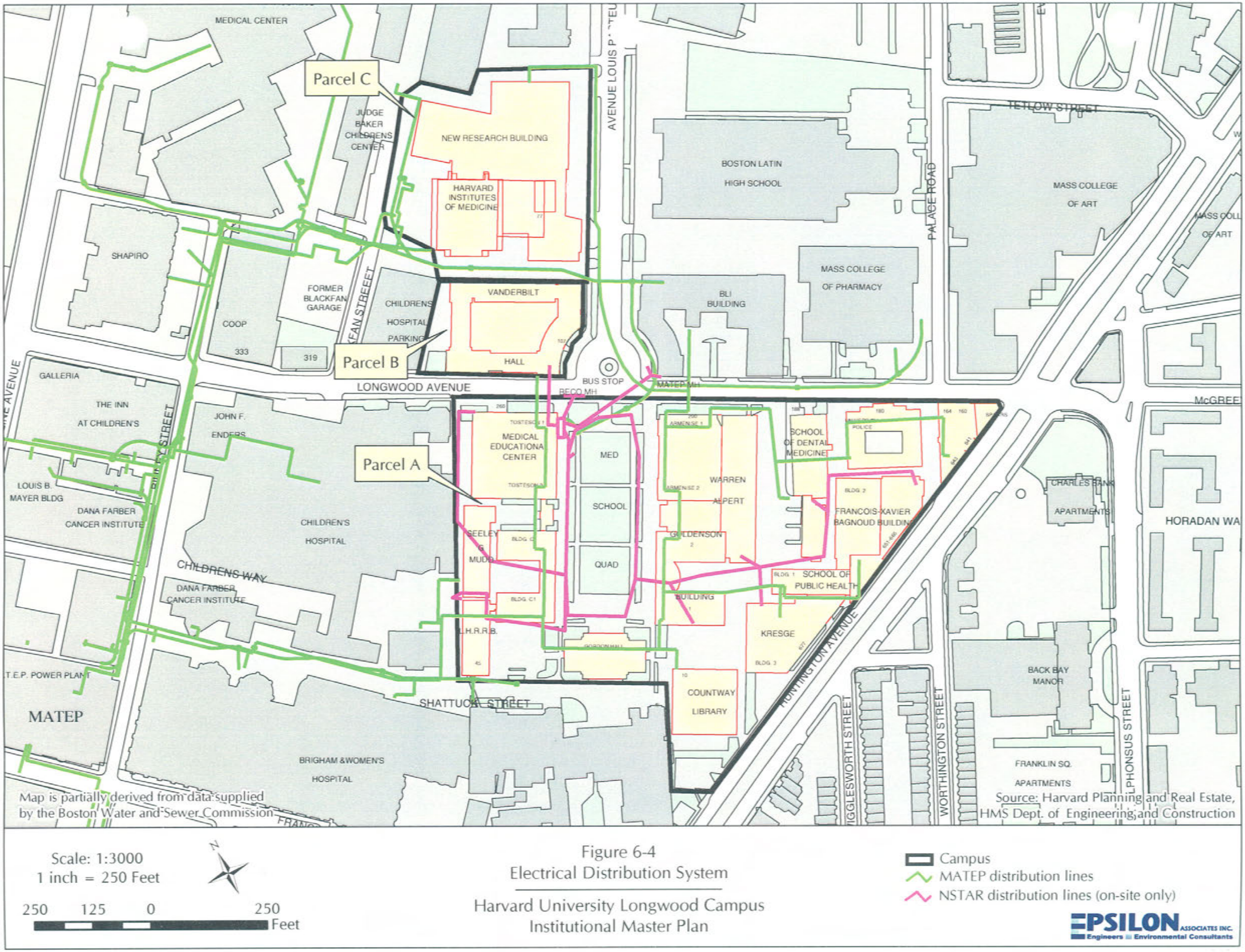


Figure 6-4
Electrical Distribution System

Harvard University Longwood Campus
Institutional Master Plan

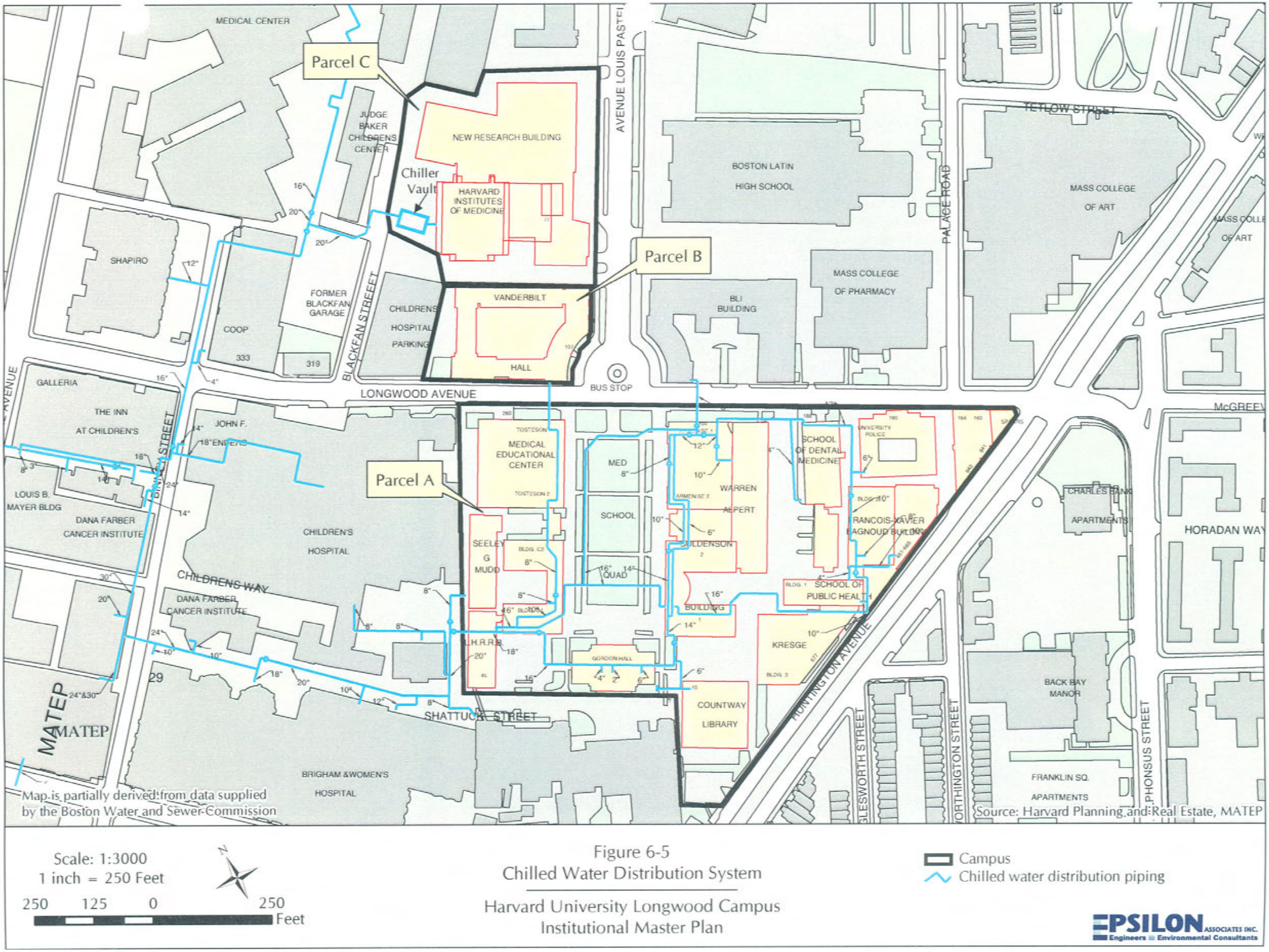


Figure 6-5
Chilled Water Distribution System

Harvard University Longwood Campus
Institutional Master Plan

6.6.2 Future Chilled Water Requirements

The chilled water line for the new HSDM Research and Education Building will connect to MATEP's existing system between the existing HSDM Building and the Warren-Alpert Building. The estimated chilled water demand of the HSDM Research and Education Building is 425 tons. MATEP has indicated that it can supply the project's cooling requirements.

6.6.3 Proposed Chiller Water System Improvements

The chilled water system is currently being evaluated to improve the balance of chilled water supplied to each building. The campus receives adequate chilled water from MATEP; however, the internal system is not balanced, and, therefore, there are some buildings that do not receive enough cooling during the summer months.

6.7 Natural Gas

6.7.1 Existing System Conditions

Keyspan Energy Delivery has a network of low pressure natural gas mains in the streets adjacent to the project, as shown in Figure 6-6. Keyspan Energy Delivery guarantees a minimum of four inches water column pressure, although it is not uncommon to reach eight and a half inches water column during the summer months. The Longwood Campus has experienced very reliable supply of natural gas over the years.

Natural gas is currently used in a limited number of water heaters, oil burners, and Bunson Burners throughout the Longwood Campus. The primary source of heat is extracted from MATEP's steam distribution network (see Section 6.8).

6.7.2 Future Natural Gas Requirements

An insignificant amount of natural gas will be required by the HSDM Research and Education Building, primarily for Bunson Burners. The remaining IMP projects at Sites 2-5 are also not expected to require significant amounts of natural gas.

6.7.3 Proposed Natural Gas System Improvements

Natural gas system improvements will be proposed primarily to provide necessary connection points for the new projects. Harvard will coordinate the design and connection with Keyspan Energy Delivery.

6.8 Steam

6.8.1 Existing System Conditions

MATEP supplies steam to the majority of the Longwood Campus through an extensive underground distribution network, as shown in Figure 6-7. The steam is converted onsite to hot water, and fan coil units located throughout the buildings transfer the energy to comfort heat.

Steam lines extend from MATEP to the Longwood Campus through two main branches. The first branch runs along Shattuck Street and supplies the buildings in Parcels A and B. A second branch travels northeast along Blackfan Street. This branch supplies Parcel C, consisting of the Harvard Institutes of Medicine Building and the New Research Building.

6.8.2 Future Steam Requirements

The steam line for the HSDM Research and Education Building will connect to MATEP's existing system between HSDM and the Warren Alpert Building. Steam will be carried to the proposed project through a 6″ high-pressure service line into the building with a heat input rating of seven million British thermal units per hour (MMBtu/hr), or approximately 7000 lbs/hour. MATEP has indicated that it can supply the required superheated steam to satisfy the project's heating requirements.

6.8.3 Proposed Steam System Improvements

Aside from providing connection points for the new projects, the Harvard Longwood Campus will undergo the following energy efficiency improvement projects that, in turn, will reduce the amount of steam usage:

- Expand the Energy Management System by automating air temperature in all buildings on campus;
- Replace air handling units in the Armenise Building, Goldenson Building, and Seeley G. Mudd Building; and,
- Replace the roof of 180 Longwood Avenue.

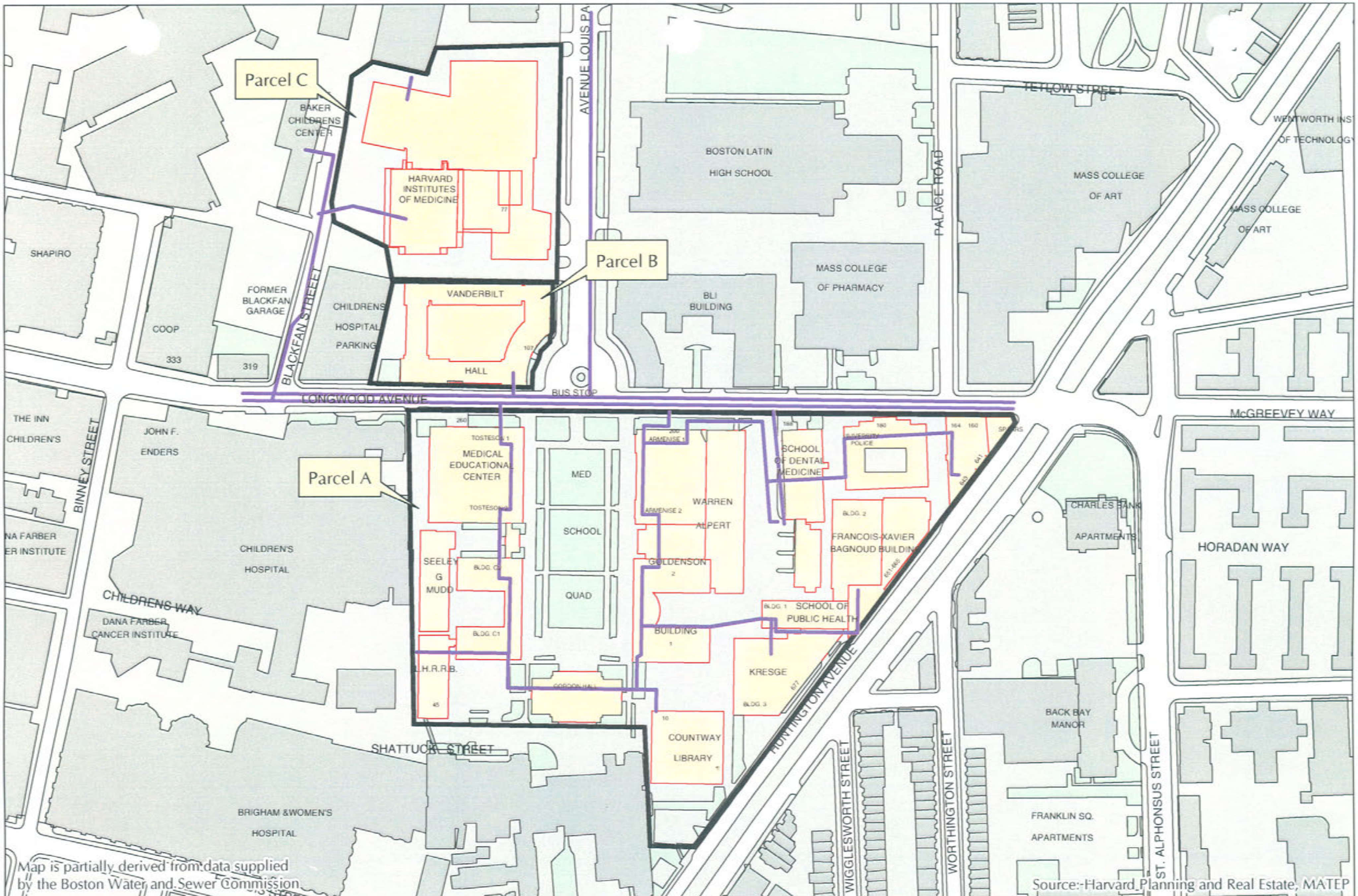


Figure 6-6
Natural Gas Distribution System

Harvard University Longwood Campus
Institutional Master Plan

EPSILON ASSOCIATES INC. Engineers Environmental Consultants

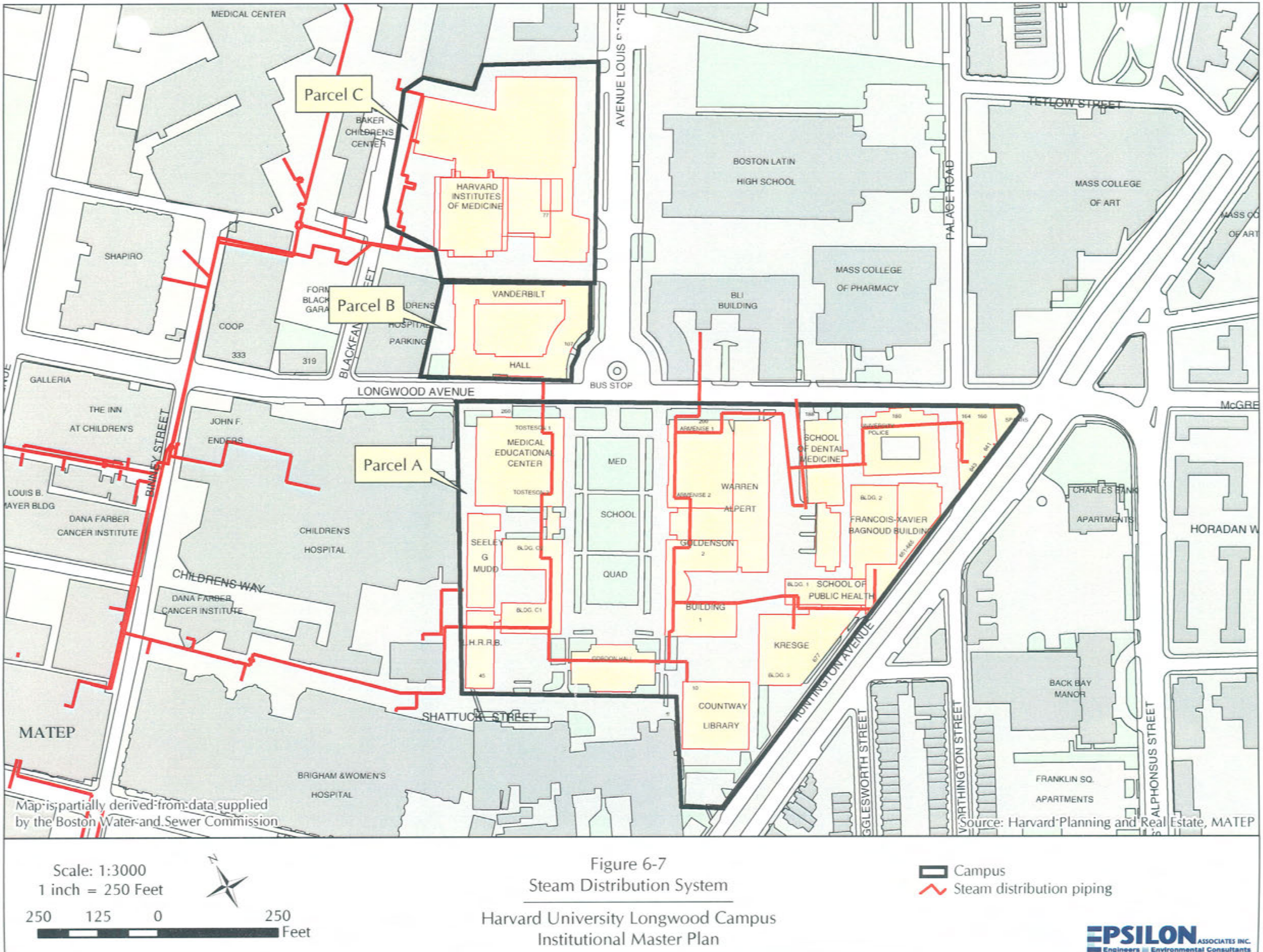


Figure 6-7
Steam Distribution System

Harvard University Longwood Campus
Institutional Master Plan

EPSILON ASSOCIATES INC.
Engineers | Environmental Consultants

6.9 Telecommunications

The Harvard Longwood Campus is supplied with telecommunications services from Verizon through two switches. The New Research Building has its own switch, supplied with a primary and secondary source of fiber optic cable. An older second switch is located by the Countway Library and supplies the remainder of Parcels A, B and C. This switch is also supplied with a primary and secondary source of fiber optic cable. In the future, Harvard will transfer Parcels B and C onto the New Research Building switch to balance the load.

7.0 Community Benefits

7.0 Community Benefits

7.1 Introduction

This section describes the numerous community service programs, employment opportunities, and other benefits – including investments in off-campus physical improvements -- resulting from Harvard University's presence in the LMA.

