Institutional Master Plan

The Arnold Arboretum of Harvard University

Submitted to:
Boston Redevelopment Authority
One City Hall Square
Boston, MA 02201

Submitted by:
The Arnold Arboretum of Harvard University
125 Arborway
Boston, MA 02130-3500

OCTOBER 4, 2006

REVISED AUGUST 3, 2007

The Arnold Arboretum of Harvard University
Institutional Master Plan—REVISED August 3, 2007

Index of Revisions to October 4, 2006 Institutional Master Plan

Chapter 1.0: Introduction / Mission and Objectives

Page 1-14: **Section 1.6.2, Outreach:** Revised text to reflect additional dates for community meetings held

Section 1.6.2, Community Concerns: Revised text to reflect the imposition of development restrictions within the Horticultural and Botanical Resource Study Area described in Chapter 5 as one of the responses to community concerns under "Extent of Future Development on the Weld Hill Parcel"

Figure 1-2: Revised figure to show the modified driveway and emergency vehicle access/egress location (May 2007)

Chapter 2.0: Arboretum Property and Context

No Revisions

Chapter 3.0: Arboretum Community Programs and Benefits

No Revisions

Chapter 4.0: Planning Principles, Future Needs & Long-Range Plans

Figure 4-1: Revised figure to show the modified driveway and emergency vehicle access/egress location (July 2007)

Chapter 5.0: Proposed Project and Future Weld Hill Development

Page 5-1: Revised text at top of page to reflect the updated span of years (2007-2017) for the ten-year term of the IMP

Page 5-7: **Section 5.3.2, Building Massing, Design, and Materials:** Revised text to indicate that brick has been added to the palette of stone and cedar siding exterior building materials for the Research and Administration Building

Page 5-8 **Parking**: Revised text to reflect the modified emergency-vehicle access/egress location

Page 5-8: **Section 5.3.2, Schedule and Project Cost:** Revised text to reflect updated schedule and project cost

Page 5-9: **Sections 5.3.3 and 5.3.4, Vehicular and Pedestrian Access and Circulation:** Revised text to reflect the modified emergency-vehicle access/egress location

Revised text to reflect potential new pedestrian access from Walter Street, near the intersection of Weld Street

Pages 5-14 and 5-15: **Section 5.5:** Added asterisk to "Yards" in Table 5-2 to indicate that the definition is as defined in Article 2A of the Boston Zoning Code

Revised text to reflect "Horticultural and Botanical Resource Study Area" as the name of the land outside of the "Designated Development Area" on the Weld Hill Parcel

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Page 5-15: **Section 5.5:** Revised text to reflect the extended term of years for the development restrictions applicable within the Horticultural and Botanical Resource Study Area to be set forth in a declaration of development restrictions.

Figure 5-1: Revised figure to show: (1) modified driveway and emergency vehicle access/egress location; (2) slight modification in the location of the parking area and the portion of the drive in the center of the parcel (shifted to the east to preserve additional existing trees); and (3) regrading and terracing proposed for existing nursery to create a more level working area (February 2007)

Figure 5-5: Updated perspectives of north (front) and south (rear) of proposed Research and Administration Building (November 2006)

Figure 5-6: Updated elevation drawings of north (front) and south (rear) of proposed Research and Administration Building (June 2007)

Figure 5-6a: New figure showing perspective rendering of proposed building from main entrance on Centre Street (November 2006)

Figure 5-6b: New figure showing proposed elevation from Centre Street (November 2006)

Figure 5-8: Revised figure to show the modified driveway and emergency vehicle access/egress location (July 2007)

Figure 5-12: Revised figure to show that existing and future views from western end of Weld Street will remain the same, due to relocation of emergency access driveway from Weld Street to Centre Street (July 2007)

Figure 5-16: Revised figure to reflect updated building footprint, vehicular circulation, and to note "Horticultural and Botanical Resource Study Area" as the name of the land outside of the "Designated Development Area" (July 2007)

Section 6.0: Transportation Access Plan Component

Page 6-8: **Section 6.3.2:** Revised text to reflect the modified emergency-vehicle access/egress location

Page 6-12: **Section 6.3.4:** Revised text to reflect the modified emergency-vehicle access/egress location

Revised text to reflect potential new pedestrian access from Walter Street, near the intersection of Weld Street

Section 7.0: Cultural Resources

Page 7-7: **Table 7-2:** Added a footnote to indicate that 1090 Centre Street has been designated a Boston Landmark by the City of Boston

Section 8.0: Utility Infrastructure

Page 8-7: Revised text to reflect that the current design of the "closed loop" geothermal heat exchange system anticipates the need for 88 "wells" to be spaced approximately 30 feet apart.

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[1] Appendix B is not included in this volume, but is available from Epsilon upon request by calling (978) 897-7100, or may be viewed online at www.arboretum.harvard.edu.

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6.0 TRANSPORTATION ACCESS PLAN COMPONENT

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1.0 INTRODUCTION / MISSION AND OBJECTIVES

1.1 Introduction

Harvard University (Harvard) is pleased to submit this Institutional Master Plan (IMP) for the Arnold Arboretum of Harvard University (Arboretum) to the Boston Redevelopment Authority (BRA) pursuant to Article 80D of the Boston Zoning Code and the BRA Scoping Determination dated April 28, 2004 (see Appendix A).

The Arboretum is located in the Jamaica Plain and Roslindale neighborhoods of the City of Boston (Figure 1-1). Founded in 1872 by Harvard, the Arboretum is the first arboretum planned from its inception to be a public landscape as well as a center for research on woody plants. The Arboretum collections contain trees and shrubs from all north temperate regions of the world with special emphasis on plants native to North America and Asia.

This IMP addresses all of the land managed by the Arboretum, including lands owned in fee by Harvard and land that is leased by the City of Boston to Harvard. The IMP describes the Arboretum's existing grounds, facilities, and programs, its long-range objectives, and its proposed building project, which is intended to meet projected future growth and space needs over the next ten years.

Within the ten-year term of the IMP, the Arboretum proposes one new construction project, a new Research and Administration Building, on land owned by Harvard. The development of this project will provide state-of-the-art research facilities needed to continue to fulfill the Arboretum's research and education mission.

The IMP includes the following chapters:[1]

1.0 Introduction/Mission and Objectives;
2.0 Arboretum Property and Context;
3.0 Arboretum Community Programs and Benefits;
4.0 Planning Principles, Future Needs, and Long-Range Plan;
5.0 Proposed Project and Future Weld Hill Development;
6.0 Transportation Access Plan Component;
7.0 Cultural Resources; and
8.0 Utility Infrastructure.

Chapter 1 includes a description of the Arboretum's background and mission, a summary of its core programs, a brief project description, a summary of the public process involved in the Arboretum's institutional master planning, and a list of changes to the Arboretum's long-term plan since its Institutional Master Plan Notification Form (IMPNF) was filed in March

[1] Figures are presented at the end of each chapter.

2004. Of particular note, the Arboretum has changed the design of the Research and Administration Building since the IMPNF to respond to public and agency comments by siting the building into Weld Hill, substantially reducing its visual impact to abutters, and altering the proposed vehicular circulation system. Other changes that respond to public comments are also described.

1.2 Background and Mission of the Arboretum

1.2.1 Establishment of the Arboretum

In 1842 Benjamin Bussey (1757-1842), a prosperous Boston merchant and scientific farmer, bequeathed more than 300 acres of his country estate, "Woodland Hill," and a part of his fortune to Harvard for "instruction in agriculture, horticulture, and related subjects." Bussey had created Woodland Hill between 1806-1837 through the acquisition and consolidation of small farmsteads, some of which had been established in the 17th century. In 1869 Harvard established the Bussey Institution on a portion of the Bussey estate. The Institution was dedicated to agricultural experimentation and served as headquarters for Harvard's undergraduate school of agriculture.

Sixteen years after Bussey's death, James Arnold (1781-1868), a New Bedford whaling merchant, specified that a portion of his estate was to be used for "the promotion of Agricultural, or Horticultural improvements." In 1872, when the trustees of the will of James Arnold transferred his estate to Harvard, Arnold's gift was combined with 123 acres of the former Bussey estate to create the Arnold Arboretum. In the deed of trust between the Arnold trustees and the College, income from Arnold's legacy was to be used for establishing, developing, and maintaining an arboretum to be known as the Arnold Arboretum which "shall contain, as far as practicable, all the trees [and] shrubs ... either indigenous or exotic, which can be raised in the open air of West Roxbury." The Arboretum would occupy a portion of Bussey's "Woodland Hill" and the Arboretum's director would carry the title of Arnold Professor of Dendrology at Harvard.

The Arboretum's first director, Charles Sprague Sargent, believed that a private research institution could also serve as a public resource. In his *Annual Report to the President and Fellows of Harvard College* for the year ending August 31, 1873, he wrote that the Arboretum was:

> *...intended to educate the public as well as the special students who resort to it. It was (to be) laid out as an open park with suitable walks and roadways. (It) could hardly fail to become a beautiful, wholesome and instructive resort, which (would become) more and more precious as populations accumulated about it.*

To this end Sargent pursued a partnership with the Boston Park Commission, which in 1882 resulted in a unique agreement that combined the Arboretum's research mission with public access. Under this agreement, Harvard granted the land of the Arboretum to the City of Boston to become part of the City's emerging park system. In turn, the City then leased the land, with an additional 45 acres that the City had acquired itself, back to Harvard for 1,000 years.

Sargent collaborated with Frederick Law Olmsted to create a design for the Arboretum that used the natural topography of the site as well as existing woodland and other features to display a scientific arrangement of plants. The resulting landscape has matured into a nationally admired example of Olmsted's naturalistic style and a living tree and shrub collection of international reputation.

Under the lease, Harvard, acting through the Arboretum, would develop and curate the living plant collections, while the City, under the aegis of the Park Commissioners, would build and maintain the roadways, sidewalks, and boundary walls; provide security; and facilitate public use of the grounds.

Implicit in this agreement was the commitment that the Arboretum would support the City's responsibility to provide and manage public access to the grounds and that; in turn, the City would support the Arboretum's mission to conduct research using the collections. This fundamental and mutually supportive relationship continues to the present.

1.2.2 Mission of the Arboretum

The mission of the Arboretum has remained focused on research and education about plants since its establishment in 1872:

> *The Arnold Arboretum of Harvard University discovers and disseminates knowledge of the plant kingdom to foster greater understanding, appreciation, and stewardship of the Earth's botanical diversity and its essential value to humankind (Arnold Arboretum Director's Report, 2003-2006).*

This mission is accomplished through three areas of activity: research, education, and horticulture.

1.3 The Arnold Arboretum Today

Through its historic partnership with the City of Boston, the Arnold Arboretum serves not only as a beloved landscape within the renowned, Olmsted-designed "Emerald Necklace," the City's linear park system, but also as an internationally recognized research institution. With a living collection of more than 14,000 accessions, representing more than 4,200 taxa (varieties) of hardy woody plants, the exceptionally well-maintained Arboretum draws more than 250,000 visitors per year, conducts numerous research projects, educates more than

1,200 continuing education students and 250 Landscape Institute students per year, and hosts more than 2,500 school-aged children annually in its educational programs. In addition, the Arboretum's library and herbarium are resources used by students, researchers, scientists, and the public.

The Arboretum has significance to both the international scientific community and the public at large. For visitors to the grounds, the Arboretum provides a unique setting for education, passive recreation, and the opportunity to study a collection of woody plants, labeled with their scientific and common names and their places of origin, growing in a historic landscape. For scientists and students, the living collections, herbarium, and library collections offer documented research materials relating to plants and their identification, management, development, and ecology.

Over the years, additional tracts of land have been added to the grounds, and today the grounds consist of approximately 290 acres, including approximately 265 acres of City-owned land under lease and 25 acres of land owned by Harvard. The grounds are bordered by the Arborway, Washington Street, an MBTA railroad right-of-way, Mendum Street, Walter Street, Weld Street, and Centre Street. Three roads open to public travel pass through the grounds, including South Street, Bussey Street, and Walter Street. The Arboretum grounds and buildings are described in detail in Chapter 2.

The Arboretum is an institution of Harvard University, administered within the University's central administration. The Arboretum is largely responsible for funding and management of its own operations and is financially dependent upon past and present philanthropy and research grants.

Following are summary descriptions of the main components of the Arboretum's programs in fulfillment of its mission. Chapter 3 describes the Arboretum's community programs and benefits in more detail.

1.3.1 Arboretum Research

The Arboretum seeks to advance knowledge in the biology and evolution of plants. As the fields of botany, horticulture, physiology, ecology, and evolution, among others, have evolved, the Arboretum's research focus has also changed. Examples of current research projects by Arboretum researchers, visiting scientists, and collaborators are highlighted below. Publication in professional journals and successful participation in peer-reviewed grants and projects affirm the value of the Arboretum's research in these fields. Examples of current Arboretum research projects are described below.

- **Plant Exploration and Biogeography -** The Arboretum continues its tradition of identifying plants and understanding their biogeography. Biogeography is the study of how plant groups got to where they are today; it seeks to learn what may have engendered the origin, dispersal, and extinction of plant groups in different geographic areas. For example, Chinese and American botanists are collaborating to inventory the

plants and fungi of unexplored areas of the Hengduan Mountains in south-central and southwestern China. The Hengduan area, roughly the size of Texas, lies on the southeastern edge of the Tibetan Plateau, extending from the Sichuan Basin to eastern Xizang (Tibet), and from northernmost Myanmar (Burma) southward to the Yunnan plateau. This "biodiversity hotspot" is exceptionally rich in vascular plants. Between 30 and 40 percent of China's roughly 30,000 species can be found here, of which possibly 3,000 or more species are endemic. The area's flora is especially noteworthy for its diverse representation of several genera, for example, rhododendron, with upwards of 225 species. Extremes of geography and climate together with inaccessibility have kept much of this area unexplored or under-explored and to a large degree biologically unknown.

From 2004 to 2008 the research team is focusing on the most poorly known areas, collecting specimens of plants and fungi and gathering information about them, determining biogeographical patterns, and drawing the boundaries of the "hotspot." Results of the project are extremely useful in advancing our understanding of phylogenetics, floristics, biogeography, ecology, and conservation needs. Specimens are deposited in Chinese herbaria and in the Harvard University Herbaria, with duplicates sent to specialists for identification and study. All collections are geo-referenced and computerized in the field, the data and digital images are made available on the web, and all collections are available to other researchers as needed. In addition, the project provides training for Chinese and American students in field techniques, database development, and geographic information systems.

- Understanding Global Differences - Ecosystem science and global climate change have focused great attention on the role of major elements such as forests in stabilizing or changing climate through impacts on water, carbon, and nutrient cycles worldwide. An understanding of the function of individual trees, and the differences among different kinds of trees, is critical to predicting the larger impacts of vegetated regions of the world. Currently the Arboretum's extensive collection of conifers from different regions of the world is the stage for a comparative study of northern and southern hemisphere species.

  Conifer families are separated from one another geographically, resulting in clearly distinct types of cone-bearing plants on the two sides of the equator. The *Pinaceae* family is strictly confined to the north, while the *Araucariaceae* and most of the *Podocarpaceae* family grow only in the south. Just one family, the *Cupressaceae*, is represented equally in both hemispheres. Fossil records indicate that *Podocarpaceae* and *Pinaceae* have rarely ventured far beyond their current, respective areas in the southern and northern hemispheres, while the *Araucariaceae* occurred in the northern hemisphere during Jurassic times, moving south later over geologic time.

  This project is examining the differences in leaf physiology among these families and the role these differences may play in the climatic limitations of these conifers. By understanding how leaf structure and morphology relate to cold, shade, and drought

tolerance, and how these families differ, the project is expected to help explain the disjunct distribution of these families in the two hemispheres.

- **Evolution of Developmental Mechanisms -** Modern investigations of the genetic basis of evolution and the construction of an evolutionary tree of life have revealed the closely linked relationships among organisms at the level of genes and cellular systems. At the same time, the development of comparative studies of closely and distantly related species has generated a rich array of hypotheses for experimentation on the mechanisms controlling the growth and development of plants. Comparative developmental and evolutionary studies have made the diverse collections of the Arnold Arboretum immensely valuable for understanding the basic biology of large, mature organisms such at trees.

  Plants use photoreceptors to determine where they are in space and time, and critically, where they are in relation to other plants. As plants have changed through time, gaining the capacity first to survive on land and then to dominate terrestrial habitats, their light-sensing capacities have also changed. Flowering plants have achieved tremendous evolutionary success, far outnumbering all other land plants combined and predominating ecologically in nearly all habitats. The Arboretum's research fellow Sarah Mathews and her team are testing whether changes in light sensing mechanisms played a role in the early establishment of flowering plants, and specifically whether the origin of novel photoreceptor functions permitted plants to germinate and flourish under the dimly lit canopy of prehistoric plants. Using a combination of gene sequencing, physiological investigation, and manipulations of genetic model systems, the Arboretum team is working to discover the links between change in photoreceptor molecules and their function, and to discover when in time these might have occurred, and how they might have aided plant survival.

  Photoreceptors also function even in parasitic plants that spend most of their lives underground in complete darkness. In order to understand how photoreceptors function in parasitic plants, Mathew's team is studying the evolution of photoreceptor genes in the *Orobanchaceae* family of root parasites. Many of the non-photosynthetic members of this family are not exposed to light for much of their existence and then seem to ignore light signals when they do emerge from underground to flower. By studying the DNA sequences of photoreceptor genes in parasitic plants, the team is testing whether selective forces that typically maintain photoreceptor function are being relaxed in these plants. This study will also help to understand the evolutionary relationships among the non-photosynthetic and photosynthetic species of the family.

- **Phylogeny and Genomic Approaches to Understanding Plant Evolution -** A phylogeny is the evolutionary history of a species or group of species, in other words, its genealogy. Phylogenetic studies help us understand how species are related evolutionarily, the changes that have led to the development of different groups, and the approximate time those changes took. Tracing the phylogeny of a plant group requires the use of evidence from various disciplines of biology, such as morphology, cytology, chemistry,

and increasingly, the study of DNA and gene sequences. Several Arboretum projects are using both morphological and DNA data to reconstruct the evolutionary history of plant families. One Arboretum team is focused on conifer families by gathering plant material from around the world to produce a collection that represents all conifer families and genera and 80 percent of the 500 species. This project will help establish a framework of evolutionary relationships for major groups within the *Coniferales* and provide a foundation for further studies at species and population levels. A clear understanding of genetic relationships of species can also guide cultivar selection and serve as a significant resource in plant breeding for desired traits.

Arboretum Research Collections

In support of its research, the Arboretum develops and curates several important collections. The living collections of the Arboretum, supported by its herbarium and library, are a unique resource for addressing basic research questions about long-lived, woody plants of diverse origin. Discovering the answers to these questions is critical to our future understanding and management of the global ecosystem and the impact of people on the earth's climate and its rich biodiversity of plants and animals. The Arboretum research collections include:

- The living collections on the Arboretum grounds,
- The herbarium (dried plant specimens) in the Hunnewell Building at the Arboretum and in the Harvard University Herbaria in Cambridge, and
- The library and archives in the Hunnewell Building at the Arboretum and in the Harvard University Herbaria in Cambridge.

Living Collections: The living collections currently consist of more than 14,000 documented plants representing more than 4,200 taxa, and their records of origin, propagation, and care. About 40 percent of the living accessions are of a known wild origin and about 40 percent are of a garden origin. The living collections are especially rich in temperate Asian flora. Of the wild-origin plants, about 35 percent come from the United States and about 45 percent come from Asia.

Stewardship of the living collections is a major effort at the Arboretum and consists of:

- Developing the collections (for example, collecting or sharing plant material, deciding which taxa to collect);
- Propagating plant material from seed or other form to planting-out in the grounds and exchange with other institutions;
- Caring for the plants in the landscape;
- Maintaining plant records (for example, maps, databases, voucher specimens);
- Reviewing and revising the taxonomy of taxa in the collections, and
- Stewarding the historically significant landscape, as designed by Olmsted and Sargent.

Herbarium: Soon after it was established in 1872, the staff of the Arboretum began assembling a herbarium, which has expanded steadily over the years. The collection was eventually combined with several other herbaria at Harvard into the Harvard University Herbaria, located in Cambridge. These combined herbaria include more than five million specimens. The oldest specimens were first collected beginning in 1842 by Asa Gray, Harvard's first professor of botany and Sargent's botanical mentor. Approximately 134,000 specimens of the Arnold Arboretum herbarium are of cultivated origin and are kept in the Hunnewell Building. In addition, the collection in the Hunnewell Building includes voucher specimens of the Arboretum's living collections. The Arnold Arboretum herbarium is especially strong in material from Indo-Malesia (the region extending from India to the Philippines and Papua New Guinea), China, and eastern and southeastern Asia; indeed, the Chinese and Philippine collections may be as comprehensive as any in the world. The Harvard University Herbaria are the largest collection of Asian plant material in North America and constitute the eighth largest collection worldwide. In addition, the collections are supported by library holdings (described below) of equal strength to form a worldwide center for botanical research.

Over the years the herbarium's traditional strength in Asian specimens has been continually enhanced. The Arboretum and Harvard University Herbaria together serve as one of the five editorial centers in the western hemisphere for the *Flora of China* project, a collaborative effort to document and publish a complete record of China's indigenous plants. An Arboretum research associate currently edits manuscripts and maintains the website for the *Flora of China* project.

Library and Archives: The horticultural library located within the Hunnewell Building is a specialized research collection that supports the curation, documentation, and study of the Arboretum's living collections, north temperate woody plants, and designed landscapes. Begun with a core collection of 6,000 volumes donated to the Arboretum in 1892 by Sargent, the library now contains more than 35,000 volumes and serves the staff, students, and faculty of the Harvard community, the Arboretum's Landscape Institute, Arboretum members, and the public. The library is also part of the combined Harvard Botany Libraries in Cambridge, where an additional 60,000 Arboretum volumes are housed within the combined botany collection of 280,000 volumes. In addition to books and journals, the Arboretum's library contains more than 25,000 photographs and includes an archive that both documents the Arboretum's history and serves as a repository for 19th-, 20th-, and 21st-century horticultural and botanical collections.

The archives are a rich resource that details the institution's historic influence on botany and horticulture. Included in the collection are the papers of staff members such as the Arnold Arboretum's first director, Sargent, and subsequent directors. Other collections, such as field notes, travel records, diaries, and journals of plant collectors Ernest H. Wilson and Joseph Rock, reflect the Arboretum's role in the introduction of plants. Institutional records generated by administrative and departmental activities, committee work, and special projects trace the evolution of the institution.

1.3.2 Arboretum Education

Education activities are based on the unique resources of the Arboretum, utilizing its living collections, cultural landscape, information resources, and staff expertise to inform and teach in life science, plant biology, horticulture, and related disciplines. Currently, educational activities are offered through class-based instruction and through interpretive services and information available to visitors, either as individuals or groups. Class-based instruction is available to school classes of pre-school and elementary students and their teachers, and as continuing education for interested adults. In addition, the Arboretum's Landscape Institute offers courses in landscape design and cultural landscape preservation, primarily to design professionals. Most Landscape Institute courses are offered in Cambridge.

The Arboretum's location in the center of Boston provides valuable opportunities to serve local communities with life science programs that use the natural landscape to address critical science goals in public education. Collaborative program development with local elementary schools and Head Start centers, an emerging program still in its pilot phase, has led to the creation of "field trip experiences" at the Arboretum that directly support science curricula and the work of classroom teachers. The Arboretum is committed to responding to changing educational needs through continuing collaboration with the Boston Public Schools, Head Start, and other education providers.

Interpretive information about the Arboretum's work and collections is available through permanent and changing exhibits in the visitor center and various print materials about the collections. Free tours are offered regularly to visitors, and the Arboretum website provides descriptions of Arboretum programs. Every year special programs are also offered or hosted at the Arboretum.

1.3.3 Arboretum Horticulture

The Arboretum aspires to be a leader among its peer institutions in the management and presentation of botanical collections and landscapes. The institution supports this role by actively building the horticultural expertise and competence of its staff, by conducting relevant applied studies in plant propagation, plant introduction, landscape management and related fields, and through education and publication. Horticulture at the Arnold Arboretum utilizes the best available information, technologies, and practices to provide exemplary stewardship for the living collections and the Olmsted/Sargent historic landscape. Horticulture staff develops and curates the living collections to enhance their scientific value and to encourage their use for research. Arboretum staff members also regularly conduct projects to monitor the condition of the collections and improve the quality of their care.

Throughout its history, the Arboretum has invested in numerous landscape improvement and preservation projects on both the land under lease and Harvard-owned land. Recent projects include the addition and restoration of the 24-acre Bussey Brook Meadow (1996),

restoration of the Bussey Street, Peters Hill, and Walter Street gates (2002), the installation of the award-winning Leventritt Garden of Shrubs and Vines (2002), and the construction of a new pedestrian path to the Leventritt Garden (2005). Current landscape projects include development of a master plan for signage and wayfinding, and on-going efforts to improve the appearance of the Arboretum perimeter. In addition to these specific landscape projects, the Arboretum routinely clears internal roads and perimeter sidewalks of snow in winter, removes trash, and maintains the benches, which are owned by the City of Boston.

As part of the Boston park system, the Arboretum grounds are open from dawn to dusk, 365 days a year. The Arboretum provides more than 250,000 visitors each year with the opportunity to experience an historic landscape that reflects exceptional standards of horticultural care. Each year the Arboretum invests more than $2.5 million in maintaining and curating its living collections in a landscape that reflects the 19th-century design principles of Olmsted.

The landscape of the original Arboretum grounds is one of Boston's best preserved and finest of Olmsted's work. In the words of Emerald Necklace historian Cynthia Zaitzevsky in her book, *Frederick Law Olmsted and the Boston Park System* (1982),

> *...the Arboretum retains more of the character and landscape effect of Olmsted's design than any other part of the Boston park system.*

In addition, the Arboretum's living collections represent the only extant arboretum design created by Olmsted. In 1965, the Secretary of the Interior listed the Arnold Arboretum as a National Historic Landmark, one of only 2,500 such places in the nation today.

1.4 Summary of Future Needs and Objectives

For over 100 years the Arboretum's world-renowned research, education, and public programs have been based in its 1892 administration building. Expanded once in 1909, and renovated in 1993, the 30,000-square-foot Hunnewell Building and herbarium addition house a 70-seat lecture hall, library, herbarium, exhibit hall and visitor center, including a bookstore, Arboretum staff offices, and public restrooms. Facilities that provide additional support space for the Arboretum include a maintenance garage constructed adjacent to the Hunnewell Building in 1968, and the Dana Greenhouse constructed in 1961 on land owned privately by Harvard.

After several years of program planning and review, the Arboretum has reaffirmed its mission of research and education on plants, in the context of a historic landscape that serves the visiting public. The Arboretum is dedicated to keeping its collections (living, herbarium, library, archives) and facilities relevant to new and emerging directions in plant science research, to strengthening its role in science education and in training of professionals in the growing field of landscape design and preservation, and to maintaining and improving its historic and scientific landscape designed by Olmsted and Sargent.

The Arboretum's living collections and the Arboretum's capacity to grow research plant materials make it ideally suited to support new research directions in biodiversity, systems biology, genomics, and comparative developmental biology. However, these new and emerging directions in plant science research also require research-quality laboratories, greenhouses, and growth chambers, which the Arboretum presently lacks in its existing facilities at the Hunnewell Building. Most of the Arboretum's current research program is conducted in Harvard facilities in Cambridge. Therefore, the Arboretum proposes to build a new state-of-the-art research facility for scientists, post-doctoral students, and other research staff that will allow the Arboretum to continue to accomplish its research and education mission.

Construction of new administrative space in the research facility also provides an opportunity to render space in the Hunnewell Building currently used for administration available for expanded programs. With some Arboretum staff moving to the new Research and Administration Building, additional space will be available for expansion of the library and archives collections and educational programs without new construction.

The Arboretum's space needs, planning objectives, and future development guidelines are described in Chapter 4.

1.5 Overview of Institutional Master Plan

The Arboretum proposes to create much-needed research facilities and administrative offices within a newly constructed Research and Administration Building on Harvard-owned land.

1.5.1 Proposed IMP Project

The 45,000-square-foot Research and Administration Building, a proposed institutional project subject to IMP review, will provide state-of-the-art research facilities and greenhouses in addition to housing much of the Arboretum's administrative staff. The building will be constructed on a 0.6-acre footprint within the approximately 14.18-acre (617,844 s.f.) parcel of land known as the Weld Hill parcel,[2] which is owned privately by Harvard. Located on Centre Street between Weld and Walter streets (Figure 1-2), this site has been known historically by Arboretum staff as the Weld-Walter tract and known locally by some as "Puddingstone Hill" or "Prouty's Hill."

The Research and Administration Building is critical to achieving the Arboretum's research mission and long-term vision, and it will enable the Arboretum to maintain its reputation as a world-class research center. Landscape improvements made in conjunction with the project will open up additional land for the enjoyment of Arboretum visitors and neighbors.

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[2] Survey by R.E. Cameron (2003), as revised by Green International Affiliates, Inc. (2006). The Weld Hill parcel size is hereafter noted as 14.2 acres in this IMP.

Additional detail on the project is provided in Chapter 5. Transportation conditions, cultural resources, and infrastructure are provided in Chapters 6, 7 and 8, respectively.

1.5.2 Changes since the Institutional Master Plan Notification Form

The Research and Administration Building is one of three projects originally proposed in the March 2004 IMPNF. Since that time, the Arboretum has re-evaluated its facility needs in light of programming and site planning analyses. The Arboretum has cancelled two other projects described in the IMPNF; the Arboretum is no longer proposing:

- The Horticulture Support Facility – an 18,000-square-foot structure previously proposed for the Harvard-owned Dana Greenhouse parcel; and
- The Hunnewell Building Extension – a 15,000-square-foot addition to the Hunnewell Building on City-owned land under lease to the Arboretum.

Also since the IMPNF was filed, the size of the proposed Research and Administration Building has increased modestly from 40,000 square feet to 45,000 square feet, and several other changes have been made in response to comments received from the Arboretum Task Force, City agencies, and the general public, among them:

- The proposed building footprint has been located further north and the building has been sited into the hill to reduce building height and avoid view impacts to residential abutters; and
- The previously proposed vehicular entry off Walter Street has been abandoned and, instead, a single point of entry and exit off Centre Street is proposed.

1.6 Public Review Process and Involvement

The Arboretum is committed to soliciting the input of surrounding neighbors, community groups, City agencies, and interest groups in developing and implementing its long-range plans.

1.6.1 BRA Article 80 Review

By undergoing the BRA's Article 80D IMP review process, the Arboretum and the BRA are ensuring public involvement in the review of the Arboretum's long-range plans. The filing of the IMPNF in March 2004 formally initiated the IMP review process with the BRA. Following a 30-day public comment period, the BRA issued a Scoping Determination on April 28, 2004 outlining the topics to be addressed in the IMP. Appendix A includes the BRA Scoping Determination and comment letters received by the BRA prior to issuance of the scope. A community task force was formed by the BRA to provide on-going input to the IMP throughout the review process.

This IMP, submitted by the Arboretum in accordance with the Scoping Determination, describes the Arboretum's existing grounds and facilities, the Arboretum's long-range objectives, and the proposed building project that is intended to meet projected future growth and space needs. Following submittal of the IMP, the BRA will solicit public comments during a 60-day comment period and, within 90 days of the submittal, will hold a public hearing to consider issuance of an Adequacy Determination.

The Boston Zoning Commission subsequently will hold a public hearing to consider approval of the IMP and the institutional master plan zoning overlay district for the Weld Hill parcel. Approval by the BRA and Zoning Commission will establish an approved IMP that will govern future institutional use and development for the term of the IMP. A zoning overlay district specific to the Weld Hill parcel will be established as part of the IMP process.

In addition to review of the Research and Administration Building in the context of this IMP, the Research and Administration Building project will undergo the BRA's Small Project Review pursuant to Article 80E of the Zoning Code, which will include review of building design, site access/egress, parking, signage, and landscaping/screening.

1.6.2 Community and Public Agency Input

Outreach

Prior to filing the IMPNF, the Arboretum initiated several meetings with surrounding neighbors, community groups, public agencies, and interested parties to present the Arboretum's plans and receive public input. The Arboretum conducted three well-attended public meetings in the fall of 2003 (on September 18, September 23, and December 3) at which the Arboretum presented its long-term plans, received public comments, and responded to questions. In addition, the Arboretum met with representatives of numerous community groups and public agencies prior to filing the IMPNF.

Subsequent to filing the IMPNF, the BRA created a task force made up of neighborhood residents, business leaders, institutional representatives, and other interested parties and stakeholders. The BRA has hosted numerous task force meetings over the past three years, as follows:

- In 2004: monthly between March and September (seven meetings);
- In 2005: March 7, June 6, and December 12 (three meetings); and,
- In 2006: February 6, March 8, May 1, and September 14 (four meetings).

Future meetings are planned following submittal of the IMP. In addition, the Arboretum regularly attends local community group meetings to provide updates on its plans and activities.

Four additional community meetings were held on the following dates. Note that these were community meetings hosted by the Boston Redevelopment Authority and/or the Office of Neighborhood Services and were not Task Force meetings. Some members of the Task Force attended.

- November 14, 2006
- January 31, 2007
- February 15, 2007
- June 25, 2007

In addition, the Arboretum regularly attends local community group meetings to provide updates on its plans and activities.

Community Concerns

Key community issues and concerns regarding the proposed Research and Administration Building project as it was described in the March 2004 IMPNF are summarized below along with brief responses.

- **Extent of Future Development on the Weld Hill Parcel** – In response to the neighborhood's desire that the Weld Hill parcel remain in its natural state, the IMP includes the establishment of a "Designated Development Area" on the site, guidelines for future development, and the imposition of specific development restrictions for the "Horticultural and Botanical Resource Study Area" of the Weld Hill parcel (defined as the area outside of the Designated Development Area) .

- **Design and Siting** – In response to concerns about potential visual impacts, the facility has been redesigned and sited to minimize its visual impact on the adjacent neighborhood.

- **Traffic Impacts** – Neighbors described existing deficiencies of the current roadway network around the Arboretum and urged the institution to improve upon the existing conditions and to explore ways to minimize the traffic impact of the new project. In response, vehicular access and egress are now proposed only from Centre Street; analysis of transportation conditions following project construction has been completed.

- **Cumulative Development Impacts** – The community requested that the Arboretum coordinate its development plans with those of Hebrew SeniorLife (formerly known as Hebrew Rehabilitation Center) and explore the feasibility of sharing driveways, parking areas, etc., in order to minimize impacts on the neighborhood. The Arboretum continues to coordinate with Hebrew SeniorLife on its plans for Weld Hill; however, Hebrew SeniorLife is not actively engaged in planning for its own property at this time. The Arboretum is willing to discuss future collaborative planning with Hebrew SeniorLife when its facility planning resumes.

- **Other Concerns** – The community also expressed a desire for improved maintenance along the edges of the Arboretum and for improved pedestrian connections between the Arboretum and other nearby destinations (such as the Forest Hills MBTA station). As detailed in Chapter 3, the Arboretum plans to continue to invest significant financial resources in improvements to its perimeter and its pedestrian pathways, as it has over the past.

This IMP responds to the above concerns with revisions to the siting and design of the Research and Administration Building, a revised access and circulation plan for the proposed facility, proposed development guidelines for future development of the Weld Hill parcel, and other Arboretum improvements and community benefits.

1.6.3 City of Boston Park Commission Review

In addition to the BRA's IMP review process, the Arnold Arboretum will present its plans to the Boston Park Commission for comment. An initial project briefing was held with the Park Commissioners on February 27, 2006, and Arboretum staff regularly meets with Parks and Recreation Department staff to coordinate on specific activities and projects.

Epsilon

Scale 1:18,000
1 inch = 1,500 feet

0 500 1,000
Feet

The Arnold Arboretum of Harvard University Institutional Master Plan

Figure 1-1
Site Location

Epsilon Associates Inc.

Scale 1:8,400

0 200 400 800 Feet

The Arnold Arboretum of Harvard University
Institutional Master Plan

Figure 1-2
Location of Proposed Research & Administration Building on the Weld Hill Parcel

2.0 ARBORETUM PROPERTY AND CONTEXT

This chapter describes the Arboretum's land ownership, grounds, buildings, zoning, and area context in accordance with the BRA Scoping Determination. This discussion includes land leased by Harvard from the City of Boston, Harvard-owned land, and other City-owned land managed by the Arboretum. An overview of the intentions of earlier Arboretum planners is included at the beginning of this chapter; a detailed description of the Weld Hill parcel is provided at the end of the chapter.

2.1 Overview of Olmsted and Sargent Design Intentions

From its inception, the intent and design of the Arnold Arboretum broke with tradition. Although the era of the Arboretum's establishment was a boon time for public attendance at museums, no university botanic garden or arboretum had yet been planned with the public in mind. In contrast to other established arboreta, the privately-funded Arnold Arboretum was designed for use by both scientists and lay people for the study and enjoyment of botany and horticulture.

The Arboretum was destined to serve an unprecedented dual mission. To meet both the needs of Harvard: to acquire, grow, and curate a comprehensive collection of hardy woody plants for research and education, and those of the City: to serve as a public pleasure ground offering respite and enjoyment to the people of Boston as a part of the City's park system, an exceptional design was needed. Towards these goals, Frederick Law Olmsted, renowned landscape architect and collaborator in the design of New York City's Central Park, joined with the Arboretum's first director, Charles Sprague Sargent, to create a plan that balanced the requirements of a scientific plant collection with the topography, existing woodlands, and other natural features of the site.

Physical planning for the Arboretum by Olmsted and Sargent began in 1878, four years prior to the formal lease agreement between Harvard and the City. As described by Ida Hay in her book, *Science in the Pleasure Ground, A History of the Arnold Arboretum,* (1995), one of the primary design considerations was to create a carriageway system that was well-suited to the site's significant topography and allowed sufficient areas along its length to display the plant collections in a sequence that would show relationships among the various families and genera of plants by placing related groups in close juxtaposition. This would enhance the educational value of the collections and permit easy botanical comparison. The system they followed, the natural classification system of George Bentham and Joseph Hooker, was widely accepted by British and American botanists of the time. Based on detailed observations, Bentham and Hooker grouped plants into "cohorts" (equivalent to today's plant families) based on overall similarity; cohorts were then grouped into classes and then into the three major subdivisions of woody plants: dicots, monocots, and gymnosperms. Olmsted and Sargent's

plan would also allow some existing large trees and areas of natural woodland to remain and some plant groups to be planted out-of-sequence due to habitat requirements. Olmsted and Sargent used the topography of the site and the roadway system to accommodate the variety of plants that would be displayed. Olmsted created more than 31 circulation studies of the internal roadway system before meeting this goal.

The chosen layout created a roadway system in which visitors entered from the future Arborway and exited on Walter Street near its intersection with Centre Street. As Sargent described his vision in a letter to the Board of Park Commissioners (1880):

> *...a visitor driving through the Arboretum will be able to obtain a general idea of the arborescent vegetation of the north temperate zone without even leaving his carriage. It is hoped that such an arrangement, while avoiding the stiff and formal lines of the conventional botanic garden, will facilitate the comprehensive study of the collections, both in their scientific and picturesque aspects.*

Numerous planting plans were drafted concurrently with the development of the roadway plan. In all, more than 160 drawings exist for the Arboretum, with the final planting plan adopted in summer 1885.

The Arboretum landscape ranks as one of the best preserved 19th-century public landscapes in Boston. The Arboretum is listed in the State and National Registers of Historic Places and is designated a National Historic Landmark by the U.S. Secretary of the Interior. These designations include both the City-owned land under lease to Harvard and land privately owned by Harvard. Additional information on the Arboretum's history is provided in Chapter 7, including Figure 7-2, which demarcates the original Olmsted/Sargent-designed lands and the boundaries of the National Register nomination.

2.2 Arboretum Land Ownership

Since the initial 1882 Arboretum lease between Harvard and the City of Boston, several areas have been added to the Arboretum grounds, either by additions to the lease or via acquisition by Harvard University. Most of the additional land acquired was incorporated into the overall landscape design and planted with living collections, however some areas were used for other horticultural objectives. Following are descriptions of the existing City-owned land included in the lease and Harvard University-owned land. Figure 2-1, Existing Conditions, identifies Arboretum land ownership as well as other existing Arboretum features.

2.2.1 City-owned Land Under Lease to Harvard

The City-owned land of the Arboretum grounds consists of approximately 265 acres that are leased to and maintained by the Arnold Arboretum of Harvard University. Paved roadways within the Arboretum are not included in the lease, and their maintenance is the City of Boston's responsibility.

In the 1882 agreement, the City of Boston leased to Harvard University approximately 167 acres of land, of which 122 acres had been formerly owned by Harvard and 45 acres had been acquired independently by the City. In 1895 the lease was amended to include the Harvard-owned Peters Hill area, which consisted of approximately 68 acres, and a four-acre area near Centre and Walter streets.

In 1996, the 1882 and 1895 lease agreements were expanded by the addition of another 24 acres: 18 acres donated by Harvard University, and 6 acres owned by the City of Boston (previously taken by eminent domain from Harvard). This area was historically called the "South Street tract," but is now called Bussey Brook Meadow. Collaboration among the Arboretum Park Conservancy (an independent, nonprofit organization), the City of Boston, and the Arnold Arboretum led to this addition of land to the lease. Over time, various property takings for the purpose of widening adjacent roads have diminished the size of the land under lease.

Roles and responsibilities for managing the land under lease for public use and enjoyment are articulated in the lease agreements between Harvard and the City. The actual implementation of these responsibilities has varied through time with changing circumstances. Currently the responsibilities are shared as follows:

The Arnold Arboretum of Harvard University

- Stewardship of historic landscape;
- Horticultural care;
- Grounds maintenance (trash removal, snow and ice removal, path maintenance); and
- Visitor services, including interpretation, maps, signage, restrooms.

City of Boston

- Maintenance of roads and drainage systems;
- Maintenance of boundary walls and sidewalks;
- Maintenance of site furnishings including benches, water fountains, and gates; and
- Security for the public, provided by Park rangers and City police.

2.2.2 Harvard University-owned Land

In addition to the land within the leasehold, Harvard University privately owns approximately 25 acres of land within or adjacent to the land under lease. Some of this privately-owned land, such as the Leventritt Shrub and Vine Garden, is available to be enjoyed by visitors to the Arboretum.

- **Dana Greenhouse Parcel** -- The Dana Greenhouse parcel is a 5.1-acre property along Centre Street purchased (in parts) by Harvard over a five year period between 1924 and 1927. This area houses the Dana Greenhouse and associated nurseries and work areas, a cold storage building, the Larz Anderson Bonsai Collection, a house (1090 Centre Street), and the three-acre Leventritt Shrub and Vine Garden, which offers an outdoor exhibit displaying outstanding shrub and vine specimens for the New England landscape. The portion of the Dana Greenhouse parcel used for greenhouse, nursery, and maintenance functions serving the Arboretum is closed to the public.

- **Centre Street Parcel** -- Harvard owns a 1.5-acre parcel located at the corner of Centre Street and Walter Street, purchased in 1940 after Centre Street was realigned. The Centre Street parcel has been treated consistent with the original landscape design and supports the collections; it is available to be enjoyed by visitors to the Arboretum.

- **Weld Hill Parcel** -- Harvard owns an approximately 14.2-acre parcel located on Centre Street between Walter and Weld streets; this parcel has also been known historically by Arboretum staff as the Weld-Walter tract and locally by some as "Puddingstone Hill" or "Prouty's Hill." Purchased in 1922, and not included in the original Olmsted/Sargent design for the Arboretum grounds, the site has been used for plant accessions, nurseries, and plant breeding experiments. Historically it has been closed to the public.

- **Bussey Homestead Parcel** -- Harvard also owns a 4.7-acre parcel located between the Arboretum and the State Laboratory Institute along South Street. This land was originally part of the Bussey Institution property owned by Harvard. In 1963, the Commonwealth of Massachusetts took more than 10 acres of the Bussey Institution by eminent domain for the laboratories; the remaining acreage was transferred from the Bussey Institution to the Arboretum in 1966. The parcel houses Arboretum collections and is available to be enjoyed by visitors to the Arboretum.

2.2.3 Other City-owned Land under Arboretum Management

Beginning in 1923, the City of Boston asked the Arboretum to maintain the grounds of a small, historic cemetery, the Walter Street Burying Ground, located along the southwest boundary of the Peters Hill tract. In 1946, the City of Boston turned over the cemetery to the "custody and maintenance" of Harvard. The City retains underlying ownership.

The City of Boston also owns a 1.3-acre parcel near the intersection of Walter and Centre streets which was formerly the roadbed of Centre Street prior to its realignment in the early 1930s. This parcel defines the southern boundary of the 1.5-acre Centre Street parcel owned by Harvard.

2.2.4 Arboretum Land Stewardship

Over the past 100 years, the Arboretum has successfully resisted numerous proposals to use the City-owned land for non-Arboretum purposes. For example, in 1966 a state representative proposed a ski slope for Peters Hill, and in 1969 there was a proposal to build a swimming pool in the Arboretum.

Regarding Harvard-owned land, in 1963 the Commonwealth of Massachusetts took more than 10 acres of Bussey Institution land for the State Laboratory Institute. In 1968, the City of Boston proposed establishing an Occupational Resource Center on a portion of the area that is now called the Bussey Brook Meadow. The land was taken by eminent domain in 1970, however the center was never built. The City returned this land as City-owned land included in the Arboretum lease in 1996, when the Arboretum lease was amended to include the Bussey Brook Meadow area.

Over time, 33 additional acres within the grounds have been made available to the public. With the exception of the Walter Street Burying Ground and the old Centre Street roadbed, all of these acres are, or were, Harvard-owned land, including the Harvard portion of Bussey Brook Meadow (18 acres), the Shrub and Vine Garden (3 acres), the Centre Street parcel (1.5 acres), the Bussey Homestead parcel (4.7 acres), and land that was previously owned by Harvard but taken by the City by eminent domain (6 acres in Bussey Brook Meadow).

2.3 Description of the Grounds

2.3.1 Topography and Natural Features

The Arboretum lies within the local geological formation of the glacially-formed Boston Basin. Glacial activity and post-glacial development formed the topography and soils of the grounds, which today drain to the Charles River watershed. Rocky outcrops, many of which are Roxbury conglomerate (known locally as puddingstone), protrude through the land surface in numerous locations. Some of the puddingstone is comprised of Squantum tillite, which may be the only tillite of Late Precambrian age (about 600 million years) exposed in New England as described by J. W. Skehan in his book, *Puddingstone, Drumlins, and Ancient Volcanoes* (1979). Several areas of the grounds have been quarried in the past. Figure 2-2, Natural/Geologic Features, depicts the topography, soils, rocky outcrops, and other natural features within the Arboretum grounds.

The Arboretum contains four hills – Bussey Hill (198 feet), Peters Hill (240 feet), Weld Hill (174 feet), and Hemlock Hill (170 feet). The hills are interspersed with three stream valleys,

including Goldsmith Brook along the Arborway, Spring Brook along the south side of Bussey Hill, and Bussey Brook along the north side of Hemlock Hill. Two large wetlands also exist in the Arboretum: Bussey Brook Meadow east of South Street and North Meadow between Meadow Road and the Arborway. Three ponds, which are now called Faxon Pond, Rehder Pond, and Dawson Pond, were created near the intersection of Forest Hills Road and Meadow Road during the initial design for the Arboretum.

The Arboretum also supports areas of natural woods set aside during the original planning of the Arboretum. The original Olmsted/Sargent landscape design specified the improvement and maintenance of the "natural" woodlands remaining from the time of the Bussey Estate and earlier. These woods were actively thinned and managed to improve them, and in some cases understory trees were planted. Over time Arboretum accessions were planted along their edges, and their extent has diminished. The original woodlands included the North Woods, Meadow Border Woods, Central Woods, Hemlock Hill Woods, and South Woods (see Figure 2-2); the Meadow Border Woods no longer exist.

2.3.2 Living Collections

As described above, Sargent and Olmsted systematically laid out the Arboretum plant collections along the internal road system according to the Bentham and Hooker classification sequence, a 19th-century classification system for the plant kingdom. The design intent of the layout of the collections was to provide the visitor with an experience of viewing increasingly more botanically "complex" plants as the visitor traversed the grounds. While this historical sequence of plant families does not correspond to current scientific understanding of evolutionary relationships among plant groups, the Arboretum continues to maintain the integrity of this historic landscape and its planting scheme, as it provides a representation of the Victorian concept of plant science and the only intact example of Olmsted's design for an arboretum. Figure 2-3 shows the locations of Selected Living Collections.

In an effort to bring together a collection that would represent all north temperate floras, Sargent obtained plants from throughout North America and Europe, and then in the 1890s, initiated field expeditions to eastern Asia. These explorations, led most notably by E. H. Wilson, supplied the hundreds of plants that together with living specimens from North America and Europe form the backbone of the Arboretum's living collections. The Arboretum staff has continued to explore eastern Asia, most recently in 2005 in the second of five planned collecting expeditions to southwest China's Hendguan Mountain region.

The living collections are recognized as one of the best documented assemblages of woody plants of its kind in the world. In support of the Arboretum's research mission, the Arboretum seeks to grow three documented accessions for each taxonomic group represented, each obtained from a different location within the plant's native range. The strength of the collections is in wild-collected and authentic materials of eastern Asian origin with excellent and comprehensive representation of related materials from Europe

and North America. In addition, special collections of bonsai, dwarf conifers, lilacs (*Syringa*), crabapples (*Malus*), and rhododendrons are also maintained. In cooperation with the Center for Plant Conservation, a network of America's leading botanical institutions, thirteen taxa in the National Resource Collection of endangered American species are grown and maintained at the Arboretum.

The Larz Anderson Bonsai Collection, which is housed in the Bonsai House on the Dana Greenhouse parcel, includes the first bonsai trees brought to the US. The trees in the Larz Anderson Bonsai Collection were imported to the United States by the Honorable Larz Anderson in 1913, when he returned after serving as ambassador to Japan. These historic, dwarfed trees can be viewed mid-April through early November; during the winter the collection is in cold storage and, therefore, not accessible to the public. In 2006, the Arboretum displayed the collection at the New England Flower Show, the sixth time the collection has been shown at the event (the others being in 1916 and 1933 by Larz Anderson and in 1954, 1959, 1987, and 1997 by the Arboretum). This year the Arboretum received the Superlative Award for Trained Plants and a Gold Medal, with the judges noting that "the exhibit exemplifies the fruits of generations of stewardship."

2.3.3 Roadways and Pathways

The Arboretum's roads were laid out in a nearly continuous fashion, such that a visitor could traverse the entire grounds by moving from one road to the next. From north to south, this three-mile road system consists of Meadow Road, Forest Hills Road, Bussey Hill Road, Valley Road, Hemlock Hill Road, and Peters Hill Road. These paved roads are not included in the land area leased to Harvard and their maintenance is the City of Boston's responsibility. The road system was originally designed for horse-drawn carriages and was made with a gravel surface and cobble gutters. Gravel walkways, or sidewalks, were constructed along the roads. The roads and some of the walkways are now paved in asphalt; however, vehicular access is limited to Arboretum vehicles and visitors with special needs.

Over time, an extensive path system independent of the road system also was developed on the grounds of the Arboretum. Today, over seven miles of pathways and two miles of sidewalks wind through the Arboretum providing pedestrian access to the living collections, natural woodlands, streams, meadows, rock outcrops, significant hilltops, and other natural features. Visitors may enter through twelve different gates and nine other entrances, and parking is available at the gates or along the Arborway, Bussey Street, and Walter Street.

In addition, the Arboretum may be conveniently reached via the MBTA Forest Hills commuter rail and Orange Line Station, or by several MBTA bus routes. The Forest Hills MBTA Station is a critical transportation center at the nexus of a wide array of commercial, industrial, residential, and open space uses.

Figure 2-1 depicts the major roadways and pathways through the Arboretum, as well as the gates that allow public access. Chapter 6 provides additional detail on pedestrian and vehicular circulation at the Arboretum and in the surrounding area.

2.3.4 Views

Several significant views were originally part of the Olmsted/Sargent design for the Arboretum. Views from the two major hilltops within the Arboretum, Bussey Hill and Peters Hill, as well as views of the "hanging woods" on Hemlock Hill, have been maintained since the founding of the Arboretum in the 19th century. Other views within the Arboretum have changed as the collections have matured and changed, however, many of the viewsheds from specific points into and over the collections remain. Figure 2-4 identifies significant views on the Arboretum grounds.

Several areas within the grounds have historically been kept as meadow or mowed lawn without plant accessions, in part to create an internal view. These include the sloped, lawn area to the south of the Hunnewell Building and the lawn area where the former Bussey mansion stood. Views from atop Bussey Hill and Peters Hill have also been maintained free of plant obstructions. In particular, from Bussey Hill one has a view to the Blue Hills to the south. The grounds also include a long vista over the maintained meadow upslope of the Bussey Brook valley, between the Conifer Path and Hemlock Hill Road.

2.3.5 Other Features

In addition to the natural features, collections, roadways, and pathways, the Arboretum contains other features that contribute to the Arboretum's character:

- **Gates** – Twelve gates provide access into the Arboretum, eight of which were part of the original landscape design;
- **Boundary Walls** – Most of the Arboretum is bordered by historic, stone walls, some of which pre-date the Arboretum and some of which were built as part of the original design;
- **Buildings** – Seven buildings, including the historic, 1892 Hunnewell Building, occupy the Arboretum grounds. These structures are described below in Section 2.4;
- **Crossings and Culverts** – Crossings and culverts exist along the site's three streams, Bussey Brook, Goldsmith Brook, and Spring Brook; several of these, such as the stone crossing over Goldsmith Brook at the Arborway Gate were part of the original design; and,
- **Walter Street Burying Ground** – This burial ground, located on the southwest side of Peters Hill, contains slate and marble headstones dating to the 18th and 19th centuries, as well as two commemorative plaques.

2.4 Existing Buildings and Zoning

2.4.1 Existing Buildings

There are currently seven buildings on the Arboretum grounds, three on land under lease and four on Harvard-owned land. All buildings are owned by Harvard, under the management and control of the Arnold Arboretum. Existing Arboretum buildings are described below; Table 2-1 provides additional information.

Buildings on City-owned Land under Lease to Harvard

- **Hunnewell Building** – Constructed in 1892, the Hunnewell Building was designed by the firm of Longfellow, Alden and Harlow. An addition to house the Arboretum's herbarium was designed by Alexander Wadsworth Longfellow and constructed in 1909. Renovated in 1993, the Hunnewell Building has served as the Arboretum's center for more than a century;

- **Maintenance Garage** – Constructed in 1968, the maintenance garage serves purely utilitarian functions of maintenance vehicle and equipment storage; and

- **House at 163 Walter Street** – This two-story, brick residential structure, constructed in 1921, is currently in residential use.

Buildings on Harvard University-owned Land

- **Dana Greenhouse** – Constructed in 1961, the Dana Greenhouse is used for on-site plant propagation and nurseries;

- **Cold Storage Building** – This small, 1,650-square-foot structure allows for storage of dormant plants in winter;

- **Bonsai House** – The Bonsai House is a small hexagonal structure that houses the Larz Anderson Bonsai Collection between April and October each year; and

- **House at 1090 Centre Street** – This two-story, wood-frame building, was constructed in 1820 and is also known as the Jabez Lewis Farmhouse. It has been vacant since 1993.

Table 2-1: Existing Arboretum Buildings

Building/Address	Occupancy/Use	Year Built	Building Area (sf)[1]	Height (feet/stories above/below ground)	Footprint (sf)	Parking Spaces	Employees	Condition	Proposed IMP Action
On City-owned Land Under Lease to Harvard									
Hunnewell Building 125 Arborway	Staff offices for administration, curation, development, library, archives, public programs, grounds, and information technology; 70-seat lecture hall (place of assembly); exhibit space/visitor center and bookstore; library/archives; herbarium	1892 (rear addition 1909)	28,670	58 / 3-4 / 1 (HB is 3 stories; addition is 4)	6,800	47[2]	54[3]	Good (renovated in 1993)	None
Maintenance Garage 125 Arborway	Storage of horticulture maintenance vehicles (4 garage bays), tools, supplies, and equipment; limited crew work space	1968	4,070	16 / 1 / 0	4,650	Included in Hunnewell above	Included in Hunnewell above	Good	None
House 163 Walter Street	Residential house	1921 (garage 1952)	1,830	19 / 2½ / 1	800	1	n/a[4]	Good	None
On Harvard-owned Land									
Dana Greenhouse 1050 Centre St.	Greenhouses (four); plant propagation areas; lab; staff offices; classroom; residential	1961	12,500	22 / 2 / 1	4,000	14	4[5]	Good	None
Cold Storage Building 1050 Centre St.	Winter storage for dormant plants	1961	1,650	10 / 1 / 0	1,650	0	0	Good	None
Bonsai House 1050 Centre St.	Display of Larz Anderson Bonsai Collection	1962	n/a	8 / 1 / 0	980	0	0	Fair	None
House 1090 Centre St.	Vacant residential house; storage	ca. 1820	3,070	25 / 2½ / 1	1,077	0	0	Poor	None[6]
Total			**51,790**			**61**	**58**		

Notes:

1. Approximate; per Boston Zoning Code.
2. Includes 28 spaces in front of building for staff and building visitors and 19 spaces within maintenance yard for staff.
3. In addition, approximately 14 paid summer interns and 11 year-round volunteers periodically occupy the building.
4. The house at 163 Walter Street is occupied by tenant residents.
5. In addition, approximately 2 paid summer interns and 2 year-round volunteers periodically occupy the building, and tenant residents occupy the second floor.
6. This building is currently vacant; however the structure is stable and is "mothballed" to prevent damage and deterioration.

2.4.2 Existing Zoning

The Arboretum land under lease, Harvard's Dana Greenhouse parcel, and the Centre Street parcel are all located within the Arnold Arboretum Botanical/Zoological Garden Open Space (OS-BZ) zoning subdistrict of the Jamaica Plain Neighborhood District. The description of this subdistrict included in Section 55-14.6 of the Zoning Code provides:

> *The land … is governed by the terms of certain orders of taking by the Board of Park Commissioners of the City of Boston, by certain agreements between the City of Boston and President and Fellows of Harvard College (including but not limited to certain Indentures), and by rules and regulations issued by the City of Boston Parks Commission with respect to such land. Within the Arnold Arboretum Botanical/Zoological Garden Open Space Subdistrict, no land or structure shall be erected, used, or arranged or designed to be used, in whole or in part, except in accordance with all such takings, agreements, rules, and regulations, as they may be amended from time to time, with respect to such land or Structure, and no Structure shall be erected, used, or arranged or designed to be used, in whole or in part, except as approved by the City of Boston Parks Commission or any successor thereto, in accordance with such takings, agreements, rules, and regulations.*

The Weld Hill parcel is located within a Residence S-.3 zoning district, which allows residential development at a density of 0.3 floor area ratio (FAR). The Weld Hill parcel also is included within the Roslindale Interim Planning Overlay District, under Article 27R of the Zoning Code.

The Bussey Homestead parcel is located in a residential (1F-5000) zoning district.

Portions of the Arboretum grounds are also located within the Greenbelt Protection Overlay District (GPOD), which runs along the Arborway, Centre Street, and South Street in the Jamaica Plain Neighborhood District (see Figures 2-5a and 2-5b, Existing Zoning).

2.5 Area Context

Below are descriptions of land use, building heights, and open space in the vicinity of the Arboretum. Transportation conditions and historic resources in the area are presented in Chapters 6 and 7.

2.5.1 Land Use

The Arboretum grounds, located within the Jamaica Plain and Roslindale neighborhoods of the City of Boston, are bordered generally by the Arborway to the northeast, the MBTA railroad right-of-way to the southeast, Centre Street to the northwest, and a residential neighborhood along the southwest perimeter. Figure 2-6 depicts land uses in the vicinity of the Arboretum.

This section of Boston was originally settled as farms and estates of the wealthy in the 18th, 19th and early 20th centuries. Today, the area is characterized by a combination of historic mansions, large and small single-family homes, and multi-family homes constructed in the late 19th and early 20th century, institutions, industrial areas, parks, and parkways. The predominant land uses are residential and institutional, with some commercial and industrial facilities along the MBTA right-of-way south of the Arboretum and a small commercial area along Centre Street south of Weld Street.

Prominent public and private institutions in the immediate vicinity of the Arboretum include the Hebrew SeniorLife facility, located adjacent to the Arboretum at 1200 Centre Street, the Roxbury Home for Aged Women/Sophia Snow House at 1205-1215 Centre Street, the Faulkner Hospital at 1137 Centre Street, and the State Laboratory Institute, or "State Lab," at 375 South Street. The Franciscan Monastery of Saint Clare also borders the northwest corner of the Arboretum at 920 Centre Street. The surrounding neighborhoods have a plentiful stock of open space and parkways including the Arboretum, Allandale Woods, Jamaica Park (also known as Jamaica Pond for the pond it contains), Franklin Park, Forest Hills Cemetery, the Arborway, and the Jamaicaway, which are described in Section 2.5.2 below.

Schools in the area include the Haley Elementary School, the Manning Elementary School, the Philbrick Elementary School, the Sumner Elementary School, the Irving Middle School, the Young Achievers K-8 School, and the English High School.

2.5.2 Building Heights

As indicated in Figure 2-7, buildings in the immediate vicinity of the Arboretum, which are primarily institutional and residential, range in height from one to eight stories. The largest institutional buildings in the area are located immediately adjacent to the Arboretum grounds including the six-story Hebrew SeniorLife, the seven-story Faulkner Hospital, and the eight-story State Laboratory Institute; in addition, the Sophia Snow House was recently reconstructed at four to five stories. A few commercial and industrial structures located along the MBTA right-of-way east of the Arboretum range from one to three stories. The majority of the residential structures around the Arboretum, predominately constructed in the late 19th and early 20th centuries, are low-rise buildings of one to three stories. The former Adams Nervine Asylum, located just north of the Dana Greenhouse, is now a condominium complex known as the Adams Arboretum Condominiums and consists of several one- to three-story buildings.

2.5.3 Open Space

The Arboretum is an integral part of the Olmsted-designed City of Boston park system now known as the Emerald Necklace, which includes the Back Bay Fens, Riverway, Olmsted Park, Jamaica Park, Arnold Arboretum, and Franklin Park (see Figure 2-8).

The Emerald Necklace park system stretches five miles from the Charles River in Boston to Dorchester and includes over 1,000 acres of parkland. The Arboretum lies between Jamaica Park and Franklin Park.

Residents living in the area surrounding the Arboretum have access not only to the Arboretum but also to some of the largest expanses of open space anywhere in the City (Figure 2-9, Area Open Space). Jamaica Park, enjoyed for its public boating, fishing, and concerts, consists of the 60-acre freshwater Jamaica Pond surrounded by trees, shrubs, and pathways. The 527-acre Franklin Park has six miles of roads and 15 miles of pedestrian and bridle paths. Designed as a country park, the area contains a pond, woodlands, structures, an 18-hole public golf-course, and the Franklin Park Zoo. Jamaica Park, the Arboretum, and Franklin Park are connected by the Jamaicaway and Arborway parkways, lined with sidewalks and large shade trees, essential elements in Olmsted's park system.

In addition to these large parks associated with the Emerald Necklace, the 250-acre Forest Hills Cemetery east of the Arboretum is also open to the public, and the 90-acre Allandale Woods is an urban wild to the west of the Arboretum. Several playing fields and playgrounds are also interspersed among the residential neighborhoods. Nearby are the regional parks of Stony Brook Reservation (475 acres) and the Blue Hills Reservation (7,000 acres).

2.6 Weld Hill Parcel

The Weld Hill parcel, located across Walter Street from the Arboretum land under lease, is bounded by the Hebrew SeniorLife facility to the north, Centre Street to the west, Weld Street to the south, and Walter Street to the east (Figure 2-1), with a 10-foot wide Boston Water and Sewer Commission easement roughly bisecting the property (as shown on Figure 5-1) in a north-south direction. Figure 2-10 provides an aerial perspective of the Weld Hill parcel. The parcel is dominated by Weld Hill itself, which offers panoramic views (see Figure 2-11).

2.6.1 Historic Land Use

Purchased by Harvard University in 1922, the Weld Hill parcel historically has been used by the Arboretum for plant accessions, nurseries, and plant breeding experiments. Prior to Harvard's ownership, the Weld Hill parcel was part of a large farm owned successively by Benjamin Child, William Dudley heirs, Joseph Dudley, Henry Hatch, and Benjamin Lyon.

The Weld Hill parcel is included in a 1934 bird's-eye view of the Arboretum, and no site improvements appear at that time. Between 1936 and the mid-1980s much of the parcel was planted with tree accessions and mass plantings, with the rest of the parcel covered with woodland of native trees dominated by oaks (*Quercus*). A nursery was located in the southeast portion of the parcel by 1936, and by the early 1940s the Arboretum had installed mass plantings along Walter and Centre Streets and had created several orchard-like

nurseries in the eastern portion and northwest corner of the parcel. Between 1950 and the early 1980s the majority of the parcel was planted with additional trees with the exception of the native woods in the northeast portion of the parcel.

In 1968, in preparation for the celebration of the Arboretum's centennial, a number of improvements were made to the Weld Hill parcel. A paved drive was laid out on the site from Walter Street to the top of Weld Hill in a manner consistent with Olmsted design principles of preserving significant natural features and views. In addition, new accessions were planted and more than 1,000 ground cover plants were installed to serve as a demonstration for road bank plantings. Although the improvements and plantings on Weld Hill were always sympathetic with the Olmsted/Sargent design intent of the original grounds, the parcel was acquired after their design was executed and hence not included in the original Olmsted/Sargent plan for the Arboretum. With its mixture of accession plantings, natural woodland, and nurseries, the parcel has had its own character more likened to a working agricultural landscape than the Olmsted/Sargent designed landscape.

2.6.2 Site Context and Adjacencies

The Weld Hill parcel is situated at the southwest end of the Arboretum land under lease, bordered primarily by institutions, residential neighborhoods, and Arboretum grounds. The site has distinctive conditions on all four of its edges. To the north, an expansive parking lot and six-story building dominates the site of the Hebrew SeniorLife facility. Bussey Brook flows through the Hebrew SeniorLife parking lot in a channelized streambed and partly in an underground culvert. On the east edge, Walter Street separates the site from the Arboretum land under lease. Centre Street, a major traffic artery, with residential use on the opposite side of the street, forms the western edge. To the south is a residential neighborhood across Weld Street that has views into the property.

2.6.3 Landform and Drainage

The site is dominated by Weld Hill at the western end of the parcel, which rises some 20 feet above Weld Street to a total elevation of 174 feet. There is a smaller highland at the site's eastern edge, with a broad sloping plane, that drains to the north. A gentle valley separates the plane from the base of Weld Hill (see Figure 2-12, Weld Hill Elevation, Site Drainage, and Slope Analysis).

Throughout the western portion of the site, bedrock lies approximately 10 feet below grade. The site slopes to the north, and dominant winter winds are from the northwest. Slopes across the site range from 5 percent to 35 percent. Half of the site contains slopes of 12 to 25 percent (see Figure 2-12).

2.6.4 Vegetation

Site vegetation consists generally of meadow bordered by trees, including trees that pre-date the Arboretum's acquisition of the parcel, naturally-established plants, groups of trees planted by the Arboretum along Walter and Centre Streets, and Arboretum accessions.

A stand of naturally-established mature oaks occurs on the eastern highland (noted above), and a number of large, individual oaks can be found scattered across the property. Most of these large oaks were present at the time the property was acquired, although oaks continue to establish naturally (see Figure 2-13, Vegetation and Circulation Analysis).

Along the northern edge of the site, a band of woods screens views of Hebrew SeniorLife. Mature maple (*Acer*) accessions interspersed with older cherry (*Prunus*) and crabapple (*Malus*) plantings from the 1940s and a mix of volunteer species form a closed canopy in the northwestern portion of the site. Higher up the northern face of Weld Hill, the slope has scattered mature, hardwood accessions.

Along the eastern edge of the site is a mass planting of Carolina hemlock (*Tsuga caroliniana*), in decline because of an infestation of the wooly adelgid. A mix of species grows along the southern edge of the site including mature oaks, cherries, and junipers (*Juniperus*). A mass planting of larch (*Larix*) from the 1930s occurs along Centre Street. Working nursery plots occupy the east end. A mix of maples dominates the broad shallow valley through the center of the site.

2.6.5 Access and Circulation

The Weld Hill parcel is traversed by a gravel (formerly paved) drive from Walter Street to the top of Weld Hill. This curvilinear drive, in keeping with the design of other roadways in the Arboretum, was constructed in 1968 as one of several landscape improvement projects undertaken for the celebration of the Arboretum's centennial. An overgrown service drive, originally built to provide access to an extensive cherry and crabapple nursery, still remains along the northwest edge of the property, appearing today like a closed canopy allee. Several unsurfaced paths, mown in the summer, form the remainder of the pedestrian network of the site. Access to the site is the old service drive on Centre Street and the existing service entrance on Walter Street. (See Figure 2-13.)

Bordering the western edge of the site is Centre Street, a divided parkway. Along the eastern edge is Walter Street, a major thoroughfare with a high volume of traffic, and to the south is Weld Street, a low-volume residential street. Additional detail on pedestrian and vehicular access and circulation on the Weld Hill parcel is provided in Chapter 6.

2.6.6 Views into Weld Hill Parcel

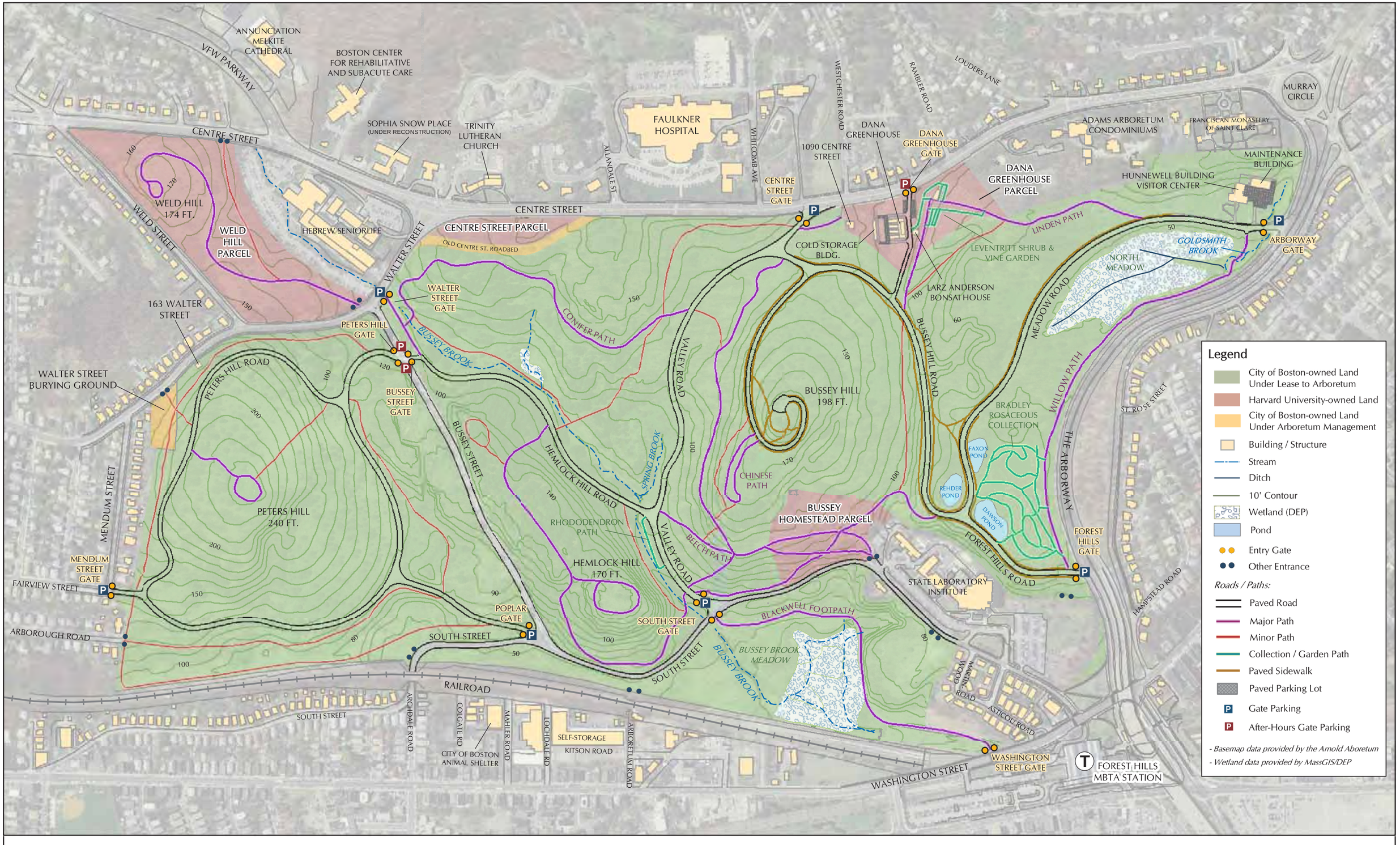
Views into the Weld Hill parcel exist from the surrounding roadways, sidewalks, and neighborhoods. Figures 2-14 through 2-16 depict views into the Weld Hill parcel from specific locations. The more general views into the site are described here.

- **VFW Parkway** –The view from the VFW Parkway, near its intersection with Centre Street, is across a wide, grassy roadside and the wide expanse of Centre Street to the northwest edge of the site. The property edge here is bordered with a chain link fence, behind which stand large, mature trees, with Weld Hill rising behind. To the north is the tall Hebrew SeniorLife building, separated from the Weld Hill parcel by a parking lot.

- **Centre Street** – From along the two-lane divided Centre Street the view into the site consists of mature, oak street trees along a narrow sidewalk. Along most of the sidewalk a steep, cut bank rises a few feet to the site's gently sloping, wooded hillside. A large rock outcrop emerges from one section of the cut slope, and close to Weld Street the property edge is densely planted with mature larch trees. One and two-family houses line the west side of Centre Street. The expansive intersection of Centre Street and the VFW Parkway is located in the distance to the north.

- **Weld Street** – A jagged-topped, stone wall borders the parcel along Weld Street. The site's gravel drive winds its way through the parcel and up to the top of Weld Hill. The single-family residences on the south side of Weld Street have a view of trees and meadows on undulating grounds with the winding gravel drive. The hill and trees on the site block the view of the Hebrew SeniorLife complex from Weld Street.

- **Weld/Walter Street Intersection** – At the intersection of Walter and Weld Streets, the parcel is bounded by stone walls on both streets. Looking into the site from this location the view is of the stone wall, behind which lies a generally flat, open area with the Arboretum nursery. In the distance is another high point covered with natural woodland of mostly oak trees. In the distance to the west is the shallow valley that traverses the site north to south and that is planted with Arboretum accessions, most of which are maples. The incline up Weld Hill is also visible from this street edge.



Epsilon Associates Inc.

Scale 1:5,400

0 150 300 600 Feet

The Arnold Arboretum of Harvard University
Institutional Master Plan

Figure 2-1
Existing Conditions

Epsilon Associates Inc.