Harvard University is the Greater Boston area's second largest private employer, one of the largest purchasers of goods and services, and is a major revenue generator. Harvard estimates that the institution's regional economic impact is over $2 billion annually. Harvard is committed to the ethic and action of public service called for in its original charter. Harvard students, staff, and faculty participate in approximately 240 community service programs, dozens of which originate with HMS, HSDM, and HSPH.

In addition to the benefits described in this section, the three schools within the Harvard University Longwood Campus – HMS, HSDM, and HSPH – and Harvard's affiliated hospital together attract hundreds of millions of dollars in federal research funding each year. This funding helps Boston maintain its standing as a national leader in health care innovation, cutting-edge biomedical research, and new technology development. Such substantial federal R&D funding also stimulates significant secondary employment and economic growth in Boston and throughout the region.[1]

7.2 Community Service Programs

The three Harvard professional schools on the Longwood Campus – HMS, HSDM, and HSPH -- operate numerous community service programs. Among them are the following:

- Mission Hill Multicultural High School Science Enrichment – This program has brought Boston Public School ninth graders to HMS to do genetics research, and Harvard has donated laboratory equipment to the Mission Hill Multicultural High School for use in a genetics curriculum at the school.

- The Family Van – This HMS initiative services local communities with basic medical screening, health education, counseling, and personalized referrals and serves as a bridge between medically underserved populations and existing medical and social service agencies. The Van has had more than 18,000 client visits and made 1,700 referrals to over 100 health and social service agencies. The Family Van administrative offices have recently moved to Parker Hill Avenue in Mission Hill.

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1 *Federal R&D Funding in Boston, City's Intellectual Capital Yields Large Economic Benefits*, Boston Redevelopment Authority, Report #557, May 2002.

- First-year Urban Neighborhood Campaign – This program was started in 1998 and is designed to encourage incoming students to do community service work in the Boston area. Students join the program for a week before orientation begins, with groups of six to eight first-year students matched with second-year leaders. They participate in community service projects throughout Boston, including vaccination, pediatric prevention programs, dental awareness programs and others.

- Health NOW! – Medical, dental and public health students participate in a 12-hour training and then volunteer a minimum of once per week teaching health curricula in local agencies. Students volunteer in agencies such as the Vietnamese-American Civic Association, Haitian Multi-Service Center, Suffolk County Jail and Boston-Chinatown Neighborhood Center. Students also participate in reflection sessions and a spring term seminar series.

- Martha Eliot Health Center Mentoring Program – HMS/HSDM students are matched with and work one-on-one with (mostly Latino) middle and high school aged students at the Martha Eliot Health Center. Mentors also see students outside of their academic tutoring relationship and engage youth in other outside activities. Student mentors work to provide a complete orientation and ongoing training and support for mentors.

- Mentoring for Science – Mentoring for Science is an after-school program established through a HMS partnership with 8th grade teachers. Eighth grade middle school students are linked with Medical School faculty and graduate and medical students who serve as advisors on science projects and as role models/mentors. The program is designed to enhance student critical thinking skills, provide laboratory exposure and increase knowledge about careers in science through mentoring relationships.

- Prevention, Health Awareness and Choice through Education – Harvard Medical and Dental School students participate in a training program on adolescent health issues and then volunteer time to teach a health course at Boston English High School in the Spring.

- Saturday Science Academy – With the guidance and support of HMS faculty and graduate students, Harvard College undergraduate minority students piloted a Saturday Science Academy designed to expose Boston 10th and 11th grade students to various fields of science, hands-on experiments, and one-to-one mentoring.

- Senior Citizen’s Dinner/Dance – On the first Friday of December, the Office of Government and Community Programs begins the holiday season by commemorating the rich contributions of Mission Hill's senior citizen community with its annual Senior Citizen's Dinner/Dance. Staff and students from the School of Public Health and HMS join in the festivities.

- Faculty Community Outreach – Many HMS faculty members serve as volunteer staff, providing free or affordable health services in many of the community's underserved areas. The local health organizations where they volunteer include the Dimock Community Health Center, the East Boston Neighborhood Health Center, and Health Care for the Homeless.

- Just for Girls at MissionSAFE – An after-school exercise and nutrition program for inner city girls, this project encourages teens to exercise through dance. Girls are also educated about a wide variety of health topics such as violence prevention, self-esteem, HIV and STDs and much more.

- Mission Hill Walk for Health -- For seven years, HMS, HSDM, HSPH and a wide variety of local institutions, schools, hospitals and area non-profit agencies have worked to produce the annual Mission Hill Walk for Health. Monies raised from the walk benefit youth programs in Mission Hill.

- ABC/BABIES Clinic (Adolescent and Baby Care/Boston Adolescent and Baby Initiative to Ensure Success) – This program seeks to improve maternal and infant health for minority adolescent mothers in Roxbury by increasing teen parent knowledge and providing extra support to teen parents. The ABC/BABIES program uses a mentorship/mentee relationship by matching medical students with parenting/pregnant teens.

- Project Bridge – This is a student-run collaboration between HSDM and the Bridge Over Troubled Waters organization, which was created to provide outreach, counseling and primary health and dental services to runaway teens in Boston. Project Bridge has tried to satisfy the dental needs of this under-served population. It provides, on a weekly basis, such services as consultations, examinations, prophylaxis and fluoride treatment, general restorative dentistry, endodontics, limited periodontics, and limited oral surgery. Project Bridge has been successful in raising in excess of $50,000 towards the improvement of the Bridge Over Troubled Waters dental clinic. Project Bridge is an on-going effort to broaden the scope of services provided, to design educational programs geared for patients and counselors, and to collect and report data on the dental needs and attitudes of the Bridge population.

- Bright Smiles/Bright Futures Program -- HSDM students provide oral health screening, intervention, and education to children in Boston neighborhoods.

- Operation Mouthguard - This is a new student-driven project which works with the Charlestown Boys & Girls Club to provide mouthguards for youth athletic teams in the greater Boston area: Blue Hill, Charlestown, Chelsea, Roxbury, and South Boston. Its goals are to help prevent facial injuries and dental trauma, and increase awareness of oral health and safety. In its first year, Operation Mouthguard served 50 youths.

- School of Dental Medicine Clinical Teaching Practice – HSDM students participate in the pre-and post-doctoral teaching clinics coordinated by the School, providing supervised direct-care services at reduced rates. All 4th-year predoctoral students have a three-month rotation at one of the local community health centers, or one of the Veterans' Administration Medical Centers.

- Cambridge Children's Dental Project – In this program, HSDM students participate in a school-based screening program that identifies children with unmet dental needs and those high-risk children who should receive dental treatment.

- Emerson Nursing Home Program – Starting in August of 2002, this program will provide screening and dental services to ambulatory and non-ambulatory residents of the Emerson Nursing Home in Watertown. Dental services such as oral health screening, oral hygiene instructions and soft tissue management, simple extractions, denture adjustments and appropriate referrals, and basic treatments will be provided for the 130 long-term and 25 short-term residents by HSDM 4th year students. This program attempts to provide services that meet the dental needs of the geriatric patient with physical and psychological problems.

- Boston Alliance for a Healthy Environment -- HSPH has linked together community leaders and Harvard faculty to work on this initiative. The mission of this project is for researchers, community leaders, and health care providers to identify and address the environmental health concerns of the Roxbury, South End, and Jamaica Plain neighborhoods. Special focus will be placed on childhood asthma and lead poisoning.

- Environmental Health Education Project -- HSPH and research specialist Marshall Katler collaborate with Boston Public schools to develop curricula and projects for elementary and middle school students designed to stimulate interest in the science and the environment. The project is open to schools system-wide.

- ABCD SummerWorks Program -- Each year HSPH arranges for summer job placements in HSPH offices and centers for local youth participating in the ABCD program. In 2002, 5 youth were assigned to various administrative and research areas.

- Community Partnership Day -- This annual HSPH event focuses on public health issues and community involvement. It provides an opportunity for over 40 human and social service agencies from Mission Hill and greater Boston to meet and recruit School of Public Health faculty and students for practice opportunities, internships, and volunteer activities.

- Harvard Mentoring Project -- HSPH's Center for Health Communication is directing this national media initiative with funding from the Robert Wood Johnson Foundation and the MCJ Foundation to recruit mentors for at-risk youth. The program's goals are to recruit additional volunteers for existing programs and to stimulate the creation of new projects. The Harvard Mentoring Project is teaming up with leading communications companies to create National Mentoring Month--an annual, concentrated burst of national and local media activity combined with extensive community outreach. National Mentoring Month will be held each January beginning in 2002.

- Minority Research Apprenticeship Program --The HSPH sponsors this program, which provides 10 high school juniors and seniors with a combination of summer work experience, mentoring, and independent study in a health or technical field. The program is open to students from Boston public schools through an application process.

- Mission Hill Walk for Health --The Mission Hill Walk for Health was organized by the School of Public Health as a community-wide event to raise funds for local youth programs. Over the past five years, the Walk has raised approximately $200,000, which have benefited upwards of nine organizations including programs at the Mission Hill School, Project LIFE, Mission SAFE, Sociedad Latina, and Roxbury Tenants of Harvard.

- Youth Day -- Youth Day is part of the HSPH/Boston School outreach effort. This past year (2002) students and teachers from the Mission Hill Pilot School 7th and 8th grades were part of a three day learning experience in lab techniques in Science.

- Harvard Prevention Research Center on Nutrition and Physical Activity --The Harvard Prevention Research Center is collaborating with the Boston Public Schools to introduce *Planet Health* curriculum in six middle schools and *Eat Well and Keep Moving* curriculum in six elementary schools citywide. In 2003, the programs will expand into an additional six middle and six elementary schools respectively.

- The Prevention Research Center is also actively working with the City's Office of Community Partnership and the Boston Public Health Commission to promote physical activity and Nutrition as part of the *Play-Across Boston* initiative. The initiative recently completed a "mapping" of the City's recreational facilities, playgrounds and youth programs in conjunction with the City's Office for Community Partnerships.

- Violence Prevention Programs -- HSPH's Violence Prevention program is also working with six elementary schools to implement the *Peace Zone Violence Prevention Program.* This collaborative is directly working with schools located across Boston in an effort to promote nonviolent behavior and to assist in creating a safe educational environment.

- The HSPH Harvard Youth Violence Prevention Center is a collaboration of Health Centers from South Boston, Dorchester, Roxbury, East Boston, and Mattapan; three community youth agencies, the Boston Police Department, the Attorney General's Office, the Boys and Girls Club, and Boston's Office of Community Partnerships. The Center is developing a community wide strategy to address youth concerns and prevent violence and has cosponsored several of the City of Boston's Office for Community Partnerships' conferences and symposia.

- ACCESS Project -- The ACCESS project is an Asthma Health intervention targeting women and children at high risk for developing asthma. The Collaboration consists of a partnership of HSPH and 5 Community Health Centers and the Center for Community Health Education Research and Service (CCHERS) at Northeastern University

7.3 Training and Employment Initiatives

As the Greater Boston area's second largest private employer, Harvard University employs over 2,000 faculty and 12,000 staff, approximately 2,600 (19 percent) of whom are Boston residents. At the Longwood Campus, approximately, 2,350 full-time staff, 715 part-time staff, and 250 casual/temporary employees work at HMS, HSDM, and HSPH, in addition to the 622 on-campus faculty members employed at those schools (see Section 3.2).

A wide variety of professional, administrative and support jobs are available at Harvard University, and Harvard makes a special effort to recruit people from Boston through citywide advertising and neighborhood and campus newspapers. Harvard also recruits through more that 100 community-based employment training programs and agencies, including Training, Inc., in Boston.

Harvard provides job seekers with an online database of all open administrative positions at Harvard and the tools to apply for positions online. HIRES, Harvard's online job database, is updated daily and includes all non-faculty position listings from every school at the University. Job seekers can search the database by school, job category, salary range, keyword, and other specific criteria and submit an online application.

Harvard also participates in a number of youth employment and training programs including the Boston Summer Youth Employments Program, sponsored by the Private Industry Council.

7.3.1 Construction Employment

The construction of the proposed IMP projects will contribute directly to the economy by providing approximately 50 – 75 daily construction jobs, 75 – 100 during peak construction. A Boston Residents Construction Employment Plan will be submitted in accordance with the Boston Jobs Policy. The Plan will provide that Harvard will make reasonable good-faith efforts to have at least 50 percent of the total employee work hours be by Boston residents, at least 25 percent of total employee work hours be by minorities, and at least 10 percent of the total employee work hours be by women.

7.3.2 Permanent Employment

Development of the IMP projects will result in approximately 25 new jobs, including technical and support positions. Harvard provides an opportunity for collaboration in job training and outreach programs among the affiliated institutions that will occupy the building.

7.4 Tax Benefits

Harvard University is in discussions with the City of Boston regarding a Payment in Lieu of Taxes (PILOT) relating to the New Research Building.

7.5 Linkage Payments

The BRA requires linkage payments in the amount of $7.18 per sf for every zoning sf above 100,000 square feet devoted to development impact uses, and jobs linkage payments of $1.49 per square foot above 100,000 sf of development impact uses, which include the research uses proposed for the HSDM Research and Education Building. The BRA allows a one-time, 100,000-square-foot exemption; the HSDM Research and Education Building project is included within the exemption and, therefore, no linkage payments are required. The gross floor area included within the building addition projects will similarly be attributed to the 100,000-square-foot exemption and are not expected to trigger the requirement for linkage payments.

7.6 Pedestrian Network Improvements

As part of its commitment to improving the pedestrian network in the Longwood Campus area, Harvard is participating in two major off-campus improvement projects.

- Reconfiguration of Oscar Tugo Circle with widened sidewalks and new plantings.

  MASCO (with Harvard's financial support) has recently constructed roadway and pedestrian access improvements at the Longwood Avenue and Avenue Louis Pasteur intersection known as Oscar Tugo Circle. This unsignalized intersection, located in the LMA, is heavily used by vehicles and pedestrians destined for the surrounding medical and academic facilities.

  Under the improvement project, Harvard and MASCO recently relocated the existing shuttle bus stop from directly in the circle to a point approximately 300 feet north of the intersection. As a result of relocating the shuttle bus staging area, the travel lanes along Avenue Louis Pasteur were realigned with the existing curb on both sides of the street. With the realignment of the travel lanes on Avenue Louis Pasteur, Oscar Tugo Circle was widened to increase the area for pedestrian and landscape improvements within the circle. A new sidewalk on the island facing Longwood Avenue was also created to accommodate the high pedestrian volume that previously had to cross over 120 feet of pavement across Avenue Louis Pasteur.

In an effort to maintain the historic aesthetics of Oscar Tugo Circle and to provide a friendly environment, the island's landscape design was intended to complement the pre-existing granite planter and landscaping within the circle as well as be consistent with the entire Harvard Longwood Campus. All handicapped ramps within the intersection were also reconstructed to ensure that they comply with the federal Americans with Disabilities Act.

See Figure 7-1, and Figure 5-16 in Section 5.0, for a depiction of the roadway and pedestrian safety improvements at Oscar Tugo Circle.

- **Extension of Blackfan Street to the north and east to connect with Avenue Louis Pasteur.**

  As part of HMS's New Research Building, Harvard has included setbacks along Blackfan Circle to allow for the development of pedestrian access and open space amenities along Blackfan Circle. Blackfan "Square" will be an identifiable and attractive gathering place for pedestrians along Blackfan Circle that will be further supported by additional parcel setbacks that are proposed by Lyme Properties as part of their proposed Blackfan Research Center project (located adjacent to the New Research Building). It is envisioned that the creation of Blackfan Square will also encourage the use of off-street pedestrian connections by many LMA employees traveling between Avenue Louis Pasteur, Harvard, and the Beth Israel Deaconess Medical Center East Campus. This project is partially in progress as part of construction of the New Research Building. Harvard has committed its fair share of required land and monetary funding related to the future design and construction of the Blackfan Street extension project.

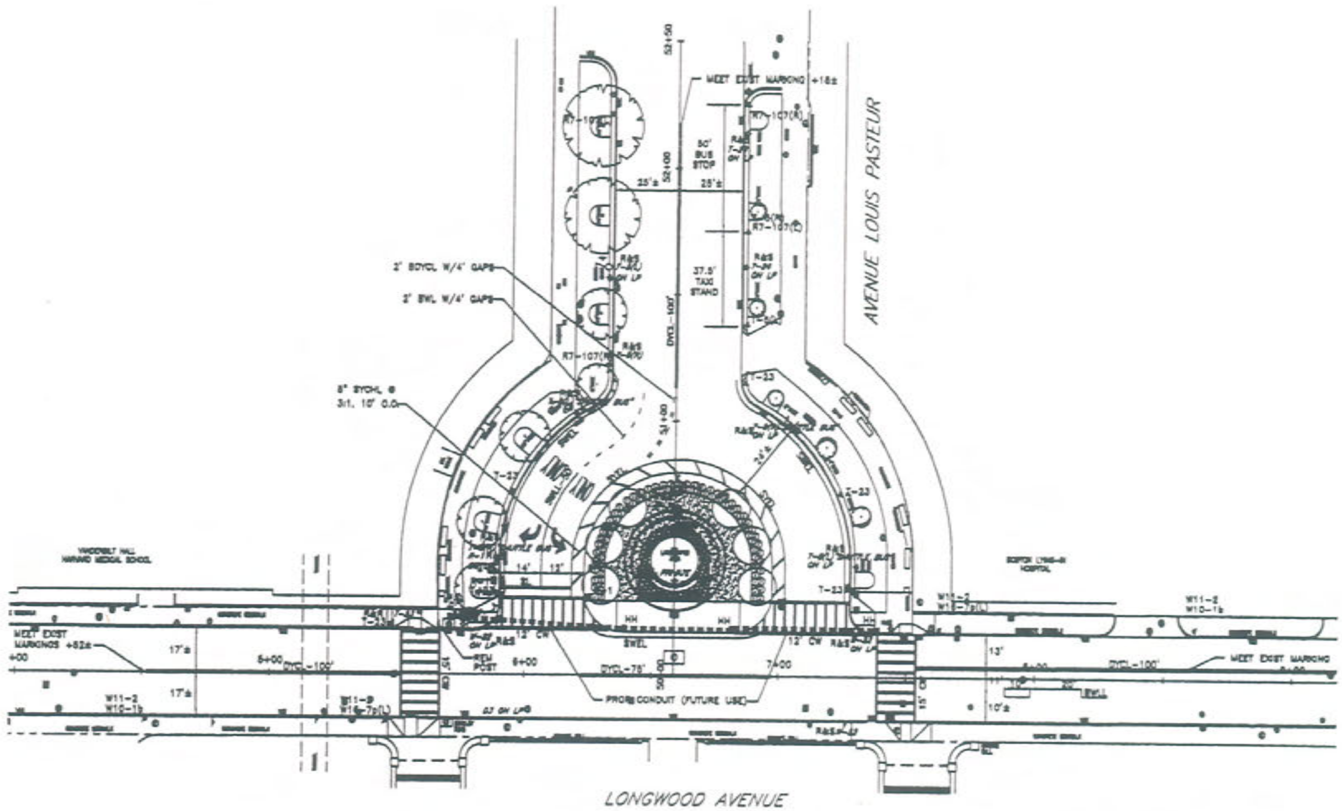

Figure 7-1: Oscar Tugo Circle Improvement Project

Appendices

APPENDIX A SCOPING DETERMINATION

BOSTON REDEVELOPMENT AUTHORITY
SCOPING DETERMINATION

FOR

HARVARD UNIVERSITY LONGWOOD CAMPUS
INSTITUTIONAL MASTER PLAN

PREAMBLE

The Harvard University Longwood Campus ("Harvard" or "Campus") is located in the Longwood Medical and Academic area (the "LMA") of Boston which is situated three miles from downtown and is adjacent to the Mission Hill and Fenway residential neighborhoods. Harvard has a significant presence on Longwood and Huntington Avenues and Avenue Louis Pasteur. The Harvard University Longwood Campus, for the most part, directly abuts other institutions in the LMA. The LMA is one of the country's most highly respected centers of medical and academic institutions. The LMA encompasses approximately 210 acres and provides approximately 30,000 jobs. The LMA is densely developed with approximately 13 million square feet of building floor area and approximately 12,000 parking spaces.

The LMA has reached a point where existing transportation infrastructure cannot accommodate additional growth or maintain a desired level of function without fundamental improvements. Peak-hour weekday traffic already exceeds the capacity of the area street network in many locations. Volumes during off-peak hours also tend to be substantial due to growth in outpatient services. New development must balance the interests of area institutions and adjacent residential neighborhoods, enhance the character and quality of the physical environment, and employ Transportation Demand Management (TDM) strategies to minimize on-site automobile use and parking. In participation with area residents and institutions, the Boston Redevelopment Authority ("BRA") intends to prepare a strategic plan ("Strategic Plan") for the LMA to guide future change in the area. The BRA will also seek, as part of the Strategic Plan, to locate some types of expansion to appropriate locations elsewhere in Boston, such as the Crosstown area near Melnea Cass Boulevard as a way to accommodate expansion needed by LMA institutions.

Under the Boston Zoning Code, an Institutional Master Plan has a dual purpose of meeting the needs of the institution and relating the campus to its context in a positive way. In preparing its Institutional Master Plan and Draft Project Impact Report, Harvard will need not only to demonstrate an understanding of its future facilities needs but also the context of its campus: land uses, physical characteristics, expected changes, resident desires, and applicable public policy. Care should be taken to respond to the concerns outlined below.

- The Longwood Medical Area is a dense institutional environment. However, Institutions located in the LMA will continue to need to grow if they are to remain an important and healthy sector of the Boston economy. It is important to the City that this growth be accommodated in sustainable ways to lessen the cumulative effects of development and to allow the LMA to remain a viable center for medical care and education. Therefore, it is reasonable to limit the rate of growth in the LMA and to allow necessary growth by institutions on a fair and equitable basis until completion of the Strategic Plan noted previously. Under these circumstances, therefore, the BRA will limit all Institutional Master Plans going forward to a five-year period. This means that the development program described in the Harvard Institutional Master Plan, for which zoning rights are sought, must be limited to projects that need to be developed and/or occupied within a five-year period from the date of approval by the Boston Zoning Commission.

- Attractive residential neighborhoods are viewed by the BRA as being vital to the long-term success of Boston. The LMA sits within the context of the Fenway and Mission Hill neighborhoods. The BRA has an ongoing concern that impacts from institutional operations and expansion not result in degradation of residential life in these neighborhoods. Further, the BRA encourages physical linkages and ongoing relationships between LMA institutions and abutting neighborhoods, which will strengthen nearby residential areas. The issue, for example, has been raised by residents with regard to the Huntington Avenue edge of the Campus. The northside of Huntington Avenue from Brigham Circle to Louis Prang Street is almost exclusively occupied by institutions. The section between Brigham Circle and Longwood Avenue is exclusively occupied by Brigham and Women's Hospital and by Harvard, except for Spaars Pharmacy. In this block neither the urban design characteristics of the buildings nor the homogeneity of institutional uses support residential life located on the other side of Huntington Avenue.

- The Mayor has appointed a Citizens Advisory Group (CAC) to assist the BRA in planning for the redevelopment of property owned by Mission Church, located at 80-100 Smith Street. The developer, retained by the Church, has proposed the demolition of the three existing historic buildings owned by the Church and the construction of housing on the site. The CAC, along with the BRA, is examining the feasibility of an alternate development scheme that would result in the reuse of one or more of the existing buildings. As a part of this effort, use of the redeveloped space by institutions in the LMA is being explored. This initiative is supported by the CAC. In preparing its IMP, Harvard is encouraged to examine the feasibility of meeting some of its need for space at the Mission Church property on Smith Street, which in turn would support the desire of the community to save these historic buildings.

- Harvard is encouraged to provide adequate University housing facilities for its students in response to Mayor Menino's policy which seeks to increase the number of students living in school controlled and managed housing rather than using scarce neighborhood housing resources. An assessment of the unmet need for Harvard sponsored student housing should be presented in the Master Plan.

Harvard's plan and schedule for addressing the need, if any, should also be described.

- Pedestrian circulation is particularly important in this district of the city where the traditional Boston block pattern is largely absent. The compactness of the LMA provides an opportunity to increase pedestrian movements by thoughtfully linking pedestrian routes into a network interconnecting campuses and the LMA as a whole. Pedestrian linkages between the LMA and adjacent areas are important as well to functionally integrate the two, to encourage walk to work benefits and reduce unnecessary vehicular trips. The Master Plan should examine this issue for the Harvard campus and propose pedestrian circulation improvements.

- The academic campus is in a large block that has limited access and makes wayfinding difficult. It would be desirable to enhance access to the Dental School facility, which is used now as a circulation path and entrance to the parking and delivery garage beneath the Quadrangle. Enhancing this entrance would improve access and legibility of the campus, and would create a distinctive setting for the campus. The path should be designed to look more like a normal city street, with curbs, sidewalks, lights, and trees. The path should not be compromised by the location of the ramp to the below-grade parking and delivery garage beneath the Harvard Quadrangle in the apparent right-of-way off of Longwood Avenue between Avenue Louis Pasteur and Palace Road.

- Green campus space, where it exists, is a great resource in the Longwood Medical Area, valued by the institutions and the general public. To preserve and enhance this dwindling resource institutions should create below-grade parking spaces and change the grade level to open space. Harvard deserves acknowledgement for beginning the process with this Master Plan and development proposal. The translation of surface parking into green landscape southwest of the Proposed Project's location presents the opportunity to enhance the green space amenities in the Longwood area and is significant to the open space network in and around the LMA. As part of this effort it may be necessary to consider alternatives to the cantilever design of the Proposed Project which may detract from the green space and pathway.

- As development of the campus proceeds any building that is close to Longwood Avenue should be designed so that the Longwood Avenue façade is treated as a building front, not as a side elevation. On the Harvard Medical inner campus the building facades do not recognize the unique and potentially beautiful avenue. The New Dental School project combined with the greenspace and pedestrian link to Longwood Avenue begins to take advantage of Harvard's distinctive characteristics and returns a handsome facade to the area's main street.

- The issue of access to the Campus is a major element of the Master Plan. Harvard should be applauded for its existing low ratio of parking. However, because of the current Campus uses, in association with the area street network whose capacity is stressed at peak periods in some locations, Harvard should continue to balance the use of transportation options available to them and consider reducing the amount of parking provided. The full and effective use of the public transportation facilities which serve the Harvard Longwood Campus and other transportation demand management strategies need to be included in the Campus transportation access plan.

- Harvard University's Longwood Campus Master Plan should include the location and details of all Harvard owned and leased space within the area of the City impacted by the LMA, including all surface and below-grade parking spaces.

SUBMISSION REQUIREMENTS

FOR

THE HARVARD UNIVERSITY LONGWOOD CAMPUS INSTITUTIONAL MASTER PLAN

The Boston Redevelopment Authority ("BRA") is issuing this Scoping Determination pursuant to Section 80D-1 of the Boston Zoning Code ("Code"). On March 18, 2002, Harvard filed an Institutional Master Plan Notification Form ("IMPNF") with the BRA seeking an Adequacy Determination for the approval of the Harvard University Longwood Campus Institutional Master Plan ("Master Plan"). Notice of the receipt by the BRA of the IMPNF ("Notice") was published in the Boston Herald on March 19, 2002 initiating the public comment period that ended on April 18, 2002. In conjunction with the submission of the IMPNF, Harvard also submitted a PNF which seeks Large Project Review, under Section 80B of the Code, for the New Dental School Facility project ("Proposed Project"). A separate Scoping Determination for the Proposed Project is being issued contemporaneously with the Scoping Determination for the Master Plan.

Pursuant to Section 80D-4.3c of the Code, scoping sessions were held on April 16, 2002 with the City's public agencies and on April 8, 2002 with the Impact Advisory Group ("IAG") where the proposed Master Plan, as outlined in the IMPNF, was reviewed and concerns were discussed. In addition, a copy of the Notice and IMPNF were provided to residents of the Mission Hill and Fenway neighborhoods. A public community scoping session, the LMA Forum, was held on March 25, 2002 where Harvard presented the IMPNF and issues were discussed. Following the scoping sessions and based on the BRA's review of public comments, comments from the City's public agencies and the IMPNF, the BRA hereby issues its written Scoping Determination pursuant to Section 80D-4.3 of the Code. Comments from the City's public agencies and the public, found in Appendix 1, 2 and 3 respectively, are incorporated as a part of this Scoping Determination.

The Scoping Determination sets forth those elements specified in Section 80D-3 of the Code that are required to be included in Harvard's Institutional Master Plan. The Scoping Determination requests information required by the BRA for its review of the proposed Master Plan in connection with the following:

1. Approval of the Harvard University Longwood Campus Institutional Master Plan pursuant to Article 80 and other applicable sections of the Code;

2. Recommendation to the Zoning Commission for approval of the Harvard University Longwood Campus Institutional Master Plan.

Harvard's Institutional Master Plan should be documented in a report of appropriate dimensions and in presentation materials which support the review and discussion of the Master Plan at public meetings. Thirty-five copies of the full report should be submitted to the BRA. An additional fifty copies or more of the document should be available for distribution to the LMA Forum participants, community groups, and other interested parties in support of the public review process. The Master Plan document should be a stand alone document or a separate and distinct section of an impact report submitted to the BRA in meeting the requirements of Large Project review for the Proposed Project. The Master Plan document may reference or include information from said impact report. The Master Plan document should include this Scoping Determination and text, maps, plans, and other graphic materials sufficient to clearly communicate the various elements of the plan. The Master Plan document should including the following elements.

I. HARVARD UNIVERSITY LONGWOOD CAMPUS MISSION AND GOALS

The mission of the Harvard University as it relates to its LMA campus ("Campus") should be described. In this case, Campus refers to the area in or near the LMA where Harvard occupies or proposes to occupy buildings, whether owned or leased, that are in such proximity that they share a common impact area and therefore should be the subject of the proposed Master Plan. The description should articulate the larger, as well as the local, aspects of the mission. Harvard's role as it relates to its affiliated teaching hospital in the LMA should be discussed. Services to the local community are of particular interest. The population served by Harvard and the major programs conducted need to be described. Changes expected in the type or size of the mission components, particularly as they relate to the Proposed Project, should be highlighted. The longer term goals and the expected growth in the number of students and research needs, at least ten years into the future, should be described. A statement of how the Master Plan will advance the mission and goals of Harvard should be included.

II. PROGRAM NEEDS AND OBJECTIVES

Specific program needs and objectives for the Campus to be addressed in the Master Plan should be defined in sufficient detail. A description of the analysis which was undertaken to identify the needs and objectives should be summarized. Included in the description should be current and future trends that are impacting Harvard and shaping program objectives. Projection of changes on campus populations, new or expanded programs, research, housing, parking, Harvard enterprises, and other activities that require space on the Campus in the next 5 years should be included.

The impacts of student housing demand is of particular concern to the City. A discussion of the need for housing by students of Harvard and Harvard's objectives to address the need should be included in this section. The purpose of this request is to gain an understanding of the impact of Harvard's students on Boston neighborhoods, especially the private housing market, and of the efforts of Harvard to mitigate such impacts. The discussion of housing, therefore, should include both the quantitative and the qualitative dimensions especially with regard to students living in private housing. In addition, a description and assessment of the effectiveness of Harvard's oversight management of student life in private housing should be provided.

A thorough description of Harvard's housing needs and objectives should be provided. The analysis should include the number of students (current and future), the demand generated for housing in Boston and the share of the demand met by Harvard provided housing and by private market housing. Analysis of the impact of students occupying private market housing needs to be described and analyzed. Such description and analysis should focus especially on areas where there are concentrations of college student residents and should seek to assess the impact students have on the residential housing market as well as on the residential quality of host neighborhoods.

III. PHYSICAL NEEDS AND OBJECTIVES

A. Campus

A summary analysis of the Campus should be provided using sufficient text and visual materials. The important physical characteristics and conditions should be mapped and described including buildings, building height and floor area ratio ("FAR"), open space, landscape, pedestrian and vehicular circulation, historic resources, and other important features. Land use, patterns of use, functional areas, building clusters, landmarks or other historic resources, vistas, view corridors, and other environmental features should be delineated and studied. Identification of the intentions of earlier Campus planners may help in analyzing current Campus conditions. The analysis should conclude by identifying the existing strengths of the Campus to be enhanced and the needs of the Campus to be addressed in the Master Plan.

B. Facilities

An inventory and description of the buildings, facilities, and other structures occupied on the Campus should be provided as required by Section 80D-3.2 of the Code. An updated illustrative Campus plan should be prepared showing the location of each facility. For each building the following information should be provided: total gross floor area, occupancy or use by gross floor area, height in stories and in feet, FAR (for each lot), year built and ownership. Information on parking facilities should include the total number of parking spaces and a breakdown of the number of spaces allocated by user category. Appropriate description of other types of facilities and their use such as infrastructure systems, recreational fields, and places of assembly should be provided.

An analysis of the existing facilities in light of the identified program needs and objectives should be undertaken and documented. Specific facility objectives which are addressed in the Master Plan should be set out. This section should conclude with a summary of Harvard's need for additional facilities described by use and floor area projected on an annual basis over the five-year period of the Master Plan.

IV. CAMPUS CONTEXT

The immediate area context of the Campus should be inventoried, analyzed and summarized in the Master Plan. The analysis should include land use, streets, building height and FARs, historic resources, open space, pedestrian routes, population, public facilities, and a five-year projection of future growth. The capacity and condition of the infrastructure system that serves the Campus should be documented. The impact of Harvard and its proposed expansion on the surrounding area should be discussed. Area residents and businesses should be consulted and their views regarding the Master Plan should be described. From this analysis, guidelines should be defined that will shape the Master Plan so that the Campus will relate positively to the area around it.

V. MASTER PLAN

A. Concept Plan

Alternative concept plans should be prepared and analyzed for the Campus with particular attention to areas of the Campus which interface with adjacent neighborhoods, public streets, historic resources and public open spaces. This analysis should address the question of the amount and types of services and facilities to be located on and off Campus. Elements of the concept plan would include the following:

- Definition and description of planning objectives;
- Illustration and description of a campus development concept;
- Design concepts which are used should be clarified;
- Articulation of subareas of the Campus based on use, density, and/or physical features;

- Definition of design principles which will serve as guidelines for the development of the Campus; and

- Identification of the pedestrian circulation system and its objectives and guidelines.

The alternatives analysis should lead to an explanation of why the proposed alternative concept plan was chosen.

B. <u>Development Program</u>

A description of all the significant physical changes proposed for the 5 year Master Plan time period should be provided at the level of definition required by Section 80D-3.4 of the Code. For those locations which are to gain zoning rights through the IMP, the information required is defined in Section 80D-3.4 of the Code. The impacts of each proposal should be discussed at a level of definition appropriate to the Master Plan and mindful that projects shall undergo Article 80 Large Project Review or Small Project Review when they are implemented. The demolition of any building over 50 years old is subject to the provisions of Article 85 of the Zoning Code (Demolition Delay).

1. <u>Buildings</u>

The information required for each new or recycled building project proposed includes the following:

(a) site location and approximate building footprint;
(b) square feet of total gross floor area and principal subuses;
(c) gross square feet of space that is demolished or occupancy terminated;
(d) floor area ratio (for each lot);
(e) building height in approximate feet and stories;
(f) number of parking spaces;
(g) current zoning of site;
(h) total project cost;
(i) estimated development impact payments; and
(j) estimated month and year of construction start and completion.

2. <u>Campus Improvements</u>

Information required for campus improvement projects include the following:

(a) description;
(b) location;

(c) estimated cost; and
(d) estimated month and year of construction start and completion.

3. Campus Expansion

Harvard must clarify its intentions with regard to campus expansion including the Sparrs building. If expansion is proposed through lease or purchase, the following information must be provided for each expansion location:

(a) location;
(b) gross floor area in square feet broken down by uses proposed by Harvard;
(c) lease period;
(d) current use;
(e) current owners;
(f) current zoning;
(g) current property assessment and property taxes paid to city;
(h) current occupants to be dislocated;
(i) description of proposed improvements;
(j) estimated cost; and
(k) acquisition and improvement schedule.

4. Development Program Context

(a) a series of context drawings should be prepared showing phase-by-phase the proposed developments in their larger surroundings for the campus, including

(1) a building heights map,
(2) an open space plan, and
(3) an isometric (3-D) drawing showing the general building massing of all buildings in the district.

(b) a study model of the larger neighborhood at a scale of 1"=40'-0" showing the proposed phases in context should be provided.

C. Transportation Plan

The scope of the transportation component of the Master Plan is included in Appendix 1.

D. Community Benefits Plan

1. Training and Employment Initiatives

Provide a description of Harvard's current workforce and project future employment needs concerning proposed future projects. There is particular interest in learning about that part of the workforce drawn from adjacent neighborhoods and about programs to recruit, train and promote this population.

2. Taxes

In the context of the master planning process, the Brigham should meet with the City's assessor to address the concerns expressed in Commissioner Rakow's letter found in Appendix 2.

3. Other Benefits

Identify current community benefits as well as any other benefits that minimize or mitigate detrimental and adverse impacts on the local community from the Hospital and proposed future expansion.

E. Urban Design Scope

1. Issues

The Campus and the City

The growth of the campus is an important and welcome enhancement of the most important sector of our local and regional economy. However, it brings with it the danger of the negative impacts of increased density - the creation of an impenetrable precinct very different in scale from the adjacent communities, lacking physical connections to the surrounding urban fabric, where way-finding is difficult for pedestrians and drivers, where relationships to the system of open spaces are disappearing, and where the single-use character creates an environment that may seem abandoned and unsafe after working hours. Harvard's efforts at reinforcing the predominant height and size of buildings have been successful and the proposed projects promise to continue that effort. The connections between urban systems and the campus have deteriorated, however, as the campus has grown.

The master plan should address the issue of connecting the campus to the city by setting forth a program to enhance existing connections and by identifying the opportunities to create new physical connections with the surrounding urban fabric. The physical connections shall comprise streets and sidewalks, pedestrian paths and plazas, landscapes and the spaces between them, and views.