Scale 1:5,400

0 150 300 600 Feet

The Arnold Arboretum of Harvard University
Institutional Master Plan

Figure 2-2
Natural & Geologic Features

Arboretum Soil Types

(see Figure 2-2)

Soil Code	Soil Name
CaB	Canton Fine Sandy Loam, 3 to 8 percent slopes
CaC	Canton Fine Sandy Loam, 8 to 15 percent slopes
CaD	Canton fine sandy loam, 15 to 25 percent slopes
ChC	Charlton-Hollis-Rock Outcrop Complex, 8 to 15 percent slopes
ChD	Charlton-Hollis-Rock Outcrop Complex, 15 to 25 percent slopes
CuC	Charlton-Hollis-Urban Land Complex, 3 to 15 percent slopes
HaA	Haven Very Fine Sandy Loam,0 to 3 percent slopes
HfB	Hinckley Sandy Loam, 3 to 8 percent slopes
HfC	Hinckley Sandy Loam, 8 to 15 percent slopes
HfD	Hinckley Loamy Sand, 15 to 25 percent slopes
HrC	Hollis-Rock Outcrop-Charlton Complex, 3 to 15 percent slopes
HrD	Hollis-Rock Outcrop-Charlton Complex, 15 to 35 percent slopes
MmB	Merrimac Fine Sandy Loam, 3 to 8 percent slopes
MnB	Merrimac-Urban Land Complex, 0 to 8 percent slopes
MnB	Merrimac-Urban Land Complex, 0 to 8 percent slopes
NpB	Newport Silt Loam, 3 to 8 percent slopes
NpC	Newport Silt Loam, 8 to 15 percent slopes
NpD	Newport Silt Loam, 15 to 25 percent slopes
NuC	Newport-Urban Land Complex, 3 to 15 percent slopes
PtB	Pittstown Silt Loam, 2 to 8 percent slopes
Ra	Raynham Silt Loam
RdA	Ridgebury Fine Sandy Loam, 0 to 3 percent slopes
Rm	Rippowam Fine Sandy Loam
RoD	Rock Outcrop-Hollis Complex, 3 to 25 percent slopes
Sa	Saco Silt Loam
ScB	Scio Silt Loam, 3 to 8 percent slopes
Sw	Swansea Muck
Ud	Udorthents, Loamy
Ue	Udorthents, Wet, Substratum
Ur	Urban Land

Epsilon

Scale 1:9,600
1 inch = 800 feet

0 250 500
Feet

The Arnold Arboretum of Harvard University
Institutional Master Plan

Figure 2-3
Selected Living Collections

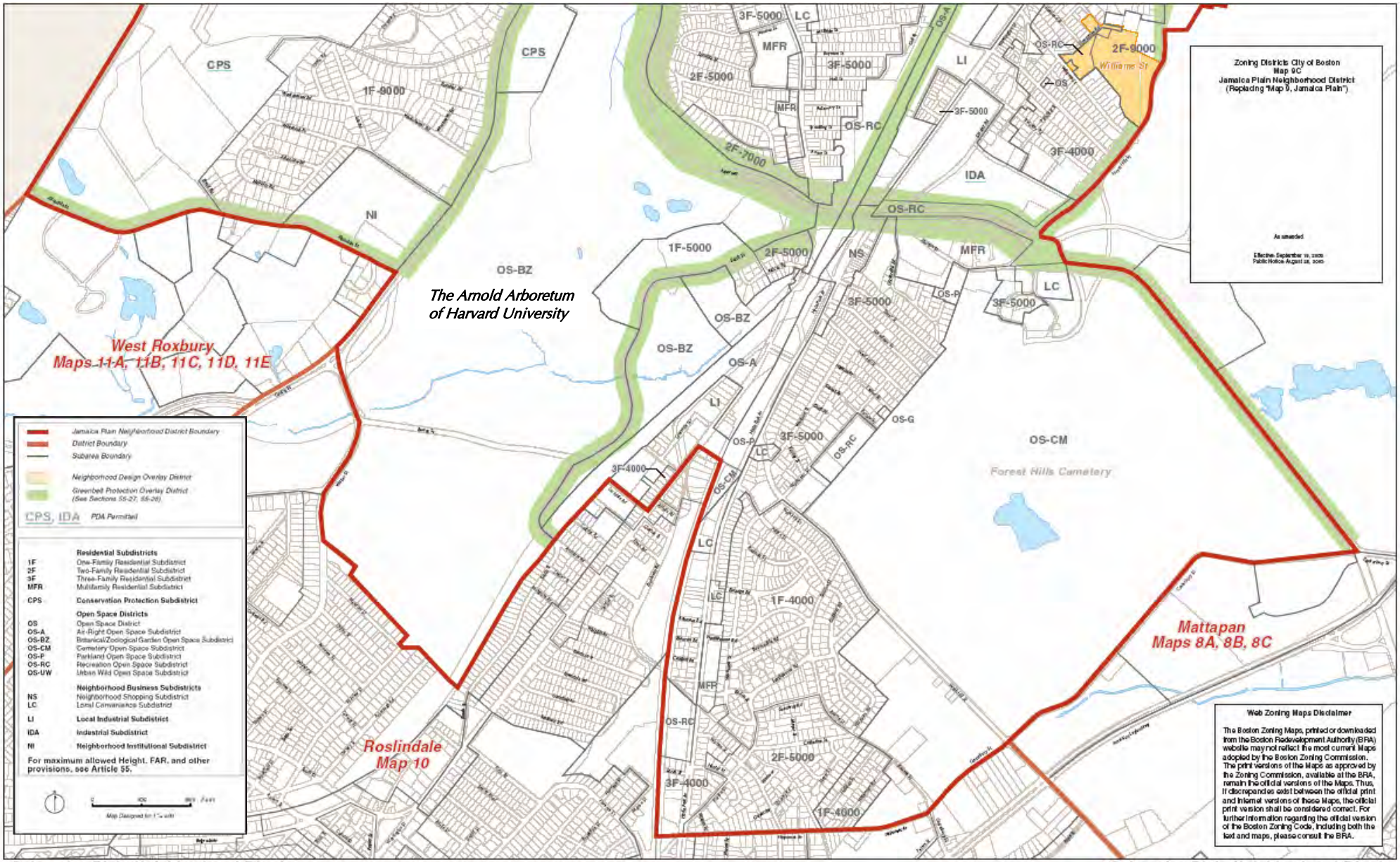
Epsilon

Scale 1:8,400

0 200 400 800 Feet

The Arnold Arboretum of Harvard University
Institutional Master Plan

Figure 2-4
Significant Views



Source: BRA, 2006

10 Roslindale 10 Roslindale

Source: BRA, 2006

Epsilon

Scale 1:12,000
1 inch = 1,000 feet

0 500 1,000 Feet

The Arnold Arboretum of Harvard University
Insitutional Master Plan

Figure 2-6
Area Land Use

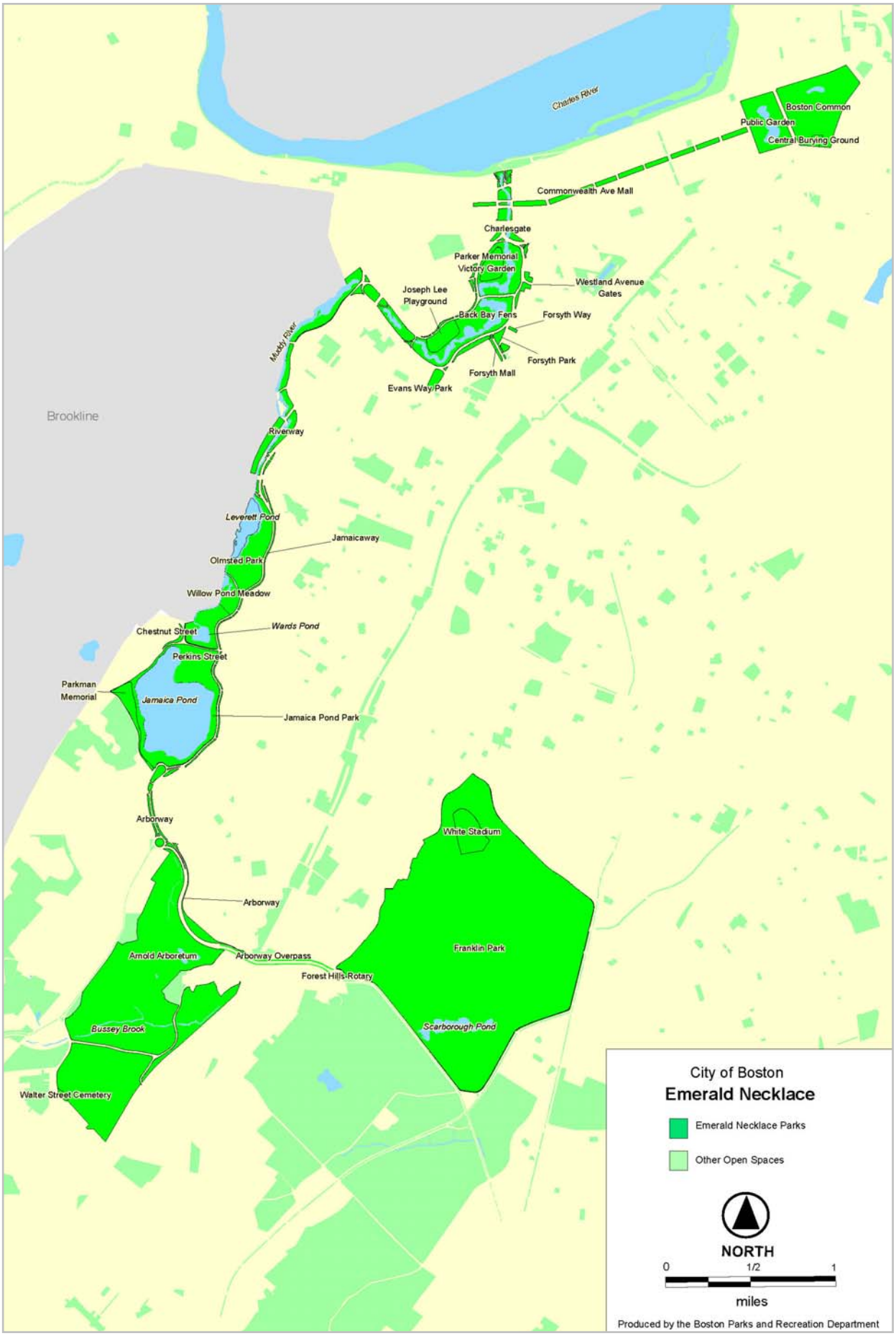
Epsilon

Scale 1:12,000
1 inch = 1,000 feet

0 500 1,000 Feet

The Arnold Arboretum of Harvard University
Insitutional Master Plan

Figure 2-7
Area Building Heights


Charles River
Boston Common
Public Garden
Central Burying Ground
Commonwealth Ave Mall
Charlesgate
Parker Memorial
Victory Garden
Westland Avenue
Gates
Joseph Lee
Playground
Back Bay Fens
Forsyth Way
Forsyth Park
Forsyth Mall
Evans Way Park
Muddy River
Brookline
Riverway
Leverett Pond
Jamaicaway
Olmsted Park
Willow Pond Meadow
Chestnut Street
Wards Pond
Perkins Street
Parkman
Memorial
Jamaica Pond
Jamaica Pond Park
Arborway
White Stadium
Arborway
Arnold Arboretum
Arborway Overpass
Forest Hills Rotary
Franklin Park
Bussey Brook
Scarborough Pond
Walter Street Cemetery
City of Boston
Emerald Necklace
Emerald Necklace Parks
Other Open Spaces
NORTH
0
1/2
1
miles
Produced by the Boston Parks and Recreation Department

Epsilon

Scale 1:18,000
1 inch = 1,500 feet

0 500 1,000
Feet

The Arnold Arboretum of Harvard University
Insitutional Master Plan

Figure 2-9
Area Open Space

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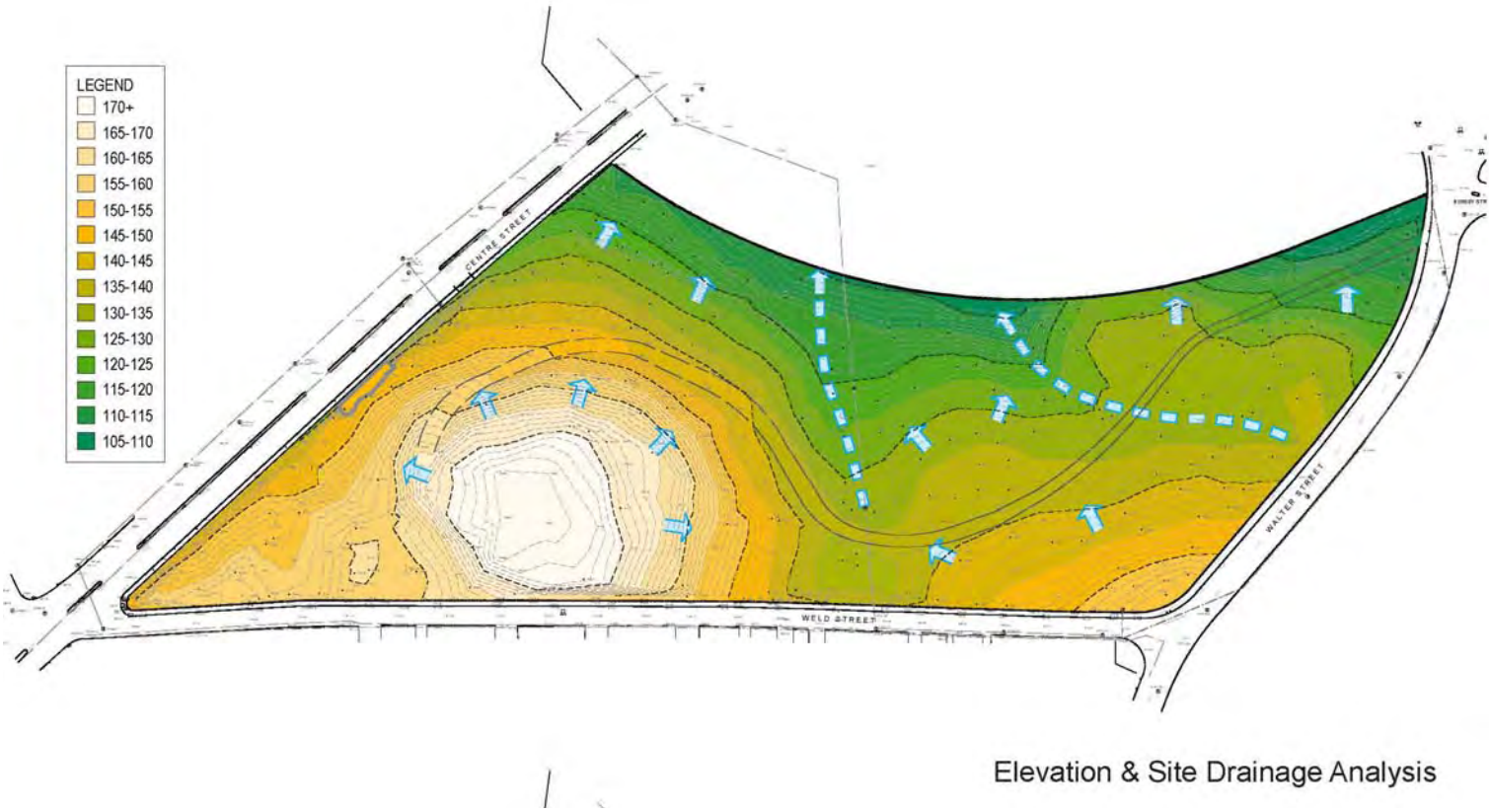
The Arnold Arboretum of Harvard University
Institutional Master Plan

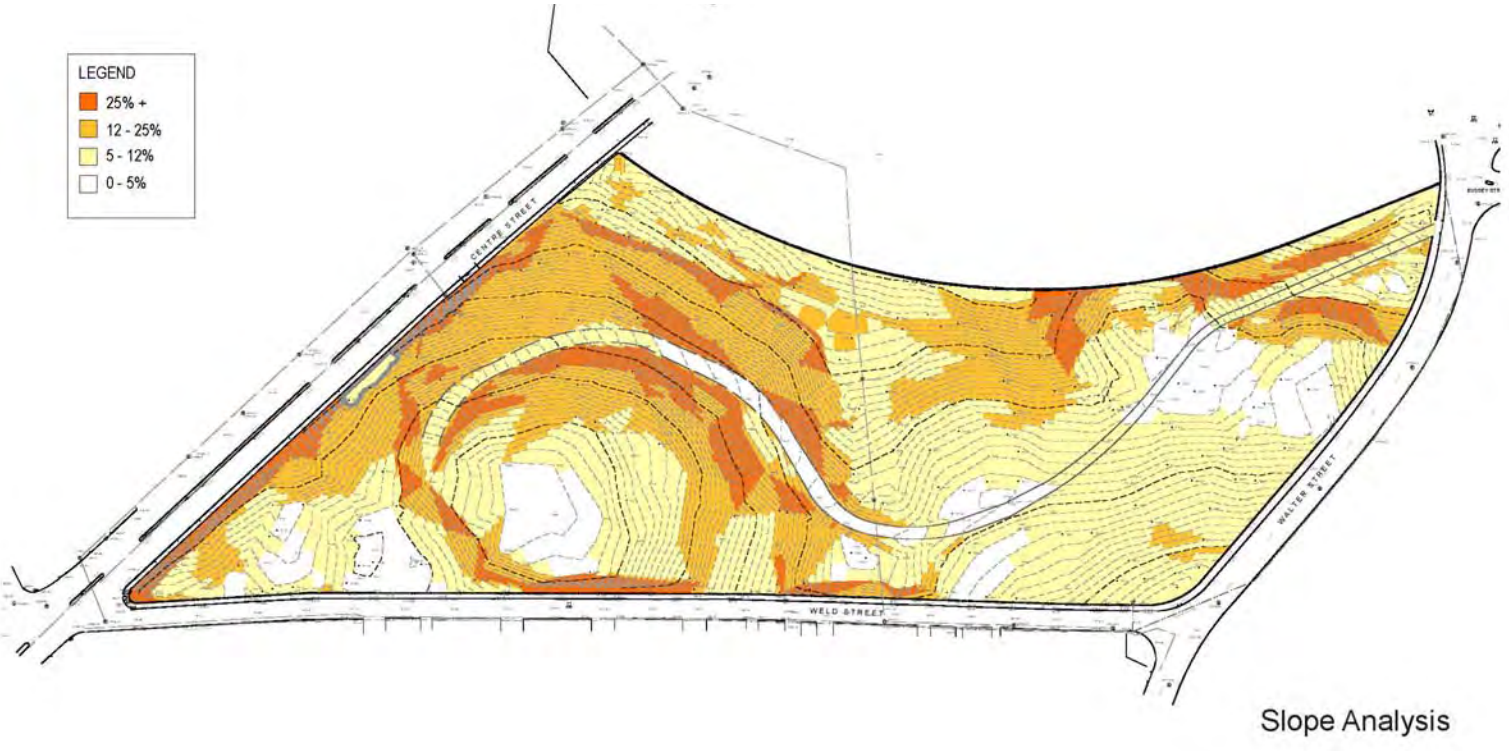
Figure 2-10
Oblique Aerial View of
Weld Hill Parcel


NORTH
EAST
SOUTH


SOUTH
WEST



Elevation & Site Drainage Analysis



Slope Analysis

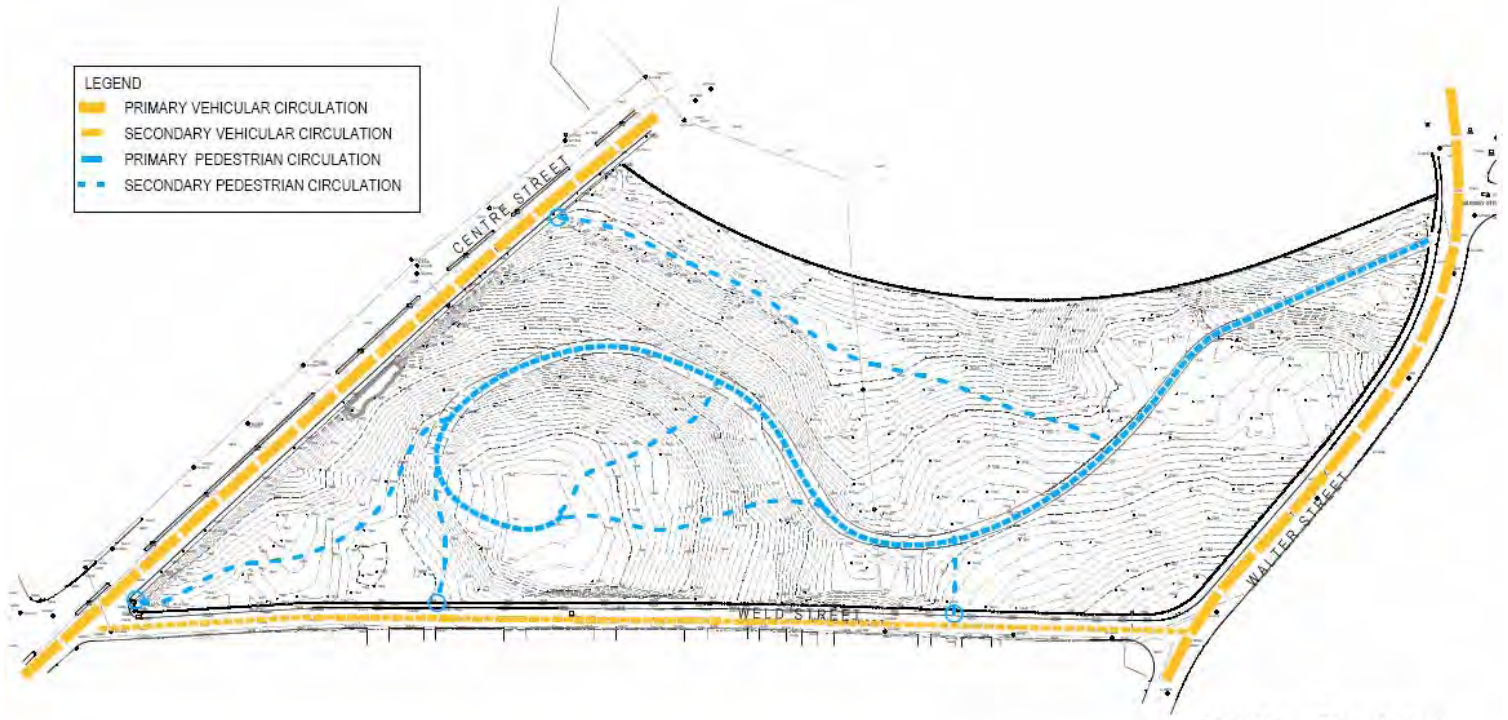
Source: Reed Hilderbrand Associates

Epsilon Associates Inc.

The Arnold Arboretum of Harvard University
Institutional Master Plan

Figure 2-12
Weld Hill Elevation, Site Drainage & Slope Analysis

Vegetation Analysis



Existing Circulation

Source: Reed Hilderbrand Associates

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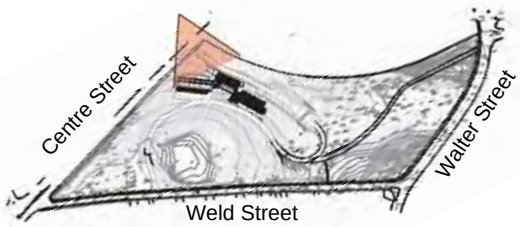
The Arnold Arboretum of Harvard University
Institutional Master Plan

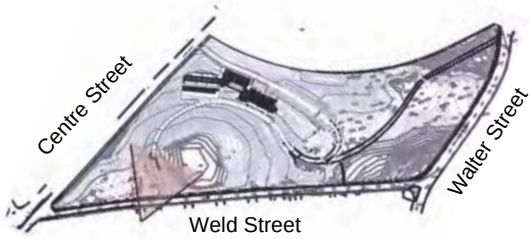
Figure 2-13
Weld Hill Vegetation & Circulation Analysis



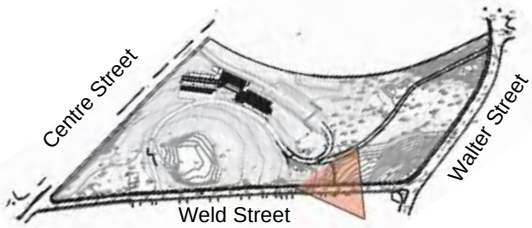
View 1

View 2

Source: The Stubbins Associates



View 3



View 4

Source: The Stubbins Associates

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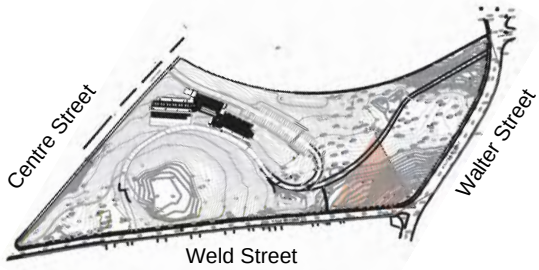
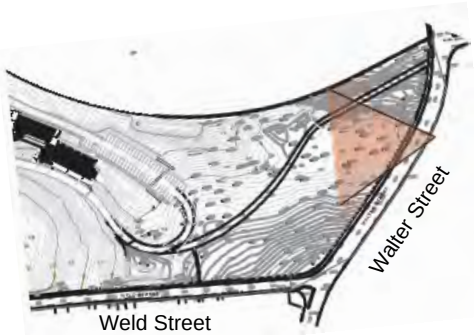
The Arnold Arboretum of Harvard University
Institutional Master Plan

Figure 2-15
Weld Hill Views 3 and 4



View 5



View 6

Source: The Stubbins Associates

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The Arnold Arboretum of Harvard University
Institutional Master Plan

Figure 2-16
Weld Hill Views 5 and 6

3.0 ARBORETUM COMMUNITY PROGRAMS AND BENEFITS

3.1 Introduction

Consistent with its unique mission, the Arboretum provides invaluable benefits to visitors who enjoy the landscape as a quiet, natural area in the midst of a highly urban environment, as well as to those who participate in classes, field trips, tours, and other educational programs. The following sections include descriptions of the main components of the Arboretum's programs that benefit the community.

3.2 The Arboretum Landscape

The Arboretum's most important community contribution is public access to its carefully maintained historic landscape and outstanding collections of woody plants. In a recent survey of members of the *Friends of the Arnold Arboretum* (described below) and participants in adult education programs, 70 percent of respondents rated care and curation of the plant collections as of the highest importance for the Arboretum. This strong interest in, and support of, the Arboretum as a living collection of woody plants open to the public began before the Arboretum was even opened. After an initial vote in support of the proposed City-Harvard venture failed to pass in the Boston City Council in 1882, a petition of support was circulated and signed by 1,305 people. The Herald covered the results in its December 1st issue:

> *The petition to the city council in favor of the Arnold Arboretum is probably the most influential ever received by that body. It includes almost all of the large taxpayers of Boston ... Nearly all of the prominent citizens are there, including ex-mayors and ex-governors ... The petition would be a prize to a collector of autographs.*

As soon as it was open to the public, the Arboretum became a popular destination for carriage rides and strolling. The Arboretum's earliest "visitor services" effort was to provide a map of the grounds that highlighted the collections as well as the roads and paths, which was published in the early 1900s.

Today, the Arboretum reaches its broad public audience by providing not only a map of the grounds and other interpretive services, but also a range of educational programs that appeal to visitors, avid gardeners, professional horticulturists and arborists, teachers and students, and landscape designers and architects. The Arboretum's living collections and the mission directive to realize the educational potential of these collections are central to all of these programs.

3.2.1 Landscape and Interpretation

People come from around the world to visit the Arboretum's landscape. Each year more than 250,000 visitors enjoy the Arboretum's exceptionally well-maintained grounds and living collections of trees and shrubs. Visitors are invited to tour the grounds from dawn to dusk 365 days of the year, attend free landscape walks led by staff or volunteers, and attend other free events held annually at the Arboretum. Information about the Arboretum and its programs is available at the visitor center. Plant highlights (such as "what is in bloom"), events, programs, and formal educational offerings are described in *Silva,* the Arboretum's popular news magazine and guide to year-round programs and events; a web site; a telephone receptionist during visitor hours and an extensive system of recorded information via the telephone; a free monthly e-news; and regular calendar announcements in local and regional magazines and newspapers.

Visitor Center

Interpretive information about the Arboretum's work and living collections is available through permanent and changing exhibits in the visitor center at the Hunnewell Building, tours, and informational materials available in print and web-based media. The visitor center, used by approximately 20,000 people annually, houses an extensive exhibit about the Arboretum entitled "Science in the Pleasure Ground." The exhibit, opened in 1996 in celebration of the Arboretum's 125th anniversary, was the culmination of a five-year project, funded by planning and implementation grants from the National Endowment for the Humanities, to develop a permanent exhibit that introduces visitors to the landscape of the Arboretum and that traces the many uses to which the land has been put through time. The exhibit features five themes of importance in the history of the Arboretum: the design of the land by the Arboretum's first director, Charles Sprague Sargent, and landscape architect Frederick Law Olmsted; its changing landscape over the past hundred years; the introduction of plants from distant lands; the development of suburban horticulture for American homes in the middle years of this century; the economic uses of wood in our culture; and the Arboretum's involvement in forest conservation in America and abroad.

A large model of the Arboretum grounds helps to orient the visitor and instill an appreciation for the land and its history, including its history prior to the establishment of the Arboretum. The use of the Arboretum grounds by Native Americans during the pre-contact period is also highlighted by a special display of artifacts that have been found on the grounds.

In addition to the exhibit, the visitor center features a bookstore and restrooms and is attended by trained, interpretive staff. The visitor center also includes a website kiosk to enable visitors to access the Arboretum website to search the Arboretum's collections inventory and to view plant location maps during their visit. The Hunnewell Building is open to the public 9 AM to 4 PM on weekdays, 10 AM to 4 PM on Saturdays, and 12 noon to 4 PM on Sundays.

Tours, Events, and Lectures

Tours of the grounds are offered regularly to visitors and to organized groups. Tours focus on the Arboretum's living collections and their history as well as plants of seasonal interest, and are led by Arboretum staff or trained volunteer docents. In a typical year, the Arboretum sponsors approximately 70 tours, many of which are free to the public, serving more than 1,000 people.

Visitors are also invited to take four self-guided tours of particular aspects of the collections. Brochures for these tours are also available from the visitor center for:

- Lilacs at the Arnold Arboretum;
- Centenarian Trees and Shrubs;
- Conifers of the Arboretum; and
- Bradley Collection of Rosaceous Plants.

In addition, each year a different self-guided tour of accessions representing the plants offered at the annual plant sale for members of the *Friends of the Arnold Arboretum* is developed, and a brochure is produced.

Every year the Arboretum also sponsors special programs and events, the most well-known of which is Lilac Sunday. This event and others combine family enjoyment with learning about plants. On Lilac Sunday, visitors gather at the Arboretum to celebrate the sight and fragrance of a whole hillside of lilacs and to picnic on the grounds, the only official day on which to do so. A well-publicized Boston tradition since the turn of the century, Lilac Sunday continues to be a truly family event, with 10-20,000 visitors attending each year, depending on the weather.

Winter is the season for the Arboretum's Horticultural Lecture Series, sponsored jointly with the Massachusetts Horticultural Society, the New England Wildflower Society, Tower Hill Botanic Garden, and Wellesley College Friends of Horticulture. The annual lecture series hosts four speakers prominent in their fields on topics of garden design and horticulture. Lectures held in winter 2005-2006 included:

- Paula Panich on *Tales of Passion, Obsession, and Other Firsthand Reports from the Garden*;
- Bill Cullina on *Exceptional Native Perennials for Creative Gardening*;
- Larry Weaner on *Natural Landscape Design: Meadow, Woods, and Water;* and
- Julie Moir Messervy on *Outside the Not so Big House: Creating the Landscape of Home*.

Another popular, year-round lecture series is for Arboretum volunteers and features Arboretum staff and researchers. A few of the lectures held this past winter included:

- David Boufford and Susan Kelley on *The 2005 Expedition to Western Sichuan*;
- James Doyle on *The Proof is in the Pictures: Beating Hearts of the Arboretum*; and
- Kevin Stevens on *Azalea Border: A History of the Design*.

The Arboretum trees and landscape have long been favorite motifs of local artists, and the Hunnewell Building lecture hall is becoming a popular place to exhibit artwork inspired by the grounds. This past fall Kyle Larabee exhibited "Peak Color," a series of collages made of fallen leaves collected in part at the Arboretum. The artist even held an afternoon "Family Leaf Workshop" for families with children to try their hand at making leaf collages. During the winter, the Arboretum hosted "An Ever Changing Moment," a series of paintings by Michael Noyes that celebrates the spirit and beauty of trees.

Throughout the year, the Arboretum hosts gatherings of a variety of professional organizations, lending its buildings and landscape, often providing programming, such as training, tours, or introductions to the library, and sometimes co-organizing these landscape- and horticulture-related events. Groups that the Arboretum has hosted over the past few years include: American Nursery and Landscape Association; Arboretum Park Conservancy; Boston Parks Department; Boston Society of Landscape Architects; Community Outreach Group for Landscape Design; Ecological Landscape Association; Friends of the Frederick Law Olmsted National Historic Site; Harvard Graduate School of Design; Harvard University Environmental Action Committee; Historic New England Friends Group; Jamaica Plain Street Tree Volunteers; New England Landscape History and Design Association; New England Society of Botanical Artists; North American China Plant Exploration Consortium; UMass Extension Service; Urban Ecology Institute's Community Forest Partners; and various local garden clubs and plant societies.

3.2.2 Landscape Improvements

For much of its history the Arboretum has focused its horticultural efforts on the care and documentation of individual plants. Indeed, the great value of the Arboretum's living collections lies in the quality of the records that document the identity, origin, and location of each specimen. These specimens grow in a landscape system that supports their survival and enhances their appreciation by Arboretum visitors. The most important natural elements in this system are the hydrology and the soils, with their differing nutrient and water retention qualities; other natural elements, such as topographic diversity and rock outcrops, give shape and add geological interest to the landscape. However, most of the landscape infrastructure is manmade: the stone walls, roadways, gates, pathways, and visitor amenities such as benches, signage, and water fountains. It is essential that the historical emphasis on individual accessions be balanced with increased attention to the overall landscape system that sustains the collections and shapes the experience of visitors.

During the past fifteen years, increasing attention has been paid to undertaking needed improvements to the landscape and physical infrastructure, as well as to more systematically monitoring the environmental conditions of the grounds. Given the historic responsibility of the City of Boston to maintain the public infrastructure (stone walls, gates, roads, benches), the Arboretum continually consults with the Department of Parks and Recreation on landscape improvements, and a number of projects have been done in direct and close collaboration with the Department and other City agencies.

The Arboretum itself has invested in numerous landscape improvement and preservation projects on the Arboretum grounds. Recent projects include improvements to the 24-acre Bussey Brook Meadow, restoration of the Bussey Street and Peters Hill gates and the historic Walter Street gate, and the installation of the award-winning Leventritt Garden of Shrubs and Vines. These projects, described briefly below, cost in excess of $5 million and serve to enhance the Arboretum landscape and facilities for the benefit of the general public.

- **Restoration of Bussey Brook and Creation of Linda J. Davison Rhododendron Path** – Through a generous donation, the Arboretum re-constructed and greatly improved a large part of its rhododendron collection affectionately known as the dell. The 1990-1992 restoration of the area began with addressing underlying ecological instability problems within the reach of Bussey Brook that flows through the collection. Approximately 200 feet of bank and channel were ecologically restored from long-term erosion damage and stabilized against future erosion; a stone wall, a terraced seating area, and several stepping stone paths were constructed; and more than 500 feet of path were re-built. Curatorial staff undertook a review of the collection, resulting in the removal of poor specimens and the planting of new rhododendrons and woodland understory plants. The overall effect was to create a naturalistic setting for the rhododendron collection that blends well with the natural state of Hemlock Hill.

- **Eleanor Cabot Bradley Collection of *Rosaceous* Plants** – This exuberant, seven-acre collection of trees and shrubs from the rose family was designed and installed in the early 1980s in an area of the Arboretum previously used for nurseries and the first shrub and vine garden. By the early 1990s its exuberance had become a maintenance challenge, and a three-year project was undertaken to improve its situation. A total of more than 5,000 feet of granite cobble stones were installed as edging to the planting beds (about 240 tons) and to more crisply define the bed/lawn border. A fieldstone retaining wall 90 feet in length was installed on either side of the Bradley Memorial Bench to create an even more pleasing area of repose and contemplation for visitors. Some planting beds were reconfigured and the lawn was re-sown throughout. This collection, located adjacent to Dawson Pond and the Arboretum's collection of cherry trees, is a favorite strolling and sitting spot for visitors, especially in spring.

- **Peters Hill Restoration** – A larger scale project, the summit of Peters Hill was restored in 1997-1998. Over time the paved drive to the hilltop had led to overuse by vehicles and degradation of the site. During this project the Arboretum removed the existing road surface, leaving just a paved walkway from the main Peters Hill Road. Rustic stone blocks were partially buried in the hillside near the summit to create seating that overlooks the Arboretum and the Boston skyline. A variety of oaks and native understory shrubs were planted to extend the natural woodland that lies on the southeastern slope of the hill.

- **Bussey Brook Meadow** – In 1996 the Arboretum, the City of Boston, and the Arboretum Park Conservancy worked together to add 24 acres of land in Bussey Brook Meadow, east of South Street, to the City-owned land under lease. Master planning for habitat restoration and public amenities began immediately, followed by implementation. By 2002 several projects with an overall value of $1 million were completed in the Bussey Brook Meadow. Improvements included new entrance gates on Washington Street and South Street (donated by the Arboretum Park Conservancy), puddingstone walls, an improved pedestrian crossing over South Street, and a multi-use path (funded by a federal ISTEA grant), named in honor of John Blackwell, connecting the Washington Street entrance with South Street and the rest of the Arboretum grounds.

- **Bussey Street Gate, Peters Hill Gate, and Walter Street Gate Restoration** – In 2002 the Arboretum took on improving pedestrian and vehicular movement between Hemlock Hill and Peters Hill, across the publicly traveled Bussey Street. In this extensive project, the Arboretum realigned the north entrance on Bussey Street so that people and vehicles could cross more safely, repaired and constructed the stone piers and walls, and installed new vehicular and pedestrian wrought iron gates. The vehicular road to the Walter Street gate was removed and converted to a smaller, pedestrian stonedust path. After the re-alignment of the roads and paths, several acres of land became newly available for collections, and the grounds were restored to a more natural condition. The cost of this project was $1.13 million. In addition, the Parks Department contributed approximately $40,000 from its Edward Ingersoll Browne Fund to fabricate a reproduction of the original historic gate for the Walter Street entrance.

- **Leventritt Garden** – Created at a cost of $3.2 million and dedicated in the fall of 2002, the Leventritt Garden of Shrubs and Vines is a newly created three-acre garden that offers an outdoor exhibit of outstanding shrub and vine specimens for the New England landscape. An emerging program of tours and interpretive signage at the Leventritt Garden will explore educational themes including plant exploration, plant conservation, plant introduction, plant physiology, exemplary horticultural specimens, and seasonal changes. Elements of the Leventritt signage system are freestanding and easily moved within the Garden and throughout the seasons. This flexible signage system was installed as a way to provide repeat visitors with fresh new information as the plants and seasons change. The Arboretum also recently constructed a new pedestrian, stonedust path to the Leventritt Garden from Meadow Road at a cost of $84,000.

As described below, in addition to these recent capital improvements, the Arboretum is currently undertaking signage and wayfinding improvements across the Arboretum grounds and a study of options to improve the appearance of the Arboretum's perimeter. The Arboretum is working closely with the Parks and Recreation Department on these projects and planning studies.

- **Signage and Wayfinding Project** – The intent of the signage and wayfinding project is to create distinctive, helpful graphics to enhance the visitor experience of the Arboretum's landscape. The new informational system, once implemented, will include perimeter signs, directional signs, trail blazes, panels with maps, destination markers, a means for temporary and mobile signage, and a new map and site brochure. These improvements will result in better directional indicators to the visitor center at the Hunnewell Building, improved patterns of access and circulation within the Arboretum, clearly marked destinations, and improved interpretation. These signage and wayfinding improvements will provide information to assist both the casual visitor and the researcher to easily access the site's important areas, collections, elements, and structures.

  The Arboretum is currently working on a pilot program for the signage project to test key elements in the landscape. The focus area for the test program is the visitor center, and elements such as wayside and directional markers will be placed primarily between the Arborway Gate and Chinese Path, including the Leventritt Garden markers. Implementation of the comprehensive signage program will then follow. Included in this project is a new map and visitor brochure.

- **Perimeter Improvements** – The Arboretum is undertaking a study of the border vegetation and physical structures that comprise the perimeter of the grounds. This study is intended to help evaluate the image conveyed to the public from the primary roads that surround the grounds and from which many people know the Arboretum. Based on the study results and with collaboration with the Parks and Recreation Department, the Arboretum hopes to develop appropriate landscape initiatives that would create a clear and consistent physical identity along the property's edge and possibly offer greater visibility into the grounds. Possible initiatives may include changing the management of the existing vegetation at the property's edge; extending and improving existing stone walls bordering the property; and creating strong visual thresholds at key locations along City streets. Other initiatives could be developed in collaboration with neighbors, such as undertaking new plantings along Centre Street to re-establish its parkway character. As noted in Chapter 2, maintenance of the stone walls and sidewalks along the Arboretum's perimeter is the responsibility of the City of Boston, hence strong collaboration will be critical to this project.

3.3 Public Education

Throughout most of its history the Arboretum has engaged in educational activities that serve the public directly. The first regular publication for the general public was started in 1888 by Sargent and called *Garden and Forest: An Illustrated Weekly Journal of Horticulture, Landscape Art and Forestry*. The plantsman J.G. Jack held the first public lectures beginning in 1891 using the living collections and grounds of the Arboretum.

Today, the Arboretum invests more than $1.6 million annually in serving school children and adult learners with instruction in botany, landscape design, horticulture and the gardening arts. Education activities are based on the singular resources of the Arboretum, utilizing its living collections, cultural landscape, information resources, and staff expertise to inform and teach in life science, plant biology, horticulture, and related disciplines.

3.3.1 Children's Education

Support of science education for children in public schools is among the most important educational activities of the Arboretum. While the programs are open to all metropolitan Boston school districts, students in Boston public schools participate free of charge and are also provided with free bus transportation for specific programs. The Arboretum's core program, called "Field Study Experiences," is for class groups of third through fifth grade students. A pre-school program for class groups from Head Start centers is a more recently developed program that is still in its pilot phase.

To make these programs possible, the Arboretum recruits and trains a group of volunteer school program guides that work with the class teachers and students. The Arboretum currently has approximately 30 school program guides, including several retired academics, former teachers, and professionals involved in science education with children.

Field Study Experiences

Arboretum field studies are designed to complement classroom life science curricula in line with the local and state school curricula. Programs include investigations of flowers and pollination, seeds and seed dispersal, and the historical roles of various tree species in Native American culture (see descriptions below). The two-hour programs are designed to encourage the investigation of plant science in the meadows and woodlands of the Arboretum. Lessons that begin in the classroom can be explored and enlarged through these outdoor learning adventures. The programs emphasize student inquiry and direct interaction with natural phenomena. Students work in small groups with a volunteer school program guide to explore and discuss science-oriented questions. Pre- and post-visit materials help teachers plan a challenging learning opportunity.

Examples of field study programs for children are described below.

- **Flowers Change –** In spring, the field study "Flowers Change" provides opportunity for students to look closely at the development of a flower as it changes from flower to fruit. Students practice looking for the parts of the flower that make seed production possible, in particular the male part that holds the pollen, and the female part where pollen is received and seed production takes place. Using the rich variety of flowers and developing fruits found on Arboretum plants, students discover the stages of a flower's transformation. The pre-visit activity asks students to dissect and draw a flower. The post-visit activity asks them to continue their exploration of the development of flowers into fruit in their schoolyard and neighborhood.

- **Native Trees, Native Peoples** – In both spring and fall, students may take the field study "Native Trees, Native Peoples." For many years, native peoples of the Eastern Woodlands lived on the land that is now the Arboretum. In this field study, students learn to identify the trees that supported a culture. Using clues, students first seek out the trees and then create a collection of plant materials, drawings, and written descriptions of each species. Students look carefully at the characteristics of specific trees and use their observations to determine what makes one kind of tree different from another. The intent is to teach the students to differentiate between evergreen and deciduous trees. This program takes place entirely outdoors in the conifer collection.

- **Plants in Autumn** – The fall-based field study, "Plants in Autumn," lets students focus on the fall phenomenon of seed dispersal and the strategies that plants use to distribute their seeds, examining the structure of the seed package for evidence of this strategy. Exploring the grounds of the Arboretum, students assemble a seed collection and group their findings into two categories: seeds that travel by wind and seeds that travel via animals. A post-visit activity supports a variety of uses for this seed collection.

- **Hemlock Hill, A Changing Ecosystem** – A new field study experience called "Hemlock Hill, A Changing Ecosystem" intended to serve the specific educational needs of fifth-grade students in nearby elementary schools in Roslindale, Jamaica Plain, and Roxbury was pilot tested in fall 2004/spring 2005, and full implementation is now underway. Designed in collaboration with an advisory group of Boston teachers, the new program supports life science curricular goals as well as strengthens skills in literacy and math. In fall 2004, eleven classrooms from seven schools came for the Hemlock Hill program; in spring 2005, five classrooms from four schools came for the program. Sixteen schools will participate in 2005-2006, including three new schools (Otis, Philbrick, and Curley) for the first time in spring 2006. All classrooms were provided bus transportation by the Arboretum.

On average, 2,500 public elementary school students participate in these programs annually, with school visits evenly divided between the fall and spring seasons. During the school year 2004-2005, the programs served 110 classrooms from seven different public school districts.

Pre-school/Head Start Program

The Arboretum's education program for pre-school children, initiated in 2004, serves two Head Start centers in Jamaica Plain and Roslindale, each of which has approximately 150 children. This program includes teacher training and a series of three Arboretum visits for each Head Start class that participates. In June 2005 the Arboretum trained 20 teachers in both centers and then hosted 12 explorations of the landscape for preschool classes over the summer. The current program plan is to bring all the children to the Arboretum three times (twice in summer and once in fall) in classes of approximately 30 children each. The Arboretum funds bus transportation for the classes to facilitate participation.

Teacher-led Programs

In addition to Arboretum-hosted classes, many other school classes visit the Arboretum for science education, either using Arboretum interpretive materials or their own. Although it is difficult to track the number of students that visit in this way, the Arboretum estimates that over 5,000 children participate each year in teacher-led activities utilizing the Arboretum landscape and collections.

Future Initiatives

In the future, the Arboretum intends to continue its work with the Boston Public Schools, possibly expanding programs to middle school students to offer science immersion programs at a more advanced level. The Arboretum also plans to increase services to the Head Start centers with which it is working. In addition, the Arboretum will continue to explore the creation of new programs for families.

3.3.2 Adult Education

The Arboretum offers an extensive adult education program that serves the general public with an annual offering of more than 100 courses, lectures, and hands-on workshops in horticulture, ecology, botany, landscape history, botanical arts, and related subjects, with a core emphasis on woody plant identification, propagation and care. Classes are held in the Hunnewell Building lecture hall and the Dana Greenhouse classroom on Centre Street. To accommodate work and family schedules, programs are offered year-round, on both weekdays and weekends, and during evening and daytime hours. The Arboretum's course list is available through the Arboretum's website, www.arborteum.harvard.edu.

Roughly 1,200 students each year attend the Arboretum's adult education classes. Students come from over 175 communities in Massachusetts and from throughout New England.

The program has benefited from collaboration with peer institutions, such as the New England Wild Flower Society, the Wellesley College Friends of Horticulture, and the Massachusetts Horticultural Society. The highly popular annual Winter Horticultural Lecture Series and symposia are co-sponsored events that allow the Arboretum to bring

prominent local and national speakers to New England garden enthusiasts. The programs attract an audience of garden and landscape professionals, as well as hobby gardeners, and serve as vocational training for area property management companies and landscape crews.

The adult education program owes its success in large part to the quality of its instructors and lecturers. Many classes are led by recognized authorities in their fields. Students have recently immersed themselves in the microscopic world of flowers with Harvard botanist Kanchi Gandhi, for example; others have debated the impact of climate change with Boston University professor Richard Primack. Many Arboretum staff members teach courses on their occupational expertise, from pruning ornamental shrubs to plant identification using the best methods currently known.

Over the past five years, the adult education program has extended an invitation to non-English speakers to explore the Arboretum via tours in Spanish, French and Russian. In March 2006, an all-day adult class in basic landscape maintenance was offered in Spanish for the first time.

In keeping with its educational mission, the Arboretum heavily subsidizes the adult education program to encourage broad participation. In addition, a series of free lectures each semester enhances education in plant research, collections, management, and environmental issues.

3.3.3 Landscape Institute

The Landscape Institute provides approximately 250 part-time, adult students with professional training in landscape planning and design, garden history, and cultural landscape preservation. The Institute was formed by combining the Arboretum's activities in cultural landscape preservation, implemented in part through a strong collaboration with the National Park Service and through the activities of the Arboretum's Institute of Cultural Landscape Studies, with the Radcliffe Seminar Landscape Design Program, a nationally known program offering a Certificate in Landscape Design and a Certificate in Landscape Design History. The administration of the landscape design program was transferred from Radcliffe to the Arboretum in 2002.

Classes are offered on weekdays during evening and daytime hours. While most classes are held in Harvard facilities in Cambridge, field labs are taught regularly at the Arboretum. A description of the certificate programs and listing of the Landscape Institute's course offerings are available on-line through the Arboretum's website.

The Landscape Institute promotes ongoing student outreach that provides broader community benefits. Studio and individual senior projects often serve the needs of non-profits and community groups seeking the assistance of landscape design students.

3.3.4 Arboretum Library

The Arboretum library serves the general public as well as approximately 600 researchers and students annually. Arboretum program participants, students, and researchers from across the country utilize the collection of more than 35,000 volumes with particular strength in botany, horticultural science, and landscape history. The library is open 10 AM to 4 PM Monday through Saturday year-round. An additional 60,000 volumes of the Arboretum's library holdings, as well as the combined holdings of the Harvard Botany Libraries (total of 280,000 volumes and 900 current scientific journals) are housed in Cambridge and are also available to the public, students, and researchers.

The library also contains the Arboretum's collection of more than 25,000 photographs that date from 1870 to the present. Many of these images document the Arboretum's living collections and record the development of taxa within the collections. In addition to images of specific genera growing at the Arboretum, the collection includes views of the Arboretum's landscape. Historic images of eastern Asian plants capture the extraordinary travels of the Arboretum's plant collectors. Undertaken with special funding from the Harvard University Digital Initiative, 5,000 images, letters, and maps from both historical and contemporary plant-collecting expeditions to China and Tibet have been digitized. Included are the 1997, 1998, and 2000 expeditions of David Boufford to China's Hengduan Mountains region and the Arboretum's 1924-1927 expedition to China and Tibet led by Joseph Rock.

These digital historic images, as well as many of the images of the Arboretum's landscape, are now available on-line through Harvard's public Visual Image Access (VIA) catalog, http://via.harvard.edu.

Beginning in 2003, Arboretum library staff developed additional resources and programs to ensure the collection reflected the needs of the Landscape Institute's faculty and students. To enable students to gain better access to the collection, the library's weekly schedule and overall hours of operation were increased. Each semester the library staff conducts an information session that includes a description of the library collection, an overview of useful reference tools, e-resources, visual resource holdings, and the scope of the Arboretum's extensive archives. Landscape Institute students use the Arboretum library to access their class readings and resources.

3.3.5 Publications

Although the publications have continually changed, the Arboretum has always produced serial publications as well as special reports, studies, and informational materials. Currently the Arboretum publishes *Arnoldia* and *Silva.* *Arnoldia*, published quarterly, contains articles on plant science, ecology and conservation, parks and open spaces, landscape design and history. Begun in 1911 and first called the Bulletin of Popular Information, *Arnoldia* is the Arboretum's longest standing contribution to providing horticultural

information. *Silva* is published twice a year and serves as a combined publication of Arboretum news, adult education class catalog, member events, and visitor information. Circulation of *Arnoldia* is slightly more than 3,000 per issue and *Silva* is approximately 10,000 per issue.

The Arboretum has also engaged in developing interactive teaching software for science education. Based on Arboretum research in the tropical forests of Indonesia, the Arboretum produced an electronic-based science curriculum "Rainforest Researchers" that won a prestigious Codie Award as the best piece of software for middle-school students produced in the United States in 1996.

In addition, a paperbound plant inventory of the living collections is available to the public. It lists alphabetically, by both genus and species, all the 4,448 different kinds of plants (excluding nursery holdings) that were growing in the Arboretum's collections in 2003. The continually updated plant inventory is also available via the Arboretum's website.

3.3.6 Arboretum Website

In September 2002, the Arboretum launched a redesigned website (www.arboretum.harvard.edu), offering extensive information on the Arboretum. Website visitors can search the Arboretum's collections inventory, view plant location maps, and access the plant information hotline. Photographic collections also can be viewed, and a link to Harvard's photographic collections is provided. Many of the Arboretum's publications are also accessible through the website. In 2005 there were more than one million "page views" or "hits" on the site.

The Arboretum website provides a wealth of information for potential visitors, including hours, interactive directions, maps of the grounds, and upcoming events and self-guided tours. The site also serves as an easy way for the Arboretum to communicate with the community at large about our facility needs and plans. The site also offers information about educational programs, publications, and online exhibits, as well as detailed information about our research initiatives and library resources and services. The site clearly details the many different ways that community members can get involved with the Arboretum's programs, either as volunteers, interns, class participants, researchers, or staff members. Finally, the site provides clear and easy access to contact information, encouraging interested parties to contact Arboretum staff by phone, mail, or email.

3.3.7 Plant Hotline

For over 30 years, the Arboretum has maintained a plant information telephone "hotline" *(617-524-1718 x127)* where the public can call with horticultural questions. Staffed by a team of five knowledgeable volunteers, the hotline is available for questions about woody plants hardy in the Boston area. The hotline is staffed February through December on Monday afternoons from 1 PM to 3 PM. In addition, voicemail messages received at other

times are checked and responded to several times each week. Hotline volunteers also respond to questions that come through the Arboretum's general email address, arbweb@arnarb.harvard.edu.

Over the course of a year, hotline volunteers respond to hundreds of diverse questions. In 2005, many questions related to the hemlock woolly adelgid, winter moth caterpillar, crabapple foliar diseases, tarspot on maples, and maintenance of peach and fig trees. Perennial topics are ways to control poison ivy and Japanese knotweed, how to outwit chipmunks and squirrels, and, each spring, questions about lilacs.

3.3.8 Friends of the Arnold Arboretum

The *Friends of the Arnold Arboretum,* a membership and Arboretum support organization, serves as a vital link between the Arboretum, its supporters, and the community at large. The most significant benefit of this relationship has traditionally been the Annual Fall Plant Sale, which relocated three years ago from the Case Estates in Weston to the Arboretum itself. By bringing members to the grounds and focusing on Arboretum-grown, woody plant material, the event has taken a more educational tone in keeping with the institution's mission. In addition to purchasing choice plant material at the Dana Greenhouse, participants are invited to join special tours of the Leventritt Garden, explore the art of bonsai with caretakers of the Larz Anderson Bonsai Collection, and view mature specimens of their purchases on a self-guided tour of the living collections. The plant sale in fall 2005 was the 25th anniversary of the first sale. Further opportunities to facilitate member interaction with Arboretum staff and the collections have been institutionalized by the creation of Members' Tour Day in spring, in which Living Collections staff members share their expertise and favorite accessions on rigorous walking tours of the Arboretum landscape. Throughout the year, special lectures for members are held by Arboretum staff and colleagues.

As a Friend of the Arboretum, members may also take advantage of the Arboretum's participation in the American Horticultural Society's Reciprocal Gardens program, which allows members free or discounted admission at more than 130 botanical gardens, arboreta, and conservatories in North America. Membership also provides discounted plant materials at 35 area nurseries and garden centers. Members at the sustaining level and above are also invited to participate in the Arboretum's annual plant dividend program, in which unusual or hard-to-obtain plants are delivered to members in time for planting in their own gardens. This program grew out of the Arboretum's horticultural objective of promoting exceptional native plants, plant introductions, and new cultivars and its practice of sharing seedlings to supporters who could then experiment with the material themselves and see how plants fared in a various climatic conditions in New England. The most recent new program for members is a developing travel program. This fall the first Arboretum group will travel to Sri Lanka, Borneo, and Thailand with Arboretum staff, including a former Arboretum director, to Arboretum research sites and to other remote areas of extraordinary plant diversity.

3.3.9 Summary of Program Participation

Table 3-1 below summarizes public participation in the Arboretum's programs.

Table 3-1: Summary of Public Participation

Arboretum Benefit / Program	Approximate Annual Participation
Arboretum Grounds	250,000 visitors
Visitor Center	20,000 visitors
Tours	1,000 participants
Children's Education – Arboretum-led	2,500 children
Children's Education – Teacher-led	5,000 children
Adult Education	1,200 students
Landscape Institute	250 students
Publications	10,000 readers
Library	600 visitors
Website	1 million "hits"
Friends of the Arnold Arboretum	2,500 members

3.4 Employment and Workforce Development

3.4.1 Existing Employment

The Arboretum employs staff members who are based at the Arboretum in Boston, the Harvard University Herbaria in Cambridge, and the Landscape Institute in Cambridge; the Arboretum also has two employees based full-time in Asia (Papua New Guinea and Indonesia) conducting research. The Arboretum currently employs 100 people (not including summer interns).

Table 3-2: Existing Arboretum Employment[1]

Staff Location	Full-time	Part-time	Total
Boston-based staff at Arnold Arboretum	52	6	58
Cambridge-based staff at Harvard University Herbaria	18	0	18
Cambridge-based staff at Landscape Institute	3	19[2]	22
Overseas-based staff	2	0	2
Total	75	25	100

1 Employment as of September 30, 2005. Does not include paid interns or volunteers.
2 Landscape Institute instructors.

Arboretum employees reflect a broad range of positions and responsibilities. Employees plan for and manage the landscape and living collections, propagate new plants for the grounds, research, and other botanical institutions, curate the living collections, curate the herbarium specimens (in Cambridge and Boston), develop and host continuing education classes for adults, develop and host professional training in landscape design and preservation for adults, develop and host children's education programs for school classes, interpret the Arboretum for visitors, curate the library and archives (in Cambridge and Boston), conduct research, develop the Arboretum membership and raise funds from external donors, and manage the financial and administrative operations.

In addition to the employees described above, the Arboretum hires (paid) temporary assistants, especially over the summer, and is greatly assisted by a group of unpaid volunteers. During the summer period, the Arboretum also sponsors an internship program in horticulture and typically hires paid, full-time interns for the summer season (described in Section 3.4.3).

As shown in Table 3-3 below, of the Arboretum's 58 employees in Boston, 54 are based at the Hunnewell Building and 4 are housed at the Dana Greenhouse. In the future, with construction of the proposed Research and Administration Building, the Arboretum expects to increase its employment in Boston by approximately 48 as a result of both new hires and the transfer of Cambridge staff to Boston. It is estimated that approximately 26 of the 48 new employees in Boston could be new hires.

Table 3-3: Existing and Future Arboretum Employment in Boston

Building Location	Existing[1]	Future	Change
Hunnewell Building	54	43	-11[2]
Dana Greenhouse	4	4	0
Research and Administration Building	n/a	59[3]	+59
Total[4]	58	106	+48

1 Employment as of September 30, 2005. Includes full-time and part-time staff. Does not include paid interns or volunteers.
2 Includes 11 staff relocated from the Hunnewell Building.
3 Includes 11 staff relocated from the Hunnewell Building, up to 15 staff relocated from the Harvard University Herbaria to the new Research and Administration Building, and three faculty with offices in both Boston and Cambridge.
4 Approximately 26 of the 48 new employees in Boston could be new hires.

3.4.2 Boston Resident Employment

Of the Arboretum's 100 employees, 32 are Boston residents, representing 32 percent of the Arboretum's workforce, and over half of these employees (19 total) reside in Jamaica Plain and Roslindale. Of the Arboretum's 58 employees at the Arboretum (not in Cambridge or overseas), 24 are Boston residents. The Arboretum's annual Boston payroll is approximately $1.6 million.

The Arboretum's Boston resident employees work in the full range of positions available at the Arboretum (for example, Research Assistant, Horticultural Technologist, Library Assistant, Gardener, Curatorial Assistant, Manager of Plant Records, Children's Education Coordinator, Landscape Institute Instructor, and Development Director/Assistant).

As reported in *Innovation & Opportunity: Harvard University's Impact on the Boston Area Economy* (November 2004), Harvard employs 16,128 individuals University-wide, of which approximately 2,900 (18 percent) are Boston residents. (See www.community.harvard.edu/economic-impact.)

3.4.3 Summer Internships and Volunteer Programs

The Arboretum sponsors a paid summer internship program, the Isabella Welles Hunnewell Internship Program, which combines practical hands-on training in horticulture with educational courses. In 2005, 14 intern trainees with experience, training, or a long-term interest in horticulture, botany, landscape design, or other plant-related fields participated in 12- to 24-week appointments. The Arboretum internship program is internationally known and over the past few years has drawn students from South Korea, Great Britain, Canada, Germany, and the United States.

The Arboretum also provides volunteer opportunities for people who wish to become more involved in its programs. Most volunteers work as docents or school program guides in the education and interpretive programs, but volunteers also work in propagation, the library and archives, curation, development, and research. The Arboretum offers special training by staff and a "Volunteer Enrichment Program," of special events and lectures.

In addition, each year Simmons library students intern at the Arnold Arboretum to fulfill the requirements for a 60-hour internship project in an archives or manuscript repository for the archives management concentration of the Master of Library Science degree within the Simmons Graduate School of Library and Information Science.

3.4.4 Harvard University Employment Opportunities

Detailed information on open positions at Harvard and the Arboretum is available on their websites. On the Harvard website, job applicants can search for positions by school or department, position type, location, and/or salary, as well as apply for positions on line. A large number and wide variety of positions are available at Harvard at any one time. As an

example, in February 2006, approximately 350 positions representing the full range of schools and departments were listed on the Harvard employment website with widely ranging educational requirements and salary ranges. The Arboretum also posts its job openings on its website.

The Harvard and Arboretum websites are, respectively: www.employment.harvard.edu, and www.arboretum.harvard.edu/aboutus/jobs.html. Jobs are also advertised in local papers or specific industry publications depending upon the position.

3.4.5 Harvard University Workforce Training and Development

The extensive employee development and training benefits offered by Harvard University are available to Arboretum staff, including tuition reimbursement and other programs.

Harvard's Center for Workplace Development (CWD) offers a wide range of courses designed to increase employees' knowledge, skills, and overall success. The range of offerings includes professional, managerial, career development, and computer courses, including hundreds of Web-based programs, for all employees. In addition, CWD offers the Bridge to Learning and Literacy program, described below. Roughly fifty different professional and career development courses are offered, often several times throughout the year, at minimal to no cost. During 2004-2005, 6,440 participants[1] took advantage of CWD training and professional development courses, with Harvard financial support totaling over $1.2 million for this period[2]. Descriptions of some of the courses and assistance offered to Harvard employees are listed below.

- **Computer Classes** – At CWD, experienced instructors offer hands-on courses in all levels of word processing, spreadsheets, database management and design, desktop publishing, and web page development. In total, CWD offers over twenty-five different computer courses, which are open to both the Harvard community and the general public.

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1 Includes persons taking multiple courses.

2 Harvard financial support includes course and program fees paid by schools and departments and program components which are centrally funded by the University including costs associated with the provision of instructors and training venues.

- **Human Resources and Financial Systems Training** – CWD provides a variety of instructor-led and online learning opportunities for users of Harvard University's financial, human resources, and reporting systems. These courses, taught by Harvard staff, are designed to help employees become proficient in the Oracle and PeopleSoft systems used by the University.

- **Consulting Services** – CWD provides internal consulting services to all Harvard schools and departments, including professional, organizational, talent, multimedia, and career development consulting. CWD works with Harvard clients to assess needs and define strategies to enhance the performance of individuals, teams, and departments across the University.

- **Leadership Programs at Harvard** – CWD offers a series of four programs to help Harvard employees develop leadership skills and experience. Through the use of assessment instruments, large- and small-group exercises, and case studies, participants in these programs develop their leadership skills, gain a full understanding of their leadership strengths and development needs, and learn to influence and improve the performance of others. The four leadership programs are as follows:

    - Focused Leadership is designed to help high-performing senior managers and university executives successfully meet their current leadership challenges and fine-tune specific skills.

    - Leadership in Action is a program that helps high-performing mid- to senior level managers develop and refine their leadership potential.

    - Foundations of Leadership is open to all managers who supervise at least one permanent staff member and focuses on developing core leadership competencies.

    - Leadership Essentials is for high performing administrative support staff and teaches skills such as networking and working effectively with others in a diverse environment.

- **Web-based Training at Harvard** – To complement CWD's instructor-led and classroom-based training, Harvard employees also have the opportunity to obtain *Element K* web-based training licenses at substantially discounted rates. Once registered, employees can select from over 300 different online courses, including all levels of the Microsoft Office suite, Macromedia Flash, FileMaker Pro, Dreamweaver, Adobe Acrobat, and even more technical courses, such as Implementing Local Computer Security and Network Administration.

- **Bridge to Learning and Literacy at Harvard** – The Harvard Bridge to Learning and Literacy is a worker education program open to all hourly employees and to members of the Harvard Union of Clerical and Technical Workers. Employees interested in improving their skills in their current positions or gaining new skills for different

positions attend two-hour classes twice a week. Classes are offered on campus during work hours. The Bridge Program offers classes in the following subjects: literacy, English as a second language, General Education Development and Adult Diploma Program test preparation, college preparation, computers, and citizenship preparation.

Bridge students may request one-on-one tutorial sessions and career development services as well. Furthermore, the Bridge Resource Center, which is equipped with supplemental English language study books, computers, and audio equipment, is managed by CWD staff and made available to Bridge students before, during, and after typical work hours.

- **Continuing Education** – In addition, Harvard's Division of Continuing Education Extension School offers a range of graduate and undergraduate courses to over 20,000 students each year.

Harvard encourages lifelong learning by granting subsidies for undergraduate and graduate-level courses taken at Harvard and elsewhere through the Tuition Assistance Plan (TAP). Available to professional, administrative, support, and teaching staff, TAP can help finance courses at most Harvard programs, as well as job-related courses at other institutions. Employees may also pursue a degree or certificate through TAP-eligible programs at the Harvard Extension School, the Graduate School of Education and the School of Public Health. Additional financial assistance is available through a separately funded Education Assistance Fund.

In addition to University-wide benefits, Arboretum employees may take any Arboretum adult education class for free.

3.5 Other Civic Benefits

The Arboretum contributes in many ways to stewardship and public service efforts in the City of Boston, especially related to planning and management of natural areas and parks. The Arboretum participates in a number of planning, management, and advocacy groups in the City, including groups that have ongoing work as well as groups that form around a particular project or initiative. Examples of the types of groups that frequently request the participation of the Arboretum are the Emerald Necklace Conservancy, the Boston Greenspace Alliance, and the Arborway Planning Committee. The Arboretum also provides institutional leadership for open space improvements including contributions to the Justine Liff Fund of the Emerald Necklace Conservancy and participation in the Heart of the City and Green Triangle initiatives.

In particular, the Arboretum provides assistance to the Parks and Recreation Department when requested, typically providing technical assistance in horticulture. For example, the Arboretum has provided training in horticulture to Parks and Recreation Department staff, and the Arboretum's horticulturalist who oversees the Bradley Collection of Rosaceous

Plants regularly provides advice to the Department on the Rose Garden in the Fenway. In 2003 and 2004, significant Arboretum donations helped to support the Boston Park Ranger program, which was facing budgetary constraints and possible layoffs. The Arboretum has also donated and planted trees along the Arborway and assists, as possible, with snow removal on the sidewalk from the Arborway Gate to the Forest Hills MBTA station. Although the Arboretum generally does not allow other institutional events to be hosted on the grounds, the Parks and Recreation Department has often held events, fundraising galas, and various ceremonies on the grounds, with permission and assistance from the Arboretum.

The Arboretum also responds to requests from community groups to use the lecture hall in the Hunnewell Building for community meetings and is always willing to attend neighborhood meetings to discuss mutual interests with concerned residents.

3.6 Economic Benefits

A recent report entitled *Innovation and Opportunity: Harvard University's Impact on the Boston Area Economy* (see www.community.harvard.edu/economic/php) documents Harvard University's broad impact on the regional economy: generating more than 48,000 jobs at many levels, drawing new consumers to the region in the form of students and visitors, directly employing more than 16,000 workers, and being a major consumer of goods and services. Harvard's overall economic impact in 2002 was estimated at more than $3.4 billion.

The report stated that Harvard's greatest impact may be as an economic stimulator, due to its large research enterprise. Harvard's research helps build the regional economy by drawing in hundreds of millions of dollars in research grants. In 2002, for example, research spending totaled $522 million, more than 75 percent of which was from federal grants. Harvard's affiliated hospitals add to that total, bringing in $750 million in 2001 alone. From 1998 to 2002, research spending at Harvard grew by 39 percent and further major expansions are under way. The strong research base attracts major corporations to invest in the region.

Discoveries made at Harvard help stimulate the economy when they are licensed to existing or new companies that develop them into useful products. By 2003, fourteen companies in the Boston area owed their creation at least in part to technology licensed at Harvard.

4.0 PLANNING PRINCIPLES, FUTURE NEEDS, AND LONG-RANGE PLAN

4.1 Introduction

This chapter describes the Arboretum's future facility needs, long-term vision, and how the needs and vision will be addressed within the Arboretum's long-range plan for institutional development. The chapter begins with a summary of the overarching principles that have historically guided planning and development at the Arboretum.

The Arboretum has identified the proposed Research and Administration Building as its priority project to help meet its long-term programmatic goals. The analysis used in determining the most suitable site for the proposed project is also provided.

4.2 Design and Development Principles for the Arboretum's Living Collections and Landscape

Planning and development of the landscape at the Arboretum has been guided by principles that serve to protect and preserve the fundamental cultural and historic resource that the Arboretum represents, namely the natural features, physical structures, and the systems (horticultural, administrative, and financial) that allow for the phenomenon of ever-changing living collections thriving in an historic landscape. The actual tree and shrub accessions change over time, but the underlying systems, modernized as technology advances, that allow for their existence persist. Public philanthropy, past and present, given in support of plant science research and horticulture, provides the means to develop and steward the scientifically-based collections. The collections, in turn, attract the public, students, and scholars to visit and learn about woody plants. Sargent and Olmsted's wholly original concept of designing an arboretum of woody plants chosen for scientific and educational value for the dual purpose of research by scientists and visitation by the public for both passive recreation and education has been successfully preserved.

This perspective of what comprises the Arboretum's fundamental cultural and historic value is reinforced by an historical assessment of the Arboretum that was conducted in 1994 by Cynthia Zaitzevsky as part of the *Master Plan Design Studies* completed by Sasaki Associates, Inc. Zaitzevsky wrote:

> *While it is recognized that the Arnold Arboretum is a significant designed landscape of the late nineteenth century, it is perhaps less well-known that its historic significance is enhanced by the style of operations and land stewardship practiced by succeeding administrations. The property has undergone only minor changes in landscape form over the past 120 years. Further, the unbroken continuity of its scientific and educational purposes adds to its value as an historic landscape.*

The Arboretum has succeeded in preserving these resources by following these principles:

- Preserve the original design intent of Sargent and Olmsted in the area of the grounds that were designed through their collaboration. The design intent of Olmsted at the Arboretum, in the City of Boston park system, and in the numerous other locations in which he worked is an area of extensive and active scholarship. Sargent's priorities are well-documented in the Arboretum archives. Very concisely described, their design intention was to create a naturalistic and visually pleasing landscape that provided the means to grow and display woody species hardy to this area in a scientifically-accepted botanical sequence (the Bentham and Hooker classification system) that would serve to educate the visitor about the relationships among woody plant species;
- Ensure that built structures are subservient to the Arboretum's landscape values and are designed and sited in deference to the landscape. To that end, strive to locate built structures on the periphery of the grounds, so as not to intrude on the visitor's experience;
- Maintain meticulous records of plant accessions and changes in the landscape, acknowledging that individual plants will change but the overall collections system persists;
- Sustain the underlying ecological processes and resources that support the living collections; and
- Nourish the Arboretum's partnership with the City of Boston, which provides for public access to the Arboretum, and adjust roles and responsibilities as circumstances permit or require.

4.3 Future Needs

Current long-range planning at the Arboretum, initiated in 2001 and described in part in the report *A Time for Change: Planning for the Arboretum's Next Quarter Century,* led the Arboretum to affirm the relevance and value of its historic mission and to envision the creation of three programmatic centers to support the Arboretum's continuing priorities of research, education, and horticulture:

- A center for state-of-the-art plant science research;
- An integrated center for horticulture including propagation, planting and long-term horticultural care; taxonomic review and collections development; and management of plant records and collections documentation; and
- A dedicated center for public and professional education, library and archive collections, and visitor services.

The Arboretum's core facilities, consisting of the historic Hunnewell Building (1892), its Herbarium addition (1909), the functional Dana Greenhouse (1963), and the modest maintenance garage (1968) at the Hunnewell Building are now at capacity in terms of their

ability to support Arboretum programs. Growth and, more importantly, modern changes in the fields of research, horticulture, and public education require more efficient and better tailored space for the Arboretum to achieve its long-term vision. The following is a description of the Arboretum's programmatic and facility needs in these three core areas: Research, Horticulture, and Public Education.

4.3.1 Research

State-of-the-art plant science research requires research-quality plant growth facilities in which plants can be grown under highly controlled conditions and laboratories for experimental manipulation of plants, especially at the genetic level. The Arboretum currently has no facilities of this kind. Existing Arboretum senior researchers use facilities belonging to other departments on the Harvard campus in Cambridge.

Facility Needs:

- Greenhouses and growth chambers in which light, day-length, humidity, temperature, rate of air circulation, irrigation, and drainage can be controlled. Growth chambers are entirely closed and controlled environments that use no natural light. Both "reach-in" and "walk-in" chambers are needed. Greenhouses need support rooms for soil storage, preparation, and potting; chemical storage and chemical mixing; and waste collection and management. Growth chambers need support spaces for plant tissue culture; preparation of plant tissue growth media; microscopic analysis; and micro-biological manipulation.
- Laboratory benches for table-top experimental procedures. Laboratories also need a variety of support rooms for tissue culture; glass-washing and sterilization; preparation of tissue growth media; microscopic analysis; refrigeration; and micro-biological manipulation.
- Office and meeting spaces for researchers, including senior scientists and technicians. People spaces need to be designed to facilitate the extensive collaboration that characterizes modern scientific research.
- Outdoor growing areas for growth of experimental plants up to approximately five years in age. Nurseries must be supplied with irrigation and facilities for computer access for electronic collection of data.

4.3.2 Horticulture

Horticultural care of the living collections has benefited from increased professionalization in the field, in part due to the strides in horticultural education that the Arboretum and other botanic institutions have championed over the past century. However, the Arboretum horticultural staff is currently in two, separated locations, at the Hunnewell Building and at the Dana Greenhouse. In addition, the grounds crew, based at the Hunnewell Building, is

inefficiently located at one end of the grounds and in an area congested with Arboretum visitors. Equipment storage is currently distributed among three locations on the grounds and two offsite locations.

Facility Needs:

- Consolidation of horticultural staff at a single location to improve operational efficiencies, with respect to staff, facilities, and equipment.
- Centralized location of grounds crew with access to the entire grounds to improve operational efficiencies, with respect to staff, facilities, and equipment.
- Modern and safe equipment maintenance facilities including garages, equipment hoist, hydraulic lift, and ventilation for enclosed, mechanical work areas.
- Sufficient and safe storage for supplies, tools, and motorized equipment and vehicles.
- Office, meeting, and locker rooms for staff.

4.3.3 Public Education

The 1993 renovation of the Hunnewell Building dramatically improved public education facilities by creating spaces specifically designed for a visitor center and as a lecture hall; providing public restrooms and expanded staff offices for the education department; and ensuring that the building is handicapped accessible. Nonetheless, the Arboretum's public education program is about to outgrow the current educational facilities for teaching, namely the lecture hall (70 people) in the Hunnewell Building and one classroom (20 people) in the Dana Greenhouse. The library and archives are at capacity as well. In addition to needing more space, the type of spaces needed is also changing. Changes in approaches to children's education and the increasing popularity of life-long learning have created new needs for classrooms and "teaching labs" to enable hands-on activities for children and adults.

The Landscape Institute's need for additional and better-tailored space for its programs has been met by acquiring and renovating new facilities on the Harvard campus in Cambridge. The Institute will move into these new facilities in the fall of 2006. The Arboretum's current understanding is that these facilities will be able to meet the Landscape Institute's needs for the next ten years.

Facility Needs:

- Expanded exhibit space for permanent and changing educational exhibits.
- Additional classrooms to be able to accommodate more than one or two programs at a time. At least one additional classroom that can accommodate "dirty," hands-on use of plant materials.
- Expansion space for the library and archives to avoid extensive de-accessioning of reference collections.
- Parking for class participants, especially for night programs.

4.4 Long-Range Vision

To maintain and improve the Arboretum as a center of excellence in research, education, and horticulture, the Arboretum needs to expand and modify its facilities to match the changing developments in these professional fields and in visitor expectations. Given the distinct nature of each of these areas of programmatic need, and the lack of a single location within the Arboretum where all programs could be housed together, the Arboretum facility master plan, developed in 2003, recommended three building projects to create three, physically separate centers, one each for research, horticulture, and public education.

4.4.1 Research Center

Creation of a research center involves construction of new research laboratories and greenhouses. The new facility would include some of the administrative offices currently housed in the Hunnewell Building.

Uses:

- Greenhouses and growth chambers;
- Laboratories;
- Support spaces for greenhouses, growth chambers, and labs;
- Offices for researchers and technicians;
- Offices for some Arboretum administrative functions;
- Large meeting hall (100 people);
- Small conference rooms;
- Outdoor growing areas (nursery); and
- Parking for building occupants.

Operational and Locational Considerations:

- Proximity to Arboretum director and senior management offices;
- Proximity to Arboretum library, archives, and herbarium collection; and
- Sufficient environmental conditions for greenhouses and nursery.

Constraints and Opportunities:

- Site must be of sufficient size to accommodate program;
- Minimize impact to Olmsted/Sargent-designed landscape and other areas devoted to collections; and
- Relocation of some administrative offices from Hunnewell Building would create modest space for educational and library programming within the existing building.

4.4.2 Horticulture Center

A new horticulture center would combine plant propagation with collections maintenance facilities in a location central to the grounds in a modern, well equipped, horticultural facility with sufficient, protected storage space for valuable equipment.

Uses:

- Equipment and vehicle maintenance facilities;
- Equipment and vehicle storage areas;
- Offices, meeting area, and locker rooms for staff;
- Parking for Arboretum work vehicles and staff; and
- Existing Dana Greenhouse, including greenhouses, headhouse, classroom, laboratory, cold storage facility, staff offices, and nurseries.

Operational and Locational Considerations:

- Consolidation and integration of horticultural functions increases operational efficiencies;
- Central location within Arboretum grounds increases operational efficiencies;
- Minimize crossing of public roads with maintenance equipment;
- Minimize exposure of visitors to traffic by heavy maintenance equipment; and
- Safe and convenient access for delivery of supplies.

Constraints and Opportunities:

- Future site must be of sufficient size. Planning work undertaken to date indicates that approximately 15,000 square feet of building and 12,000 square feet of maintenance yard and staff parking is required in addition to the existing Dana Greenhouse facilities to accommodate a central horticultural support center;
- Development of facility at preferred location adjacent to the Dana Greenhouse would require removal of the house at 1090 Centre Street;
- Minimize impacts to Olmsted/Sargent-designed landscape and other areas of collections (see Figure 7-2);
- Lease with City of Boston allows creation of maintenance facilities on City-owned land under lease;
- Relocation of grounds crew operations from the Hunnewell Building to new facility would create modest room for expansion of programs at the Hunnewell Building without new construction; and

- Other Arboretum-owned property has significant constraints:
  - Bussey Homestead (historic site, steep topography, area of collections);
  - Weld Hill (not centrally located, requires crossing public roads); and
  - Centre Street parcel (insufficient size, area of collections).

4.4.3 Public Education Center

In the long-term, the Hunnewell Building would become a dedicated center for public and professional education. Renovation of vacated space and a possible modest addition would provide more and better tailored space for the library and education programs. .

Uses:

- Visitor services (exhibit space, public restrooms, lecture hall);
- Lecture hall and classrooms;
- Library, archives, and herbarium collections;
- Offices and meeting areas for Public Education Program staff and some administrative staff;
- Offices and workshops for building maintenance; and
- Parking for staff and class participants, especially for night programs.

Operational and Locational Considerations:

- Maintain visitor services and education programs at the main gate of the Arboretum and in signature, historic building for maximum public recognition and access.

Constraints and Opportunities:

- Relocation of some administrative staff to the proposed Research and Administration building will make a modest amount of space available that with renovation would be suitable for some program expansion; and
- Building expansion is contingent on the relocation of horticultural staff from the Hunnewell Building to another location and removal of the existing garage.

4.4.4 Implementation

The Arboretum's Institutional Master Plan Notification Form submitted to the BRA in March 2004 described these three projects. As noted in Section 1.5.2, as a result of programming and site planning analyses, the Arboretum is no longer pursuing the development of an

integrated, centrally-located horticultural center, nor is it undertaking construction of an addition to the Hunnewell Building for a significantly expanded education center.

This Institutional Master Plan maintains the Arboretum's commitment to a planning framework comprised of three distinct programmatic centers, but also recognizes that the specific projects to implement the long-term vision are inextricably linked. Achieving the Arboretum's long-range vision will initially involve the development of the Research and Administration Building on the Weld Hill parcel and the subsequent reuse of space vacated at the Hunnewell Building for educational and library programs. Implementation of other components of the long-range vision is dependent upon identifying a suitable location for horticultural support facilities.

4.5 Analysis of Alternative Sites for Proposed Project

The Arboretum conducted a detailed review of available sites for new construction proximate to the Arboretum's living collections for the new Research and Administration Building. Sites that were considered for the location of the proposed building include:

- **Hunnewell Building Site within the City-owned land under lease** – The need for ample sunlight for the greenhouses would require their siting on the south lawn of the Hunnewell Building. Construction of a 45,000-square foot, above-ground structure in the lawn area next to the Hunnewell Building would compromise the historic integrity of the building;

- **Centre Street parcel owned by Harvard University** – This 1.5-acre parcel is too small to accommodate the proposed Research and Administration Building. In addition, this parcel supports the Arboretum's collections and has historically been available to be enjoyed by visitors to the Arboretum;

- **Dana Greenhouse parcel owned by Harvard University** – The portion of this five-acre site that is not occupied by the Leventritt Shrub and Vine Garden, the Dana Greenhouse, and the 1090 Centre Street house is too small to accommodate the proposed Research and Administration Building program;

- **Bussey Homestead parcel owned by Harvard University** – This 4.7-acre parcel supports the Arboretum's collections and has historically been available to be enjoyed by visitors to the Arboretum. It is also a listed historical site with the Massachusetts Historical Commission; and

- **Weld Hill** – This 14.2-acre parcel provides ample space for a new building, and its location on the periphery of the grounds would keep a new building from intruding on the Olmsted/Sargent-designed historic landscape. However, construction below-grade would be constrained by shallow depth to bedrock.

The selection of the Weld Hill parcel as the site for the Arboretum's proposed Research and Administration Building continues the property's association with providing support for the Arboretum's collections and experimental research in plant science.

The acquisition of the Weld Hill parcel in 1922 not only enabled the Arboretum's rapidly growing collections to expand but also provided much needed space for nurseries. By the 1940s, Weld Hill was also the site of experimental plantations. Since that time, the role of the Weld Hill parcel in supporting experimental studies in plant science has continued and will be strengthened and expanded with the development of the proposed Research and Administration Building. The proposed project is described in detail in Chapter 5.

4.6 Conceptual Planning beyond the Term of the IMP

The Arboretum currently has no plans for any other institutional projects within the ten-year timeframe of this IMP, beyond the proposed Research and Administration Building. As described above, however, the Arboretum has speculated on the potential future vision of the institution beyond ten years. Its long-term vision contemplates possible expansion of research facilities, consolidation of horticulture support activities, and improvements to library, education, and public programs facilities. The following potential projects set forth in Sections 4.6.2 through 4.6.4 below would help to implement this long-term vision; however, the Arboretum currently has no plans for such projects.

4.6.1 Horticulture Support Consolidation

As described above, the Arboretum anticipates a long-term need to consolidate and improve the maintenance and horticulture support functions of the Arboretum. The Arboretum presently does not have a suitable site for this, and there is no specific project contemplated at this time. For operational efficiencies and safety, a central location within the grounds would be ideal.

4.6.2 Hunnewell Building Improvements

The Arboretum also anticipates a long-term need to improve and expand space in the Hunnewell Building for the Arboretum library, education, and public program uses. No specific facility expansion or improvement plans are envisioned at this time.

4.6.3 Other Long-term Plans

The Arboretum has considered the feasibility of relocating its world-renowned botanical library and herbaria, most of which are currently housed in the Harvard University Herbaria building in Cambridge. Such a move would consolidate all of the botanical collections in one location, providing exceptional opportunities for plant science research and for more efficient management of the collections. It is anticipated that the feasibility study will be completed in 2006. However, it is unlikely that implementation of such a plan would occur in the next decade.

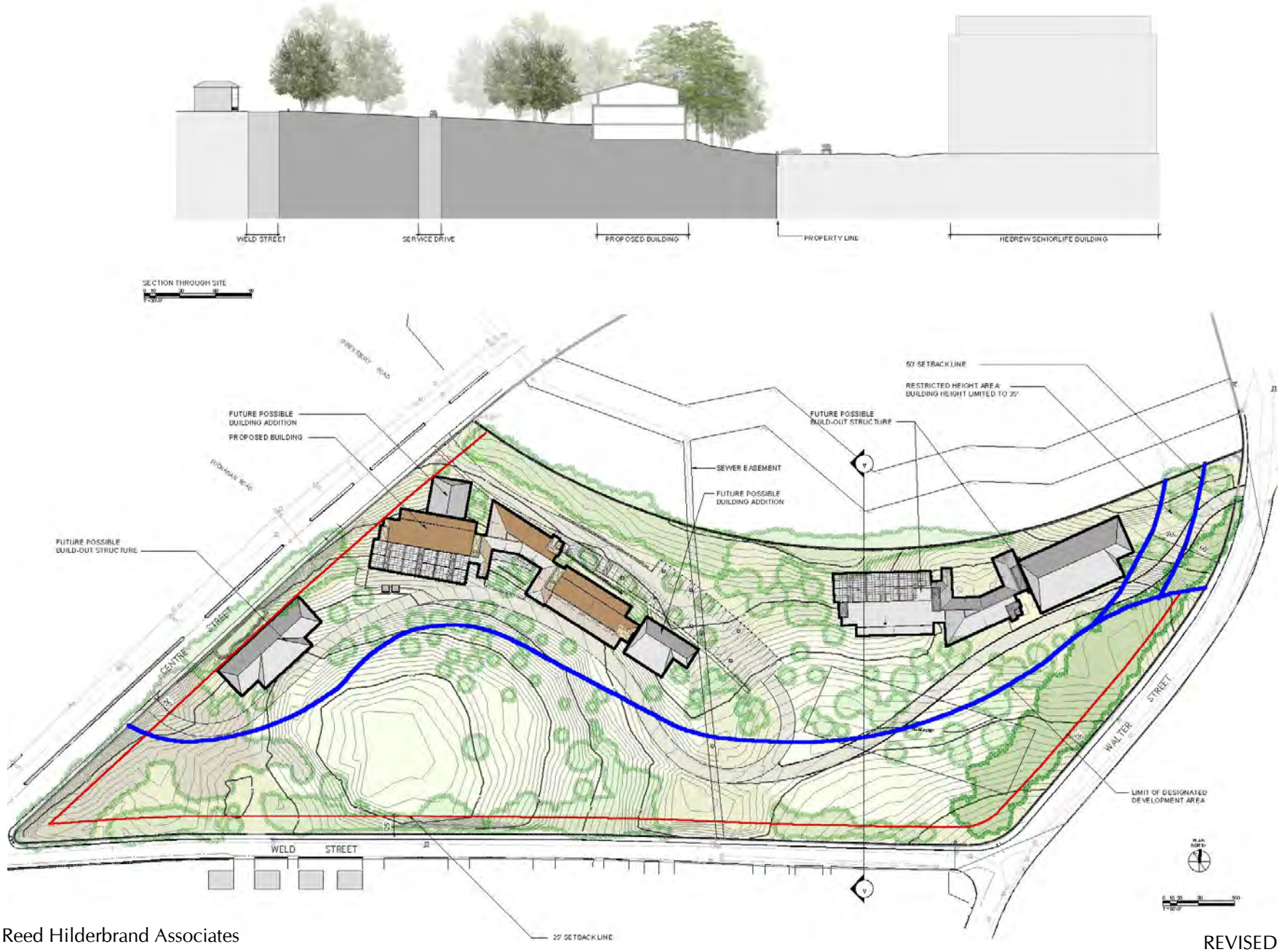
4.6.4 Illustrative Weld Hill Build-out Scenario

In response to requests from the Task Force to illustrate a full build-out of the Weld Hill parcel at a Floor Area Ratio (FAR) of .3, the Arboretum prepared an illustrative scenario (Figure 4-1). This hypothetical scenario was prepared as a planning exercise only, and it does not represent any planned future development by the Arboretum (other than the Research and Administration Building described in this IMP). Nonetheless, it illustrates where expansion of the Research and Administration Building and other facilities might be located on the Weld Hill parcel in the future.