The construction of FXB Building has dramatically improved the interface between the campus and Huntington Avenue, as has the pedestrian gateway on Huntington and the redesign of the space the surrounding the Countway Library. The master plan should include short-term proposals and long-term intentions to continue these improvements to enhance both the avenue and the campus. *The proposals may include both landscape improvements and buildings. The Kresge Building and particularly its Huntington Avenue façade require special remediation.*

<u>Campus Permeability</u>

As campus growth continues it becomes more difficult to find one's way into the campus, to move through it, to see into and through it, and to maintain a sense of orientation. The proposed projects further limit the opportunities for visual and pedestrian access and orientation by filling the spaces between buildings where pedestrians are, at this time able to pass through lobbies, and by proposing construction that will reduce the size and visual accessibility of existing pedestrian paths.

The master plan should identify at least two paths through the campus connecting Longwood and Huntington Avenues in addition to Worthington Street, and a pedestrian route between Huntington and Shattuck Street. The plan should also identify street connections between Avenue Louis Pasteur and new Blackfan Street at the north and south sides of the Institutes of Medicine. The plan should describe the improvements necessary to implement the creation of these routes and a schedule for their completion.

The plan should include a clear commitment to the construction of new Blackfan Street to city of Boston standards on Harvard owned property.

<u>The Life of the Campus</u>

Space in the LMA is a scarce commodity. As its development on the Harvard campus grows more specialized in the areas of teaching and research the life of the area becomes less varied. Harvard is fortunate in having some land to develop and redevelop where the single-use character can be modified to include more housing for staff and students, more retail space, more space available for public use and assembly, and transient housing for visitors, patients' families, and conference attendees.

The master plan should include proposals to include a mix of uses that will encourage more street activity during more hours of the day and a more lively, more secure, and more pleasant and hospitable environment.

Parks and Other Landscapes

The Harvard Campus includes the Medical School Quadrangle, the major open space in the Longwood area, and it fronts on both Longwood Avenue and Avenue Louis Pasteur, both of which connect the campus and the Emerald Necklace, one of the Country's most important park networks. Harvard's efforts have restored the original character of the Quad and have improved the edges of both streets.

Other opportunities for landscape improvement do exist and should be identified in the master plan. Specifically, some existing open areas on the campus that could be elements in the district-wide open space system are compromised by their use as parking lots and by parking equipment. Because new parking space is under construction *the plan shall include a schedule and description of improvements for these areas that remove surface parking and create streets, pedestrian paths, green spaces, and plazas, and which create or enhance views through the campus.*

The west side of the Institutes of Medicine on new Blackfan Street comprises a unique opportunity to enhance the building and create an identity and sense of place on the street. *The plan shall include the commitment to design and build this area in cooperation with the city and with abutters.*

2. Submission Requirements

The proponents shall submit materials to facilitate a thorough review of the master plan and to address the issues cited above as well as others that may arise in further development and examination of the IMP. The submission shall include all of the items listed in the Boston Zoning Code Article 80D-3, 2 and 4, *i.e.*, existing property and proposed projects of the Harvard University Longwood Campus including those items listed in the text of the article as those which the proponent "may include". In addition the proponent shall provide:

1. a series of area plans at a scale of 1"=40' showing existing and proposed building heights, building uses, pedestrian circulation, and vehicular circulation of cars, service vehicles, and ambulances; the area to be included in the plans shall extend to the blocks beyond the Harvard properties;

2. diagrammatic sections through the area cutting north-south and east-west at the scale and distance indicated above;

3. true-scale three-dimensional graphic representations of the area indicated above either as aerial perspective or isometric views showing all buildings, streets, parks, and natural features;

4. a study model at a scale of 1"=40' showing the proposed projects in the context of other buildings on and within a block of the campus; and

5. a table listing all buildings owned or leased by Harvard, both on and off the LMA campus, and indicating;

   a. total area including area below grade,
   b. uses and area devoted to each use,
   c. height in feet and number of floors, including floors below grade,
   d. age,
   e. condition,
   f. proposed action (rehabilitation, demolition, replacement, or other) during the next five years, and
   g. proposed uses with area devoted to each use.

The items above except the model shall be submitted in both printed form and as printable and duplicable digital files.

F. <u>Public Notice</u>

The Applicant will be responsible for preparing and publishing in one or more newspapers of general circulation in the city of Boston a Public Notice of the submission of the Institutional Master Plan to the BRA as required by Section 80A-2. This Notice shall be published within five (5) days after the receipt of the Master Plan by the Boston Redevelopment Authority. Public comments shall be transmitted to the Authority within sixty (60) days of the publication of this notice, unless a time extension has been granted by the Authority in accordance with the provisions of Article 80 or to coordinate the Hospital's Institutional Master Plan Review with the Large Project Review.

The form of the Public Notice is attached as Appendix 4.

Following publication of the Public Notice, the Applicant shall submit to the Authority a copy of the published Notice together with the date of publication.

APPENDIX 1
TRANSPORTATION COMPONENT SCOPE

BOSTON
TRANSPORTATION
DEPARTMENT

ONE CITY HALL PLAZA/ROOM 721
BOSTON, MASSACHUSETTS 02201
(617) 635-4680/FAX (617) 635-4295

April 30, 2002

Mr. Owen Donnelly
Deputy Director for Institutional Development
Boston Redevelopment Authority
Boston City Hall, 9th Floor
Boston, MA 02201

Re: Harvard University Longwood Campus IMPNF / New Dental School PNF

Dear Mr. Donnelly:

Thank you for the opportunity to comment on the Institutional Master Plan Project Notification Form (IMPNF) and Project Notification Form (PNF) for the Harvard University Longwood Campus. Harvard Longwood Campus contains 23 buildings on about 19 acres of land in the Longwood Medical Area (LMA) totaling about 2.4 million square feet. The campus houses the Harvard Medical School, Harvard School of Dental Medicine, and Harvard School of Public Health.

The proposal is a 5-year master plan (2002-2007) to construct one new 50,000 s.f. Dental School facility and undertake four smaller additions/renovations totaling approximately 31,500 square feet. No new parking is proposed, while 10 parking spaces are to be relocated.

The Boston Transportation Department (BTD) has reviewed the IMPNF/PNF and attached a detailed Scope to this letter. The Scope outlines the specific information and analysis that BTD needs to appropriately review the transportation impacts of this master plan. Upon BTD's final review and approval, the proponent will prepare a Transportation Access Plan Agreement (TAPA) codifying the transportation agreements and mitigation reached with BTD and a Construction Management plan (CMP). It should further be noted that the developer shall be responsible for all costs associated with mitigation efforts and construction related impacts.

BTD concerns, among others, include the impact of the master plan on traffic congestion, loading and service maneuvers, valet parking operations, off- and on-street parking, truck routes, and bicycle and pedestrian safety. Thus in the scope, we have asked that the proponent provide a detailed and comprehensive transportation study of the campus including a detailed analysis of the new proposed projects. We are interested in past efforts to mitigate transportation issues and look towards new aggressive Transportation Demand Management (TDM) programs as a means to reduce auto trips to the campus. The proponent will also be expected to mitigate traffic impacts by supporting transportation improvements in the area. Mitigation ideas include, kiosks with real-time transit information, exclusive right turn lane at Riverway/Brookline Avenue, permanent traffic count stations, variable message signs with real-time parking and directional information, Audubon Circle reconstruction, pedestrian path between Ruggles Station and the LMA, traffic video monitoring, bicycle improvements, and support for the Urban Ring.

BTD looks forward to working collaboratively with the BRA, Harvard and the community in review of this master plan and to addressing any outstanding concerns leading to the final Transportation Access Plan Agreement and Construction Management Plan (CMP).

Sincerely,

Adam Shulman

Adam Shulman
Transportation Planner

C. Vineet Gupta, Director of Policy and Planning
John DeBenedictis, Director of Engineering
Ed Hesford, Senior Traffic Engineer

BOSTON TRANSPORTATION DEPARTMENT
ONE CITY HALL PLAZA/ROOM 721. BOSTON, MA 02201 • (617) 635-4680

BOSTON TRANSPORTATION DEPARTMENT

HARVARD UNIVERSITY INSTITUTIONAL MASTER PLAN AND HARVARD SCHOOL OF DENTAL MEDICINE

TRANSPORTATION ACCESS PLAN GUIDELINES And SCOPE OF WORK

Boston is a dense city, with high levels of vehicular congestion, pedestrian traffic, and parking demand. New development of all types increases travel demand, and will have transportation impacts that require analysis, review, and mitigation. Through the City of Boston's Article 80 development review process, the Boston Transportation Department (BTD) works with development team (the "project proponent") to ensure that they thoroughly evaluate the transportation impacts associated with the proposed project or Master Plan, propose and analyze ways to mitigate these transportation impacts, and implement appropriate mitigation measures.

The project proponent is responsible for assessing and mitigating the short-term and long-term impacts of the proposed Master Plan projects. The project proponent shall cover the impact analysis and mitigation commitments in the following documentation, to be submitted to BTD:

1. Transportation Access Plan. The Transportation Access Plan shall fully describe all transportation-related issues surrounding the Master Plan and proposed projects. It should include the following principal components:
   - Description of Existing Transportation Conditions. A summary of existing traffic, public transit, pedestrian, bicycle, and parking conditions in the study area.
   - Evaluation of the Proposed Master Plan's Long-Term Transportation Impacts. A detailed description of the proposed projects and a detailed analysis of the projects long-term impacts on traffic, public transit, pedestrian, bicycle, and parking conditions.
   - Mitigation of the Master Plan's Long-Term Transportation Impacts. Identification of appropriate measures to mitigate project impacts, including physical and operational improvements, travel demand management (TDM), and long-term project impact monitoring.
   - Description of the Master Plan's Short-Term Construction Impacts and Proposed Mitigation. General overview of project's construction impacts, construction schedule and phasing, and measures to mitigate the short-term impacts. This is a summary of the more detailed Construction Management Plan (CMP) to be submitted to BTD under separate cover.

   The Access Plan typically comprises the transportation component(s) of the proposed project's various environment filings, such as the Draft Project Impact Report (DPIR) or the Final Project Impact Report (FPIR); in special cases, the Access Plan may be a separate document. In any case, the Access Plan should adhere to the guidelines and scope of work set forth below. If the project proponent believes that certain provisions are not applicable to the development in question, the proponent shall obtain BTD's explicit approval to alter those provisions.

2. Construction Management Plan. The Construction Management Plan (CMP) shall include a detailed proposal for the proposed project's construction: schedule, phasing, occupancy of the public right-of-way, access and delivery requirements, transportation impacts, and mitigation. The proponent shall submit the CMP to BTD, under separate cover from the Access Plan. The project's general contractor typically prepares the CMP. Guidelines for preparation of the CMP are available from BTD. The CMP shall be completed prior to the issuance of a Building Permit from the City of Boston's Inspectional Services Department (ISD).

3. Transportation Access Plan Agreement. The Transportation Access Plan Agreement (TAPA) is a formal legal agreement between the project developer and BTD. The TAPA formalizes the findings of the Access Plan, the mitigation commitments, elements of access and physical design, and any other responsibilities of the developer and BTD. Since the TAPA must incorporate the results of the technical analysis, physical design, and assessment of mitigation requirements, it must be executed after these processes have been completed. However, the TAPA must be executed prior to approval of the project's design through the City of Boston's Public Improvements Commissioner (PIC). An electronic copy of the basic TAPA form is available from BTD. It is the proponent's responsibility to complete the TAPA so that it reflects the specific findings and commitments for the project, and to get BTD review and approval of the document.

STUDY AREA

The Access Plan shall consist of a thorough analysis of the proposed Master Plan's transportation impacts throughout the relevant study area. BTD has designated the study area based on:

- Scale of the projects.
- Land use type and expected impacts.
- Trip distribution, trip assignment and connections to the regional transportation system.
- Roadways, intersections, public transit nodes, or other features of the transportation system that have been identified by previous studies or neighborhood input as being of particular concern.

The resulting study area typically includes all adjacent roadways, intersections, public transit supply, and other elements of the transportation system. For larger projects including Master Plans, the study area will often include a collection of more broadly distributed roadways and intersections that provide connections to the regional roadway system and are used by a concentration of project-related trips.

The study area shall comprise the public right-of-way and important transportation elements of the primary intersection listed below. It may be inefficient to recount intersections recently counted, such as traffic counts done as part of the Blackfan Research Center Project (DPIR, March 2002). The proponent is encouraged to work with BTD to determine which intersections are appropriate for new traffic counts versus using recent counts.

(* Intersections are proposed new traffic counts, no stars are proposed to use recently collected traffic counts).

Primary Intersections:

a. * All Site Driveways/curbcuts for the Harvard LMA campus
b. Longwood Avenue/Brookline Avenue
c. Longwood Avenue/Binney Street
d. Longwood Avenue/Blackfan Street, and Children's Hospital Driveway
e. * Longwood Avenue/Avenue Louis Pasteur
f. * Longwood Avenue/Palace Road
g. * Longwood Avenue/Huntington Avenue
h. Avenue Louis Pasteur/Fenway
i. * Fenway/Park Drive crossover road (volumes turning off Fenway onto Park Drive versus going to Avenue Louis Pasteur)
j. Fenway Palace Road
k. Louis Prang/Huntington Avenue/Ruggles Street
l. * Brookline Avenue/Fenway (new counts)
m. Brookline Avenue/Boylston/Park Drive
n. * Brookline Avenue/Park Drive (Audubon Circle)
o. Longwood Avenue/Riverway
p. * Riverway/Neitherlands Road
q. Brookline Avenue/Francis Street
r. Francis Street/Binney Street
s. * Francis Street/Huntington Avenue (Brigham Circle)
t. * St. Alphonsus Street/Temont Street
u. * Fenwood Road/Huntington Avenue
v. * St. Albans Road/Huntington Avenue

The proponent shall review all relevant project proposals and planning studies that would affect the study area intersections, and incorporate these into the transportation analysis, as appropriate. This includes, but not limited to:

Planning Studies:

- Fenway Neighborhood Transportation Plan (Vollmer Associates, 2001)
- West Fenway/Longwood Strategies Study (Howard/Stein-Hudson, 1999)
- Longwood Medical and Academic Area Transportation Study Update (Vanasse Hangen Brustlin, 1999)
- Huntington Avenue Reconstruction project
- Ruggles Street Improvements
- Urban Ring

Proposed/Approved Development Projects:

- Blackfan Research Center
- Harvard Institute of Medicine, New Research Building project
- Emmanuel College Master Plan
- Simmons College project
- Fenway Mixed Use project
- Children's Hospital project
- Wentworth Master Plan
- Massachusetts College of Art project
- Joslin Diabetes Center
- Massachusetts College of Pharmacy

- Brigham and Woman's Hospital Master Plan

In addition, (or in coordination with) the study area intersections listed above. the proponent shall analyze specific area transportation issues. All planning studies and proposed/approved projects listed above shall be incorporated into the studies.

- Francis Street and Fenwood Road corridor and truck study. Conduct one-week (Monday-Sunday) Automatic Traffic Recorder (ATR) counts for both corridors at key locations. Determine daily truck volumes and routes. How many trucks are utilizing each corridor per day and by time of day? To the best extent possible, determine the origin and destination of the trucks. Inventory and graphically illustrate truck regulation signage on these corridors.

- Longwood Avenue and Brookline Avenue. Conduct one-week (Monday-Sunday) Automatic Traffic Recorder (ATR) counts for the corridors at key locations. Compare and contrast the counts with those conducted recently for the Blackfan Research Center project.

- Transit Use Study. Analyze and illustrate the bus stops within the LMA. Determine the number and percentage of Harvard employees and students that utilize MBTA and MASCO buses by bus route. Conduct an employee and student mode share survey and determine numbers and percentages of people utilizing each specific bus route and subway line, including Yawkey Station. Conduct a 1-day ridership counts at the LMA Green Line Station (E Branch). Counts should record number of boardings and alightings, arrival times, headways, train number, and utilization, ie. record 1 for empty trains, 5 for trains at crush capacity.

DEFINITION OF TASKS

Task 1. Description of Existing Transportation Conditions

The Existing Conditions component shall summarize the current status of the transportation system within the study area. It shall focus on the issues listed below, and shall identify any existing problems or deficiencies in the transportation system. The Existing Conditions analysis will form the basis for projecting future conditions, and enable comprehensive assessment of the proposed project's transportation impacts.

1.1 Project Site Conditions. Describe general conditions in the vicinity of the Harvard Longwood Campus, including:
- Clarify the existing number of faculty, staff and students at each of the schools in the LMA and in total.
- Existing land use, including existing site square footage, building square footage, number of employees or residents, zoning provisions, and other applicable information. Table 1 in the IMPNF is a good start. Please break down the land use by total square footage, ie. Total square feet of academic space, residential, administrative, research etc. Coordinate this information with parking demand and supply for each use.
- Physical condition of the campus, existing access and egress
- Major streets and intersections in the vicinity of the site
- On-street regulations
- Include a survey of existing conditions.

1.2 Traffic. The Access Plan shall include traffic volume counts at the study area intersections for weekday morning and evening peak periods under existing conditions. These shall be classification counts in areas with high volumes of heavy vehicles. ATR counts shall be conducted for Longwood Avenue, Brookline Avenue, Avenue Louis Pasteur, Francis Street and Fenwood Road. Data shall be compared to recent ATR counts collected for the Blackfan Research Center.

Existing capacity analyses shall be performed to determine level of service, queuing, delay and volume/capacity at all study area intersections. Analyses shall reflect realistic peak period characteristics, including pedestrian volumes, requirements for pedestrian phases, curb operations (bus stops, pick-up / drop-off), usable lanes, grade, and percentage of heavy vehicles. Appropriate traffic models will be discussed below.

It may be inefficient to recount traffic volumes at intersections recently counted, such as the Blackfan Research Center Project (DPIR, March 2002). The proponent is encouraged to work with BTD to determine which intersections are appropriate for new traffic counts versus using counts recently collected.

1.3 Parking. The Access Plan shall summarize the parking supply within ¼ mile of the campus. The parking inventory shall include:

a. Location (block face for on-street spaces, facility for off-street spaces). Include a graphic representation of the parking supply locations and number of spaces.
b. Type of Space
    - On-street (metered, resident parking, unregulated, etc.)
    - Off-street (surface lot or garage, user type: resident, employee, commercially-available, customer, etc.)
c. Parking fees, by type of space
d. Percentage utilization during parking peak (assume 12 noon)

This inventory can be supplemented with data from published sources such as the West Fenway/Longwood Transportation Strategies Study, Emmanuel College Master Plan or others and updated as necessary with survey data.

All parking associated with the project site shall be summarized with the parking use and management and graphically displayed. The description of existing on-site and off-site parking use shall include: number of spaces, occupation of spaces by user type, hour of peak occupancy, turnover rate, parking fees, lease agreements, and any high-occupancy vehicle spaces.

1.4 Transit. The Access Plan shall describe the study area's mass transit system:

a. Transit Supply
    - Massachusetts Bay Transportation Authority (MBTA) services, proximity to site
        - Service (mode of transit, line, closest station stop)
        - Service characteristics (frequency during peak periods, geographic connections, hourly boardings)
        - Physical characteristics (station conditions, rolling stock).
    - Private transit services (summarize characteristics above)
    - Other transit and high-occupancy vehicle (HOV) services

The Urban Ring is a critical project to the transit capacity in the Longwood Medical Area. Existing Phase I service must be graphically displayed and described, including ridership and headways. Future proposed service (Phase II and Phase III) shall be described and graphically displayed.

b. System Utilization
- Capacity by line during peak periods
- Current ridership and percentage capacity utilization by line during peak periods
- Special attention shall be given to E Line, Ruggles Station, and MBTA bus routes including percentage of employees, residents and visitors that use each service.