4.7 Ongoing Maintenance and Security

Over the past 20 years, the Arboretum has expanded its investment in its grounds maintenance activities, including major improvements in particular landscape locations (Peters Hill, Bussey Street Gate, Walter Street Gate, Bussey Brook Meadow, Leventritt Shrub and Vine Garden). The Arboretum will also provide this level of maintenance operations at the Weld Hill parcel, and will continue to make major investments in the maintenance and upkeep of the landscape of the Arboretum.

Under the terms of Harvard's lease agreement with the City of Boston, the City retains jurisdiction for police patrols in and around the City-owned land under lease. Under this agreement, the City-owned land is patrolled by Boston park rangers, Boston police, and staff of the Boston Animal Care and Control Department. With the Arboretum's close monitoring of the grounds, the Arboretum is well-positioned to know where unlawful activities may be taking place. When there is evidence of such activities, they are reported to the police. The Arboretum will continue to work with the community to bring safety and security concerns to the attention of the Boston Police Department, the Parks and Recreation Department, and the Animal Care and Control Department.



Source: Reed Hilderbrand Associates

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Epsilon Associates Inc.

The Arnold Arboretum of Harvard University
Institutional Master Plan

Figure 4-1
Illustrative Weld Hill Build-out Scenario

5.0 PROPOSED PROJECT AND FUTURE WELD HILL DEVELOPMENT

Guided by the master plan concept and long-term vision described in Chapter 4, the Arboretum IMP proposes one institutional project within the ten-year term (2007 through 2017) of the IMP: the Research and Administration Building on the Weld Hill parcel. This project is described below. This chapter also includes the proposed zoning for the Weld Hill parcel and design guidelines for future development on the site beyond the term of the IMP.

5.1 Analysis of Alternative Locations within Weld Hill Parcel for Proposed Project

Three primary locations on the Weld Hill parcel were identified and evaluated with respect to several guidelines specific to the proposed facility. These guidelines include:

- First and foremost ensure that the building defers to the landscape and fits harmoniously with the natural features and character of the site;
- Cognizant of community concerns regarding open space and building visibility, site the facility to minimize the visual impact of the building from the residential community on Weld Street;
- Design the facility to reflect the working, agricultural landscape context of the Arboretum, as well as the existing Arboretum nurseries located on the site. The facility should reflect the agricultural nature of the enterprise and the mission of the Arnold Arboretum to increase and disseminate the knowledge of woody plants; and
- Design the facility to support the sustainable use of resources, with minimal impact on the natural landscape.

Finally, as a practical matter, each of the alternative locations avoid development within a Boston Water and Sewer easement that traverses the site, as shown in Figure 5-1.

5.1.1 Hilltop Location

The first location explored for the new facility was the top of Weld Hill. This site would provide unobstructed light from the south, essential for the greenhouse component of the building program. This location also would afford views of both the site's landscape and of the surrounding area, including a view of the City. Because the hilltop is level and contains few trees, it would be relatively easy to construct a structure on it. The existing gravel drive would provide a natural access route to the site.

However, this siting alternative has a number of drawbacks. Most of the building mass would be visible to the residents on Weld Street and would naturally preclude the use of the hilltop by visitors. The existing drive would be too steep for regular vehicular access through the winter and, therefore, a new two-way access road from Weld Street would be needed.

5.1.2 Valley Location

The valley scheme located the building near the center of the parcel, along the north boundary with Hebrew SeniorLife. This location is topographically the lowest point of the site. The mass of the building would screen the parking, located on the north side, from Weld Street residents, while the greenhouses on top of the building would be the primary visible buildings elements. Its location in the center of the site would preserve both Weld Hill at the western end of the site and the natural oak woodland at the eastern end of the site. This location would afford beautiful views of the site from the building. The road would be a one-way drive entering on Walter Street and exiting on Centre Street. This one-way system would limit the width and hence visual impact of the new access road.

This scheme has a number of advantages. Access and parking would be easy to accommodate with very little site work and grading required. This siting also ensures plenty of sunlight for the greenhouses. Very few trees would need to be removed for the building. Lastly the site provides for an efficient and economical building due to the level site and easy access.

Despite these advantages, there are a number of critical concerns that make this site an undesirable location for the new facility. Building the facility in this location would put it in view of residents on the east end of Weld Street. This siting would also visually divide the parcel in half diminishing the open quality of the existing meadow. Employee access is another concern; the local access point for this building would be directly off Walter Street. Access from this point was potentially dangerous due to poor sight lines, and increased traffic on Walter Street would exacerbate a peak hour queuing problem that already exists at the intersection of Walter and Centre Street. This location is also removed from the primary public transportation on Centre Street.

5.1.3 Hillside Location

The third, and chosen, siting for the building was to build into the north-facing hillside in a terraced fashion, below the summit of the hill, in the northwest corner of the site. The building in this scheme has a linear character that follows both the slope and shape of Weld Hill, avoiding the bedrock of the site and the mature trees along the north edge of the site. In this location, the hill itself would block the view of the building from Weld Street residents. Because the building would be sited at right angles to Centre Street, the new building would have a limited presence on Centre Street, where it would be in scale and character with some of the other smaller commercial and institutional buildings to the south of the site. The parking would be located to the north of the building, kept as close to the building as possible, and access would be from Centre Street, avoiding the need for a new access road from Walter or Weld Streets. This concept would minimize new development and total disturbance to a relatively small area of the site. Mature trees in the center of the

site would be preserved to help screen the parking from the east end of Weld Street. The existing gravel drive would be preserved for the service access to the upper floors of the building and would continue to serve as the main pedestrian route through the site.

5.1.4 Selection of Preferred Location within Weld Hill Parcel

After reviewing all aspects of the Weld Hill parcel, the most suitable location for the new Research and Administration Building became clear. Minimizing the visibility of the new building was a strong siting determinant for the project. The hillside location at the northwest corner of the site takes advantage of site topography and existing wooded areas to visually screen the building from neighboring residential streets. In particular, the proposed roofline would be below the summit of the hill, greatly reducing its visibility to residents on Weld Street. In addition, the access drive would be sited such that the existing maple and oak trees in the center of the site would screen the drive and parking from residents on the east end of Weld Street. The two-way access from Centre Street would minimize disruption to the Weld Street residents and would avoid exacerbating the existing traffic problems on Walter Street.

This siting is in keeping with the Arboretum's overarching principles for design and development. The terraced, hillside location and the low form of the building would ensure that the building defers to the landscape. Siting the building in the northwest corner of the parcel would concentrate the new development on the site's periphery and preserve as much contiguous landscape as possible. This would also prevent disturbance to the undeveloped portion of the site adjacent to the Peters Hill area of the Arboretum grounds. By striving to design the building as a narrow structure, the large, accessioned trees along the boundary with Hebrew SeniorLife could be preserved and used as a visual buffer between the two properties. In addition, most of the specimen maple and oak trees in the valley would be preserved by careful siting of the drive. The hillside siting of the building would also allow minimal modification to the alignment of the existing gravel drive from Walter Street to the hilltop. Although the Weld Hill parcel was not part of the original Olmsted/Sargent design, the existing gravel drive had been laid out in an attractive curvilinear pattern, in keeping with the character of roads designed by Olmsted in the grounds of the Arboretum.

5.2 Access Alternatives

Several alternative access schemes were studied for the proposed building. The following summarizes the main alternatives considered and their benefits and challenges.

5.2.1 Driveway at Walter Street/Bussey Street Intersection

A driveway at the Walter Street/Bussey Street intersection would provide opportunity to create an entrance/gateway to the site, in keeping with other Arboretum vehicular gates; strengthen connectivity to the rest of the Arboretum grounds; and would make use of the

existing gravel drive for a new driveway. The primary challenge to this driveway location would be that a significant intersection redesign and signalization would likely be required and would likely result in new traffic on Walter Street.

5.2.2 Walter Street Driveway

A Walter Street driveway would provide the best opportunity to create a pronounced entrance/gateway to the site, strengthen connectivity to the rest of the Arboretum grounds via the Peters Hill parcel, and would make use of some of the existing gravel drive for a new driveway. The major challenge to this driveway location would be achieving acceptable and safe sight distances for exiting vehicles.

5.2.3 Weld Street Driveway

A Weld Street driveway would likely be the least expensive option from a cost perspective and would make use of a portion of the existing gravel drive for the new driveway. This location, however, would create new traffic and disruption for Weld Street residents.

5.2.4 Centre Street Driveway

A Centre Street driveway would offer the benefits of keeping all routine vehicle trips on a major roadway, providing adequate sight-distances, and accommodating both entering and exiting vehicles.

5.2.5 Selection of Preferred Access

Given the disadvantages of the other alternatives considered, the Centre Street driveway was chosen to provide the principal means of vehicular access and egress to the proposed building.

5.3 Research and Administration Building

5.3.1 Overview

The proposed Research and Administration Building will augment the many existing benefits provided by the Arboretum. The facility is designed to respect the historic Arboretum landscape, expand the community benefits of its research, collections, and educational programs, and create new benefits through landscape and public enhancements to the Weld Hill parcel.

The Research and Administration Building will allow the relocation of administrative and research uses from the Hunnewell Building (thus making room for a modest programmatic expansion there without new construction), while improving the Arboretum's research capabilities through new research greenhouse and laboratory facilities. Since research and its management will be the prime responsibility of the Arboretum director and will require senior management oversight, the offices of the Arboretum director will be located within

the new research and administration facility. Curation staff, the herbarium, the library and archives, grounds maintenance staff, and education program staff will remain in the Hunnewell Building.

The overall effect of the proposed siting is to have minimal impact on the pastoral character of the site, which is comprised of undulating meadow with scattered specimen trees bordered by woodlands. As described above, the proposed hillside location for the Research and Administration Building employs the mass of the hill to visually screen the building from neighbors on Weld Street. The building is also held back from the northern edge of the parcel to preserve the mature trees along the border with Hebrew SeniorLife. The hilltop and woodlands visible from the north, south, and east will also be preserved.

5.3.2 Program, Design and Landscaping

The new 45,000-square-foot Research and Administration Building is proposed as a two-story (plus smaller basement level) building occupying a 0.6-acre footprint. The building will be a state-of-the-art research and administration facility for use by the Arboretum in conjunction with researchers from the Faculty of Arts and Sciences of Harvard University. It is expected that this facility will host approximately three faculty members and six senior researchers and approximately 36 post-doctoral researchers and technicians conducting studies in plant development and evolution. In addition, it will provide office space for eleven existing Arboretum administrative staff.

Located in the northwest portion of the site, the Research and Administration Building has been sited on the hillside overlooking Hebrew SeniorLife to preserve the site's wooded character, minimize visual impact, and allow for enjoyable pedestrian access through the site. Figure 5-1 depicts the proposed site plan.

Building Program

While taking advantage of the sloping terrain of the site, the form of the Research and Administration Building is directly related to the functions of the interior spaces. The building consists of three sections dedicated to administration, plant growth facilities, and research. The requirement of southern exposure of the greenhouses dictates the location and orientation of the west wing. Due to the sloping site, functions that are not dependent on natural light, such as laboratory space, are located in areas of the building banked into the hillside in the east wing. Administrative offices, meeting space, and public facilities have been located in the central section, which will serve as a connection between the two academic research wings. Floor plans of the proposed Research and Administration Building are provided in Figures 5-2 through 5-4.

The main entry to the building is located on the basement level in the center section of the building. People entering the building will enter a vestibule and then either walk up an open stair with views to a courtyard above, or take the elevator, to the first floor. The first floor in this central section will house a receptionist area overlooking the courtyard and a large meeting room/auditorium, with a capacity of up to 100 persons. This room is intended to be used for presentations and conferences by staff and would be available to other groups, similar to the Hunnewell Building lecture hall. The information technology staff and equipment will also be located in this area. Offices for the Arboretum administration staff relocated from the Hunnewell Building will be on the second floor of this center section. These offices will be occupied by the director's office as well as the human resources, finance, and development departments.

The east and west wings will have two floors only, at the first and second floor levels. In both wings, the rear facade of the first floor is built into the hillside and not visible from the outside rear of the building.

The first floor of the east wing will house a large, undivided laboratory of eight "benches." Laboratory support areas will also be located adjacent to the benches. These areas include a histology room, cold room, microscope rooms, clean room, dark room, equipment storage, and chemical preparation and storage. Along the north face of the wing will be write-up spaces, similar to library carrels, for approximately 36 post-doctoral researchers and technicians. At the end of the wing will be a small meeting room. A narrower second floor on the east wing will include offices for faculty and research fellows. A small lunch room, with access to the terrace located on the roof of the first floor, also will be provided on the second level.

The first floor of the west wing will house a suite of small rooms for plant tissue culture work and a large area for growth chambers. There will also be a medium-sized lab room with additional equipment, computer, and microscope rooms. The second floor of this wing will house the much-needed research greenhouse facility, consisting of twelve greenhouse modules and associated support facilities, including storage, soil preparation, potting, a greenhouse manager's office, a greenhouse control room, and chemical storage and mixing rooms. In addition there are special rooms for laboratory waste and recycling.

Table 5-1: Preliminary Research and Administration Building Program

Research Laboratory	Growth Facilities	Administrative Space
Labs	Greenhouses	Administrative Offices
Lab Support Spaces	Head-house and Plant Growth Support Spaces	Reception and Exhibit Spaces
Faculty and Fellows Offices	Growth Chambers	Meeting and Conference Rooms
Write-up spaces for Post-docs and Technicians	Outside Nurseries	Lunch Room

Building Massing, Design, and Materials

Set into the slope of the hill and wrapping around its contours, the building will be nestled into the natural topography of the site. The main entrance will be at the basement level in the center portion of the building. Although the front of the building will be perpendicular to Centre Street, the main entrance will be easily recognizable to building visitors by a prominent arcade and a facade of glass. This center portion of the building is the only part of the building that has three floors. To minimize the appearance of mass, the third floor is set back from the lower two floors, and horizontal design elements will be employed.

From this north facade, the east and west wings will be set back substantially and recede into the hillside. Both the basement and first floor will be cut into the hillside and will only have a north-facing facade. The second floors on both wings, following the example of the center portion of the building, will also be set back from the first floor. These characteristics create the building's nestled appearance. Elevations, perspectives, and sections of the proposed Research and Administration Building are provided in Figures 5-5, 5-6, and 5-7.

From the rear of the building, only the first and second floors of the center portion of the building and only the second floor facade of the east and west wings will be visible abovegrade. The central section provides the focal point of the facility and is further accentuated by the landscaped central courtyard, which draws the hillside into the building. The twelve greenhouses in the west wing create an attractive roofline with their gable ends. Along the east section, the roof is set off above a long row of windows. A terrace on the roof of the first floor will provide further integration of the building into the hillside on the east wing.

The exterior design is intended to appear natural with a focus on stone, brick, and wood. These conventional, durable New England materials will be accented with aluminum windows and doors. Because the building is comprised of two wings and a central connecting section, the varied rooflines will create visual interest. The building height (as defined by the Boston Zoning Code) at its highest point will not exceed 47 feet. Because the building will be built into the hillside, the north elevation facing Hebrew SeniorLife will be 47 feet, while the south elevation facing Weld Hill will be 20 feet.

Site Landscaping

The proposed landscape design will harmonize with the existing landscape. New trees, shrubs, ground cover, and grasses, native to this area, will be planted on the north side of the building and through the center of the site to further screen the facility from the neighboring streets, Hebrew SeniorLife, and the Peters Hill section of the Arboretum grounds. The existing shallow valley on the east side of the building, through which the parking area and access drive will be sited, will be augmented with canopy trees, shrubs,

and groundcover to further screen views of the building and parking from the surrounding neighborhood. The central courtyard will be landscaped with meadow grasses, wildflowers, and flowering trees to visually draw the landscape of the hillside into the building.

The careful integration of the site and landscape plans with the building plan in the schematic design phase of the project has produced a design that is both sympathetic to the existing landscape and mindful of the requirements of the Research and Administration Building to fulfill the mission of the Arboretum.

Consistent with the Arboretum's goal of preserving views from the hilltop, as part of this project the Arboretum also intends to restore the summit of Weld Hill in a manner similar to the restoration and improvements undertaken at the top of Peters Hill (described in Section 3.2.2). The summit of the hill, at one time cut and flattened, will be enhanced with several feet of substrate and soil and re-contoured into a more natural shape. This may raise the height of the hill by four to six feet. Improvements may also include the placement of natural stone seating and new plantings. The character of the groundcover will be native meadow (typically mowed twice annually). Views from the summit would be enhanced by these improvements.

The existing nursery use on the Weld Hill parcel will continue to be developed and used in the future by both Arboretum plant propagation staff and researchers. The nursery area will be fenced to protect plant growth.

Parking

Parking will be carefully sited along both sides of the driveway from Centre Street to avoid unnecessary disturbance of the hillside. The use of a low retaining wall along the north side of the driveway and grading along a portion of the parking area will further minimize site disturbance. Approximately 50 new parking spaces are proposed for staff and visitors to the building as shown on Figure 5-1. The driveway from Centre Street to the emergency egress on Centre Street and the parking area will be surfaced with pervious pavement, which allows rainwater to percolate through the asphalt surface and which minimizes stormwater runoff. Lighting will be a minimal level required for safety and comfort.

This parking will serve the Research and Administration Building users and visitors only and is not intended to serve visitors to the Arboretum grounds.

Schedule and Project Cost

The Arboretum intends to begin construction in October 2007. Construction is anticipated to take 18 to 24 months. Project costs are estimated at $38 million.

5.3.3 Vehicular Access and Circulation

As described above, the Research and Administration Building will be accessed by automobile from a new driveway on Centre Street at the approximate location of an existing gate. This reflects a significant change since the IMPNF was submitted in March 2004, when vehicular access was contemplated from Walter Street. Vehicles will either park in the parking lot at the eastern side of the building, or circle around to the rear of the building for service and loading.

In addition to the main Centre Street entry/exit, in the event of an emergency fire trucks could enter or exit the site from an emergency driveway further south on Centre Street. Delivery vehicles may exit the site via this driveway as well, but it is not intended to serve as an entry point for non-emergency vehicles.

The transportation study included in Chapter 6 addresses the future vehicle trips generated by the facility. Vehicle trips generated by Arboretum staff at the Research and Administration Building are low in number given the relatively small size of the facility and the type of use. In addition, most vehicle traffic generated by the site will be traveling in non-peak directions.

5.3.4 Pedestrian Access and Circulation

A pedestrian path system composed of the main drive, gravel paths, mown meadow paths, and a concrete sidewalk will navigate the entire site. Figure 5-8 depicts the proposed pedestrian circulation.

The existing entrance on Walter Street will remain, and the gravel drive that traverses the site also will remain in its current alignment for pedestrian use.

Two-to-three new pedestrian entrances and pathways will be created:

- A new pedestrian entry and sidewalk from Centre Street to the Research and Administration building along the new main entry drive will create pedestrian access to the building and parking area. Pedestrian-scale pole lighting and wall lighting will be located along the sidewalk from Centre Street and provide a safe route for pedestrians. Pedestrians will be able to traverse the Weld Hill site by entering on the new sidewalk from Centre Street and connecting to the existing path that extends to the Walter Street entry; and
- Additional pedestrian access is provided from Centre Street through the new emergency-vehicle driveway.
- A new pedestrian entrance will be added on Walter Street, near the intersection of Walter Street and Weld Street (pending consultation with relevant City agencies and the Massachusetts Historical Commission, as the stone wall is a historic resource).

If permitted by the City, the Arboretum will develop plans to improve the perimeter of the Weld Hill parcel by asphalt surfacing of the dirt sidewalk on Weld Street adjacent to the site, installing a pedestrian crosswalk at the intersection of Walter and Bussey streets, and asphalt surfacing of the dirt sidewalk on the east side of Walter Street, between Centre

Street and the point near the Walter Street gate where the existing paved sidewalk begins. The design of these improvements will require consultation with and approval from relevant agencies at the City of Boston (including the Public Works Department, Boston Transportation Department (BTD), and Public Improvement Commission); therefore, the exact nature and timing of such improvements cannot be determined at this time.

The Weld Hill parcel connects with the Arboretum grounds at the corner of Bussey and Walter Streets. Three other Arboretum gates are located at this corner, including the Walter Street Gate, Bussey Street Gate, and Peters Hill Gate, providing connection to and from the Weld Hill parcel.

5.3.5 Sustainability

Environmental sustainability is an important facet of the proposed Research and Administration Building. The building will be constructed to meet the requirements for Leadership in Energy and Environmental Design (LEED) certification. Beyond the LEED point rating system, however, the Arboretum seeks to design and construct a building that minimizes its impact on the environment as well as its life-cycle and long- term operating costs, while managing and reducing the burden the building will place on University and local infrastructure. In order to achieve these goals, the Arboretum has identified specific goals for the project:

- Create a healthy, productive workspace;
- Lower life cycle cost;
- Provide flexibility and adaptability;
- Minimize impact on the environment; and
- Use LEED as validation of performance.

These ideas will continue to guide the Arboretum's design team moving forward. At this preliminary stage of design, the project may merit a Silver rating LEED Certification under the following LEED categories: sustainable sites (site selection, alternative transportation, stormwater management, landscape and exterior design, light pollution); water efficiency (landscaping, use reduction); energy and atmosphere; materials and resources (construction waste management, recycled content, local/regional materials); indoor environmental quality; and innovation and design process.

5.3.6 View Analysis

The new Research and Administration Building has been designed in a manner to minimize the visibility of the new construction from the surrounding residential neighborhood and the more institutional district along Centre Street.

Some of the planning and design elements that accomplish this include:

- The building's proposed location at the northwest corner of the site takes advantage of site topography and existing wooded areas to visually screen the building from neighboring residential streets.

- Careful attention to grading, use of retaining walls and plantings, and selection of materials successfully incorporates the new building into the surrounding hillside.

- The proposed roofline is below the summit of the hill, greatly reducing its visibility from Weld Street.

- The irregular roofline created by the three building sections breaks up the facades of the building while creating visual interest.

- The use of natural materials as exterior cladding for the new construction relates directly to the Arboretum's desire to maintain a natural park-like setting.

- In addition, the siting of the access drive has been adjusted to preserve most of the existing maple and oak trees in the center of the site and to use them to screen the drive and parking.

Taken together, these elements create an attractive new facility that takes into account the neighboring residential and institutional areas as well as the adjacent Arboretum grounds. Photographs of a scaled model that provide three-dimensional bird's-eye views of the proposed project are presented in Figure 5-8.

The Arboretum has prepared view studies to assess the visibility of the new building from various vantage points (see Figures 5-9 through 5-14, corresponding to existing views shown in Figures 2-14 through 2-16). The new building is expected to be visible from Centre Street near the proposed driveway. More distant views of the building from neighboring residential streets will be partially screened by existing wooded areas, particularly in the summer.

With respect to nighttime lighting, areas proposed to have lighting include the building entrance, the entrance drive and sidewalk from Centre Street, the pathway from the parking area to the building entrance, the parking area, and the loading area. Lighting will be designed to provide adequate site safety and comfort while minimizing off-site impacts. Greenhouses will be equipped with protective shading that prevents any escape of night lighting. Typical hours of wintertime supplemental lighting in the greenhouses are from 5 AM to 9 PM.

5.3.7 Weld Hill Parcel Maintenance and Security

Over the past 15 years, the Arboretum has expanded its investment in its grounds maintenance activities, including major improvements in particular landscape locations (described in Section 3.2.2). In the coming years, the Arboretum will extend this general commitment to the Weld Hill parcel.

The Arboretum will provide security for the proposed Research and Administration Building to ensure the safety of its employees and building visitors. Under the terms of Harvard's lease agreement with the City of Boston, however, the City retains jurisdiction for police patrols in and around the City-owned land under lease.

5.3.8 Employment

The Arboretum expects employment to increase as a result of constructing the Research and Administration Building. Of the anticipated 48 new employees at the Arboretum, as many as 26 could be new hires, while the remainder would be existing employees shifting from Cambridge to Boston.

5.4 Zoning

5.4.1 Existing Zoning

The existing zoning districts and applicable regulations for the land described in this IMP are set forth in Section 2.4.2.

5.4.2 Existing Uses and Structures

The uses and structures existing on the Arboretum land under lease and the Harvard-owned Dana Greenhouse, Centre Street, Bussey Homestead, and Weld Hill parcels as of the date of the approval of this Institutional Master Plan by the Boston Zoning Commission shall be deemed to be in compliance with the provisions of the Boston Zoning Code (the "Zoning Code").

5.4.3 Proposed Zoning and Development Controls

Land Under Lease, Dana Greenhouse Parcel and Centre Street Parcel

The zoning controls for the City-owned Arboretum land under lease to Harvard and the Harvard-owned Dana Greenhouse and Centre Street parcels shall be the zoning controls of the existing underlying Arnold Arboretum Botanical/Zoological Garden Open Space (OS-BZ) zoning subdistrict of the Jamaica Plain Neighborhood District. The description of this subdistrict included in Section 55-14.6 of the Zoning Code provides:

> *The land … is governed by the terms of certain orders of taking by the Board of Park Commissioners of the City of Boston, by certain agreements between the City of Boston and President and Fellows of Harvard College (including but not limited to certain Indentures), and by rules and regulations issued by the City of Boston Parks Commission with respect to such land. Within the Arnold Arboretum Botanical/Zoological Garden Open Space Subdistrict, no land or structure shall be erected, used, or arranged or designed to be used, in whole or in part, except in accordance with all such takings, agreements, rules, and regulations, as they may be amended from time to time, with respect to such land or Structure, and no Structure shall be erected, used, or arranged or designed to be used, in whole or in part, except as approved by the City of Boston Parks Commission or any successor thereto, in accordance with such takings, agreements, rules, and regulations.*

Bussey Homestead Parcel

The zoning controls for the Harvard-owned Bussey Homestead parcel shall be the zoning controls of the existing 1F – 5000 District.

Weld Hill Parcel Development Controls, Uses, and Development Review Procedures

The zoning and development controls for the Weld Hill parcel shall be established on an overlay basis in accordance with the provisions of Section 80D-6 and shall supersede all of the otherwise applicable provisions of the underlying zoning including the provisions of the Roslindale Interim Planning Overlay District. The permitted uses, floor area ratio, building height, yard setbacks, and parking and loading requirements are as set forth in Table 5-2 and, together with the restrictions on development outside the Designated Development Area set forth in Section 5.5 are all of the use and dimensional controls applicable to the Weld Hill parcel.

Table 5-2: Proposed Zoning – Weld Hill Parcel

Permitted Uses:	College or University Uses* consistent with the mission and purposes of the Arnold Arboretum, including its research and education mission, and not otherwise prohibited by the IMP. Prohibited Uses are: undergraduate and graduate student dormitories; the relocation or establishment of the Arboretum's centralized maintenance garage facility; and non-accessory parking
Floor Area Ratio:*	0.3**
Building Height:*	The highest point of the roofline on any future buildings constructed on the Weld Hill Parcel is limited to a plane defined by the top of Weld Hill after its reconstruction as contemplated in this IMP (anticipated to be approximately 180 feet vertical elevation, Boston City Base Datum), except within the Restricted Height Setback Area as delineated on Figure 5-16, where Building Height shall not exceed 35 Feet
Yards*:	♦ Weld Street lot line: 25 feet ♦ Centre Street lot line: 25 feet ♦ Walter Street lot line: 25 feet (50 feet within the Designated Development Area as delineated in Figure 5-16) ♦ Hebrew SeniorLife lot line: 0 feet (Yard setbacks are shown on Figure 5-16)
Parking and Loading:	As set forth in this Institutional Master Plan or as otherwise determined pursuant to the provisions of Article 80 of the Code.

* As defined in Article 2A of the Zoning Code existing as of the effective date of approval of this Institutional Master Plan by the Boston Zoning Commission. The definitions set forth in said Article 2A shall be applicable to the land described in this Institutional Master Plan.

** The proposed Research and Administration Building is included in this limit.

5.5 Designated Development Area and Development Controls on the Weld Hill Parcel

For purposes of reviewing future development proposals on the Weld Hill parcel, the site is divided into two parts: the northern part (closest to Hebrew SeniorLife and referred to as the "Designated Development Area") and the southern part (closest to Weld Street and referred to as the "Horticultural and Botanical Resource Study Area"). The boundary between the two parts is demarcated on Figure 5-16.

.1 Construction of buildings is allowed within the area shown on Figure 5-16 as the Designated Development Area. Building construction within the Designated Development Area shall be consistent with the Design Guidelines established in Section 5.7.

.2 No permanent above-ground enclosed structures may be constructed within the Horticultural and Botanical Resource Study Area.

.3 No surface parking areas will be permitted within the Horticultural and Botanical Resource Study Area.

.4 Subsurface geothermal heat exchange systems and associated components and any other below-grade installations may be located within the Horticultural and Botanical Resource Study Area.

.5 The development restrictions within the Horticultural and Botanical Resource Study Area set forth in subparagraphs .2 and .3 of this Section 5.5 shall be imposed by Harvard for a period of time coterminous with the 1882 lease indenture between the City of Boston and Harvard for the adjacent City-owned Arboretum park land (this indenture expires in 2882) in accordance with the terms of a declaration of development restrictions, provided that the use and dimensional controls applicable to development on the Weld Hill Parcel are not reduced below, or, in the case of yards, increased above, or otherwise made more restrictive than, those set forth in Table 5-2.

5.6 Review Thresholds for Weld Hill Development

The following review procedures shall apply during the term of the IMP:

- Proposed new construction containing from 1 to 5,000 square feet of gross floor area (including the construction or placement of the permitted above-ground structures outside of the Designated Development Area) shall be subject to BRA review at the staff level for consistency with the IMP Development Controls.

- New construction of between 5,001 and 20,000 square feet of gross floor area shall require BRA director approval and shall be subject to the Small Project Review procedures in accordance with Article 80 requirements.

- Proposed new buildings or additions to existing buildings containing more than 20,000 square feet of gross floor area shall require an amendment to the IMP and the applicable project review in accordance with Article 80 (e.g., Small Project Review for projects less than 50,000 square feet of gross floor area and Large Project Review for projects of 50,000 square feet. or more), and in each event subject to approval by the BRA and/or the Zoning Commission, as may be required under Article 80.

5.7 Design Guidelines for Development on the Weld Hill Parcel

In collaboration with the IMP Task Force established by the BRA, the Arboretum has adopted the following design guidelines for future development on the Weld Hill parcel.

5.7.1 Siting of Future Buildings

Within the Designated Development Area described above in Section 5.5, the siting and massing of buildings should be near the Centre Street and Hebrew SeniorLife boundaries of the property.

5.7.2 Character of Development

- The Arboretum should ensure the compatibility of all built structures with the natural character of the site and ensure sensitivity to the adjacent Arboretum grounds;
- Development should acknowledge the distinction between the "urban" edges of the site (along the boundary with the Hebrew SeniorLife and Centre Street), the "residential" edge of the site (along Weld Street), and the "natural area" edge (along Walter Street);
- Buildings and roads should defer to the landscape and topography to maintain the natural character of the site; and
- To the degree possible, future development should serve to enhance the site edge shared with Hebrew SeniorLife, including Bussey Brook, as an amenity for both institutions. The Arboretum should explore available opportunities to work jointly with Hebrew SeniorLife.

5.7.3 Landscaping

- The natural beauty of the site should be maintained and enhanced through management of naturally established vegetation, Arboretum accessions, and other plant materials for landscaping purposes;
- The site should be managed to standards consistent with the rest of the Arboretum grounds; and
- As noted above, buildings, roads, and other structures should defer to the landscape and topography to maintain the natural character of the site.

5.7.4 Lighting

Lighting should be designed to provide adequate site safety and comfort while minimizing off-site impacts through careful consideration of the following:

- Location, aim, and shielding (to minimize stray light beyond the property borders);
- Number and position of light fixtures;
- Height of pole-mounted light fixtures;
- Hours of illumination for non-essential lights; and
- Type of lights (low-pressure sodium, high-pressure sodium, metal-halide, etc.).

5.7.5 Vehicular Access

Additional vehicular access points should be carefully located, taking into consideration the character and use of neighboring property, the traffic speed and volume on roadways, and sight distances.

5.7.6 Parking

- Parking should be screened with trees and other landscape materials compatible with the natural character of the site to minimize visibility from public streets and adjacent properties;
- Shared parking with the Hebrew Rehabilitation Center is encouraged and should be pursued in the future if opportunities arise; and
- The addition of impervious surface parking areas should be minimized.

5.7.7 Public Access and Circulation

- Pedestrian access to and through the site should be maintained; and
- The possibility of a link to Hebrew SeniorLife to facilitate access by its residents and visitors should be explored.

5.7.8 Sustainability

Future development should seek to lower building life cycle costs, create healthy, productive workspaces; provide flexibility and adaptability for future use; minimize impacts on the environment; and utilize Leadership in Energy and Environmental Design (LEED) standards as a measure of performance.

Source: Reed Hilderbrand Associates

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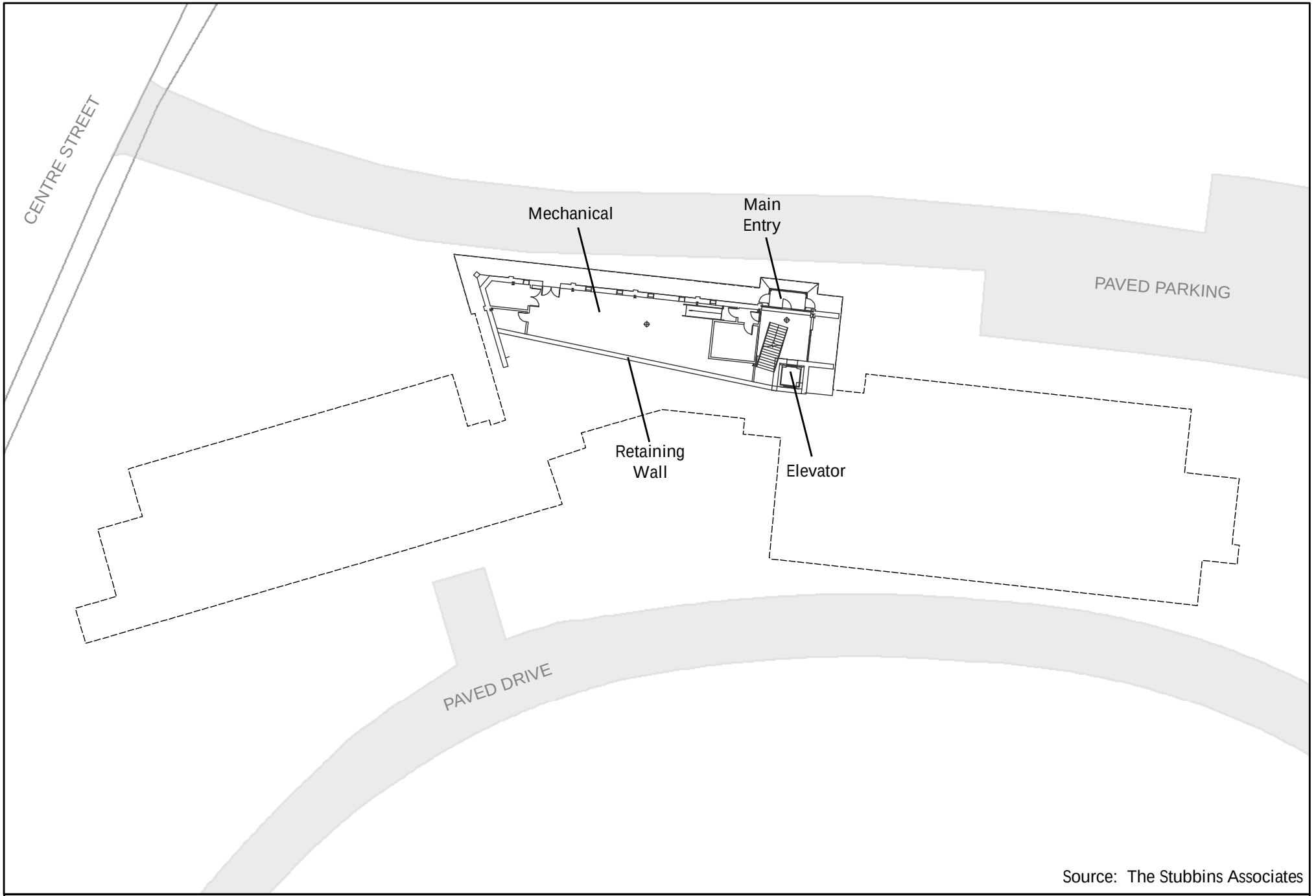
Institutional Master Plan

Figure 5-1
Proposed Site Plan



Source: The Stubbins Associates

Epsilon ASSOCIATES INC.

Scale 1:480

0 10 20 40 Feet

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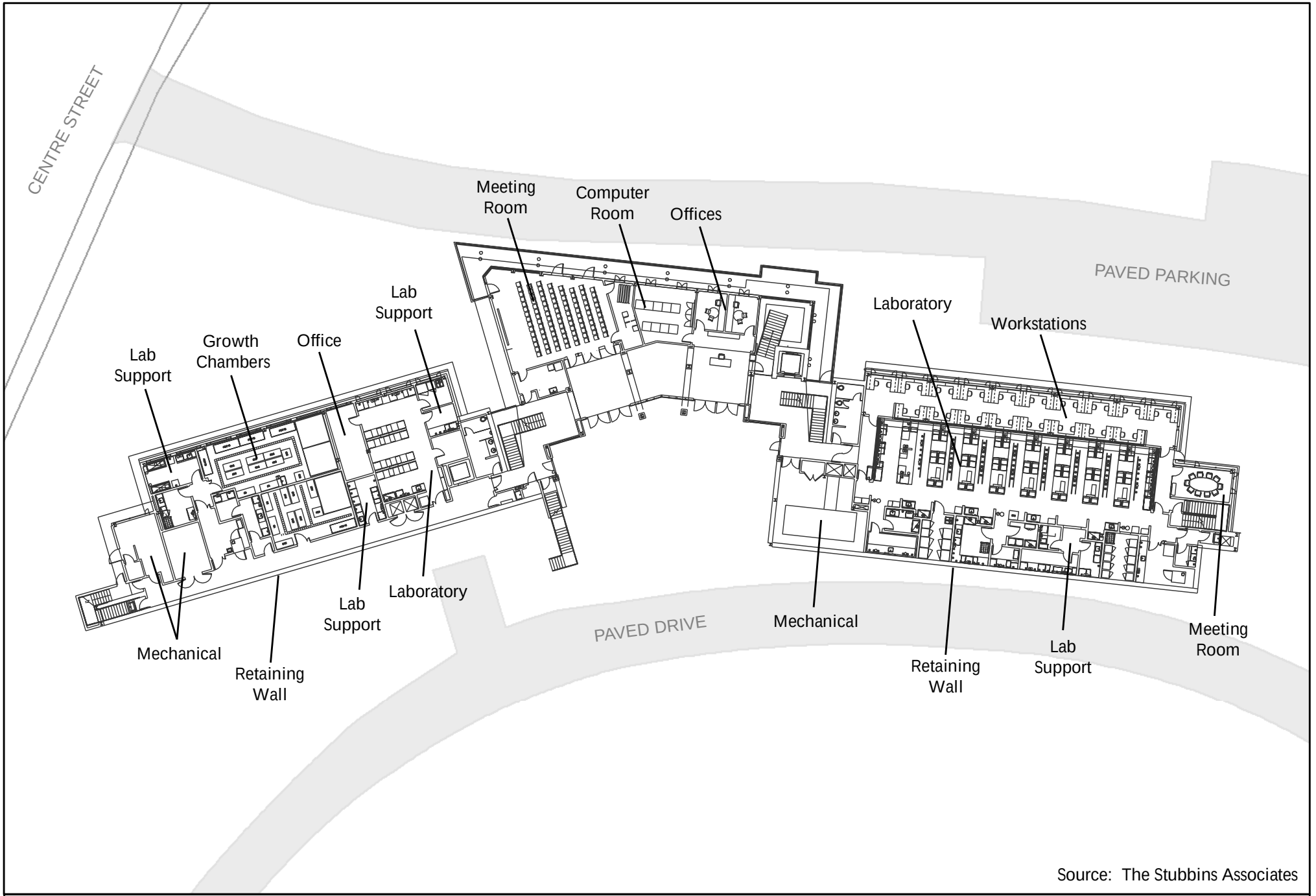
Figure 5-2
Basement Floor Plan



Source: The Stubbins Associates

Epsilon ASSOCIATES INC.

Scale 1:480

0 10 20 40 Feet

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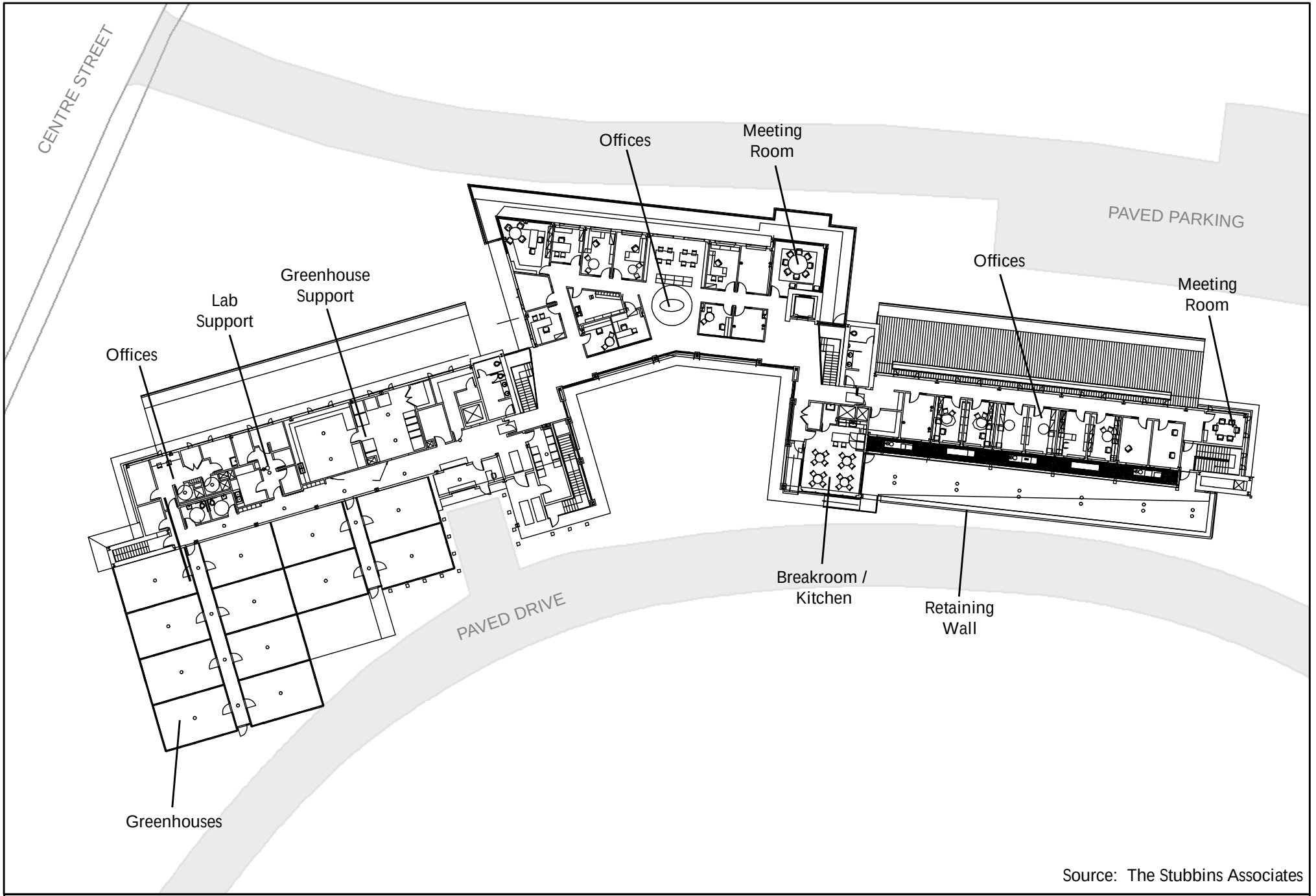
Figure 5-3
First Floor Plan



Source: The Stubbins Associates

Epsilon ASSOCIATES INC.

Scale 1:480

0 10 20 40 Feet

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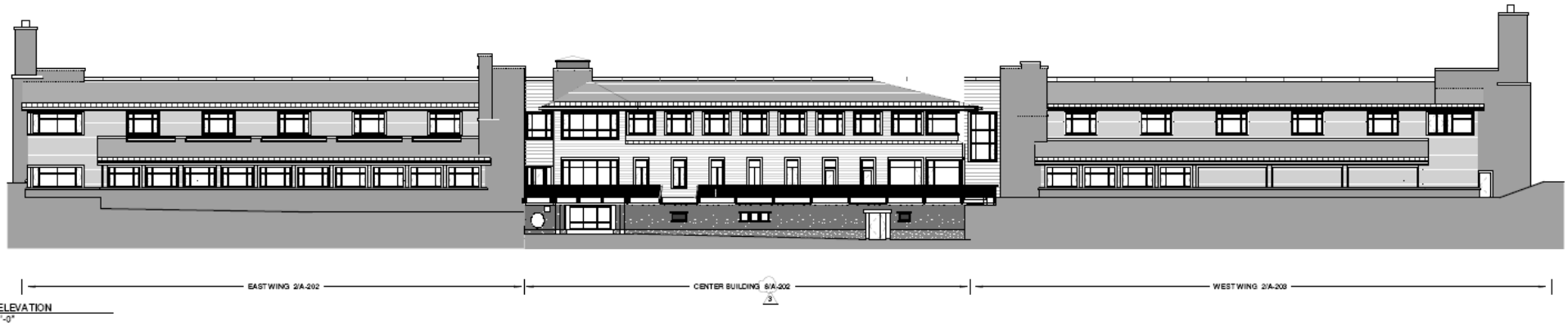
Figure 5-4
Second Floor Plan



1 NORTH ELEVATION
1/16" = 1'-0"

NOTE: THESE ELEVATIONS HAVE BEEN UNFOLDED FOR A STRAIGHT-LINE VIEW - FOR REFERENCE ONLY.

Source: The Stubbins Associates

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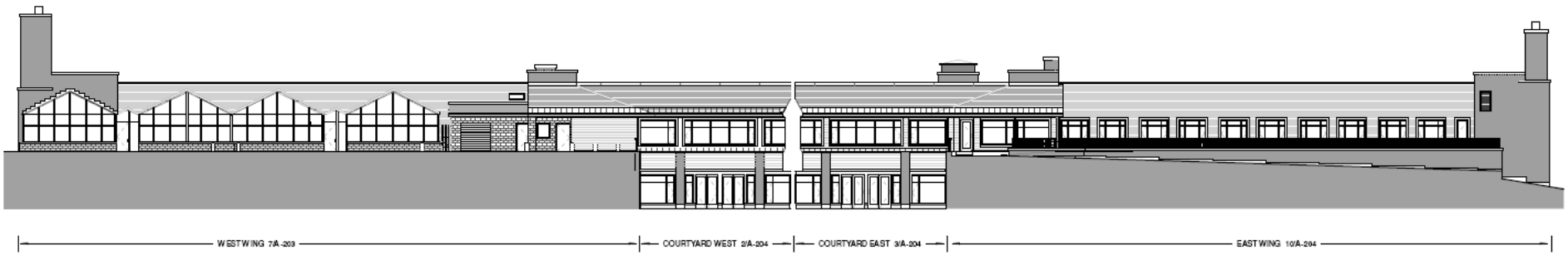
Figure 5-5
North Perspective and Elevation



2 SOUTH ELEVATION
1/16" = 1'-0"

NOTE: THESE ELEVATIONS HAVE BEEN UNFOLDED FOR A STRAIGHT-LINE VIEW - FOR REFERENCE ONLY.

Source: The Stubbins Associates

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Figure 5-6
South Perspective and Elevation

Source: The Stubbins Associates

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Figure 5-6a
Proposed Building from Centre Street

Source: The Stubbins Associates

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Figure 5-6b
Centre Street Elevation

Section A:

Section B:

Source: Reed Hilderbrand Associates

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Figure 5-7
Sections through Site
(section locations are noted on Figure 5-1)

Source: Reed Hilderbrand Associates

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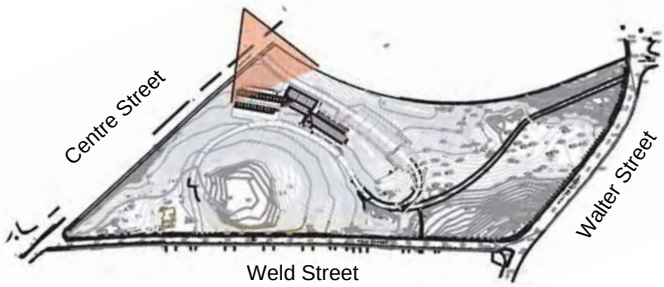
Figure 5-8
Proposed Pedestrian Circulation



Source: The Stubbins Associates

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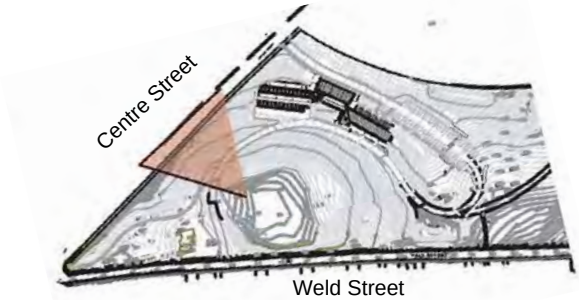
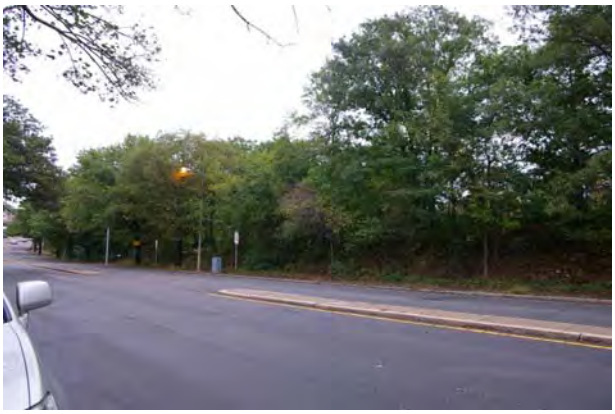
Figure 5-10
Future (above) &
Existing (below) View 1





Source: The Stubbins Associates

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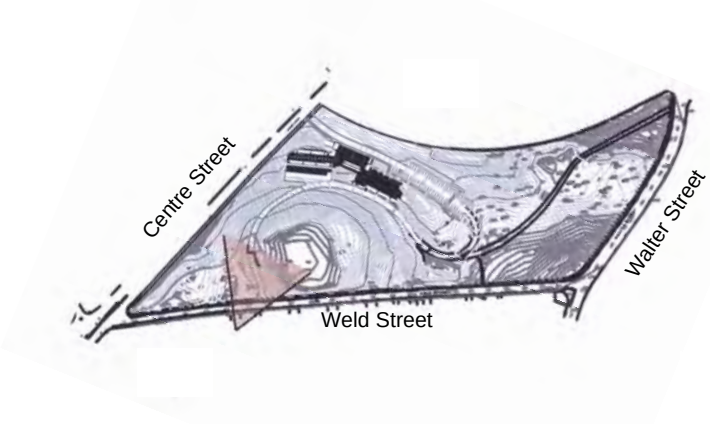
Figure 5-11
Future (above) &
Existing (below) View 2



Source: The Stubbins Associates

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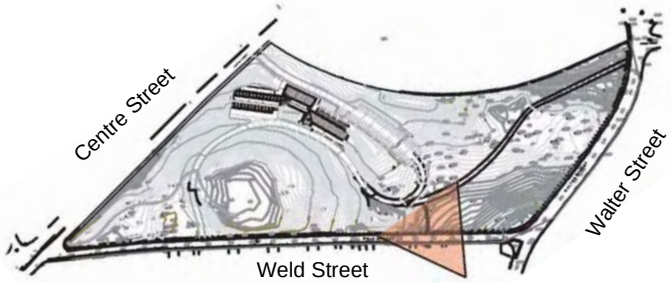
Figure 5-12
Future (above) &
Existing (below) View 3



Source: The Stubbins Associates

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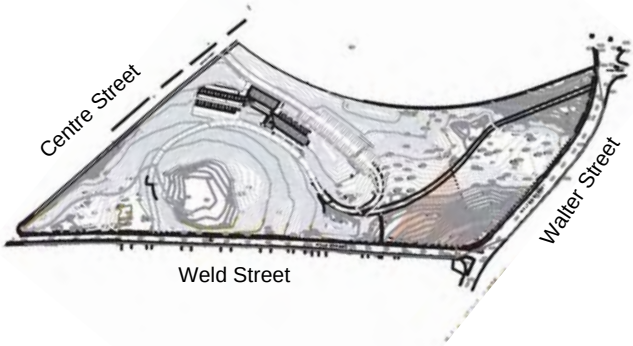
Figure 5-13
Future (above) &
Existing (below) View 4



Source: The Stubbins Associates

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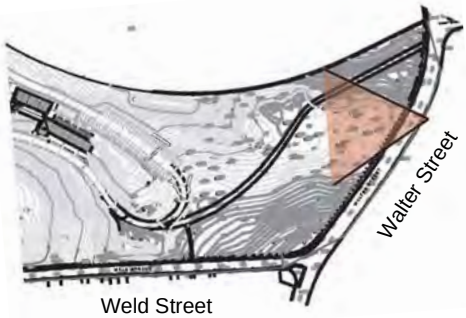
Figure 5-14
Future (above) &
Existing (below) View 5



Source: The Stubbins Associates

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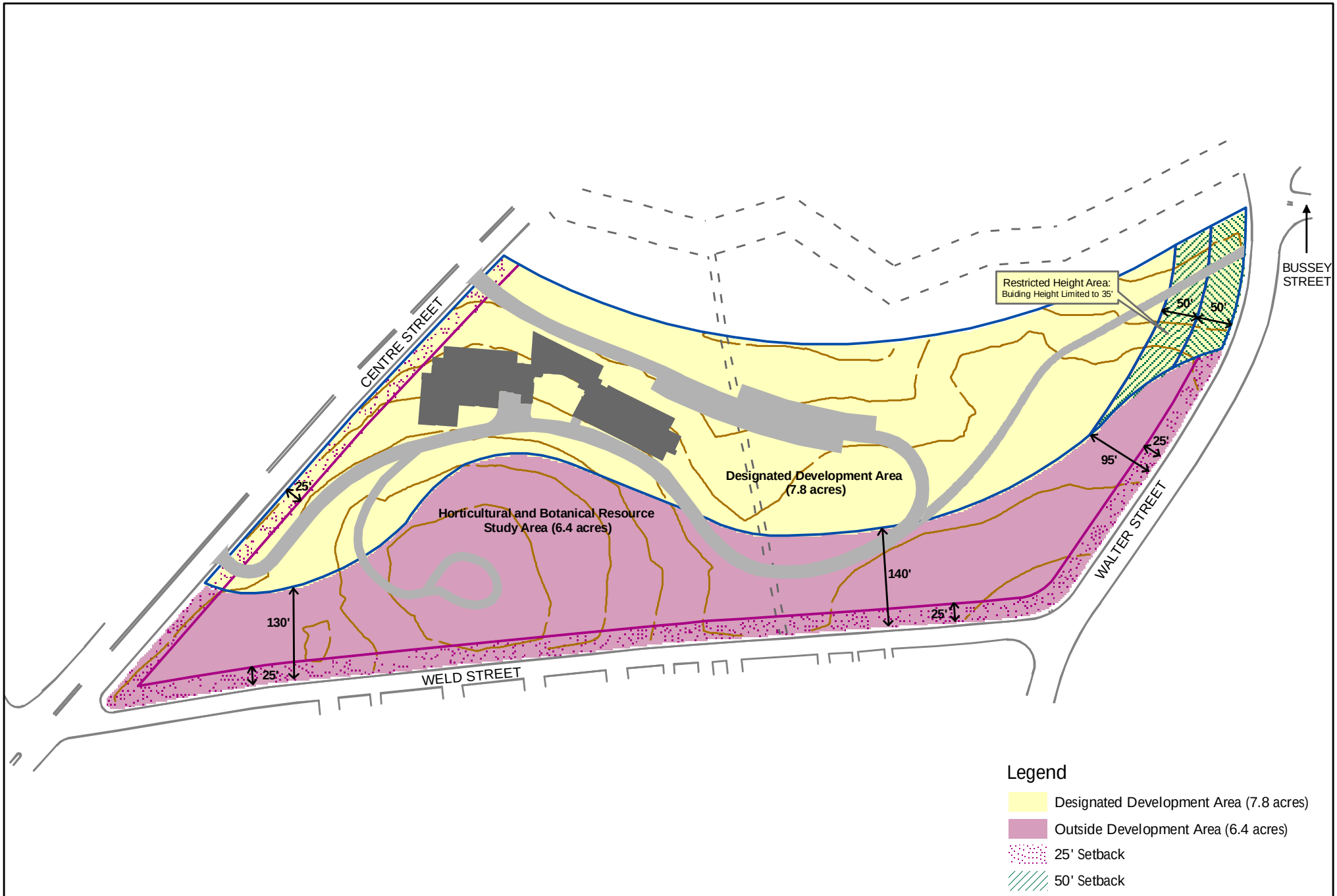
Figure 5-15
Future (above) &
Existing (below) View 6



REVISED JULY 2007

Epsilon ASSOCIATES INC.

Scale 1:2,400

0 50 100 200 Feet

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Figure 5-16
Designated Development Area,
Weld Hill Parcel

6.0 TRANSPORTATION ACCESS PLAN COMPONENT

6.1 Introduction

This chapter describes existing conditions for the Arboretum grounds and presents an evaluation and summary of the transportation elements of the proposed Research and Administration Building, including an assessment of the transportation impacts that are expected within the project study area under future conditions with the proposed project completed. This Transportation Access Plan Component includes an analysis of vehicle traffic, parking conditions, loading and service activities, pedestrian and bicycle activity, and public transportation in the area surrounding the Arboretum property. The transportation analysis presented in this chapter includes the following:

- An overview of the proposed project and the study methodology;
- Definition and quantification of existing transportation conditions in the project study area;
- Quantification of the travel demand characteristics of the Arnold Arboretum and the proposed project;
- Projection of future transportation conditions with and without the proposed project;
- Detailed assessment of traffic operations in the study area; and
- A summary of proposed improvements, including transportation demand management strategies, to be implemented as part of the IMP.

This chapter also responds to comments on the IMPNF that were received from the Boston Redevelopment Authority (BRA) and the Boston Transportation Department (BTD).

6.1.1 Summary of Findings

The primary finding of this transportation analysis is that the proposed Research and Administration Building project will not result in a noticeable change in area traffic conditions at nearby intersections during weekday morning and evening peak hours. The proposed parking for the project will accommodate expected demands. The Arboretum will continue to provide proactive transportation demand management (TDM) measures and supporting amenities to encourage and support the use of transit, walking, and bicycling.

6.1.2 Proposed Project

As discussed previously in Chapter 5, the Arboretum proposes development of a Research and Administration Building on the Weld Hill parcel. This project includes construction of a 45,000-square-foot facility on a small portion of the 14.2-acre Weld Hill parcel owned by Harvard. Project access and egress is proposed via Centre Street.

The quantitative analyses presented within this chapter focus on the transportation impacts and benefits associated with the future construction and full occupancy of this facility on the Weld Hill parcel.

6.2 Existing Conditions

This section includes an overview of existing roadway conditions, public transportation, pedestrian and bicycle facilities, and general site conditions for the Weld Hill parcel. A discussion of the existing on- and off-street public parking supply is also provided.

6.2.1 Study Area

The Weld Hill parcel is bounded by Weld Street to the south, Walter Street to the east, Centre Street to the west, and Hebrew SeniorLife to the north as shown previously in Figures 1-2 and 2-2.

The project study area includes roadways and intersections surrounding the Weld Hill parcel identified by the BTD as potentially being affected by the project. These roadways and intersections are discussed below and are illustrated in Figure 6-1.

6.2.2 Roadway Conditions

Bussey Street runs east-west through the Arboretum grounds and connects South Street and Walter Street. One lane of travel is provided for both eastbound and westbound traffic. The road is divided by a double-yellow centerline. No formal on-street parking is designated along this roadway; however, parking is allowed, and vehicles were observed parking on the shoulders in some locations. Sidewalks are provided along both sides of the street.

Centre Street runs between Jackson Square in Roxbury, through Jamaica Plain and West Roxbury, and onward to the Town of Dedham to the south. In the study area, Centre Street provides two northbound and two southbound lanes divided by a raised median. The street widens at some intersection approaches to allow for turning lanes. Sidewalks are provided on both sides of the street. Parking is not prohibited by posted signs on Centre Street in the study area, however no vehicles were observed parking on the street. Centre Street between Murray Circle and the VFW Parkway is a parkway that is managed by the Department of Conservation and Recreation (DCR).

VFW Parkway provides travel between Centre Street near the project site and its terminus at Washington Street in Dedham. Travel is divided by a wide raised median and no parking is provided. Two travel lanes are provided in each direction. Sidewalks are provided on both sides of the street.

Walter Street runs generally southwest from Centre Street to its terminus at Conway Street. One lane is provided in each direction divided by a double-yellow centerline. No formal parking is provided, however, vehicles often park on the roadway shoulders. Adjacent to the site, asphalt sidewalks are provided on both sides of the street.

Weld Street is a local roadway connecting Walter Street to Centre Street on the southern edge of the project site. One travel lane is provided in each direction divided by a double-yellow centerline. Parking is unrestricted on Weld Street although only a few parked vehicles were observed on-street. A gravel sidewalk is provided adjacent to the site on the north side of Weld Street. Sidewalk presence and type varies by residential lot on the south side of the street.

6.2.3 Intersection Conditions

Existing intersection geometry and conditions in the study area are presented below. Traffic level of service (LOS) analyses are provided later in Section 6.4 of this chapter.

Centre Street/VFW Parkway is a signalized intersection under the control of the DCR. This intersection operates with a heavy movement between Centre Street and the VFW Parkway. The southbound approach on Centre Street is striped for a right-turn only lane and two general travel lanes. The northbound Centre Street approach consists of two through lanes. Left turns to the VFW Parkway are prohibited at this location. The eastbound VFW Parkway approach operates with an exclusive left-turn lane and a shared left/right turn lane. Pedestrians are accommodated with push-buttons, crosswalks, and an exclusive walk phase that is pedestrian push-button actuated. This intersection controller also commands the signalized crosswalk just north of the intersection in front of Hebrew SeniorLife.

Centre Street/Weld Street is a signalized intersection. The northbound and southbound approaches on Centre Street operate with two general shared travel lanes. The Weld Street approaches operate with one general travel lane. Andover Road is within the limits of the intersection; however it runs one-way from the intersection, thus no signal control is provided for this leg. Pedestrians are accommodated with an exclusive walk-phase when the pedestrian phase is activated.

Weld Street/Walter Street is an unsignalized intersection with posted stop control on Weld Street. The eastbound Weld Street approach consists of one general travel lane for left and right turning movements. The northbound and southbound Walter Street approaches consist of one general travel lane. No crosswalks are provided at this location for pedestrians.

Walter Street/Bussey Street is an unsignalized intersection. The westbound Bussey Street approach is stop-controlled and consists of one general lane for right and left turning vehicles. Because of a raised median on this approach, traffic is unable to operate with two approach lanes at the stop-line often resulting in significant delays and queue lengths. The northbound and southbound Walter Street approaches consist of one general travel lane. Bussey Street is wide enough at this intersection to allow through vehicles to pass vehicles slowing to turn. A crosswalk is provided for pedestrians crossing Bussey Street only.

6.2.4 Existing Traffic Volumes

In June 2004, an Automatic Traffic Recorder (ATR) count was conducted on Walter Street between Centre and Bussey adjacent to the Arboretum. Results shown in Figure 6-2 indicate that the peak hours of traffic on Walter Street coincide with typical peak hours of commuter traffic. Daily traffic volumes and peak hour volumes are provided in Table 6-1.

Table 6-1: Traffic Volume Summary

Location	Daily Traffic (vehicles per day)	AM Peak Hour		PM Peak Hour	
		Volume (vph)	K Factor*	Volume (vph)	K Factor *
Walter Street					
Northbound	7,500	835	11%	425	6%
Southbound	7,300	315	4%	715	10%
Total	14,800	1,150	8%	1,140	8%

* Percent of daily traffic during peak hour.

Manual turning movement counts (TMCs) were conducted in June and September 2004 at each of the study area intersections. Counts were conducted during the commuter peak hours of 7:00 – 9:00 AM and 4:00 - 6:00 PM. TMCs included the intersection of Centre Street/Walter Street for informational purposes. Detailed traffic counts are provided in Appendix B (bound separately and available upon request).

The intersection TMCs were used to establish traffic networks for the 2004 Existing Condition. From the TMCs, the study area's morning and evening peak hours were further defined as 7:30-8:30 AM and 4:46-5:45 PM, respectively. Existing condition (2004) morning and evening peak-hour traffic volumes are shown in Figures 6-3 and 6-4.

6.2.5 Public Transportation

As shown in Figure 6-5 and Table 6-2, the Weld Hill parcel is well served by the MBTA route #38 bus that provides access between the Forest Hills MBTA Station on the Orange Line and Wren Street in Roslindale. Headways (the interval of time between buses) during rush hour are approximately 20 minutes. At Forest Hills MBTA Station numerous connections can be made to local bus lines, as shown in Table 6-2.

Table 6-2: Nearby MBTA Bus Routes

Route	Route Description	Peak Hour Headways (minutes)*
30	Mattapan Sta. - Forest Hills Sta. via Cummins Highway & Roslindale Sq.	15
32	Wolcott Sq. - Forest Hills Sta. via Cleary Sq. & Hyde Park Ave.	10
34	Dedham Mall/Stimson St. - Forest Hills Station via Belgrade Ave. & Centre St.	20
35	Dedham Mall/Stimson St. - Forest Hills Station via Belgrade Ave. & Centre St.	20
36	Charles River Loop or V.A. Hospital - Forest Hills Sta. via Belgrade Ave. & Centre St.	11
37	Baker and Vermont Sts. – Forest Hills sta. via Belgrade Ave. & Centre St.	20
38	Wren St. – Forest Hills sta. via Centre & South Streets	22
39	Forest Hills Sta. - Back Bay Sta. via Huntington Ave.	5
40	Georgetown - Forest Hills Sta. via Washington St. & West Boundary Rd.	30
41	Centre & Eliot Sts. - JFK/UMass Station via Dudley Sta., Centre St. & Jackson Sq. Sta.	20
48	Jamaica Plain Loop Monument - Jackson Square Station via Green Street & Stony Brook Stations	35
50	Cleary Square - Forest Hills Station via Roslindale Square	20
51	Cleveland Circle – Forest Hills sta. via Hancock Village	20

Source: Massachusetts Bay Transportation Authority

* Headway denotes the number of minutes between each apparatus during peak service times.

Route #51 traverses Weld Street adjacent to the site. This bus provides service to Forest Hills Station where connections can be made to the Orange Line and Cleveland Circle where connections can be made to the Green Line's C Line trains.

Commuter Rail services also available at Forest Hills MBTA Station include the following:

- The Needham Line;
- Forge Park – 495
- Providence (T.F.Green Airport); and
- Stoughton

These commuter rail lines provide access to Back Bay and South Station to the northeast and numerous points to the south and west.

6.2.6 Arboretum Pedestrian and Bicycle Conditions

The Arboretum includes an extensive system of formal and informal paths for public use. Public access and circulation surrounding the Arboretum, including vehicular access, parking locations, entry gates, sidewalks, and crosswalks are shown in Figure 2-1. Internal paths are made of different materials and range from major, paved and gravel pathways to minor paths of various surfaces, to unsurfaced "desire" lines. The Arboretum roadways, which are owned and maintained by the City of Boston, are used by maintenance and emergency vehicles and are not normally open for public vehicle travel. However, visitors with special needs may receive permission to travel along the roads.

Sidewalks are provided adjacent to the Weld Hill parcel on Walter, Weld, and Centre streets; however, the sidewalk on Weld Street is narrow and unpaved. The Weld Hill parcel connects with the Arboretum grounds at the corner of Bussey and Walter Streets. Three Arboretum gates are located at this corner, including the Walter Street Gate, Bussey Street Gate, and Peters Hill Gate, providing connection to and from the Weld Hill site. Pedestrian volumes are generally low in the study area, with fewer than ten pedestrians crossing per hour at the study area intersections. Detailed intersection counts are provided in Appendix B.

There are no designated off-street bicycle paths close to the site. Bicycles are allowed in the Arboretum on roads and paved pathways. Wide shoulders are striped on Bussey Street and on Centre Street (north of the VFW Parkway). These shoulders provide ample room for bicycles traveling on-street.

6.2.7 Arboretum Parking

The public parking supply in the area surrounding the Arboretum primarily consists of unregulated on-street spaces. There are some other small off-street parking areas located around the perimeter of the Arboretum. These parking areas are generally located near entrances to the Arboretum, are not striped, and are used mostly by visitors. Parking is primarily unregulated adjacent to the site on Centre, Walter and Weld streets, however, a few vehicles park on the streets adjacent to the Weld Hill parcel. Staff and individuals

conducting business at the Arboretum park in designated parking areas within the Arboretum. These are located at the Dana Greenhouse (14 spaces) and the Hunnewell Building (28 spaces in front of the building and 19 spaces in the maintenance yard).

6.3 Proposed Conditions: Evaluation of Long-term Impacts

To evaluate future roadway operations, traffic volumes in the study area were projected to the year 2010. In accordance with BTD guidelines, this future analysis year represents a five-year horizon from existing conditions. The 2010 No-Build traffic volumes include all existing traffic, new traffic attributable to general background growth, and traffic generated by identified planned/approved developments in the area. Anticipated project-generated traffic volumes were then added to the No-Build traffic volumes to reflect Build traffic volume conditions.

Two scenarios were evaluated for the year 2010:

- 2010 No-Build condition without the proposed project; and
- 2010 Build condition including the proposed project.

6.3.1 2010 No Build Condition

The 2010 No-Build condition was developed and analyzed to evaluate future transportation conditions in the project study area without consideration of the proposed Research and Administration Building project. In accordance with BTD guidelines, this future analysis year represents a five-year horizon from existing conditions. The No-Build condition provides insight to future traffic conditions.

For this project a background traffic growth rate of 1.0 percent per year was applied to the existing traffic volumes. This growth rate was provided by the BTD. No additional projects either approved or undergoing the City of Boston's Article 80 Development Review process were identified in the area. In addition, there are no significant public roadway projects that are planned in the study area that would change the current geometric or operational configuration of study area roadways and intersections. It is our understanding that the BTD is considering investing in improvements to the intersection of Centre Street and Walter Street, pending available funding. At this time, no completed redesign plans for that project are available. Consequently, this analysis has assumed that geometric and traffic control conditions at this location remain unchanged from current conditions.

The 2010 No-Build condition weekday morning and evening peak hour traffic volumes were developed by increasing the 2004 Existing Condition volumes to include general background traffic growth as previously described. Figures 6-6 and 6-7 present the 2010 No-Build condition traffic volume networks for the morning and evening peak hours.

6.3.2 2010 Build Condition

The Arboretum proposes to construct a Research and Administration Building on the Weld Hill parcel. This site is currently undeveloped. A gravel drive traverses the site from Walter Street near the northern edge of the parcel and ends at the top of Weld Hill. The proposed Research and Administration Building will be supported by the following access amenities:

- The facility's main entrance will be via a single curb cut along Centre Street near the parcel's border with the adjacent Hebrew SeniorLife. The driveway will provide all public vehicle access to the site via a two-way unsignalized driveway that will be located opposite Shrewsbury Road and at an existing break in the raised median along Centre Street. This median may need to be cut back slightly to accommodate the proposed driveway location. The driveway will be paved with pervious pavement from Centre Street to the proposed emergency egress on Weld Street. A sidewalk from Centre Street to the proposed building will be constructed.

- The project will create a new emergency access/egress on Centre Street just north of Weld Street. This emergency driveway will serve only as an emergency-vehicle entry/exit, pedestrian access, and delivery vehicle egress.

- The project also plans to maintain the existing gravel drive that traverses the site from the Walter Street/Bussey Street intersection to the summit of the hill. This drive will remain in its current alignment. A portion of this drive will be upgraded and paved with pervious pavement for delivery vehicles to access the loading dock and for emergency vehicles to access the rear of the building. In addition, the portion of the drive from the rear of the building to the emergency egress on Centre Street will be paved (with pervious pavement), per Boston Fire Department request. Since service to the loading dock will be infrequent, use by service vehicles will not conflict with its continuing use as a major pedestrian path through the site. The entrance to this path on Walter Street will continue to be used by both pedestrians and Arboretum vehicles required for work in the nursery.

- The facility will be supported by approximately 50 surface spaces onsite. The greenhouse portion of the facility will be serviced from the rear of the building with vehicle access and egress via Centre Street. Figure 5-1 provides a site plan of the proposed Research and Administration Building project.

6.3.2.1 Project-Generated Trips and Mode Split

The trip generation estimate for the Research and Administration Building was determined using the Institute of Transportation Engineers (ITE) trip rates for Research and Development (Land Use Code 760). Person trip generation is provided in Appendix B.

Mode splits, to account for alternative modes of transportation, were applied to the trip generation results. The auto mode split includes all vehicle-based trips including taxis. Mode splits for the Arboretum are based on the existing mode share of employees at the Arboretum. The mode share summary is shown in Table 6-3 below.

Table 6-3: Mode Shares

Mode	Percent
Automobile	81%
Transit	11%
Walk/Bike/Other	8%
Total	100%

Source: Arnold Arboretum of Harvard University

Results of the vehicle trip generation estimate are provided in Table 6-4.

Table 6-4: Net-new Vehicle Trips per Land Use Category

	Net New Vehicle Trips
Morning Peak Hour	
In	38
Out	8
Total	46
Evening Peak Hour	
In	6
Out	31
Total	37
Weekday Daily	
In	148
Out	148
Total	296

As shown in Table 6-4, the Research and Administration Building project is expected to generate approximately 46 new vehicle trips (38 in, 8 out) during the weekday morning peak hour, and 37 new vehicle trips (6 in, 31 out) during the weekday evening peak hour.

While the transportation analysis assumes these trips to all be new trips, these trips are not all new to the study area as eleven employees currently working at the Hunnewell Building will be relocated to the new building.

6.3.2.2 Transit and Pedestrian Trip Generation

Daily and peak hour person-trip estimates were multiplied by the transit and pedestrian mode shares to determine the transit and pedestrian trip estimate. Table 6-5 provides a summary of the project's transit and pedestrian trip estimate.

Table 6-5: Transit and Pedestrian Trip Generation

	Transit Trips	Pedestrian/ Bike Trips
Morning Peak Hour		
In	6	4
Out	1	1
Total	7	5
Evening Peak Hour		
In	1	1
Out	5	3
Total	6	4
Weekday Daily		
In	22	16
Out	22	16
Total	44	32

6.3.2.3 Trip Distribution

The distribution of site-generated traffic was determined as a function of population densities, potential travel behavior of the occupants and potential visitors at the proposed site, existing travel patterns, and the efficiency of the roadways leading to the site. Specifically, the Central Transportation Planning Staff (CTPS)/ BTD trip distribution data for Area 19 (West Roxbury) was utilized to calculate the trip distribution patterns for the 2010 Build condition. Using the Area 19 guidelines, vehicle origins were assigned to the study area based on the shortest travel routes to the project site. Table 6-6 presents the anticipated local trip distribution patterns for the proposed project.

Table 6-6: Trip Distribution

Origin Travel Route	Percentage of Site Traffic Assigned to Route*
VFW Parkway from/to West/East	38%
Arborway from/to North/South	30%
Bussey Street from/to East/West	9%
Walter Street from/to South/North	7%
Centre Street from/to South/North	10%
Weld Street from/to West/East	6%
Total	**100%**

Source: CTPS/BTD Trip Distribution Data set for Area 19

Since exiting vehicles are not able to make a left turn to VFW Parkway from Centre Street, it was assumed that a portion of these vehicles will travel to Walter Street and make a u-turn or access VFW Parkway via Weld Street.

6.3.2.4 2010 Build Condition

The project-generated traffic volumes are assigned to the study area roadways according to the trip distribution and travel patterns presented previously in Table 6-6. Resulting project-generated trips are shown graphically in Figures 6-8 and 6-9. Project-generated traffic and the effects of anticipated diverted traffic were then combined with the 2010 No-Build traffic volumes to develop the 2010 Build traffic volumes. The resulting 2010 Build condition morning and evening peak hour traffic volumes are presented in Figures 6-10 and 6-11.

6.3.2.5 Traffic Volume Increases

Table 6-7 provides a comparison of the 2004 Existing, projected 2010 No-Build, and projected 2010 Build condition traffic volumes. As indicated by a comparison of the No-Build and Build traffic volumes, the proposed development is expected to increase two-way traffic volumes by less than 2 percent during the peak hours.

Table 6-7: Peak Hour Traffic Volume (Vehicles per hour) Increases

Street Location	Peak Hour	2004 Existing	2010 No-Build	2010 Build	Percent Change
Walter Street (South)	Morning	1143	1213	1215	no change
	Evening	1193	1265	1267	no change
Walter Street (North)	Morning	1182	1255	1257	no change
	Evening	1251	1328	1329	no change
Centre Street (North)	Morning	2570	2728	2746	6%
	Evening	2542	2699	2726	1%
Centre Street (South)	Morning	1171	1242	1256	1%
	Evening	1143	1214	1217	no change
Weld Street	Morning	223	237	242	2%
	Evening	312	331	334	1%

6.3.3 Public Transportation

As previously described, and based on estimated travel characteristics, approximately 11 percent of the employees and building visitors will use public transportation.

In total, the project is expected to generate seven public transportation trips during the morning peak hour and six public transportation trips during the evening peak hour. The MBTA operates the rapid transit rail lines and bus system that serve the general vicinity of the project site. Figure 6-5 presents the official MBTA public transit map for the area. The additional riders, less than one additional rider every ten minutes, are anticipated to have a negligible effect on operations.

6.3.4 Weld Hill Pedestrian and Bicycle Conditions

With the Research and Administration Building project, pedestrian access and egress to the site will be provided from Walter Street, Centre Street, and Weld Street. Two-to three new pedestrian entrances and pathways will be created:

- A new pedestrian entry and sidewalk from Centre Street to the Research and Administration building along the new main entry drive will create pedestrian access to the building and parking area. Pedestrian-scale pole lighting and wall lighting will be located along the sidewalk from Centre Street and provide a safe route for pedestrians. Pedestrians will be able to traverse the Weld Hill site by entering on the new sidewalk from Centre Street and connecting to the existing path that extends to the Walter Street entry; and
- Additional pedestrian access is provided from Centre Street through the new emergency-vehicle driveway.
- A new pedestrian entrance will be added on Walter Street, near the intersection of Walter Street and Weld Street (pending consultation with relevant City agencies and the Massachusetts Historical Commission, as the stone wall is a historic resource).

If permitted by the City, the Arboretum will develop plans to improve the perimeter of the Weld Hill parcel by asphalt surfacing of the dirt Weld Street sidewalk adjacent to the site, installing a pedestrian crosswalk at the intersection of Walter and Bussey streets, and asphalt surfacing of the dirt sidewalk on the east side of Walter Street, between Centre Street and the point near the Walter Street gate where the existing paved sidewalk begins. The design of these improvements will require consultation with and approval from relevant agencies at the City of Boston; therefore, the exact nature and timing of such improvements cannot be determined at this time.

Bicycle racks will be installed on-site in a sheltered location. These racks will be available to employees and visitors to the building.

6.3.5 Parking and Loading

The Arnold Arboretum currently provides parking at each of its facilities for staff, individuals conducting business on-site, and students.

Approximately 50 parking spaces will be provided on the Weld Hill parcel for the Research and Administration Building. This parking will prevent on-street parking where it could interrupt vehicle operations as well as pedestrians and cyclists in the neighborhood.

All loading will be accommodated internally to the site. Daily deliveries and trash pick-up will access the site from the main driveway on Centre Street. Greenhouse- related vehicles will then circulate to the designated loading area at the rear of the building.

6.4 Intersection Level of Service Operations

Consistent with BTD guidelines, Synchro 5 software was used to analyze level of service (LOS) operations at the study area intersections. LOS is the term used to denote the different operating conditions that occur on a given roadway segment under various traffic volume loads. It is a qualitative measure that considers a number of factors including roadway geometry, speed, travel delay, freedom to maneuver, and safety. LOS provides an index to the operational qualities of a roadway segment or an 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 LOS designation is analyzed differently for signalized and unsignalized intersections. For signalized intersections, the analysis considers the operation of all traffic entering the intersection and the LOS designation is for overall conditions at the intersection, as well as for each individual approach. For unsignalized intersections, however, the analysis assumes that traffic on the mainline is not affected by traffic on the side streets. Thus, the LOS designation is for the critical movement exiting the side street, which is generally the left-turn out of the side street. The evaluation criteria used to analyze area intersections and roadways are based on the 2000 Highway Capacity Manual (HCM).

Adjustments were made to the Synchro model to include heavy vehicles, bus blockages, and pedestrian crossings.

Tables 6-8 and 6-9 provide detailed results from the Synchro model. These results include LOS for each of the analysis conditions: Existing (2004), No-Build (2010) and Build (2010) conditions. Detailed tables and Synchro reports are provided in Appendix B.

Table 6-8: Intersection LOS Summary (AM Peak Hour)

Intersection	Signalized/ Unsignalized	2004 Existing	2010 No Build	2010 Build
Centre Street / Weld Street	Signalized	**B**	**B**	**B**
Eastbound left/thru/right		C	C	C
Westbound left/thru/right		C	C	C
Northbound left/thru/right		B	B	B
Southbound left/thru/right		A	B	B
Centre Street / VFW Parkway	Signalized	**B**	**B**	**B**
Eastbound left/right		C	C	C
Northbound thru		B	C	C
Southbound thru		B	B	B
Southbound right		A	A	A
Walter Street / Bussey Street	Unsignalized	N/A	N/A	N/A
Westbound left/right		F	F	F
Northbound thru/right		A	A	A
Southbound left/thru		A	A	A
Walter Street / Weld Street	Unsignalized	N/A	N/A	N/A
Eastbound left/right		E	F	F
Northbound left/thru		A	A	A
Southbound thru/right		A	A	A
Centre Street/New Driveway	Unsignalized	---	---	N/A
Eastbound thru/right		---	---	A
Westbound left/thru		---	---	A
Northbound left/right		----	---	C

N/A – overall LOS not available for unsignalized intersections.

Table 6-9: Intersection LOS Summary (PM Peak Hour)

Intersection	Signalized/ Unsignalized	2004 Existing	2010 No Build	2010 Build
Centre Street / Weld Street	Signalized	B	B	B
Eastbound left/thru/right		A	B	B
Westbound left/thru/right		B	B	B
Northbound left/thru/right		B	B	B
Southbound left/thru/right		B	B	B
Centre Street / VFW Parkway	Signalized	B	B	B
Eastbound left/right		B	B	B
Northbound thru		B	B	B
Southbound thru		B	B	B
Southbound right		A	A	A
Walter Street / Bussey Street	Unsignalized	N/A	N/A	N/A
Westbound left/right		F	F	F
Northbound thru/right		A	A	A
Southbound left/thru		A	A	A
Walter Street / Weld Street	Unsignalized	N/A	N/A	N/A
Eastbound left/right		D	E	E
Northbound left/thru		A	A	A
Southbound thru/right		A	A	A
Centre Street/New Driveway	Unsignalized	Closed	Closed	N/A
Eastbound thru/right		-	-	A
Westbound left/thru		-	-	A
Northbound left/right		-	-	B

N/A – overall LOS not available for unsignalized intersections.

Under existing conditions, the unsignalized intersections of Weld Street and Bussey Street with Walter Street show significant delay for vehicles stopped on the minor street approach. This delay is due to heavy vehicle volumes on Walter Street during peak commuter periods. In the AM peak hour, traffic is heaviest for the northbound movement on Walter Street to Centre Street. In the PM peak hour, this pattern is reversed with the heavy movement southbound.

The signalized intersections of Weld Street and the VFW Parkway with Centre Street operate under acceptable conditions during the peak hours. These intersections have adequate capacity and operate with minimal average vehicle delay.

Under No-Build conditions, the eastbound left turn from Walter Street to Weld Street is expected to drop to a LOS E during the PM peak hour. This drop is a result of an additional nine seconds in delay for turning vehicles.

The northbound approach on Centre Street at the intersection of VFW Parkway currently queues to the first median break south of VFW Parkway during the morning peak hour. Field observations verified that the 50th percentile queue in Synchro (approximately 8 vehicles) is the average queue on the approach. The 95th percentile queue, 13 vehicles, reported in Synchro was not observed in the field. The proposed driveway may at times be blocked by vehicles queued on the northbound approach under Build conditions during the morning peak hour. However, because the traffic signals on Centre Street at VFW Parkway and at Weld Street create prolonged gaps in traffic, there is adequate time for vehicles to exit the proposed driveway location without impact to traffic on Centre Street or without significant delays.

The traffic model suggests that the proposed site driveway will operate at LOS C and LOS B during the AM peak and PM peak, respectively, under the 2010 Build condition. It is expected that the proposed Research and Administration Building will result in no noticeable change to area intersection operations during the morning and evening peak commuter hours.

6.5 Transportation Improvements and Enhancements

6.5.1 Project Improvements

This section describes the transportation improvements and enhancement plan being proposed to support planned improvements at the Research and Administration Building. The purpose of this transportation improvement plan is to help alleviate transportation impacts generated by the proposed project and provide transportation infrastructure enhancements to the surrounding area.

This transportation improvement plan includes several elements:

- Intersection safety improvements;
- Parking management strategies;
- Transportation demand management enhancements;
- Pedestrian access and open space improvements; and
- Construction management.

Table 6-10 lists each transportation improvement element that is proposed and a summary of the purpose and benefit of that action.

Table 6-10: Arboretum Transportation Improvements and Enhancements

	Improvement Element	Description	Purpose/Benefit
1	New Driveway	*New Centre Street/Site Driveway :* Modify existing entrance, including new driveway curbcut and modification of raised median in Centre Street, modification of sidewalk to provide handicapped ramps, pavement markings, and signage.	Will provide for increased safety and improved sightlines for both motorists and pedestrians at this driveway location.
2	On-Site Parking	Provide 50 parking spaces on the Weld Hill parcel as part of the Research and Administration Building.	Minimizes potential for parking demand to be accommodated on existing streets in the area.
3	Pedestrian Access Improvements	Provide improved pedestrian access to and through the Weld Hill parcel. If permitted by the City, improve Weld Street sidewalk adjacent to site with paving, install a pedestrian crosswalk at the intersection of Walter and Bussey streets, and pave the unpaved portion of sidewalk on Walter Street (north side, west of Walter Street gate)	Will improve pedestrian connections in the area.
4	Transportation Demand Management Actions	Continue to provide a wide array of TDM programs and amenities that seek to encourage the use of transit as a regular means of commuting.	Will encourage shift in mode share from auto to transit.
5	Bicycle Parking	Provide bicycle racks, showers, and lockers on-site as part of the project	Will encourage shift in mode share from auto to bicycle.
6	Prepare Construction Management Plan	Prepare and submit detailed Construction Management Plan.	Will minimize construction impacts.

6.5.3 Transportation Demand Management

Harvard proactively supports many efforts to reduce single occupancy vehicle travel, offering information and incentives to its faculty, staff, and students to facilitate their use of alternative forms of transportation. These efforts include the following:

- Providing discounted transit passes for faculty and staff. In addition to pre-tax payroll deductions, Harvard subsidizes transit passes by 40 percent;
- Providing on-site bicycle racks for staff in sheltered areas and shower facilities;
- Limiting on-site parking to discourage employees from driving to work; and
- Promoting alternative transportation through a variety of employee newsletters, information kiosks, websites, e-mail, and special events including employee orientations.

6.5.4 Construction Management Plan

The Arboretum will prepare and submit a Construction Management Plan (CMP) for review by the BTD and other City of Boston agencies as appropriate. The forthcoming CMP is anticipated to include the following elements:

- Vehicular access to the project site during the construction period will be from Centre Street;
- The construction site will be maintained on private property and will likely not require long-term roadway and/or sidewalk occupancies (other than for utilities connections, the reconstruction of new driveways and sidewalks, lighting, and street furniture);
- Construction worker parking will be provided on-site, thereby eliminating the need for construction worker parking elsewhere in the area; and
- A majority of staging areas for construction are anticipated to be located directly on the site.

Source: Vanasse Hangen Brustlin, Inc.

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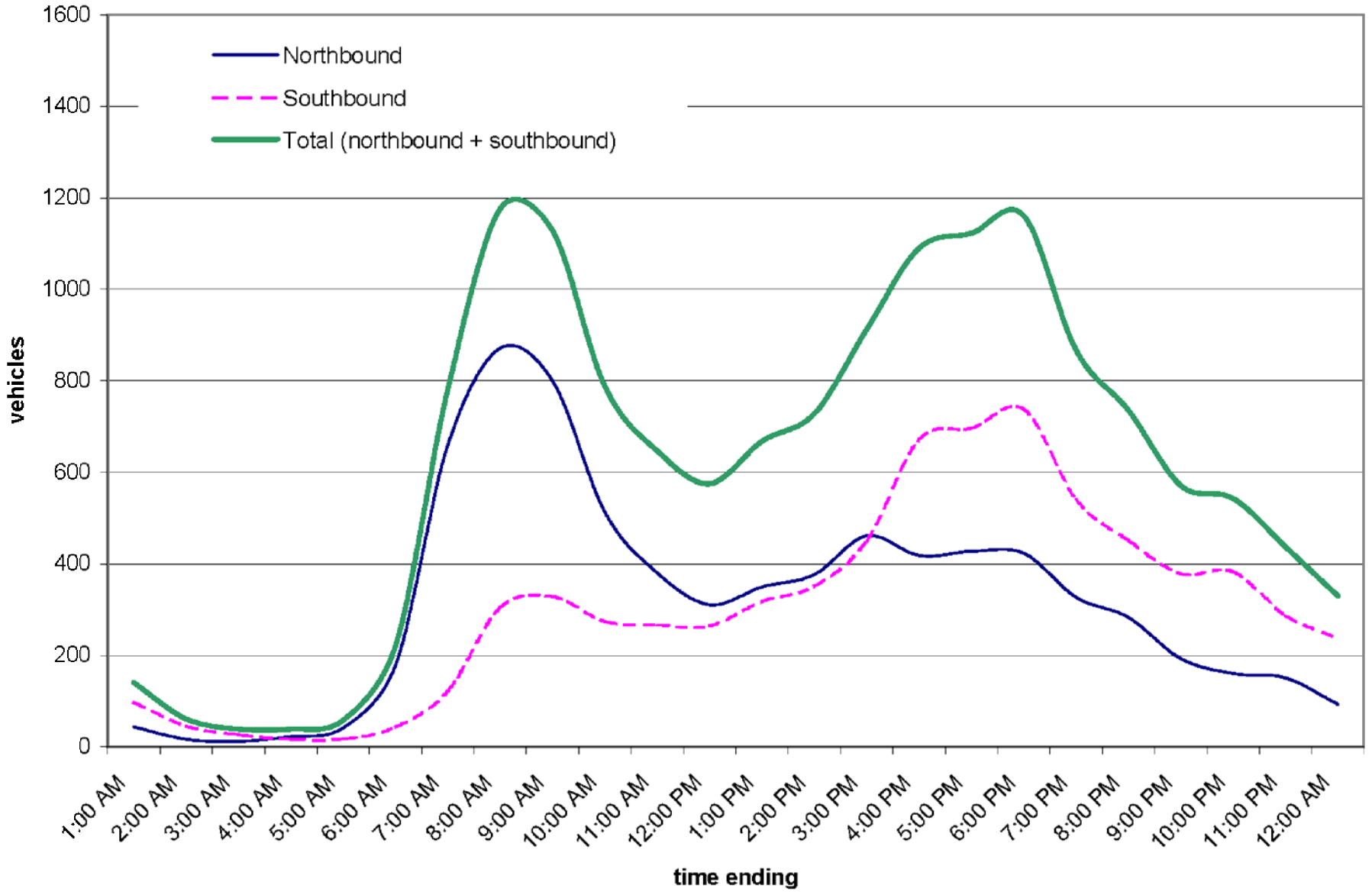
Figure 6-1
Study Area Intersections



Source: Vanasse Hangen Brustlin, Inc.

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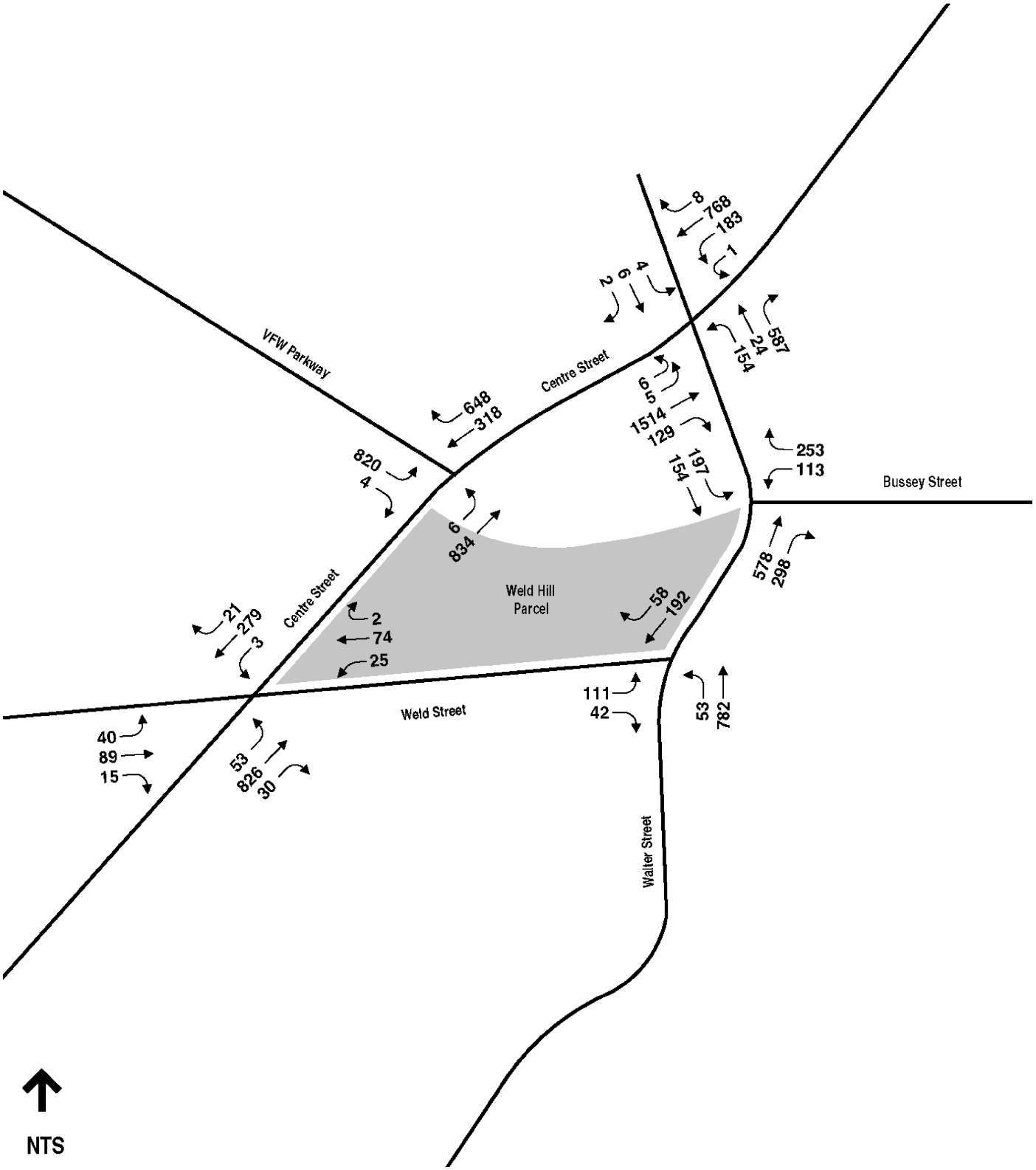
Figure 6-2
Average Daily Traffic Volumes
Walter Street June 2004



Source: Vanasse Hangen Brustlin, Inc.

Epsilon Associates Inc.

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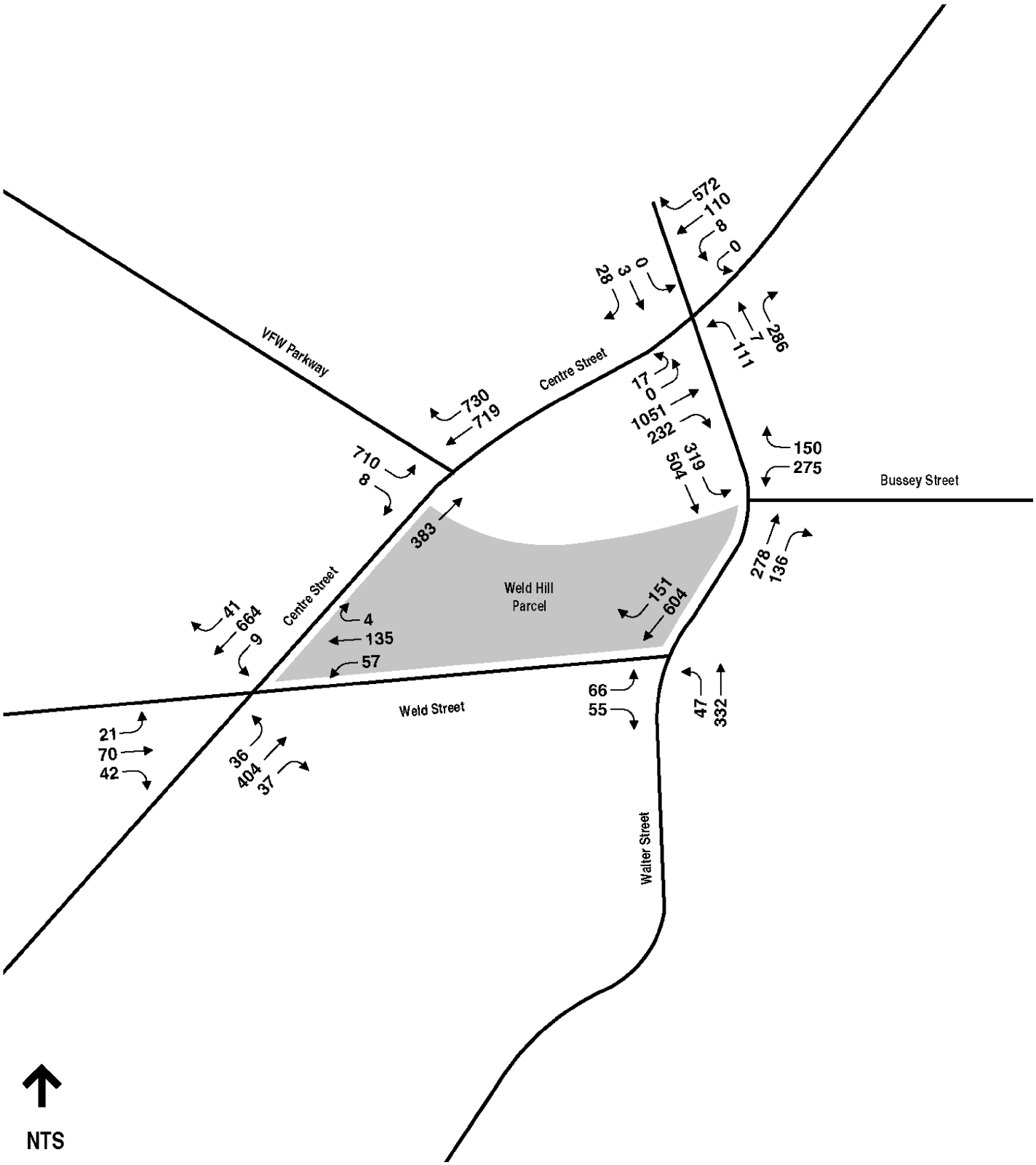
Figure 6-3
Existing (2004) Traffic Volumes
AM Peak Hour



Source: Vanasse Hangen Brustlin, Inc.

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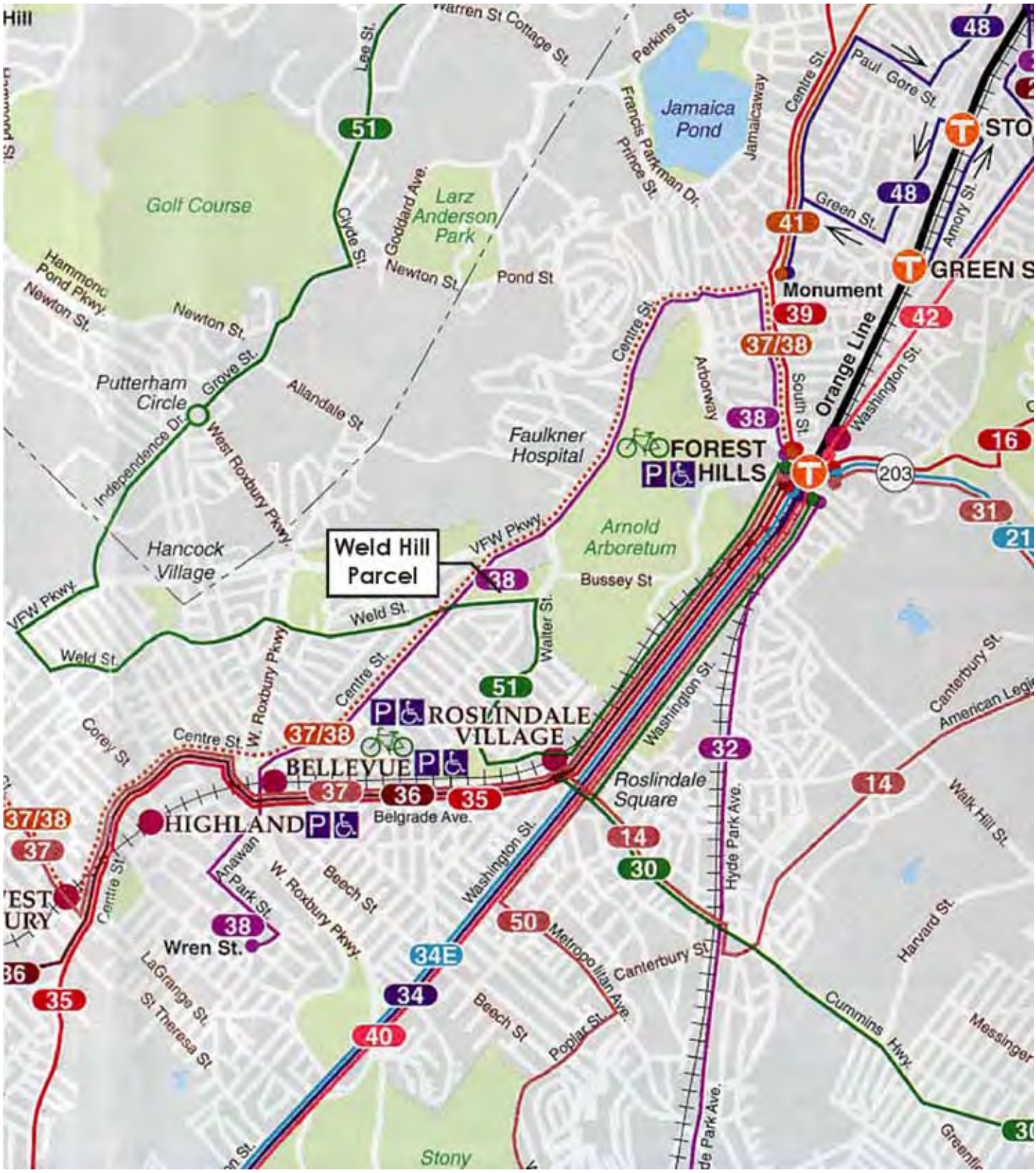
Figure 6-4
Existing (2004) Traffic Volumes
PM Peak Hour


Weld Hill Parcel
Golf Course
Larz Anderson Park
Jamaica Pond
Arnold Arboretum
Faulkner Hospital
Hancock Village
Putterham Circle
Monument
FOREST HILLS
ROSLINDALE VILLAGE
BELLEVUE
HIGHLAND
Roslindale Square
Belgrade Ave.
Wren St.
Stony
Orange Line
Lee St.
Clyde St.
Goddard Ave.
Newton St.
Pond St
Grove St.
Allandale St
Independence Dr.
West Roxbury Pkwy.
VFW Pkwy.
Weld St.
Bussey St
Walter St.
Centre St.
Corey St
Anawan Park St.
Beech St
LaGrange St.
St Theresa St
Arborway
South St.
Washington St.
Hyde Park Ave.
Canterbury St.
Metropolitan Ave.
Poplar St.
Cummins Hwy.
Harvard St.
Walk Hill St.
Messinger
Perkins St.
Francis Parkman Dr.
Prince St.
Jamaicaway
Paul Gore St.
Green St.
Amory St.
Washington St.
Warren St Cottage St.
Hammond Pond Pkwy.
51
48
41
39
37/38
38
42
16
203
31
21
32
14
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34E
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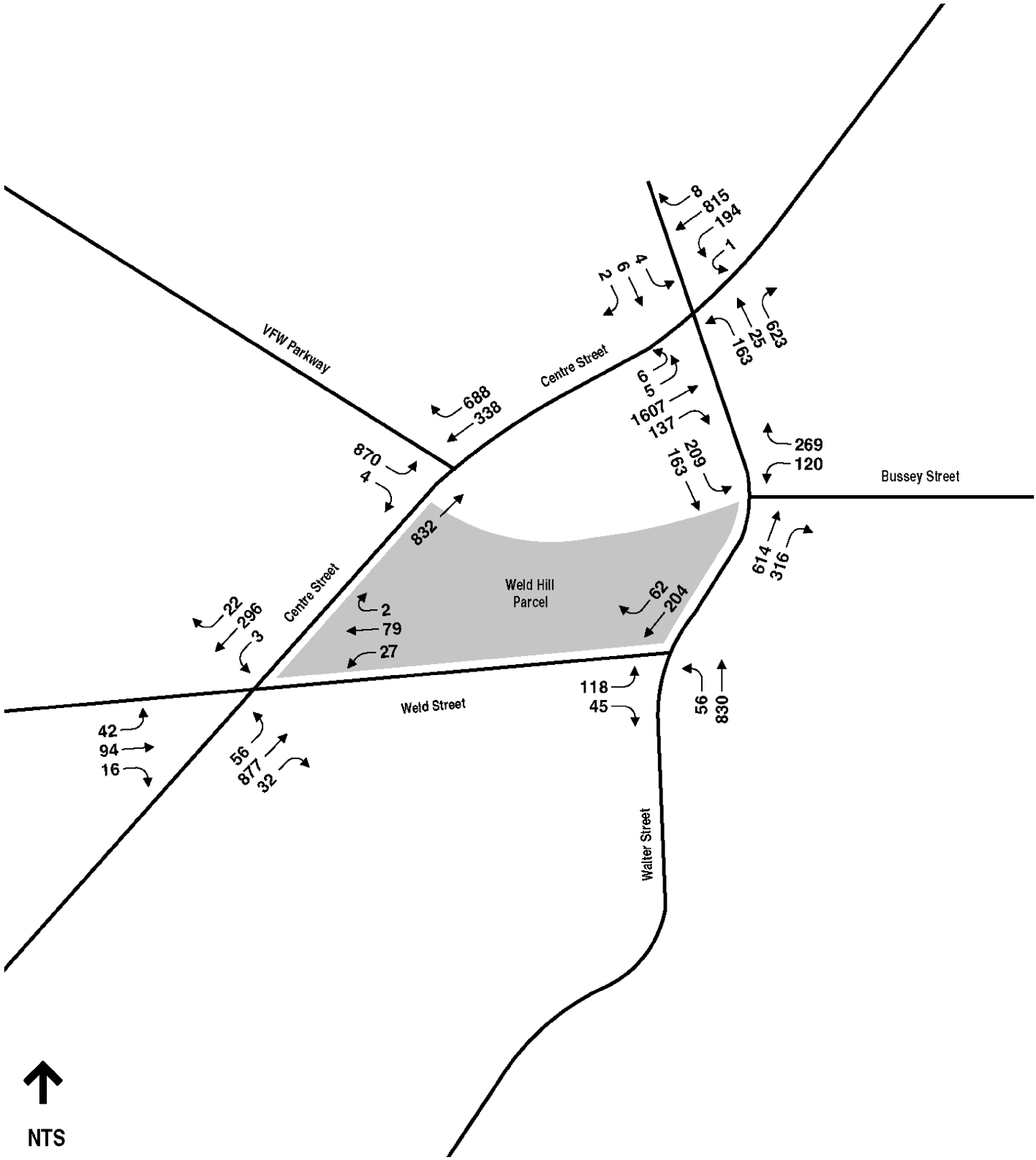
35
37

Source: MBTA



Source: Vanasse Hangen Brustlin, Inc.

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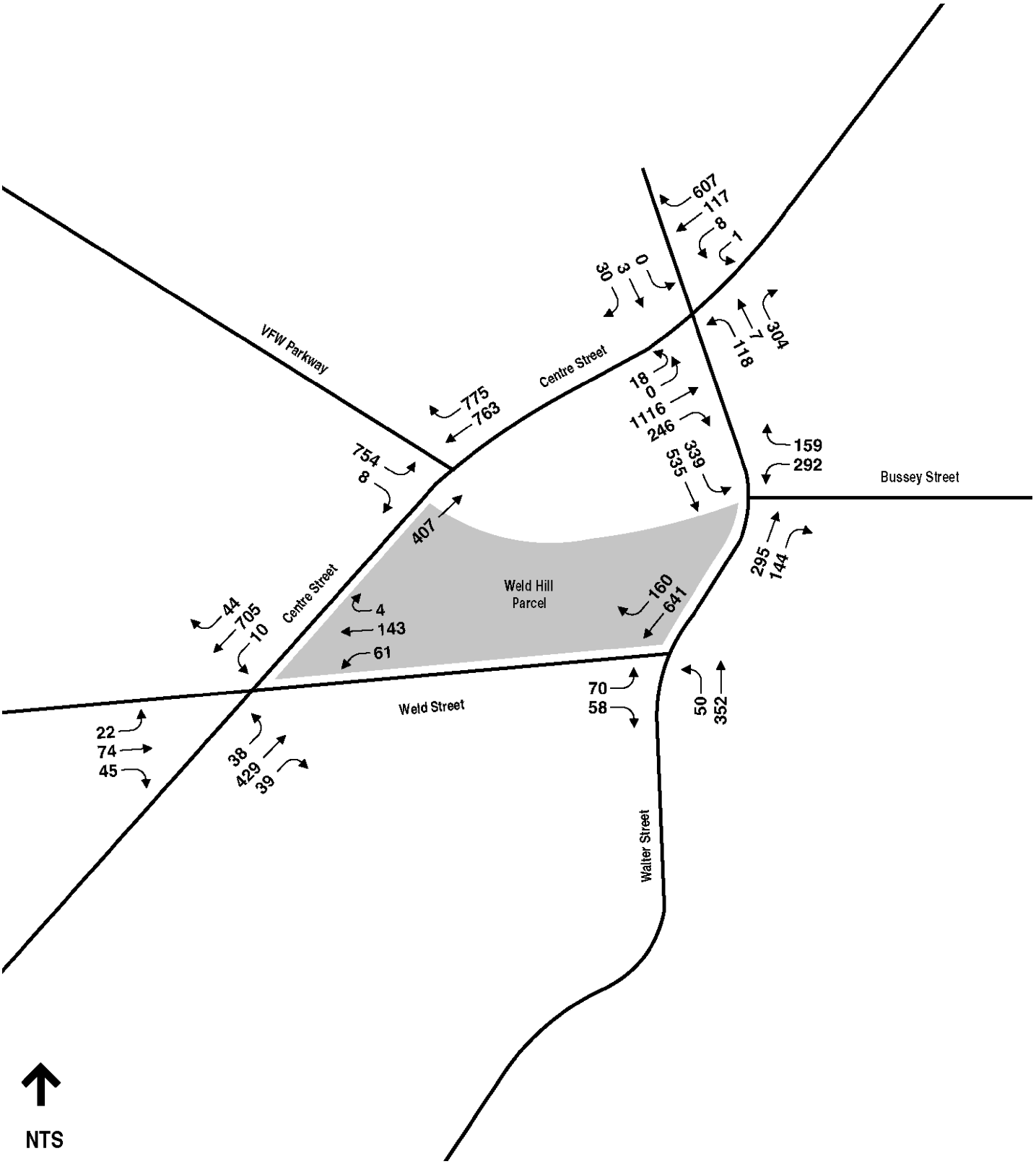
Figure 6-6
No-Build (2010) Traffic Volumes
AM Peak Hour



Source: Vanasse Hangen Brustlin, Inc.

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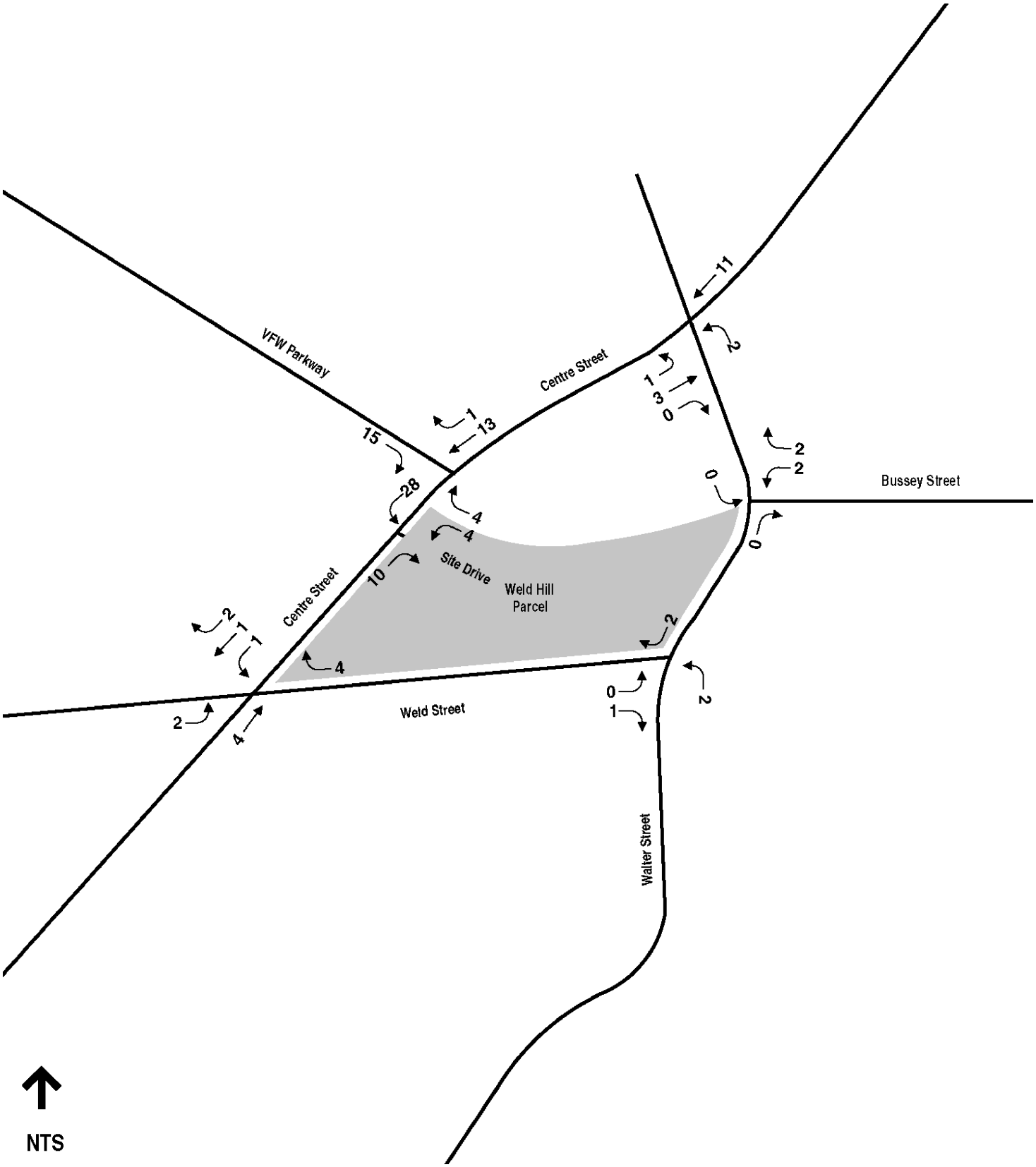
Figure 6-7
No-Build (2010) Traffic Volumes
PM Peak Hour



Source: Vanasse Hangen Brustlin, Inc.

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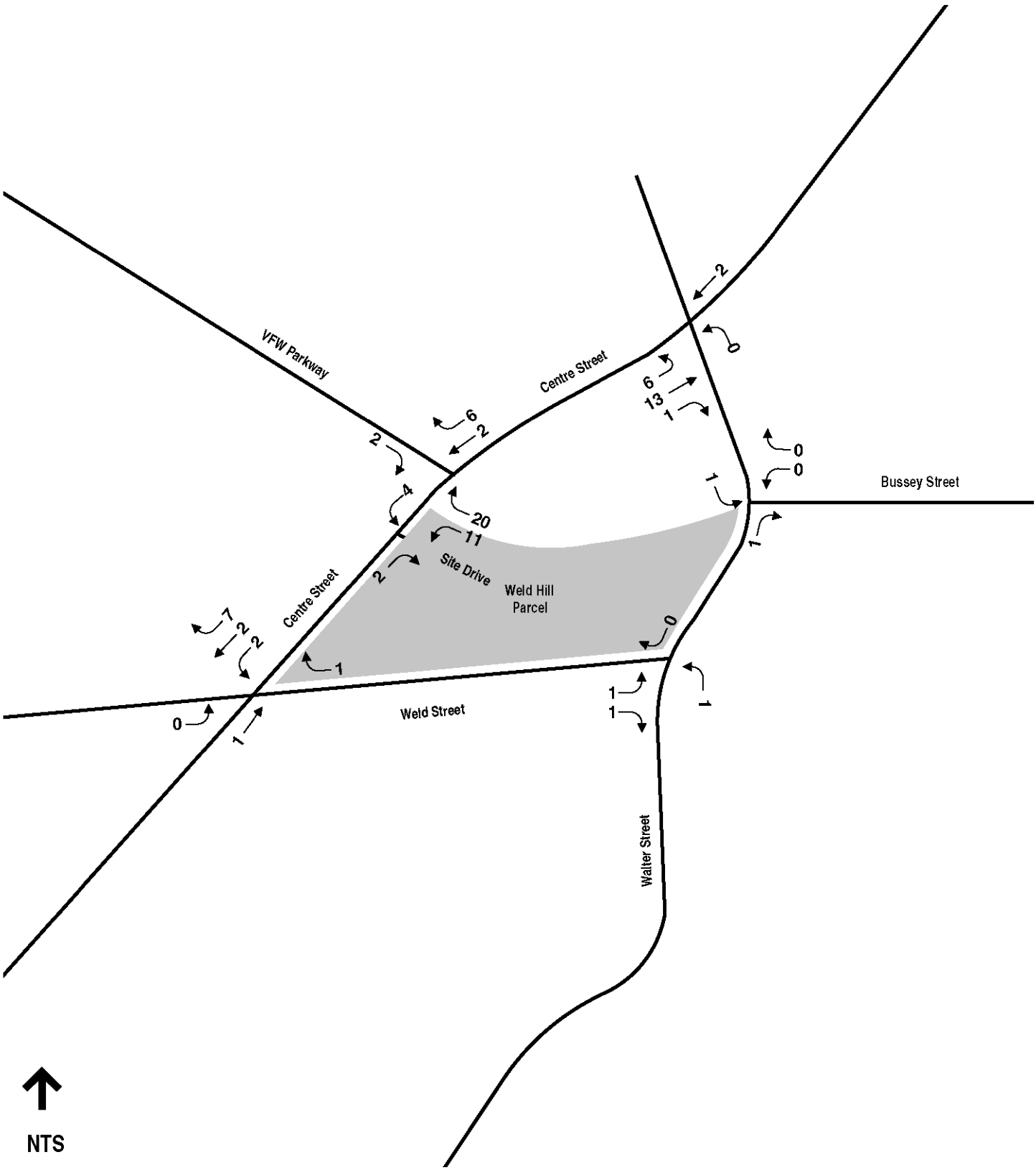
Figure 6-8
Project Generated Trips
AM Peak Hour



Source: Vanasse Hangen Brustlin, Inc.

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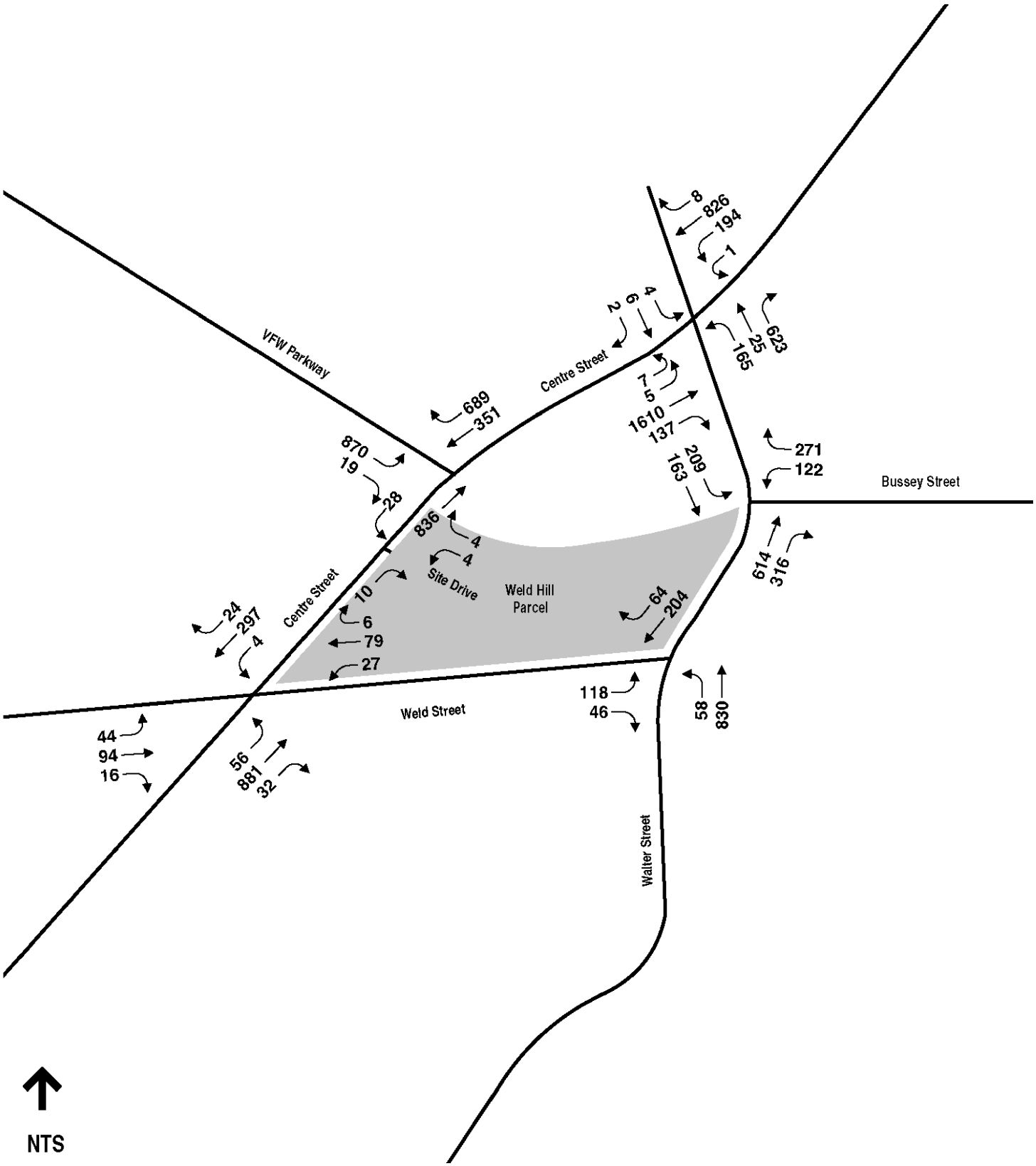
Figure 6-9
Project Generated Trips
PM Peak Hour



Source: Vanasse Hangen Brustlin, Inc.

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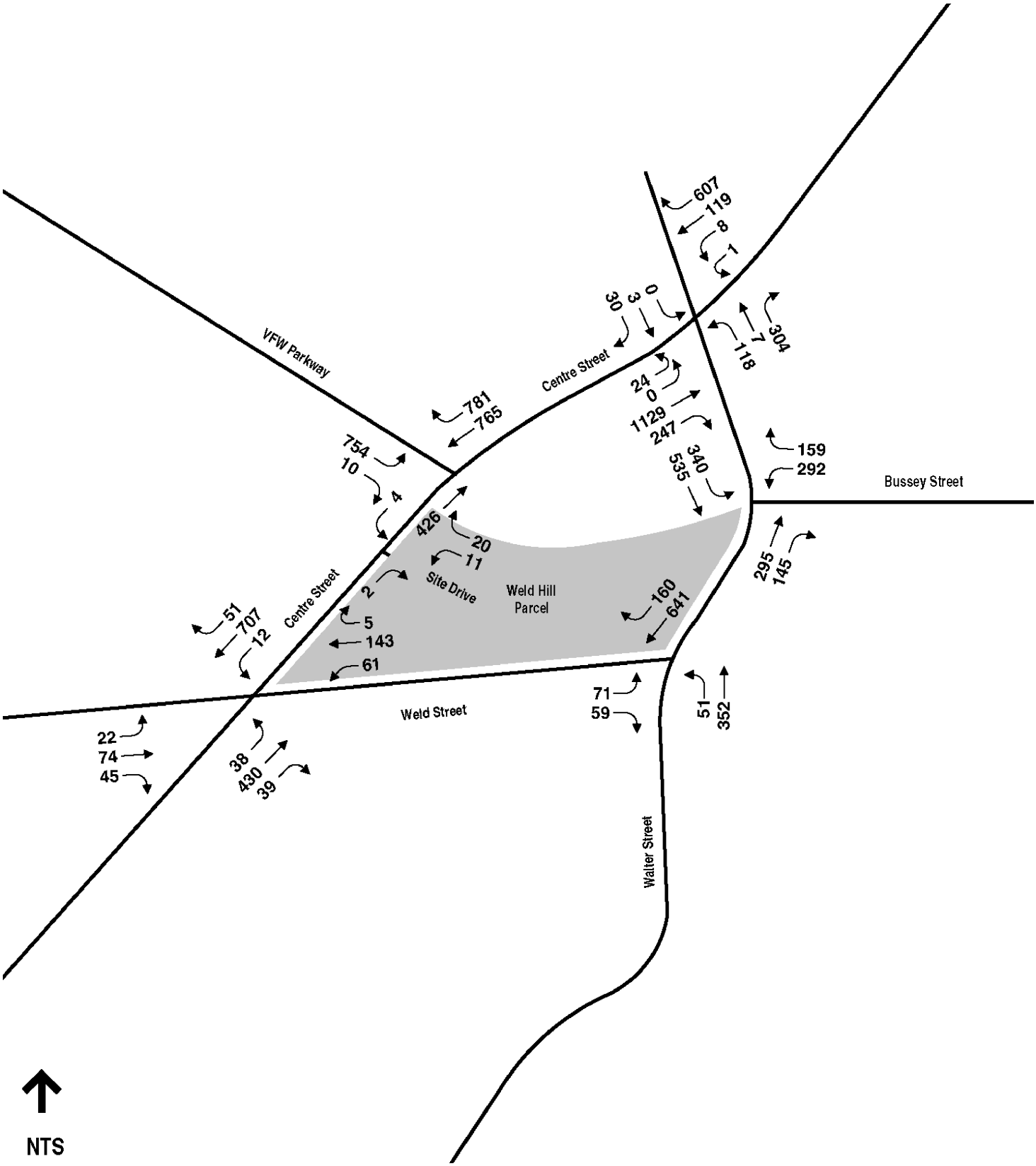
Figure 6-10
Build (2010) Traffic Volumes
AM Peak Hour



Source: Vanasse Hangen Brustlin, Inc.

Epsilon Associates Inc.

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Figure 6-11
Build (2010) Traffic Volumes
PM Peak Hour

7.0 CULTURAL RESOURCES

7.1 Introduction

The following sections describe cultural resources in the Arnold Arboretum and its vicinity and generally discuss potential impacts on cultural resources from the proposed Arboretum project. A Cultural Resources Management Plan (CRMP) for the Arboretum has been submitted for information purposes to the Massachusetts Historical Commission (MHC) and Boston Landmarks Commission (BLC).

7.2 Historic Resources in the Vicinity of the Arnold Arboretum

The Arnold Arboretum is listed in the State and National Registers of Historic Places. It is also designated a National Historic Landmark, one of only 2,500 in the nation. Properties listed in the National Register of Historic Places are those properties of local, state, or national significance designated by the Department of the Interior through the State Historic Preservation Office. The National Register of Historic Places is maintained by the National Park Service. National Historic Landmarks are nationally significant historic places designated by the Secretary of the Interior because they possess exceptional value or quality in illustrating or interpreting the heritage of the United States.

Properties listed in the State Register include resources listed in the National Register of Historic Places, National Historic Landmarks, Local and Massachusetts Landmarks, properties under a Preservation Restriction, and Local Historic Districts. Massachusetts Landmarks are those resources designated by the Massachusetts Historical Commission. They are subject to the Standards for the Care and Management of Certified Historic Landmarks, which are recorded with the property's deed. Properties under a Preservation Restriction are so designated under MGL Chapter 184, section 31-33, to preserve those characteristics of a property which contribute to the architectural, archaeological, and historical integrity of the property. In the City of Boston, Local Landmarks are those resources that have been designated by the BLC as having historic, social, cultural, architectural or aesthetic significance to the City. Alterations to Boston Landmarks are regulated by the BLC.

Twelve other historic resources listed in the State and National Registers of Historic Places are in the vicinity of the Arnold Arboretum. Properties listed on the State and National Registers in the study area (within a half-mile radius of the Arboretum) include:

- Arnold Arboretum;
- Arborway;
- The Adams Nervine Asylum;
- Jamaica Pond;
- Monument Square Historic District;

- Sumner Hill Historic District;
- Loring-Greenough House;
- Woodbourne Historic District;
- Roslindale Congregational Church;
- Roslindale Baptist Church;
- VFW Parkway;
- Brandegee Estate;
- District 13 Police Station and Municipal Court; and
- Forest Hills Cemetery.

In addition, multiple properties and areas located in the vicinity of the Arboretum are included in the Inventory of Historic and Archaeological Assets of the Commonwealth (Inventory). The Massachusetts Historical Commission created and maintains the Inventory by systematically identifying and cataloging the historic and archaeological resources within the Commonwealth. The inventory serves as the State's primary record of information on historic resources.

The name and address of properties within a half-mile radius of Arboretum that are listed in the State and National Registers of Historic Places or that are included in the Inventory are listed below in Table 7-1, and their locations are shown in Figure 7-1. Appendix C includes descriptions of properties, based on information included in National Register nominations and Inventory forms.

7.3 Historic Resources in the Arnold Arboretum

Established by Harvard in 1872, the design of the Arboretum is a result of the collaboration of landscape architect Frederick Law Olmsted and the first Arboretum director, Charles Sprague Sargent, and it was constructed in partnership with the City of Boston. Today, the Arboretum preserves one of Olmsted's most significant landscapes and the only extant Olmsted-designed arboretum. The boundaries of the Olmsted/Sargent-designed landscape and the boundaries of the National Historic Landmark designation are depicted in Figure 7-2.

A brief summary of the historical significance of the Arboretum and its character-defining features is provided below; additional historical information on the Arboretum is provided within the CRMP submitted to MHC and BLC for information purposes. The history of the Arboretum is described in detail by Ida Hay in her book, *Science in the Pleasure Ground: A History of the Arnold Arboretum* (1995).

Table 7-1: Historic Resources Within or in the Vicinity (half-mile radius) of the Arnold Arboretum

State and National Register-listed			
Map	**Name (as listed in the Registers)**	**Address**	**Designation***
A	Arnold Arboretum	The Arborway	NHL, NR, SR
B	The Arborway	The Arborway	NR, SR
C	The Adams Nervine Asylum	990-1020 Centre Street	NR, SR
D	Jamaica Pond [also known as Jamaica Park]	The Jamaicaway	NR, SR
E	Monument Square Historic District	Jamaicaway, Pond, Centre and Eliot Streets	NR, SR
F	Sumner Hill Historic District	Seaverns and Carolina Avenues, Everett and Newbern Streets	NR,SR
G	Loring-Greenough House	12 South Street	NR, SR, MAL, PR, LL
H	Woodbourne Historic District	Wachusett, Walk Hill Goodway	NR, SR
I	Roslindale Congregational Church	25 Cummins Highway	NR, SR
J	Roslindale Baptist Church	52 Cummins Highway	NR, SR
K	VFW Parkway	VFW Parkway	NR, SR
L	Brandegee Estate	165 Allandale Street	NR, SR
M	District 13 Police Station and Municipal Court	28 Seaverns Avenue	NR, SR
N	Forest Hills Cemetery	95 Forest Hills Avenue	NR, SR
Included in the Inventory of Historic and Archaeological Assets of the Commonwealth			
Map	**Name (as listed in the Inventory)**	**Address**	
1	Isabella M. Carter House	61 Arborway	
2	Mary A. Cronin Double House	278 Arborway	
3	William G. Gilmore House	356 Arborway	
4	Thomas Downey House	362 Arborway	
5	West Roxbury District Courthouse	445 Arborway	
6	Swedish Congregational Church	455 Arborway	
7	Bussey Institution – State Biological Laboratory	375 South Street	
8	Stephen Minot Weld House	800 Centre Street	
9	Samuel J. McDougall Three Decker	801 Centre Street	
10	Emil F. Nolte House	803 Centre Street	
11	William Lovering House	812-814 Centre Street	
12	Charles H. Smith House and Carriage House	960 Centre Street	
13	John J. Dixwell House	991 Centre Street	
14	John J. Dixwell House	1011 Centre Street	
15	A.J. Cross House and Stable	1051 Centre Street	
16	A. Seaverns House	22 Orchard Street	
17	Dr. Benjamin Wing House	45 Orchard Street	
18	Dr. Benjamin Wing House	57 Orchard Street	
19	Elizabeth G. Rice Stable	37 Pond Circle	
20	Frances Tomasello House	230 Pond Street	
21	Stephen Heath House	242 Pond Street	
22	Ebenezer Murray House	258/85 May Street	
23	Benjamin May House	63 May Street	
24	Benjamin R. Nichols House	180 Moss Hill Road	
25	Alfred Bowditch House	32 Woodland Street	
26	Catherine Broderick – Adelbert Durkee House	48 Goldsmith Street	
27	Joseph P. Cleve House	15 Custer Street	

* NHL – National Historic Landmark
NR – National Register
SR – State Register
MAL – Massachusetts Landmark
PR – Preservation Restriction
LL – Local Landmark

Table 7-1: Historic Resources Within or in the Vicinity of the Arnold Arboretum (continued)

Included in the Inventory of Historic and Archaeological Assets of the Commonwealth		
Map	Name (as listed in the Inventory)	Address
28	St. Thomas Aquinas Roman Catholic High School	13-19 St. Joseph Street
29	Martin Craffey House	34 Jamaica Street
30	John Patton House	53 Jamaica Street
31	L.H. Ford House	9 Hampstead Street
32	Anton Koerner House	27 Hampstead Street
33	John M. Costello House	36 Hampstead Street
34	William Winchester House	14 Seaverns Avenue
35	John E. and George H. Williams House	18 Seaverns Avenue
36	Benjamin Armstrong House	20 Seaverns Avenue
37	Benjamin Armstrong House	4 Maple Place
38	JH Rowe Farm Worker's Double House	76-82 Child Street/17-27 Lee Street
39	John A. McAlay Three Decker	16 Verona Street
40	John Ryan House	85 McBride Street
41	Thomas Lally Double House	101-103 McBride Street
42	Benjamin J. French Double House	19 Rosemary Street
43	Saint Thomas Aquinas Roman Catholic Church & Rectory	95-97 South Street
44	Orchard Hill Road Area	24-72, 29-75 Orchard Hill Road
45	Yale Terrace Area	16-18 to 60 and 21-45 Yale Terrace
46	Tower Street Area	10-86 and 11-87 Tower Street
47	Woodlawn Street Area	6-80 and 7-83 Woodlawn Street
48	Weld Hill Street Area	6-76 and 7-75 Weld Hill Street
49	Charles Emmel Two Family Area	45-47 Wenham Street.5-7 Craft Place
50	St. Andrew the Apostle Roman Catholic Complex	84-86 Wachusett St./36-38 Walk Hill St.
51	Engine House	16-18 Walk Hill Street
52	Thomas F. Minton Building	2-16 Hyde Park Avenue
53	James Travers Double House	3841 Washington Street
54	Puritan Ice Cream Company	3895 Washington Street
55	Bussey Bridge	South Street at Archdale of MBTA
56	Roslindale Village Area	Belgrade, Corinth, Cummins Highway, Poplar, South, Washington Streets
57	Roslindale High School	120 Poplar Street
58	644 South Street	644 South Street
59	Boston Edison Substation	669 South Street
60	Charles W. Whittemore House	11 Bexley Road
61	Charles Sumner Elementary School	11 Basile Street
62	John Basile House	38 Basile Street
63	Samuel F. Dearborn House	47 Florence Street
64	William Macomber House	8 Florence Street
65	Ann Mahoney House	2-4 Florence Street
66	Elias Bowthorpe House	43 Prospect Avenue
67	James Ryan House	37 Fairview Street
68	HJ Lang House	37 Fairview Street
69	Ashfield Street Area	9-43 and 10-38 Ashfield Street
70	Symmes Street Area	9-49 and 10-50 Symmes Street
71	Centre – South Street Area	814-870 and 825-871 South Street
72	Longfellow Elementary School	885 South Street
73	AM Celute House	903 South Street
74	C.S. Keith Row House	49, 51,53 Walter Street
75	Fletcher Street Area	46-106 Fletcher Street
76	MBTA Bus Shelter	Centre Street at VFW Parkway
77	Theo and Eva Snow House	30 Farquhar Street
78	Stephen Allen Gardner's House	64 Allandale Street

Character-defining features consist of "all features that contribute to the landscape's historic character" (National Park Service Preservation Brief 36:6). For the purposes of the CRMP, character-defining features are all historically significant features over 50 years of age and any individual features identified in the Arnold Arboretum National Register nomination. All character-defining features are included in Table 7-2. The location of archaeological resources is privileged information and cannot be published.

James Arnold, a successful and public-minded merchant from New Bedford who died in 1868, bequeathed a portion of his estate to Harvard for the promotion of agriculture and horticulture. As specified in the 1872 deed of trust between the trustees of James Arnold's estate and Harvard, income from Arnold's legacy was to be used for establishing, developing, and maintaining an arboretum to be known as the Arnold Arboretum, which: "*shall contain, as far as is practicable, all the trees, shrubs, and herbaceous plants, either indigenous or exotic, which can be raised in the open air at… [then-called] West Roxbury.*" Through a bequest of land to Harvard by Benjamin Bussey (1757 – 1842), the Arboretum would be created on "Woodland Hill," the site of Bussey's estate. Bussey was a prosperous Boston merchant who, in addition to his land, had bequeathed a part of his fortune to Harvard for "*instruction in agriculture, horticulture, and related subjects.*"

The Arboretum's first director, Sargent, believed that a private research institution could also serve as a public resource. In his *Annual Report to the President and Fellows of Harvard College* for the year ending August 31, 1873, he wrote that the Arboretum was:

> *…intended to educate the public as well as the special students who resort to it. It was (to be) laid out as an open park with suitable walks and roadways. (It) could hardly fail to become a beautiful, wholesome and instructive resort, which (would become) more and more precious as populations accumulated about it.*

To this end Sargent pursued a partnership with the Boston Park Department that in 1882 resulted in a unique agreement with the City of Boston that combined the Arboretum's research mission with public access. Under this agreement, Harvard granted the land of the Arboretum to the City to become part of the City's emerging park system. In turn, the City then leased the land, with an additional 45 acres that the City had acquired itself, back to Harvard. Under the lease, Harvard, acting through the Arboretum, would conduct research, develop and curate the living collections, and maintain the buildings within the Arboretum, while the City would build and maintain the boundary walls, gates, and roadway system, provide security, and otherwise facilitate public use of the grounds. Implicit in this agreement, the Arboretum would support the City's desire to provide and manage public access to the grounds; in turn, the City would support the Arboretum's mission to conduct research using the collections.

Table 7-2: Character-defining Features Within the Arnold Arboretum

Resource	Location
Collections	
Accessioned Collections	Throughout grounds
Herbarium	Hunnewell Building
Library and Archives	Hunnewell Building
Roadways	
Meadow Road	Arborway Gate to Forest Hills Road
Forest Hills Road	Meadow Road to Forest Hills Gate
Bussey Hill Road	Forest Hills Road to Bussey Hill
Valley Road	Center Street Gate to South Street Gate
Hemlock Hill Road	Valley Road to Walter Street Gate
Peters Hill Road	Peters Hill Gate to Poplar Gate
Pathways	
Willow Path	Arborway Gate to Meadow Road
Linden Path	Meadow Road to Dana Greenhouse
Catalpa Path	Bussey Hill Road to Woodland Hill Path
Chinese Path	Southeast side of Bussey Hill
Azalea Path	Southeast side of Bussey Hill
Oak Path	Bussey Hill Road to Beech Path
Beech Path	Beech Path Gate to Valley Road
Hickory Path	Centre Street Gate to Hemlock Hill Road
Conifer Path	Valley Road to Walter Street Gate
Rhododendron Path	Valley Road
Hemlock Hill Path	Hemlock Hill Road to Valley Road
Orchard Path	Mendum Street Gate to Peters Hill Road at Poplar Gate
Culverts, Outfalls and Crossings	
Goldsmith Book Culvert	Meadow Road at Arborway Gate
Bussey Brook Culvert #1	Walter Street near Walter Street Gate
Bussey Brook Culvert #2	Hemlock Hill near Valley Road
Bussey Brook Culvert #3	South Street near South Street Gate
Rockery Spring	Valley Road
Bussey Brook Crossing #1	Conifer Path near Walter Street Gate
Bussey Brook Crossing #2	Hickory Path near Hemlock Hill Road
Boundary Walls	
Arborway Wall	Murray Circle to Forest Hills Road
South Street Wall	West side of South Street
Bussey Brook Meadow Wall	East side of South Street
Peters Hill Walls	Walter (east side), Bussey (south side), South (west side), and Mendum Streets
Bussey Street Wall	North side of Bussey Street
Walter Street Wall	Bussey Street to Centre Street
Centre Street Wall	East side of Centre Street
Weld Hill Walls	West side of Walter Street; north side of Weld Street

Table 7-2: Character-defining Features Within the Arnold Arboretum (continued)

Gates	
Arborway Gate	Arborway at Meadow Road
Forest Hills Gate	Arborway at Forest Hills Road
Beech Path Gate	South Street at Beech Path
South Street Gate	South Street at Valley Road
Poplar Gate	South Street at Peters Hill Road
Bussey Street Gate	West end of Bussey Street at Hemlock Hill Road
Peters Hill Gate	West end of Bussey Street at Peters Hill Road
Walter Street Gate	Walter Street near Bussey Street intersection
Mendum Street Gate	Mendum Street at Peters Hill Road
Centre Street Gate	Centre Street at Valley Road
Furnishings	
Benches	Throughout Arboretum along roads
Soldiers Monument	Walter Street at Walter Street Burying Ground
Views	
Hunnewell Lawn View	Linden Path north to Hunnewell Building
The North Meadow View	Meadow Road south across Meadow
View Over The Ponds (Faxon, Rehder, Dawson)	Bussey Hill Road northeast over Ponds
Bussey Hill View	Bussey Hill Summit south to Blue Hills, west to City
Bussey Brook View	Bussey Brook near Hickory Path west along Brook
Hemlock Hill Woods View	Above Conifer Path southeast to Hemlock Hill
Peters Hill View	Peters Hill Summit south to Blue Hills, east to City, north to Arboretum
Oak Allee View	View west at Poplar Gate along Poplar Gate Drive
Natural Woods	
Hemlock Hill Woods	North side of Hemlock Hill
North Woods	North side of Bussey Hill Road
Central Woods	East side of Centre Street to Conifer Path
South Woods	South side of Bussey Street to Orchard Path
Peters Hill Woods	East side of Peters Hill
Water Features	
Goldsmith Brook	North of Hunnewell Building to Arborway
The Ponds	Intersection of Meadow, Bussey Hill and Forest Hills Roads
Bussey Brook	Walter Street Gate to Bussey Brook Meadow
Spring Brook	West of Valley Road to Bussey Brook
Structures	
Hunnewell Building	125 Arborway
163 Walter Street	163 Walter Street
1090 Centre Street[1]	1090 Centre Street
Dana Greenhouse[2]	1050 Centre Street
Bonsai House[2]	Dana Greenhouse
Burial Grounds	
Walter Street Burying Ground[3]	Walter Street on Peters Hill
Archaeological Resources	
Not listed to preserve confidentiality of location	

1 1090 Centre Street has also been designated as a Boston Landmark by the City of Boston

2 Not a historic structure, but included here because it is described in the National Historic Register nomination form

3 City-owned; grounds maintained by Arboretum.

In 1877 Sargent enlisted the skills of noted landscape architect Olmsted to develop plans for the Arboretum. Working collaboratively, Olmsted and Sargent developed a concept plan for an arboretum accessible by carriageways and surrounded by walls and fences. Once the final agreement between the City and the University was reached in 1882, Sargent and Olmsted began working in earnest on a final plan.

Olmsted developed a series of landscape studies for a park circulation system to access as much of the grounds as possible while taking advantage of the existing topography. The system also allowed sufficient area to plant the collections following the then current botanical classification system of plants. The layout of the circulation system and grounds improvements also needed to respond to each plant group's habitat needs. For example, willows needed moisture-rich environments while oaks required well-drained soils. The circulation system also had to connect with the existing and proposed parkway system and, by agreement with the Boston Park Commission, two areas of natural woodlands and open spaces for public reservations, were required to remain.

As a result of these special design considerations for an arboretum, as opposed to a traditional public park, Olmsted devised a number of plant distribution studies that responded to these unique requirements. Following many iterations of the planting and circulation studies, Olmsted and Sargent finally devised a plan which included multiple entrances and exits, a planting area that appeared at the time sufficient to accommodate all the plants that would be grown in the collections, and attractive roadways and landscape features to provide access through the collections as well as to the summit of Bussey Hill.

This final arrangement of plants, laid out nearly as the systematic design was envisioned, met Sargent's goal for the Arboretum. Sargent, in a letter to the Board of Park Commissioners in 1880, described the vision for the Arboretum grounds as follows:

> *...each species, represented, if possible, by a half dozen specimens, will be planted in immediate connection with its varieties, making with its allies, native and foreign, loose generic groups in which each individual will find sufficient space for full development, and through which the visitor can freely pass. Each of these groups will rest on the main avenue so that a visitor driving through the Arboretum will be able to obtain a general idea of the arborescent vegetation of the north temperate zone without even leaving his carriage. It is hoped that such an arrangement ... will facilitate the comprehensive study of the collections, both in their scientific and picturesque aspects.*

Intended as an educational landscape with aesthetically pleasing park-like features, the Arboretum continues to serve the original design intent of Sargent and Olmsted. As with any landscape, and especially a working landscape devoted to the research of woody plants, the overall appearance and content of the Arboretum's collections are continually

changing. Consistent with Sargent and Olmsted's intentions, however, the Arboretum and the City have maintained the significant character-defining features of the landscape to a remarkably high degree. These include the circulation systems, boundary walls and gates, furnishings, views and the arrangement of the collections, natural woods and water features, structures, and the burying ground and archaeological resources. The setting and mission of this National Historic Landmark landscape have been preserved by Harvard and the City.

7.4 Archaeological Resources of the Arnold Arboretum

An archaeological reconnaissance survey, conducted under a permit by the State Archaeologist, identified several areas of archaeological sensitivity within the Arboretum. The survey was submitted to the State Archaeologist in December 2005; on January 25, 2006, the State Archaeologist determined that the survey met the standards outlined in 950 CMR 70.13.

7.5 Potential Impacts of Proposed Project

Potential impacts to historic and archaeological resources are limited to alteration of existing features within the Arboretum and visual impacts to historic resources along the immediate boundaries of the Arboretum.

7.5.1 Proposed Project

The proposed Research and Administration Building will be located on the Weld Hill parcel, an area not associated with the Olmsted/Sargent-designed Arboretum landscape. The proposed Research and Administration Building has been designed to minimize its visibility within the setting of the Olmsted/Sargent-designed Arboretum and from surrounding historic resources. The use of natural construction materials such as wood and stone blends the new structure into its hillside location, further minimizing the visibility of the new building from historic resources outside the Weld Hill parcel. An abundance of plantings is also proposed within the Weld Hill parcel to visually connect the Weld Hill parcel with the main grounds of the Arboretum. This treatment is consistent with the historic management and mission of the Arboretum and will avoid impacts to the Olmsted/Sargent-designed Arboretum by locating the new construction outside the main grounds.

The Arboretum will attempt to avoid areas potentially sensitive for containing archaeological resources in pursuing its IMP project. If avoidance is not possible, the Arboretum will conduct additional archaeological survey in these areas under permit by the State Archaeologist. The City Archaeologist will be provided with copies of all archaeological reports.

7.5.2 On-going Protection of Cultural Resources

The CRMP, prepared for the Arnold Arboretum and submitted separately to MHC and BLC for information purposes, was developed to assist the Arboretum in the long-term management of character-defining features and archaeological resources within the Arboretum within the context of the Arboretum's mission. The CRMP includes an inventory and assessment of all character-defining features, including archaeological resources, within the Arboretum grounds, as well as cultural resources in the vicinity of the Arboretum. The CRMP also includes management recommendations to protect the resources of the Arboretum. Responsibility for the management of character-defining features and archaeological resources at the Arboretum belongs either to Harvard or to the City of Boston; through mutual agreement these responsibilities are sometimes shared or exchanged. The CRMP is intended to be a planning tool for use by Arboretum staff during its long-term management of the character-defining features and archaeological resources within the Arboretum.

In general, the CRMP recommends treatment of character-defining features and archaeological resources consistent with the *Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes*. Regarding the vacant house at 1090 Centre Street, since the future use of the property has not been determined, the CRMP recommends that the house be protected in a manner consistent with the mothballing measures identified in *Preservation Brief 36: Protecting Cultural Landscape.* As of August 2006, the Arboretum had completed measures to stabilize the structure and to prevent deterioration. No changes are proposed to buildings on the Arboretum grounds within the term of the IMP.

Legend

- City of Boston-owned Land Under Lease to Arboretum
- Harvard University-owned Land
- City of Boston-owned Land Under Arboretum Management
- National Register Properties and Districts
- Inventoried Properties and Areas
- Approximate Half Mile Radius

BROOKLINE
BOSTON

Match Line Sheet 1
Sheet 2

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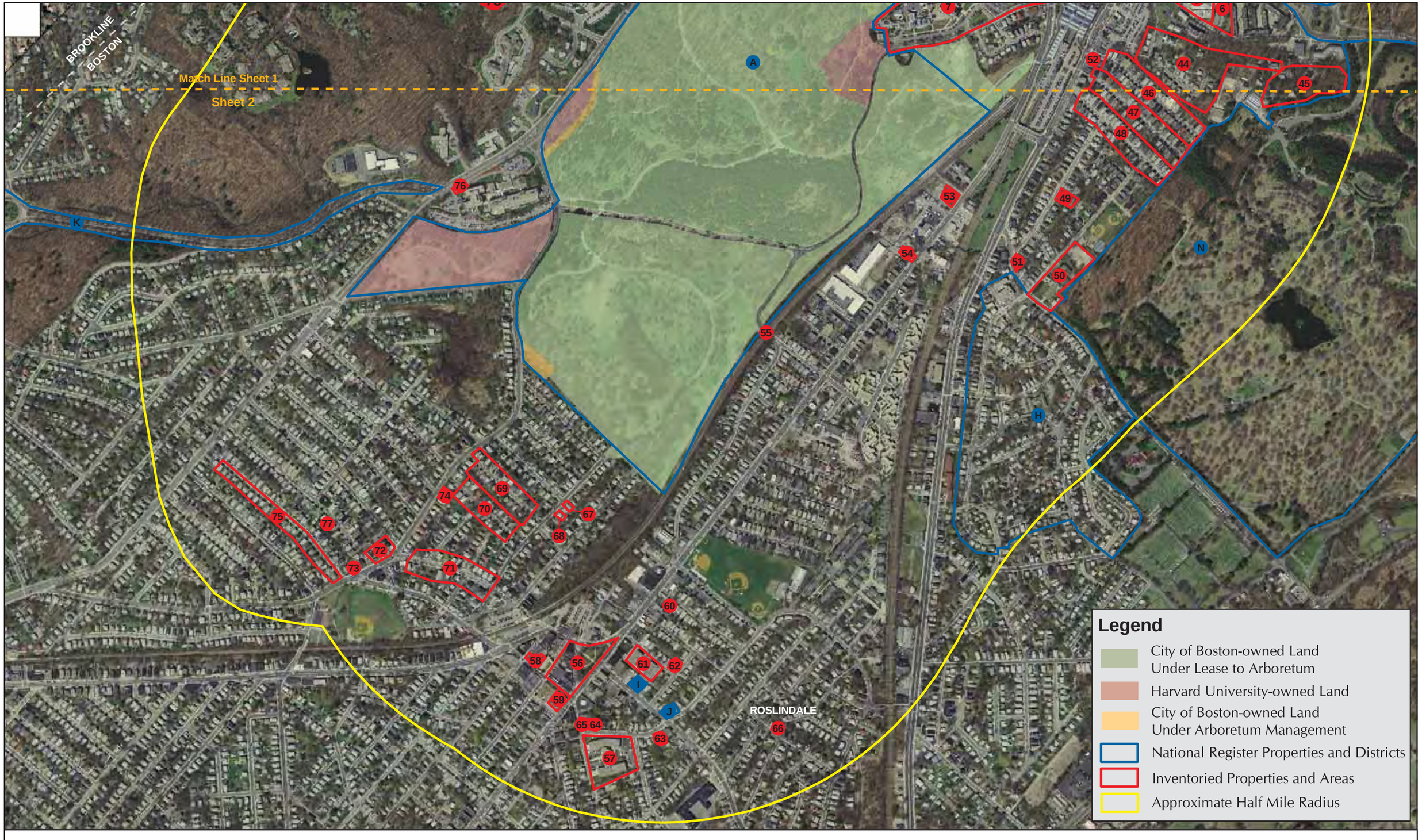
Scale 1:8,400

0 200 400 800 Feet

N W E S

The Arnold Aboretum of Harvard University
Institutional Master Plan

Figure 7-1 (Sheet 1 of 2)
Historic Resources



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Scale 1:8,400

0 200 400 800 Feet

N W E S

The Arnold Aboretum of Harvard University
Institutional Master Plan

Figure 7-1 (Sheet 2 of 2)
Historic Resources

Epsilon

Scale 1:8,400

0 175 350 700 Feet

The Arnold Aboretum of Harvard University
Institutional Master Plan

Figure 7-2
Cultural Resource Boundaries

8.0 UTILITY INFRASTRUCTURE

This chapter describes the infrastructure systems that serve the existing buildings at the Arboretum as well as the anticipated service to the proposed research building on the Weld Hill site. Infrastructure to existing buildings includes sanitary sewer, water supply, stormwater drainage, electrical service, and natural gas. There is no steam service or chilled water service at the Arboretum.

8.1 Water

8.1.1 Existing Conditions

The Boston Water and Sewer Commission (BWSC) owns and operates water mains around the Arboretum under the Arborway and under South, Walter, Weld and Centre Streets. These water mains are described below and depicted in Figure 8-1. Average water consumption for the Hunnewell Building at the Arboretum is approximately 1,000 gallons per day based on recent water records from BWSC. An additional 500 gallons per day on average is used for irrigation.

- At the Hunnewell Building, three water lines, supplied by water mains in the Arborway, enter the site at the northern boundary, cross the site upgradient of the Goldsmith Brook outfall, and service the buildings.
- The Dana Greenhouse and cold storage building are serviced by a water line that enters the site at the Dana Greenhouse Gate from the 12-inch water main in Centre Street.
- The vacant house at 1090 Centre Street was formerly served by a water line that is assumed to come from a 12-inch water main beneath Centre Street; however, this water line is no longer active.
- The house at 163 Walter Street is served by a water line from a 12-inch high service water main beneath Walter Street.
- Three outside water fountains maintained by the Parks Department are located on the Arboretum grounds: near the Hunnewell Building, at the intersection of Forest Hills Road and Bussey Hill Road, and at the intersection of Valley Road and Bussey Hill Road. These water fountains are supplied by water lines from the Hunnewell Building, the Dana Greenhouse, and the water main that supplies the adjacent hydrant, respectively.
- In addition to water service to the Arboretum buildings, a 24-inch BWSC water main traverses the Arboretum, entering the grounds at the Walter Street Gate, following the alignment of Hemlock Hill Road and Valley Road to the South Street Gate. Here the water main connects with another 24-inch water main in South Street. The Arboretum water service does not tie into either of these two water mains.

The Weld Hill site currently has no water service; however, 12-inch BWSC water mains are located in Centre, Weld, and Walter streets.

8.1.2 Proposed Conditions

The proposed Research and Administration Building at Weld Hill will be served by the water main in Centre Street. Water use consumption is estimated to be 9,000 gallons per day, based on an estimated water consumption rate of 200 gallons per day per 1,000 square feet of gross building area, a conservative rate based on other research facilities in the city that range from 75 to 200 gallons per day per 1,000 square feet.

8.2 Sanitary Sewer

8.2.1 Existing Conditions

The existing sanitary sewer system is shown on Figure 8-2 and described below. Existing sewer mains within area streets are owned and operated by the BWSC. Based on existing water use records for the Hunnewell Building alone, existing Arboretum sewage generation at the building is estimated to be approximately 900 gallons per day.

- A sanitary sewer line from the Hunnewell Building and maintenance garage ties into a 15-inch city sewer line in front of the buildings in Meadow Road. This sanitary sewer line enters the Arboretum at the north end of the Dana Greenhouse parcel, roughly follows the boundary between the Adams Arboretum Condominiums and the Arboretum grounds, until it turns east to meet and run under Meadow Road to the Arborway.
- A 6-inch sanitary sewer line from the Dana Greenhouse connects with a 10-inch city sanitary sewer in Centre Street. There is no sanitary service at the Cold Storage Building.
- There is no sanitary connection between the vacant house at 1090 Centre Street and the city sanitary sewer in Centre Street. The house was served by a septic system in the rear yard.
- A sanitary sewer line from 163 Walter Street connects with a 12-inch city sanitary sewer line in Walter Street.

Sewer infrastructure is present on the site within a ten foot wide easement. A sanitary sewer follows the alignment of Centre Street, and a 10-inch sanitary sewer crosses the Weld Hill site via the BWSC easement from Weld Street and ties into a 24-inch sanitary sewer that traverses the Hebrew SeniorLife property. The latter is the same sanitary sewer that traverses the Arboretum along Hemlock Hill Road and Valley Road, described below.

In addition to the sanitary sewer service to the Arboretum buildings, two other, major sanitary sewer lines traverse the Arboretum. These include the 24-inch sanitary sewer line that traverses the Hebrew SeniorLife property (mentioned above), which enters the

Arboretum at the Walter Street Gate, follows the alignment of Hemlock Hill Road and Valley Road, and connects with the ten-foot diameter MWRA "high-level" South Street sanitary sewer line. This large diameter sanitary line, flowing in southerly direction, follows the alignment of South Street from Washington Street to the railroad easement, except where it crosses the Arboretum's Bussey Brook Meadow between the South Street Gate and a location near the State Lab.

8.2.2 Proposed Conditions

The sanitary sewer line serving the Research and Administration Building will tie into the BWSC sanitary sewer line that crosses the Weld Hill site from Weld Street to the Hebrew SeniorLife property.

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 have been estimated conservatively to be equal to 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 proposed project will have an average daily sewage flow or 9,000 gallons per day.

8.3 Stormwater Drainage

8.3.1 Existing Conditions

Stormwater at the Arboretum infiltrates onsite and/or drains primarily to the brooks that lie within the Arboretum, namely Bussey Brook, its tributary Spring Brook, and Goldsmith Brook. Both Bussey Brook and Goldsmith Brook drain to the underground Stony Brook Conduit that discharges to the Muddy River.

- Stormwater at the Hunnewell Building and maintenance garage area either infiltrates onsite and/or drains to the North Meadow and Goldsmith Brook. There are no piped connections between the area and the city storm drain system. The North Meadow drainage and Goldsmith Brook flow into a belowground culvert that exits the Arboretum at the property line and then flows under the Arborway to connect with a city storm drain along the Arborway (and eventually connects to Stony Brook Conduit).

- The area immediately around the perimeter of the Dana Greenhouse and cold storage building drains to a 12-inch Arboretum storm drain under the Dana Greenhouse driveway. This drain ties into the city storm drain in Centre Street.

- There is no piped stormwater drainage at the vacant house at 1090 Centre Street. Stormwater infiltrates onsite and/or flows offsite, following local topography.

- There is no piped stormwater drainage at 163 Walter Street. Stormwater infiltrates onsite and/or flows offsite, following local topography.

- There is no existing piped stormwater collection system at the Weld Hill site; although a 15-inch storm drain traverses the site within a ten-foot easement from Weld Street to the Hebrew SeniorLife property, where it discharges to Bussey Brook. The majority of the Weld Hill site drains to Bussey Brook, except for a portion of the site along the western end of Weld Street, which drains to Weld Street. Weld Street drainage is presumed to flow into the storm drain that crosses the Weld Hill site, discharging to Bussey Brook.

In addition to the drainage described above, most of the internal Arboretum roads have storm drains that serve as infiltration chambers and/or drain to a local discharge point within the Arboretum. Storm drains are located in Meadow Road near the Hunnewell Building; Forest Hills Road near the ponds, Bussey Hill Road, Valley Road, Hemlock Hill Road, and Peters Hill Road. None of these road drains are known to connect to the piped City storm drain system.

Three City stormwater drains traverse the Arboretum, and the open-channel Bussey Brook serves as a major stormwater conveyance as well.

- A City storm drain enters the Arboretum at the north end of the Dana Greenhouse parcel, along the boundary with the Adams Arboretum Condominiums, crosses the Linden Collection and Meadow Road, and runs below the North Meadow until it joins the culvert that exits the Arboretum to the Arborway. This is the same culvert into which the North Meadow and Goldsmith Brook flow (described above).

- A 24-inch stormwater line enters the Arboretum across from Faulkner Hospital on Centre Street. This line crosses the Hickory Collection to Valley Road, under which it runs until it discharges to Bussey Brook, within the culvert that carries Bussey Brook below Hemlock Hill Road.

- A stormwater relief drain diverts stormwater from the northeast corner of the Peters Hill area, under South Street, to the Bussey Brook Meadow area, eventually draining to the Stony Brook conduit. Two relatively short portions of this drainage are piped, under South Street and then along the railroad easement across from Arboretum Road. This partially piped subsystem diverts stormwater from entering the system that drains the Archdale Road neighborhood.

- Bussey Brook, which flows in an open channel through the Arboretum and into the Bussey Brook Meadow, ultimately drains into the belowground BWSC Stony Brook Conduit that exits the Arboretum near the Forest Hills MBTA Station and that eventually discharges to the Muddy River.

8.3.2 Proposed Conditions

At the proposed Research and Administration Building, stormwater runoff from impervious surfaces will drain to re-charge and infiltration chambers installed below the pervious pavement of the parking area. These chambers are designed to mitigate post-development, peak runoff flow rates from a 25-year (24-hour) storm event. Stormwater mitigation will reduce the peak rate of runoff to less than pre-development conditions. The Arboretum will consult with BWSC during design development to ensure that stormwater impacts from the Research and Administration Building are avoided or minimized.

8.4 Electrical Service

8.4.1 Existing Conditions

NStar provides electrical service to the Arboretum; no NStar or private electrical lines traverse the Arboretum grounds. Service to the Hunnewell Building and maintenance garage enters the site at the rear of the garage from an underground cable that originates near Murray Circle. This service is also utilized for the lighting at the parking area in front of the Hunnewell Building.

Electrical service to the Dana Greenhouse and cold storage building enters the site underground from Centre Street. An NSTAR transformer substation is located in the basement of the greenhouse building. Electrical service to 1090 Centre Street enters the site underground from Centre Street. Electrical service to 163 Walter Street is provided from Walter Street.

There is no existing electrical service at the Weld Hill site.

8.4.2 Proposed Conditions

The proposed Research and Administration Building at Weld Hill would be provided with electrical service from NStar via Centre Street in underground conduit.