1.5 Pedestrians. The Access Plan shall include a description of pedestrian conditions on sidewalks and intersections adjacent to the campus, including major pedestrian routes and desire lines in and around the campus, volumes of pedestrians on these routes, and the conditions of these corridors, including any deficiencies or barriers.

Pedestrian volumes shall be counted and pedestrian level of service shall be calculated at all major study area intersections, including Avenue Louis Pasteur/Longwood, Longwood/Huntington Avenue, Avenue Louis Pasteur/Fenway, Longwood Avenue/Palace Road.

Describe pedestrian accommodation at signalized intersections in the study area (i.e. exclusive vs. concurrent, crossing time, pedestrian ramps). Describe and illustrate the pedestrian improvements planned as part of the Huntington Avenue reconstruction project and MASCO's Osco Togo Circle improvements.

1.6 Bicycles. The Access Plan shall describe existing bicycle usage, primary bicycle routes, accommodation of bicycles in the public right-of-way, and the current supply and location of any existing bicycle racks on or adjacent to the project site. On a day with good weather (record date and weather conditions), survey bicycle rack utilization by location. Document storage of bicycles in locations without bicycle racks. Include bicycle volume counts at key study area intersections.

1.7 Loading and Service. The Access Plan shall describe any existing loading and service facilities on the campus, including number of deliveries per day or per week and time of day, as well as any special conditions relative to loading and service in the surrounding area. Truck operations are a key concern to area residents. Special attention must be made to the loading and service impacts on residential streets, ie. cut through traffic, hours of operation, idling, fee policies and parking violations. Provide a detailed map illustrating all campus loading areas. Include a table containing the number of loading bays, hours of operations, daily number of deliveries per day, and time of day. Consolidation and Coordination of truck operations with other institutions should also be discussed. For example, to minimize truck trips, an empty truck should not leave the LMA if another institution is having an empty truck enter the LMA to pick something up.

Task 2. Evaluation of Proposed Project's Long-Term Transportation Impacts

The central component of the Access Plan is the evaluation of the proposed project's long-term transportation impacts. The Access Plan must evaluate these impacts in detail, for all the transportation modes and aspects that will be affected, including traffic, parking, public transit, pedestrians, bicycles, and service and loading. These impacts must be compared to the appropriate baseline condition, the Future No-Build Condition. The following are the principal issues, modes, and conditions that must be analyzed.

2.1 Project Description. The Access Plan shall include a summary of the key project characteristics that are relevant to the project's transportation impacts. These include:

- Project name and street address
- Study area, including critical intersections
- Anticipated construction start and completion dates
- Relevant zoning regulations with respect to use, parking and other characteristics
- Required permits, variances, and licenses
- Site area
- Project's gross square footage and floor-area ratio (FAR)
- Gross square footage by use
- Other relevant variables (e.g. number of dwelling units, number of hotel rooms, number of employees)
- Number of parking spaces, specified by use type
- Number of loading bays, dimensions of bays, design loading vehicle

2.2 Trip Generation Analysis. The Access Plan shall include a clear and detailed trip generation analysis for the proposed uses of the site. This analysis shall include:

a. Person-Trip Generation. The Access Plan shall summarize the proposed project's person-trip generation, for daily, AM peak, and PM peak trips.

The person-trip calculations shall be based on appropriate trip generation rates, typically the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 6th Edition*. The ITE manual includes comprehensive vehicle-trip generation rates based on surveys in suburban locations throughout the United States. Because Boston benefits from an excellent public transit system and pedestrian access, ITE vehicle-trip generation rates are not directly applicable to resulting vehicle trips. ITE rates shall be used to generate total person-trips by correcting for vehicle occupancy rate (VOR). Where necessary, these trip generation rates may be supplemented by survey data or information from other sources (subject to BTD requirement and/or approval). The person-trip generation analysis shall be summarized in a clear table, in the body of the Access Plan, including all of the following information:

- Land use type
- Square footage, by land use type
- Vehicle-occupancy rate (VOR) assumption, by land use type (for translation of vehicle-trip rates to person-trip rates)
- Daily person-trip generation (by land use and overall)
  - Daily person-trip generation rate (per 1,000 square feet, or per unit)
  - Resulting daily person-trip ends
- AM peak hour person-trip generation (by land use and overall)
  - AM peak hour person-trip generation rate
  - AM peak hour person-trips, entering
  - AM peak hour person-trips, exiting
- PM Peak Hour person-trip generation (by land use and overall)

        - PM peak hour person-trip generation rate
        - PM peak hour person-trips, entering
        - PM peak hour person-trips, exiting
    - Source for trip generation rates

b. Mode Split and Vehicle Occupancy Rate. Person-trips shall be apportioned among the various principal modes (automobile, public transit, walking, bicycling) using an appropriate mode split and occupancy rate. The mode split shall be presented as percentages of automobile, public transit, walk and bicycle travel. Current data shall be provided to back up mode share assumptions, including a comparison to other projects recently approved in the LMA.

c. Trip Distribution. The trip distribution shall identify the directional split (i.e. north, south, west) of person-trips and vehicle-trips for the specific location and trip types of the proposed project.

d. Trip Assignment. The distributed trips shall be assigned to the appropriate means of accessing the project: highway routes, surface streets, surface intersections, sidewalks, crosswalks, site access / egress points, and public transit lines. If the project expects to rely upon an off-site parking supply, trips shall be assigned appropriately to these locations. Drop-off, pick-up, and valet trips shall also be assigned appropriately, i.e. both entering and exiting the site access, and entering or exiting an off-site parking area.

2.3 Future No-Build Condition. The analysis of the proposed project's transportation impacts must be based on a comparison with an appropriate baseline condition. The proposed project's impacts would be felt fully during some future "horizon year" when the project is expected to be complete, occupied, and operating. The effects of the proposed project (under the "Future Build Condition") are most appropriately demonstrated in comparison to projected transportation conditions during the horizon year without the effects of the proposed project.

- The horizon year shall be five years in the future, unless specific circumstances require that a different time frame be used.
- The Future No-Build Condition shall be based on the Existing Conditions assessment, with the addition of development and infrastructure projects that have been proposed and are expected to be complete and operational by the horizon year (per BTD and BRA instructions). This includes Children's Hospital, Fenway Mixed Use Project, Simmons College, Emmanuel/Merck, Harvard Institute of Medicine, Joslin Diabetes Center, Massachusetts College of Pharmacy, Brigham and Woman's Hospital, Wentworth, Blackfan Research Center and Massachusetts College of Art.
- The Future No-Build Condition traffic, transit, and pedestrian volumes shall also include a background growth rate consistent with other LMA projects added to existing traffic volume counts, transit ridership, and pedestrian counts, unless otherwise specified by BTD.

2.4 Future Build Condition. The central component of the Access Plan is the assessment of the proposed project's long-term impacts. This shall include evaluations of the project's effects on all transportation modes and aspects, throughout the study area.

a. Traffic Impacts.

i) Traffic and Pedestrian Volumes. The traffic analysis shall include diagrams of pedestrian flows and vehicle turning movement volumes for both the existing conditions and for the future build condition. . AM and PM peak hours shall be identified. Data shall be broken down into 15-minute intervals with hourly totals provided for each movementTherefore, the Access Plan shall include pedestrian and vehicular turning movement volume diagrams for AM Peak and PM Peak hours.

a) Existing Conditions (based on current traffic counts)
b) Future No-Build Conditions (Existing Conditions, plus appropriate future changes and growth factor)
c) Project-Generated Traffic Volumes (based on trip generation and trip distribution)
d) Future Build Conditions (Future No-Build Conditions, plus Project-Generated Traffic Volumes)
e) Future Build Conditions with Mitigation (if the proponent plans to undertake any roadway or signalization changes in order to mitigate traffic impacts of the proposed project)

ii) Traffic Capacity Analysis Software. The Access Plan shall include traffic capacity analyses for Existing Conditions, Future No-Build Conditions, and Future Build Conditions. The capacity analysis shall be performed using the latest version of Syncho.

- The proponent shall use the latest Syncho computer model. The model shall be calibrated to reflect field conditions.
- The computer model output shall be attached to the Access Plan as an appendix and an electronic version must be supplied on a computer disk.
- A summary of the traffic analysis assumptions and parameters shall be included in the Access Plan.

iii) Traffic Capacity Analysis Results Summary. The Access Plan shall include a tabular summary of the traffic capacity analysis, for all conditions (Existing, No-Build, Build) for each intersection as a whole and for each approach of every intersection. The summary shall include the volume-to-capacity ratio (v/c), level of service (LOS), delay, and estimated queue lengths for each study intersection, and for each approach of every intersection. A summary table shall highlight changes to intersection and individual approach LOS that result from site-generated traffic.

iv) Traffic and Pedestrian Counts. The proponent shall submit, turning movement count summary sheets for key intersection in the study area (to be approved by BTD). Data shall be collected and tablulated in 15-minute intervals during peak hours and include hourly totals for each intersection approach and pedestrian crossing.

b. Parking Impacts. The Access Plan shall include an analysis of projected parking demand and proposed parking supply for the entire campus.

i) Parking Demand Analysis. The Access Plan shall include an analysis of total parking demand in the horizon year, broken down by land use and user type (e.g. employee vs. students. The parking demand analysis shall include

- Daily vehicle-trip generation by land use and user type (consistent with mode split and VOR)
- Parking turnover by land use and user type (cite source)
- Parking demand peaks by land use and user type
- Overall parking demand and peak parking demand, based on shared parking among all land uses and user types included in the proposed project
- Parking policies for employees, students and visitors

ii) Proposed Parking Supply. The Access Plan shall include a summary of the campus proposed off-street parking supply and parking ratio. Parking supply, and parking costs, play a central role in determining mode split and vehicular traffic impact. In general, parking shall be limited to minimum supply that is appropriate to the neighborhood, the project's transit access, and the project's mode split. The information below shall be summarized in a clear table.

- Total Spaces
  - Existing
  - Future No-Build (if applicable)
  - Future Build Parking Conditions
- Parking Allocation
  - Space allocation among various land uses
  - Parking ratios: spaces per thousand square feet or per unit, by land use
  - Specially-designated parking spaces, e.g. vanpools, livery vehicles, rental cars, car-sharing
  - Treatment of existing parking spaces, including displacement of existing parking spaces and how the parking demand for these spaces would be met in the Future Build Condition
- Comparison of Parking Supply and Demand
- Valet parking operations and policies
  - Projected shortfall or surplus of parking spaces, by land use
  - Proposed management of shortfall or surplus
- Provide a plan of all parking facilities, including layout, access, and size of spaces.

iii) Off-Site Parking Supply. Describe any anticipated utilization of off-site parking supply (as described in the Existing Conditions section, amended to reflect Future No-Build Conditions) required to satisfy project-generated parking demand and overall campus parking demand.

- On-Street Parking Supply
- Off-Street Parking Supply
  - Number and type of spaces required (i.e. publicly-available, employee, residential)
  - Resulting parking utilization at 12 noon on a weekday (additional parking survey times may be required, depending upon the nature of the project)

iv) Proposed Parking Management Plan

- Description of Proposed Parking Operations

  - Access control
  - Valet operations
  - Pass or payment medium
  - Management of operations to prevent illegal parking, violation of 5-minute idling law
- Parking Fees
- Management of Specially-Designated Parking Spaces (e.g. vanpool, carpools, rental cars, car-sharing)
  - Location
  - Parking fees
  - Accommodation of increased supply if demand warrants

c. Transit Impacts. Describe the anticipated impacts of the Harvard Longwood campus on the mass transit system, based on the information about Existing Conditions and the projected transit person-trips (based on trip generation – trip distribution – mode split calculations). Future transit conditions shall be based on transit supply and capacity that is expected to be available in the horizon year; if there is some doubt, the proponent shall consult with BTD and/or the MBTA. The proponent may use generally available MBTA ridership data as a basis for this analysis. The Access Plan shall include the following information:

i) Transit Trip Distribution
- Distribution of project-generated transit trips by zone
- Distribution of project-generated transit trips by transit line / route

ii) System Utilization
- Existing Conditions: Capacity and utilization by line
- No-Build Conditions: Capacity and utilization by line
- Build Conditions: Capacity and utilization by line

The Urban Ring is a critical project to improve the transit system capacity in the Longwood Medical area and must be incorporated into the short-term and long-term impacts of the project. Existing Urban Ring components (ie. CT2 and CT3) must be described and documented for ridership and headway. Phase II bus rapid transit (BRT) and Phase III light rail must be described and graphically displayed for it's relationship and impacts to the Harvard Longwood Campus.

d. Pedestrian Impacts. Describe future pedestrian conditions in the study area:
- Pedestrian access to and from the campus, pedestrian circulation routes
- Pedestrian accommodation in the campus's public spaces (e.g. sidewalk, adjacent intersections, plaza spaces, benches, etc.)
- Pedestrian level of service (LOS) at all surveyed crosswalks, sidewalks and other locations
  - Existing Conditions
  - Future No-Build Conditions
  - Future Build Conditions

NOTE: The traffic capacity analyses must also assume appropriate accommodation of pedestrians in all signalization assumptions. The pedestrian impacts analysis shall describe the assumptions regarding accommodation of pedestrians in the traffic analysis, i.e. pedestrian walk rate and percentage of cycles in which pedestrian phase is called (verify with BTD).

e. Bicycles. Describe bicycle access to, from, and within the Harvard Longwood campus. Describe bicycle storage and other amenities (e.g. shower and changing facilities) to be provided. BTD will provide guidelines on bicycle storage requirements based on project type and size. The Access Plan must specify the proposed location (also shown on project site plan) and number of bicycle parking spaces.

f. Air Transportation. Document the existing helicopter landing routes in the LMA and any impacts that the proposed height of the project may have on helicopter operations.

g. Loading and Service. The campus must accommodate loading and service facilities in an off-street location. The loading and service plan shall not rely upon loading facilities and truck back-up maneuvers in the public right-of-way. Sharing existing curb cuts is preferable to new curb cuts.

h. Describe service and loading requirements:
- Number of loading bays
- Services to be provided (e.g. garbage compactor, garbage collection, restaurant service, move-in / move-out, etc.)
- Level of loading and service activity (number of trucks per day or per week)
- Loading and service schedule, schedule restrictions (proponent shall prohibit or strictly limit loading and service activities during peak periods)
- Design vehicle(s)
- Required truck turning movements (show design vehicle turning movements on site plan)
- Major loading and service vehicle routes for site access and egress
- Access for emergency vehicles
- Enforcement of 5-minute idling law

2.5 Site Plan. Provide an engineered site plan showing Campus Build Conditions (contrast with existing conditions):
- Public right-of-way layout
  - Roadways
  - Sidewalks
- Vehicular access and circulation
- Service and loading
- Parking
- Bicycle storage
- Proposed on-street regulations

Task 3. Mitigation of the Project's Long-Term Transportation Impacts

Major development projects offer benefits, but they also consume public services and create impacts on public resources. Chief among these impacts is a development's effect on the transportation system. The project proponent is required to quantify and analyze these impacts through the Access Plan. It is then the responsibility of the project proponent, working with BTD, to develop alternatives for reducing and mitigating these impacts. Existing transportation studies, along with community and public sector input, should form the basis for transportation mitigation strategies. These strategies will typically include travel demand management (TDM) measures and improvements to Boston's transportation system.

These transportation system improvements and mitigation measures have associated costs. The proponent should view these costs as an integral component of the overall project cost, necessary to enable the transportation system to accommodate the project's impacts. The mitigation measures benefit the users of the transportation system, in particular the new users associated with the proposed project. Project proponents shall allocate appropriate funding for the mitigation. The mitigation measures associated with a development project will be specified in the project's Transportation Access Plan Agreement (TAPA) between the proponent and BTD.

3.1 Travel Demand Management (TDM). Travel demand management comprises a variety of strategies designed to reduce single-occupancy vehicle (SOV) travel and encourage "alternate modes" of transportation (public transit, walking, bicycling). TDM programs are critical due to the disproportionate impacts of SOV travel on congestion, parking demand, air quality, and quality of life. TDM programs are especially important for projects that generate higher trip volumes, create concentrated peaks of demand, and create more impacts related to roadway congestion, parking demand, and vehicle emissions. TDM programs are required even when proponent uses the default analysis assumptions for mode split and VOR, since these default assumptions reflect long-standing TDM efforts and Transportation Management Association programs.

Appropriate TDM measures and requirements will vary depending upon the type of development, the neighborhood, the impact analysis assumptions, and other circumstances. For example, many of the measures below would not apply to a residential development. In the case of commercial office development, some (but not all) of the measures below would be the responsibility of the tenants, rather than the proponent. The proponent will be required to implement those TDM measures that are within its control, and should at least encourage and facilitate such measures. However, if the proponent seeks to base its impact analysis on aggressive assumptions (e.g. a high transit mode share), the proponent must require appropriate TDM measures in its lease agreements with tenants.

In the TAPA, the proponent will be required to implement the following TDM measures (as appropriate to the specific project):

a. Transportation Coordinator. Designate a full-time, on-site employee as the Harvard Longwood Campus transportation coordinator. The transportation coordinator shall oversee all transportation issues. This includes managing vehicular operations, service and loading, parking, and TDM programs. In addition, the transportation coordinator will be responsible for the monitoring program and will serve as the contact and liaison for BTD and the Transportation Management Association (TMA).
b. Ridesharing / Carpooling. Facilitate ridesharing through geographic matching, parking fee discounts, and preferential parking for carpools / vanpools. May be accomplished through membership in a TMA, participation in CARAVAN for Commuters, and/or use of computerized ridesharing software.

c. Guaranteed Ride Home Program. Offer a "guaranteed ride home" in order to remove an obstacle to transit use and ridesharing
d. Transit Pass Programs. Encourage employees to use transit through the following measures:
   - Offer on-site transit pass sales or participate in the MBTA Corporate T-Pass Program
   - Offer federal "Commuter Choice" programs, including pre-tax deductions for transit passes and subsidized transit passes
e. Information and Promotion of Travel Alternatives
   - Provide employees and visitors with public transit system maps and other system information
   - Provide an annual (or more frequent) newsletter or bulletin summarizing transit, ridesharing, bicycling, alternative work schedules, and other travel options
   - Sponsor an annual (or more frequent) "Transportation Day" at which employees may obtain information on travel alternatives and register to participate in ridesharing programs
   - Provide information on travel alternatives for employees and visitors via the Internet
   - Provide information on travel alternatives to new employees
f. Transportation Management Association (TMA) Membership. A TMA can provide many of these TDM measures, including ridematching, guaranteed ride home, and transit information and promotional materials.
g. Bicycle Facilities and Promotion
   - Provide secure bicycle storage (number of spaces and locations must be specified)
   - Provide additional publicly-accessible bicycle storage (number of spaces and locations must be specified)
   - Provide shower and changing facilities for bicycle commuters
   - Promote bicycles as an alternative to SOV travel, provide promotional material on bicycle commuting and bicycle safety, and provide incentives for bicycle use.
h. Parking Management
   - Charge market-rate parking fees
   - Offer preferential parking to carpools and vanpools
   - Offer reduced parking rates to carpools and vanpools
   - Offer parking "cash-out" option
   - Offer garage space for car rentals
   - Offer parking space for car-sharing
   - Offer parking space, charging facilities for alternative fuel vehicles
   - Offer parking / layover space for livery vehicles (hotel development)
   - Enforce a 5-minute limit on vehicle idling for all users of the Development, in accordance with Massachusetts state law
i. Trip Reduction Strategies. To the degree possible, the Developer shall implement the following strategies for its own on-site employees. The Developer shall also encourage tenants to implement these strategies as well.
   - Telecommuting. Reduce overall trip demand by enabling employees to telecommute.
   - Flexible Work Schedules. Reduce peak hour and overall trip demand by enabling employees to telecommute, work a compressed work week, or work hours that enable off-peak commuting.