8.5 Natural Gas

8.5.1 Existing Conditions

Currently, the Arboretum uses natural gas for heating the Hunnewell Building and maintenance garage, and is in the process of converting the heating system at the Dana Greenhouse from oil to gas. Natural gas service to the Arboretum is provided by NStar; no NStar or private gas lines traverse the Arboretum grounds. Service is provided to the Arboretum facilities as follows:

- Natural gas service to the Hunnewell Building and maintenance garage enters the site behind the garage from gas lines in the Arborway and Murray Circle;

- Gas service is not active at the Dana Greenhouse and cold storage building, however, a gas line from Centre Street was installed in 2002 in anticipation of converting the existing oil heat system to gas in 2006;
- The house at 1090 Centre Street is served by an inactive gas line from Centre Street; the line is capped at 1090 Centre Street, and no meter is present; and,
- Natural gas service to 163 Walter Street is provided from Walter Street.

There is no existing gas service at the Weld Hill site; however, 12-inch NStar gas lines run beneath Centre Street and Weld Street.

8.5.2 Proposed Conditions

Laboratory facilities within the proposed Research and Administration Building at Weld Hill will be served with gas from NStar from Centre Street. The Research and Administration Building will not use natural gas for space heating purposes; heating and cooling will be provided by a geothermal heat exchange system, described below.

8.6 Geothermal Heat Exchange System

8.6.1 Existing Conditions

None.

8.6.2 Proposed Conditions

Under the proposed project, a geothermal heat exchange system will be installed at the Weld Hill site to provide heating and cooling to the proposed new building. The following description of geothermal systems is paraphrased from a comprehensive description by the Geothermal Heat Pump Consortium (*Information for Evaluating Geoexchange Applications, 2004*). A geothermal heat exchange system transfers thermal energy (heat) between the steady temperature of the earth and a building, providing heat in winter and cooling in summer. The subsurface temperature of the ground typically remains in the low to mid 50 degrees Fahrenheit throughout the year. This stable temperature provides a source of heat in the winter and a means to reject excess heat, thereby providing cooling, in summer. In a geothermal heat exchange system, a fluid is circulated between the building and in-ground loops of piping. In the winter the fluid picks up heat from the ground and moves it to the building. In the summer the fluid picks up heat from the building and moves it to the ground. Highly efficient heat pumps in the building do the work of concentrating and transferring the heat between the building and the fluid. This exchange of thermal energy between the building and the ground through the medium of a fluid makes the system efficient. Rather than creating heat (or cooling) by burning a fossil fuel onsite, the geothermal exchange system moves thermal energy between the ground and the building using heat pump technology.

The benefits of a geothermal exchange system are substantial over conventional heating and cooling systems. These benefits include:

- Low operating cost – The efficiency of heat pumps provides the basis for high efficiency and low operating cost. In addition, the equipment is relatively simple (similar to a refrigerator or air conditioner), so that it requires less energy to operate, and its use of operating energy is more efficient. The same equipment is also used for both heating and cooling, so maintenance is reduced.

- No exposed outdoor equipment – The piping, where the thermal energy is being exchanged between the fluid and the ground, is buried belowground, and the heat pumps are located within the mechanical room of the building. No "cooling towers" are required, thereby eliminating visual clutter on the building rooftop and more importantly, the noise associated with running the tower.

- Low environmental impact - No fossil fuel needs to be consumed onsite. Electricity is required to run the equipment; however, the electricity is generated at the community's central power plant, where pollution can be appropriately mitigated.

The Arboretum proposes to install a vertical, "closed loop" geothermal system. In a "closed loop" system, BWSC water will be used to initially fill the piping network; and the system will not involve on-site withdrawal or discharge of groundwater. This system would consist of approximately 88 vertical "wells," each being approximately 500 feet deep (final number of wells to be determined after test boreholes have been drilled). Each "well" is a 4 inch diameter borehole, in which a loop of extremely durable plastic piping, with a U-bend at the bottom, is inserted and grouted into place. This system differs from other types of geothermal heat exchange systems that may involve wells approximately 1,500 feet deep, and 6-8 inches in diameter. The type of system that is proposed for the Research and Administration Building typically involves 6 to 12 "wells" connected together to form a circuit, which can be isolated, before the multiple circuits are joined together before entering the building. The "wells" are spread about 30 feet apart. Since no water is actually being withdrawn (or added) to the "well," these are simply boreholes into which the plastic piping is inserted.

Epsilon Associates Inc.

Scale 1:5,400

0 150 300 600 Feet

The Arnold Arboretum of Harvard University
Institutional Master Plan

Figure 8-1
Water Plan

VFW PARKWAY
CENTRE STREET
WELD HILL PARCEL
WELD STREET
10" Sewer Line
12-15" Storm Line
24" Sewer Line
CENTRE STREET
CENTRE STREET PARCEL
WALTER STREET
BUSSEY BROOK
PETERS HILL ROAD
24" Sewer Line
24" Storm Line
VALLEY ROAD
DANA GREENHOUSE PARCEL
BUSSEY HILL ROAD
15" Sewer Line
HUNNEWELL BUILDING VISITOR CENTER
36" Storm Line
GOLDSMITH BROOK
NORTH MEADOW
MEADOW ROAD
THE ARBORWAY
HEMLOCK HILL ROAD
SPRING BROOK
FAXON POND
REHDER POND
DAWSON POND
FOREST HILLS ROAD
BUSSEY HOMESTEAD PARCEL
116" High Level Sewer Line
12" Storm Line
SOUTH STREET
BUSSEY BROOK MEADOW
RAILROAD
WASHINGTON STREET
FOREST HILLS MBTA STATION

Legend

- City of Boston-owned Land Under Lease to Arboretum
- Harvard University-owned Land
- City of Boston-owned Land Under Arboretum Management
- Building / Structure
- Entry Gate
- Other Entrance
- Paved Road
- Path
- Wetland (DEP)
- Pond
- Stream
- Ditch
- 10' Contour

Sewer Line Types:

- Stormwater
- Sanitary
- Combined
- Sewer Outfalls
- Manholes
- Drain Inlets *(AA baseplan)*

Catch Basin Types:

- Combined
- Sanitary
- Stormwater

Source: BWSC, 2005; AA Baseplan

Epsilon Associates Inc.

Scale 1:5,400

0 150 300 600 Feet

The Arnold Arboretum of Harvard University
Institutional Master Plan

Figure 8-2
Sewer Plan

APPENDIX A

BOSTON REDEVELOPMENT AUTHORITY SCOPING DETERMINATION

Boston Redevelopment Authority

Boston's Planning & Economic Development Office

Thomas M. Menino, *Mayor*
Clarence J. Jones, *Chairman*
Mark Maloney, *Director*

One City Hall Square
Boston, MA 02201-1007
Tel 617-722-4300
Fax 617-248-1937

April 28, 2004

Mr. Robert Cook
The Arnold Arboretum of Harvard University
125 Arborway
Boston, MA 02130-3500

Dear ~~Mr. Cook~~ Bob:

Re: The Arnold Arboretum of Harvard University
Institutional Master Plan Scoping Determination

Please find enclosed the Scoping Determination for the proposed Arnold Arboretum of Harvard University Institutional Master Plan. The Scoping Determination describes information required by the Boston Redevelopment Authority in response to the Institutional Master Plan Notification Form which was submitted under Article 80 of the Boston Zoning Code on March 8, 2004. Additional information may be required during the course of the review of the proposed Institutional Master Plan.

If you have any questions regarding the Scoping Determination or the review process, please contact me at (617) 918-4267.

Sincerely,

Keith C. Craig
Project Manager

KC/ArbScope
42804/1

BOSTON REDEVELOPMENT AUTHORITY
SCOPING DETERMINATION

FOR

THE ARNOLD ARBORETUM OF HARVARD UNIVERSITY
INSTITUTIONAL MASTER PLAN

PREAMBLE

The Arnold Arboretum of Harvard University ("Arboretum") is located adjacent to the Jamaica Plain, Roslindale, and West Roxbury residential neighborhoods in the city of Boston. The Arboretum was established in 1872 by Harvard University ("Harvard"). In 1882, under an agreement with the City of Boston ("City"), Harvard granted the land of the Arboretum to the City to become part of the City's park system. In return, the City leased back the land to the Arboretum for 1,000 years to allow the Arboretum to conduct research and education. The City-owned Arboretum is comprised of approximately 265 acres of land with approximately 4,500 varieties of plants and shrubs. Harvard owns approximately 27 acres of land adjacent to the Arboretum for research and horticultural use.

Under the Boston Zoning Code ("Code"), an Institutional Master Plan has a dual purpose of meeting the needs of the institution and relating the institution to its context in a positive way. In preparing its Institutional Master Plan ("Master Plan"), the Arboretum will need not only to demonstrate an understanding of its future facilities needs but also the context of its environment: land uses, physical characteristics, expected changes, resident desires, and applicable public policy. Care should be taken to respond to the concerns outlined below.

- The proposed 8-year Arboretum Master Plan should include all currently proposed development projects planned for the term of the Master Plan, including adjacent Harvard-owned and Harvard-leased properties. However, only those proposed projects seeking zoning rights through Institutional Master Plan Review, pursuant to Article 80 of the Code, shall be granted the Institutional Master Plan overlay designation.

- The Master Plan should establish and define the long-term goals of the Arboretum beyond the Master Plan timeframe, including but not limited to, anticipated future Arboretum needs, plans for future development activities, and potential sites for future Arboretum expansion.

- Details are required of the Arboretum's proposed projects anticipated development schedules.

- Attractive residential neighborhoods are viewed by the Boston Redevelopment Authority ("BRA") as being vital to the long-term success of Boston. The BRA has an ongoing concern that impacts from institutional operations and expansion not result in degradation of residential life in these neighborhoods. The BRA encourages physical linkages, provisions of open space, and ongoing relationships between Boston institutions and abutting

neighborhoods that will strengthen nearby residential areas. The Master Plan should discuss the role that the Arboretum plays within the context of the Jamaica Plain, Roslindale, and West Roxbury neighborhoods, and how the Arboretum will continue to develop relationships with its neighbors. In addition, the Master Plan should discuss other institutions in the area, their anticipated development needs, and how the Arboretum can work with these institutions to minimize the effects of expansion on their adjacent communities. Specifically, the Master Plan should discuss the opportunities available to work jointly with the Hebrew Rehabilitation Center for Aged to minimize potential expansion impacts.

- Open space in Boston is a great resource to residents and visitors alike. The Arboretum is a significant part of a vast open space network called the Emerald Necklace, which current and future landscape designers have the task of preserving and enhancing. As part of the Master Plan, all efforts should be made to ensure that the extraordinary open space resources of the Arboretum remain accessible, protected, and enhanced. During the Master Plan process, many questions have been raised regarding the future of Weld Hill, also referred to as Puddingstone Hill and Prouty's Hill, which is bounded by Weld Street, Walter Street, Centre Street, and the Hebrew Rehabilitation Center for Aged. Although owned by Harvard for many years, neighborhood residents view Weld Hill as open space and as a buffer from the institutional environment along Centre Street. The Master Plan should consider options for maintaining the expectation of open space at Weld Hill. Options may include, but not be limited to, conservation restrictions, open space easements, rezoning, and land donations.

- The unique nature of the proposed Master Plan, including plans of the Arboretum located on public parkland but also on Harvard-owned property in close proximity to public parkland, presents the opportunity to address the long-term protection and enhancement of open space. Harvard and the staff of the Arboretum should work closely with the Boston Parks Department and Boston Parks Commission in preparing the Master Plan.

- Safe and functional pedestrian circulation is important within and around the Arboretum. The Master Plan provides an opportunity to consider ways to increase pedestrian movements by thoughtfully linking pedestrian routes. In addition, the Master Plan provides an opportunity to examine the quality and condition of pedestrian routes. The Master Plan should examine these issues for the Arboretum and propose pedestrian circulation improvements and pedestrian route maintenance and enhancement.

- The issue of public access to the Arboretum is a major element of the Master Plan. The Master Plan should consider the range of transportation options available to the Arboretum. The full and effective use of public transportation facilities which serve the Arboretum and other transportation demand management strategies need to be included in the Arboretum transportation access plan.

- The issue of transportation impacts along the perimeters of the Arboretum is of significant concern. As part of the Master Plan, Harvard should comprehensively evaluate the parking, vehicular access, and vehicular circulation and propose effective mitigation of determined

impacts. Of primary concern are the operational issues at the intersections of Walter and Bussey Streets and Walter and Centre Streets.

- The City has a strong commitment to making Boston a sustainable city and is proactive in implementing sustainable development practices. The Arboretum provides a landscape for world-class horticultural research and educational activities. The Master Plan should, as part of the proposed development program, consider high-performance design and construction elements to create state-of-the-art green buildings and landscapes.

- Several concerns exist regarding loitering and illegal behavior within the Arboretum and at perimeter locations. The Master Plan should evaluate options for dealing with these activities, including the possibility of Harvard Police security patrols.

- The Arboretum is treasured for its historical, cultural and scientific resources. In addition, the Arboretum is designated as a National Historic Landmark. The Master Plan should include a Cultural Resource Management Plan to document historic and archaeological resources, potential impacts on resources, and specific recommendations and preservation plans for minimizing impacts. The Arboretum should work closely with the Boston Landmarks Commission and the Massachusetts Historical Commission in this effort.

SUBMISSION REQUIREMENTS

FOR

THE ARNOLD ARBORETUM OF HARVARD UNIVERSITY INSTITUTIONAL MASTER PLAN

The BRA is issuing this Scoping Determination pursuant to Section 80D-1 of the Code. On March 8, 2004, Harvard filed an Institutional Master Plan Notification Form ("IMPNF") with the BRA seeking an Adequacy Determination for the approval of the Arboretum Master Plan. Notice of the receipt by the BRA of the IMPNF ("Notice") was published in the Boston Herald on March 9, 2004 initiating the public comment period that ended on April 12, 2004. The Notice was also published in the Jamaica Plain, Roslindale, and West Roxbury local newspapers, as well as posted at local community centers. In addition, a copy of the Notice and IMPNF were available for viewing at local libraries and community centers in the Jamaica Plain, Roslindale, and West Roxbury neighborhoods and provided to local community groups, elected officials, and other interested individuals and organizations.

Pursuant to Section 80D-4.3(c) of the Code, a scoping session was held on March 25, 2004 with the City's public agencies where the proposed Master Plan, as outlined in the IMPNF, was reviewed and concerns were discussed. A community public meeting was held on March 31, 2004 where Harvard presented the IMPNF and issues were discussed. The BRA, in association

with the Mayors Office of Neighborhood Services, also held three public meetings prior to Harvard's submission of an IMPNF because of the unique nature of the Arboretum proposals and the varied interest in the proposals by neighborhood residents. In addition, the BRA created a Task Force, made up of neighborhood residents, business leaders, institutional representatives, and other interested parties/stakeholders, which will advise the Arboretum and the BRA through the master planning process and the implementation of the Master Plan. The Task Force may continue to serve as an advisory group for future Arboretum activities, fostering dialogue between the Arboretum and its neighboring communities.

Following the scoping session and public meeting 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 the 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 Master Plan pursuant to Article 80 and other applicable sections of the Code;

2. Recommendation to the Boston Zoning Commission for approval of the Master Plan.

The Master Plan will 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 will be submitted to the BRA. An additional fifty copies or more of the document will be available for distribution to community groups, elected officials, and other interested parties in support of the public review process. The Master Plan document will include this Scoping Determination along with text, maps, plans, and other graphic materials sufficient to clearly communicate the various elements of the Master Plan. Comments from the City's public agencies and the public, found in **Appendix 1, 2 and 3** respectively, will be responded to in the Master Plan. The Master Plan should include the following elements.

I. ARBORETUM MISSION AND GOALS

The mission of the Arboretum should be described. The description should articulate the larger, as well as the local, aspects of the mission. Services to the local community are of particular interest. The population served by the Arboretum 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 projects, 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 the Arboretum should be included.

II. PROGRAM NEEDS AND OBJECTIVES

Specific program needs and objectives for the Arboretum 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 the Arboretum and shaping program objectives. Projection of changes for Arboretum populations, new or expanded programs, research, parking, Harvard enterprises, and other activities that require space in the Arboretum in the next eight years should be included. Specifically, the Master Plan should provide a population analysis for the Radcliffe Landscape Design Program detailing historical enrollment and expected future enrollment trends.

III. PHYSICAL NEEDS AND OBJECTIVES

A. Arboretum Site

A summary analysis of the Arboretum 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 Arboretum planners will help in analyzing current Arboretum conditions. The analysis should conclude by identifying the existing strengths of the Arboretum to be enhanced and the needs of the Arboretum to be addressed in the Master Plan.

B. Facilities

An inventory and description of the buildings, facilities, and other structures occupied at the Arboretum should be provided as required by Section 80D-3.2 of the Code. An updated illustrative Arboretum 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 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 the Arboretum's need for additional facilities described by use and floor area projected on an annual basis over the eight-year period of the Master Plan.

IV. ARBORETUM CONTEXT

The immediate area context of the Arboretum 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 ten-year projection of future growth. The capacity and condition of the infrastructure system that serves the Arboretum should be documented. The impact of the Arboretum 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 Arboretum will relate positively to the area around it.

V. MASTER PLAN

A. Concept Plan

Alternative concept plans should be prepared and analyzed for the Arboretum with particular attention to areas of the Arboretum 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 the Arboretum. Elements of the concept plan should 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 Arboretum based on use, density, and/or physical features;
- Definition of design principles which will serve as guidelines for the development of the Arboretum; and
- Identification of the pedestrian circulation system and its objectives and guidelines.

The alternatives analysis should lead to an explanation of why the proposed concept plan was chosen.

B. Development Program

A description of all the significant physical changes proposed for the 8-year Master Plan time period should be provided at the level of definition required by Section 80D-3.4 of the Code. The impacts of each proposed project should be discussed at a level of definition appropriate to the Master Plan and mindful that projects shall undergo Article 80 Small Project Review or design review when they are implemented. The

demolition of any building over 50 years old is subject to the provisions of Article 85 of the Code (Demolition Delay).

1. Buildings

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) FAR (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; and
(i) estimated month and year of construction start and completion.

2. Arboretum Improvements

Information required for Arboretum improvement projects include the following:

(a) description;
(b) location;
(c) estimated cost; and
(d) estimated month and year of construction start and completion.

3. Arboretum Expansion

Harvard must clarify its intentions with regard to expansion, including Weld Hill. The following information must be provided (if applicable):

(a) location;
(b) gross floor area in square feet broken down by uses;
(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, 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 Master Plan should include a description of the Arboretum's existing transportation and parking characteristics and the proposed future transportation and parking characteristics over the term of the Master Plan. The full scope of the transportation component of the Master Plan is included in **Appendix 1**.

D. Workforce Development

1. Training and Employment Initiatives

Provide a description of the Arboretum's current workforce and project future employment needs concerning proposed future projects. This description should include a breakdown of the number and percentage of current employees who are Boston residents, by neighborhood, and a breakdown of the types of jobs Boston residents currently hold. A description of all current or proposed workforce development programs should be included, indicating the level of financial support from Harvard. Include in this any proposed connections with the Boston Schools or other external institutions.

E. Community Benefits Plan

1. Taxes

In the context of the Master Plan process, the Arboretum should meet with the City's assessor to discuss the Payment-In-Lieu-Of-Taxes agreement.

2. Other Benefits

Identify current community benefits as well as any other benefits that minimize or mitigate detrimental and adverse impacts on the local communities from Arboretum development.

F. Urban Design Scope

1. Issues

General

The growth of the Arboretum is an important and welcome enhancement to one of the most important and historic public landscapes in Boston and the world. However, it can also bring with it the danger of the negative impacts such as loss of parkland, increased traffic, adding elements that are not harmonious with the surrounding landscape, rapid increased density, and loss of historic fabric.

The Master Plan should address these issues by proposing projects that will have the least amount of impact on the Arboretum and the surrounding neighborhoods. For example, the Master Plan should look at the parking needs for all of the proposed projects combined and determine the correct amount of spaces needed. A concern is that each of the three projects has its own parking needs and little effort has been made to determine if some the parking needs can be shared thus reducing the total amount of spaces found in the Arboretum.

Finally, all three proposed projects should incorporate green building design and technology so that they can meet the criteria for LEED certification.

Hunnewell Building Extension

As the design of this project moves forward incorporation of the parking into the footprint of the addition should also be studied. Removing the parking from view (either by covering it as suggested or incorporating in to the new addition) should be an important design goal. The Master Plan should provide analysis justifying the number of parking spaces listed in the IMPNF.

The Horticulture Support Facility

Having a combined facility that is centrally located is a sound idea. This location is well chosen since it can provide direct access from Centre Street for deliveries and keeping that activity from the interior of the Arboretum. Design of this facility will be important so that its appearance from Centre Street is sensitive to the residential structures across the street while maintaining the park edge established further up Centre Street and the interior. As the design of this portion of the Master Plan moves forward incorporation of the existing house into the scheme needs to be explored. Loss of this existing house (1090 Centre Street) for parking does not seem to be appropriate.

Research and Administration Building

Siting of this facility is crucial to the success of the overall Master Plan's goals for this site. If the building is placed on top of Weld hill it will loom over Centre Street and detract from the landscape. If the building is located to close to Weld Street the open pastoral sense of the site will be lost. And if the building is sited close to Walter Street the wooded sense of the site will be lost. The Master Plan needs to present several options for the building's placement and lists the pros and cons for each site. The Master Plan should include the necessary drawings (plans, elevations, and sections) that show these options. Models for each of the options that can be plugged into a base model should be included. Important design goals should be: minimizing the footprint of the facility, elimination of any redundant elements and or program needs (i.e., looking to the share access points and or parking with the Hebrew Rehabilitation Center for Aged), maintenance and enhancement of the existing stone wall, providing pedestrian connections into and through the site, and making the site be a continuation of the main section of the Arboretum. Having the main vehicular access from Weld Street slicing the property is not compatible with these design goals. Alternatives for the access should also be explored.

2. Submission Requirements

Harvard 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 Master Plan. The submission shall include all of the items listed in Article 80D-3, 2 and 4 of the Code, *i.e.,* existing property and proposed projects of the Arboretum including those items listed in the text of the Article as those which Harvard "may include". In addition Harvard shall provide:

1. written description of program elements and space allocation for each element.
2. 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; showing relationships of the proposed project to the surrounding area and district:
    a. massing,
    b. building height,
    c. scaling elements,
    d. open space,
    e. major topographical features,
    f. pedestrian and vehicular circulation,
    g. land use;
3. diagrammatic sections through the area cutting north-south and east-west at the scale and distance indicated above;

4. eye-level perspective (reproducible line drawings) showing the proposal (including main entries and public passages/areas) in the context of the surrounding area with particular emphasis on important viewing areas such as key intersections or attractions. Views from Centre Street, Weld Street and Walter Street are required for the Research and Administration Building, views from Centre Street and from within the park are required for the Horticulture Support Facility, and views from the Arborway and the park are required for the Hunnewell Building Extension. Long-range (distanced) views of the proposed project should also be studied to assess the impact on the skyline or other view lines. At least one bird's-eye perspective should also be included. All perspectives should show (in separate comparative sketches) both the build and no-build conditions. The BRA should approve the view locations before analysis is begun. View studies should be cognizant of light and shadow, massing and bulk;
5. 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;
6. a study model at a scale of 1"=40' showing the proposed projects in the context of the Arboretum;
7. a table listing all buildings owned or leased by Harvard, 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 eight years, and
    g. proposed uses with area devoted to each use;
8. site plan at an appropriate scale (1" = 20' or larger) showing:
    a. general relationships of proposed and existing adjacent buildings and open space,
    b. open spaces defined by buildings on adjacent parcels and across streets,
    c. general location of pedestrian ways, driveways, parking, service areas, streets, and major landscape features,
    d. pedestrians, handicapped, vehicular and service access and flow through the parcel and to adjacent areas,
    e. survey information, such as extending elevations, benchmarks, and utilities,
    f. construction limits;
9. proposed schedule for submittal of all design or development related materials.

The items above except the model shall be submitted in both printed form and as printable and duplicable digital files.

MEMORANDUM

FROM: **DAVID CARLSON, EXECUTIVE DIRECTOR, BOSTON CIVIC DESIGN COMMISSION**

SUBJECT: **GUIDELINES COMMITTEE RECOMMENDATIONS FOR BOSTON CIVIC DESIGN COMMISSION MASTER PLAN REVIEW**

THE BOSTON CIVIC DESIGN COMMISSION (BCDC) encourages institutions to come in early in the planning process to present their Masterplan to the BCDC, not to freeze a Masterplan, but to allow comments early in the public review process, with sufficient time for response or incorporation. The BCDC considers Masterplans to be District Plans and, as such, they are fully subject to BCDC review.

BCDC review is focused on the impacts on the public realm of the city of Boston, which by the nature of most institutions, public and private, is incorporated into their physical tapestry, woven into the fabric of their composite buildings and open space network as well as the edges which interface the broader city.

Masterplans set forth parameters of use, disposition, and density which are encoded as zoning ordinance for their district. Masterplans are by their nature presumed to be living documents, which change or evolve pursuant to comments received, as well as to changes in program, conditions, or unforeseen opportunities.

Individual projects which fall under the Masterplan's framework will be reviewed individually (if required) by the BCDC, with the expectation that the Masterplan and more specific information regarding program, conditions and context will be brought in as background for each project reviewed.

Material required for BCDC review includes:

1. Availability of all material requested in BRA Scoping Determination.
2. Graphic and physical (model) representation of the Masterplan area, its context, and proposed project sites.
3. Information on program, and program and neighborhood interrelationships; public and institutional circulation, and access, accommodation, and service.
4. A summary of objective (factual) and subjective (aesthetic) goals, both overall and parcel by parcel (new project sites).

Harvard should contact David Carlson at 617-918-4284 to schedule a presentation of the Master Plan to the BCDC at the earliest convenience.

G. Public Notice

Harvard 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 Master Plan to the BRA as required by Section 80A-2. This Public Notice shall be published within five (5) days after the receipt of the Master Plan by the BRA. Public comments shall be transmitted to the BRA within sixty (60) days of the publication of this notice, unless a time extension has been granted by the BRA in accordance with the provisions of Article 80.

The form of the Public Notice is attached as **Appendix 4**.

Following publication of the Public Notice, Harvard shall submit to the BRA a copy of the published Public Notice together with the date of publication.

APPENDIX 1

ENVIRONMENTAL SERVICES SCOPE

Environmental Services
CITY OF BOSTON

THOMAS M. MENINO
Mayor

ANDREA d'AMATO
Chief of Environmental Services

April 12, 2004

Keith Craig, Project Manager
Boston Redevelopment Authority
One City Hall Square, 9th Floor
Boston, MA 02201

Re: Arnold Arboretum Institutional Master Plan
Project Notification Form Comments

Dear Mr. Craig:

Enclosed are comments from the Boston Transportation Department, the Boston Parks and Recreation Department and the Environment Department on the above captioned project. The comments are submitted to provide an Arboretum-wide analysis, that insures public accessibility, minimizes traffic and parking impacts, preserve historic properties and protects open space.

As a member of the Mayor's Green Building Task Force, I am pleased that Harvard University included LEED certification as a component of the new Research and Administration Building. It is imperative however, that the building utilize current standards for green building designs and should be coordinated with Beth Sheppard-Rabadam, Harvard's designee on the Mayor's Task Force. The section on sustainable building practices in the Environment Department's comments should be included in the Scope.

It is essential that the open space that has been a part of the community for so many years be preserved. Consistent with community comments, I want to emphasize the importance of including a conservation restriction on the perimeter of the Weld Hill parcel. This is emphasized in the comments of the Parks and Environment Departments.

SUITE 603 • ONE CITY HALL PLAZA • BOSTON • MASSACHUSETTS • 02201
(617) 635-3425 Fax (617) 635-3496

Thank you for this opportunity to comment on the IMP notification form.

Sincerely,

Andrea d'Amato
Chief and Commissioner

BOSTON
TRANSPORTATION
DEPARTMENT

ONE CITY HALL PLAZA/ROOM 721
BOSTON, MASSACHUSETTS 02201
(617) 635-4680/FAX (617) 635-4295

Mr. Keith Craig, Project Manager
Boston Redevelopment Authority
One City Hall Square
Boston, MA 02201-1007

April 12, 2004

Subject: Arnold Arboretum - Institutional Master Plan Notification Form

Dear Mr. Craig:

The Arnold Arboretum of Harvard University Institutional Master Plan Notification Form (IMPNF) has been submitted to the Boston Transportation Department (BTD) as part of the Article 80 process. The IMPNF identifies three construction projects that are planned for the Arboretum. There are plans for a new 40,000 s.f. Research Administration Building on the Weld Hill Parcel, a 18,000 s.f. Horticulture Support Facility adjacent to the Dana Greenhouses and a 15,000 s.f. addition to the Hunnewell Building.

BTD has reviewed the IMPNF and outlines below specific concerns to be addressed in the Institutional Master Plan (IMP). These concerns should be incorporated in the Transportation Study that is required as part of the IMP.

Issues:

- The IMP must study the three Arboretum proposed developments as a whole to evaluate their *combined* impacts with respect to parking, vehicular access and circulation.

- The Research and Administration Building, which is proposed to be located on Weld Hill, will have impacts on Centre, Weld and Walter Streets. The IMP should detail how the residential community abutting Weld Street will be protected from traffic generated by the proposed development. Access to the site from Walter Street is also of concern as it currently carries a significant amount of traffic as a connector to Centre Street, the area's major arterial. To minimize the impact of ingress/egress to the site, BTD recommends that the IMP evaluate the feasibility of reducing the number of curbs-cuts along Walter Street from 3 to 2.

- BTD strongly recommends that the Arboretum coordinate with the Hebrew Rehabilitation Center (HRC) in an effort to utilize existing ingress/egress points for both sites. In the short and long term, joint access will be beneficial to both the HRC and the Arboretum.

- Bicycle and pedestrian circulation should be examined comprehensively in and around the entire Arboretum. The analysis should include the Blackwell Footpath, which connects the MBTA Forest Hill Station with South Street.

- The IMP should propose a Parking Management Plan for the entire perimeter of the Arboretum especially given the underground parking proposed at the Hunnewell Building. Mitigation proposed in the plan should include measures to accommodate the parking demand created by special events.

- The operation of the Walter/Bussey Streets intersection should be studied in detail, given the demands of maintenance vehicles and combined access for Hebrew Rehab.

Transportation Study:

A Transportation Study to assess the impacts of the proposed projects will be required as part of the IMP submission. The Study should provide a summary of the no-build and build conditions with respect to vehicular traffic, public transit access, pedestrian and bicycle circulation and parking. Mitigation of the long-term impacts should be identified. The Transportation Study should include the following general areas:

- Traffic – Trip generation, mode splits and directional distribution; traffic volume counts; capacity analysis to determine the level of service; queuing, delay and volume/capacity during the a.m. and p.m. peaks (and special event peak) should be calculated as base information for the Study. The analysis should include all the intersections mentioned above.

- Circulation - Circulation as it relates to City streets was not mentioned in the IMPNF. The Study should evaluate the existing circulation conditions for vehicles and pedestrians and project future circulation patterns. The circulation analysis should include staff and visitor movements.

- Parking - The existing and future parking supply associated with the proposed projects should be summarized. The parking inventory should include: location of spaces, types of spaces, percentage utilization during the parking peak, management of parking and characterization of on-street parking near and around the entire Arboretum. Special event parking should be identified.

- Transit - The area's public transit should be described including type of service, service characteristics, and evaluation of physical access to bus stops and train stations.

- Pedestrians - A description of the pedestrian conditions on sidewalks and intersections adjacent to the site should be described, including major pedestrian routes and desire lines in and around the site, and the conditions of these corridors, including, any deficiencies or barriers.

- Bicycles - The existing bicycle usage, primary bicycle routes, accommodation of bicycles, and the current supply and location of any existing racks on and around the site should be described.

- Loading and Service - The existing and proposed loading and service including Arboretum maintenance vehicles should be identified. The number of deliveries per day should be included.

We look forward to working with you on this interesting project. If you have any questions, please call me at (617) 635-4839.

Sincerely,

James D. McCarthy
Senior Planner
Policy and Planning Division

Cc: Andrea d'Amato, Commissioner and Chief of Environmental Services
Vineet Gupta, Director of Policy and Planning, BTD

BOSTON

Thomas M. Menino, Mayor

April 12, 2004

Keith Craig
Project Manager
Boston Redevelopment Authority
One City Hall Square
Boston, MA 02201

Dear Mr. Craig:

These comments are submitted on behalf of the Boston Parks Department in response to the Institutional Master Plan Notification Form submitted by the Arnold Arboretum of Harvard University. The Department remains committed to the original vision for the partnership with Harvard University to provide unprecedented access for the public to a world class arboretum. The Parks Department's ownership of the property and the investment by the public in the property's infrastructure has ensured broad accessibility. Harvard and the staff of the Arnold Arboretum have created and maintained an extraordinary collection. We look forward to this new phase of the Arnold Arboretum's life and will work with the community, city agencies and the university to improve the public private partnership established in the 1880s.

The primary areas of interest to the Department are public accessibility, protection and enhancement of open space and the preservation of the National Historic Landmark property. The development of an Institutional Master Plan is a useful tool for the city and institution, however, it is important to note that this IMP is unique. The IMP will address the plans of an institution located primarily on public parkland but also privately owned property. It is imperative that the institution provides access to its 2002 long range plan *A Time for Change: Planning for the Arnold Arboretum's Next Quarter Century* in its entirety, not simply in summary form. A review of the internal planning process and its participants would also be useful.

The IMP should address the unique partnership between the Parks Commission and the institution. Public access to and through the property should be fully addressed. Any proposed alterations to improve access should be described in terms of both the public benefit and impact on historic public parkland. Access studies should address how Arnold Arboretum staff, visitors and students will get to and move through the property.

Long term protection and enhancement of the open space should be addressed including goals for limiting impact of new construction and any proposed alterations to ownership or management models. New construction on existing open space should limit visual and environmental impacts. A commitment to sustainable construction methods for all new structures would benefit both the open space and enhance the educational mission of the Arnold

Boston Parks and Recreation Department
1010 Massachusetts Ave., Boston, MA 02118 / Tel.: (617) 635-4505 / Fax: 635-3173

Arboretum. The lease for the property is between the Parks Commissioners and Harvard's Board of Overseers, so a clear statement of the relationship between the Overseers and the Arnold Arboretum in terms of the ability for each body to make commitments and plans for the property would be helpful.

As defined by the lease, Harvard may not build any structure on the public parkland without the consent of the Park Commissioners. (Nor could the City construct buildings without the consent of the Harvard Board of Overseers.) Therefore, the Parks Commission will have the authority to accept or reject proposals for the Hunnewell Building. City ordinance also assigns the Parks Commission the responsibility for reviewing construction within 100 feet of parkland, therefore the Commission will review the work at the Dana Greenhouses and Weld Hill.

The projects shall be reviewed in terms of their service to the public interest, protection of public parkland and the public's right, as defined by the Massachusetts Constitution, to enjoy the natural, scenic, historic and aesthetic qualities of their environment. The IMP should clearly delineate the schedule for development of plans and for review and acceptance of plans. Parks Commission approval should not be assumed and adequate time assigned in the schedule for response to Commission concerns.

Thank you for this opportunity to provide comments on the IMP notification form.

Sincerely,

Antonia M. Pollak
Commissioner

CITY OF BOSTON
THE ENVIRONMENT DEPARTMENT

Boston City Hall, Room 805 • Boston, MA 02201 • 617/635-3850 • FAX: 617/635-3435

April 12, 2003

Mark Maloney, Director
Boston Redevelopment Authority
Boston City Hall, Room 925
Boston, MA 02201
Attention: Keith Craig

Re: The Arnold Arboretum –Institutional Master Plan Notification Form

Dear Director Maloney:

The City of Boston Environment Department has reviewed the Institutianal Master Plan Notification Form (IMPNF) for the Arnold Arboretum (Arboretum) and submits the following comments.

The Arbaretum is designated as a Natianal Historic Landmark and is listed an the National Register of Histaric Places (National Register). It accupies 265 acres of land, with Harvard University (Harvard) owning faur additional, adjacent parcels in areas at the perimeter that are used for research and horticultural use. The latter parcels are known as the Bussey Homestead Parcel (4.7-acres), Dana Greenhause Parcel (five-acres), Centre Street Parcel (2.9-acres) and Weld Hill (AKA Puddingstone Hill and Prouty's Hill) Parcel (14.2-acres).

The faur-story Hunnewell Building houses a small lecture hall, library, bookstore, herbarium, staff locker raoms, an exhibit and visitar's center and public restraoms. It is an administrative building located an land awned by the City of Baston. The structure was built in 1892 with an addition constructed in 1908-1909. It no longer provides sufficient space for the Arboretum's public education programs and its research facilities are aut-of-date. There is a maintenance garage adjacent to the Hunnewell Building and the Dana Greenhouse is located nearby on Harvard-owned land.

One element of the proposed project is demolition of the maintenance garage, the creation of additional parking, renovation of the Hunnewell Building and canstruction of a three-story, 15,000 square foot (SF) addition/extension. The addition/extension is to be on the current location of the maintenance garage and parking lat. Parking may be increased from the existing 26 to as many as 50 spaces. Harvard is evaluating the potential for constructing a below-grade parking facility as part of the Hunnewell additian.

Harvard proposes to construct an 18,000 SF, two and one-half story Horticultural Support Facility for maintenance functions and horticultural propagatian. It is to be located on the existing Dana Greenhause parcel that is awned by Harvard. The demolition of twa existing buildings would be necessary for a new building – a two-story Greek Revival house at 1090 Centre Street,

constructed in 1820, and a one-story storage building. Surface parking presently exists at the site for 14 vehicles. An additional 13 spaces are proposed for this area.

Construction of a new, 40,000 SF Research and Administration Building, subject to review under an Institutional Master Plan, is proposed for a 14.2-acre site on the Weld Hill Parcel, owned by Harvard. Weld Street, Walter Street, Centre Street and the Hebrew Rehabilitation Center baund the site for Aged. The new building is to be occupied by the Arboretum's administrative staff and contain greenhouse space and a location for curation functions and research. Pedestrian entrances, walkways, overlooks and non-public surface parking for 25 vehicles are also to be constructed.

It is expected that, at full build, ten to 15 employees will be added to the existing 40 employees at the Arboretum. An unspecified number of additional students will use the improved facilities.

The described work will be reviewed through three Small Project Review processes. Construction of the Research and Administration Building and Horticultural Support Facility is expected to begin during spring/summer 2005 with completion in summer 2006. It is anticipated that construction of the Hunnewell addition/extension will begin in 2006 or 2007.

Harvard is seeking an eight-year term for the IMP. We support this extended term for the benefit of concerned residents of the surrounding community.

The IMP should provide the following.

- Identification of all portions of the Arboretum that are located in the Greenbelt Protection Overlay District (GPOD). A map showing the GPOD should be included.
- Confirm that the extension/addition will be part of the existing Hunnewell Building structure.
- The Boston Landmarks Commission (BLC) appreciates recognition that Article 85 will apply to the proposed demolition of 1090 Centre Street. In preparation for that process, it will be necessary to document the historical and architectural significance of the property, document constraints of moving the building to another location ond re-using it on-site, and evoluate alternatives to demolition.
- Identify ond describe any properties within a half-mile rodius of the Arboretum thot are listed on the Massachusetts Historical Commission's (MHC) *Inventory of Historic and Archaeological Assets of the Commonwealth.* (Examples include the Adams-Nervine Asylum property at 990-1020 Centre Street, Franklin Park, and the Arborway.) The IMP should also include a map showing these resources.
- Because the BLC is particularly concerned about resources that might be visually affected by proposed development, the IMP should provide the results of an assessment of such potential effects.
- Identification of conceptual strategies for mitigating visual effects of new construction on the Hunnewell Building (for its new extension) and on the Arboretum parkland (for all three proposals).
- Identification of any anticipated funding/licensing/permitting that would trigger federal or state environmental reviews.
- Identification and description of any other improvement projects envisioned within the time frame of the IMP, including further information on the recent and future work at Bussey Brook Meadow and Leventritt Garden that is noted on pp. 2-4.
- A detailed description of proposed work on the perimeter of the Arboretum and a time-line for this work.

This department shares the Boston Parks and Recreation Department's (BPRD) interest in public accessibility, protection and enhancement of open space and the preservation of this National Historic Landmark property. We support its request that Harvard describe in the IMP planned alterations to access in terms of public benefit and impact on historic public parkland. Access studies should address how Arnold Arboretum staff, visitors and students will get to and move through the property.

Although the proposed construction work is confined to three individual locations, visual and functional effects on the character of the property as a whole, and on its surroundings, need to be considered. Relevant context includes the relationships between new and existing drives, pathways, gates, walls, fences, plantings, and buildings. Integration of the proposed work within existing uses, features, and design concepts should be addressed in a comprehensive manner. So that we may become aware of Harvard's thoughts about the future, the IMP should include the full text of its 2002 long range plan, *A Time for Change: Planning for the Arnold Arboretum's Next Quarter Century*. A description of the internal planning process and its participants should also be provided.

Eighteen prehistoric and historic period archaeological sites have been located within the limits of the Arboretum. The potential for the recovery of additional, significant, below- ground resources exists and the BLC kindly requests that a cultural resources survey be conducted as part of the IMP process. The survey results and a Cultural Resource Management Plan should be included in the IMP. The Boston City Archaeologist, located in this department, is available for consultation to develop a scope of work for this cultural resources survey.

Harvard has held several meetings with the local community at which Arboretum neighbors expressed concerns regarding potential future expansion of Harvard's institutional uses on the Weld Hill parcel that would go beyond that proposed in the IMPNF. The parcel abuts a residential neighborhood and open space at the Arboretum and is in close proximity to ecologically valuable wetlands at a City-owned conservation area behind Weld and Walter Streets. Given these sensitive receptors and resources behind Weld and Walter Streets, this department shares the apprehension of the community about the impacts of potential future development at this site. Our additional concerns include traffic, air quality, noise, stormwater runoff and shadow impacts. This department requests that the IMP include provisions for conservation restrictions to be granted to the Boston Conservation Commission (Commission) to preserve an undeveloped portion of land along the entire perimeter of the Weld Hill parcel.

The Executive Secretary of the Commission met with Arboretum staff in the fall of 2003 to discuss a conceptual plan for the Hunnewell Building addition/extension that would include an underground parking garage, allowing the existing maintenance yard area to be converted to open green space. The foundation for this proposed garage would significantly impact the bank of the Goldsmith Brook, which runs alongside the building. This conceptual design would have required the diversion of the stream's course away from the building. Those proposed alterations to the stream and its banks could not be permitted by the Commission in accordance with both the Massachusetts Rivers Protection Act, which prohibits development within 25 feet of a river's banks, and the Massachusetts Wetlands Protection Act, which prohibits alterations to the banks of streams. The Commission would support the conversion of the existing maintenance yard to open green space; however, hydrological analyses of groundwater depth and flow must be conducted to assess the feasibility of a below-grade garage. These analyses must be used to evaluate the interaction of surface water and

groundwater in the riparian zone and to determine if construction of underground parking would negatively impact the natural flood storage of the brook.

Harvard representatives indicated at the March 25, 2004 Scoping Session that the project will be sustainable. We commend Harvard for its decision to incorporate high-performance design and construction elements in such an important undertaking. This perspective is consistent with both the university's broad commitment to sustainable development and with Mayor Thomas M. Menino's multi-faceted effort to make Boston a sustainable city.

This project offers a starting point for the development of a comprehensive plan to use practices and technologies at the Arboretum. As the Arboretum serves a notable and nationally recognized educational purpose, the proposed project offers an opportunity to design and construct sustainable "buildings that teach" by showcasing a wide range of sustainable options. We encourage Harvard to use as a model the Massachusetts Audubon Society's George Robert White Environmental Conservation Center. The technologies and practices used in design and construction have provided regional and local benefits in addition to creating a building that minimizes reliance upon the local grid and will result in operational cost-savings for the Audubon Society. The City of Boston Environment Department Guidelines for High Performance Buildings and Sustainable Development and Construction Guidelines, provided to the proponent provide a wide range of informational resources for the proponent.

Thank you for the opportunity to offer comment. We look forward to the IMP.

Sincerely,

Bryan Glascock
Acting Director

cc: Andrea d'Amato, Chief of Environmental Services
Antonia M. Pollak, Commissioner, Boston Parks and Recreation Department
James McCarthy, Boston Transportation Department

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APPENDIX 2

COMMENTS FROM CITY/STATE PUBLIC AGENCIES

ROB CONSALVO
BOSTON CITY COUNCIL
DISTRICT 5

April 7, 2004

Mr. Keith Craig. Project Manager
Boston Redevelopment Authority
One City Hall Square
Boston, MA 02201

Dear Mr. Craig,

I am writing this letter to strongly support the Longfellow Area Neighborhood Association's compromise proposal to Harvard University regarding the Arboretum expansion on the Weld Hill property in Roslindale.

While recognizing the Arboretum's right and need for expansion, I also recognize the community's right and need to protect the quality of life of their neighborhood. Therefore, I encourage the BRA to seriously consider the LANA proposal which asks the city to designate the remaining land, not used for the current development proposal, as permanently preserved open space. In addition, if new institutional uses are granted on this property, that existing zoning limits on height and density are honored.

I believe that the community's concerns are real. Institutional encroachment along this stretch of road has been aggressive and continues to be so. The proposal presented by LANA will allow the Arboretum to build the facility it needs while placing a permanent cap on future expansion. It will offer a permanent buffer of open space for this neighborhood of primarily single-family homes.

Sincerely,

ROB CONSALVO
Boston City Council
District 5

CC: Mark Maloney, Director

BOSTON CITY HALL, ONE CITY HALL SQUARE, BOSTON, MASSACHUSETTS 02201
(617) 635-4210 FAX: (617) 635-4203 ROB.CONSALVO@CI.BOSTON.MA.US

Boston Water and Sewer Commission

980 Harrison Avenue
Boston, MA 02119-2540
617-989-7000

April 8, 2004

Mr. Keith Craig
Economic Development
Planning and Economic Development
Boston Redevelopment Authority
One City Hall Square
Boston, MA 02201-1007

Re: Institutional Master Plan Notification Form
The Arnold Arboretum of Harvard University

Dear Mr. Craig:

The Boston Water and Sewer Commission (Commission) has reviewed the Notice of Institutional Master Plan Project Notification Form (IMPNF) for the Arnold Arboretum of Harvard University. The Arboretum is comprised of approximately 265 acres of land with over 4,500 varieties of plants and shrubs. The Arboretum was established by Harvard University in 1872 which granted the land to the city of Boston. In return, Boston leased the land back to Harvard University with a 1,000 year lease.

Harvard University conducts research and education activities within the Hunnewell Building, an administrative building originally constructed in 1892 and expanded in 1908. The 30,000-square-foot building houses a 90-seat lecture hall, a 40,000-volume library, herbarium, exhibit and visitor's center, a bookstore, administrative offices, public restrooms, and staff locker rooms. A maintenance garage was constructed adjacent to the Hunnewell Building in 1968 and the Dana Greenhouse was constructed in 1961. Following several years of long-range planning, the Arboretum has determined that the Hunnewell Building and the supporting facilities no longer provide sufficient space to accomplish the Arboretum's public education mission.

The Master Plan Notification Form provides an overview of the Arboretum's plan to solve its long-term challenges to its research and educational space needs and includes the following:

- The Arboretum proposes an approximately 15,000 square foot expansion of the Hunnewell Building for public education programs, visitor services, and library uses with new construction and renovation. As part of the expansion, the existing maintenance garage will be demolished.

- A new 18,000 square foot facility will be constructed at the Dana Greenhouse location to house the displaced maintenance functions.

- A new 40,000 square foot research and administration building devoted to administration, botanical research and curation will be constructed on a 14.2 acre parcel of land owned privately by Harvard University and not included with the Arboretum's land.

The notification of the IMPNF initiates the process for institutional master plan review. The Commission has the following comments concerning the IMPNF:

General

1. To assist the Commission in evaluating the impacts of future developments under the Master Plan, the document should include plans showing all existing and proposed public and private water, sanitary sewer and drainage systems serving the Arboretum, including pipe sizes and locations of service connections.

2. The Master Plan document should provide estimates of water demand, sanitary sewer flow and stormwater runoff generation for each new building or building undergoing renovation proposed under the Master Plan. The Master Plan document should also include current and projected estimates for existing buildings on the Arboretum's land.

3. It is Harvard University's responsibility to evaluate the capacity of the public water, sewer and storm drainage systems serving the Arboretum to determine if they are adequate to meet future project demands. A written summary of these evaluations should be included in the Master Plan.

4. Harvard University is advised that any new or reconstructed water, sanitary sewer and drain pipes required to accommodate future development must be designed and constructed at Harvard University's expense and in conformance with the Commission's Sewer Use and Water Distribution System regulations.

5. Prior to the demolition of any building, all water, sewer and storm drain service connections to the building must be cut and capped. Harvard University 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. Harvard University is responsible for ensuring that the necessary precautions are taken during demolition to prevent debris and sediments from leaving the site and discharging to the sanitary or storm drainage systems.

6. For each new building, Harvard University must submit a site specific site plan and a General Service Application to the Commission. The site plans must show the location of existing public and private water mains, sanitary sewers and storm drains which serve the project site, as well as the location of proposed service connections. With each site plan submitted, Harvard University will be required to submit detailed and updated estimates for water demand, sanitary sewer flows and stormwater runoff generation. The amount of potable water required for landscape irrigation must be quantified and provided separately.

Water

1. Over the next few years, the Commission will be replacing its existing meter reading system with a Fixed Radio Meter Reading System. For each new and existing water meter, the Commission will provide a Meter Transmitter Unit (MTU) and connect the device to the meter. For information regarding the installation of MTUs, the proponent should contact the Commission's Meter Installation Department.

Sewage / Drainage

1. The Commission requires Harvard University to control stormwater on the project site.

   In conjunction with each site plan and General Service Application, Harvard University, must submit a stormwater management plan to the Commission. The plan must:

   - Identify specific best management practices for controlling erosion and for preventing the discharge of sediment and stormwater runoff to the Commission's drainage system when construction is underway.

   - Include a site map which shows, at a minimum, existing drainage patterns and areas used for storage or treatment of contaminated soils, groundwater or stormwater, and the location of major control or treatment structures to be utilized during the construction.

   - Provide a stormwater management plan in compliance with the DEP standards mentioned above. The plan should include a description of the measures to control pollutants in stormwater after construction is completed.

2. Developers of projects involving disturbances of land of one acre or more are required to obtain an NPDES General Permit for Construction from the Environmental Protection Agency and the Massachusetts Department of Environmental Protection. Harvard University is responsible for determining if such a permit is required and for obtaining the permit. If such a permit is required, it is requested that a copy of the permit and any pollution prevention plan prepared pursuant to the permit be provided to the Commission's Engineering Services Department, prior to the commencement of construction. The pollution prevention plan submitted pursuant to a NPDES Permit may be submitted in place of the pollution prevention plan required by the Commission provided the Plan addresses the same components identified in item 1 above.

3. The Commission will require the installation of particle separators on storm drains serving any new open parking and paved areas of 7,500 square feet or larger. Specifications for particle separators are provided in the Commission's Requirements for Site Plans, which can be obtained by contacting the Commission's Engineering Customer Services Division. Harvard University should consider installing particle separators on all existing storm drains that collect runoff from uncovered parking and paved areas. The Commission encourages Harvard University to explore additional opportunities for implementing best management measures to aid in reducing quantity and improving quality of stormwater discharged from Arboretum. This may include minimizing impervious surfaces and minimizing use of sand and deicing chemicals, pesticides and fertilizers.

4. Harvard University is advised that the discharge of dewatering drainage to a sanitary sewer is prohibited by the Commission. If Harvard University proposes to discharge dewatering drainage to a storm drain during any phase of construction the University will be required to obtain a Drainage Discharge Permit from the Commission and an NPDES Permit exclusion from the EPA.

5. Site plans must show in detail where drainage from the building roofs and from other impervious areas will be discharged. Roof runoff must be conveyed separately from sanitary sewage within the building and not be discharged to the sanitary sewer serving the site.

6. The IMPNF states that the Arboretum is investigating the feasibility of providing parking for the Hunnewell Building in an underground structure. If the Arboretum does construct a below-grade parking garage, the floor of the parking garage must drain through oil separators into the sanitary sewer system. Parking garage drainage must be directed to separate sanitary sewer connections and not combined with roof and other surface runoff. The proponents may obtain copies of the Commission's Requirements

for Site Plans, which include requirements for these separators, from the Commission's Engineering Services Division.

Thank you for the opportunity to comment on this project.

Yours truly,

John P. Sullivan, P.E.
Chief Engineer

JPS/cj

c: B. Cook, The Arnold Arboretum of Harvard University
M. Zoldy, BED
P. Larocque, BWSC

Boston

Keith Craig
Project Manager
Boston Redevelopment Authority
One City Hall Square
Boston, MA 02201-1007

March 23, 2004

Dear Mr. Craig:

Regarding the Project Notification Form for the Arnold Arboretum of Harvard University project submitted to the BRA in March 2004 the Boston Fire Department requires the following issues addressed by a qualified individual.

1. Emergency vehicle site access to the new buildings as well as existing buildings that might be affected.
2. Impact on availability and accessibility of hydrant locations for new buildings as well as for any existing buildings that might be impacted.
3. Impact on availability and accessibility to siamese connection locations for new buildings as well as for any existing buildings that might be impacted.
4. Impact that a transformer vault fire or explosion will have on the fire safety of the building. Particularly as it relates to the location of the vault.
5. Need for Boston Fire Department permit requirements as outlined in the Boston Fire Prevention Code, the Massachusetts Fire Prevention Regulations (527 CMR), and the Massachusetts Fire Prevention Laws (MGL CH148).
6. For projects involving air-supported structures, it is critical that the impact of the design has on fire safety relative to the interaction of the area underneath the structure to the structure as well as to the interaction of the structure to the area underneath the structure.
7. Due to the increasing popularity of private wireless communication services, it has become increasingly difficult and costly for the Fire Department to locate our emergency communications equipment at appropriate sites. At the same time, the need for antenna sites has grown as development continues in downtown/Back Bay. We would appreciate it if the BRA, as part of its development review process for high-rise towers, could assist the Fire Department in obtaining rooftop access for our communications equipment as a public benefit too meet this critical public safety need.

These items should be analyzed for all phases of the construction as well as the final design stage. This project will need permits from the Boston Fire Department as well as the Inspectional Services Department.

Respectfully,

Peter A. Laizza
Fire Marshal

Pjm
Cc: Paul Donga, FPE, Plans Unit, BFD

MASSACHUSETTS SENATE
SENATOR MARIAN WALSH

(617) 722-1348 ▲ Fax: (617) 722-1071
State House, Room 405, Boston, MA 02133

April 12, 2004

Keith Craig, Project manager
Boston Redevelopment Authority
Boston City hall, 9th Floor
One City Hall Square
Boston, MA 02201

RE: The Arnold Arboretum of Harvard University
Institutional Master Plan Notification Form ("IMPNF")

Dear Mr. Craig:

This letter of public comment is in regard to the above referenced IMPNF submitted by the Arnold Arboretum of Harvard University.

As stated in your public notice, one IMP project is proposed for this eight-year period – a Research and Administration Building planned for construction on a parcel bounded by Weld Street, Walter Street, Centre Street, and the Hebrew Rehabilitation Center in the Roslindale neighborhood of Boston. This letter concerns that project and the future use of that parcel of land.

As described in the IMP, Harvard University owns an approximately 14-acre parcel to the southwest of the Arboretum located on Weld Street between Centre and Walter streets known as Weld Hill. The site was not included in the Arboretum's leased land, and has historically been closed to the public. The land has been used periodically as a plant nursery. The parcel is zoned for residential use.

The IMP describes the construction of a new three story Research and Administration Building of approximately 40,000 square feet at the Weld Hill site. Under present zoning such a use requires the granting of a conditional use permit from the Board of Appeal.

IMP review is designed to examine the cumulative impact of institutional expansion. It recognizes that hospitals, colleges, and universities need to expand and renovate their facilities more frequently than do other uses, and that the cumulative effects of incremental expansion may be greater than, or different from, the effects of each project individually. To assess these impacts and determine appropriate community benefits and other mitigation measures, IMP review examines a project in the context of the institution's overall development program.

Before the adoption of IMP review, hospitals, colleges, and universities generally were designated as conditional, if not forbidden, uses in most of the city's neighborhoods, because of their impact on surrounding residential areas and the need to establish appropriate conditions. Institutions needed to seek individual conditional use permits from the Board of Appeal for each expansion or change of use or to apply for the designation of a Planned Development Area ("PDA") for development on contiguous parcels. Both approaches created difficulties for the institutions, for neighborhood residents, and for the city, because review and approval were limited to single projects (for conditional use permits) or contiguous areas (for PDAs).

IMP review was developed to address the limitations of conditional use permits and PDAs. IMP review may approve uses, dimensions, and parking requirements that vary from the requirements of the underlying zoning district. If a project is adequately described in the approved plan and is consistent with that description and has received any necessary approvals (under Large Project Review or Small Project Review), the project is deemed to be in compliance with the use, dimensional, and parking requirements of the underlying zoning. Unlike a PDA, however, the approval of an IMP does not create a true overlay district; as with a conditional permit, the IMP's requirements apply only to the project it describes.

As you know, the Arboretum land was given by Harvard to the city for development as a public park and leased back to Harvard for park use only. This city-owned land is located within the Arnold Arboretum Botanical/Zoological Garden Open Space (OS-BZ) zoning subdistrict of the Jamaica Plain Neighborhood District. As such, no structure can be built except as approved by the city of Boston Parks Commission in accordance with the original agreements between Boston and Harvard.

Since the IMP applies only to the Arboretum's use of the property, and does not affect the underlying zoning[1], it is appropriate, and consistent with the overall usage of the Arboretum land itself, to restrict any future use of the Weld Hill site, after the construction of the Research and Administration Building, to open space purposes, such as the passive recreational uses allowed under the OS-BZ Subdistrict.

The IMPNF concludes by noting that the Arboretum was originally conceived as a research station "that was also a public park dedicated to community benefit." The Scoping

[1] Thereby avoiding any of the "taking" arguments that result from rezoning property to more restricted uses.

Determination, which identifies the elements the IMP must include, should therefore restrict any future use of the Weld Hill site by the Arboretum to open space purposes.

Thank you for your attention to this matter. If you have any questions, please contact my office.

Sincerely,

Marian Walsh

MARIAN WALSH
State Senator

MW/djo

The Commonwealth of Massachusetts
House of Representatives
State House, Boston 02133-1054

REPRESENTATIVE
LIZ MALIA
11TH SUFFOLK DISTRICT

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Committees on:
Public Service, Vice Chair
Public Safety
Transportation

April 6, 2004

Mr. Keith Craig
Boston Redevelopment Authority
1 City Hall Square
Boston, MA 02201

Dear Mr. Craig:

I am writing in regards to the concerns of many of my constituents relating to the proposed development of open space at Centre and Weld Streets on the Roslindale/West Roxbury border in the Arnold Arboretum.

As an elected official, I recognize the complexity of redevelopment projects that involve making significant changes within a community. I understand the legitimate need of the Arboretum for new administrative facilities. I also understand the neighborhood concerns, as articulated by the Longfellow Area Neighborhood Association and others who have attended the various public meetings on this issue, with regards to protecting open space from excessive institutional encroachment. I hope that by collaborating with the community, this very real concern can be addressed. In addition, I urge the City and the Arboretum to work with the abutting neighborhoods to address other concerns such as maintenance and security in and around the grounds of the Arboretum.

I will look forward to being a part of the future discussions about the Institutional Master Plan for the Arnold Arboretum. Thank you for taking my requests into consideration.

Sincerely,

Liz Malia

LIZ MALIA
State Representative, 11th Suffolk District

The Commonwealth of Massachusetts

William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

April 9, 2004

Mark Maloney
Director
Boston Redevelopment Authority
1 City Hall Square
Boston, MA 02201-1007

RE: Arnold Arboretum Institutional Master Plan, Jamaica Plain, Boston. MHC #RC.9609.

Dear Mr. Maloney:

Staff of the Massachusetts Historical Commission have reviewed the *Institutional Master Plan Notification Form: The Arnold Arboretum of Harvard University*. The proposed Institutional Master Plan should consider historic and archaeological resources as part of the existing conditions of the property and its environs, and project planners should also take into account the effects of the operation of the institution, and of the proposed projects on cultural resources within the proposed project areas of effect.

The Arnold Arboretum is a highly significant cultural resource, treasured by scholars, biological research scientists, landscape historians, and the public. The Arnold Arboretum is an internationally recognized historic, scientific, and cultural asset with significant living horticultural collections, a designed historical and cultural landscape with historic buildings and archaeological resources, and unique and irreplaceable research collections of archives, scholarly materials, and artifacts. It is essential that the property's significant historic and archaeological qualities and characteristics—including its landscape, historic and archaeological resources, and the associated collections—be recognized explicitly and comprehensively in institutional planning documents and continue to be treated appropriately in accordance with professionally accepted cultural resources and collections preservation and management standards and practices.

A comprehensive Cultural Resource Management Plan (CRMP) should be developed as a key component of the Institutional Master Plan for the property. MHC believes that the Arnold Arboretum has developed management and preservation plans for their associated significant collections, and if so, such documents should be referenced in the Institutional Master Plan, and should be summarized in the CRMP.

The Arnold Arboretum is listed in the State and National Registers of Historic Places, and is designated a National Historic Landmark. The property includes several buildings, areas, and archaeological sites, for some of which MHC inventory forms were prepared several decades ago.

Within the Arnold Arboretum there are eighteen ancient and historic period archaeological sites recorded in the Inventory of Historic and Archaeological Assets of the Commonwealth. In Boston, the preservation of any ancient period archaeological sites is notably rare. Development of urban lands has obscured and

220 Morrissey Boulevard, Boston, Massachusetts 02125
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www.state.ma.us/sec/mhc

obliterated many ancient period archaeological sites. The identification of preserved ancient and historic period archaeological sites within the property, the earliest approximately 7,500 years old, is largely a result of several archaeological surveys having been conducted within limited portions of the property. Casual finds made on the property of ancient stone tools also contributed to the inventoried database. It is likely that many other, as yet unidentified, ancient and historic period archaeological sites are located within the property which have not been substantially impacted, in areas that have not been systematically surveyed by professional archaeologists. In New England, archaeological sites are typically buried and require professional archaeological survey to be located and identified.

MHC requests that as part of the Institutional Master Plan process that a cultural resources survey be conducted for the Arnold Arboretum. Systematic archival and documentary research, review of pertinent scholarly works, and reconnaissance-level fieldwork, survey, and documentation will be critical components of the survey. The technical research design and methodology of the survey should be scoped in consultation with the professional staff of the Boston Landmarks Commission and the MHC. The survey should be conducted under a field investigation permit (950 CMR 70) issued by the State Archaeologist. The goals of the cultural resources survey are to: 1) systematically identity, compile, evaluate, and analyze available information concerning architectural and archaeological resources within the Arnold Arboretum and in areas adjacent and in visual proximity to the city- and Harvard University-owned parcels; 2) document existing conditions of historic buildings within and in visual proximity to the Arnold Arboretum with current photographs and updated MHC inventory forms as necessary; 3) evaluate the historic and architectural significance of the buildings and landscape based on current conditions; and 4) identify archaeologically sensitive portions of the project area by conducting documentary research of land use history including previous impacts and existing conditions and by thoughtful application of an explicit archaeological predictive model.

MHC requests that the Institutional Master Plan review process should require the preparation of a CRMP based on the information and findings obtained during the cultural resources survey. The CRMP should consider on-going and foreseeable projects that could affect significant historic and archaeological resources, including scientific research projects, visitor impacts and other land use considerations, the facilities maintenance requirements of the infrastructure and landscape, and proposed and future construction projects. For example, the CRMP should provide explicit recommendations for the care and maintenance of the ca. 1820 house at 1090 Centre Street. The CRMP should comprehensively and systematically consider potential impacts to significant historic and archaeological resources, and offer explicit recommendations, based on accepted historic preservation practice and technology, to avoid, minimize, or mitigate adverse impacts to significant cultural resources. The CRMP should also include information concerning the associated significant institutional collections and provide reference to pertinent and related collections management and preservation planning documents.

Because particular locational information concerning ancient and historic period archaeological resources is highly sensitive, confidential, and is not a public record (MGL c. 9, ss. 26A & 27C, 950 CMR 70.13(7)), archaeological site locations should **not** be disclosed in documents proposed for release to the general public. Therefore, the report of the cultural resources survey and the CRMP should **not** be released to the public. The State Archaeologist should be contacted if qualified researchers or others might require access to sensitive archaeological site locational information.

The Institutional Master Plan should contain only summary information about archaeological resources. The Institutional Master Plan, however, should: 1) note, generally, the presence of ancient and historic period archaeological sites and archaeologically sensitive areas within the property; 2) consider, generally, the potential effects of proposed actions regarding archaeological sites and archaeologically

sensitive areas; and 3) propose specific steps to avoid, minimize, or mitigate any adverse effects on significant archaeological resources in consultation with the MHC and the Boston Landmarks Commission.

The MHC is concerned about potential adverse effects to historic and archaeological resources for the proposed projects described in the institutional master plan notification form: the Hunnewell Building Extension, Horticultural Support Facility, and the Research and Administration Building. To evaluate what impacts, if any, these proposed projects may have on significant historic and archaeological resources, additional information is required by the MHC. Harvard University should complete and submit to the MHC and the Boston Landmarks Commission for concurrent review and comment, a Project Notification Form (950 CMR 71, Appendix A) and scaled project plans, elevation drawings, and specifications, for the proposed projects. Depending of the planning schedule for the proposed projects in relation to the completion of the cultural resources survey and CRMP, current photographs of the project areas of effect may be required to be completed and submitted with the Project Notification Forms.

These comments are offered to assist in compliance with MGL c. 9, ss. 26-27C (950 CMR 70-70-71), the Secretary of Interior's *Standards and Guidelines for Archeology and Historic Preservation* (48 Federal Register 190 (1983)), and the *Standards for the Treatment of Historic Properties* (36 CFR 68). Please contact Edward L. Bell (Senior Archaeologist), or Ann Lattinville (Director of Architectural Review) of my staff if you have any immediate questions or require further information.

Sincerely,

Brona Simon

Brona Simon
State Archaeologist
Deputy Historic Preservation Officer
Massachusetts Historical Commission

xc:
Robert Cook, Arnold Arboretum
David J. Russo, Arnold Arboretum
Laura Tenny Brogna, Arnold Arboretum
Sheila Connor, Arnold Arboretum
Epsilon Associates
Boston Landmarks Commission
Ellen P. Berkland, Boston City Archaeologist

APPENDIX 3
COMMENTS FROM THE PUBLIC

Longfellow
Area
Neighborhood
Association, Inc.

P.O. Box 222, Roslindale, MA 02131-0002 www.roslindale.net email: lana@roslindale.net Phone: 617-215-5262

March 20, 2004

Neighborhood Proposes Compromise to Harvard University to Preserve Open Space at Arnold Arboretum in Roslindale

The proposed development of open space at Centre and Weld Streets on the Roslindale / West Roxbury border has made us think carefully about the consequences for our community. Rather than saying no to this proposal, however, the Longfellow Area Neighborhood Association's Board of Directors believes there is a way to permit this proposal to go forward while protecting the long-term interests of our neighborhood.

The Arnold Arboretum has proposed that the City of Boston change current zoning to let another institutional facility take root in our neighborhood. This might seem insignificant until one considers the steady creep of institutions along Centre Street: Kilmer Park was taken away from this neighborhood fifty years ago for the Hebrew Rehabilitation Center, which expanded seven years after it was built; Rogerson Communities Sophia Snow House is expanding to four stories across the street; Faulkner Hospital continues to grow. Open space is disappearing steadily, while traffic congestion along Centre Street is approaching intolerable levels at rush hours. Promises made years ago to protect the neighborhood from future institutional encroachment must be kept.

Therefore, the Longfellow Area Neighborhood Association proposes that if the City is to consider rezoning portions of the Arboretum for institutional facilities, then the remaining portions of this land should be rezoned as open space.

We recognize the Arboretum's legitimate need for new administrative facilities. We also believe that having the institution's Director stationed in a new building located on this side of the Arboretum would end the institution's long neglect of its property and neighbors in Roslindale. Such a facility could be beneficial to the area as long as the neighborhood is assured that it will not mushroom over the years into another large institutional complex that consumes more open space and aggravates traffic problems.

We feel strongly that even if new institutional uses are permitted on this property, existing zoning limits on building height and density should be preserved. This will allow the Arboretum to build the facility it needs while preserving a permanent cap on future expansion as well as a permanent buffer of open space for the neighborhood.

As the Roslindale / West Roxbury / Jamaica Plain Bulletin newspaper editorialized, "This is about protecting green space and maintaining zoning. Residents' concerns are real. That buffer of green space has been a separation from industry and the noise and traffic it brings. Should Harvard receive too much leeway to build what it wants, it sends Roslindale back."

We have additional concerns about this proposal that have yet to be answered: the site and design of any proposed buildings; traffic access and parking; and longstanding concerns about the maintenance, upkeep and security of the Arboretum's land in our area. We invite the Arnold Arboretum and Harvard University to join with the neighborhood in resolving these important issues in a constructive way for the benefit of all as this process moves forward.

The Longfellow Area Neighborhood Association

JAMAICA HILLS ASSOCIATION, INC.
P.O. Box 392, Jamaica Plain, MA 02130

April 7, 2004

Mr. Keith Craig
Project Manager
Boston Redevelopment Authority
One City Hall Square
Boston, MA 02201-1007

Re: Public Comment
Institutional Master Plan Notification Form
The Arnold Arboretum of Harvard University

Dear Project Manager Craig:

One hundred twenty-two years ago, family dinner conversation on spring evenings and Sunday afternoons at 1090 Centre Street (the old Boston/Providence post road) probably drifted in and out of the gift and thousand year leaseback arrangement of the land surrounding their property that was the Arnold Arboretum. Their home had stood for 62 years and they would now be protected from encroaching development. Who knew what yupification was coming. A place called Doyle's was opening on Washington Street that year. Two years later Boston would elect its first Irish-Catholic Mayor. The world was moving faster than the mail coaches that bumped and rattled past the front door twice a day.

Though uninhabited for the past few years and unheralded pretty much as a link to the past, the basic structure has stood where it is since 1820, for 184 years. Current plans are for the Arboretum to demolish the building.

This is to request that the BRA do what it can to ensure that every reasonable effort is made to retain the building on its present site. This could include the Arboretum actively seeking a private individual to restore the home in return for its use for a form of years, a corporation (i.e. Bank of America) willing to become involved for good public relations, or even the Arboretum removing later add-ons and restoring and landscaping the Centre Street section while accommodating the new Horticulture Support Facility behind it.

The Arboretum is and has been a valuable neighborhood resource over the years. This one accommodation to our neighborhood could lay the way for an excellent relationship for years to come. Thank you for your attention.

Sincerely,

John Lovett

John Lovett, President

cc: Thomas Menino, Mayor
Mark Maloney, Director BRA
Ellen Lipsey, Landmarks Commission
Robert Cook, Director, Arnold Arboretum
Polly Selkoe, Chair, JHA Zoning Committee

990 SOUTH STREET
ROSLINDALE, MA 02131

April 8, 2004

Mr. Keith Craig
Boston Redevelopment Authority
Boston City Hall, 9th Floor
Boston, MA 02201

Dear Keith:

On behalf of the Longfellow Area Neighborhood Association (LANA), I urge the Boston Redevelopment Authority to include the following issues in its scoping determination for the institutional master plan for the Arnold Arboretum:

1) consideration of the long-term context, history and likely future of the open space in Roslindale bounded by Centre, Weld and Walter Streets, the creeping institutionalization and loss of open space along Centre Street and acknowledgement of the pattern that once an institutional use gets through the regulatory door, that door keeps opening – unless measures to limit creeping institutionalization are taken at the outset

2) the debt owed to this community by the City of Boston for the sale of the nine acre Joyce Kilmer Park in 1956, a decision justified by the adjacent 14 acres of open space acquired for the expansion of the Arboretum's collections

3) the dissenting memorandum by Boston Parks Commissioner Theodore C. Heffenreffer objecting to the sale of Kilmer Park and the loss of open space which adds value to the City at little cost and its replacement by tax exempt institutional uses which contribute to imbalances in the City's tax base

4) any records in possession of the City of Boston, or the Arnold Arboretum or Harvard University concerning the Arboretum's or Harvard's views regarding the sale and subsequent development of Kilmer Park

5) the December 22, 1970 decision of the Zoning Board of Appeal approving expansion of the Hebrew Rehabilitation Center, a decision justified by the presence of the existing institutional facility and by the presence of "adjacent lots permanently devoted to open uses"

6) the preservation restriction on the site of the former Kilmer Park held by the City of Boston and recorded at the Suffolk Registry of Deeds

7) whether the Hebrew Rehabilitation Center and the City of Boston are in compliance with this preservation restriction, whether the institution has kept commitments to the public over time, and whether the City has enforced them

8) whether the Boston Parks Commission retains any interest in the former Kilmer Park site and whether the Parks Commission has authority to review development of the adjacent 14 acres of open space

9) the City of Boston's current Open Space Plan 2002-2006, which declares that these 14 acres of open space should remain "open rather than urbanized"

10) current City policy to rectify past losses of public parkland, including the restoration of the so-called "missing link" in the Emerald Necklace at Park Drive, Brookline Avenue and the Riverway, which was sold to Sears-Roebuck & Co. at the same time as the sale of Kilmer Park

11) anticipation of future Arboretum expansion and identification of potential alternate sites to accommodate future expansion

12) maintenance of existing zoning restrictions on height and density at the site bounded by Centre, Weld and Walter Streets, a legally binding limit on future expansion at this site, and permanent protection of the remaining open space at this site

13) concern expressed for the potential loss and permanent protection of open space at this site by City Councilor Robert Consalvo

14) the siting and design of administrative facilities and greenhouses to minimize visual impact on surrounding areas, consistent with Fredrick Law Olmsted's belief that built features should be subordinated to the natural landscape

15) the use of "green" building technology and design where possible

16) integration of the 14 acres at Centre, Weld and Walter Streets with the rest of the Arboretum, and compatibility of landscape design, gates, signage, footpaths and public rights of way

17) evaluation of alternate sites for the proposed new nursery and permanent restrictions to prevent any new nursery from evolving into a building, greenhouse or structure of any kind

18) minimizing the loss of green spaces to surface parking

19) a technical analysis of groundwater to evaluate the impact of any development at this site on the flooding of basements in homes adjacent to the wetlands behind Weld and Walter Streets

20) location of access/egress points that take advantage of existing curb cuts without adverse impact to the safety of Walter and Centre Streets

21) solutions for calming traffic at the intersections of Walter and Centre Streets and Walter and Bussey Streets, and along Walter Street from Centre Street to South Street

22) installation or enhancement of infrastructure such as concrete sidewalks on Walter Street and signage at gates and visible intersections

23) increased security patrols at the Arboretum during evening hours from May through October

24) the designation of the Arboretum as a National Historic Landmark in 1965 by the U.S. Department of the Interior and maintenance of the Arboretum's historic features according to the Secretary of the Interior's Standards for Historic Preservation, and

25) the Arboretum's record as a neighbor to Roslindale, the condition and maintenance of its property and perimeter in Roslindale and various ways to strengthen its relationship to the community of Roslindale.

Sincerely,

Carter Wilkie

cc. Councilor Rob Consalvo
Andrea D'Amato
Antonia Pollak
Kevin McElmoyle

Steven J. Gag
631 South Street
Roslindale, MA 02131

April 12, 2004

Mr. Keith Craig, Project Manager
Boston Redevelopment Authority
One City Hall Square
Boston, MA 02201-1007

RE: Written Comments on the Arnold Arboretum's Institutional Master Plan Notification Form

Dear Mr. Craig:

I live adjacent to the Arboretum and my family and I enjoy it on a daily basis. I am the President of Roslindale Village Main Street and a member of the Lower South Street Neighborhood Association (for identification purposes only). The Arboretum has been a good neighbor to us for the eighteen years we have lived here, but I along with many Roslindale residents have concerns about the proposed Research and Administration Building and Nursery to be located on the Weld Hill parcel.

My major concern is how the community in concert with the Arnold Arboretum can maintain the Harvard University-owned Weld Hill parcel as open space in perpetuity. Because the institutions of Harvard and the Arboretum will outlive all of the individuals currently involved in the Institutional Master Plan, it is essential that any agreements among the IMP parties address open space issues well beyond the eight-year IMP overlay.

The development history of the Hebrew Rehabilitation Center for the Aged which is directly adjacent to the Weld Hill parcel provides the Roslindale community with ample reason for caution in regards to the proposed Arboretum Research and Administration Building and Nursery. Built on City of Boston parkland in the 1960s, the Hebrew Rehabilitation Center began as a modest development only to grow over the years into an extremely large and, in the eyes of many Roslindale residents, inappropriate facility for a residential area.

I strongly believe that the proposed Research and Administration Building and Nursery should not be allowed to be developed unless Harvard agrees to sign a conservation easement that would encompass the remaining open-space on the Weld Hill parcel. The easement would protect the land from any further development in perpetuity.

My remaining concerns about the proposed Research and Administration Building and Nursery are as follows:

- Traffic issues, especially on Walter and Centre Streets must be addressed by a thorough traffic study. The location of the entrance and exit for vehicles must be well documented.
- The location of the building and nursery must ensure that current site lines from Weld Street to the Weld Hill parcel are not obscured.
- The design of the building must take into account the topography of the land and the building type and materials from nearby structures. In addition, the building must use environmentally friendly materials and be designed to minimize the use of water and energy.
- The size of the road and the amount of parking should be minimized so as not to encourage the use of cars through the parcel. The materials use to construct the road and parking should be environmentally friendly.

Thank you for your consideration of these comments on the Institutional Master Plan. Do not hesitate to call or write me with any questions or comments. I can be reached at 617-469-2506 (h), 617-635-2338 (w) or steven@gagang.com via e-mail.

Sincerely,

Steven J. Gag

TO: Keith Craig
FROM: Adriana Cillo
RE: Arnold Arboretum IMP
DATE: April 8, 2004

After careful review of the Arboretum IMP proposal, and attending the local meeting in Roslindale, I have some concerns and questions. As a Roslindale resident I'm pleased that we have a first class parkland in our neighborhood and for that reason I urge the City of Boston to consider placing some restrictions before changing the current zoning status. I, like many residents enjoy walking the trails and admire the beauty of the grounds. We are honored to have the Arnold Arboretum parkland in our town, but at the same time we want to make sure that this parkland/green space stays for our future residents to enjoy and use as a resource. For all the above reasons, I urge the City of Boston to consider protecting this open space for the future. My concerns and recommendation are as follow.

CONCERNS/QUESTIONS:

Pg. 1-2 (1-3) Summary of Proposed Arboretum Projects – states that "two smaller projects that are not subject to IMP review but are being included for informational purposes – the Hunnewell Building Extension and the Horticulture Support Facility."

We have to make sure that any type of project should be part of IMP review due to the fact that it will have a major impact on the neighborhood: traffic (access/egress), loss of green space and design.

Pg. 2-10 Landscape Institute – Classes that are held by the Radcliffe Insitute in Cambridge - ("Current planning envisions all classes being held at the Arboretum within the next five years."

Concerns: No problem if classes are held at the Arboretum, but what happens when they have more students than space? Do they need to expand or build a new facility to accommodate the number of students? Is there enough parking for the current and future students? Do they park on the street or around the facility? What security precautions are taken for night students or cars that are parked on the street?

School/Programs.
"As part of its special commitment to the local community, field trips are provided free of charge to the Boston school.—a new field study to serve the specific educational need of nearby elementary schools in Roslindale, JP, Dorchester and Roxbury.

Comment: some of the schools are not stated in this section. The Haley school - American Legion Highway, Roslindale.
Question: Why are the local private schools not included? Holy Name School – Roslindale, Sacred Heart School – Roslindale, St. Andrew School – Forest Hills.

All Children should benefit from this educational outreach program.

Pg. 408 (4.4.3) Improvements to the Grounds
The formative elements in the existing Arboretum context include:

Comments: the perimeter should also include the clean-up of brush, pine needles, leaves, overgrown weeds, etc. These elements make it impossible for pedestrians to walk around the perimeter of the park, especially during fall and winter.

MAJOR CONCERNS:

1. **The approved IMP will govern development at the Arboretum for the eight-year IMP term. If the City is to consider rezoning portions of the Arboretum for institutional facilities, then the remaining should be under Conservation Restriction (green space). The community cannot be a watch dog every time the institution decides it needs more space or buildings to accommodate demand, especially if it's less than 20,000 square feet of gross floor area and it's part of the small project review.**

2. **Lack of security during evening hours needs to be addressed. Suggestion – a possible partnership between the Boston Police and Harvard security for late hours from May to October.**

3. **Facilitate/coordinate a crime watch between the Arboretum and abutters.**

4. **Lighting at the various entrances**

5. **Wall repairs**

RESEARCH and ADMINISTRATION BUILDING – Weld Hill parcel.

Major Concerns:

1. **Design of proposed building**

2. **Vehicle access/egress on Walter Street and Centre Street—overwhelming traffic concerns on both of these streets. Possible reconfiguration of Walter Street's egress to Centre Street. Major accidents have taken place at this junction. Is there a need for a traffic light?**

3. **Maintain a buffer of green space/trees between Weld Street residents and the proposed site.**

22 Arborway
Jamaica Plain, MA 02130

April 12, 2004

Keith Craig, Project Manager
Boston Redevelopment Authority
One City Hall Square
Boston, MA 02201

Re: Arnold Arboretum Institutional Master Plan Notification Form

Dear Mr. Craig,

As described in the Arnold Arboretum IMPNF, the Arboretum is one of Boston's most precious public spaces, as well as being acclaimed world wide for its collections and research activities. My interest in this project is multi-faceted: I am a neighbor and frequent visitor, a green space advocate, and a member of organizations such as the Arborway Coalition and the Emerald Necklace Greenway Project which have been working to improve linear connections, traffic safety and pedestrian and bicycle access to and through the Emerald Necklace park system since 1996 and 1998 respectively. - ***My hope is for this project to meet the Arboretum's needs with minimal impact to the landscape and with a proactive approach to the transportation issues – safe access for motorists, and creation of conditions conducive to car-free access for all others.***

The Emerald Necklace is a world-renowned example of landscape architecture designed by Frederick Law Olmsted. It is a national and urban treasure. Olmsted's design for the Emerald Necklace included multi-use parkways in addition to the park's landscapes, waterways and woodlands. The park system could accommodate multiple types of transportation, with separate paths for each. There were pedestrian paths, bridle paths, and carriage paths, making it one of America's first greenways.