- Local Hiring. Recruit and hire employees from the local area. Such local employees can more easily use alternatives to SOV travel, including walking, bicycling, and transit.

j. Transportation Monitoring and Annual Reporting. Monitor transportation conditions, conduct student and employee transportation surveys, and provide BTD with an annual report on findings. This information will be useful to BTD in identifying and addressing issues with travel and access, including transit service, pedestrian and bicycle access, parking, and traffic. This information will enable BTD to pursue improved access for the project, and provide benefits to the proponent. Upon request, BTD will provide employee survey forms and transportation monitoring forms to ensure uniformity of data.

3.2 Transportation System Improvements. In order to meet Boston's mobility needs as its population, density, and land development increase, Boston's transportation system requires improvements. These improvements offset the transportation impacts of new development. In addition, these improvements can make the traveling experience easier in the vicinity of the project, which accrues to the benefit of the proponent and the development's users.

a. Geometric Changes and Improvements to the Public Right-of-Way. The proponent may be required to make geometric changes and improvements to roadways, sidewalks, and other elements in the vicinity of the proposed project. These changes and improvements may be necessary in order to enable new circulation patterns resulting from the project and mitigate impacts of new vehicle or pedestrian trips. Changes and improvements shall be designed by the proponent's consultant in consultation with BTD. The project proponent will be required to directly fund and implement all changes and improvements to the public right-of-way, and to obtain any required permits. The proponent shall obtain the approval of the City of Boston's Public Improvements Commission (PIC) for any changes to the public right-of-way. These improvements shall be made with input from BTD, per specifications provided by BTD, by a contractor approved by BTD, and subject to final BTD inspection and approval.
   - Harvard Institute of Medicine and New Research Building has agreed to provide their fair share of land and monetary funding to adequately design and construct the proposed extension of Blackfan Circle to Avenue Louis Pasteur. Additionally, Harvard will be required to maintain their fair share of the roadway. Describe Harvard's commitment to this improvement as it relates to the overall campus planning.

b. Traffic Signal Improvements. BTD operates most of the traffic signals in Boston. Improvements to traffic signals in the vicinity of the proposed project may be necessary to manage the increased travel demands placed on the intersection. Improving the operations of these signals can reduce congestion and improve conditions for pedestrians, bicycles, transit vehicles, and general traffic. Typical traffic signal improvements that BTD may require include:
   i) Traffic signal equipment
      - Signal controller
      - Signal heads and pedestrian heads
      - Signal poles and mast arms
   ii) Traffic monitoring and surveillance equipment

- System detectors
- Video monitoring cameras

iii) Traffic signal communications equipment

- Communications conduit (4" PVC)
- Signal interconnect cable

The project proponent will be required to directly fund and implement all traffic signal improvements, and to obtain any required permits. These improvements shall be made with input from BTD, per specifications provided by BTD, by a contractor approved by BTD, and subject to final BTD inspection and approval.

- MASCO and it's institutional members, in coordination with the Boston Transportation Department is working to improve the Longwood Avenue/Avenue Louis Pasteur intersection. Discuss the details of this improvement.

c. Public Transit System Improvements. New development can add significantly to public transit demand and have other impacts on the transit system. In order to manage this demand and mitigate the impacts, the proponent may be required to make or contribute to transit system improvements. These improvements shall be determined in consultation with BTD and the MBTA. Improvements may include:

- Physical improvements to MBTA system stations and stops
- Physical improvements and/or funding implementation of the Urban Ring in the Longwood Medical Area.
- Supplemental transit services. Public transit is the most desirable means of achieving transit access, and the proponent shall make every effort to facilitate transit access to the Harvard Longwood campus via public services. However, there may be some situations in which private supplemental transit services, such as shuttle buses, are necessary.
  - Overall transit demand in the area is too low to justify public transit service, but the proposed project requires transit access
  - The proposed project generates a concentration of trips to and from certain locations, such that a shuttle is feasible and useful in reducing auto trips (e.g. a hotel with airport and/or convention shuttles)

Task 4. Description of the Project's Short-Term Construction Impacts and Proposed Mitigation

The Access Plan shall include an overview of construction period transportation impacts and proposed short-term mitigation. This shall be a summary of the more detailed Construction Management Plan (CMP) that must be submitted to BTD under separate cover. The construction management summary in the Access Plan shall provide an appropriate level of information regarding the analysis and proposed management of the impacts of the project(s) during the construction period, including:

- The need for full or partial street closures, street occupancy, sidewalk closures, and/or sidewalk occupancy during construction
- Frequency and schedule for truck movements and construction materials deliveries, including designated and prohibited delivery times
- Designated truck routes
- Plans for maintaining pedestrian and vehicle access during each phase of construction
- Parking provisions for construction workers

- Mode of transportation for construction workers, initiatives for reducing driving and parking demands
- Coordination with other construction projects in the area
- Distribution of information regarding construction conditions and impact mitigation to abutters

CITY OF BOSTON
THE ENVIRONMENT DEPARTMENT

Boston City Hall, Room 805 • Boston, MA 02201 • 617/635-3850 • FAX: 617/635-3435

April 25, 2002

Mark Maloney, Director
Boston Redevelopment Authority
Boston City Hall, Room 925
Boston, MA 02201
Attention: Keith Craig, Project Manager for Institutional Development

Re: Harvard University, Longwood Campus – Institutional Master Plan Notification Form

Dear Director Maloney:

The City of Boston Environment Department has reviewed the Institutional Master Plan Notification Form (IMPNF). We hereby submit the following comments to promote the use of proven environmental strategies and technologies in fulfilling environmental requirements.

DESCRIPTION

The project proponent, Harvard University, has submitted an IMPNF for its Longwood Medical Area (LMA) campus. Fall 2000 statistics show that Harvard Medical School (HMS) employs 8,356 faculty members, about 300 on the LMA campus, 1,521 staff and has 774 students. Harvard School of Dental Medicine (HSDM) employs 356 faculty, 114 staff and has 263 students. The Harvard School of Public Health (HSPH) has 199 faculty members, 869 staff and 844 students. The IMPNF indicates that about 8,900 faculty teach at the Longwood Campus and about 2,500 full-time equivalent staff are employed there, not counting casual employees, students and teaching fellows. The staff figure includes filled positions only.

Harvard owns in the LMA about 19.1 acres of land and 23 buildings containing about 2.4 million square feet (SF) of floor area. The following parcels of land are identified as the total of the LMA campus:

- Parcel A – 19 buildings with an aggregate gross floor area of about 1,546,000 SF/134,605 zoning gross SF on approximately 14.3 acres roughly bounded by Huntington Avenue, Longwood Avenue, Shattuck Street and property owned by Children's Hospital.
- Parcel B – about one and four-tenths (1.4) acres at 107 Avenue Louis Pasteur occupied by Vanderbilt Hall, a 321-bed/136,450 zoning gross SF dormitory for Harvard Medical School (HMS) and Harvard School of Dental Medicine (HSDM) students;
- Parcel C – about three (3) acres bounded by Vanderbilt Hall, Avenue Louis Pasteur, Blackfan Circle and land owned by Emmanuel College occupied by a 239,180 SF Harvard Institutes of Medicine (HIM) building and a 430,000 SF New Research Building that is under construction and due to be completed in 2003; and
- Parcel D – a three-building, 70 unit apartment complex, the Henry Lee Shattuck International House, located on four-tenths of an acre (0.4) at 199, 203 and 207 Park Drive in the West Fenway.

During the term of the proposed Master Plan, 2002 – 2007, Harvard plans the demolition of a building and 77,500 to 81,500 gross SF of new construction. New construction includes a new 50,000 SF Dental School Facility for research, classrooms and faculty offices and additions to the following buildings on Parcel A for biomedical research and related teaching and administrative functions:

- Goldenson – two additions consisting of one 3,500 to 4,000 SF below-grade structure under the courtyard at 220 Longwood Avenue for Magnetic Resonance Imaging (MRI) research and an 8,000 to 9,000 SF addition on the courtyard for biomedical research facilities. Construction on addition one is to begin in 2003 and be completed in 2004. Work on addition two will begin in 2005 and be completed in 2006;
- Armenise – at 210 Longwood Avenue will be expanded by 8,000 to 9,000 SF for biomedical research facilities. Construction is to begin in 2004 and be completed by 2005;
- Building C – at 240 Longwood Avenue will be expanded by 8,000 to 9,000 SF for biomedical research facilities. Construction is expected to begin in 2005 and be completed in 2006.

The IMPNF indicates that 16,000 SF of the new space at the Dental School Facility will be used for new research uses and staff. Construction of this facility is expected to begin during the first quarter of 2003 and be completed in the second quarter of 2004.

A Summary of the March 25, 2002 LMA Forum meeting indicates that Harvard does not plan to incorporate renewable energy into the new Dental School Building and is considering experimental alternatives for heating, ventilation and cooling systems (HVAC).

Supplies, food and waste are ferried between the main HMS facility located in the Quad Garage and some of the larger, centralized campus facilities through an underground service tunnel system. The HSDM has a dedicated loading and dumpster bay at 200 Longwood Avenue; the Countway Library, located on Parcel A on Huntington Avenue next to the Kresge Building, has a small loading kiosk at 677 Huntington; the Toteson Medical Education Center at 260 Longwood Avenue has a small loading dock where some deliveries are accepted; and loading for the HIM and New Research Building will be at a consolidated loading area at 77 Avenue Louis Pasteur.

The IMPNF indicates that the Medical Academic and Scientific Community (MASCO) Transportation Management Association (TMA), of which Harvard is a member, operates several shuttles that connect LMA institutions to major transit nodes, remote parking facilities and other important locations. Shuttles serving Harvard LMA facilities are the M2 bus between the LMA and Harvard's Cambridge campus, Ruggles Station on the Massachusetts Bay Transportation Authority's (MBTA) Orange Line and the LMA and a trial service between the MBTA's JFK/UMASS station on the Red Line and the LMA.

Parking for Harvard's LMA facilities are located at 200 Longwood Avenue (HMS Quad Garage) and at eight other unidentified LMA parking lots.

The IMPNF identifies the following as Harvard's efforts at Transportation Demand Management (TDM):

- on site distribution of transit passes for faculty and staff;
- an unspecified transit pass subsidy;
- participation in and financial support of MASCO's CommuteWorks TMA;

- preferential on-site parking for carpools;
- support of shuttle service between the LMA, Cambridge, Allston and off-site parking;
- secure bicycle racks and on-site shower and locker facilities in unidentified locations;
- centralized bus and transit schedule kiosks in several unidentified locations;
- dissemination of MASCO's Commuter Bulletin; and
- support of and participation in a variety of MASCO efforts to increase employee use of transit and high occupancy vehicle (HOV) commuting.

The LMA Forum Summary also notes that some staff at the Forsyth Research Institute, an affiliate of the HSDM, have appointments at the School of Dental Medicine and/or Harvard Medical School and vice versa.

The IMPNF lists historic resources within an unspecified distance from Harvard's LMA campus. Sources for the list are the State Register of Historic Places, National Register of Historic Places and the Massachusetts Historical Commission's (MHC) *Inventory of Historic and Archaeological Assets of the Commonwealth* (Inventory).

<u>RESPONSE</u>
Harvard has acquired or will soon acquire a parcel of land on Longwood Avenue to the corner of Huntington currently occupied, in part, by Sparr's Fountain. It is not clear if this new acquisition is included in the total campus acreage identified in the IMPNF and plans for the site are not described. The status and planned use of the site should be described in detail in the Master Plan.

Harvard identifies itself as a leader in collaborative research and we note that the April 24, 2002 edition of the <u>Boston Globe</u> (Globe) describes a $50 million genetics center with more than 300 researchers and staff that will be established by Partners HealthCare members Massachusetts General Hospital (MGH) and Brigham and Women's Hospital (BWH) and Harvard Medical School at three locations in Boston and Cambridge. The facility will contain laboratory space and a genetic testing facility. According to the Globe article, Harvard will create a new academic department and recruit 22 to 25 new faculty members who will each bring about 15 lab researchers, a faculty/staff increase of 330 to 375 persons. The genetics center will recruit 100 administrators and support staff.

The Master Plan should identify Harvard's planned location(s) for the genetics center, the time-line for inception and number of faculty/staff to be employed at each location.

Informational materials on building materials recycling, conservation, resource protection and TDM and <u>City Of Boston Environment Department Guidelines For Responsible and Sustainable Development</u> (Guidelines) are being provided to the proponent with a copy of these comments. The Guidelines are designed to protect, in both the short and long term, the environmental health of those who live and work in Boston and to preserve and promote the integrity of our natural resources. TDM information is intended to help further the goal of minimizing localized air quality impacts by increasing transit and high occupancy vehicle (HOV) use by commuters. Informational materials and Guidelines should be used as a resource for minimizing the environmental impacts of proposed projects.

As the City of Boston is committed to sustainability as a guiding environmental concept and the basic operating principle for the management of Boston's natural and historic resources, the Institutional Master Plan (IMP) should include *distinct sections* and discussions about the issues addressed in the Guidelines with a campus-wide emphasis on Conservation, Recycling and Environmental/Resource Protection, Historic and Archaeological Resources and Transportation Demand Management. The Guidelines should also be used as a basis for the facilities design, construction and operating foundations of projects. The IMP should address each of the following issues and provide the information requested.

The faculty and staff numbers provided in the IMPNF are confusing and contradictory. The Master Plan should provide basic information about the students, staff and faculty of Harvard's LMA campus. including the following:

- the number of full-time students at all LMA-based facilities;
- the number of part-time students at all LMA-based facilities;
- the number of full-time staff at all LMA-based facilities;
- the number of part-time staff at all LMA-based facilities;
- the number of staff working under outside contracts for services with full- and part-time reported separately for all LMA-based facilities;
- the number of full-time faculty at all LMA-based facilities;
- the number of part-time faculty at all LMA-based facilities; and
- the number of students, faculty and staff who also work at Harvard's Cambridge and/or Allston campuses.

This information should not be reported in full-time equivalents (FTEs).

Conservation, Recycling and Environmental/Resource Protection

Air Quality

State law prohibits vehicle idling for more than five minutes (MGL C. 90, Section 16A and 310 CMR 7.11). Permanent "No Idling" signs should be posted at all loading/delivery docks, service, drop-off/ and parking areas on campus advising vehicle operators of law and Harvard's expectation of compliance.

High Performance Buildings

New construction and adding to/renovating existing structures provide a wealth of opportunities for minimizing environmental effects while realizing an economic benefit.

A "high performance building" is one that uses efficient equipment, as few ducts as possible, less energy and more daylight; has fewer leaks but more fresh air than traditional buildings, no cold spots, good indoor air quality; and reduces impacts on utilities and infrastructure systems. The creation of a such a building requires attention to many elements that must be integrated into planning and design.

The building envelope is important for the heating and cooling load and for comfort at the building perimeter. Glazing with a low shading coefficient will result in appropriately sized HVAC systems, lower peak demand, reduced energy consumption for cooling and increased interior comfort. Low-e glass with argon, for example, is a good option for maximizing heating and cooling savings. Heat Mirror, Vision Wall and Superglass are products that the proponent should evaluate when glazing decisions are being made.

Daylighting and the use of dimmable ballasts with photosensors can be combined for substantial savings in lighting costs.

We strongly recommend that the proponent participate in the U.S. Environmental Protection Agency's (EPA) Energy Star/Green Lights program and consider using the Leadership in Energy

& Environmental Design (LEED™) standards for the project. LEED™, a green building rating and certification system is a program of the U.S. Green Building Council (USGBC). It evaluates environmental performance from a "whole building" perspective over a structure's life cycle. Specific energy-conserving project elements might include T-85 fluorescent lighting systems and an energy management system.

Constructing a building heating system that is 20 percent more efficient than the standards of the American Society of Heating, Refrigerating and Air- Conditioning Engineers, Inc. (ASHRAE) can cost 0.5 to 2 percent more with a two to three year payback time. A system that is 30 percent more efficient can cost one to three percent more with a payback period of five to seven years.

Application of cool roof material is an inexpensive option for energy conservation and peak demand savings. Cool roofs are both highly reflective and emissive, and stay 50 to 60 degrees Fahrenheit cooler during peak summer conditions than traditional hot materials. These cooler surfaces transmit less heat into buildings, helping them reduce cooling energy use as well as peak electricity demand. On a warm summer day, a city can be 6-8°F warmer than surrounding areas. A cool roof absorbs less solar heat than a dark roof, the cooling load for the building it covers is less than that for a building with a dark roof and cooler temperatures in an area mean less air pollution and smog. The EPA's Energy Star program has compiled a list of more than 100 highly reflective roofing products.

Cool roofing has been around for well over twenty years, but research confirming its benefits began to mount in the 1990's. The Lawrence Berkeley National Laboratory and the Florida Solar Energy Center have led the way in monitoring energy savings of actual buildings and modeling of theoretical buildings. The Lawrence Berkeley National Laboratory and Oak Ridge National Laboratory have investigated the properties and durability of cool roof materials. Two years ago the EPA added roofing to its roster of Energy Star labeled products. The US EPA's Heat Island Reduction Initiative has also spearheaded the formation of "Cool Community" programs in cities across the United States. Cool roofing can be expected to reduce cooling energy use by an average of 0.4 kilowatt hours per square foot (about 20%) and electricity demand by 0.3 watts per square foot (about 6%). Actual energy and demand savings are difficult to pinpoint for any particular building, but research shows that buildings with lower insulation levels, no attic or plenum space below the roof, and correctly sized cooling equipment stand to save the most with cool roofing. Cool roofing has many other benefits besides energy and demand savings. The two main causes of roof failure, exposure to ultraviolet rays and excessive temperature, are greatly minimized on cool roofs. This means that cool roofing lasts longer and costs less to maintain than traditional roofing, mainly because it can reduce or even eliminate costly roof tear-offs. This not only saves money for the building owner, but also reduces waste to landfills. Cool roofing can improve the comfort inside both cooled and non-cooled buildings as well as reducing outside air temperatures. Traditional hot roofs hit peaks of 150 to 190 degrees Fahrenheit during the summer and transfer this heat to the building below and the air above. Cool roofs reach peaks of only 100 to 130 degrees Fahrenheit and reduce the heat load on the building as well as the heat island effect on the surrounding community. Reducing heat islands in urban areas not only reduces the risk of heat stress, but also reduces smog formation and associated asthma and respiratory distress.

Lighting

Careful choices should be made about exterior project lighting. It should serve operational and security needs while not adding to light pollution. Fixtures should be downward directed or shielded. The Good Neighbor Outdoor Lighting information provided with these comments is an excellent guide to urban lighting design and should be utilized in planning lighting for the LMA campus.

Noise
Mechanical equipment, including emergency generators, loading/receiving activities and the removal of trash and recyclables are subject to the Regulations for the Control of Noise in the City of Boston. This includes noise from back-up beepers and the emptying of dumpsters. The proponent should ensure that its waste hauler understands that dumpsters may not be emptied prior to 7:00 a.m. The frequency and duration of testing of emergency generators should be the minimum amount recommended by the manufacturer and at times when ambient noise levels in the area are at their highest.

Because residences, including dormitories and in-patient hospital space, are close to Harvard buildings, compliance with the City's residential noise limits will be required.

Solid Waste and Recycling
One of the City's goals is to increase the reuse and recycling of wastes. State law (State Solid Waste Facility Management Regulations, 310 CMR 19.017) has required the recycling of white goods since 1992; metal cans since 1993; glass since 1993; plastics since 1995; paper since 1995 and bans the disposal of Cathode Ray Tubes (CRTs) found in televisions and computer monitors. Recycling will help to extend the life of landfills and minimize the pollutants emitted by incinerators. The proponent should plan new construction and renovations in anticipation of increasing rates of recycling over the operational life of the buildings.

The Master Plan should describe any existing recycling program or should include a plan for initiating a program that will include the recycling of glass containers, metal containers, cardboard, newsprint, white paper, milk cartons, juice boxes and plastic containers designated from 1 to 7.

Other easily recycled materials include fluorescent lights, light ballasts, cartridges for copier and printer toner and pallets. WasteCap of Massachusetts, with funding from the Massachusetts Executive Office of Environmental Affairs (EOEA) and DEP, compiles and produces the Recycling Service Directory and Markets Guide for Massachusetts. This directory provides information on recycling service providers who accept, collect or purchase recyclable materials and other sources of recycling market information. Such materials include cardboard, pallets and fluorescent lamps and ballasts. WasteCap also provides technical assistance to businesses interested in establishing recycling programs. This resource should be used in establishing a recycling program for the campus. It is located at 376 Boylston Street, Suite 303 in Boston, 02216. The phone is (617) 236-7715, fax is (671) 236-7141 and the Internet address is www.wastecap.org.

The Master Plan should detail Harvard's solid waste recycling program.

Stormwater Quality
The Boston Water and Sewer Commission (BWSC) spends more than $300,000 annually for the disposal of materials removed from catch basins. This cost does not include labor and general operating and maintenance costs. In addition, the quality of stormwater is receiving increasing regulatory attention as it is a primary contributor to the condition of receiving water bodies. We hope that the proponent will help to educate the public and further improve the water quality of

local water bodies by agreeing to the permanent installation of plaques at all storm drains that bear the warning "Don't Dump - Drains to Charles River." Further information on obtaining the casting for these plaques from a vendor is available from the Operations Division at the BWSC (617-989-7000).

Water Conservation
The Master Plan should describe plans that would avoid, minimize or mitigate impacts on water usage and services. For example, low flow plumbing fixtures should include water conserving aerators and sensor operated sinks and toilets should be installed in public restrooms. The Master Plan should address this issue.

Construction
The Construction section of the Guidelines and the following can be used to provide a basis for a university-wide construction management protocol and we request that the Master Plan respond to and evaluate each element.

Air and Water Quality
During construction projects, street and sidewalk cleaning should be done at least weekly using a vacuum sweeper to prevent the transport of sediment onto city streets and into the stormwater system. A wheel wash and one to two inches of gravel no less than ten (10) feet in length at truck entrances and egresses should be used at each vehicular exit from construction projects to prevent the tracking of dust, mud and other materials onto city streets.

Air Quality, Public Health and the Voluntary Diesel Retrofit Program
According to the Massachusetts Department of Environmental Protection (DEP), about 33 percent of mobile source particulate matter (PM) and ten percent of all nitrogen oxide (NO_x) pollution in the northeast is caused by construction vehicles. More than 90 percent of diesel engine particulate emissions are highly respirable and carry toxins deep into the lung, exacerbating human respiratory ailments. The U. S. Environmental Protection Agency (EPA) has proposed classification of diesel exhaust as "highly likely to be carcinogenic in humans." It estimates that diesel engines currently on the road can run for 1,000,000 miles and remain in operation for as much as 20 to 30 years. This amounts to 160 to 240 tons of pollution over the life of each engine.

In November 1998 DEP inaugurated the Massachusetts Clean Air Construction Initiative (CACI) as part of its Mobile Source Emissions Control Effort. The Voluntary Diesel Retrofit Program of the CACI is designed to reduce air quality degradation caused by emissions of carbon monoxide (CO), volatile organic compounds (VOC), NO_x and air toxics from heavy-duty, diesel-powered construction equipment. Oxidation catalysts and catalyzed particulate filters reduce toxic emissions of formaldehyde, benzene, acrolein and 1-3 butadiene by as much as 70 percent.

The CACI offers contractors a cost-effective way to decrease localized adverse impacts and reduce dust and odor complaints from project abutters and regulatory agencies. Experience with a pilot project that retrofitted 83 pieces of equipment working on the Central Artery/Tunnel (CA/T) project showed that:

- vehicles did not experience significant power loss;
- there are no additional operation and maintenance (O & M) or fuel costs; and
- engine manufacturers continue to honor vehicle warranties.

We ask that Harvard contact Steven G. Lipman, P.E. of DEP to discuss the CACI and how it might be used to minimize adverse construction impacts from the proposed projects. Mr. Lipman can be contacted at (617) 292-5698.

Recycling, Reprocessing and Reuse
Demolition and construction may offer substantial opportunity for the recycling, reprocessing or reuse of demolition and construction debris and materials, including glass, brick, stone and interior furnishings. We encourage Harvard to require as a standard part of construction contracts that contractors recycle, reprocess or reuse, on-site or off-site, demolition and construction debris to the maximum extent possible. Some materials may be suitable for tax-deductible donation to the Building Materials Resource Center (BMRC) at 100 Terrace Street, Roxbury, 02120 (617-442-8197). We encourage contact with the BMRC well prior to demolition to determine if donations to the organization are appropriate. Please see the Guidelines for additional information.

Historic and Archaeological Resources and Urban Design
The Master Plan should identify all historic resources within each designated parcel and within a 1/2 mile radius of parcel boundaries using the Massachusetts Historical Commission's (MHC) *Inventory of Historic and Archaeological Assets of the Commonwealth.* The Master Plan should include a map showing the location of each resource, a narrative description of each resource including its age, style and materials and a discussion of all anticipated impacts of proposed projects. For example, the Master Plan should make clear how the height and massing of planned structures will relate to historic buildings and areas.

Staff of the Boston Landmarks Commission (BLC) request that a meeting be set up well before the completion of the Master Plan so that Harvard, the BLC and MHC can review proposed projects and identify concerns that will need to be addressed..

BLC staff agree with BRA Urban Design staff that projects in the City should be constructed with traditional building materials and techniques rather than synthetic composite materials. Simulated materials such as Aristcraft, exterior insulated finish systems (EIFS), and glass fiber reinforced concrete (GFRC) are inconsistent with Boston architecture and are unlikely to withstand decades of the City's freeze-and-thaw climate. The IMP should discuss the materials planned for each project.

The BLC requests that dated cornerstones be incorporated into all new construction. This element will allow those who are attentive to and value the architecture of the City to appreciate the historical context in which structures were conceived.

Transportation and Environmental Consequences
The number of faculty teaching at Harvard's LMA campus is unclear from the IMPNF and should be clarified in the Master Plan. In addition, the Master Plan should distinguish between the number of faculty and staff who work solely at the LMA campus and those who may also work at other LMA sites or at Harvard in Cambridge and/or Allston.

The Master Plan should identify the remote parking facilities and other important locations served by shuttle services as stated in the IMPNF.

One of the primary goals of this department is to improve air quality. Reducing the number of single occupant vehicles (SOVs) entering and leaving the city is not only related to traffic impacts but is essential to air quality improvement and quality of life. As such, we are committed to seeing that all effective steps are taken to encourage transit and high occupancy vehicle (HOV) use by commuters and residents.

There are environmental benefits to reducing the number of motor vehicles driven in the City of Boston at any time of the day or night. Motor vehicles emit 64 percent of the carbon monoxide (CO) in our country's air, 35 percent of the oxides of nitrogen (NO_x) and 27 percent of the volatile organic compounds (VOCs). NO_x and VOCs combine to create ground level ozone, a significant contributor to human respiratory illness. Vehicle trips, regardless of time of day, increase noise, congestion and degrade the quality of life in any neighborhood. In addition to the standard air pollutants caused by motor vehicles (CO, VOCs, NO_x and particulates), they may also leak or deposit rubber, lead, zinc, copper, cadmium, chromium, ethylene glycol and petroleum products. These contaminants affect air quality, water quality and land quality. (See Opportunities to Improve Air Quality through Transportation Pricing Programs, USEPA, EPA 420-R-97-004, 1997.)

The Master Plan should identify all parking areas/facilities owned, rented, leased, operated, managed, controlled and maintained by Harvard in the LMA or for LMA campus use for any purpose and should detail any arrangements with parking facilities to accommodate its students, staff and/or faculty. Parking should be identified by location and information provided about the number of parking spaces at each facility; criteria for use; rate schedules, if any; and the amount of subsidy if the spaces are provided at less than market rates. Market rates for each facility should be identified with, for non-commercial parking, an explanation as to how market rates were identified.

The IMP should provide detailed information on the transportation behavior of Harvard students, staff and faculty. This information should include:

- total numbers of students, staff and faculty as requested on pages four of these comments;
- mode splits for full-time students, staff and faculty;
- mode splits for part-time students, staff and faculty;
- vehicle occupancy rates (VOR) for each category;
- a map of area parking facilities used by Harvard students, staff and faculty, including commercial parking facilities;
- parking rates and eligibility for parking at each of the identified facilities;
- the level of parking subsidy per month provided for each of the above categories of students and employees;
- a map showing the location and number of bicycle racks and shower/locker areas for commuters at Harvard facilities; and
- the eligibility requirements for each TDM program element.

The Master Plan should describe in detail Harvard's existing TDM program, any new program elements planned for the period of the Master Plan and should indicate specifically if each of the following is presently in place; will be added to the TDM program with the planned date of inclusion; or if the element will not be in the TDM plan:

- on-site Transportation Coordinator;
- Guaranteed Ride Home program for non-drivers and HOV users;
- a parking "cash out" option;
- maintaining a database of employee and student information for ridematching/planning purposes - home address, commuting mode;

- posting public and private transit routes (including water), schedules and rates;
- providing the same information on the Harvard Web site and through e-mails, newsletters and at student and employee orientations;
- on-site availability of public and private transit schedules;
- offering MBTA pass subsidies for all employees (including contract employees) with a *pro rata* subsidy for part-timers;
- pre-tax payroll deduction for MBTA pass purchase;
- on-site MBTA pass sales;
- providing secure bicycle storage in an area protected from the elements (for commuters);
- providing additional bicycle storage for short-term users;
- offering incentives such as preferential parking or reduced-rate parking for high occupancy vehicle (HOV) commuting (three or more commuters). Any incentives should be identified;
- offering occasional parking for transit commuters who may sometimes need to drive;
- establishing parking rate structures to discourage commuter use;
- when parking is off-site, assigning parking based upon trip origin so that commuters are not driving across the LMA and Boston's residential areas;
- offering direct deposit of paychecks;
- having an on-site ATM;
- offering a flextime work option;
- offering a telecommuting work option;
- sharing services with institutional neighbors such as a cafeteria to reduce lunchtime vehicle trips or showers and changing/locker rooms to encourage biking and walking;
- participating in the Walk to Work program;
- sending transit information to all registrants of conferences or seminars to be held at Harvard LMA facilities; and
- providing space for a ZipCar or other car-sharing service.

Thank you for the opportunity to offer comment. We look forward to the Master Plan.

Sincerely,

Antonia M. Pollak

Antonia M. Pollak
Director

Enc.

cc: Andrea d'Amato, Chief of Environmental Services
John P. Sullivan, Jr., P.E., Boston Water and Sewer Commission
Adam Shulman, Boston Transportation Department

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ASSESSING DEPARTMENT

Boston City Hall, Room 301, Boston, MA 02201

April 26, 2002

Keith Craig, Project Manager
for Institutional Development
Boston Redevelopment Authority - 9th Floor
One City Hall Square
Boston, MA 02201-1007

RE: Harvard University's Longwood Campus: Institutional Master Plan Notification Form (IMPNF), School of Dental Medicine Project Notification Form (PNF), and Invitation to Scoping Session

Dear Mr. Craig:

I am writing to you to provide my comments on the above named project as described at the scoping session held April 16, 2002. This letter will serve as the Assessing Department's comments for purposes of the BRA's Scoping Determination.

Harvard University is proposing an Institutional Master Plan for its Longwood Campus. Harvard plans to add additional square footage to 4 campus buildings, demolish the old dental school and construct a new dental school and has submitted the Project Notification Form (PNF) for the construction of the new dental school. The dental school will be approximately 50,000 s.f..

The Harvard Longwood Campus comprises 19.1 acres and approximately 2.4 million s.f. of floor area in 23 buildings. The Campus houses three professional and graduate schools: Harvard Medical School, Harvard School of Dental Medicine, and Harvard School of Public health. Presently the City has only one PILOT agreement on the Longwood Campus and that is on the Harvard Institute of Medicine (HIM) a building of approximately 239,180 s.f..

The Assessing Department submits these comments to express the City's desire to enter into a PILOT agreement on the dental school and in addition, a PILOT agreement has not been reached on the new Research Building known as HIM II, a building of approximately 430,000 s.f..

Sincerely,

Ronald W. Rakow, Commissioner

Cc; J. Kevin Hurton, Director – Harvard
Jeffrey Austin, Special Assistant Corporation Counsel
Yul D. Anderson, Tax Policy

APPENDIX 2
COMMENTS FROM CITY PUBLIC AGENCIES

Boston Water and Sewer Commission

980 Harrison Avenue
Boston, MA 02119-2540
617-989-7000

April 1, 2002

Mr. Keith Craig
Economic Development
Boston Redevelopment Authority
One City Hall Square
Boston, MA 02201

Re: Harvard University Longwood Campus Institutional Master Plan and
Harvard School of Dental Medicine New Dental School Facility
Project Notification Form

Dear Mr. Craig:

The Boston Water and Sewer Commission has reviewed the Institutional Master Plan (IMP) for Harvard University's Longwood Campus March 2002 and the Project Notification Form (PNF) for the New Dental School Facility. The Master Plan provides a framework within which future development and additions to existing facilities will be undertaken. Within the next five years Harvard University plans to construct one new 50,000 s.f. building, the New Dental School Facility, and undertake four smaller additions to existing structures totaling approximately 25,500 s.f.

The New Dental School Facility is mentioned in the IMP and described in depth in the PNF. The new facility will be a five-story building located on a 10,000 s.f. footprint behind 188 Longwood Avenue. The project will include the demolition of the existing HSDM Interim Building. There will be no parking spaces created.

Also included in the IMP are four building additions. These are:

- The Goldenson Magnet Unit Addition of approximately 3,750 s.f. located below-grade in the courtyard of the Goldenson Medical Research Building at 220 Longwood Avenue. The unit will conduct Magnetic Resonance Imaging (MRI) research.
- The Goldenson Addition of approximately 8,500 s.f. to the Goldenson Medical Research Building located at 220 Longwood Avenue. The addition will be located within the courtyard of the building above the previously described Goldenson Magnetic Unit, to house additional biomedical research facilities.
- The Armenise Addition which will add approximately 8,500 s.f. to the Armenise Medical

Research Building located at 210 Longwood Avenue (formerly known as Building D). The addition will be located within the building's courtyard and will house additional biomedical research facilities.

- The Building C Addition which will add approximately 8,500 s.f. to Building C, located at 240 Longwood Avenue. The addition will be located within the buildings courtyard and will house additional biomedical research facilities.

Water demand for the New Dental School Facility and building additions combined is estimated at approximately 14,560 gallons per day. It is estimated that of the 14,560 gallons per day of water demand, 7,925 gallons per day will be for the New Dental School Facility. The sewage generation estimated for the new facility and the additions is 11,650 gallons per day. Of the 11,650 gallons per day sewage generation, it is estimated that 6,340 gallons per day will be from the New Dental School Facility.

The Commission has the following comments:

General Comments:

1. The proponent is required to submit a site plan and a General Service Application to the Commission for the new water, sewer and building storm drain service connections. The site plan should include the location and size of the water mains, sewers and storm drains serving the site, as well as the location of the proposed service connections. A site plan and General Service Application should be submitted for each of the four additions and the new facility.

2. Service connections to the building to be demolished must be cut and capped at the connection to the respective water main and sewer pipe. The proponent must complete a Termination Verification Approval Form for a Demolition Permit, available from the Commission and submit the completed form to the City of Boston's Inspectional Services Department before a demolition permit will be issued. The proponent is advised to take precautions during demolition to prevent debris from entering the sewer or drainage system.

3. All water, sewer or drainage facilities connecting to the Commission's facilities must be designed and constructed at the proponent's expense in accordance with the Commission's Water Distribution System and Sewer Use Regulations and Requirements for Site Plans. To assure compliance with the Commission's requirements, the proponent should submit the site plan and General Service Application to the Commission for review when the design of the project is 50 percent complete.

4. With each site plan, the proponent will be required to submit detailed estimates, with the

basis for the estimates for water demand, sanitary sewer and stormwater flows. The amount of potable water required for air conditioning make-up water and landscape irrigation must be quantified and provided separately.

Sewer and Stormwater

5. The proponent must fully assess the feasibility of retaining stormwater on-site before the Commission will consider allowing the discharge of stormwater to the Commission's drainage system. The feasibility assessment must be submitted to the Commission with the site plan for the project.

6. Each site plan must show in detail how any drainage not retained on site will be conveyed to the Commission's drainage system. Separate building sewers and building storm drains will be required for the new buildings in accordance with Article III, Section I of the Commission's Sewer Use Regulations.

7. In conjunction with the site plan and General Service Application, the proponent must submit to the Commission a stormwater management plan that identifies specific best management measures for controlling erosion and for preventing the discharge of sediment, or contaminated groundwater or stormwater to the Commission's sewer system during construction. The plan must comply with the DEP's Stormwater Performance Standards and should include a description of measures to control pollutants in stormwater after construction is completed.

8. The Commission prohibits permanent and temporary discharge of site dewatering drainage to a sanitary sewer. If the proponent proposes to discharge dewatering drainage to a storm drain then the proponent must obtain a Drainage Discharge Permit from the Commission.

9. The Commission requests that the proponent install a permanent sign (casting) stating: "Don't Dump: Drains to Charles River" next to any new catch basin installed as part of the project. The proponent may contact the Commission's Operation's division for information concerning the purchase of castings.

Water

10. The proponent should explore opportunities for implementing water conservation measures in addition to those required by the State Plumbing Code. In particular the proponent should consider the use of sensor-operated faucets and toilets.

11. Since the proposed project will use more than 500 cubic feet (3,740 gallons) of water per day, if new water meters are required the proponent must provide for the connection of the water meter to the Commission's automatic meter reading system. The proponent must provide at its own expense, a meter interface unit (MIU), approved by the Commission and mounted near each meter, a telephone line and jack, and an outside meter reading device. The Commission will connect the telephone line and the MIU to the meter and program the MIU, at the Commission's expense. For information regarding the installation of AMR, the proponent should contact Mr. Mark Aigen of the Commission's Meter Installation Department.