During the middle of the last century, the Emerald Necklace, experienced substantial decay and degradation, along with changes favoring automobiles over all other uses. The changes in the vicinity of the Arboretum, such as the rotary known as "Murray Circle", are among the most challenging and dangerous for pedestrians, bicyclists and motorists. In recent years, there have been very substantial and coordinated state, city and private efforts with the potential to restore the Emerald Necklace as a historic park, recreational greenway and connector between many of the City's parks. These efforts include the organization of the Emerald Necklace Conservancy, the completion of an Emerald Necklace Masterplan, the ongoing development of an Arborway Masterplan, and the Historic Parkways Initiative of the Massachusetts Executive Office of Environmental Affairs. *However, there are still many "gaps" to be addressed within the Emerald*

Necklace before it can be considered a safe recreational resource. I believe the integrity of the Emerald Necklace as a linear park and recreational resource must be considered, protected and, to the maximum feasible extent, restored whenever possible during new construction within the park system, enhancing public safety, promoting physical activity, and supporting Olmsted's principle of separation of uses. This is more important now than ever before, due to the growing obesity epidemic (65% of the population is overweight or obese) with an estimated cost of $75 billion per year. There is growing recognition of the importance of physical activity in preventing obesity and many related chronic diseases.

The Arnold Arboretum has been a wonderful neighbor and has participated actively in recent efforts to address issues along the Arborway, such as:

- Caring for new trees planted by DCR (Dep't of Conservation and Recreation) along the portion of the historic parkway that is also the perimeter of the Arboretum
- Hosting public meetings for the Arborway Master Plan, a City, State and community effort to address both the historic landscape and the transportation issues along the Arborway – the parkway that Olmsted designed to connect Jamaica Pond, Arnold Arboretum and Franklin Park.

  * Unfortunately, the transportation issues for the portion of the Arborway between the Arboretum and Jamaica Pond, have been left unresolved due to funding limitations for transportation studies within a Dep't of Environmental Management Historic Landscape Preservation grant.

  * Therefore, in conjunction with the new development, I encourage the Arnold Arboretum to continue such participation, and to facilitate the completion of the transportation studies necessary to resolve the public safety issues related to access for all users: motorists, pedestrians, bicyclists, in-line skaters, persons in wheelchairs, and others, and to rehabilitate the Emerald Necklace as a landscaped, multi-use parkway consistent with Olmsted's vision.

Sincerely,

Sarah E. Freeman

Sarah E. Freeman

22 Arborway
Jamaica Plain, MA 02130

April 12, 2004

Keith Craig, Project Manager
Boston Redevelopment Authority
One City Hall Square
Boston, MA 02201

Re: Arnold Arboretum Institutional Master Plan Notification Form –

Additional Comments

Dear Mr. Craig,

In addition to the previous comments, I would like to submit the following for consideration:

- Re: Section 1.3 (page 1-5), Research and Administration Building: In addition to the pedestrian entrances and walkways, in order to encourage car-free visitors, please plan for transportation by bicycle, including ample parking for bicycles. There will be a "recurring theme" in these comments: when a pedestrian path is mentioned, is it a multi-use path, or will there be a separate path with bicycle and wheelchair friendly surfaces? As someone working to restore bicycle paths, e.g. along the former bridle path along the Emerald Necklace parkways, I appreciate how much easier it is to plan ahead and include these patbs in the first place.
- Re: page 1-9, last comment: In addition to traffic analysis in the Weld/Walter/Centre Streets triangle, please study traffic in the vicinity of the Hunnewell Building Extension, where the public educational programs, visitor services and library will be located, as well as Forest Hills Station/Washington St/South St./Arborway/Murray Circle.
- Re: page 1-11, comments: Placement of new parking underground, if feasible, would enhance the feeling of *transition from the chaos and noise of the outside world to tranquility upon passing through the Arboretum gates*. It seems that 50 Landscape Institute students per course will create much greater traffic movement than the current maintenance facility.
- Re: Section 2.2.1, page 2-3, The Arboretum Landscape: Visitors "may park at the gates or along Arborway and Bussey Street. In addition, the Arboretum may be conveniently reached via the Forest Hills station of the Orange Line or by several bus routes." Among potential students, there is apparently an impression that these options are less safe than driving. Is this real or imagined? Parking and security are also issues in Cambridge. Maybe there is a need for marketing, increased police presence, improvements in lighting, snow-plowing

in winter, sidewalk repair, etc. to make car-free options more attractive (in addition to safe crossings etc.)

- Re: Section 2.2.1, page 2-4, Bussey Brook Meadow: The new Footpath through Bussey Brook Meadow creates new pedestrian access from the Forest Hills MBTA station, but the surface is not bicycle-friendly or handicapped-friendly. Whenever Olmsted had the opportunity, he provided for multiple uses, with separate paths for each use.
- Re: Section 2.3.2, page 2-17, Dana Greenhouse parcel: Since the portion of the parcel immediately adjacent to Centre St. is a GPOD, what are the implications for the proposed project?
- Re: Section 3.2, page 3-2, Facility Goals: In addition to "Creation of new classroom space for the Landscape Institute, providing appropriate parking", I would like the goals include provision for bicycle storage and promotion of car-free alternatives as a goal.
- Re: Section 3.4, Facility Siting: Regarding Alternate sites, the State Laboratoy Institute is an intriguing possibility. On the maps (pages 1-3 and 2-15) the State Lab property seems to "belong" to the Arboretum. Were there any discussions with the state? Also, were off-site alternatives considered for any portion of the additional needs, such as the Landscape Institute? Nearby options include properties owned by the City of Boston, such as the Curley Mansion on the Jamaicaway, and the Pinebank building, as well as the eight acres that will be turned over to the City by the MBTA when the Arborway Yard Bus Facility is completed.
- Re: Section 4.2.1, page 4-2, Planning and Siting Considerations: Visitors currently park on the street. If cars will be entering and exiting the Arboretum main gate frequently for the landscape institute, perhaps there can be coordination with the nearby pedestrian-activated crossing light (enabling pedestrians to cross the Arborway about 50 feet beyond the gate.)
- Re: Section 4.3.2, Horticulture Support Facility, project description: Re: Removal of the unoccupied 19th century house at 1090 Centre St., have alternatives been explored (fund-raising auction, donation, relocation)? Does the house have historic significance?
- Re: Section 4.4.2, page 4-7, Research and Administration Building, project description: In addition to allowing for enjoyable pedestrian access, please consider expanding to include access via bicycle etc. which also makes it handicapped accessible.
- Re: Section 4.4.2, page 4-7, Research and Administration Building, project description: As previously mentioned, please include the heavily traveled Arborway side of the site in the transportation studies.
- Re: Section 4.4.3, page 4-8, Improvements to the Grounds: In addition to planning a new pedestrian network, please consider a new multi-use network.

Thank you for soliciting comments on the Arnold Arboretum IMPNF. Sincerely,

Sarah E. Freeman

Sarah E. Freeman

Craig, Keith

From: peters@fas.harvard.edu
Sent: Monday, April 12, 2004 1:19 PM
To: keith.craig.bra@ci.boston.ma.us
Subject: IMP feedback/Arnold Arboretum

1453 Centre St.
Roslindale, MA 02131-1415
(617) 327-7763
April 12, 2004

Mr. Keith Craig
Boston Redevelopment Authority
1 City Hall Square
Boston, MA 0211

Mr. Craig,

We are writing to offer our feedback on the Arnold Arboretum's proposed development of a research facility on the Weld Hill land as outlined in its Institutional Master Plan.

My wife and I have attended four public meetings on the issue, with virtually no additional information from the Arboretum. Therefore, we are somewhat at a loss to address the specifics of the proposal, so I will restate the positions that we have expressed since the first public hearing last fall.

1.) Community input or community briefing? It has been clear from the beginning that the Arboretum's proposal for development of the Weld Hill parcel is not a proposal at all. Rather, it is a plan, one conceived outside the public sphere and brought to the neighboring community for tweaking. In conversations with friends and neighbors since the "proposal" was made public, I have encoountered an undercurrent of skepticism, a conviction that the research facility is inevitable, that the Arboretum will do what it wants. Indeed, one is hard-pressed to believe that neighborhood concerns will be taken seriously when one sees tree cutting, soil testing, digging, and other site work proceeding on the land. Concern No. 1, then, is that the opinions and input of neighbors be taken seriously and incorporated into the Arboretum's existing plan for Weld Hill.

2.) Preservation of open space. Whatever the outcome of the Weld Hill development, the one non-negotiable prerequisite is the preservation of open space. That would entail nothing less than a conservation restriction or other applicable legal limit on the amount of future development on Weld Hill and that the open space allow public access to the Arboretum from the Centre Street/Weld Street area of Roslindale and West Roxbury. Such open space should be guaranteed, not by the assertions of public or Arboretum officials but by legal public documents. No one believes that the development of Weld Hill will stop with the Arboretum's current plan. As part of the IMP process, the city should require an independent study be done to determine the compatibility of the Weld Hill site with the Arboretum's vision of its research role.

3.) State of the art facility. The proposed research facility should be nothing less than a showplace of energy efficiency, environmental compatibility, and landscape integration. Consider what the new Audubon building has meant for Mattapan. Roslindale deserves nothing less.

4.) Radcliffe seminar students. Some of the impetus of the Arboretum's master plan is the future accommodation of the Radcliffe seminars landscape design program in the Hunnewell Building. Bob Cook rightly underscored the importance of the seminars by noting that many of the students are urban, minority, or from low-income situations. He added that many of these students complete the program while holding down full-time jobs, raising families, or both, and that after graduation many use their skills to benefit their home communities. A Radcliffe seminars spokesman in attendance estimated that 70 percent of students rely on public transportation to get to class. The Hunnewell Building is not readily accessible using public transportation and if the Arboretum

truly is committed to the mission of the Radcliffe landscape design seminars, it should do no less than fund a shuttle from the Forest Hills T station to transport students to and from their classes.

While these are our primary concerns, no doubt others will arise as the IMP process progresses and details of the Arboretum's plan appear. We appreciate the opportunity to offer input, and we will be following developments closely.

Sincerely,

Alicia and Bertil Peterson

[illegible]
Roslindale MA 02131
April 9, 2004

Dear Mr Craig:

My name is Richard Matulis. I have been an abutter of the Roslindale gate of the Arnold Arboretum for over 36 years and as a result have seen many events in and around the surrounding area. I was the recipient of a Boston Police Neighborhood Crime Watch Award this past year which included several events around the Arboretum

I heartily concur with my next door Neighbor Wayne Bertsch and his assessment of conditions in the surrounding area concerning security. I would go further my stressing the removal of and lack of signs relative to conduct within the Arboretum relative to dog owners. Within the Arb I feel it's a major accident waiting to happen. Outside my concern is the 5:30 AM to 10 PM visits of pet owners even though the park is posted as closed before dawn and at dusk.

With many responsible owners, there are still those who do not control their pets from the moment they open their car doors in vehicles posted adjacent to or near my domain. These include dogs relieving themselves in our yard or on the lawn and intimidating good children who may be in the back yard.

Walter Mccalick of Longfellow Associates seems to agree with me in his assessment of Arboretum Security. The Boston Police under former Captain Tim Mooney were most responsive. I give the Arb an "incomplete grade" feeling that there is much to be done in this regard as I note several out of state plates as well as non-resident stickers in town that would readily indicate their last behaviors.

158 Walter Street
Roslindale, MA 02131
617-327-6670
April 11, 2004

Mr. Keith Craig
Boston Redevelopment Authority
One City Hall Square
Boston, MA 02201

Dear Mr. Craig:

This letter concerns the institutional master plan submitted recently by Harvard University's Arnold Arboretum. I have two concerns to express.

First and most important is the likely loss of green space and the reduction or elimination of a buffer between the residential area in which I live and the institutions along Centre Street. It has been my experience that institutions have an insatiable appetite for growth and will continue to press for development at the expense of surrounding residential areas, unless a firm and lasting limitation is put in place. I support the Longfellow Area Neighborhood Association's proposal that the proposed building on Weld Hill be allowed, but that the property be rezoned to limit future growth and preserve green space.

Observations of my alma mater, Boston University, have fed this concern over the years. In the early 1980s, the Audubon Circle neighborhood at the corner of Beacon Street and Park Drive was a viable neighborhood, contesting the acquisition of apartment buildings by BU. The university claimed that these buildings were used to house members of the community at large, but it was common knowledge that they were used for off-campus student housing and for visiting faculty members. Today, a drive through that area reveals BU residence hall signs on virtually every building. The neighborhood was defeated and ultimately "eaten" by the university. Fifty years from now, will an ambitious new arboretum director seek to develop the Arboretum Hotel and Conference Center to accommodate international visitors and host conferences at which the results of horticultural research will be presented? Unless we draw a firm line today, we leave the door wide open for such an eventuality.

Secondly, I am concerned about the hazardous traffic patterns in the area. The intersection of Walter and Centre Streets is a death trap where one takes one's life in one's hands to try to merge into the flow of traffic. Adding more cars and a Walter Street driveway will further aggravate this already dangerous situation. If any development is to proceed on the Weld Hill site, a comprehensive traffic study and redesign should be undertaken as well.

Thank you for the opportunity to comment on this project.

Sincerely,

Deborah Beatty Mel

Craig, Keith

From: Tumposky, Bob
Sent: Monday, April 12, 2004 10:09 AM
To: Craig, Keith
Subject: Arboretum comment

Keith,

I want to make two suggestions as an Arboretum neighbor in Roslindale for community benefits from the proposed project:

1. Security--getting Harvard or Boston police to drive through Arboretum areas twice every evening at varying times to discourage adolescent drinking parties and other destructive behavior

2. The Arboretum has always said that it has no responsibility for picking up litter or cleaning up naturally occurring mess on its periphery, even though as residents we are obliged to clean up city-owned sidewalks and grass strips (an Arboretum employee does some pickup on his own occasionally).

I think that it's very important that the Arboretum commit itself in writing to pick up litter from the sidewalks and gutters from its entire periphery at least once per week and that it trim weeds and sweep sidewalks at least twice a year, in the spring and in the late fall.

Bob Tumposky

Craig, Keith

From: r.sandler@neu.edu
Sent: Monday, April 12, 2004 9:02 AM
To: keith.craig.BRA@ci.boston.ma.us
Subject: Arboretum IMPNF

Dear Mr. Craig,

I know that the deadline for comment on the Arboretum's IMPNF was yesterday. I hope that the following comments will still be considered, although they are a day late.

I understand the need for the Arboretum to expand and improve on its facilities. I also understand that it is in the arboretum's interest and expertise in maintaining the ecological integrity of the land. My concerns are therefore not concerned about the ecology of the project. I am concerned about the community impact; or the impact on the character and atmosphere of the arboretum. My specific concerns are these:

1. Aesthetic. I am concerned about he aesthetic impact the construction will have on the arboretum. The IMPNF says that the arboretum is sensitive to this issue, but there are not sufficient details about the proposed construction to determine the aesthetic impact. Each of the construction projects represents a major expansion over existing facilities and has the potential to be aesthetically detrimental.

2. Relocation of the Landscape Design Program. The IMPNF attempts to make the location of this program to the Arboretum seem trivial, in that it will not impact traffic through the arboretum. This seems to me to be misleading. By their own numbers, the program as it stands will greatly increase traffic to the arboretum and on the streets that pass through the arboretum. The Arboretum must be more forthcoming about what the program's impact will be, and whether there are plans for expanding the program in the future. This seems to be an area where there is the potential for significantly changing the character and atmosphere of the arboretum.

3. Additional Parking. The IMPNF calls for nearly doubling the amount of parking in the Arboretum. This will undoubtedly change the character of the arboretum. One of the wonderful aspects of the arboretum is that once inside of the gates, there are not cars. I suspect that the Arboretum will argue that the parking will be near the gates and will therefore not affect the visitors' arboretum experience. However, this is not the case. All visitors come in where the cars come in. So the confluence of people will be where traffic is the highest. Many people--elderly, disabled, those with small children, those with old dogs--do not get that far away from those areas. The additional car traffic will be detrimental to their experience. Moreover, there are stray cars that drive the interior roads of the arboretum. This traffic is sure to go up with the addition of more parking. Finally, the Arboretum is located right on the Orange T line and a bus transfer point. We should be encouraging public transportation to the arboretum, not driving cars.

Thank you for considering my comments and concerns.
Sincerely,

Ronald Sandler
38 Custer Street, #2
Jamaica Plain, MA 02130
tel: 617.522.5852

Ronald Sandler
Assistant Professor of Philosophy
Department of Philosophy and Religion
Northeastern University
371 Holmes Hall

Mr. Keith Craig, Project Manager
Boston Redevelopment Authority
Boston City Hall, 9th Floor
One City Hall Square
Boston, MA 02201

April 7, 2004

Re: Arnold Arboretum Institutional Master Plan Notification Form

Dear Mr. Craig:

Thank you for helping present the Arboretum's Institutional Master Plan Notification Form at the public meeting at Roslindale's Knights of Columbus Hall last Wednesday March 31. As a Roslindale resident who owns a home one house away from the Arboretum's Mendum Street gate, I have two comments that I would like to be made part of the Institutional Master Plan review process:

1) The Harvard University Police Department should provide warm-weather after-hours security patrols in the Arboretum. Without revisiting the City's ultimate oversight of Arboretum security under the original 19th Century agreement, a commitment from Harvard to address abutters' serious security concerns by providing two-person foot patrols from May 1 through October 31 from 10:00 PM until 2:00 AM would go a long distance towards winning the trust and support of the neighboring community. Setting aside the age-old disruptions of late-night underage drinking, myself and my neighbors have all witnessed Arboretum-associated drug use, drug selling, loud and violent fights, and attempted sexual assaults right outside our houses. Harvard's sizeable Police Department has substations as close as Allston and Longwood, and a two-person security patrol four hours a night for six months a year would require minimal resources from the University while greatly helping reduce the Arboretum's attractiveness as a location for quite serious criminal activity.
2) Harvard University must make a clear, permanent, legally binding commitment to preserving the majority of the Weld Hill parcel as public open space. After selling off Joyce Kilmer Park several decades ago for the construction and expansion of the Hebrew Rehabilitation Center, the City of Boston made very straightforward assurances to the people of Roslindale that all of Weld Hill would remain permanent open space. Indeed, the assurance that Weld Hill would remain permanent open space provided the chief rationale for granting zoning variances allowing the massive expansion of the Hebrew Rehab in the 1970s and is clearly shown in those documents. Many people in Roslindale support the Arboretum's mission and goals and truly wish to help realize them, but we cannot support Harvard's desire to establish an institutional use on this large residentially-zoned parcel without a clear, permanent, legally binding guarantee that most of the site will remain open space. Weld Hill forms a key buffer between the exponentially increasing institutional development along Centre Street and our small-scale residential neighborhood. A legal agreement such as a permanent Conservation Restriction, with a building envelope allowing for current and future building and parking needs and the rest of the parcel remaining permanent open space, would guarantee to the community that this side of Roslindale will not be overwhelmed with institutional growth in the decades ahead.

Thank you for the opportunity to comment on the Institutional Master Plan Notification Form, and as always many thanks to you and your colleagues for all your efforts in helping Harvard, the Arboretum, and the people of Roslindale and Jamaica Plain work towards a positive outcome.

Sincerely, Wayne Beitler

Wayne Beitler, 55 Fairview Street, Roslindale, MA 02131

April 9, 2004

Mr. Keith Craig, Project Manager
Boston Redevelopment Authority
Boston City Hall, 9th Floor
One City Hall Square
Boston MA 02201

RE: Arnold Arboretum Institutional Master Plan Notification Form

Dear Mr. Craig,

I heard your presentation about the Arboretum's Institutional Master Plan Notification Form at the public meeting in Roslindale on March 31. I have a few comments to make about it, as a resident of Roslindale who owns a home on Mendum Street, a few steps away from the gated entrance to the Arboretum. I hope these comments will be included in the Institutional Master Plan review process:

1) The Harvard University Police Department really should provide warm weather after-hours security patrols in the Arboretum. All of the neighbors in this area (Mendum and Fairview Street) have witnessed Arboretum associated drug deals, loud fights, assaults, etc. These activities occur right in front of our homes and are frightening as well as jeopardize our safety. We really would like a commitment from Harvard to address our concerns by providing two person foot patrols from May 1 through October 31 from 10pm till 2 a.m in the Arboretum. A two person security patrol (comparable to what is provided by Harvard in the Medical area) four hours per night, six month per year would require minimal resources from the University while greatly reducing the Arboretum's attractiveness for all of these illegal behaviors and criminal activity.

2) Harvard University really needs to make a clear, permanent, legally binding commitment to preserving the majority of the Weld Hill parcel as public open space. After selling off Joyce Kilmer Park several decades ago for the construction and expansion of the Hebrew Rehab Center, the City of Boston made very straightforward assurances to the people of Roslindale that all of Weld Hill would remain permanent space. It was the assurance that Weld Hill would remain permanent open space that provided the primary rationale for granting zoning variances allowing the huge expansion of the Hebrew Rehab Ctr in the 70s and is clearly evident in those documents. Many of us in Roslindale support the Arboretum's mission and goals and want to help realize them, but we can NOT support Harvard's desire to establish an institutional use on this large residentially-zoned parcel without a clear, permanent, legally binding guarantee that most of the site will remain open space. Weld Hill forms an important buffer between the ever increasing development along Centre Street and our small

residential neighborhood. Additinally, a legal agreement re:permanent Conservation Restriction, would guarantee our community that this side of Roslindale will not be overwhelmed with institutional growth in decades ahead.

Thank you for listening to these concerns, and for your efforts in helping Harvard, the Arboretum, and the residents of Roslindale work towards a positive outcome.

Sincerely,

Michelle Papazian
8 Mendum St
Roslindale MA 02131

RICHARD HEATH

Richard Heath

42 Bourne Street
Jamaica Plain, Massachusetts 02130
617-522-7431

April 4, 2004

Mr. Keith Craig
The Boston Redevelopment Authority
City Hall
Boston, MA 02201

Dear Mr. Craig:

RE: ARNOLD ARBORETUM IMPNF

This is an exciting plan that will increase the capacity of the Arnold Arboretum to carry out its mission of research, study and public information.

It makes very good use of a large tract of unused, well-drained and sunny highground on Weld and Walter streets adjacent to the original Arboretum grounds.

The conflict of public information / visitor center with research and grounds keeping has long clashed at the existing space at the Hunnewell building. This plan successfully and thoughtfully resolves that conflict.

I have lived in the neighborhood for over 30 years. The staffs of the Arboretum have been of great value to my professional and personal work for all that time; as recently as last month I used the library to great benefit. The Arnold Arboretum has contributed to the quality of life for all Bostonians but especially for those who live nearby.

When the Blackwell Footpath was first proposed by the Boston Natural Areas Network 15 years ago it was enthusiastically taken up by the Arboretum and Boston Parks Dept and there is now a very pleasant connection from Forest Hills Station to the South Street Gate.

The Arboretum grounds crew has taken time and resources out of its normal busy schedule to vastly improve the South Street boundary as well as begin the reclamation of a former city land fill above the Footpath

I look forward to the completion of the Arnold Arboretum's educational, research and the new nursery planting fields on the Weld Street tract and the new maintenance building at the Dana Greenhouse area. Together they will greatly improve the Arboretum for all of us.

Sincerely,
Richard Heath

Craig, Keith

From: Russcove@aol.com

Sent: Wednesday, March 31, 2004 10:53

To: Keith.Craig.bra@ci.boston.ma.us

Subject: response to Arboretum meeting

Dear Mr. Craig:

Thank you for taking the time to listen to me tonight at the public meeting. I am horrified that Harvard plans to build on the Weld Hill site. This project should never be allowed. This area is zoned for single family. The city already gave up the park that the Jewish Rehab Center sits on. The loss of valuable green space in the city needs to stop. I am an abutting neighbor and am deeply opposed to the project.
Instead of building, Harvard ought to maintain the property better by fixing the walls, picking up the trash, trimming the trees, removing the cement blocks and most importantly plant some decorative bushes, trees and plants. Nothing else should happen to this property except to turn it into permanent conservation land.

Building on this property could cause serious flooding to the Wetlands bordered by Weld, Walter and Coniston Streets. As a result this could cause flooding into the bordering houses. This could be disastrous to our comfort and enjoyment of our homes.

I think their plans to put a road off Walter Street is very dangerous. They should utilize the Jewish Rehab Center's existing entrance way off Centre Street. In addition, proper sidewalks should be installed on Weld, Walter, South and Bussey Streets so that people can walk safely around the perimeter.

If Harvard is looking for a site for its landscape design program, please have them leave it in Cambridge or look for an alternative site other than beautiful open green space. There are plenty of buildings nearby that could serve as classroom space. For example, the MBTA building on the corner of Washington and Cummings Highway, the Ashmost Discount Warehouse on Washington Street, the Roslindale Community Center or the land next to the train tracks. Why should the Roslindale community have to bear the burden of Harvard's desire to construct buildings? I want a community and having big buildings next to my house was not what I expected when I decided to purchase my house. I am a teacher, and I firmly believe that the children of Roslindale and West Roxbury deserve to have this green space preserved. Kids sled here during the winter, parents walk across the site with their children to get to the main section of the Arboretum and people come and sit at the top of the hill. Please do not let this project happen.

Sincerely,
Lisa Evans
10 Weld Street
617-792-5425 cell
617-363-9199home

4/2/04

Craig, Keith

From: Jane Lewis

Sent: Tuesday, April 20, 2004 9:08 PM

To: keith.craig.bra@ci.boston.ma.us

Subject: Arboretum Institutional Master Plan

Dear Keith:
I would like to repeat my hope that the Institutional Master Plan for the Arboretum expansion incorporates a provision for conservation of a percentage of the land at Weld Hill. I would also like to reiterate the hope that any building on the site is environmentally sensitive and makes use of the latest eco-friendly design ideas, including building materials, energy and water conservation, and alternative solutions to asphalt and other road and parking surfaces. Another hope is that as many trees as possible be spared (although many have already been cut) in this effort and that the impact of the changes to this parcel of land is non-intrusive to the neighborhood. Lastly, I would like to see Harvard take responsibility for the maintenance of the sidewalks adjacent to it's property in winter, as well as safety monitoring, year-round, on a regular basis.

Thank you.
Sincerely,

Jane Lewis
9 Walter Street
Roslindale, MA 02131-1531
(617) 323-0146

Towards a Memorandum of Agreement

Last week [9/16/03] I orally presented certain issues appertaining the *Arnold Arboretum of Harvard University* garnered over 43 years living within one-half mile of its southern perimeter. I spoke of a "benign neglect" to this neighborhood by the *Arnold Arboretum* and/or *Harvard University* which I enumerated, among other things, contained

(1) a failure to perform debris removal after hurricane damage to trees and limbs hanging onto and over the then-existing chain link fence on the Walter Street perimeter sidewalk of the *Prouty's Hill* [aka "*Weld Hill*"] parcel,

(2) the inability of the *Arboretum* to police itself and this neighbor's participation as a founding member of the Arnold Arboretum Public Safety Committee et. seq. which successfully brought the Park Rangers to the *Arnold Arboretum* to redress the Arb's inability to police itself.

I listened in amazement when certain audience members thanked Dr. Cook for convening this meeting at this "beginning stage" of a Master Plan admittedly already 10 years old!

I was astonished when certain audience members outside the immediate neighborhood requested that the "community" involvement be opened up beyond the immediate neighborhood when indeed, Dr. Cook had already enunciated that his service area was global in scope in order to attract researchers from around the world.

I was disappointed when I learned that "40 school buses" of students regularly participated in *Arboretum* programs when my own son had never in 9 years of attendance at a local school within 2 miles of the Hunnewell Building ever been availed such an invitation or opportunity.

I was insulted when another audience member seated beside me last week showed me the material he had received from the *Arboretum* announcing that evening's meeting which he had received in the mail at his Brookline home address when I myself had received no such mailing or any previous mailings over these many years. In fact, the *Audubon Society's Nature Center* on Walk Hill Street on the opposite side of Roslindale has sent me more mail in two years than the *Arboretum* has in four decades.

I was bemused by certain audience members' insistences that the *Arboretum* is an asset to our community. That is not in contention by this neighbor. In fact, on the balance sheet, all assets have offsetting liabilities. The simple fact of proximity does not in itself weigh in favor of a better quality of life for the abutting community. When I learn that many of my neighbors feel unsafe in 256 acres of unpatrolled woodlands, I realize some of the

liability. When I learn of vandalism to parked cars at the gates of the Arboretum, I realize more of the inherent liability that spills into our residential community. When I envision the response to accidental or purposeful fires in the *Arboretum*, I realize this liability is borne by taxpayer dollars since the *Arboretum* cannot of itself provide policing or firefighting. When I was attacked by a gray fox one early Sunday morning last year, I was informed by the City's Animal Control officer, after the animal died on my front lawn, that the animal was indeed rabid, I realized the liability for this cost, too, is borne by us taxpayers.

I was quizzical of the remark of one audience member who challenged that "change must come" and "we should not be opposed to change". However, as responsible citizens we are surely aware and on guard for detrimental change.

In order to work together openly and cooperatively, I request certain principles be agreed to at this juncture.

First, we agree to common terms. I grew up here calling the Walter Street parcel, *"Prouty's Hill"* whereas in all the *Arboretum's* literature this site is referred to therein as *"Weld Hill."* This shift in nomenclature will surely confuse an older generation of neighbors who, if hearing about the project may have a different opinion otherwise. Therefore, all references should clearly list all versions of the site's name.

Second, we agree that *The Arnold Arboretum of Harvard University* and *Harvard University* are not mutually exclusive in respect to the *Prouty's Hill* [aka *Weld Hill*] parcel. For years debris on Walter Street has festered on the sidewalk and in the gutters. While we acknowledge that the City of Boston remains responsible for the sidewalks and gutters, the reputations of *Harvard* and/or the *Arboretum* require that they bear an obligation to hold the City accountable for cleaning the external area. This has not been the case over these decades.

Third, we agree that *The Arnold Arboretum* and *Harvard University* have an obligation to reverse its history of neglect and keep *Prouty's Hill* free of debris resulting from alcohol consumption at that site. Years of broken glass, can pop-tops, beer case containers, and the like are symptomatic of the neglect we endure.

Fourth, as a sign of neighborly good faith, the *Arnold Arboretum* and *Harvard University* agree to halt all proposed development and pre-development activities at the proposed *Prouty's Hill* site until we are clear on its impact on indigenous animals and their migration into our neighborhood. Clearly without such a voluntary suspension, should the neighborhood residents pursue a court injunction that would be hurtful to all future relations and trust between the parties.

Fifth, all future meetings regarding Roslindale development proposals will be held in a Roslindale location. Meetings held in Jamaica Plain while convenient to some are sore reminders to others of a feeling of short shrift on behalf of the *Arboretum* toward the Roslindale community.

Sixth, all future meetings should be convened, not by the *Arnold Arboretum* or *Harvard University*, but rather by the City of Boston's *Office of Neighborhood Services*. We noticed that the Roslindale Neighborhood Services Coordinator was not present at the September 23 meeting. And, in order to prevent any sense of "cooking the books", all attendance sheets will become public record and under the control of the *Mayor's Office of Neighborhood Services*. Notices in advance of meetings should also be mailed through ONS to the Roslindale community.

Seventh, maps displaying the *Prouty's Hill* parcel should be drawn to show the abutting neighborhood within a 1-mile radius. The only residences displayed on last week's renderings showed the 16 or so homes in the Forest Hill area adjacent to the *State Biological Labs*.

Doubtless there are other valid concerns revolving around the development of this parcel. As an example: while the *Arboretum* searches the world for trained researchers and scientists to relocate to a Roslindale facility, there are no scholarship opportunities for Roslindale's student to be among that elite group. Proximity by itself does not guarantee raising our quality of life. It does not happen by osmosis but, rather, requires direct participation.

Walter Michalik
45 Selwyn Street
Roslindale, MA 02131

APPENDIX 4

EXAMPLE OF PUBLIC NOTICE

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 Master Plan, including the comments of public agencies, should be transmitted to Keith Craig, Project Manager, 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

APPENDIX B

TRANSPORTATION DATA

BOSTON
TRANSPORTATION
DEPARTMENT

ONE CITY HALL PLAZA/ROOM 721
BOSTON, MASSACHUSETTS 02201
(617) 635-4680/FAX (617) 635-4295

Mr. Keith Craig, Project Manager
Boston Redevelopment Authority
One City Hall Square
Boston, MA 02201-1007

April 12, 2004

Subject: Arnold Arboretum - Institutional Master Plan Notification Form

Dear Mr. Craig:

The Arnold Arboretum of Harvard University Institutional Master Plan Notification Form (IMPNF) has been submitted to the Boston Transportation Department (BTD) as part of the Article 80 process. The IMPNF identifies three construction projects that are planned for the Arboretum. There are plans for a new 40,000 s.f. Research Administration Building on the Weld Hill Parcel, a 18,000 s.f. Horticulture Support Facility adjacent to the Dana Greenhouses and a 15,000 s.f. addition to the Hunnewell Building.

BTD has reviewed the IMPNF and outlines below specific concerns to be addressed in the Institutional Master Plan (IMP). These concerns should be incorporated in the Transportation Study that is required as part of the IMP.

Issues:

- The IMP must study the three Arboretum proposed developments as a whole to evaluate their *combined* impacts with respect to parking, vehicular access and circulation.

- The Research and Administration Building, which is proposed to be located on Weld Hill, will have impacts on Centre, Weld and Walter Streets. The IMP should detail how the residential community abutting Weld Street will be protected from traffic generated by the proposed development. Access to the site from Walter Street is also of concern as it currently carries a significant amount of traffic as a connector to Centre Street, the area's major arterial. To minimize the impact of ingress/egress to the site, BTD recommends that the IMP evaluate the feasibility of reducing the number of curbs-cuts along Walter Street from 3 to 2.

- BTD strongly recommends that the Arboretum coordinate with the Hebrew Rehabilitation Center (HRC) in an effort to utilize existing ingress/egress points for both sites. In the short and long term, joint access will be beneficial to both the HRC and the Arboretum.

- Bicycle and pedestrian circulation should be examined comprehensively in and around the entire Arboretum. The analysis should include the Blackwell Footpath, which connects the MBTA Forest Hill Station with South Street.

- The IMP should propose a Parking Management Plan for the entire perimeter of the Arboretum especially given the underground parking proposed at the Hunnewell Building. Mitigation proposed in the plan should include measures to accommodate the parking demand created by special events.

- The operation of the Walter/Bussey Streets intersection should be studied in detail, given the demands of maintenance vehicles and combined access for Hebrew Rehab.

Transportation Study:

A Transportation Study to assess the impacts of the proposed projects will be required as part of the IMP submission. The Study should provide a summary of the no-build and build conditions with respect to vehicular traffic, public transit access, pedestrian and bicycle circulation and parking. Mitigation of the long-term impacts should be identified. The Transportation Study should include the following general areas:

- Traffic – Trip generation, mode splits and directional distribution; traffic volume counts; capacity analysis to determine the level of service; queuing, delay and volume/capacity during the a.m. and p.m. peaks (and special event peak) should be calculated as base information for the Study. The analysis should include all the intersections mentioned above.

- Circulation - Circulation as it relates to City streets was not mentioned in the IMPNF. The Study should evaluate the existing circulation conditions for vehicles and pedestrians and project future circulation patterns. The circulation analysis should include staff and visitor movements.

- Parking - The existing and future parking supply associated with the proposed projects should be summarized. The parking inventory should include: location of spaces, types of spaces, percentage utilization during the parking peak, management of parking and characterization of on-street parking near and around the entire Arboretum. Special event parking should be identified.

- Transit - The area's public transit should be described including type of service, service characteristics, and evaluation of physical access to bus stops and train stations.

- Pedestrians - A description of the pedestrian conditions on sidewalks and intersections adjacent to the site should be described, including major pedestrian routes and desire lines in and around the site, and the conditions of these corridors, including, any deficiencies or barriers.

- Bicycles - The existing bicycle usage, primary bicycle routes, accommodation of bicycles, and the current supply and location of any existing racks on and around the site should be described.

- Loading and Service - The existing and proposed loading and service including Arboretum maintenance vehicles should be identified. The number of deliveries per day should be included.

We look forward to working with you on this interesting project. If you have any questions, please call me at (617) 635-4839.

Sincerely,

James D. McCarthy
Senior Planner
Policy and Planning Division

Cc: Andrea d'Amato, Commissioner and Chief of Environmental Services
Vineet Gupta, Director of Policy and Planning, BTD

Accurate Counts
978-664-2565

Location : Bussey Street East of
Location : Walter Street
City/State: Boston, MA
Counter : 119

01660002
Site Code: 01660002

Start Time	25-May-0 Tue	EB Morning	EB Afternoon	Hour Totals Morning	Hour Totals Afternoon	WB Morning	WB Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		6	50			11	59				
12:15		8	43			2	57				
12:30		9	37			7	52				
12:45		8	54	31	184	4	50	24	218	55	402
01:00		7	52			6	54				
01:15		3	58			5	61				
01:30		0	67			5	60				
01:45		2	52	12	229	5	77	21	252	33	481
02:00		1	78			3	58				
02:15		4	57			4	76				
02:30		1	65			1	103				
02:45		0	78	6	278	3	103	11	340	17	618
03:00		3	98			0	89				
03:15		1	111			3	87				
03:30		0	93			2	132				
03:45		1	107	5	409	2	102	7	410	12	819
04:00		3	105			0	106				
04:15		1	108			2	110				
04:30		1	89			1	127				
04:45		2	89	7	391	3	123	6	466	13	857
05:00		8	109			9	139				
05:15		10	112			18	125				
05:30		16	105			16	125				
05:45		23	102	57	428	25	115	68	504	125	932
06:00		20	79			33	115				
06:15		31	70			48	85				
06:30		50	85			81	88				
06:45		73	80	174	314	92	69	254	357	428	671
07:00		110	53			98	74				
07:15		96	54			98	45				
07:30		119	56			99	49				
07:45		126	47	451	210	111	55	406	223	857	433
08:00		123	40			89	35				
08:15		129	31			90	48				
08:30		121	26			90	29				
08:45		92	32	465	129	88	30	357	142	822	271
09:00		78	58			71	21				
09:15		68	22			69	38				
09:30		49	34			59	33				
09:45		54	31	249	145	63	28	262	120	511	265
10:00		51	23			42	18				
10:15		49	25			52	18				
10:30		42	25			50	28				
10:45		35	23	177	96	53	24	197	88	374	184
11:00		45	24			56	26				
11:15		47	31			62	18				
11:30		53	16			53	19				
11:45		46	12	191	83	52	11	223	74	414	157
Total		1825	2896			1836	3194			3661	6090
Percent		38.7%	61.3%			36.5%	63.5%			37.5%	62.5%

Location : Bussey Street East of
Location : Walter Street
City/State: Boston, MA
Counter : 119

01660002
Site Code: 01660002

Start Time	26-May-0 Wed	EB Morning	EB Afternoon	Hour Totals Morning	Hour Totals Afternoon	WB Morning	WB Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		11	42			13	63				
12:15		15	49			16	58				
12:30		7	60			4	46				
12:45		5	52	38	203	2	56	35	223	73	426
01:00		4	65			2	49				
01:15		5	55			6	86				
01:30		3	60			3	66				
01:45		5	62	17	242	3	55	14	256	31	498
02:00		0	64			2	76				
02:15		0	54			0	85				
02:30		1	67			4	101				
02:45		1	79	2	264	4	84	10	346	12	610
03:00		1	92			1	131				
03:15		2	112			4	110				
03:30		2	107			3	135				
03:45		2	102	7	413	3	135	11	511	18	924
04:00		4	111			0	132				
04:15		3	102			3	116				
04:30		1	99			4	125				
04:45		0	104	8	416	3	114	10	487	18	903
05:00		5	94			3	154				
05:15		8	112			10	139				
05:30		16	101			16	108				
05:45		14	100	43	407	14	115	43	516	86	923
06:00		19	83			28	72				
06:15		26	87			53	96				
06:30		35	70			83	80				
06:45		69	73	149	313	100	65	264	313	413	626
07:00		86	56			88	62				
07:15		90	60			90	43				
07:30		104	55			114	50				
07:45		105	49	385	220	106	34	398	189	783	409
08:00		135	50			103	43				
08:15		102	46			82	37				
08:30		105	43			104	40				
08:45		94	28	436	167	98	40	387	160	823	327
09:00		62	42			67	30				
09:15		67	32			62	25				
09:30		46	29			46	28				
09:45		44	24	219	127	42	26	217	109	436	236
10:00		38	24			59	20				
10:15		33	26			44	25				
10:30		41	26			47	29				
10:45		40	16	152	92	36	20	186	94	338	186
11:00		44	34			33	27				
11:15		45	16			35	25				
11:30		36	20			39	15				
11:45		48	11	173	81	51	16	158	83	331	164
Total		1629	2945			1733	3287			3362	6232
Percent		35.6%	64.4%			34.5%	65.5%			35.0%	65.0%
Grand Total		3454	5841			3569	6481			7023	12322
Percent		37.2%	62.8%			35.5%	64.5%			36.3%	63.7%
ADT	Not Calculated										

Accurate Counts
978-664-2565

Location : Bussey Street East of
Location : Walter Street
City/State: Boston, MA
Counter : 119

01660002
Site Code: 01660002

Start Time	24-May-04 EB	24-May-04 WB	Tue EB	Tue WB	Wed EB	Wed WB	Thu EB	Thu WB	Fri EB	Fri WB	Sat EB	Sat WB	Sun EB	Sun WB	Week Average EB	Week Average WB
12:00 AM	*	*	31	24	38	35	*	*	*	*	*	*	*	*	34	30
01:00	*	*	12	21	17	14	*	*	*	*	*	*	*	*	14	18
02:00	*	*	6	11	2	10	*	*	*	*	*	*	*	*	4	10
03:00	*	*	5	7	7	11	*	*	*	*	*	*	*	*	6	9
04:00	*	*	7	6	8	10	*	*	*	*	*	*	*	*	8	8
05:00	*	*	57	68	43	43	*	*	*	*	*	*	*	*	50	56
06:00	*	*	174	254	149	264	*	*	*	*	*	*	*	*	162	259
07:00	*	*	451	406	385	398	*	*	*	*	*	*	*	*	418	402
08:00	*	*	465	357	436	387	*	*	*	*	*	*	*	*	450	372
09:00	*	*	249	262	219	217	*	*	*	*	*	*	*	*	234	240
10:00	*	*	177	197	152	186	*	*	*	*	*	*	*	*	164	192
11:00	*	*	191	223	173	158	*	*	*	*	*	*	*	*	182	190
12:00 PM	*	*	184	218	203	223	*	*	*	*	*	*	*	*	194	220
01:00	*	*	229	252	242	256	*	*	*	*	*	*	*	*	236	254
02:00	*	*	278	340	264	346	*	*	*	*	*	*	*	*	271	343
03:00	*	*	409	410	413	511	*	*	*	*	*	*	*	*	411	460
04:00	*	*	391	466	416	487	*	*	*	*	*	*	*	*	404	476
05:00	*	*	428	504	407	516	*	*	*	*	*	*	*	*	418	510
06:00	*	*	314	357	313	313	*	*	*	*	*	*	*	*	314	335
07:00	*	*	210	223	220	189	*	*	*	*	*	*	*	*	215	206
08:00	*	*	129	142	167	160	*	*	*	*	*	*	*	*	148	151
09:00	*	*	145	120	127	109	*	*	*	*	*	*	*	*	136	114
10:00	*	*	96	88	92	94	*	*	*	*	*	*	*	*	94	91
11:00	*	*	83	74	81	83	*	*	*	*	*	*	*	*	82	78
Lane	0	0	4721	5030	4574	5020	0	0	0	0	0	0	0	0	4649	5024
Day	0		9751		9594		0		0		0		0		9673	
AM Peak			08:00	07:00	08:00	07:00									08:00	07:00
Volume			465	406	436	398									450	402
PM Peak			17:00	17:00	16:00	17:00									17:00	17:00
Volume			428	504	416	516									418	510

Comb. Total	0	9751	9594	0	0	0	0	9673
ADT	Not Calculated							

Accurate Counts
978-664-2565

Location : Weld Street West of
Location : Walter Street
City/State: Boston, MA
Counter : 632

01660001
Site Code: 01660001

Start Time	25-May-0 Tue	EB Morning	EB Afternoon	Hour Totals Morning	Hour Totals Afternoon	WB Morning	WB Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		2	25			5	22				
12:15		3	12			6	24				
12:30		4	23			2	12				
12:45		1	17	10	77	2	14	15	72	25	149
01:00		0	18			1	16				
01:15		2	22			1	17				
01:30		1	17			4	14				
01:45		2	13	5	70	0	16	6	63	11	133
02:00		0	26			1	15				
02:15		2	20			0	27				
02:30		0	18			0	18				
02:45		0	28	2	92	0	27	1	87	3	179
03:00		1	33			1	26				
03:15		0	20			0	19				
03:30		0	26			2	33				
03:45		0	35	1	114	1	32	4	110	5	224
04:00		0	32			0	29				
04:15		0	29			0	29				
04:30		0	29			0	40				
04:45		1	28	1	118	0	38	0	136	1	254
05:00		4	39			4	49				
05:15		1	34			3	37				
05:30		2	43			0	45				
05:45		8	40	15	156	5	38	12	169	27	325
06:00		8	32			4	33				
06:15		5	14			9	39				
06:30		14	28			18	28				
06:45		25	40	52	114	20	20	51	120	103	234
07:00		35	28			27	20				
07:15		37	26			28	17				
07:30		37	24			26	16				
07:45		37	22	146	100	24	19	105	72	251	172
08:00		37	11			27	12				
08:15		43	12			16	15				
08:30		43	13			21	9				
08:45		26	16	149	52	29	14	93	50	242	102
09:00		29	11			17	4				
09:15		19	13			8	8				
09:30		18	12			8	7				
09:45		11	4	77	40	12	12	45	31	122	71
10:00		19	10			16	7				
10:15		18	7			11	5				
10:30		15	7			7	6				
10:45		14	6	66	30	9	5	43	23	109	53
11:00		22	14			16	8				
11:15		14	3			17	4				
11:30		17	2			13	5				
11:45		20	3	73	22	15	3	61	20	134	42
Total		597	985			436	953			1033	1938
Percent		37.7%	62.3%			31.4%	68.6%			34.8%	65.2%

Location : Weld Street West of
Location : Walter Street
City/State: Boston, MA
Counter : 632

01660001
Site Code: 01660001

Start Time	26-May-0 Wed	EB Morning	EB Afternoon	Hour Totals Morning	Hour Totals Afternoon	WB Morning	WB Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		3	18			5	25				
12:15		0	20			7	13				
12:30		5	23			0	16				
12:45		2	16	10	77	5	14	17	68	27	145
01:00		1	27			2	14				
01:15		3	25			2	16				
01:30		0	23			1	24				
01:45		0	19	4	94	1	14	6	68	10	162
02:00		1	30			0	18				
02:15		1	18			0	19				
02:30		0	35			0	30				
02:45		0	32	2	115	1	24	1	91	3	206
03:00		0	19			0	30				
03:15		0	30			2	33				
03:30		0	29			1	38				
03:45		0	30	0	108	1	33	4	134	4	242
04:00		0	32			0	28				
04:15		1	27			2	29				
04:30		1	30			0	38				
04:45		2	25	4	114	0	39	2	134	6	248
05:00		2	29			0	44				
05:15		2	20			7	48				
05:30		6	36			0	29				
05:45		10	35	20	120	4	35	11	156	31	276
06:00		5	31			6	27				
06:15		7	24			6	35				
06:30		14	31			5	24				
06:45		23	21	49	107	21	16	38	102	87	209
07:00		31	17			16	16				
07:15		21	18			34	13				
07:30		54	14			17	18				
07:45		47	18	153	67	25	5	92	52	245	119
08:00		45	17			31	14				
08:15		47	16			16	12				
08:30		29	9			21	11				
08:45		36	5	157	47	30	7	98	44	255	91
09:00		32	7			19	11				
09:15		30	11			9	6				
09:30		20	15			16	4				
09:45		12	7	94	40	8	10	52	31	146	71
10:00		15	6			11	5				
10:15		6	16			13	9				
10:30		14	5			13	6				
10:45		12	8	47	35	18	3	55	23	102	58
11:00		27	6			11	7				
11:15		21	10			15	8				
11:30		19	2			16	6				
11:45		23	4	90	22	15	5	57	26	147	48
Total		630	946			433	929			1063	1875
Percent		40.0%	60.0%			31.8%	68.2%			36.2%	63.8%
Grand Total		1227	1931			869	1882			2096	3813
Percent		38.9%	61.1%			31.6%	68.4%			35.5%	64.5%
ADT	Not Calculated										

Accurate Counts
978-664-2565

Location : Weld Street West of
Location : Walter Street
City/State: Boston, MA
Counter : 632

01660001
Site Code: 01660001

Start Time	24-May-04 EB	24-May-04 WB	Tue EB	Tue WB	Wed EB	Wed WB	Thu EB	Thu WB	Fri EB	Fri WB	Sat EB	Sat WB	Sun EB	Sun WB	Week Average EB	Week Average WB
12:00 AM	*	*	10	15	10	17	*	*	*	*	*	*	*	*	10	16
01:00	*	*	5	6	4	6	*	*	*	*	*	*	*	*	4	6
02:00	*	*	2	1	2	1	*	*	*	*	*	*	*	*	2	1
03:00	*	*	1	4	0	4	*	*	*	*	*	*	*	*	0	4
04:00	*	*	1	0	4	2	*	*	*	*	*	*	*	*	2	1
05:00	*	*	15	12	20	11	*	*	*	*	*	*	*	*	18	12
06:00	*	*	52	51	49	38	*	*	*	*	*	*	*	*	50	44
07:00	*	*	146	105	153	92	*	*	*	*	*	*	*	*	150	98
08:00	*	*	149	93	157	98	*	*	*	*	*	*	*	*	153	96
09:00	*	*	77	45	94	52	*	*	*	*	*	*	*	*	86	48
10:00	*	*	66	43	47	55	*	*	*	*	*	*	*	*	56	49
11:00	*	*	73	61	90	57	*	*	*	*	*	*	*	*	82	59
12:00 PM	*	*	77	72	77	68	*	*	*	*	*	*	*	*	77	70
01:00	*	*	70	63	94	68	*	*	*	*	*	*	*	*	82	66
02:00	*	*	92	87	115	91	*	*	*	*	*	*	*	*	104	89
03:00	*	*	114	110	108	134	*	*	*	*	*	*	*	*	111	122
04:00	*	*	118	136	114	134	*	*	*	*	*	*	*	*	116	135
05:00	*	*	156	169	120	156	*	*	*	*	*	*	*	*	138	162
06:00	*	*	114	120	107	102	*	*	*	*	*	*	*	*	110	111
07:00	*	*	100	72	67	52	*	*	*	*	*	*	*	*	84	62
08:00	*	*	52	50	47	44	*	*	*	*	*	*	*	*	50	47
09:00	*	*	40	31	40	31	*	*	*	*	*	*	*	*	40	31
10:00	*	*	30	23	35	23	*	*	*	*	*	*	*	*	32	23
11:00	*	*	22	20	22	26	*	*	*	*	*	*	*	*	22	23
Lane	0	0	1582	1389	1576	1362	0	0	0	0	0	0	0	0	1579	1375
Day	0		2971		2938		0		0		0		0		2954	
AM Peak			08:00	07:00	08:00	08:00									08:00	07:00
Volume			149	105	157	98									153	98
PM Peak			17:00	17:00	17:00	17:00									17:00	17:00
Volume			156	169	120	156									138	162

Comb. Total	0	2971	2938	0	0	0	0	2954
ADT	Not Calculated							

N/S Street : Center Street
E/W Street: VFW Parkway
City/State : Boston, MA
Weather : Rain

Accurate Counts
978-664-2565

File Name : 09010001
Site Code : 09010001
Start Date : 9/29/2004
Page No : 1

Groups Printed- Cars - Trucks

	Center St From North			Center St From South			VFW Pkwy From West					
Start Time	Thru	Right	Peds	Left	Thru	Peds	Left	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00	49	134	0	1	267	0	192	0	0	0	643	643
07:15	96	170	0	0	243	0	173	1	0	0	683	683
07:30	73	164	0	0	243	0	201	0	0	0	681	681
07:45	82	200	0	0	198	0	212	1	2	2	693	695
Total	300	668	0	1	951	0	778	2	2	2	2700	2702
08:00	98	142	0	5	180	0	207	2	0	0	634	634
08:15	65	142	0	1	163	1	200	1	1	2	572	574
08:30	72	167	0	0	142	0	218	3	0	0	602	602
08:45	67	128	0	5	185	0	194	1	0	0	580	580
Total	302	579	0	11	670	1	819	7	1	2	2388	2390
Grand Total	602	1247	0	12	1621	1	1597	9	3	4	5088	5092
Apprch %	32.6	67.4		0.7	99.3		99.4	0.6				
Total %	11.8	24.5		0.2	31.9		31.4	0.2		0.1	99.9	

	Center St From North			Center St From South			VFW Pkwy From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour From 07:00 to 08:45 - Peak 1 of 1										
Intersection	07:00									
Volume	300	668	968	1	951	952	778	2	780	2700
Percent	31.0	69.0		0.1	99.9		99.7	0.3		
07:45 Volume	82	200	282	0	198	198	212	1	213	693
Peak Factor										0.974
High Int.	07:45			07:00			07:45			
Volume	82	200	282	1	267	268	212	1	213	
Peak Factor			0.858			0.888			0.915	
Peak Hour From 07:00 to 08:45 - Peak 1 of 1										
By Approach	07:15			07:00			07:45			
Volume	349	676	1025	1	951	952	837	7	844	
Percent	34.0	66.0		0.1	99.9		99.2	0.8		
High Int.	07:45			07:00			08:30			
Volume	82	200	282	1	267	268	218	3	221	
Peak Factor			0.909			0.888			0.955	

N/S Street : Center Street
E/W Street: VFW Parkway
City/State : Boston, MA
Weather : Rain

Accurate Counts
978-664-2565

File Name : 09010001
Site Code : 09010001
Start Date : 9/29/2004
Page No : 1

Groups Printed- Cars

	Center St From North			Center St From South			VFW Pkwy From West					
Start Time	Thru	Right	Peds	Left	Thru	Peds	Left	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00	45	132	0	1	262	0	191	0	0	0	631	631
07:15	96	169	0	0	241	0	171	1	0	0	678	678
07:30	70	161	0	0	242	0	199	0	0	0	672	672
07:45	80	199	0	0	194	0	212	1	2	2	686	688
Total	291	661	0	1	939	0	773	2	2	2	2667	2669
08:00	94	141	0	5	176	0	206	2	0	0	624	624
08:15	64	142	0	1	159	1	200	1	1	2	567	569
08:30	64	165	0	0	141	0	218	2	0	0	590	590
08:45	64	128	0	5	182	0	194	0	0	0	573	573
Total	286	576	0	11	658	1	818	5	1	2	2354	2356
Grand Total	577	1237	0	12	1597	1	1591	7	3	4	5021	5025
Apprch %	31.8	68.2		0.7	99.3		99.6	0.4				
Total %	11.5	24.6		0.2	31.8		31.7	0.1		0.1	99.9	

	Center St From North			Center St From South			VFW Pkwy From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour From 07:00 to 08:45 - Peak 1 of 1										
Intersection	07:00									
Volume	291	661	952	1	939	940	773	2	775	2667
Percent	30.6	69.4		0.1	99.9		99.7	0.3		
07:45 Volume	80	199	279	0	194	194	212	1	213	686
Peak Factor										0.972
High Int.	07:45			07:00			07:45			
Volume	80	199	279	1	262	263	212	1	213	
Peak Factor			0.853			0.894			0.910	
Peak Hour From 07:00 to 08:45 - Peak 1 of 1										
By Approach	07:15			07:00			07:45			
Volume	340	670	1010	1	939	940	836	6	842	
Percent	33.7	66.3		0.1	99.9		99.3	0.7		
High Int.	07:45			07:00			08:30			
Volume	80	199	279	1	262	263	218	2	220	
Peak Factor			0.905			0.894			0.957	

N/S Street : Center Street
E/W Street: VFW Parkway
City/State : Boston, MA
Weather : Rain

Accurate Counts
978-664-2565

File Name : 09010001
Site Code : 09010001
Start Date : 9/29/2004
Page No : 1

Groups Printed- Trucks

	Center St From North			Center St From South			VFW Pkwy From West					
Start Time	Thru	Right	Peds	Left	Thru	Peds	Left	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00	4	2	0	0	5	0	1	0	0	0	12	12
07:15	0	1	0	0	2	0	2	0	0	0	5	5
07:30	3	3	0	0	1	0	2	0	0	0	9	9
07:45	2	1	0	0	4	0	0	0	0	0	7	7
Total	9	7	0	0	12	0	5	0	0	0	33	33
08:00	4	1	0	0	4	0	1	0	0	0	10	10
08:15	1	0	0	0	4	0	0	0	0	0	5	5
08:30	8	2	0	0	1	0	0	1	0	0	12	12
08:45	3	0	0	0	3	0	0	1	0	0	7	7
Total	16	3	0	0	12	0	1	2	0	0	34	34
Grand Total	25	10	0	0	24	0	6	2	0	0	67	67
Apprch %	71.4	28.6		0.0	100.0		75.0	25.0				
Total %	37.3	14.9		0.0	35.8		9.0	3.0		0.0	100.0	

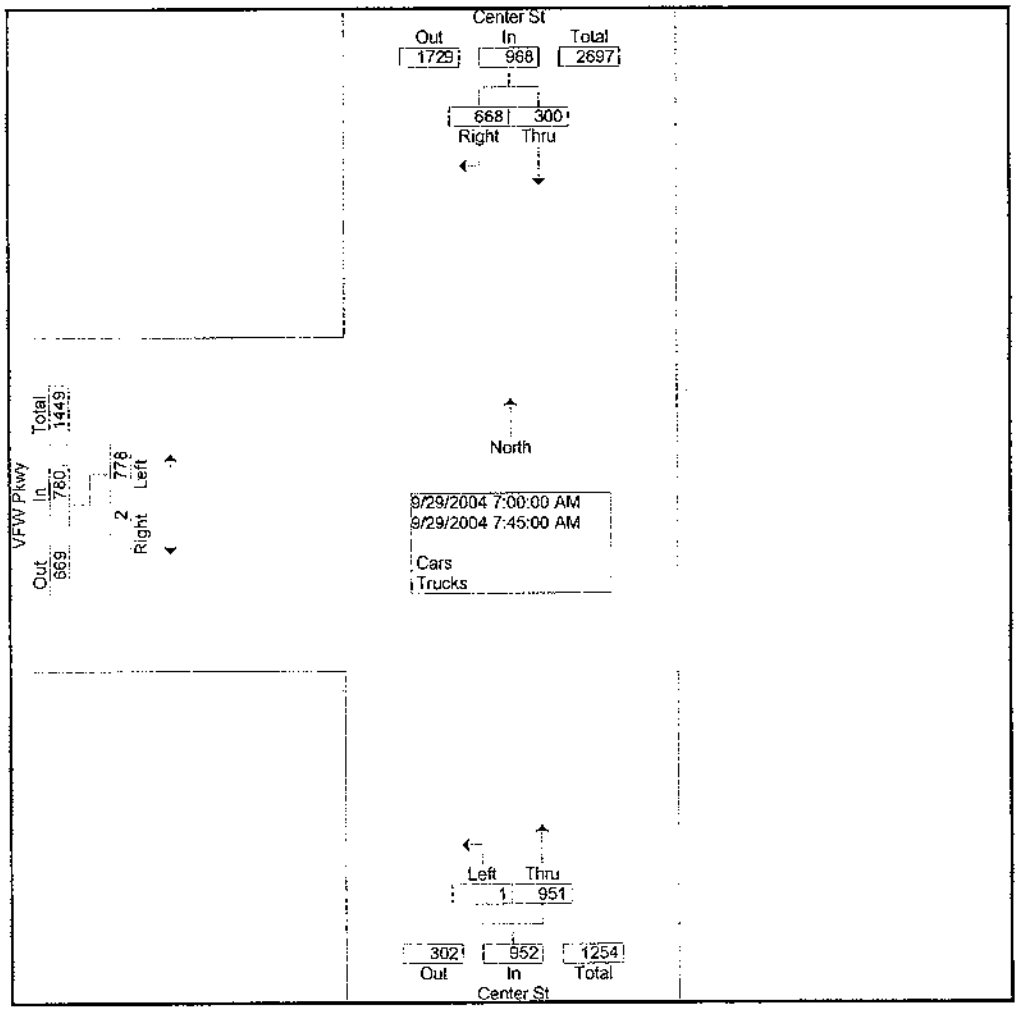
	Center St From North			Center St From South			VFW Pkwy From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour From 07:00 to 08:45 - Peak 1 of 1										
Intersection	07:45									
Volume	15	4	19	0	13	13	1	1	2	34
Percent	78.9	21.1		0.0	100.0		50.0	50.0		
08:30 Volume	8	2	10	0	1	1	0	1	1	12
Peak Factor										0.708
High Int.	08:30			07:45			08:00			
Volume	8	2	10	0	4	4	1	0	1	
Peak Factor			0.475			0.812			0.500	
Peak Hour From 07:00 to 08:45 - Peak 1 of 1										
By Approach	07:45			07:30			07:00			
Volume	15	4	19	0	13	13	5	0	5	
Percent	78.9	21.1		0.0	100.0		100.0	0.0		
High Int.	08:30			07:45			07:15			
Volume	8	2	10	0	4	4	2	0	2	
Peak Factor			0.475			0.812			0.625	

N/S Street : Center Street
E/W Street: VFW Parkway
City/State : Boston, MA
Weather : Rain

Accurate Counts
978-664-2565

File Name : 09010001
Site Code : 09010001
Start Date : 9/29/2004
Page No : 1

	Center St From North			Center St From South			VFW Pkwy From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour From 07:00 to 08:45 - Peak 1 of 1										
Intersection 07:00										
Volume	300	668	968	1	951	952	778	2	780	2700
Percent	31.0	69.0		0.1	99.9		99.7	0.3		
07:45 Volume	82	200	282	0	198	198	212	1	213	693
Peak Factor										0.974
High Int. 07:45				07:00			07:45			
Volume	82	200	282	1	267	268	212	1	213	
Peak Factor			0.858			0.888			0.915	

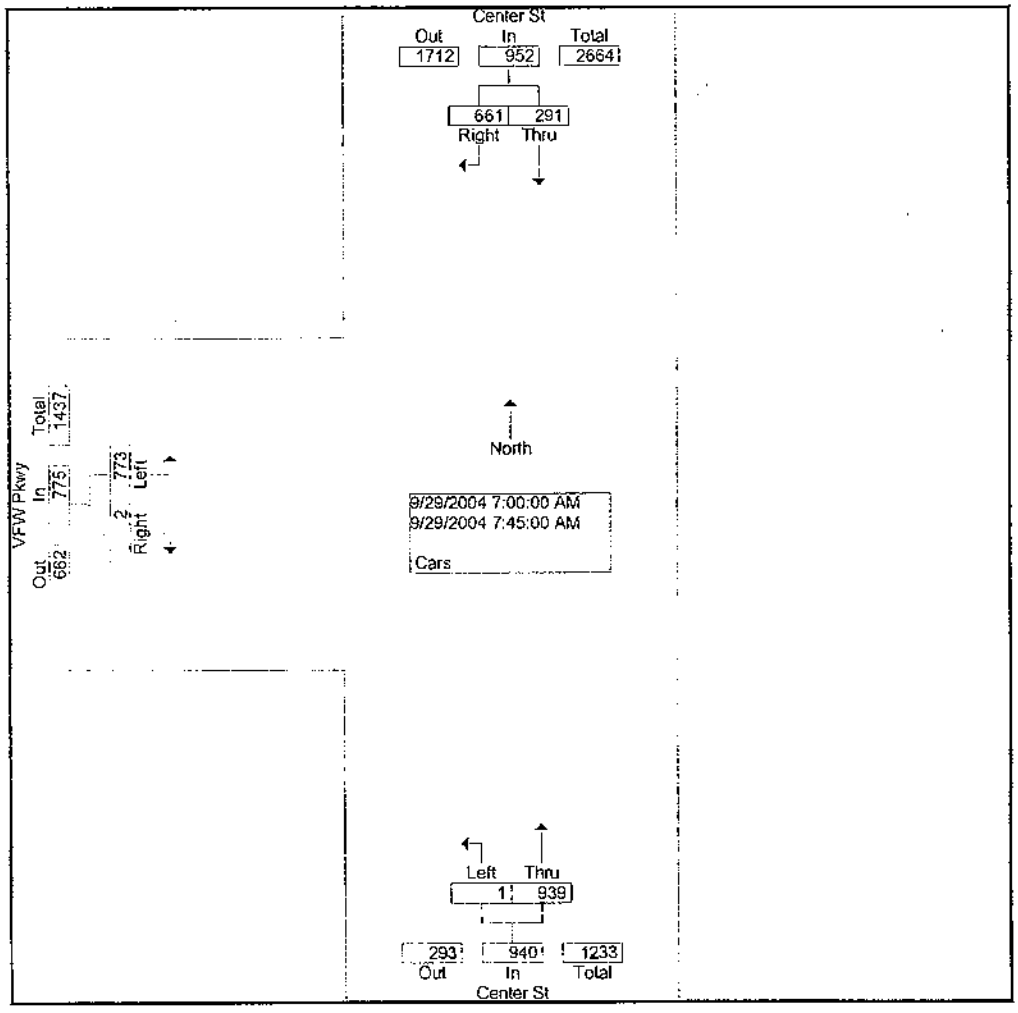


N/S Street : Center Street
E/W Street: VFW Parkway
City/State : Boston, MA
Weather : Rain

Accurate Counts
978-664-2565

File Name : 09010001
Site Code : 09010001
Start Date : 9/29/2004
Page No : 1

	Center St From North			Center St From South			VFW Pkwy From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour From 07:00 to 08:45 - Peak 1 of 1										
Intersection 07:00										
Volume	291	661	952	1	939	940	773	2	775	2667
Percent	30.6	69.4		0.1	99.9		99.7	0.3		
07:45 Volume	80	199	279	0	194	194	212	1	213	686
Peak Factor										0.972
High Int. 07:45				07:00			07:45			
Volume	80	199	279	1	262	263	212	1	213	
Peak Factor			0.853			0.894			0.910	



N/S Street : Center Street
E/W Street: VFW Parkway
City/State : Boston, MA
Weather : Rain

Accurate Counts
978-664-2565

File Name : 09010001
Site Code : 09010001
Start Date : 9/29/2004
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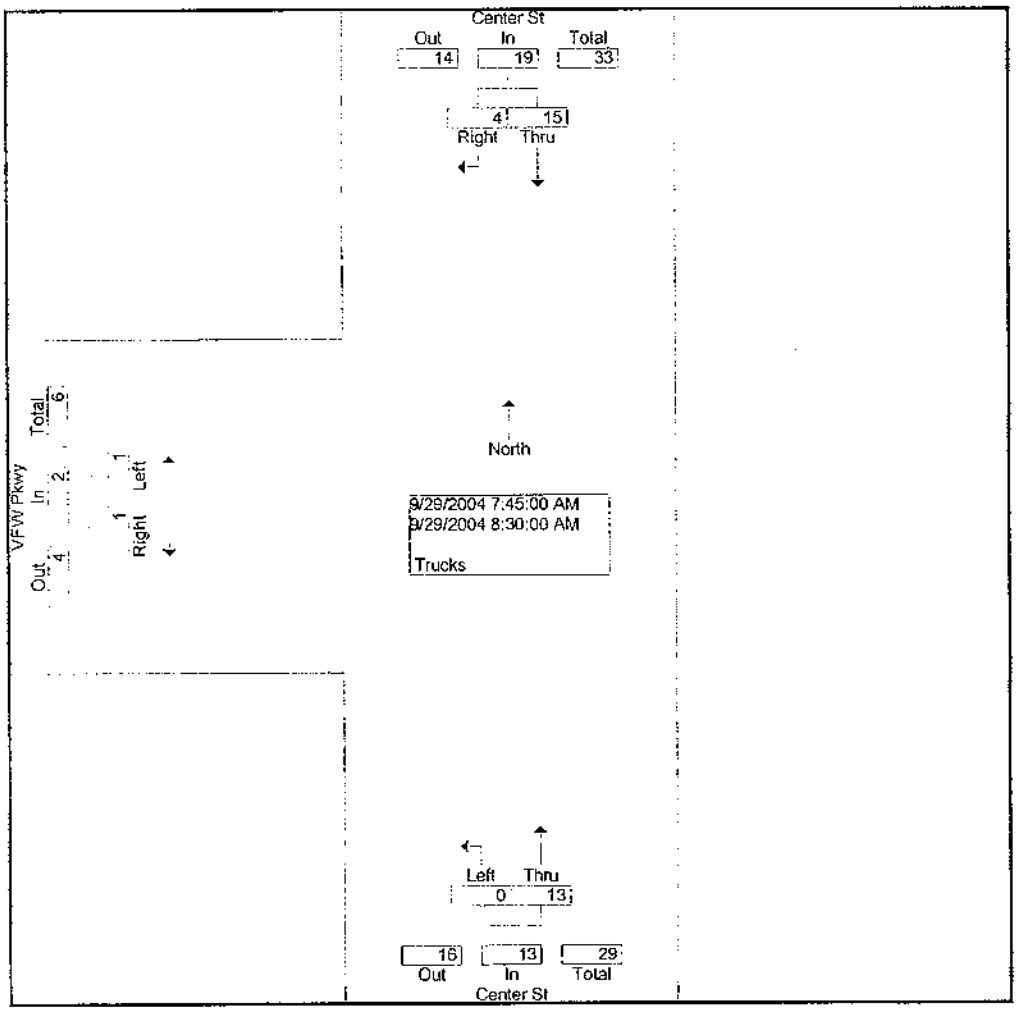
	Center St From North			Center St From South			VFW Pkwy From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour From 07:00 to 08:45 - Peak 1 of 1										
Intersection 07:45										
Volume	15	4	19	0	13	13	1	1	2	34
Percent	78.9	21.1		0.0	100.0		50.0	50.0		
08:30 Volume	8	2	10	0	1	1	0	1	1	12
Peak Factor										0.708
High Int. 08:30				07:45			08:00			
Volume	8	2	10	0	4	4	1	0	1	
Peak Factor			0.475			0.812			0.500	



N/S Street : Center Street
E/W Street: VFW Parkway
City/State : Boston, MA
Weather : Rain

Accurate Counts
978-664-2565

File Name : 09010001
Site Code : 09010001
Start Date : 9/29/2004
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Groups Printed- Cars - Trucks

	Center St From North			Center St From South			VFW Pkwy From West					
Start Time	Thru	Right	Peds	Left	Thru	Peds	Left	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
16:00	176	176	0	1	93	0	0	4	0	0	450	450
16:15	181	171	0	0	108	0	0	2	0	0	462	462
16:30	206	182	0	0	98	0	0	0	2	2	486	488
16:45	177	196	0	0	105	0	0	1	0	0	479	479
Total	740	725	0	1	404	0	0	7	2	2	1877	1879
17:00	164	178	0	0	97	0	0	2	0	0	441	441
17:15	197	192	0	0	99	0	0	3	0	0	491	491
17:30	181	164	0	0	82	0	0	2	0	0	429	429
17:45	171	201	0	0	92	0	0	2	0	0	466	466
Total	713	735	0	0	370	0	0	9	0	0	1827	1827
Grand Total	1453	1460	0	1	774	0	0	16	2	2	3704	3706
Apprch %	49.9	50.1		0.1	99.9		0.0	100.0				
Total %	39.2	39.4		0.0	20.9		0.0	0.4		0.1	99.9	

	Center St From North			Center St From South			VFW Pkwy From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour From 16:00 to 17:45 - Peak 1 of 1										
Intersection	16:30									
Volume	744	748	1492	0	399	399	0	6	6	1897
Percent	49.9	50.1		0.0	100.0		0.0	100.0		
17:15 Volume	197	192	389	0	99	99	0	3	3	491
Peak Factor										0.966
High Int.	17:15			16:45			17:15			
Volume	197	192	389	0	105	105	0	3	3	
Peak Factor			0.959			0.950			0.500	
Peak Hour From 16:00 to 17:45 - Peak 1 of 1										
By Approach	16:30			16:15			17:00			
Volume	744	748	1492	0	408	408	0	9	9	
Percent	49.9	50.1		0.0	100.0		0.0	100.0		
High Int.	17:15			16:15			17:15			
Volume	197	192	389	0	108	108	0	3	3	
Peak Factor			0.959			0.944			0.750	

N/S Street : Center Street
E/W Street: VFW Parkway
City/State : Boston, MA
Weather : Rain

Accurate Counts
978-664-2565

File Name : 09010001
Site Code : 09010001
Start Date : 9/29/2004
Page No : 1

Groups Printed- Cars

	Center St From North			Center St From South			VFW Pkwy From West					
Start Time	Thru	Right	Peds	Left	Thru	Peds	Left	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
16:00	174	175	0	1	92	0	0	4	0	0	446	446
16:15	179	171	0	0	106	0	0	2	0	0	458	458
16:30	201	179	0	0	94	0	0	0	2	2	474	476
16:45	175	195	0	0	103	0	0	0	0	0	473	473
Total	729	720	0	1	395	0	0	6	2	2	1851	1853
17:00	160	178	0	0	95	0	0	2	0	0	435	435
17:15	193	190	0	0	98	0	0	3	0	0	484	484
17:30	179	163	0	0	80	0	0	2	0	0	424	424
17:45	170	201	0	0	91	0	0	2	0	0	464	464
Total	702	732	0	0	364	0	0	9	0	0	1807	1807
Grand Total	1431	1452	0	1	759	0	0	15	2	2	3658	3660
Apprch %	49.6	50.4		0.1	99.9		0.0	100.0				
Total %	39.1	39.7		0.0	20.7		0.0	0.4		0.1	99.9	

	Center St From North			Center St From South			VFW Pkwy From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour From 16:00 to 17:45 - Peak 1 of 1										
Intersection	16:30									
Volume	729	742	1471	0	390	390	0	5	5	1866
Percent	49.6	50.4		0.0	100.0		0.0	100.0		
17:15 Volume	193	190	383	0	98	98	0	3	3	484
Peak Factor										0.964
High Int.	17:15			16:45			17:15			
Volume	193	190	383	0	103	103	0	3	3	
Peak Factor			0.960			0.947			0.417	
Peak Hour From 16:00 to 17:45 - Peak 1 of 1										
By Approach	16:30			16:15			17:00			
Volume	729	742	1471	0	398	398	0	9	9	
Percent	49.6	50.4		0.0	100.0		0.0	100.0		
High Int.	17:15			16:15			17:15			
Volume	193	190	383	0	106	106	0	3	3	
Peak Factor			0.960			0.939			0.750	

N/S Street : Center Street
E/W Street: VFW Parkway
City/State : Boston, MA
Weather : Rain

Accurate Counts
978-664-2565

File Name : 09010001
Site Code : 09010001
Start Date : 9/29/2004
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Groups Printed- Trucks

	Center St From North			Center St From South			VFW Pkwy From West					
Start Time	Thru	Right	Peds	Left	Thru	Peds	Left	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
16:00	2	1	0	0	1	0	0	0	0	0	4	4
16:15	2	0	0	0	2	0	0	0	0	0	4	4
16:30	5	3	0	0	4	0	0	0	0	0	12	12
16:45	2	1	0	0	2	0	0	1	0	0	6	6
Total	11	5	0	0	9	0	0	1	0	0	26	26
17:00	4	0	0	0	2	0	0	0	0	0	6	6
17:15	4	2	0	0	1	0	0	0	0	0	7	7
17:30	2	1	0	0	2	0	0	0	0	0	5	5
17:45	1	0	0	0	1	0	0	0	0	0	2	2
Total	11	3	0	0	6	0	0	0	0	0	20	20
Grand Total	22	8	0	0	15	0	0	1	0	0	46	46
Apprch %	73.3	26.7		0.0	100.0		0.0	100.0				
Total %	47.8	17.4		0.0	32.6		0.0	2.2		0.0	100.0	

	Center St From North			Center St From South			VFW Pkwy From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour From 16:00 to 17:45 - Peak 1 of 1										
Intersection	16:30									
Volume	15	6	21	0	9	9	0	1	1	31
Percent	71.4	28.6		0.0	100.0		0.0	100.0		
16:30 Volume	5	3	8	0	4	4	0	0	0	12
Peak Factor										0.646
High Int.	16:30			16:30			16:45			
Volume	5	3	8	0	4	4	0	1	1	
Peak Factor			0.656			0.562			0.250	
Peak Hour From 16:00 to 17:45 - Peak 1 of 1										
By Approach	16:30			16:15			16:00			
Volume	15	6	21	0	10	10	0	1	1	
Percent	71.4	28.6		0.0	100.0		0.0	100.0		
High Int.	16:30			16:30			16:45			
Volume	5	3	8	0	4	4	0	1	1	
Peak Factor			0.656			0.625			0.250	

N/S Street : Center Street
E/W Street: VFW Parkway
City/State : Boston, MA
Weather : Rain

Accurate Counts
978-664-2565

File Name : 09010001
Site Code : 09010001
Start Date : 9/29/2004
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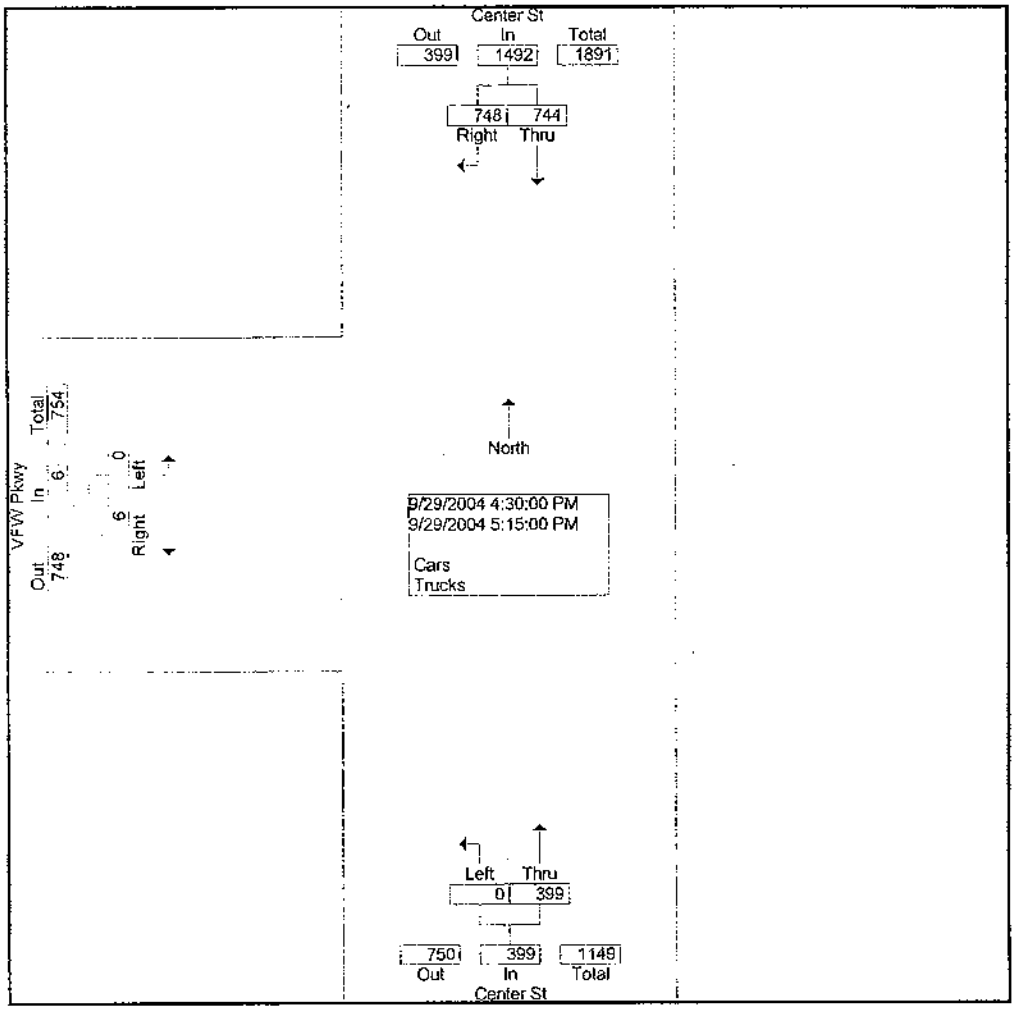
	Center St From North			Center St From South			VFW Pkwy From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour From 16:00 to 17:45 - Peak 1 of 1										
Intersection	16:30									
Volume	744	748	1492	0	399	399	0	6	6	1897
Percent	49.9	50.1		0.0	100.0		0.0	100.0		
17:15 Volume	197	192	389	0	99	99	0	3	3	491
Peak Factor										0.966
High Int.	17:15			16:45			17:15			
Volume	197	192	389	0	105	105	0	3	3	
Peak Factor			0.959			0.950			0.500	



N/S Street : Center Street
E/W Street: VFW Parkway
City/State : Boston, MA
Weather : Rain