Thank you for the opportunity to comment on this project.

Yours truly,

John P. Sullivan, Jr., P.E.
Chief Engineer

JPS/jb

cc: E. Buehrens, Executive Dean of Administration, Harvard Medical School
K. Craig, BRA
R. Mertens, BRA
M. Zlody, BED
P. Larocque, BWSC

APPENDIX 3
COMMENTS FROM THE PUBLIC

M A S C O

Medical Academic and Scientific Community Organization, Inc.

April 11, 2002

Mr. Owen Donnelly
Deputy Director,
Institutional Development
Boston Redevelopment Authority
One City Hall Plaza
Boston, MA 02108

RE: Harvard University Longwood Campus Institutional Master Plan and Project Notification Form for Harvard School of Dental Medicine New Dental School Facility

Dear Mr. Donnelly:

I am submitting comments a member of the Harvard Impact Advisory Group (IAG). The Harvard School of Dental Medicine's New Dental School Facility and proposed master plan represent very modest new building plans and additions. As such I believe their impacts, as described thus far, on the Longwood Medical and Academic Area to be equally modest.

As discussed at the IAG meeting on April 8, 2002, it would be helpful to see additional alternatives to the conceptual design of the new Dental School Building. As it is currently configured it would involve a significant overhang over the first floor pedestrian level, which is not optimal from a pedestrian point of view in terms of attractiveness or legibility (providing a clear, open pedestrian path to and from Longwood Avenue into the heart of the Harvard School of Public Health campus). The plan includes additional pedestrian plaza areas and trees, all of which are positive contributions to open space in the area. Additional trees and landscaping would be wonderful to see here. Harvard has identified some real potential obstacles to alternative designs, including required size of floor plates, the existence of an underground loading dock, and a campus agreement on provision of pedestrian paths from the Harvard School of Public Health. The question is whether an alternative could be created that can achieve their programmatic and campus needs, improve the pedestrian environment more than the current conceptual design, and not have a negative impact on the Quad Buildings.

Sincerely,

Sarah Hamilton (JD)

Sarah J. Hamilton
Director,
Area Planning and Development

Cc: Eric Buehrens, HMS

375 Longwood Avenue, Boston, Massachusetts 02215-5328 617 632-2310 Fax: 617 632-2759

87 Gainsborough Street #407
Boston, MA 02115

Mr. Owen Donnelly fax: 617-367-5916
Deputy Director for Institutional Development
Boston Redevelopment Authority, 9th Floor
One City Hall Square
Boston, MA 02201-1007

Subject: Comments on

"Institutional Master Plan Notification Form (PNF),
Harvard University, Longwood Campus (Harvard U, Longwood IMP),
March 2002"
&
"Project Notification Form (PNF), Harvard University,
Harvard School of Dental Medicine, New Dental School Facility (Harvard HSDM),
March 2002"

Thank you for the opportunity to review the subject documents. Thank you for allowing me to participate in the IAG process. I am making these comments both on my own behalf and on the behalf of Fenway Community Development Corporation.

General Comments: I appreciate that Harvard University, Longwood Campus has chosen to have very modest expansion goals for at least the next five years. Given the mammoth 430,000 square foot facility still under construction this is understandable. I have no objections to allowing this project to move forward in the Article 80 process.

Transportation: Normally, the majority of comments on development are related to this issue. Harvard University, Longwood Campus has however chosen in their own words, "a favorite architectural features" of no new parking in all of their proposed work. This is commendable. Harvard University, Longwood Campus has also let us know that they are providing only about 0.5 employee parking spaces per 1,000 square foot of facility space. I appreciate knowing that there are a least some institutional uses that do not require higher levels of parking.

There are several items I would like to see in Harvard's DPIR:

I would like to see transportation plans showing the pedestrian and bicycle routes through the Longwood campus. I would like to see how these pathways connect to the broader pedestrian and bicycle routes through the Longwood Medical Area and the adjacent neighborhoods. The IMP page 18 makes preliminary mention of this network of paths.

I understand that Harvard University, Longwood Campus actively participates in Transportation Demand Management (TDM) programs (IMP page 11) and I am aware that these efforts have paid off. Harvard reports that more than half of their employees arrives by public transportation. I look forward to a more rigorous break down of the numbers in the DPIR.

I understand and appreciate that Harvard subsidizes part of the cost of public transportation for their employees. Unfortunately, Harvard also subsidizes a portion of the parking costs for their employees. There is no plausible reason to be subsidizing employee parking in the LMA. Harvard does not plan on eliminating these subsides in their five year IMP plan. I hope that Harvard can be prevailed upon to reconsider their plans. I expect to see the extent of these subsidies in the DPIR.

Energy/Sustainability: The scoping document should require the DPIR to include a LEED self-assessment of the proposed building. I have attached the project checklist that LEED recommends for rating. Will this building earn at least 26 points from this checklist and be able to be LEED certified? I'm unsure, but collecting the self assessments in DPIR filings will allow those in the development community to know how much farther we have to go to achieve sustainable buildings.

Campus Utility Systems: I expect the IMP to have campus maps of all public and private utility systems. .

Electrical Systems: I expect the DPIR to provide an estimate of peak kW electrical load for the HSDM building. In addition I would expect a peak cubic feet of gas per hour consumption along with other expected utility loads.

I also expect any description of an electrical system to include the size, number and service voltages of the building service disconnect(s). I expect the ownership of the transformers to be discussed. Since the service transformer will most likely contain several hundred gallons of flammable fluid, I expect this issue to be discussed. If the transformer requires special access by the local utility this should also be discussed.

Standby Electrical Systems: Harvard U, Longwood Campus verbally mentioned that a generator would be included in the project. I expect the DPIR to indicate the expected hours of operation, fuel source (diesel or gas), how much fuel will be stored on the site and where will the fuel be stored. Since it is not a high-rise, I would estimate the emergency electrical load of a building like this one would require approximately a 15 kW generator.

Harvard U, Longwood Campus may explore other methods for supplying standby power for this building. A stand-alone standby diesel generator may be a very cumbersome solution. A second service to this building from an existing standby generator in a nearby building or from a separate utility lateral may avoid many problems.

Emergency loads as defined by the state building codes are those required for the life safety evacuation of building occupants. Harvard U, Longwood Campus verbally indicated that the standby generator would supply loads in addition to emergency loads. Maintaining laboratory experiments can be described as a "critical" load, but it does not qualify as an "emergency" load.

Other: The scoping document should ask for community group meetings. Please provide a list of groups to be met with, the dates and any other information about this process that the proponent feels would be valuable.

Sincerely,

Marc Laderman

Harvard IMP & HSDM IAG Member

Fenway CDC Board member

Fenway CDC representative to the Fenway Planning Task Force

Cc: C. Koechlin, fax 617-267-8591

C:\My Documents\Fenway CDC\Development Letters\Havard IMP & HSDM.doc

Project Checklist

LEED

Sustainable Sites

14 Possible Points

Y	Prereq 1	Erosion & Sedimentation Control		Required
Y ? N	Credit 1	Site Selection		1
Y ? N	Credit 2	Urban Redevelopment		1
Y ? N	Credit 3	Brownfield Redevelopment		1
Y ? N	Credit 4.1	Alternative Transportation,	Public Transportation Access	1
Y ? N	Credit 4.2	Alternative Transportation,	Bicycle Storage & Changing Rooms	1
Y ? N	Credit 4.3	Alternative Transportation,	Alternative Fuel Refueling Stations	1
Y ? N	Credit 4.4	Alternative Transportation,	Parking Capacity	1
Y ? N	Credit 5.1	Reduced Site Disturbance,	Protect or Restore Open Space	1
Y ? N	Credit 5.2	Reduced Site Disturbance,	Development Footprint	1
Y ? N	Credit 6.1	Stormwater Management,	Rate or Quantity	1
Y ? N	Credit 6.2	Stormwater Management,	Treatment	1
Y ? N	Credit 7.1	Landscape & Exterior Design to Reduce Heat Islands,	Non Roof	1
Y ? N	Credit 7.2	Landscape & Exterior Design to Reduce Heat Islands,	Roof	1
Y ? N	Credit 8	Light Pollution Reduction		1

Water Efficiency

5 Possible Points

Y ? N	Credit 1.1	Water Efficient Landscaping,	Reduce by 50%	1
Y ? N	Credit 1.2	Water Efficient Landscaping,	No Potable Use or No Irrigation	1
Y ? N	Credit 2	Innovative Wastewater Technologies		1
Y ? N	Credit 3.1	Water Use Reduction,	20% Reduction	1
Y ? N	Credit 3.2	Water Use Reduction,	30% Reduction	1

Energy & Atmosphere

17 Possible Points

Y	Prereq 1	Fundamental Building Systems Commissioning		Required
Y	Prereq 2	Minimum Energy Performance		Required
Y	Prereq 3	CFC Reduction in HVAC&R Equipment		Required
Y ? N	Credit 1.1	Optimize Energy Performance,	20% New / 10% Existing	2
Y ? N	Credit 1.2	Optimize Energy Performance,	30% New / 20% Existing	2
Y ? N	Credit 1.3	Optimize Energy Performance,	40% New / 30% Existing	2
Y ? N	Credit 1.4	Optimize Energy Performance,	50% New / 40% Existing	2
Y ? N	Credit 1.5	Optimize Energy Performance,	60% New / 50% Existing	2
Y ? N	Credit 2.1	Renewable Energy,	5%	1
Y ? N	Credit 2.2	Renewable Energy,	10%	1
Y ? N	Credit 2.3	Renewable Energy,	20%	1
Y ? N	Credit 3	Additional Commissioning		1
Y ? N	Credit 4	Ozone Depletion		1
Y ? N	Credit 5	Measurement & Verification		1
Y ? N	Credit 6	Green Power		1

LEED

Materials & Resources

13 Possible Points

Y	Prereq 1	**Storage & Collection of Recyclables**	Required
Y ? N	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Shell	1
Y ? N	Credit 1.2	**Building Reuse**, Maintain 100% of Shell	1
Y ? N	Credit 1.3	**Building Reuse**, Maintain 100% Shell & 50% Non-Shell	1
Y ? N	Credit 2.1	**Construction Waste Management**, Divert 50%	1
Y ? N	Credit 2.2	**Construction Waste Management**, Divert 75%	1
Y ? N	Credit 3.1	**Resource Reuse**, Specify 5%	1
Y ? N	Credit 3.2	**Resource Reuse**, Specify 10%	1
Y ? N	Credit 4.1	**Recycled Content**, Specify 25%	1
Y ? N	Credit 4.2	**Recycled Content**, Specify 50%	1
Y ? N	Credit 5.1	**Local/Regional Materials**, 20% Manufactured Locally	1
Y ? N	Credit 5.2	**Local/Regional Materials**, of 20% Above, 50% Harvested Locally	1
Y ? N	Credit 6	**Rapidly Renewable Materials**	1
Y ? N	Credit 7	**Certified Wood**	1

Indoor Environmental Quality

15 Possible Points

Y	Prereq 1	**Minimum IAQ Performance**	Required
Y	Prereq 2	**Environmental Tobacco Smoke (ETS) Control**	Required
Y ? N	Credit 1	**Carbon Dioxide (CO_2) Monitoring**	1
Y ? N	Credit 2	**Increase Ventilation Effectiveness**	1
Y ? N	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
Y ? N	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
Y ? N	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
Y ? N	Credit 4.2	**Low-Emitting Materials**, Paints	1
Y ? N	Credit 4.3	**Low-Emitting Materials**, Carpet	1
Y ? N	Credit 4.4	**Low-Emitting Materials**, Composite Wood	1
Y ? N	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
Y ? N	Credit 6.1	**Controllability of Systems**, Perimeter	1
Y ? N	Credit 6.2	**Controllability of Systems**, Non-Perimeter	1
Y ? N	Credit 7.1	**Thermal Comfort**, Comply with ASHRAE 55-1992	1
Y ? N	Credit 7.2	**Thermal Comfort**, Permanent Monitoring System	1
Y ? N	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
Y ? N	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Innovation & Design Process

5 Possible Points

Y ? N	Credit 1.1	**Innovation in Design**: Specific Title	1
Y ? N	Credit 1.2	**Innovation in Design**: Specific Title	1
Y ? N	Credit 1.3	**Innovation in Design**: Specific Title	1
Y ? N	Credit 1.4	**Innovation in Design**: Specific Title	1
Y ? N	Credit 2	**LEED™ Accredited Professional**	1

Project Totals

69 Possible Points

Certified 26-32 points Silver 33-38 points Gold 39-51 points Platinum 52-69 points

APPENDIX 4
EXAMPLES OF PUBLIC NOTICE

SAMPLE

PUBLIC NOTICE

The Boston Redevelopment Authority ("BRA"), pursuant to Article 80 of the Boston Zoning Code, hereby gives notice that an Institutional Master Plan was submitted by the NAME OF INSTITUTION, on MONTH, DAY, AND YEAR. The NAME OF INSTITUTION Institutional Master Plan (the "Master Plan") describes currently proposed institutional projects and the current facilities and uses on the NAME OF INSTITUTION campus. Public comments on the DPIR, including the comments of public agencies, should be transmitted to E. Owen Donnelly, Deputy Director for Institutional Development, BRA, Boston City Hall, Boston, MA 02201, within sixty (60) days of this notice or by ______________. Approvals are required of the BRA pursuant Article 80 for the issuance of an Adequacy Determination by the Director of the BRA for the APPROVAL, AMENDMENT, and/or RENEWAL of the Master Plan. The Master Plan may be reviewed or obtained at the Office of the Secretary of the BRA, Room 910, Boston City hall, Boston, Boston, MA 02201 between 9:00 AM and 5:00 PM.

BOSTON REDEVELOPMENT AUTHORITY
Harry R. Collings, Secretary

Date

SAMPLE

PUBLIC NOTICE

The Boston Redevelopment Authority (BRA), acting pursuant to Article 80 of the Boston Zoning Code, hereby gives notice that a Draft Project Impact Report (DPIR) for Large Project Review has been received from ______________________________

____
(Name of Applicant)

for ____
(Brief Description of Project)

proposed at ____.
(Location of Project)

The DPIR may be reviewed or obtained at the Office of the Secretary of the BRA Boston City Hall, Room 910, between 9:00 A.M. and 5:00 P.M., Monday through Friday, except legal holidays. Public comments on the DPIR, including the comments of public agencies, should be transmitted to E. Owen Donnelly, Deputy Director for Institutional Development, BRA, Boston City Hall, Boston, MA 02201, within forty-five (45) days of this notice or by _______________. Approvals are requested of the BRA pursuant to Article 80 for ______________________________.

The BRA in the Preliminary Adequacy Determination regarding the DPIR may waive further review requirements pursuant to Section 80B-5.4(c)(iv), if after reviewing public comments, the BRA/EDIC finds that the ______________________________ adequately describes the Proposed Project's impacts.

BOSTON REDEVELOPMENT AUTHORITY
Harry R. Collings, Secretary

<u>Date</u>

OD/HarvScopes
043002/40

APPENDIX 5
REQUIRED FINANCIAL INFORMATION

REQUIRED FINANCIAL INFORMATION
CENTER FOR ADVANCED MEDICINE PROPOSED PROJECT

DEVELOPMENT PRO FORMA includes all the information normally found in a development pro forma, by phase. This includes, but is not limited to:

- Land costs, per land square foot and total, by parcel, including any incremental disposition cost attributed to the project. Include any imputed or actual carrying costs.
- Attribution of acquisition expense over project components (per FAR square foot, academic, retail, office, etc.).
- All hard costs on a per-unit and total basis by phase (desegregated into base building, site work, furniture, fixtures and equipment, etc.).
- All soft cost on a per-unit and total basis, (desegregated into individual line items such as architectural, engineering, legal, accounting, and developer's fees, and any other professional fees, insurance, permits, real estate tax during construction, etc.).
- All contingencies, on a per-unit and total basis, by phase (specify whether contingency is on hard costs, soft cost, or total cost).
- All assumptions regarding financing terms on acquisition, pre-development, construction and permanent loans, by phase (including financing fees, interest rates, drawdown assumptions, terms, participations, amortization).
- Calculation of housing and jobs linkage obligations pursuant to Articles 26A and 26B, and anticipated payment method (over term of obligation or on a net present value basis).
- Any other project-related expenses not within any of the above categories
- Calculation of Total Development Cost (TDC) by component, including total and per unit breakdown (e.g., per square foot academic, retail, office, etc.).
- Sources of debt and equity for total project costs.
- Projected financing sources, including banks, institutional investors, private, corporate or government donors (an analysis of the costs versus benefits of the financing options, including interest costs and loan term, as well a comparison of available sources, should be included).

- Appropriate return measures (return on equity, return on total development cost, net present value, internal rate of return; specify method of calculation and hurdle rates).

APPENDIX 6
SUBMISSION REQUIREMENTS FOR DESIGN DEVELOPMENT AND CONTRACT DOCUMENTS SUBMISSIONS

Phase II Submission: Design Development

1. Written description of the Proposed Project.

2. Site sections.

3. Site plan showing:

    a. Relationship of the proposed building and open space and existing adjacent buildings, open spaces, streets, and buildings and open spaces across streets.

    b. Proposed site improvements and amenities including paving, landscaping, and street furniture.

    c. Building and site dimensions, including setbacks and other dimensions subject to zoning requirements.

4. Dimensional drawings at an appropriate scale (e.g., 1" = 8') developed from approved schematic design drawings which reflect the impact of proposed structural and mechanical systems on the appearance of exterior facades, interior public spaces, and roofscape including:

    a. Building plans

    b. Preliminary structural drawings

    c. Preliminary mechanical drawings

    d. Sections

    e. Elevations showing the Proposed Project in the context of the surrounding area as required by the Authority to illustrate relationships or character, scale and materials.

5. Large-scale (e.g., 3/4" = 1'-10") typical exterior wall sections, elevations and details sufficient to describe specific architectural components and methods of their assembly.

6. Outline specifications of all materials for site improvements, exterior facades, roofscape, and interior public spaces.

7. Eye-level perspective drawings showing the Proposed Project in the context of the surrounding area.

8. Samples of all proposed exterior materials.

9. Complete photo documentation (35 mm color slides) of above components including major changes from initial submission to the Proposed Project approval.

Phase III Submission: Contract Documents

1. Final written description of the Proposed Project.

2. A site plan showing all site development and landscape details for lighting, paving, planting, street furniture, utilities, grading, drainage, access, service, and parking.

3. Complete architectural and engineering drawings and specifications.

4. Full-size assemblies (at the project site) of exterior materials and details of construction.

5. Eye-level perspective drawings or presentation model that accurately represents the Proposed Project, and a rendered site plan showing all adjacent existing and proposed structures, streets and site improvements.

6. Site and building plan at 1" - 100' for Authority's use in updating its 1" = 100" photogrammetric map sheets.

Phase IV Submission: Construction Inspection

1. All contract addenda, proposed change orders, and other modifications and revisions of approved contract documents which affect site improvements, exterior facades, roofscape, and interior public spaces shall be submitted to the BRA prior to taking effect.

2. Shop drawings of architectural components which differ from or were not fully described in contract documents.

APPENDIX B TRANSPORTATION DATA

Appendix B, Transportation Data,
is bound separately and available upon request from Epsilon Associates.