Accurate Counts
978-664-2565

File Name : 09010001
Site Code : 09010001
Start Date : 9/29/2004
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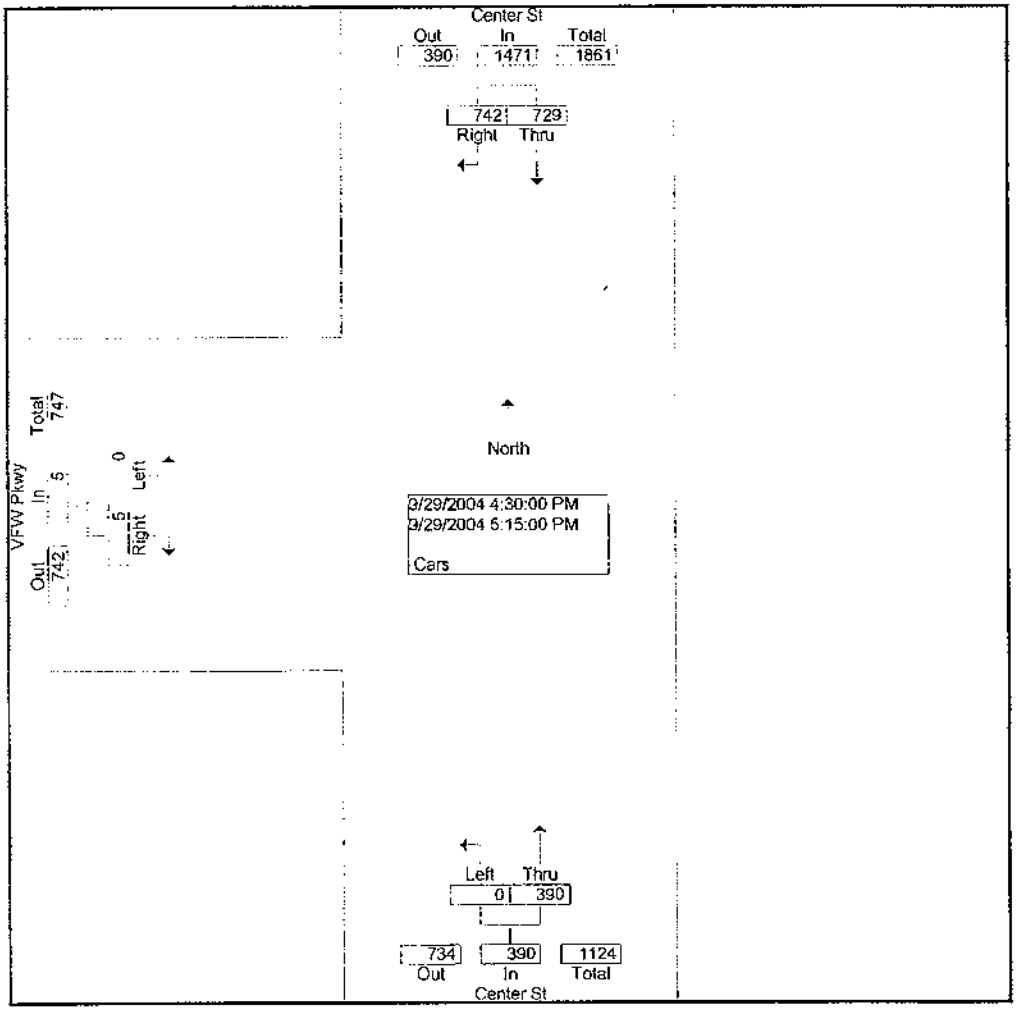
	Center St From North			Center St From South			VFW Pkwy From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour From 16:00 to 17:45 - Peak 1 of 1										
Intersection	16:30									
Volume	729	742	1471	0	390	390	0	5	5	1866
Percent	49.6	50.4		0.0	100.0		0.0	100.0		
17:15 Volume	193	190	383	0	98	98	0	3	3	484
Peak Factor										0.964
High Int.	17:15			16:45			17:15			
Volume	193	190	383	0	103	103	0	3	3	
Peak Factor			0.960			0.947			0.417	



N/S Street : Center Street
E/W Street: VFW Parkway
City/State : Boston, MA
Weather : Rain

Accurate Counts
978-664-2565

File Name : 09010001
Site Code : 09010001
Start Date : 9/29/2004
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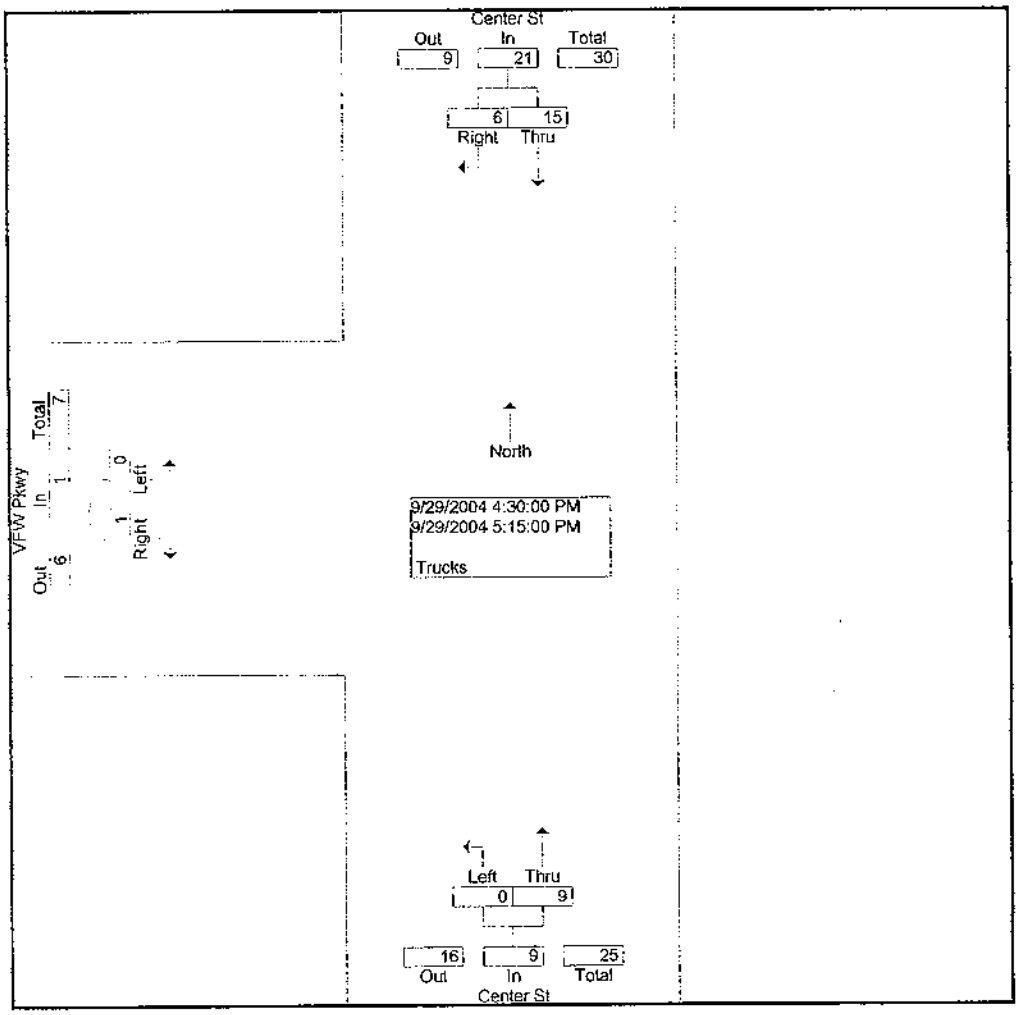
	Center St From North			Center St From South			VFW Pkwy From West			
Start Time	Thru	Right	App. Total	Left	Thru	App. Total	Left	Right	App. Total	Int. Total
Peak Hour From 16:00 to 17:45 - Peak 1 of 1										
Intersection	16:30									
Volume	15	6	21	0	9	9	0	1	1	31
Percent	71.4	28.6		0.0	100.0		0.0	100.0		
16:30 Volume	5	3	8	0	4	4	0	0	0	12
Peak Factor										0.646
High Int.	16:30			16:30			16:45			
Volume	5	3	8	0	4	4	0	1	1	
Peak Factor			0.656			0.562			0.250	



TDC
Transportation Data Corporation
P.O. Box 734 Natick, MA 01760
Office: 508-651-1610 Fax: 508-651-1229

N/S: Walter Street
W: Weld Street
City, State: Roslindale, MA
Client: VHB/E. Betancourt

File Name : 03020B
Site Code : 00009010
Start Date : 6/8/2004
Page No : 1

Groups Printed- Cars - Trucks

	Walter Street From North				Walter Street From South				Weld Street From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:30 AM	12	44	0	0	0	195	9	0	8	0	29	0	297
07:45 AM	16	45	0	0	0	197	13	0	9	0	24	0	304
Total	28	89	0	0	0	392	22	0	17	0	53	0	601
08:00 AM	17	43	0	0	0	220	14	0	13	0	31	0	338
08:15 AM	13	60	0	0	0	170	17	0	12	0	27	0	299
08:30 AM	13	51	0	0	0	161	9	0	4	0	19	0	257
08:45 AM	24	50	0	0	0	124	9	0	10	0	26	0	243
Total	67	204	0	0	0	675	49	0	39	0	103	0	1137
09:00 AM	14	61	0	0	0	117	6	0	5	0	17	0	220
09:15 AM	9	43	0	0	0	92	6	0	6	0	10	0	166
Grand Total	118	397	0	0	0	1276	83	0	67	0	183	0	2124
Apprch %	22.9	77.1	0.0	0.0	0.0	93.9	6.1	0.0	26.8	0.0	73.2	0.0	
Total %	5.6	18.7	0.0	0.0	0.0	60.1	3.9	0.0	3.2	0.0	8.6	0.0	

	Walter Street From North					Walter Street From South					Weld Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 07:30 AM to 09:15 AM - Peak 1 of 1																
Intersection	07:30 AM															
Volume	58	192	0	0	250	0	782	53	0	835	42	0	111	0	153	1238
Percent	23.2	76.8	0.0	0.0		0.0	93.7	6.3	0.0		27.5	0.0	72.5	0.0		
08:00 Volume	17	43	0	0	60	0	220	14	0	234	13	0	31	0	44	338
Peak Factor																0.916
High Int.	08:15 AM					08:00 AM					08:00 AM					
Volume	13	60	0	0	73	0	220	14	0	234	13	0	31	0	44	
Peak Factor					0.856					0.892					0.869	

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N/S: Walter Street
W: Weld Street
City, State: Roslindale, MA
Client: VHB/E. Betancourt

File Name : 03020B
Site Code : 00009010
Start Date : 6/8/2004
Page No : 1

Groups Printed- Cars

	Walter Street From North				Walter Street From South				Weld Street From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:30 AM	12	44	0	0	0	195	9	0	8	0	29	0	297
07:45 AM	16	45	0	0	0	197	13	0	8	0	24	0	303
Total	28	89	0	0	0	392	22	0	16	0	53	0	600
08:00 AM	17	42	0	0	0	220	13	0	13	0	31	0	336
08:15 AM	13	58	0	0	0	168	17	0	12	0	27	0	295
08:30 AM	13	50	0	0	0	160	9	0	4	0	18	0	254
08:45 AM	24	50	0	0	0	124	9	0	10	0	25	0	242
Total	67	200	0	0	0	672	48	0	39	0	101	0	1127
09:00 AM	14	61	0	0	0	116	6	0	5	0	17	0	219
09:15 AM	9	43	0	0	0	90	6	0	6	0	10	0	164
Grand Total	118	393	0	0	0	1270	82	0	66	0	181	0	2110
Apprch %	23.1	76.9	0.0	0.0	0.0	93.9	6.1	0.0	26.7	0.0	73.3	0.0	
Total %	5.6	18.6	0.0	0.0	0.0	60.2	3.9	0.0	3.1	0.0	8.6	0.0	

	Walter Street From North					Walter Street From South					Weld Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 07:30 AM to 09:15 AM - Peak 1 of 1																
Intersection	07:30 AM															
Volume	58	189	0	0	247	0	780	52	0	832	41	0	111	0	152	1231
Percent	23.5	76.5	0.0	0.0		0.0	93.8	6.3	0.0		27.0	0.0	73.0	0.0		
08:00 Volume	17	42	0	0	59	0	220	13	0	233	13	0	31	0	44	336
Peak Factor																0.916
High Int.	08:15 AM					08:00 AM					08:00 AM					
Volume	13	58	0	0	71	0	220	13	0	233	13	0	31	0	44	
Peak Factor					0.870					0.893					0.864	

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Client: VHB/E. Betancourt

File Name : 03020B
Site Code : 00009010
Start Date : 6/8/2004
Page No : 1

Groups Printed- Trucks

	Walter Street From North				Walter Street From South				Weld Street From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	1	0	0	0	1
Total	0	0	0	0	0	0	0	0	1	0	0	0	1
08:00 AM	0	1	0	0	0	0	1	0	0	0	0	0	2
08:15 AM	0	2	0	0	0	2	0	0	0	0	0	0	4
08:30 AM	0	1	0	0	0	1	0	0	0	0	1	0	3
08:45 AM	0	0	0	0	0	0	0	0	0	0	1	0	1
Total	0	4	0	0	0	3	1	0	0	0	2	0	10
09:00 AM	0	0	0	0	0	1	0	0	0	0	0	0	1
09:15 AM	0	0	0	0	0	2	0	0	0	0	0	0	2
Grand Total	0	4	0	0	0	6	1	0	1	0	2	0	14
Apprch %	0.0	100.0	0.0	0.0	0.0	85.7	14.3	0.0	33.3	0.0	66.7	0.0	
Total %	0.0	28.6	0.0	0.0	0.0	42.9	7.1	0.0	7.1	0.0	14.3	0.0	

	Walter Street From North					Walter Street From South					Weld Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 07:30 AM to 09:15 AM - Peak 1 of 1																
Intersection	07:45 AM															
Volume	0	4	0	0	4	0	3	1	0	4	1	0	1	0	2	10
Percent	0.0	100.0	0.0	0.0		0.0	75.0	25.0	0.0		50.0	0.0	50.0	0.0		
08:15 Volume	0	2	0	0	2	0	2	0	0	2	0	0	0	0	0	4
Peak Factor																0.625
High Int.	08:15 AM					08:15 AM					07:45 AM					
Volume	0	2	0	0	2	0	2	0	0	2	1	0	0	0	1	
Peak Factor					0.500					0.500					0.500	

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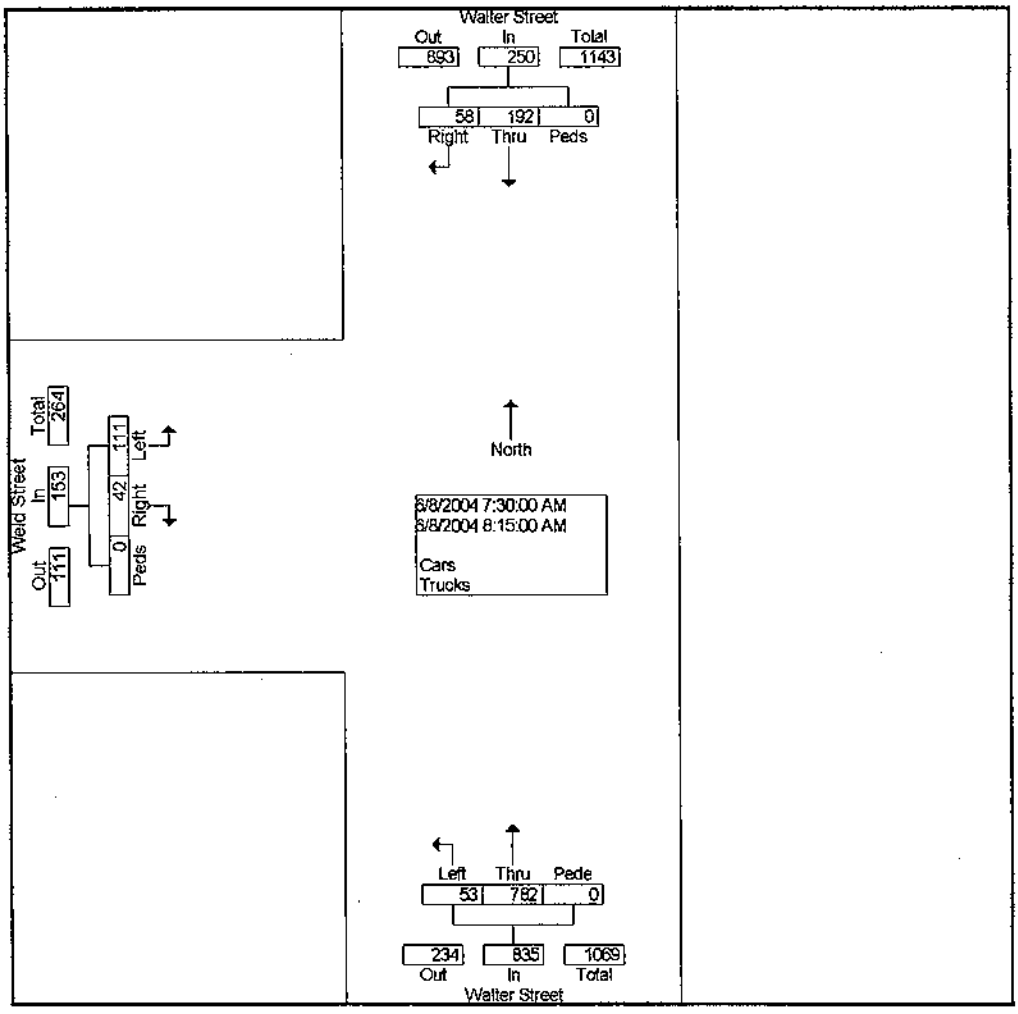
	Walter Street From North					Walter Street From South					Weld Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 07:30 AM to 09:15 AM - Peak 1 of 1																
Intersection	07:30 AM															
Volume	58	192	0	0	250	0	782	53	0	835	42	0	111	0	153	1238
Percent	23.2	76.8	0.0	0.0		0.0	93.7	6.3	0.0		27.5	0.0	72.5	0.0		
08:00 Volume	17	43	0	0	60	0	220	14	0	234	13	0	31	0	44	338
Peak Factor																0.916
High Int.	08:15 AM					08:00 AM					08:00 AM					
Volume	13	60	0	0	73	0	220	14	0	234	13	0	31	0	44	
Peak Factor					0.856					0.892					0.869	



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City, State: Roslindale, MA
Client: VHB/E. Betancourt

File Name : 03020A
Site Code : 00009010
Start Date : 6/8/2004
Page No : 1

Groups Printed- Cars - Trucks

	Centre Street From North				Weld Street From East				Centre Street From South				Weld Street From West				
Start Time	Hard Right	Right	Thru	Left	Right	Bear Right	Thru	Left	Right	Thru	Bear Left	Left	Right	Thru	Left	Hard Left	Int. Total
07:30 AM	0	4	85	0	0	0	16	6	5	186	0	14	3	25	14	0	358
07:45 AM	0	8	61	1	1	0	17	7	4	215	1	18	4	21	8	0	366
Total	0	12	146	1	1	0	33	13	9	401	1	32	7	46	22	0	724
08:00 AM	0	4	66	2	0	0	19	8	10	219	2	9	4	19	5	0	367
08:15 AM	0	5	67	0	1	0	22	4	11	206	0	9	4	24	13	0	366
08:30 AM	0	4	63	1	0	0	17	7	4	161	0	6	1	15	11	0	290
08:45 AM	0	2	64	1	1	0	14	14	17	187	0	9	3	12	5	0	329
Total	0	15	260	4	2	0	72	33	42	773	2	33	12	70	34	0	1352
09:00 AM	0	4	58	0	0	0	8	10	2	151	1	7	4	18	7	0	270
09:15 AM	0	6	69	0	4	0	7	8	6	118	0	8	4	12	3	0	245
Grand Total	0	37	533	5	7	0	120	64	59	1443	4	80	27	146	66	0	2591
Apprch %	0.0	6.4	92.7	0.9	3.7	0.0	62.8	33.5	3.7	91.0	0.3	5.0	11.3	61.1	27.6	0.0	
Total %	0.0	1.4	20.6	0.2	0.3	0.0	4.6	2.5	2.3	55.7	0.2	3.1	1.0	5.6	2.5	0.0	

	Centre Street From North					Weld Street From East					Centre Street From South					Weld Street From West					
Start Time	Hard Right	Right	Thru	Left	App. Total	Right	Bear Right	Thru	Left	App. Total	Right	Thru	Bear Left	Left	App. Total	Right	Thru	Left	Hard Left	App. Total	Int. Total
Peak Hour From 07:30 AM to 09:15 AM - Peak 1 of 1																					
Intersection	07:30 AM																				
Volume	0	21	279	3	303	2	0	74	25	101	30	826	3	50	909	15	89	40	0	144	1457
Percent	0.0	6.9	92.1	1.0		2.0	0.0	73.3	24.8		3.3	90.9	0.3	5.5		10.4	61.8	27.8	0.0		
08:00 Volume	0	4	66	2	72	0	0	19	8	27	10	219	2	9	240	4	19	5	0	28	367
Peak Factor																					0.993
High Int.	07:30 AM					08:00 AM					08:00 AM					07:30 AM					
Volume	0	4	85	0	89	0	0	19	8	27	10	219	2	9	240	3	25	14	0	42	
Peak Factor					0.851					0.935					0.947					0.857	

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City, State: Roslindale, MA
Client: VHB/E. Betancourt

File Name : 03020A
Site Code : 00009010
Start Date : 6/8/2004
Page No : 1

Groups Printed- Cars

	Centre Street From North				Weld Street From East				Centre Street From South				Weld Street From West				
Start Time	Hard Right	Right	Thru	Left	Right	Bear Right	Thru	Left	Right	Thru	Bear Left	Left	Right	Thru	Left	Hard Left	Int. Total
07:30 AM	0	4	84	0	0	0	16	6	5	185	0	14	3	25	14	0	356
07:45 AM	0	8	61	1	1	0	17	7	4	214	1	18	4	21	8	0	365
Total	0	12	145	1	1	0	33	13	9	399	1	32	7	46	22	0	721
08:00 AM	0	4	66	2	0	0	19	8	10	216	2	9	4	19	5	0	364
08:15 AM	0	5	67	0	1	0	21	4	11	206	0	9	3	24	13	0	364
08:30 AM	0	4	63	1	0	0	17	7	4	158	0	6	1	14	11	0	286
08:45 AM	0	2	64	1	1	0	14	14	16	185	0	9	3	12	5	0	326
Total	0	15	260	4	2	0	71	33	41	765	2	33	11	69	34	0	1340
09:00 AM	0	2	57	0	0	0	8	10	2	151	1	7	4	18	7	0	267
09:15 AM	0	5	69	0	4	0	7	8	6	117	0	8	4	12	3	0	243
Grand Total	0	34	531	5	7	0	119	64	58	1432	4	80	26	145	66	0	2571
Apprch %	0.0	6.0	93.2	0.9	3.7	0.0	62.6	33.7	3.7	91.0	0.3	5.1	11.0	61.2	27.8	0.0	
Total %	0.0	1.3	20.7	0.2	0.3	0.0	4.6	2.5	2.3	55.7	0.2	3.1	1.0	5.6	2.6	0.0	

	Centre Street From North					Weld Street From East					Centre Street From South					Weld Street From West					
Start Time	Hard Right	Right	Thru	Left	App. Total	Right	Bear Right	Thru	Left	App. Total	Right	Thru	Bear Left	Left	App. Total	Right	Thru	Left	Hard Left	App. Total	Int. Total
Peak Hour From 07:30 AM to 09:15 AM - Peak 1 of 1																					
Intersection	07:30 AM																				
Volume	0	21	278	3	302	2	0	73	25	100	30	821	3	50	904	14	89	40	0	143	1449
Percent	0.0	7.0	92.1	1.0		2.0	0.0	73.0	25.0		3.3	90.8	0.3	5.5		9.8	62.2	28.0	0.0		
07:45 Volume	0	8	61	1	70	1	0	17	7	25	4	214	1	18	237	4	21	8	0	33	365
Peak Factor																					0.992
High Int.	07:30 AM					08:00 AM					07:45 AM					07:30 AM					
Volume	0	4	84	0	88	0	0	19	8	27	4	214	1	18	237	3	25	14	0	42	
Peak Factor					0.858					0.926					0.954					0.851	

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City, State: Roslindale, MA
Client: VHB/E. Betancourt

File Name : 03020A
Site Code : 00009010
Start Date : 6/8/2004
Page No : 1

Groups Printed- Trucks

	Centre Street From North				Weld Street From East				Centre Street From South				Weld Street From West				
Start Time	Hard Right	Right	Thru	Left	Right	Bear Right	Thru	Left	Right	Thru	Bear Left	Left	Right	Thru	Left	Hard Left	Int. Total
07:30 AM	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	2
07:45 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Total	0	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	3
08:00 AM	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	3
08:15 AM	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	2
08:30 AM	0	0	0	0	0	0	0	0	0	3	0	0	0	1	0	0	4
08:45 AM	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	3
Total	0	0	0	0	0	0	1	0	1	8	0	0	1	1	0	0	12
09:00 AM	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3
09:15 AM	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2
Grand Total	0	3	2	0	0	0	1	0	1	11	0	0	1	1	0	0	20
Apprch %	0.0	60.0	40.0	0.0	0.0	0.0	100.0	0.0	8.3	91.7	0.0	0.0	50.0	50.0	0.0	0.0	
Total %	0.0	15.0	10.0	0.0	0.0	0.0	5.0	0.0	5.0	55.0	0.0	0.0	5.0	5.0	0.0	0.0	

	Centre Street From North					Weld Street From East					Centre Street From South					Weld Street From West					
Start Time	Hard Right	Right	Thru	Left	App. Total	Right	Bear Right	Thru	Left	App. Total	Right	Thru	Bear Left	Left	App. Total	Right	Thru	Left	Hard Left	App. Total	Int. Total
Peak Hour From 07:30 AM to 09:15 AM - Peak 1 of 1																					
Intersection	08:00 AM																				
Volume	0	0	0	0	0	0	0	1	0	1	1	8	0	0	9	1	1	0	0	2	12
Percent	0.0	0.0	0.0	0.0		0.0	0.0	100.0	0.0		11.1	88.9	0.0	0.0		50.0	50.0	0.0	0.0		
08:30 Volume	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	1	0	0	1	4
Peak Factor																					0.750
High Int.	7:15:00 AM					08:15 AM					08:00 AM					08:15 AM					
Volume	0	0	0	0	0	0	0	1	0	1	0	3	0	0	3	1	0	0	0	1	
Peak Factor										0.250					0.750					0.500	

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File Name : 03020A
Site Code : 00009010
Start Date : 6/8/2004
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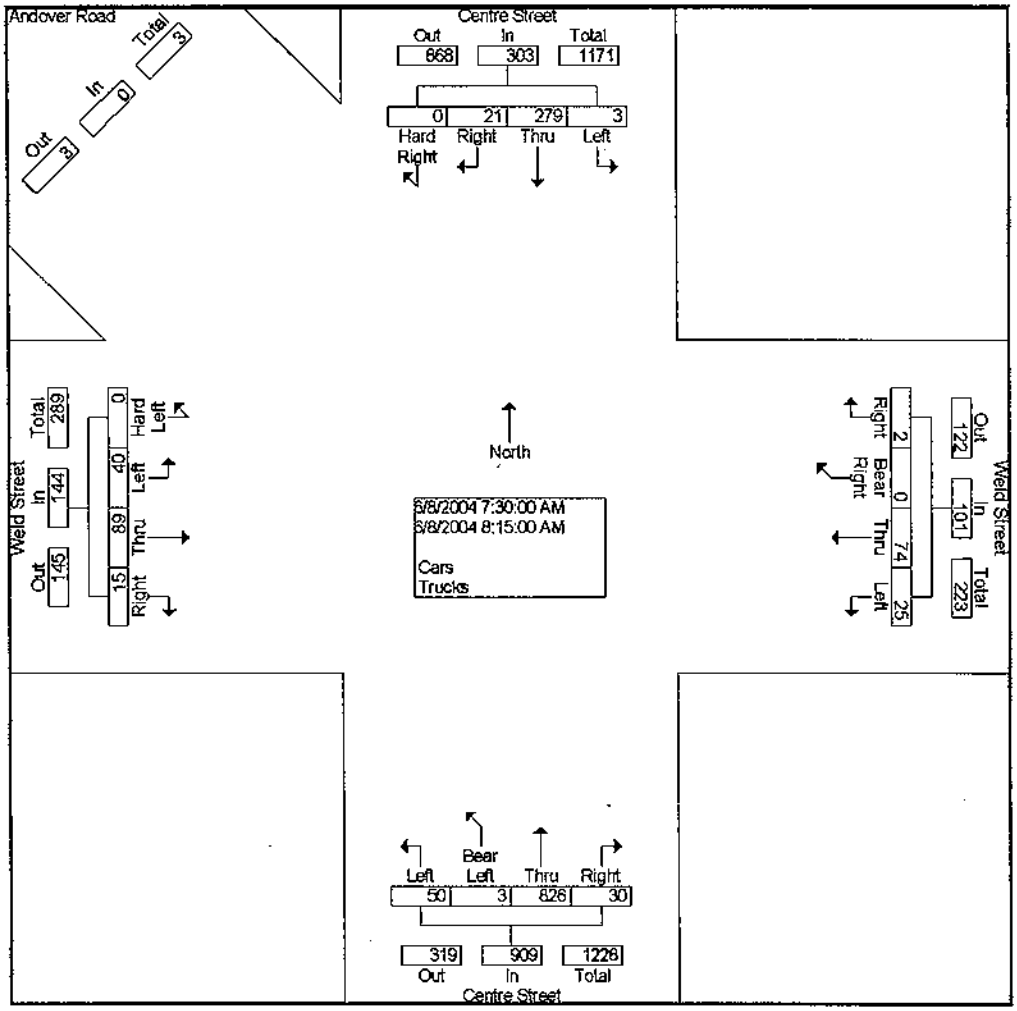
	Centre Street From North					Weld Street From East					Centre Street From South					Weld Street From West					
Start Time	Hard Right	Right	Thru	Left	App. Total	Right	Bear Right	Thru	Left	App. Total	Right	Thru	Bear Left	Left	App. Total	Right	Thru	Left	Hard Left	App. Total	Int. Total
Peak Hour From 07:30 AM to 09:15 AM - Peak 1 of 1																					
Intersection	07:30 AM																				
Volume	0	21	279	3	303	2	0	74	25	101	30	826	3	50	909	15	89	40	0	144	1457
Percent	0.0	6.9	92.1	1.0		2.0	0.0	73.3	24.8		3.3	90.9	0.3	5.5		10.4	61.8	27.8	0.0		
08:00 Volume	0	4	66	2	72	0	0	19	8	27	10	219	2	9	240	4	19	5	0	28	367
Peak Factor																					0.993
High Int.	07:30 AM					08:00 AM					08:00 AM					07:30 AM					
Volume	0	4	85	0	89	0	0	19	8	27	10	219	2	9	240	3	25	14	0	42	
Peak Factor					0.851					0.935					0.947					0.857	



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N/S: Centre Street
E/W: Walter Street/Church Driveway
City, State: Roslindale, MA
Client: VHB/E. Betancourt

File Name : 03020D
Site Code : 00009010
Start Date : 6/8/2004
Page No : 1

Groups Printed- Cars - Trucks

	Centre Street From North				Walter Street From East			Centre Street From South				Church Driveway From West			
Start Time	Right	Thru	Left	UTurn	Right	Thru	Left	Right	Thru	Left	UTurn	Right	Thru	Left	Int. Total
07:30 AM	1	221	36	1	138	3	31	19	355	1	1	0	0	0	807
07:45 AM	3	201	43	0	157	9	46	33	387	2	2	0	1	0	884
Total	4	422	79	1	295	12	77	52	742	3	3	0	1	0	1691
08:00 AM	2	182	54	0	145	7	38	39	386	0	1	1	3	2	860
08:15 AM	2	164	50	0	147	5	39	38	386	2	2	1	2	2	840
08:30 AM	0	172	56	0	134	5	44	36	325	1	2	3	2	1	781
08:45 AM	0	175	56	0	118	1	35	37	304	2	7	2	1	0	738
Total	4	693	216	0	544	18	156	150	1401	5	12	7	8	5	3219
09:00 AM	0	124	55	0	109	3	34	30	268	2	2	1	0	1	629
09:15 AM	1	150	52	0	84	3	21	26	267	3	2	1	4	2	616
Grand Total	9	1389	402	1	1032	36	288	258	2678	13	19	9	13	8	6155
Apprch %	0.5	77.1	22.3	0.1	76.1	2.7	21.2	8.7	90.2	0.4	0.6	30.0	43.3	26.7	
Total %	0.1	22.6	6.5	0.0	16.8	0.6	4.7	4.2	43.5	0.2	0.3	0.1	0.2	0.1	

	Centre Street From North					Walter Street From East				Centre Street From South					Church Driveway From West				
Start Time	Right	Thru	Left	UTurn	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	UTurn	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour From 07:30 AM to 09:15 AM - Peak 1 of 1																			
Intersection	07:30 AM																		
Volume	8	768	183	1	960	587	24	154	765	129	1514	5	6	1654	2	6	4	12	3391
Percent	0.8	80.0	19.1	0.1		76.7	3.1	20.1		7.8	91.5	0.3	0.4		16.7	50.0	33.3		
07:45 Volume	3	201	43	0	247	157	9	46	212	33	387	2	2	424	0	1	0	1	884
Peak Factor																			0.959
High Int.	07:30 AM					07:45 AM				08:15 AM					08:00 AM				
Volume	1	221	36	1	259	157	9	46	212	38	386	2	2	428	1	3	2	6	
Peak Factor					0.927				0.902					0.966				0.500	

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N/S: Centre Street
E/W: Walter Street/Church Driveway
City, State: Roslindale, MA
Client: VHB/E. Betancourt

File Name : 03020D
Site Code : 00009010
Start Date : 6/8/2004
Page No : 1

Groups Printed- Cars

	Centre Street From North				Walter Street From East			Centre Street From South				Church Driveway From West			
Start Time	Right	Thru	Left	UTurn	Right	Thru	Left	Right	Thru	Left	UTurn	Right	Thru	Left	Int. Total
07:30 AM	1	220	36	1	138	3	31	19	354	1	1	0	0	0	805
07:45 AM	3	201	43	0	157	9	46	33	387	2	2	0	1	0	884
Total	4	421	79	1	295	12	77	52	741	3	3	0	1	0	1689
08:00 AM	2	181	54	0	145	7	38	38	383	0	1	1	3	2	855
08:15 AM	2	164	49	0	147	5	37	38	384	2	2	1	2	2	835
08:30 AM	0	172	55	0	133	5	44	36	322	1	2	3	2	1	776
08:45 AM	0	175	56	0	118	1	35	37	303	2	7	2	1	0	737
Total	4	692	214	0	543	18	154	149	1392	5	12	7	8	5	3203
09:00 AM	0	122	53	0	107	3	33	30	267	2	2	1	0	1	621
09:15 AM	1	149	52	0	83	3	21	26	264	3	2	1	4	2	611
Grand Total	9	1384	398	1	1028	36	285	257	2664	13	19	9	13	8	6124
Apprch %	0.5	77.2	22.2	0.1	76.2	2.7	21.1	8.7	90.2	0.4	0.6	30.0	43.3	26.7	
Total %	0.1	22.6	6.5	0.0	16.8	0.6	4.7	4.2	43.5	0.2	0.3	0.1	0.2	0.1	

	Centre Street From North					Walter Street From East				Centre Street From South					Church Driveway From West				
Start Time	Right	Thru	Left	UTurn	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	UTurn	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour From 07:30 AM to 09:15 AM - Peak 1 of 1																			
Intersection	07:30 AM																		
Volume	8	786	182	1	957	587	24	152	763	128	1508	5	6	1647	2	6	4	12	3379
Percent	0.8	80.0	19.0	0.1		76.9	3.1	19.9		7.8	91.6	0.3	0.4		16.7	50.0	33.3		
07:45 Volume	3	201	43	0	247	157	9	46	212	33	387	2	2	424	0	1	0	1	884
Peak Factor																			0.956
High Int.	07:30 AM					07:45 AM				08:15 AM					08:00 AM				
Volume	1	220	36	1	258	157	9	46	212	38	384	2	2	426	1	3	2	6	
Peak Factor					0.927				0.900					0.967				0.500	

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File Name : 03020D
Site Code : 00009010
Start Date : 6/8/2004
Page No : 1

Groups Printed- Trucks

	Centre Street From North				Walter Street From East			Centre Street From South				Church Driveway From West			
Start Time	Right	Thru	Left	UTurn	Right	Thru	Left	Right	Thru	Left	UTurn	Right	Thru	Left	Int. Total
07:30 AM	0	1	0	0	0	0	0	0	1	0	0	0	0	0	2
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	0	0	0	0	1	0	0	0	0	0	2
08:00 AM	0	1	0	0	0	0	0	1	3	0	0	0	0	0	5
08:15 AM	0	0	1	0	0	0	2	0	2	0	0	0	0	0	5
08:30 AM	0	0	1	0	1	0	0	0	3	0	0	0	0	0	5
08:45 AM	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Total	0	1	2	0	1	0	2	1	9	0	0	0	0	0	16
09:00 AM	0	2	2	0	2	0	1	0	1	0	0	0	0	0	8
09:15 AM	0	1	0	0	1	0	0	0	3	0	0	0	0	0	5
Grand Total	0	5	4	0	4	0	3	1	14	0	0	0	0	0	31
Apprch %	0.0	55.6	44.4	0.0	57.1	0.0	42.9	6.7	93.3	0.0	0.0	0.0	0.0	0.0	
Total %	0.0	16.1	12.9	0.0	12.9	0.0	9.7	3.2	45.2	0.0	0.0	0.0	0.0	0.0	

	Centre Street From North					Walter Street From East				Centre Street From South					Church Driveway From West				
Start Time	Right	Thru	Left	UTurn	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	UTurn	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour From 07:30 AM to 09:15 AM - Peak 1 of 1																			
Intersection	08:15 AM																		
Volume	0	2	4	0	6	3	0	3	6	0	7	0	0	7	0	0	0	0	19
Percent	0.0	33.3	66.7	0.0		50.0	0.0	50.0		0.0	100.0	0.0	0.0		0.0	0.0	0.0		
09:00 Volume	0	2	2	0	4	2	0	1	3	0	1	0	0	1	0	0	0	0	8
Peak Factor																			0.594
High Int.	09:00 AM					09:00 AM				08:30 AM					7:15:00 AM				
Volume	0	2	2	0	4	2	0	1	3	0	3	0	0	3					
Peak Factor					0.375				0.500					0.583					

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File Name : 03020D
Site Code : 00009010
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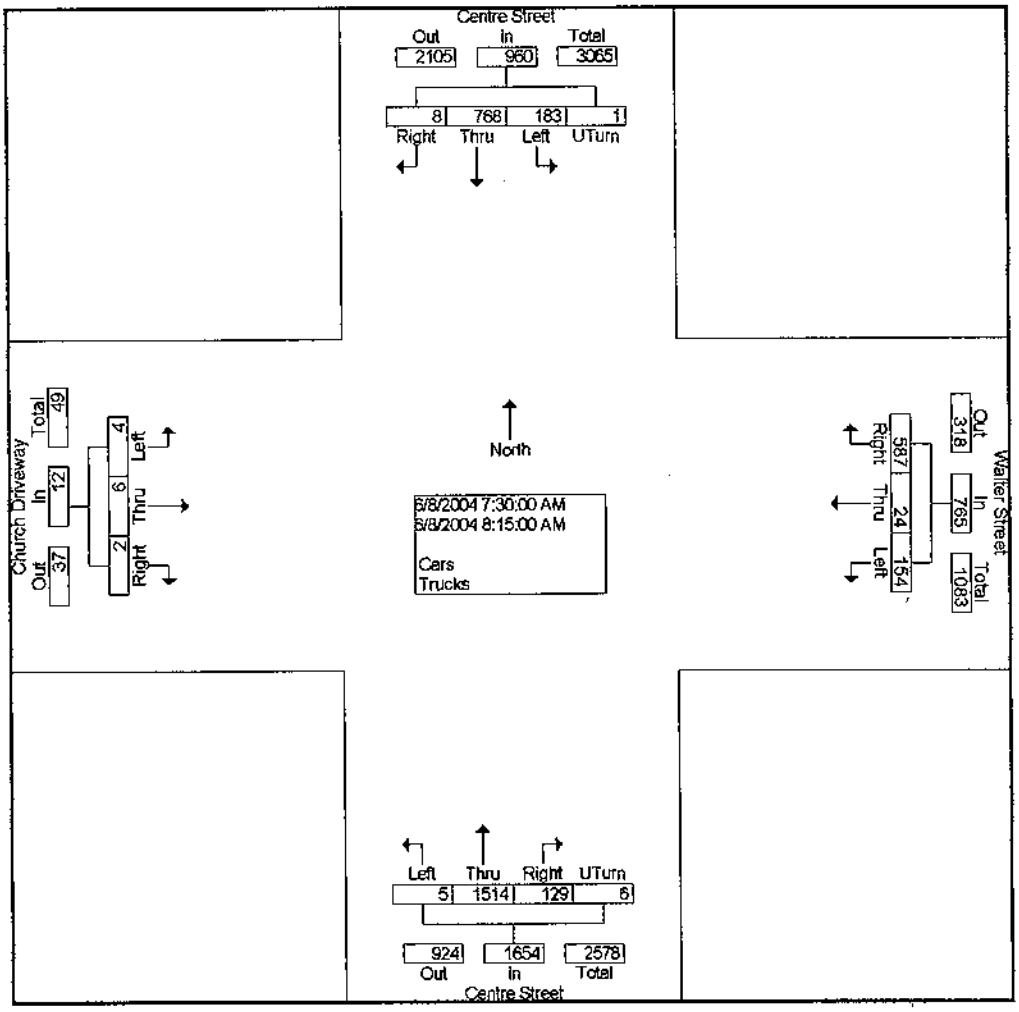
	Centre Street From North					Walter Street From East				Centre Street From South					Church Driveway From West				
Start Time	Right	Thru	Left	UTurn	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	UTurn	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour From 07:30 AM to 09:15 AM - Peak 1 of 1																			
Intersection	07:30 AM																		
Volume	8	768	183	1	960	587	24	154	765	129	1514	5	6	1654	2	6	4	12	3391
Percent	0.8	80.0	19.1	0.1		76.7	3.1	20.1		7.8	91.5	0.3	0.4		16.7	50.0	33.3		
07:45 Volume	3	201	43	0	247	157	9	46	212	33	387	2	2	424	0	1	0	1	884
Peak Factor																			0.959
High Int.	07:30 AM					07:45 AM				08:15 AM					08:00 AM				
Volume	1	221	36	1	259	157	9	46	212	38	386	2	2	428	1	3	2	6	
Peak Factor					0.927				0.902					0.966				0.500	



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File Name : 03020C
Site Code : 00009010
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Groups Printed- Cars - Trucks

	Walter Street From North				Bussey Street From East				Walter Street From South				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:30 AM	0	36	45	0	66	0	33	0	69	124	0	0	373
07:45 AM	0	39	47	0	60	0	23	0	63	159	0	0	391
Total	0	75	92	0	126	0	56	0	132	283	0	0	764
08:00 AM	0	36	58	0	64	0	27	0	95	159	0	0	439
08:15 AM	0	43	47	0	63	0	30	0	71	136	0	0	390
08:30 AM	0	42	44	0	70	0	28	0	51	143	0	0	378
08:45 AM	0	39	41	0	55	0	37	0	51	101	0	0	324
Total	0	160	190	0	252	0	122	0	268	539	0	0	1531
09:00 AM	0	49	45	0	55	0	30	0	35	97	0	0	311
09:15 AM	0	31	33	0	34	0	22	0	31	72	0	0	223
Grand Total	0	315	360	0	467	0	230	0	466	991	0	0	2829
Apprch %	0.0	46.7	53.3	0.0	67.0	0.0	33.0	0.0	32.0	68.0	0.0	0.0	
Total %	0.0	11.1	12.7	0.0	16.5	0.0	8.1	0.0	16.5	35.0	0.0	0.0	

	Walter Street From North					Bussey Street From East					Walter Street From South					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 07:30 AM to 09:15 AM - Peak 1 of 1																
Intersection	07:45 AM															
Volume	0	160	196	0	356	257	0	108	0	365	280	597	0	0	877	1598
Percent	0.0	44.9	55.1	0.0		70.4	0.0	29.6	0.0		31.9	68.1	0.0	0.0		
08:00 Volume	0	36	58	0	94	64	0	27	0	91	95	159	0	0	254	439
Peak Factor																0.910
High Int.	08:00 AM					08:30 AM					08:00 AM					
Volume	0	36	58	0	94	70	0	28	0	98	95	159	0	0	254	
Peak Factor					0.947					0.931					0.863	

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File Name : 03020C
Site Code : 00009010
Start Date : 6/8/2004
Page No : 1

Groups Printed- Cars

	Walter Street From North				Bussey Street From East				Walter Street From South				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:30 AM	0	36	45	0	66	0	33	0	69	124	0	0	373
07:45 AM	0	39	47	0	60	0	23	0	63	159	0	0	391
Total	0	75	92	0	126	0	56	0	132	283	0	0	764
08:00 AM	0	35	58	0	64	0	27	0	95	159	0	0	438
08:15 AM	0	41	47	0	63	0	30	0	71	134	0	0	386
08:30 AM	0	41	44	0	70	0	28	0	51	142	0	0	376
08:45 AM	0	39	41	0	55	0	37	0	50	101	0	0	323
Total	0	156	190	0	252	0	122	0	267	536	0	0	1523
09:00 AM	0	49	44	0	55	0	30	0	35	96	0	0	309
09:15 AM	0	31	33	0	34	0	22	0	31	70	0	0	221
Grand Total	0	311	359	0	467	0	230	0	465	985	0	0	2817
Apprch %	0.0	46.4	53.6	0.0	67.0	0.0	33.0	0.0	32.1	67.9	0.0	0.0	
Total %	0.0	11.0	12.7	0.0	16.6	0.0	8.2	0.0	16.5	35.0	0.0	0.0	

	Walter Street From North					Bussey Street From East					Walter Street From South					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 07:30 AM to 09:15 AM - Peak 1 of 1																
Intersection	07:45 AM															
Volume	0	156	196	0	352	257	0	108	0	365	280	594	0	0	874	1591
Percent	0.0	44.3	55.7	0.0		70.4	0.0	29.6	0.0		32.0	68.0	0.0	0.0		
08:00 Volume	0	35	58	0	93	64	0	27	0	91	95	159	0	0	254	438
Peak Factor																0.908
High Int.	08:00 AM					08:30 AM					08:00 AM					
Volume	0	35	58	0	93	70	0	28	0	98	95	159	0	0	254	
Peak Factor					0.946					0.931					0.860	

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File Name : 03020C
Site Code : 00009010
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Groups Printed- Trucks

	Walter Street From North				Bussey Street From East				Walter Street From South				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	1
08:15 AM	0	2	0	0	0	0	0	0	0	2	0	0	4
08:30 AM	0	1	0	0	0	0	0	0	0	1	0	0	2
08:45 AM	0	0	0	0	0	0	0	0	1	0	0	0	1
Total	0	4	0	0	0	0	0	0	1	3	0	0	8
09:00 AM	0	0	1	0	0	0	0	0	0	1	0	0	2
09:15 AM	0	0	0	0	0	0	0	0	0	2	0	0	2
Grand Total	0	4	1	0	0	0	0	0	1	6	0	0	12
Apprch %	0.0	80.0	20.0	0.0	0.0	0.0	0.0	0.0	14.3	85.7	0.0	0.0	
Total %	0.0	33.3	8.3	0.0	0.0	0.0	0.0	0.0	8.3	50.0	0.0	0.0	

	Walter Street From North					Bussey Street From East					Walter Street From South					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 07:30 AM to 09:15 AM - Peak 1 of 1																
Intersection	08:15 AM															
Volume	0	3	1	0	4	0	0	0	0	0	1	4	0	0	5	9
Percent	0.0	75.0	25.0	0.0		0.0	0.0	0.0	0.0		20.0	80.0	0.0	0.0		
08:15 Volume	0	2	0	0	2	0	0	0	0	0	0	2	0	0	2	4
Peak Factor																0.563
High Int.	08:15 AM					7:15:00 AM					08:15 AM					
Volume	0	2	0	0	2	0	0	0	0	0	0	2	0	0	2	
Peak Factor					0.500										0.625	

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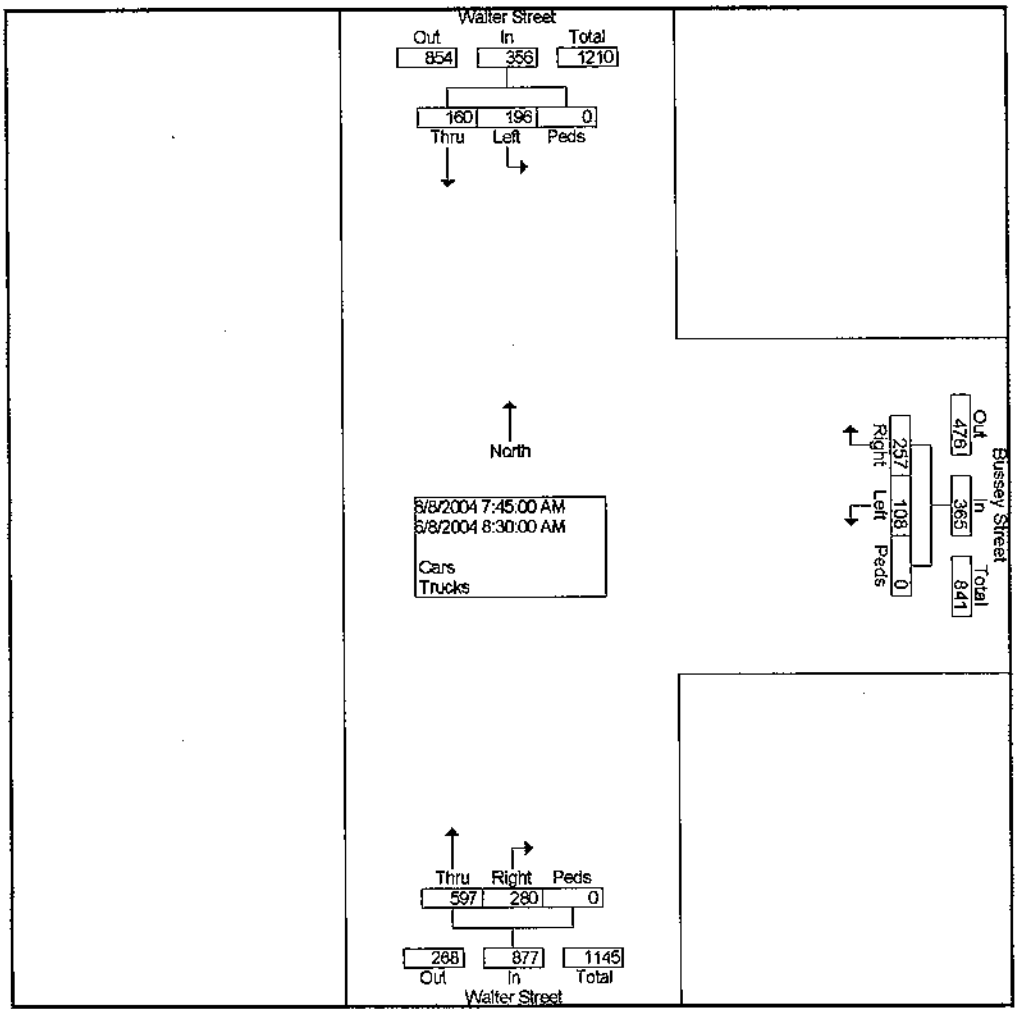
	Walter Street From North					Bussey Street From East					Walter Street From South					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 07:30 AM to 09:15 AM - Peak 1 of 1																
Intersection	07:45 AM															
Volume	0	160	196	0	356	257	0	108	0	365	280	597	0	0	877	1598
Percent	0.0	44.9	55.1	0.0		70.4	0.0	29.6	0.0		31.9	68.1	0.0	0.0		
08:00 Volume	0	36	58	0	94	64	0	27	0	91	95	159	0	0	254	439
Peak Factor																0.910
High Int.	08:00 AM					08:30 AM					08:00 AM					
Volume	0	36	58	0	94	70	0	28	0	98	95	159	0	0	254	
Peak Factor					0.947					0.931					0.863	



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File Name : 03020DD
Site Code : 00009010
Start Date : 6/8/2004
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Groups Printed- Cars - Trucks

	Centre Street From North				Water Street From East			Centre Street From South				Church Driveway From West			
Start Time	Right	Thru	Left	UTurn	Right	Thru	Left	Right	Thru	Left	UTurn	Right	Thru	Left	Int. Total
04:00 PM	0	292	148	1	67	1	11	61	274	0	2	0	0	0	857
04:15 PM	0	287	143	1	59	3	22	59	217	0	7	3	2	1	804
04:30 PM	8	349	126	0	65	1	48	38	227	0	5	8	4	0	879
04:45 PM	1	282	114	0	72	1	21	73	258	0	9	5	0	0	836
Total	9	1210	531	2	263	6	102	231	976	0	23	16	6	1	3376
05:00 PM	6	276	141	0	63	3	25	60	228	0	5	7	0	0	814
05:15 PM	0	288	153	1	85	0	38	45	303	0	2	9	1	0	925
05:30 PM	1	294	164	0	66	3	27	54	262	0	1	7	2	0	881
05:45 PM	0	299	120	0	73	0	23	39	278	0	2	0	1	0	835
Total	7	1157	578	1	287	6	113	198	1071	0	10	23	4	0	3455
Grand Total	16	2367	1109	3	550	12	215	429	2047	0	33	39	10	1	6831
Apprch %	0.5	67.7	31.7	0.1	70.8	1.5	27.7	17.1	81.6	0.0	1.3	78.0	20.0	2.0	
Total %	0.2	34.7	16.2	0.0	8.1	0.2	3.1	6.3	30.0	0.0	0.5	0.6	0.1	0.0	

	Centre Street From North					Water Street From East				Centre Street From South					Church Driveway From West				
Start Time	Right	Thru	Left	UTurn	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	UTurn	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																			
Intersection	04:45 PM																		
Volume	8	1140	572	1	1721	286	7	111	404	232	1051	0	17	1300	28	3	0	31	3456
Percent	0.5	66.2	33.2	0.1		70.8	1.7	27.5		17.8	80.8	0.0	1.3		90.3	9.7	0.0		
05:15 Volume	0	288	153	1	442	85	0	38	123	45	303	0	2	350	9	1	0	10	925
Peak Factor																			0.934
High Int.	05:30 PM					05:15 PM				05:15 PM					05:15 PM				
Volume	1	294	164	0	459	85	0	38	123	45	303	0	2	350	9	1	0	10	
Peak Factor					0.937				0.821					0.929				0.775	

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File Name : 03020DD
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Groups Printed- Cars

	Centre Street From North				Water Street From East			Centre Street From South				Church Driveway From West			
Start Time	Right	Thru	Left	UTurn	Right	Thru	Left	Right	Thru	Left	UTurn	Right	Thru	Left	Int. Total
04:00 PM	0	290	148	1	67	1	11	61	274	0	2	0	0	0	855
04:15 PM	0	286	143	1	59	3	22	59	216	0	7	3	2	1	802
04:30 PM	8	348	126	0	65	1	48	38	227	0	5	8	4	0	878
04:45 PM	1	282	114	0	72	1	21	73	258	0	9	5	0	0	836
Total	9	1206	531	2	263	6	102	231	975	0	23	16	6	1	3371
05:00 PM	6	276	141	0	63	3	25	60	228	0	5	7	0	0	814
05:15 PM	0	287	153	1	85	0	38	45	303	0	2	9	1	0	924
05:30 PM	1	294	164	0	66	3	27	54	262	0	1	7	2	0	881
05:45 PM	0	299	120	0	73	0	23	39	278	0	2	0	1	0	835
Total	7	1156	578	1	287	6	113	198	1071	0	10	23	4	0	3454
Grand Total	16	2362	1109	3	550	12	215	429	2046	0	33	39	10	1	6825
Apprch %	0.5	67.7	31.8	0.1	70.8	1.5	27.7	17.1	81.6	0.0	1.3	78.0	20.0	2.0	
Total %	0.2	34.6	16.2	0.0	8.1	0.2	3.2	6.3	30.0	0.0	0.5	0.6	0.1	0.0	

	Centre Street From North					Water Street From East				Centre Street From South					Church Driveway From West				
Start Time	Right	Thru	Left	UTurn	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	UTurn	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																			
Intersection	04:45 PM																		
Volume	8	1139	572	1	1720	286	7	111	404	232	1051	0	17	1300	28	3	0	31	3455
Percent	0.5	66.2	33.3	0.1		70.8	1.7	27.5		17.8	80.8	0.0	1.3		90.3	9.7	0.0		
05:15 Volume	0	287	153	1	441	85	0	38	123	45	303	0	2	350	9	1	0	10	924
Peak Factor																			0.935
High Int.	05:30 PM					05:15 PM				05:15 PM					05:15 PM				
Volume	1	294	164	0	459	85	0	38	123	45	303	0	2	350	9	1	0	10	
Peak Factor					0.937				0.821					0.929				0.775	

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N/S: Centre Street
E/W: Walter Street/Church Driveway
City, State: Roslindale, MA
Client: VHB/E. Betancourt

File Name : 03020DD
Site Code : 00009010
Start Date : 6/8/2004
Page No : 1

Groups Printed- Trucks

	Centre Street From North				Water Street From East			Centre Street From South				Church Driveway From West			
Start Time	Right	Thru	Left	UTurn	Right	Thru	Left	Right	Thru	Left	UTurn	Right	Thru	Left	Int. Total
04:00 PM	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
04:15 PM	0	1	0	0	0	0	0	0	1	0	0	0	0	0	2
04:30 PM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	4	0	0	0	0	0	0	1	0	0	0	0	0	5
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Grand Total	0	5	0	0	0	0	0	0	1	0	0	0	0	0	6
Apprch %	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	
Total %	0.0	83.3	0.0	0.0	0.0	0.0	0.0	0.0	16.7	0.0	0.0	0.0	0.0	0.0	

	Centre Street From North					Water Street From East				Centre Street From South					Church Driveway From West				
Start Time	Right	Thru	Left	UTurn	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	UTurn	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																			
Intersection	04:00 PM																		
Volume	0	4	0	0	4	0	0	0	0	0	1	0	0	1	0	0	0	0	5
Percent	0.0	100.0	0.0	0.0		0.0	0.0	0.0		0.0	100.0	0.0	0.0		0.0	0.0	0.0		
04:15 Volume	0	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	2
Peak Factor																			0.625
High Int.	04:00 PM					3:45:00 PM				04:15 PM					3:45:00 PM				
Volume	0	2	0	0	2	0	0	0	0	0	1	0	0	1					
Peak Factor					0.500									0.250					

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File Name : 03020DD
Site Code : 00009010
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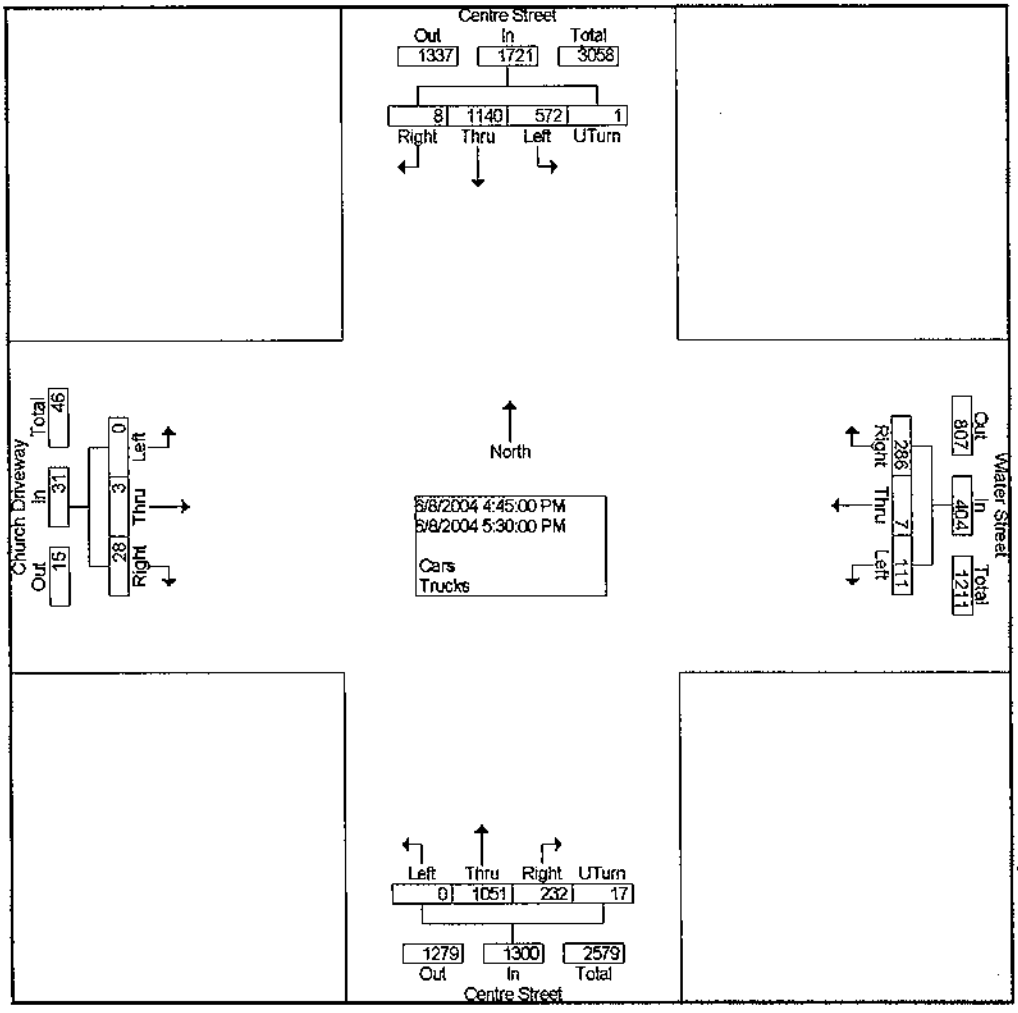
	Centre Street From North					Water Street From East				Centre Street From South					Church Driveway From West				
Start Time	Right	Thru	Left	UTurn	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	UTurn	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																			
Intersection	04:45 PM																		
Volume	8	1140	572	1	1721	286	7	111	404	232	1051	0	17	1300	28	3	0	31	3456
Percent	0.5	66.2	33.2	0.1		70.8	1.7	27.5		17.8	80.8	0.0	1.3		90.3	9.7	0.0		
05:15 Volume	0	288	153	1	442	85	0	38	123	45	303	0	2	350	9	1	0	10	925
Peak Factor																			0.934
High Int.	05:30 PM					05:15 PM				05:15 PM					05:15 PM				
Volume	1	294	164	0	459	85	0	38	123	45	303	0	2	350	9	1	0	10	
Peak Factor					0.937				0.821					0.929				0.775	



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Client: VHB/E. Betancourt

File Name : 03020CC
Site Code : 00009010
Start Date : 6/8/2004
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Groups Printed- Cars - Trucks

	Walter Street From North				Bussey Street From East				Walter Street From South				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
04:00 PM	0	106	82	0	24	0	48	0	36	44	0	0	340
04:15 PM	0	114	75	0	41	0	56	0	29	48	0	0	363
04:30 PM	0	101	60	0	46	0	71	0	26	64	0	0	368
04:45 PM	0	128	68	0	30	0	82	0	33	73	0	0	414
Total	0	449	285	0	141	0	257	0	124	229	0	0	1485
05:00 PM	0	118	91	0	41	0	56	0	30	74	0	0	410
05:15 PM	0	127	70	0	48	0	70	0	38	73	0	0	426
05:30 PM	0	131	90	0	31	0	67	0	35	58	0	0	412
05:45 PM	0	109	69	0	35	0	63	0	29	71	0	0	376
Total	0	485	320	0	155	0	256	0	132	276	0	0	1624
Grand Total	0	934	605	0	296	0	513	0	256	505	0	0	3109
Apprch %	0.0	60.7	39.3	0.0	36.6	0.0	63.4	0.0	33.6	66.4	0.0	0.0	
Total %	0.0	30.0	19.5	0.0	9.5	0.0	16.5	0.0	8.2	16.2	0.0	0.0	

	Walter Street From North					Bussey Street From East					Walter Street From South					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																
Intersection	04:45 PM															
Volume	0	504	319	0	823	150	0	275	0	425	136	278	0	0	414	1662
Percent	0.0	61.2	38.8	0.0		35.3	0.0	64.7	0.0		32.9	67.1	0.0	0.0		
05:15 Volume	0	127	70	0	197	48	0	70	0	118	38	73	0	0	111	426
Peak Factor																0.975
High Int.	05:30 PM					05:15 PM					05:15 PM					
Volume	0	131	90	0	221	48	0	70	0	118	38	73	0	0	111	
Peak Factor					0.931					0.900					0.932	

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File Name : 03020CC
Site Code : 00009010
Start Date : 6/8/2004
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Groups Printed- Cars

	Walter Street From North				Bussey Street From East				Walter Street From South				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
04:00 PM	0	106	82	0	24	0	48	0	36	44	0	0	340
04:15 PM	0	114	75	0	41	0	56	0	29	48	0	0	363
04:30 PM	0	101	60	0	46	0	71	0	26	64	0	0	368
04:45 PM	0	128	68	0	30	0	82	0	33	73	0	0	414
Total	0	449	285	0	141	0	257	0	124	229	0	0	1485
05:00 PM	0	118	91	0	41	0	56	0	30	74	0	0	410
05:15 PM	0	126	70	0	48	0	69	0	38	73	0	0	424
05:30 PM	0	131	90	0	31	0	67	0	35	58	0	0	412
05:45 PM	0	109	69	0	35	0	63	0	29	71	0	0	376
Total	0	484	320	0	155	0	255	0	132	276	0	0	1622
Grand Total	0	933	605	0	296	0	512	0	256	505	0	0	3107
Apprch %	0.0	60.7	39.3	0.0	36.6	0.0	63.4	0.0	33.6	66.4	0.0	0.0	
Total %	0.0	30.0	19.5	0.0	9.5	0.0	16.5	0.0	8.2	16.3	0.0	0.0	

	Walter Street From North					Bussey Street From East					Walter Street From South					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																
Intersection	04:45 PM															
Volume	0	503	319	0	822	150	0	274	0	424	136	278	0	0	414	1660
Percent	0.0	61.2	38.8	0.0		35.4	0.0	64.6	0.0		32.9	67.1	0.0	0.0		
05:15 Volume	0	126	70	0	196	48	0	69	0	117	38	73	0	0	111	424
Peak Factor																0.979
High Int.	05:30 PM					05:15 PM					05:15 PM					
Volume	0	131	90	0	221	48	0	69	0	117	38	73	0	0	111	
Peak Factor					0.930					0.906					0.932	

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File Name : 03020CC
Site Code : 00009010
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Groups Printed- Trucks

	Walter Street From North				Bussey Street From East				Walter Street From South				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	1	0	0	0	0	1	0	0	0	0	0	2
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	0	0	1	0	0	0	0	0	2
Grand Total	0	1	0	0	0	0	1	0	0	0	0	0	2
Apprch %	0.0	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	
Total %	0.0	50.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	

	Walter Street From North					Bussey Street From East					Walter Street From South					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																
Intersection	04:30 PM															
Volume	0	1	0	0	1	0	0	1	0	1	0	0	0	0	0	2
Percent	0.0	100.0	0.0	0.0		0.0	0.0	100.0	0.0		0.0	0.0	0.0	0.0		
05:15 Volume	0	1	0	0	1	0	0	1	0	1	0	0	0	0	0	2
Peak Factor																0.250
High Int.	05:15 PM					05:15 PM					3:45:00 PM					
Volume	0	1	0	0	1	0	0	1	0	1						
Peak Factor					0.250					0.250						

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File Name : 03020CC
Site Code : 00009010
Start Date : 6/8/2004
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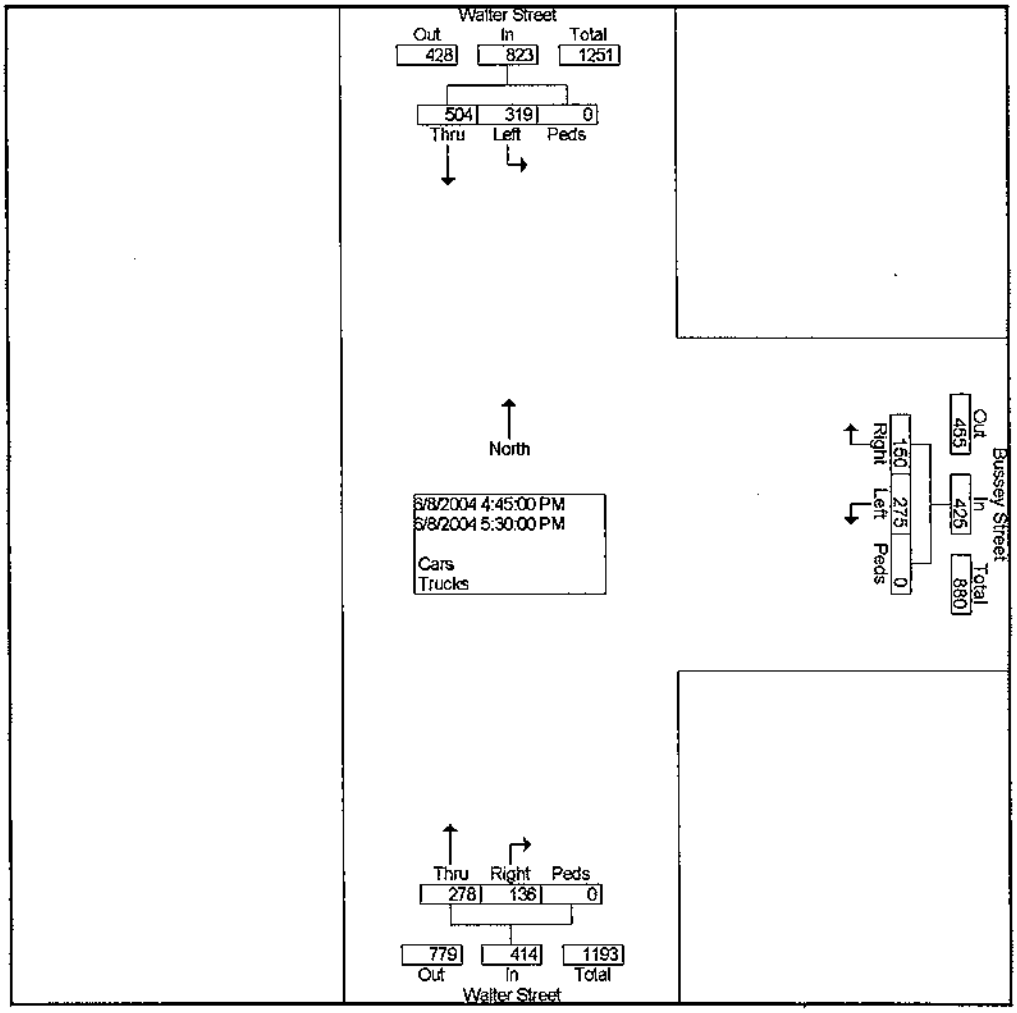
	Walter Street From North					Bussey Street From East					Walter Street From South					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																
Intersection	04:45 PM															
Volume	0	504	319	0	823	150	0	275	0	425	136	278	0	0	414	1662
Percent	0.0	61.2	38.8	0.0		35.3	0.0	64.7	0.0		32.9	67.1	0.0	0.0		
05:15 Volume	0	127	70	0	197	48	0	70	0	118	38	73	0	0	111	426
Peak Factor																0.975
High Int.	05:30 PM					05:15 PM					05:15 PM					
Volume	0	131	90	0	221	48	0	70	0	118	38	73	0	0	111	
Peak Factor					0.931					0.900					0.932	



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N/S: Walter Street
W: Weld Street
City, State: Roslindale, MA
Client: VHB/E. Betancourt

File Name : 03020BB
Site Code : 00009010
Start Date : 6/8/2004
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Groups Printed- Cars - Trucks

	Walter Street From North				Walter Street From South				Weld Street From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
04:00 PM	18	143	0	0	0	84	2	0	14	0	16	0	277
04:15 PM	25	164	0	0	0	64	6	0	16	0	12	0	287
04:30 PM	36	133	0	0	0	69	5	0	15	0	17	0	275
04:45 PM	38	154	0	0	0	78	20	0	9	0	14	0	313
Total	117	594	0	0	0	295	33	0	54	0	59	0	1152
05:00 PM	34	140	0	0	0	94	11	0	14	0	10	0	303
05:15 PM	42	151	0	0	0	88	9	0	12	0	21	0	323
05:30 PM	37	159	0	0	0	72	7	0	20	0	21	0	316
05:45 PM	31	141	0	0	0	90	9	0	14	0	12	0	297
Total	144	591	0	0	0	344	36	0	60	0	64	0	1239
Grand Total	261	1185	0	0	0	639	69	0	114	0	123	0	2391
Apprch %	18.0	82.0	0.0	0.0	0.0	90.3	9.7	0.0	48.1	0.0	51.9	0.0	
Total %	10.9	49.6	0.0	0.0	0.0	26.7	2.9	0.0	4.8	0.0	5.1	0.0	

	Walter Street From North					Walter Street From South					Weld Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																
Intersection	04:45 PM															
Volume	151	604	0	0	755	0	332	47	0	379	55	0	66	0	121	1255
Percent	20.0	80.0	0.0	0.0		0.0	87.6	12.4	0.0		45.5	0.0	54.5	0.0		
05:15 Volume	42	151	0	0	193	0	88	9	0	97	12	0	21	0	33	323
Peak Factor																0.971
High Int.	05:30 PM					05:00 PM					05:30 PM					
Volume	37	159	0	0	196	0	94	11	0	105	20	0	21	0	41	
Peak Factor					0.963					0.902					0.738	

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File Name : 03020BB
Site Code : 00009010
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Groups Printed- Cars

	Walter Street From North				Walter Street From South				Weld Street From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
04:00 PM	18	143	0	0	0	84	2	0	14	0	16	0	277
04:15 PM	25	164	0	0	0	64	6	0	16	0	12	0	287
04:30 PM	36	133	0	0	0	69	5	0	15	0	17	0	275
04:45 PM	38	154	0	0	0	78	20	0	9	0	14	0	313
Total	117	594	0	0	0	295	33	0	54	0	59	0	1152
05:00 PM	34	140	0	0	0	94	11	0	14	0	10	0	303
05:15 PM	42	150	0	0	0	88	9	0	12	0	21	0	322
05:30 PM	37	159	0	0	0	72	7	0	20	0	21	0	316
05:45 PM	31	141	0	0	0	90	9	0	14	0	12	0	297
Total	144	590	0	0	0	344	36	0	60	0	64	0	1238
Grand Total	261	1184	0	0	0	639	69	0	114	0	123	0	2390
Apprch %	18.1	81.9	0.0	0.0	0.0	90.3	9.7	0.0	48.1	0.0	51.9	0.0	
Total %	10.9	49.5	0.0	0.0	0.0	26.7	2.9	0.0	4.8	0.0	5.1	0.0	

	Walter Street From North					Walter Street From South					Weld Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																
Intersection	04:45 PM															
Volume	151	603	0	0	754	0	332	47	0	379	55	0	66	0	121	1254
Percent	20.0	80.0	0.0	0.0		0.0	87.6	12.4	0.0		45.5	0.0	54.5	0.0		
05:15 Volume	42	150	0	0	192	0	88	9	0	97	12	0	21	0	33	322
Peak Factor																0.974
High Int.	05:30 PM					05:00 PM					05:30 PM					
Volume	37	159	0	0	196	0	94	11	0	105	20	0	21	0	41	
Peak Factor					0.962					0.902					0.738	

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File Name : 03020BB
Site Code : 00009010
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Groups Printed- Trucks

	Walter Street From North				Walter Street From South				Weld Street From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	1	0	0	0	0	0	0	0	0	0	0	1
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	0	0	0	0	0	0	0	0	1
Grand Total	0	1	0	0	0	0	0	0	0	0	0	0	1
Apprch %	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total %	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

	Walter Street From North					Walter Street From South					Weld Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																
Intersection	04:30 PM															
Volume	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Percent	0.0	100.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		
05:15 Volume	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Peak Factor																0.250
High Int.	05:15 PM					3:45:00 PM					3:45:00 PM					
Volume	0	1	0	0	1											
Peak Factor					0.250											

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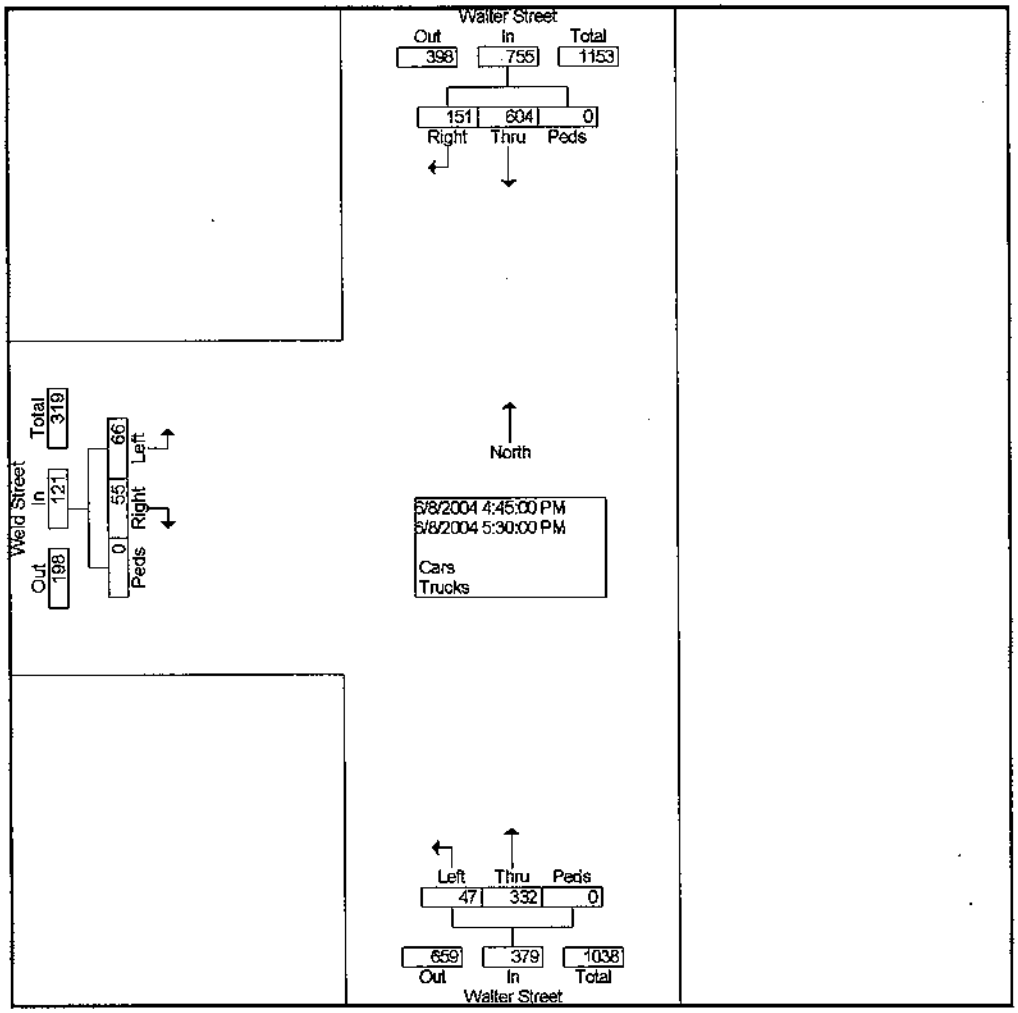
N/S: Walter Street
W: Weld Street
City, State: Roslindale, MA
Client: VHB/E. Betancourt

File Name : 03020BB
Site Code : 00009010
Start Date : 6/8/2004
Page No : 1

	Walter Street From North					Walter Street From South					Weld Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																
Intersection	04:45 PM															
Volume	151	604	0	0	755	0	332	47	0	379	55	0	66	0	121	1255
Percent	20.0	80.0	0.0	0.0		0.0	87.6	12.4	0.0		45.5	0.0	54.5	0.0		
05:15 Volume	42	151	0	0	193	0	88	9	0	97	12	0	21	0	33	323
Peak Factor																0.971
High Int.	05:30 PM					05:00 PM					05:30 PM					
Volume	37	159	0	0	196	0	94	11	0	105	20	0	21	0	41	
Peak Factor					0.963					0.902					0.738	



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N/S: Centre Street
E/W/NW: Weld Street/Andover Road
City, State: Roslindale, MA
Client: VHB/E. Betancourt

File Name : 03020AA
Site Code : 00009010
Start Date : 6/8/2004
Page No : 1

Groups Printed- Cars - Trucks

	Centre Street From North				Weld Street From East				Centre Street From South				Weld Street From West				
Start Time	Hard Right	Right	Thru	Left	Right	Bear Right	Thru	Left	Right	Thru	Bear Left	Left	Right	Thru	Left	Hard Left	Int. Total
04:00 PM	0	15	163	2	0	0	15	6	9	101	0	9	4	25	2	0	351
04:15 PM	0	7	147	2	2	0	22	8	10	101	0	8	5	14	2	0	328
04:30 PM	0	13	189	4	0	0	23	14	8	89	1	14	6	17	8	0	386
04:45 PM	0	9	167	1	0	0	43	13	9	101	0	7	8	12	3	0	373
Total	0	44	666	9	2	0	103	41	36	392	1	38	23	68	15	0	1438
05:00 PM	0	8	172	4	4	0	35	13	4	95	0	7	12	16	3	0	373
05:15 PM	0	9	152	2	0	0	36	15	9	110	1	12	11	20	8	0	385
05:30 PM	0	15	173	2	0	0	21	16	15	98	0	9	11	22	7	0	389
05:45 PM	0	10	158	1	0	0	32	9	9	106	0	7	6	20	7	0	365
Total	0	42	655	9	4	0	124	53	37	409	1	35	40	78	25	0	1512
Grand Total	0	86	1321	18	6	0	227	94	73	801	2	73	63	146	40	0	2950
Apprch %	0.0	6.0	92.7	1.3	1.8	0.0	69.4	28.7	7.7	84.4	0.2	7.7	25.3	58.6	16.1	0.0	
Total %	0.0	2.9	44.8	0.6	0.2	0.0	7.7	3.2	2.5	27.2	0.1	2.5	2.1	4.9	1.4	0.0	

	Centre Street From North					Weld Street From East					Centre Street From South					Weld Street From West					
Start Time	Hard Right	Right	Thru	Left	App. Total	Right	Bear Right	Thru	Left	App. Total	Right	Thru	Bear Left	Left	App. Total	Right	Thru	Left	Hard Left	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	04:45 PM																				
Volume	0	41	664	9	714	4	0	135	57	196	37	404	1	35	477	42	70	21	0	133	1520
Percent	0.0	5.7	93.0	1.3		2.0	0.0	68.9	29.1		7.8	84.7	0.2	7.3		31.6	52.6	15.8	0.0		
05:30 Volume	0	15	173	2	190	0	0	21	16	37	15	98	0	9	122	11	22	7	0	40	389
Peak Factor																					0.977
High Int.	05:30 PM					04:45 PM					05:15 PM					05:30 PM					
Volume	0	15	173	2	190	0	0	43	13	56	9	110	1	12	132	11	22	7	0	40	
Peak Factor					0.939					0.875					0.903					0.831	

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City, State: Roslindale, MA
Client: VHB/E. Betancourt

File Name : 03020AA
Site Code : 00009010
Start Date : 6/8/2004
Page No : 1

Groups Printed- Cars

	Centre Street From North				Weld Street From East				Centre Street From South				Weld Street From West				
Start Time	Hard Right	Right	Thru	Left	Right	Bear Right	Thru	Left	Right	Thru	Bear Left	Left	Right	Thru	Left	Hard Left	Int. Total
04:00 PM	0	15	161	2	0	0	15	6	9	101	0	9	4	25	2	0	349
04:15 PM	0	7	147	2	2	0	22	8	10	101	0	8	5	14	1	0	327
04:30 PM	0	13	188	4	0	0	23	14	8	89	1	14	6	17	8	0	385
04:45 PM	0	8	167	1	0	0	43	13	9	101	0	7	8	12	3	0	372
Total	0	43	663	9	2	0	103	41	36	392	1	38	23	68	14	0	1433
05:00 PM	0	8	172	4	4	0	35	13	4	95	0	7	12	16	3	0	373
05:15 PM	0	9	151	2	0	0	36	15	9	110	1	12	11	20	8	0	384
05:30 PM	0	15	173	2	0	0	21	16	15	98	0	9	11	22	7	0	389
05:45 PM	0	10	158	1	0	0	32	9	9	106	0	7	6	20	7	0	365
Total	0	42	654	9	4	0	124	53	37	409	1	35	40	78	25	0	1511
Grand Total	0	85	1317	18	6	0	227	94	73	801	2	73	63	146	39	0	2944
Apprch %	0.0	6.0	92.7	1.3	1.8	0.0	69.4	28.7	7.7	84.4	0.2	7.7	25.4	58.9	15.7	0.0	
Total %	0.0	2.9	44.7	0.6	0.2	0.0	7.7	3.2	2.5	27.2	0.1	2.5	2.1	5.0	1.3	0.0	

	Centre Street From North					Weld Street From East					Centre Street From South					Weld Street From West					
Start Time	Hard Right	Right	Thru	Left	App. Total	Right	Bear Right	Thru	Left	App. Total	Right	Thru	Bear Left	Left	App. Total	Right	Thru	Left	Hard Left	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	04:45 PM																				
Volume	0	40	663	9	712	4	0	135	57	196	37	404	1	35	477	42	70	21	0	133	1518
Percent	0.0	5.6	93.1	1.3		2.0	0.0	68.9	29.1		7.8	84.7	0.2	7.3		31.6	52.6	15.8	0.0		
05:30 Volume	0	15	173	2	190	0	0	21	16	37	15	98	0	9	122	11	22	7	0	40	389
Peak Factor																					0.976
High Int.	05:30 PM					04:45 PM					05:15 PM					05:30 PM					
Volume	0	15	173	2	190	0	0	43	13	56	9	110	1	12	132	11	22	7	0	40	
Peak Factor					0.937					0.875					0.903					0.831	

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File Name : 03020AA
Site Code : 00009010
Start Date : 6/8/2004
Page No : 1

Groups Printed- Trucks

	Centre Street From North				Weld Street From East				Centre Street From South				Weld Street From West				
Start Time	Hard Right	Right	Thru	Left	Right	Bear Right	Thru	Left	Right	Thru	Bear Left	Left	Right	Thru	Left	Hard Left	Int. Total
04:00 PM	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
04:30 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
04:45 PM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	1	3	0	0	0	0	0	0	0	0	0	0	0	1	0	5
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Grand Total	0	1	4	0	0	0	0	0	0	0	0	0	0	0	1	0	6
Apprch %	0.0	20.0	80.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	
Total %	0.0	16.7	66.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.7	0.0	

	Centre Street From North					Weld Street From East					Centre Street From South					Weld Street From West					
Start Time	Hard Right	Right	Thru	Left	App. Total	Right	Bear Right	Thru	Left	App. Total	Right	Thru	Bear Left	Left	App. Total	Right	Thru	Left	Hard Left	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	04:00 PM																				
Volume	0	1	3	0	4	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	5
Percent	0.0	25.0	75.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	100.0	0.0		
04:00 Volume	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Peak Factor																					0.625
High Int.	04:00 PM					3:45:00 PM					3:45:00 PM					04:15 PM					
Volume	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	
Peak Factor					0.500															0.250	

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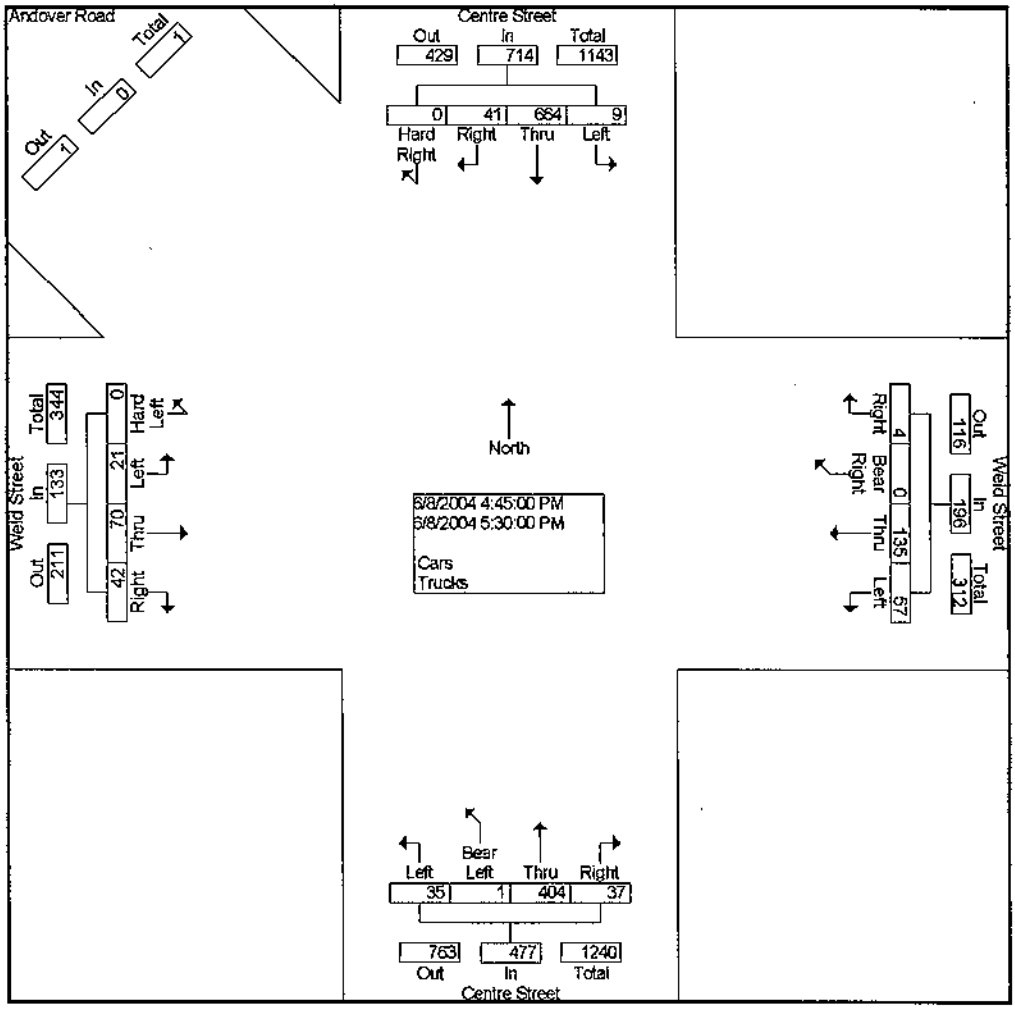
File Name : 03020AA
Site Code : 00009010
Start Date : 6/8/2004
Page No : 1

	Centre Street From North					Weld Street From East					Centre Street From South					Weld Street From West					
Start Time	Hard Right	Right	Thru	Left	App. Total	Right	Bear Right	Thru	Left	App. Total	Right	Thru	Bear Left	Left	App. Total	Right	Thru	Left	Hard Left	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	04:45 PM																				
Volume	0	41	664	9	714	4	0	135	57	196	37	404	1	35	477	42	70	21	0	133	1520
Percent	0.0	5.7	93.0	1.3		2.0	0.0	68.9	29.1		7.8	84.7	0.2	7.3		31.6	52.6	15.8	0.0		
05:30 Volume	0	15	173	2	190	0	0	21	16	37	15	98	0	9	122	11	22	7	0	40	389
Peak Factor																					0.977
High Int.	05:30 PM					04:45 PM					05:15 PM					05:30 PM					
Volume	0	15	173	2	190	0	0	43	13	56	9	110	1	12	132	11	22	7	0	40	
Peak Factor					0.939					0.875					0.903					0.831	



Havard University at Arnold Arboretum

Trip Generation Estimate

VHB,Inc.

8/23/2005

Proposed Weld Hill Parcel

	Size	Trip Rate	Unadjusted Vehicle Trips	VOR	Person Trips	Transit Share	Walk/Other Share	Vehicle Share	Local VOR	Transit Trips	Walk/Other Trips	Vehicle Trips
Daily		8.11	365		401					44	32	296
In	45,000	4.06	182	1.1	201	11%	8%	81%	1.1	22	16	148
Out	square feet	4.06	182	1.1	201	11%	8%	81%	1.1	22	16	148
AM Peak Hour		1.24	56		61					7	5	46
In	45,000	1.03	46	1.1	51	11%	8%	81%	1.1	6	4	38
Out	square feet	0.21	9	1.1	10	11%	8%	81%	1.1	1	1	8
PM Peak Hour		1.0	45		50					6	4	37
In	45,000	0.15	7	1.1	8	11%	8%	81%	1.1	1	1	6
Out	square feet	0.9	38	1.1	42	11%	8%	81%	1.1	5	3	31

Notes:

Mode split: Arnold Arboretum staff survey

Trip rate: ITE

Arboretum Employees		EXISTING: 2005							FUTURE: 2010						
Dept		Staff	Interns	Apprentice, Term	Volunteers	TOTAL	Location		Staff	Interns	Apprentice, Term	Volunteers	TOTAL	Location	Change in future
		Existing	Existing	Existing	Existing	Existing			Future	Future	Future	Future			
Directors		2				2	HB		2				2	WH-1, HB-1	
Living Collections													0		
	Grounds	15	10	2		27	HB		18	10	2		30	HSF	3 new grounds crew
	Nursery	4	2		2	8	DGH		4	2		2	8	DGH	
	DGH tenants	2				2	DGH		2				2	DGH	
	Plant Records	3	2		1	6	HB		4	2		1	7	DGH	1 new Director of Living Collections
Public Programs													0		
	Education	5			6	11	HB		5			6	11	HB	
	Website	1				1	HB		1				1	HB	
	Visitor Center	3				3	HB		3				3	HB	
	Library & Archives	4	2		2	8	HB		4	2		2	8	HB	
Admininistration													0		
	Finance & Admin	3				3	HB		3				3	WH	
	Human Resources	1				1	HB		1				1	WH	
	Info Tech	1	1			2	HB		3	1			4	WH-2, HB-2	2 new IT staff
	Facilities & Planning	4				4	HB		4				4	HB-3, WH-1	1 new custodian (WH), 1 less planner
Development		6			2	8	HB		4			2	6	WH	2 staff less
Research		1				1	HB		23				23	WH	22 new research staff plus XX? Students
Total		55	17	2	13	87	down		81	17	2	13	113	down	
						87	across						113	across	

NOTES	Staff by Location		
HB = Hunnewell Building	Location	Existing	Future
DGH = Dana Greenhouse	HB	77	30
HSF = Horticulture Support Facility	DGH	10	17
WH = Weld Hill Research and Administration Building	HSF		30
	WH		36
	Total	87	113

Notes
Does not include business visitors
Does not include students at Weld Hill

	Existing				No Build 2010				Build 2010			
	LOS	Delay	v/c	95th Queue	LOS	Delay	v/c	95th Queue	LOS	Delay	v/c	95th Queue
Centre Street/Weld Street	**B**	**15.5**	**0.63**		**B**	**17**	**0.67**		**B**	**17.2**	**0.68**	
Eastbound left/thru/right	A	10	0.23	74	B	10	0.24	77	B	10	0.24	77
Westbound left/thru/right	B	12.9	0.35	126	B	13	0.37	133	B	12.9	0.37	133
Northbound left/thru/right	B	14.8	0.53	145	B	17.4	0.58	182	B	17.6	0.59	183
Southbound left/thru/right	B	17.8	0.63	246	B	19.1	0.67	271	B	19.4	0.68	275
Centre Street/VFW Parkway	**B**	**10.4**	**0.65**		**B**	**10.8**	**0.68**		**B**	**10.9**	**0.68**	
VFW EB left/right	B	16.3	0.65	285	B	17	0.68	306	B	17	0.68	306
Centre NB thru	B	12.4	0.28	143	B	12.9	0.29	154	B	13	0.31	162
Centre SB thru	B	6.9	0.53	283	B	7.2	0.55	309	B	7.3	0.55	311
Centre SB right	A		0.52	26	A		0.55	26	A		0.56	26
Walter Street / Bussey Street	**N/A**	**2560**	**4.25**		**N/A**	**2560**	**5.37**		**N/A**	**2557**	**5.4**	
Westbound left/right	F	Error	4.25	Error	F	Error	5.37	Error	F	Error	5.4	Error
Northbound thru/right	A	0	0.26	0	A	0	0.28	0	A	0	0.28	0
Southbound left/thru	A	6.5	0.31	4.5	A	7	0.34	38	A	7.1	0.34	38
Walter Street / Weld Street	**N/A**	**3.8**	**0.52**		**N/A**	**4.7**	**0.6**		**N/A**	**4.8**	**0.62**	
Eastbound left/right	D	33.5	0.52	68	E	42	0.6	88	E	42.9	0.62	90
Northbound left/thru	A	1.9	0.06	5	A	2	0.07	6	A	2.1	0.07	6
Southbound thru/right	A	0	0.48	0	A	0	0.51	0	A	0	0.51	0

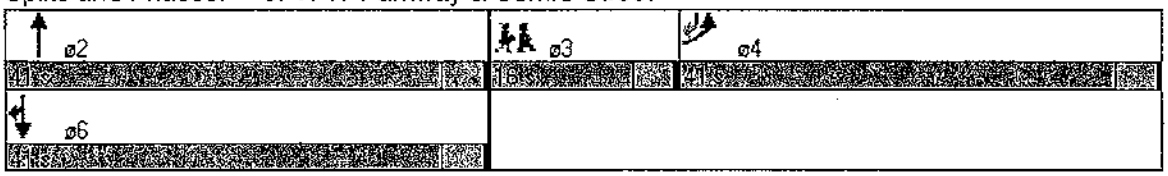
	Existing				No Build 2010				Build 2010			
	LOS	Delay	v/c	95th Queue	LOS	Delay	v/c	95th Queue	LOS	Delay	v/c	95th Queue
Centre Street/Weld Street	B	**14.2**	**0.56**		**B**	**14.5**	**0.6**		**B**	**14.5**	**0.6**	
Eastbound left/thru/right	C	23.1	0.31	137	C	23.3	0.33	145	C	23.3	0.33	146
Westbound left/thru/right	C	23.3	0.21	102	C	23.3	0.23	108	C	23	0.24	111
Northbound left/thru/right	B	13.2	0.56	307	B	13.6	0.6	334	B	13.6	0.6	336
Southbound left/thru/right	A	10	0.18	86	B	10	0.19	91	B	10	0.19	92
Centre Street/VFW Parkway	**B**	**14.7**	**0.6**		**B**	**15**	**0.64**		**B**	**15.1**	**0.65**	
VFW EB left/right	C	20.3	0.6	337	C	20.8	0.64	363	C	20.9	0.65	372
Centre NB thru	B	19.8	0.56	320	C	20.2	0.59	344	C	20.2	0.59	346
Centre SB thru	B	5.7	0.23	121	B	5.7	0.24	128	B	17	0.25	134
Centre SB right	A		0.46	25	A		0.49	26	A	0.2	0.49	25
Walter Street / Bussey Street	**N/A**	**107.1**	**1.89**		**N/A**	**8.9**	**0.8**		**N/A**	**153.3**	**2.32**	
Westbound left/right	F	458	1.89	717	F	64.6	0.8	145	F	652.3	2.32	875
Northbound thru/right	A	0	0.56	0	A	1.3	0.05	4	A	0	0.59	0
Southbound left/thru	A	8.5	0.3	31	A	0	0.17	0	A	9.3	0.33	36
Walter Street / Weld Street	**N/A**	**6.5**	**0.68**		**N/A**	**95**	**1.98**		**N/A**	**9.1**	**0.81**	
Eastbound left/right	E	46.1	0.68	110	F	511.2	1.98	607	F	66.1	0.81	148
Northbound left/thru	A	1.2	0.04	3	A	0	0.59	0	A	1.3	0.05	4
Southbound thru/right	A	0	0.16	0	A	9.3	0.33	36	A	0	0.17	0

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø3
Lane Configurations							
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	
Satd. Flow (prot)	3440	0	0	3539	3539	1564	
Flt Permitted	0.953						
Satd. Flow (perm)	3440	0	0	3539	3539	1564	
Satd. Flow (RTOR)	1					704	
Volume (vph)	820	4	0	784	318	648	
Lane Group Flow (vph)	895	0	0	852	346	704	
Turn Type					custom		
Protected Phases	4			2	6	6	3
Permitted Phases						4	
Detector Phases	4			2	6	6	
Minimum Initial (s)	4.0			4.0	4.0	4.0	4.0
Minimum Split (s)	20.0			20.0	20.0	20.0	22.0
Total Split (s)	41.0	0.0	0.0	41.0	41.0	41.0	16.0
Total Split (%)	42%	0%	0%	42%	42%	42%	16%
Yellow Time (s)	3.5			3.5	3.5	3.5	3.5
All-Red Time (s)	0.5			0.5	0.5	0.5	0.5
Lead/Lag	Lag						Lead
Lead-Lag Optimize?	Yes						Yes
Recall Mode	Max			Max	Max	Max	None
Act Effct Green (s)	37.5			37.5	37.5	82.5	
Actuated g/C Ratio	0.43			0.43	0.43	0.95	
v/c Ratio	0.60			0.56	0.23	0.48	
Uniform Delay, d1	20.6			20.1	16.9	0.0	
Delay	20.3			19.8	16.8	0.2	
LOS	C			B	B	A	
Approach Delay	20.3			19.8	5.7		
Approach LOS	C			B	A		

Intersection Summary

Cycle Length: 98
Actuated Cycle Length: 86.4
Natural Cycle: 70
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.60
Intersection Signal Delay: 14.7 Intersection LOS: B
Intersection Capacity Utilization 55.8% ICU Level of Service A

Splits and Phases: 8: VFW Parkway & Centre Street

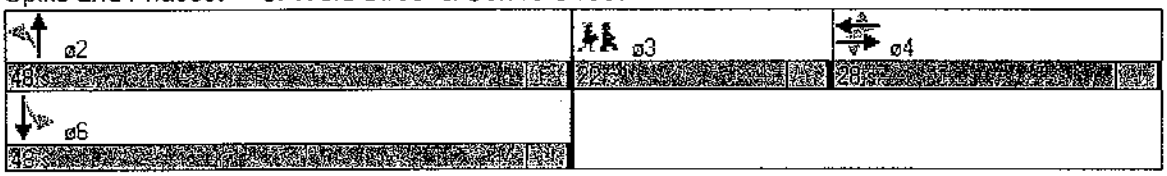


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	0	1811	0	0	1837	0	0	3511	0	0	3504	0
Flt Permitted		0.898			0.910			0.907			0.949	
Satd. Flow (perm)	0	1649	0	0	1692	0	0	3194	0	0	3325	0
Satd. Flow (RTOR)		6			1			5			10	
Volume (vph)	40	89	15	25	74	2	53	826	30	3	279	21
Lane Group Flow (vph)	0	156	0	0	109	0	0	989	0	0	329	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			4			2			6	
Permitted Phases	4			4			2			6		
Detector Phases	4	4		4	4		2	2		6	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	28.0	28.0	0.0	28.0	28.0	0.0	48.0	48.0	0.0	48.0	48.0	0.0
Total Split (%)	29%	29%	0%	29%	29%	0%	49%	49%	0%	49%	49%	0%
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag	Lag	Lag		Lag	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	Max	Max		Max	Max		Max	Max		Max	Max	
Act Effct Green (s)		24.3			24.3			44.5			44.5	
Actuated g/C Ratio		0.30			0.30			0.55			0.55	
v/c Ratio		0.31			0.21			0.56			0.18	
Uniform Delay, d1		22.4			22.4			13.2			9.8	
Delay		23.1			23.3			13.2			10.0	
LOS		C			C			B			A	
Approach Delay		23.1			23.3			13.2			10.0	
Approach LOS		C			C			B			A	

Intersection Summary

Cycle Length: 98
Actuated Cycle Length: 80.4
Natural Cycle: 70
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.56
Intersection Signal Delay: 14.2 Intersection LOS: B
Intersection Capacity Utilization 61.9% ICU Level of Service B

Splits and Phases: 5: Weld Street & Centre Street



Lane Group	ø3
Lane Configurations	
Total Lost Time (s)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Volume (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	3
Permitted Phases	
Detector Phases	
Minimum Initial (s)	4.0
Minimum Split (s)	22.0
Total Split (s)	22.0
Total Split (%)	22%
Yellow Time (s)	3.5
All-Red Time (s)	0.5
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Uniform Delay, d1	
Delay	
LOS	
Approach Delay	
Approach LOS	

Intersection Summary	

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	111	42	53	782	192	58
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (veh/h)	121	46	58	850	209	63
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
vC, conflicting volume	1205	240	272			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	38	94	96			
cM capacity (veh/h)	194	799	1292			

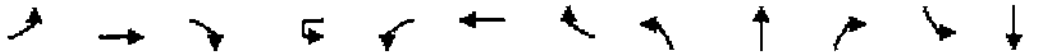
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	166	908	272
Volume Left	121	58	0
Volume Right	46	0	63
cSH	245	1292	1700
Volume to Capacity	0.68	0.04	0.16
Queue Length (ft)	110	3	0
Control Delay (s)	46.1	1.2	0.0
Lane LOS	E	A	
Approach Delay (s)	46.1	1.2	0.0
Approach LOS	E		

Intersection Summary			
Average Delay	6.5		
Intersection Capacity Utilization	82.2%	ICU Level of Service	D

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	113	253	578	298	197	154
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (veh/h)	123	275	628	324	214	167
Pedestrians			20			20
Lane Width (ft)			12.0			12.0
Walking Speed (ft/s)			4.0			4.0
Percent Blockage			2			2
Right turn flare (veh)						
Median type	None					
Median storage veh)						
vC, conflicting volume	1406	810			952	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	26			70	
cM capacity (veh/h)	106	373			722	

Direction, Lane #	WB	NB	SB
Volume Total	398	952	381
Volume Left	123	0	214
Volume Right	275	324	0
cSH	210	1700	722
Volume to Capacity	1.89	0.56	0.30
Queue Length (ft)	717	0	31
Control Delay (s)	458.0	0.0	8.5
Lane LOS	F		A
Approach Delay (s)	458.0	0.0	8.5
Approach LOS	F		

Intersection Summary			
Average Delay	107.1		
Intersection Capacity Utilization	108.5%	ICU Level of Service	F



Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Sign Control		Free				Free			Stop			Stop
Grade		0%				0%			0%			0%
Volume (veh/h)	11	514	129	1	183	768	8	163	25	623	4	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (veh/h)	12	1646	140	0	199	835	9	177	27	677	4	7
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type									Raised			Raised
Median storage veh)									1			1
vC, conflicting volume	843			0	1786			2560	2981	893	2097	3047
vC1, stage 1 conf vol								1740	1740		1237	1237
vC2, stage 2 conf vol								821	1241		860	1810
tC, single (s)	4.1			0.0	4.1			7.5	6.5	6.9	7.5	6.5
tC, 2 stage (s)								6.5	5.5		6.5	5.5
tF (s)	2.2			0.0	2.2			3.5	4.0	3.3	3.5	4.0
p0 queue free %	98			0	42			0	48	0	96	0
cM capacity (veh/h)	788			0	343			47	52	285	118	-324

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total	835	963	199	557	287	204	677	13
Volume Left	12	0	199	0	0	177	0	4
Volume Right	0	140	0	0	9	0	677	2
cSH	788	1700	343	1700	1700	47	285	0
Volume to Capacity	0.02	0.57	0.58	0.33	0.17	4.33	2.38	Err
Queue Length (ft)	1	0	87	0	0	Err	1345	Err
Control Delay (s)	0.4	0.0	29.0	0.0	0.0	Err	659.6	Err
Lane LOS	A		D			F	F	F
Approach Delay (s)	0.2		5.5			2824.6		Err
Approach LOS						F		F

Intersection Capacity Utilization	132.2%	ICU Level of Service	H

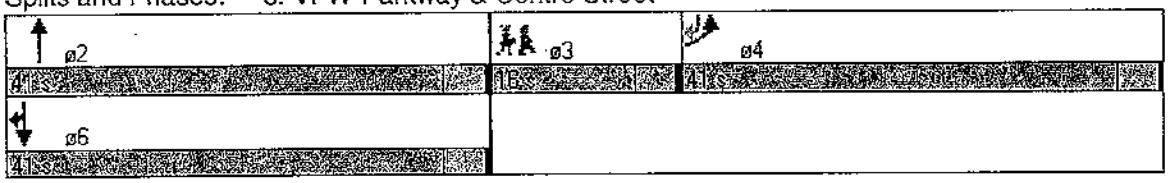
Movement	SBR
Lane Configurations	
Sign Control	
Grade	
Volume (veh/h)	2
Peak Hour Factor	0.92
Hourly flow rate (veh/h)	2
Pedestrians	
Lane Width (ft)	
Walking Speed (ft/s)	
Percent Blockage	
Right turn flare (veh)	
Median type	
Median storage veh)	
vC, conflicting volume	422
vC1, stage 1 conf vol	
vC2, stage 2 conf vol	
tC, single (s)	6.9
tC, 2 stage (s)	
tF (s)	3.3
p0 queue free %	100
cM capacity (veh/h)	580
Direction, Lane #	

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø3
Lane Configurations							
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	
Satd. Flow (prot)	3437	0	0	3539	3539	1564	
Flt Permitted	0.953						
Satd. Flow (perm)	3437	0	0	3539	3539	1564	
Satd. Flow (RTOR)	1					793	
Volume (vph)	710	8	0	383	719	730	
Lane Group Flow (vph)	781	0	0	416	782	793	
Turn Type						custom	
Protected Phases	4			2	6	6	3
Permitted Phases						4	
Detector Phases	4			2	6	6	
Minimum Initial (s)	4.0			4.0	4.0	4.0	4.0
Minimum Split (s)	20.0			20.0	20.0	20.0	22.0
Total Split (s)	41.0	0.0	0.0	41.0	41.0	41.0	16.0
Total Split (%)	42%	0%	0%	42%	42%	42%	16%
Yellow Time (s)	3.5			3.5	3.5	3.5	3.5
All-Red Time (s)	0.5			0.5	0.5	0.5	0.5
Lead/Lag	Lag						Lead
Lead-Lag Optimize?	Yes						Yes
Recall Mode	Min			Min	Min	Min	None
Act Effct Green (s)	18.3			22.0	22.0	49.7	
Actuated g/C Ratio	0.35			0.42	0.42	0.95	
v/c Ratio	0.65			0.28	0.53	0.52	
Uniform Delay, d1	15.3			10.8	12.2	0.0	
Delay	16.3			12.4	13.7	0.3	
LOS	B			B	B	A	
Approach Delay	16.3			12.4	6.9		
Approach LOS	B			B	A		

Intersection Summary

Cycle Length: 98
Actuated Cycle Length: 52.4
Natural Cycle: 65
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 10.4 Intersection LOS: B
Intersection Capacity Utilization 52.5% ICU Level of Service A

Splits and Phases: 8: VFW Parkway & Centre Street

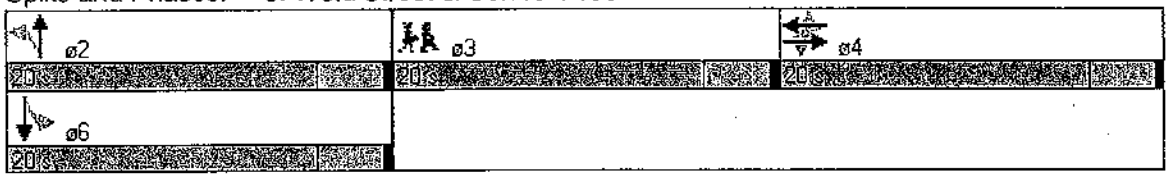


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↕			↕	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	0	1768	0	0	1831	0	0	3483	0	0	3504	0
Flt Permitted		0.936			0.885			0.750			0.947	
Satd. Flow (perm)	0	1669	0	0	1644	0	0	2623	0	0	3321	0
Satd. Flow (RTOR)		38			2			14			10	
Volume (vph)	21	70	42	57	135	4	36	404	37	9	664	41
Lane Group Flow (vph)	0	145	0	0	213	0	0	518	0	0	777	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			4			2			6	
Permitted Phases	4			4			2			6		
Detector Phases	4	4		4	4		2	2		6	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	20.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
Total Split (%)	33%	33%	0%	33%	33%	0%	33%	33%	0%	33%	33%	0%
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag	Lag	Lag		Lag	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	Max	Max		Max	Max		Max	Max		Max	Max	
Act Effct Green (s)		16.5			16.5			16.5			16.5	
Actuated g/C Ratio		0.37			0.37			0.37			0.37	
v/c Ratio		0.23			0.35			0.53			0.63	
Uniform Delay, d1		8.0			11.5			12.2			13.0	
Delay		10.0			12.9			14.8			17.8	
LOS		A			B			B			B	
Approach Delay		10.0			12.9			14.8			17.8	
Approach LOS		A			B			B			B	

Intersection Summary

Cycle Length: 60
Actuated Cycle Length: 44.4
Natural Cycle: 65
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.63
Intersection Signal Delay: 15.5 Intersection LOS: B
Intersection Capacity Utilization 52.7% ICU Level of Service A

Splits and Phases: 5: Weld Street & Centre Street



Lane Group	ø3
Lane Configurations	
Total Lost Time (s)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Volume (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	3
Permitted Phases	
Detector Phases	
Minimum Initial (s)	4.0
Minimum Split (s)	22.0
Total Split (s)	20.0
Total Split (%)	33%
Yellow Time (s)	3.5
All-Red Time (s)	0.5
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Uniform Delay, d1	
Delay	
LOS	
Approach Delay	
Approach LOS	

Intersection Summary

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	66	55	47	332	604	151
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (veh/h)	72	60	51	361	657	164
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
vC, conflicting volume	1202	739	821			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	62	86	94			
cM capacity (veh/h)	191	418	808			

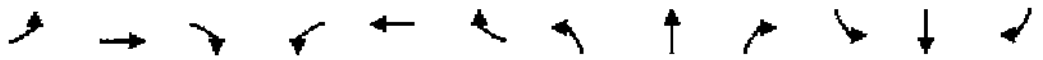
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	132	412	821
Volume Left	72	51	0
Volume Right	60	0	164
cSH	254	808	1700
Volume to Capacity	0.52	0.06	0.48
Queue Length (ft)	68	5	0
Control Delay (s)	33.5	1.9	0.0
Lane LOS	D	A	
Approach Delay (s)	33.5	1.9	0.0
Approach LOS	D		

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	84.0%	ICU Level of Service	D

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	275	150	278	136	319	504
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (veh/h)	299	163	302	148	347	548
Pedestrians			20			20
Lane Width (ft)			12.0			12.0
Walking Speed (ft/s)			4.0			4.0
Percent Blockage			2			2
Right turn flare (veh)						
Median type	None					
Median storage veh)						
vC, conflicting volume	1687	396			450	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	75			69	
cM capacity (veh/h)	75	642			1110	

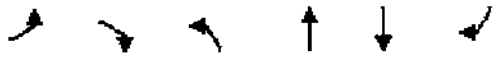
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	462	450	895
Volume Left	299	0	347
Volume Right	163	148	0
cSH	109	1700	1110
Volume to Capacity	4.25	0.26	0.31
Queue Length (ft)	Err	0	34
Control Delay (s)	Err	0.0	6.5
Lane LOS	F		A
Approach Delay (s)	Err	0.0	6.5
Approach LOS	F		

Intersection Summary			
Average Delay	2560.1		
Intersection Capacity Utilization	110.1%	ICU Level of Service	G



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	17	1051	232	8	110	572	111	7	286	0	3	28
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (veh/h)	18	1142	252	9	120	622	121	8	311	0	3	30
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								Raised			Raised	
Median storage veh)								1			1	
vC, conflicting volume	741			1395			1415	2064	697	1060	1879	371
vC1, stage 1 conf vol							1305	1305		448	448	
vC2, stage 2 conf vol							109	759		612	1432	
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			98			16	95	19	100	98	95
cM capacity (veh/h)	861			486			144	151	383	62	148	627

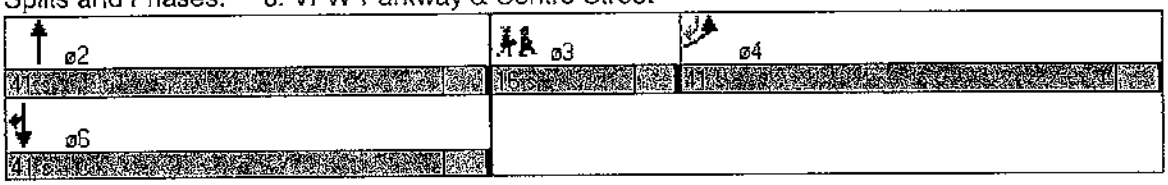
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total	590	823	9	80	662	128	311	34
Volume Left	18	0	9	0	0	121	0	0
Volume Right	0	252	0	0	622	0	311	30
cSH	861	1700	486	1700	1700	145	383	478
Volume to Capacity	0.02	0.48	0.02	0.05	0.39	0.89	0.81	0.07
Queue Length (ft)	2	0	1	0	0	150	179	6
Control Delay (s)	0.6	0.0	12.5	0.0	0.0	107.5	44.2	13.1
Lane LOS	A		B			F	E	B
Approach Delay (s)	0.2		0.1			62.7		13.1
Approach LOS						F		B



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø3		
Lane Configurations									
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0			
Satd. Flow (prot)	3440	0	0	3539	3539	1564			
Flt Permitted	0.953								
Satd. Flow (perm)	3440	0	0	3539	3539	1564			
Satd. Flow (RTOR)						748			
Volume (vph)	870	4	0	832	338	688			
Lane Group Flow (vph)	950	0	0	904	367	748			
Turn Type						custom			
Protected Phases	4			2	6	6	3		
Permitted Phases						4			
Detector Phases	4			2	6	6			
Minimum Initial (s)	4.0			4.0	4.0	4.0	4.0		
Minimum Split (s)	20.0			20.0	20.0	20.0	22.0		
Total Split (s)	41.0	0.0	0.0	41.0	41.0	41.0	16.0		
Total Split (%)	42%	0%	0%	42%	42%	42%	16%		
Yellow Time (s)	3.5			3.5	3.5	3.5	3.5		
All-Red Time (s)	0.5			0.5	0.5	0.5	0.5		
Lead/Lag	Lag						Lead		
Lead-Lag Optimize?	Yes						Yes		
Recall Mode	Max			Max	Max	Max	None		
Act Effct Green (s)	37.3			37.3	37.3	82.1			
Actuated g/C Ratio	0.43			0.43	0.43	0.95			
v/c Ratio	0.64			0.59	0.24	0.49			
Uniform Delay, d1	21.1			20.5	17.0	0.0			
Delay	20.8			20.2	16.9	0.2			
LOS	C			C	B	A			
Approach Delay	20.8			20.2	5.7				
Approach LOS	C			C	A				

Intersection Summary			
Cycle Length: 98			
Actuated Cycle Length: 86.4			
Natural Cycle: 75			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.64			
Intersection Signal Delay: 15.0		Intersection LOS: B	
Intersection Capacity Utilization 58.8%		ICU Level of Service A	

Splits and Phases: 8: VFW Parkway & Centre Street

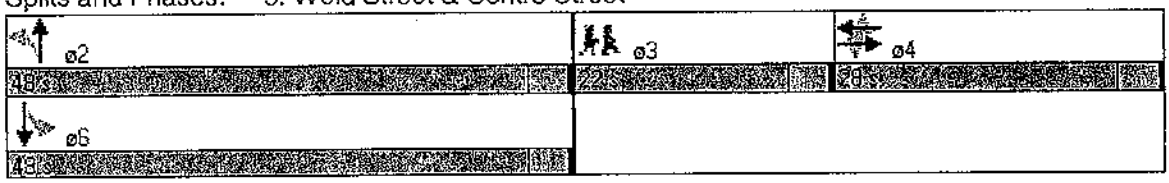


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	0	1811	0	0	1837	0	0	3511	0	0	3504	0
Flt Permitted		0.893			0.907			0.904			0.949	
Satd. Flow (perm)	0	1640	0	0	1686	0	0	3183	0	0	3325	0
Satd. Flow (RTOR)		6			1			5			10	
Volume (vph)	42	94	16	27	79	2	56	877	32	3	296	22
Lane Group Flow (vph)	0	165	0	0	117	0	0	1049	0	0	349	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			4			2			6	
Permitted Phases	4			4			2			6		
Detector Phases	4	4		4	4		2	2		6	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	28.0	28.0	0.0	28.0	28.0	0.0	48.0	48.0	0.0	48.0	48.0	0.0
Total Split (%)	29%	29%	0%	29%	29%	0%	49%	49%	0%	49%	49%	0%
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag	Lag	Lag		Lag	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	Max	Max		Max	Max		Max	Max		Max	Max	
Act Effct Green (s)		24.3			24.3			44.5			44.5	
Actuated g/C Ratio		0.30			0.30			0.55			0.55	
v/c Ratio		0.33			0.28			0.60			0.19	
Uniform Delay, d1		22.6			22.5			13.6			9.9	
Delay		23.3			23.3			13.6			10.0	
LOS		C			C			B			B	
Approach Delay		23.3			23.3			13.6			10.0	
Approach LOS		C			C			B			B	

Intersection Summary

Cycle Length: 98
Actuated Cycle Length: 80.4
Natural Cycle: 70
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.60
Intersection Signal Delay: 14.5 Intersection LOS: B
Intersection Capacity Utilization 64.6% ICU Level of Service B

Splits and Phases: 5: Weld Street & Centre Street



Lane Group	ø3
Lane Configurations	
Total Lost Time (s)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Volume (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	3
Permitted Phases	
Detector Phases	
Minimum Initial (s)	4.0
Minimum Split (s)	22.0
Total Split (s)	22.0
Total Split (%)	22%
Yellow Time (s)	3.5
All-Red Time (s)	0.5
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Uniform Delay, d1	
Delay	
LOS	
Approach Delay	
Approach LOS	

Intersection Summary

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	118	45	56	830	204	62
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (veh/h)	128	49	61	902	222	67
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
vC, conflicting volume	1279	255	289			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	26	94	95			
cM capacity (veh/h)	174	783	1273			

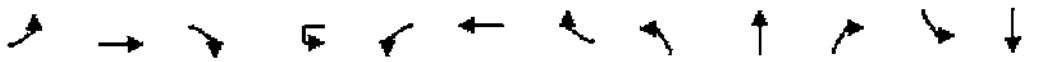
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	177	963	289
Volume Left	128	61	0
Volume Right	49	0	67
cSH	222	1273	1700
Volume to Capacity	0.80	0.05	0.17
Queue Length (ft)	145	4	0
Control Delay (s)	64.6	1.3	0.0
Lane LOS	F	A	
Approach Delay (s)	64.6	1.3	0.0
Approach LOS	F		

Intersection Summary			
Average Delay	8.9		
Intersection Capacity Utilization	86.7%	ICU Level of Service	D

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	120	169	614	316	209	163
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (veh/h)	130	184	667	343	227	177
Pedestrians			20			20
Lane Width (ft)			12.0			12.0
Walking Speed (ft/s)			4.0			4.0
Percent Blockage			2			2
Right turn flare (veh)						
Median type	None					
Median storage veh)						
vC, conflicting volume	1491	859			1011	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	48			67	
cM capacity (veh/h)	90	350			686	

Direction, Lane #	WB	NB	SB
Volume Total	314	1011	404
Volume Left	130	0	227
Volume Right	184	343	0
cSH	159	1700	686
Volume to Capacity	1.98	0.59	0.33
Queue Length (ft)	607	0	36
Control Delay (s)	511.2	0.0	9.3
Lane LOS	F		A
Approach Delay (s)	511.2	0.0	9.3
Approach LOS	F		

Intersection Summary			
Average Delay	95.0		
Intersection Capacity Utilization	107.6%	ICU Level of Service	F



Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Sign Control		Free				Free			Stop			Stop
Grade		0%				0%			0%			0%
Volume (veh/h)	11	1607	137	1	194	815	8	163	25	623	4	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (veh/h)	12	1747	149	0	211	886	9	177	27	677	4	7
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type									Raised			Raised
Median storage veh)									1			1
vC, conflicting volume	895			0	1896			2715	3161	948	2223	3232
vC1, stage 1 conf vol								1845	1845		1312	1312
vC2, stage 2 conf vol								870	1316		911	1920
tC, single (s)	4.1			0.0	4.1			7.5	6.5	6.9	7.5	6.5
tC, 2 stage (s)								6.5	5.5		6.5	5.5
tF (s)	2.2			0.0	2.2			3.5	4.0	3.3	3.5	4.0
p0 queue free %	98			0	32			0	29	70	93	97
cM capacity (veh/h)	754			0	311			37	38	262	66	204

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total	885	1022	211	591	304	204	677	13
Volume Left	12	0	211	0	0	177	0	4
Volume Right	0	149	0	0	9	0	677	2
cSH	754	1700	311	1700	1700	38	262	128
Volume to Capacity	0.02	0.60	0.68	0.35	0.18	5.45	2.59	0.10
Queue Length (ft)	1	0	115	0	0	Err	1411	8
Control Delay (s)	0.4	0.0	37.9	0.0	0.0	Err	755.2	36.2
Lane LOS	A		E			F	F	E
Approach Delay (s)	0.2		7.2			2898.1		36.2
Approach LOS						F		E

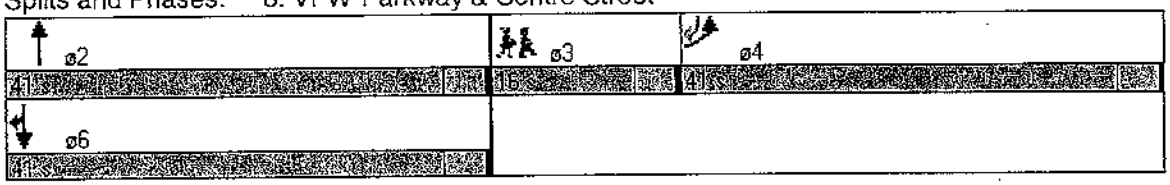
Movement	SBR
Lane Configurations	
Sign Control	
Grade	
Volume (veh/h)	2
Peak Hour Factor	0.92
Hourly flow rate (veh/h)	2
Pedestrians	
Lane Width (ft)	
Walking Speed (ft/s)	
Percent Blockage	
Right turn flare (veh)	
Median type	
Median storage veh)	
vC, conflicting volume	447
vC1, stage 1 conf vol	
vC2, stage 2 conf vol	
tC, single (s)	6.9
tC, 2 stage (s)	
tF (s)	3.3
p0 queue free %	100
cM capacity (veh/h)	559
Direction, Lane #	

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø8
Lane Configurations							
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	
Satd. Flow (prot)	3437	0	0	3539	3539	1564	
Flt Permitted	0.953						
Satd. Flow (perm)	3437	0	0	3539	3539	1564	
Satd. Flow (RTOR)	1					842	
Volume (vph)	754	8	0	407	763	775	
Lane Group Flow (vph)	829	0	0	442	829	842	
Turn Type						custom	
Protected Phases	4			2	6	6	3
Permitted Phases						4	
Detector Phases	4			2	6	6	
Minimum Initial (s)	4.0			4.0	4.0	4.0	4.0
Minimum Split (s)	20.0			20.0	20.0	20.0	22.0
Total Split (s)	41.0	0.0	0.0	41.0	41.0	41.0	16.0
Total Split (%)	42%	0%	0%	42%	42%	42%	16%
Yellow Time (s)	3.5			3.5	3.5	3.5	3.5
All-Red Time (s)	0.5			0.5	0.5	0.5	0.5
Lead/Lag	Lag						Lead
Lead-Lag Optimize?	Yes						Yes
Recall Mode	Min			Min	Min	Min	None
Act Effct Green (s)	19.4			23.3	23.3	52.1	
Actuated g/C Ratio	0.35			0.43	0.43	0.95	
v/c Ratio	0.68			0.29	0.55	0.55	
Uniform Delay, d1	16.1			11.2	12.8	0.0	
Delay	17.0			12.9	14.3	0.3	
LOS	B			B	B	A	
Approach Delay	17.0			12.9	7.2		
Approach LOS	B			B	A		

Intersection Summary

Cycle Length: 98
Actuated Cycle Length: 54.8
Natural Cycle: 65
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.68
Intersection Signal Delay: 10.8 Intersection LOS: B
Intersection Capacity Utilization 55.5% ICU Level of Service A

Splits and Phases: 8: VFW Parkway & Centre Street

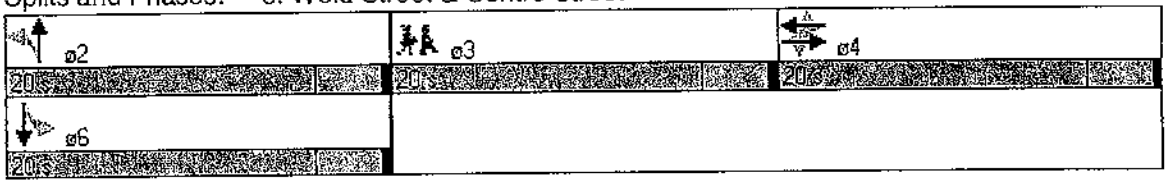


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↕			↕	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	0	1768	0	0	1833	0	0	3486	0	0	3504	0
Flt Permitted		0.934			0.888			0.716			0.946	
Satd. Flow (perm)	0	1665	0	0	1651	0	0	2506	0	0	3318	0
Satd. Flow (RTOR)		39			1			14			10	
Volume (vph)	22	74	45	61	143	4	38	429	39	10	705	44
Lane Group Flow (vph)	0	158	0	0	225	0	0	549	0	0	825	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			4			2			6	
Permitted Phases	4			4			2			6		
Detector Phases	4	4		4	4		2	2		6	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	20.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
Total Split (%)	33%	33%	0%	33%	33%	0%	33%	33%	0%	33%	33%	0%
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag	Lag	Lag		Lag	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	Max	Max		Max	Max		Max	Max		Max	Max	
Act Effct Green (s)		16.5			16.5			16.5			16.5	
Actuated g/C Ratio		0.37			0.37			0.37			0.37	
v/c Ratio		0.24			0.37			0.58			0.67	
Uniform Delay, d1		8.1			11.7			12.6			13.3	
Delay		10.0			13.0			17.4			19.1	
LOS		B			B			B			B	
Approach Delay		10.0			13.0			17.4			19.1	
Approach LOS		B			B			B			B	

Intersection Summary

Cycle Length: 60
Actuated Cycle Length: 44.4
Natural Cycle: 65
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.67
Intersection Signal Delay: 17.0 Intersection LOS: B
Intersection Capacity Utilization 55.6% ICU Level of Service A

Splits and Phases: 5: Weld Street & Centre Street



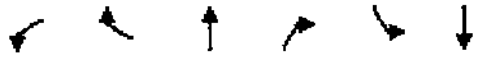
Lane Group	ø3
Lane Configurations	
Total Lost Time (s)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Volume (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	3
Permitted Phases	
Detector Phases	
Minimum Initial (s)	4.0
Minimum Split (s)	22.0
Total Split (s)	20.0
Total Split (%)	33%
Yellow Time (s)	3.5
All-Red Time (s)	0.5
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Uniform Delay, d1	
Delay	
LOS	
Approach Delay	
Approach LOS	

Intersection Summary

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	70	58	50	352	641	160
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (veh/h)	76	63	54	383	697	174
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
vC, conflicting volume	1275	784	871			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	56	84	93			
cM capacity (veh/h)	171	393	774			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	139	437	871
Volume Left	76	54	0
Volume Right	63	0	174
cSH	230	774	1700
Volume to Capacity	0.60	0.07	0.51
Queue Length (ft)	88	6	0
Control Delay (s)	42.0	2.0	0.0
Lane LOS	E	A	
Approach Delay (s)	42.0	2.0	0.0
Approach LOS	E		

Intersection Summary			
Average Delay	4.7		
Intersection Capacity Utilization	88.5%	ICU Level of Service	D



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	292	159	295	144	339	535
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (veh/h)	317	173	321	157	368	582
Pedestrians			20			20
Lane Width (ft)			12.0			12.0
Walking Speed (ft/s)			4.0			4.0
Percent Blockage			2			2
Right turn flare (veh)						
Median type	None					
Median storage veh)						
vC, conflicting volume	1737	419			477	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	72			66	
cM capacity (veh/h)	62	624			1085	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	490	477	950
Volume Left	317	0	368
Volume Right	173	157	0
cSH	91	1700	1085
Volume to Capacity	5.37	0.28	0.34
Queue Length (ft)	Err	0	38
Control Delay (s)	Err	0.0	7.0
Lane LOS	F		A
Approach Delay (s)	Err	0.0	7.0
Approach LOS	F		

Intersection Summary			
Average Delay	2559.9		
Intersection Capacity Utilization	116.2%	ICU Level of Service	G

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Sign Control		Free				Free			Stop			Stop
Grade		0%				0%			0%			0%
Volume (veh/h)	18	1116	246	1	8	117	607	118	7	304	0	3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (veh/h)	20	1213	267	0	9	127	660	128	8	330	0	3
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type									Raised			Raised
Median storage veh)									1			1
vC, conflicting volume	787			0	1480			1501	2190	740	1124	1994
vC1, stage 1 conf vol								1386	1386		474	474
vC2, stage 2 conf vol								115	804		649	1520
tC, single (s)	4.1			0.0	4.1			7.5	6.5	6.9	7.5	6.5
tC, 2 stage (s)								6.5	5.5		6.5	5.5
tF (s)	2.2			0.0	2.2			3.5	4.0	3.3	3.5	4.0
p0 queue free %	98			0	98			0	94	8	100	98
cM capacity (veh/h)	828			0	451			128	137	359	21	134

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	626	874	9	85	702	466	36
Volume Left	20	0	9	0	0	128	0
Volume Right	0	267	0	0	660	330	33
cSH	828	1700	451	1700	1700	236	459
Volume to Capacity	0.02	0.51	0.02	0.05	0.41	1.98	0.08
Queue Length (ft)	2	0	1	0	0	848	6
Control Delay (s)	0.6	0.0	13.1	0.0	0.0	488.1	13.5
Lane LOS	A		B			F	B
Approach Delay (s)	0.3		0.1			488.1	13.5
Approach LOS						F	B

Intersection Capacity Utilization	44.4%	ICU Level of Service	E

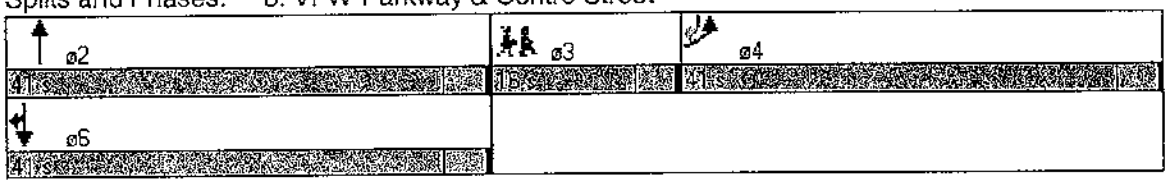
Movement	SBR
Lane Configurations	
Sign Control	
Grade	
Volume (veh/h)	30
Peak Hour Factor	0.92
Hourly flow rate (veh/h)	33
Pedestrians	
Lane Width (ft)	
Walking Speed (ft/s)	
Percent Blockage	
Right turn flare (veh)	
Median type	
Median storage veh)	
vC, conflicting volume	393
vC1, stage 1 conf vol	
vC2, stage 2 conf vol	
tC, single (s)	6.9
tC, 2 stage (s)	
tF (s)	3.3
p0 queue free %	95
cM capacity (veh/h)	606
Direction, Lane #	

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø3
Lane Configurations							
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	
Satd. Flow (prot)	3434	0	0	3539	3539	1564	
Flt Permitted	0.953						
Satd. Flow (perm)	3434	0	0	3539	3539	1564	
Satd. Flow (RTOR)	3					749	
Volume (vph)	870	19	0	836	351	689	
Lane Group Flow (vph)	967	0	0	909	382	749	
Turn Type					custom		
Protected Phases	4			2	6	6	3
Permitted Phases						4	
Detector Phases	4			2	6	6	
Minimum Initial (s)	4.0			4.0	4.0	4.0	4.0
Minimum Split (s)	20.0			20.0	20.0	20.0	22.0
Total Split (s)	41.0	0.0	0.0	41.0	41.0	41.0	16.0
Total Split (%)	42%	0%	0%	42%	42%	42%	16%
Yellow Time (s)	3.5			3.5	3.5	3.5	3.5
All-Red Time (s)	0.5			0.5	0.5	0.5	0.5
Lead/Lag	Lag						Lead
Lead-Lag Optimize?	Yes						Yes
Recall Mode	Max			Max	Max	Max	None
Act Effct Green (s)	37.3			37.3	37.3	82.1	
Actuated g/C Ratio	0.43			0.43	0.43	0.95	
v/c Ratio	0.65			0.59	0.25	0.49	
Uniform Delay, d1	21.2			20.5	17.1	0.0	
Delay	20.9			20.2	17.0	0.2	
LOS	C			C	B	A	
Approach Delay	20.9			20.2	5.9		
Approach LOS	C			C	A		

Intersection Summary

Cycle Length: 98
Actuated Cycle Length: 86.4
Natural Cycle: 75
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 15.1 Intersection LOS: B
Intersection Capacity Utilization 59.4% ICU Level of Service A

Splits and Phases: 8: VFW Parkway & Centre Street



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	4	4	921	10	28	342
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (veh/h)	4	4	1001	11	30	372
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
vC, conflicting volume	1253	506			1012	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	99			96	
cM capacity (veh/h)	157	512			681	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	9	667	345	154	248
Volume Left	4	0	0	30	0
Volume Right	4	0	11	0	0
cSH	240	1700	1700	681	1700
Volume to Capacity	0.04	0.39	0.20	0.04	0.15
Queue Length (ft)	3	0	0	4	0
Control Delay (s)	20.6	0.0	0.0	2.5	0.0
Lane LOS	C			A	
Approach Delay (s)	20.6	0.0		1.0	
Approach LOS	C				

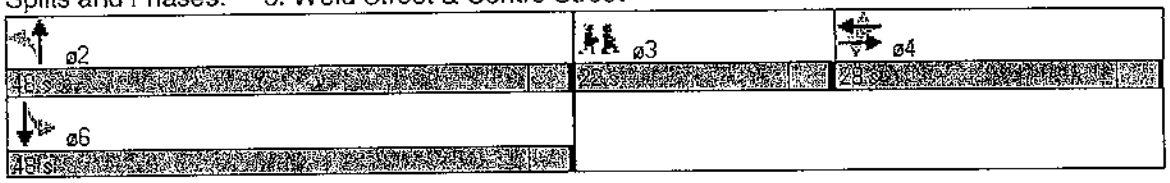
Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	38.0%	ICU Level of Service	A

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	0	1811	0	0	1826	0	0	3511	0	0	3497	0
Flt Permitted		0.896			0.912			0.904			0.946	
Satd. Flow (perm)	0	1646	0	0	1685	0	0	3183	0	0	3311	0
Satd. Flow (RTOR)		6			3			4			11	
Volume (vph)	44	94	16	27	79	6	56	881	32	4	297	24
Lane Group Flow (vph)	0	167	0	0	122	0	0	1054	0	0	353	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			4			2			6	
Permitted Phases	4			4			2			6		
Detector Phases	4	4		4	4		2	2		6	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	28.0	28.0	0.0	28.0	28.0	0.0	48.0	48.0	0.0	48.0	48.0	0.0
Total Split (%)	29%	29%	0%	29%	29%	0%	49%	49%	0%	49%	49%	0%
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag	Lag	Lag		Lag	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	Max	Max		Max	Max		Max	Max		Max	Max	
Act Effct Green (s)		24.3			24.3			44.5			44.5	
Actuated g/C Ratio		0.30			0.30			0.55			0.55	
v/c Ratio		0.33			0.24			0.60			0.19	
Uniform Delay, d1		22.6			22.2			13.6			9.9	
Delay		23.3			23.0			13.6			10.0	
LOS		C			C			B			B	
Approach Delay		23.3			23.0			13.6			10.0	
Approach LOS		C			C			B			B	

Intersection Summary

Cycle Length: 98
Actuated Cycle Length: 80.4
Natural Cycle: 70
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.60
Intersection Signal Delay: 14.5 Intersection LOS: B
Intersection Capacity Utilization 65.0% ICU Level of Service B

Splits and Phases: 5: Weld Street & Centre Street



Lane Group	Ø3
Lane Configurations	
Total Lost Time (s)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Volume (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	3
Permitted Phases	
Detector Phases	
Minimum Initial (s)	4.0
Minimum Split (s)	22.0
Total Split (s)	22.0
Total Split (%)	22%
Yellow Time (s)	3.5
All-Red Time (s)	0.5
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Uniform Delay, d1	
Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	118	46	58	830	204	64
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (veh/h)	128	50	63	902	222	70
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
vC, conflicting volume	1285	1257	291			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	26	94	95			
cM capacity (veh/h)	173	782	1270			

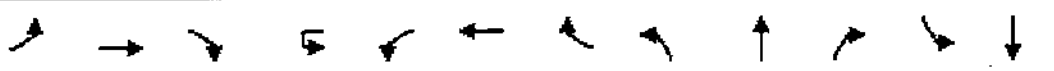
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	178	965	291
Volume Left	128	63	0
Volume Right	50	0	70
cSH	221	1270	1700
Volume to Capacity	0.81	0.05	0.17
Queue Length (ft)	148	4	0
Control Delay (s)	66.1	1.3	0.0
Lane LOS	F	A	
Approach Delay (s)	66.1	1.3	0.0
Approach LOS	F		

Intersection Summary			
Average Delay	9.1		
Intersection Capacity Utilization	87.0%	ICU Level of Service	D

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	122	271	614	316	209	163
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (veh/h)	133	295	667	343	227	177
Pedestrians			20			20
Lane Width (ft)			12.0			12.0
Walking Speed (ft/s)			4.0			4.0
Percent Blockage			2			2
Right turn flare (veh)						
Median type	None					
Median storage veh)						
vC, conflicting volume	1491	859			1011	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	16			67	
cM capacity (veh/h)	90	350			686	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	427	1011	404
Volume Left	133	0	227
Volume Right	295	343	0
cSH	184	1700	686
Volume to Capacity	2.32	0.59	0.33
Queue Length (ft)	875	0	36
Control Delay (s)	652.3	0.0	9.3
Lane LOS	F		A
Approach Delay (s)	652.3	0.0	9.3
Approach LOS	F		

Intersection Summary			
Average Delay	153.3		
Intersection Capacity Utilization	114.8%	ICU Level of Service	G



Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Sign Control		Free				Free			Stop			Stop
Grade		0%				0%			0%			0%
Volume (veh/h)	12	1610	137	1	194	826	8	165	25	623	4	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (veh/h)	13	1750	149	0	211	898	9	179	27	677	4	7
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type									Raised			Raised
Median storage veh)									1			1
vC, conflicting volume	907			0	1899			2727	3179	949	2239	3249
vC1, stage 1 conf vol								1851	1851		1324	1324
vC2, stage 2 conf vol								876	1328		915	1925
tC, single (s)	4.1			0.0	4.1			7.5	6.5	6.9	7.5	6.5
tC, 2 stage (s)								6.5	5.5		6.5	5.5
tF (s)	2.2			0.0	2.2			3.5	4.0	3.3	3.5	4.0
p0 queue free %	98			0	32			0	27	0	93	97
cM capacity (veh/h)	746			0	310			37	37	261	64	190

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total	888	1024	211	599	308	207	677	13
Volume Left	13	0	211	0	0	179	0	4
Volume Right	0	149	0	0	9	0	677	2
cSH	746	1700	310	1700	1700	37	261	123
Volume to Capacity	0.02	0.60	0.68	0.35	0.18	5.63	2.59	0.11
Queue Length (ft)	1	0	116	0	0	Err	1413	9
Control Delay (s)	0.5	0.0	38.1	0.0	0.0	Err	758.2	37.8
Lane LOS	A		E			F	F	E
Approach Delay (s)	0.2		7.2			2917.8		37.8
Approach LOS						F		E

Intersection Capacity Utilization	137.2%	ICU Level of Service	H

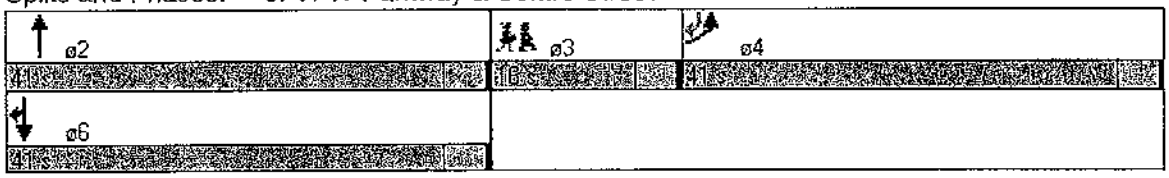
Movement	SBR
Lane Configurations	
Sign Control	
Grade	
Volume (veh/h)	2
Peak Hour Factor	0.92
Hourly flow rate (veh/h)	2
Pedestrians	
Lane Width (ft)	
Walking Speed (ft/s)	
Percent Blockage	
Right turn flare (veh)	
Median type	
Median storage veh)	
vC, conflicting volume	453
vC1, stage 1 conf vol	
vC2, stage 2 conf vol	
tC, single (s)	6.9
tC, 2 stage (s)	
tF (s)	3.3
p0 queue free %	100
cM capacity (veh/h)	554
Direction, Lane #	

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Lane Configurations							
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	
Satd. Flow (prot)	3437	0	0	3539	3539	1564	
Flt Permitted	0.953						
Satd. Flow (perm)	3437	0	0	3539	3539	1564	
Satd. Flow (RTOR)	2					849	
Volume (vph)	754	10	0	426	765	781	
Lane Group Flow (vph)	891	0	0	463	832	849	
Turn Type					custom		
Protected Phases	4			2	6	6	3
Permitted Phases						4	
Detector Phases	4			2	6	6	
Minimum Initial (s)	4.0			4.0	4.0	4.0	4.0
Minimum Split (s)	20.0			20.0	20.0	20.0	22.0
Total Split (s)	41.0	0.0	0.0	41.0	41.0	41.0	16.0
Total Split (%)	42%	0%	0%	42%	42%	42%	16%
Yellow Time (s)	3.5			3.5	3.5	3.5	3.5
All-Red Time (s)	0.5			0.5	0.5	0.5	0.5
Lead/Lag	Lag						Lead
Lead-Lag Optimize?	Yes						Yes
Recall Mode	Min			Min	Min	Min	None
Act Effct Green (s)	19.7			23.4	23.4	52.4	
Actuated g/C Ratio	0.36			0.42	0.42	0.95	
v/c Ratio	0.68			0.31	0.56	0.56	
Uniform Delay, d1	16.0			11.4	12.9	0.0	
Delay	17.0			13.0	14.5	0.3	
LOS	B			B	B	A	
Approach Delay	17.0			13.0	7.3		
Approach LOS	B			B	A		

Intersection Summary

Cycle Length: 98
Actuated Cycle Length: 55.2
Natural Cycle: 65
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.68
Intersection Signal Delay: 10.9 Intersection LOS: B
Intersection Capacity Utilization 55.9% ICU Level of Service A

Splits and Phases: 8: VFW Parkway & Centre Street



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	11	20	491	2	4	771
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (veh/h)	12	22	468	2	4	838
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
vC, conflicting volume	897	235			471	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	97			100	
cM capacity (veh/h)	278	766			1087	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	34	312	158	284	559
Volume Left	12	0	0	4	0
Volume Right	22	0	2	0	0
cSH	472	1700	1700	1087	1700
Volume to Capacity	0.07	0.18	0.09	0.00	0.33
Queue Length (ft)	6	0	0	0	0
Control Delay (s)	13.2	0.0	0.0	0.2	0.0
Lane LOS	B			A	
Approach Delay (s)	13.2	0.0		0.1	
Approach LOS	B				

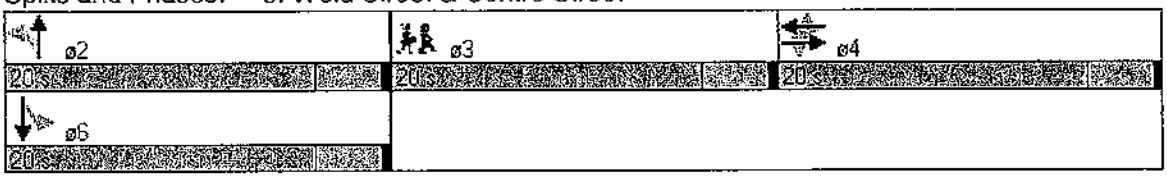
Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	34.0%	ICU Level of Service	A

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↑↑			↑↑	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	0	1768	0	0	1831	0	0	3486	0	0	3500	0
Flt Permitted		0.934			0.889			0.710			0.944	
Satd. Flow (perm)	0	1665	0	0	1651	0	0	2485	0	0	3308	0
Satd. Flow (RTOR)		39			2			14			12	
Volume (vph)	22	74	45	61	143	5	38	430	39	12	707	51
Lane Group Flow (vph)	0	163	0	0	226	0	0	550	0	0	836	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			4			2			6	
Permitted Phases	4			4			2			6		
Detector Phases	4	4		4	4		2	2		6	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	20.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
Total Split (%)	33%	33%	0%	33%	33%	0%	33%	33%	0%	33%	33%	0%
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag	Lag	Lag		Lag	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	Max	Max		Max	Max		Max	Max		Max	Max	
Act Effct Green (s)		16.5			16.5			16.5			16.5	
Actuated g/C Ratio		0.37			0.37			0.37			0.37	
v/c Ratio		0.24			0.37			0.68			0.69	
Uniform Delay, d1		8.1			11.6			12.6			13.3	
Delay		10.0			12.9			17.6			19.4	
LOS		B			B			B			B	
Approach Delay		10.0			12.9			17.6			19.4	
Approach LOS		B			B			B			B	

Intersection Summary

Cycle Length: 60
Actuated Cycle Length: 44.4
Natural Cycle: 65
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.68
Intersection Signal Delay: 17.2 Intersection LOS: B
Intersection Capacity Utilization 56.5% ICU Level of Service A

Splits and Phases: 5: Weld Street & Centre Street



Lane Group	ø3
Lane Configurations	
Total Lost Time (s)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Volume (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	3
Permitted Phases	
Detector Phases	
Minimum Initial (s)	4.0
Minimum Split (s)	22.0
Total Split (s)	20.0
Total Split (%)	33%
Yellow Time (s)	3.5
All-Red Time (s)	0.5
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Uniform Delay, d1	
Delay	
LOS	
Approach Delay	
Approach LOS	

Intersection Summary

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	71	59	51	352	641	160
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (veh/h)	77	64	55	383	697	174
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
vC, conflicting volume	1277	784	871			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	55	84	93			
cM capacity (veh/h)	171	393	774			

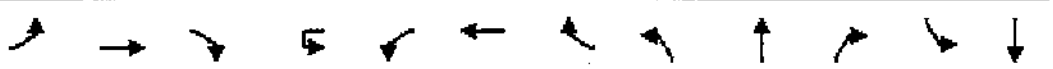
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	141	438	871
Volume Left	77	55	0
Volume Right	64	0	174
cSH	230	774	1700
Volume to Capacity	0.62	0.07	0.51
Queue Length (ft)	90	6	0
Control Delay (s)	42.9	2.1	0.0
Lane LOS	E	A	
Approach Delay (s)	42.9	2.1	0.0
Approach LOS	E		

Intersection Summary			
Average Delay	4.8		
Intersection Capacity Utilization	88.6%	ICU Level of Service	D

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	292	159	295	145	340	535
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (veh/h)	317	173	321	158	370	582
Pedestrians			20			20
Lane Width (ft)			12.0			12.0
Walking Speed (ft/s)			4.0			4.0
Percent Blockage			2			2
Right turn flare (veh)						
Median type	None					
Median storage veh)						
vC, conflicting volume	1740	419			478	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	72			66	
cM capacity (veh/h)	62	623			1084	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	490	479	951
Volume Left	317	0	370
Volume Right	173	158	0
cSH	91	1700	1084
Volume to Capacity	5.40	0.28	0.34
Queue Length (ft)	Err	0	38
Control Delay (s)	Err	0.0	7.1
Lane LOS	F		A
Approach Delay (s)	Err	0.0	7.1
Approach LOS	F		

Intersection Summary			
Average Delay	2557.0		
Intersection Capacity Utilization	116.4%	ICU Level of Service	G



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Sign Control		Free			Free			Stop			Stop
Grade		0%			0%			0%			0%
Volume (veh/h)	24	1129	247	1	8	119	607	118	7	304	0	3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (veh/h)	26	1227	268	1	9	129	660	128	8	330	0	3
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								Raised			Raised
Median storage veh)								1			1
vC, conflicting volume	789			0	1496		1530	2220	748	1146	2024
vC1, stage 1 conf vol							1414	1414		477	477
vC2, stage 2 conf vol							116	807		670	1548
tC, single (s)	4.1			0.0	4.1		7.5	6.5	6.9	7.5	6.5
tC, 2 stage (s)							6.5	5.5		6.5	5.5
tF (s)	2.2			0.0	2.2		3.5	4.0	3.3	3.5	4.0
p0 queue free %	97			0	98		0	94	7	100	97
cM capacity (veh/h)	826			0	445		122	132	355	16	129

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	640	882	9	86	703	466	36
Volume Left	26	0	9	0	0	128	0
Volume Right	0	268	0	0	660	330	33
cSH	826	1700	445	1700	1700	229	452
Volume to Capacity	0.03	0.52	0.02	0.05	0.41	2.04	0.08
Queue Length (ft)	2	0	1	0	0	867	6
Control Delay (s)	0.8	0.0	13.3	0.0	0.0	516.0	13.6
Lane LOS	A		B			F	B
Approach Delay (s)	0.4		0.1			516.0	13.6
Approach LOS						F	B

Movement	SBR
Lane Configurations	
Sign Control	
Grade	
Volume (veh/h)	30
Peak Hour Factor	0.92
Hourly flow rate (veh/h)	33
Pedestrians	
Lane Width (ft)	
Walking Speed (ft/s)	
Percent Blockage	
Right turn flare (veh)	
Median type	
Median storage veh)	
vC, conflicting volume	395
vC1, stage 1 conf vol	
vC2, stage 2 conf vol	
tC, single (s)	6.9
tC, 2 stage (s)	
tF (s)	3.3
p0 queue free %	95
cM capacity (veh/h)	605

Direction, Lane #	

APPENDIX C: AREA HISTORIC RESOURCES

This appendix includes descriptions of properties listed in the State and National Registers of Historic Places and properties included in the *Inventory of Historic and Archaeological Assets of the Commonwealth* within a half-mile radius of the Arboretum. These descriptions correspond to Table 7-1 and Figure 7-1 in the main body of the Institutional Master Plan for the Arnold Arboretum. The following descriptions are based upon information included in National Register nominations and Massachusetts Historical Commission Inventory forms.

Properties Listed in the State and National Registers of Historic Places

A. Arnold Arboretum

The Arnold Arboretum of Harvard University (Arboretum) is America's pre-eminent institution for research in woody plants. Established by Harvard in 1872, the Arboretum is listed in the State and National Registers of Historic Places and is a National Historic Landmark. The design of the Arboretum is a result of the collaboration of landscape architect Frederick Law Olmsted and the first Arboretum director, Charles Sprague Sargent, and was constructed in partnership with the City of Boston. Today, the Arboretum preserves one of Olmsted's most significant landscapes. Below is a brief summary of the Arboretum; additional historical detail on the Arboretum was provided within the CRMP submitted to the Boston Landmarks Commission.

The CRMP identified the character-defining features within the Arboretum. Character-defining features consist of "all features that contribute to the landscape's historic character" (National Park Service Preservation Brief 36:6). For the purposes of the CRMP, character-defining features are all historically significant features over 50 years of age and any individual features identified in the Arnold Arboretum National Register Nomination. All character-defining features are included in Table C-1.

James Arnold, a successful and public-minded merchant from New Bedford who died in 1868, bequeathed a portion of his estate to Harvard for the promotion of either agriculture or horticulture purposes. As specified in the 1872 deed of trust between the trustees of James Arnold's estate and Harvard, income from Arnold's legacy was to be used for establishing, developing, and maintaining an arboretum to be known as the Arnold Arboretum, which: "*shall contain, as far as is practicable, all the trees, shrubs, and herbaceous plants, either indigenous or exotic, which can be raised in the open air at... [then-called] West Roxbury.*" The arboretum was to be created on land bequeathed to Harvard by Benjamin Bussey (1757 – 1842), a prosperous Boston merchant who had bequeathed his Jamaica Plain estate and a part of his fortune to Harvard for "instruction in agriculture, horticulture, and related subjects."

Table C-1: Character-defining Features Within the Arnold Arboretum

Resource	Location
Collections	
Accessioned Collections	Throughout grounds
Herbarium	Hunnewell Building
Library and Archives	Hunnewell Building
Roadways	
Meadow Road	Arborway Gate to Forest Hills Road
Forest Hills Road	Meadow Road to Forest Hills Gate
Bussey Hill Road	Forest Hills Road to Bussey Hill
Valley Road	Center Street Gate to South Street Gate
Hemlock Hill Road	Valley Road to Walter Street Gate
Peters Hill Road	Peters Hill Gate to Poplar Gate
Pathways	
Willow Path	Arborway Gate to Meadow Road
Linden Path	Meadow Road to Dana Greenhouse
Catalpa Path	Bussey Hill Road to Woodland Hill Path
Chinese Path	Southeast side of Bussey Hill
Azalea Path	Southeast side of Bussey Hill
Oak Path	Bussey Hill Road to Beech Path
Beech Path	Beech Path Gate to Valley Road
Hickory Path	Centre Street Gate to Hemlock Hill Road
Conifer Path	Valley Road to Walter Street Gate
Rhododendron Path	Valley Road
Hemlock Hill Path	Hemlock Hill Road to Valley Road
Orchard Path	Mendum Street Gate to Peters Hill Road at Poplar Gate
Culverts, Outfalls and Crossings	
Goldsmith Book Culvert	Meadow Road at Arborway Gate
Bussey Brook Culvert #1	Walter Street near Walter Street Gate
Bussey Brook Culvert #2	Hemlock Hill near Valley Road
Bussey Brook Culvert #3	South Street near South Street Gate
Rockery Spring	Valley Road
Bussey Brook Crossing #1	Conifer Path near Walter Street Gate
Bussey Brook Crossing #2	Hickory Path near Hemlock Hill Road
Perimeter/Boundary Walls [check w/ Taya whether perimeter & boundary are the same]	
Arborway Wall	Murray Circle to Forest Hills Road
South Street Wall	West side of South Street
Bussey Brook Meadow Wall	East side of South Street
Peters Hill Walls	Walter (east side), Bussey (south side), South (west side), and Mendum Streets
Bussey Street Wall	North side of Bussey Street
Walter Street Wall	Bussey Street to Centre Street
Centre Street Wall	East side of Centre Street
Weld Hill Walls	West side of Walter Street; north side of Weld Street

Table C-2: Character-defining Features Within the Arnold Arboretum (continued)

Gates	
Arborway Gate	Arborway at Meadow Road
Forest Hills Gate	Arborway at Forest Hills Road
Beech Path Gate	South Street at Beech Path
South Street Gate	South Street at Valley Road
Poplar Gate	South Street at Peters Hill Road
Bussey Street Gate	West end of Bussey Street at Hemlock Hill Road
Peters Hill Gate	West end of Bussey Street at Peters Hill Road
Walter Street Gate	Walter Street near Bussey Street intersection
Mendum Street Gate	Mendum Street at Peters Hill Road
Centre Street Gate	Centre Street at Valley Road
Furnishings	
Benches	Throughout Arboretum along roads
Soldiers Monument	Walter Street at Walter Street Burying Ground
Views	
Hunnewell Lawn View	Linden Path north to Hunnewell Building
The North Meadow View	Meadow Road south across Meadow
View Over The Ponds (Faxon, Rehder, Dawson)	Bussey Hill Road northeast over Ponds
Bussey Hill View	Bussey Hill Summit south to Blue Hills, west to City
Bussey Brook View	Bussey Brook near Hickory Path west along Brook
Hemlock Hill Woods View	Above Conifer Path southeast to Hemlock Hill
Peters Hill View	Peters Hill Summit south to Blue Hills, east to City, north to Arboretum
Oak Allee View	View west at Poplar Gate along Poplar Gate Drive
Natural Woods	
Hemlock Hill Woods	North side of Hemlock Hill
North Woods	North side of Bussey Hill Road
Central Woods	East side of Centre Street to Conifer Path
South Woods	South side of Bussey Street to Orchard Path
Peters Hill Woods	East side of Peters Hill
Water Features	
Goldsmith Brook	North of Hunnewell Building to Arborway
The Ponds	Intersection of Meadow, Bussey Hill and Forest Hills Roads
Bussey Brook	Walter Street Gate to Bussey Brook Meadow
Spring Brook	West of Valley Road to Bussey Brook
Structures	
Hunnewell Building	125 Arborway
163 Walter Street	163 Walter Street
1090 Centre Street	1090 Centre Street
Dana Greenhouse[1]	1050 Centre Street
Bonsai House[1]	Dana Greenhouse
Burial Grounds	
Walter Street Burying Ground[2]	Walter Street on Peters Hill
Archaeological Resources	
Not listed to preserve confidentiality of location	

1 Not a historic structure, but included here because it is described in the National Historic Register nomination form.

2 City-owned; grounds maintained by Arboretum.

The Arboretum's first director, Charles Sprague Sargent, believed that a private research institution could also serve as a public resource. In his Annual Report of the President and Fellows of Harvard College for the year ending August 31, 1873, he wrote that the Arboretum was:

> *intended to educate the public as well as the special students who resort to it. It was (to be) laid out as an open park with suitable walks and roadways. (It) could hardly fail to become a beautiful, wholesome and instructive resort, which (would become) more and more precious as populations accumulated about it.*

To this end Sargent pursued a partnership with the Boston Park Department, and in 1882, under a unique agreement with the City of Boston that combined the Arboretum's research mission with public access. Under the lease, Harvard, acting through the Arboretum, would conduct research, develop and curate the living collections, and maintain the buildings within the Arboretum, while the City would build and maintain the perimeter walls, gates, and roadway system, provide security, and otherwise facilitate public use of the grounds. Implicit in this agreement, the Arboretum would support the City's desire to provide and manage public access to the grounds; in turn, the City would support the Arboretum's mission to conduct research using the collections.

In 1877 Sargent enlisted the skills of noted landscape architect Frederick Law Olmsted to develop plans for the arboretum. Working collaboratively, Olmsted and Sargent developed a concept plan for an arboretum accessible by carriageways and surrounded by walls and fences that would be constructed and maintained by the City as part of the lease agreement. Once the final agreement between the City and the University was reached in 1882, Sargent and Olmsted began working in earnest on a final plan (Hay 1995: 85).

Olmsted developed a series of landscape studies for a park circulation system to access as much of the grounds as possible while taking advantage of the existing topography. The system also allowed sufficient area to plant the collections following the then current evolutionary botanical sequence of plants (Hay 1995: 85). The layout of the circulation system and ground improvements also needed to respond to each plant group's habitat needs. For example, willows needed moisture-rich environments while oaks required well-drained soils. The circulation system also had to connect with the existing and proposed parkway system and, by agreement with the park commission, two areas of natural woodlands and open spaces, for public reservations, were required to remain (Hay 1995: 85).

As a result of these special design considerations for an arboretum, as opposed to a traditional public park, Olmsted devised a number of plant distribution studies that responded to these unique requirements. Following many iterations of the planting and circulation studies, Olmsted and Sargent finally devised a plan which included multiple

entrances and exits, a planting area that appeared at the time sufficient to accommodate all the plants that would be grown in the collections, and attractive roadways and landscape features to provide access through the collections as well as and to the summit of Bussey Hill.

This final arrangement of plants, laid out nearly as the systematic design was envisioned, met Sargent's goal for the Arboretum. Sargent, in a letter to the Board of Park Commissioners in 1880, described the vision for the Arboretum grounds as follows:

> *...each species, represented, if possible, by a half dozen specimens, will be planted in immediate connection with its varieties, making with its allies, native and foreign, loose generic groups in which each individual will find sufficient space for full development, and through which the visitor can freely pass. Each of these groups will rest on the main avenue so that a visitor driving through the Arboretum will be able to obtain a general idea of the arborescent vegetation of the north temperate zone without even leaving his carriage. It is hoped that such an arrangement...will facilitate the comprehensive study of the collections, both in their scientific and picturesque aspects.*

Intended as an educational landscape with aesthetically pleasing park-like features, the Arboretum continues to serve the original design intent of Sargent and Olmsted. As with any landscape, and especially working landscapes, the overall appearance of the Arboretum is constantly changing. Consistent with Sargent and Olmsted's intentions, however, the Arboretum and the City have maintained, as much as possible, the significant character-defining features of the landscape including the circulation and drainage systems, perimeter walls and gates, furnishings, views and the collections, natural woods and water features, structures, and the burial ground and archaeological resources. The setting and mission of this National Historic Landmark landscape has been preserved by the University and City.

B. The Arborway

Designed as part of the Olmsted Park System, the Arborway runs alongside the Arboretum. The roadway links Jamaica Pond with Franklin Park and is lined with large shade trees. Laid out by Frederick Law Olmsted, the Arborway is one of several parkways within Olmsted's Park System. The Arborway has been altered in some locations, but retains much of its original parkway qualities.

C. Adams Nervine Asylum (990-1020 Centre Street)

The Adams Nervine Asylum is Boston's only remaining rural estate that consists of outstanding later Victorian wood frame structures in their original setting. The property is located on the highlands at the edge of the former Bussey Estate, now the Arboretum. Originally constructed for J. Gardiner Weld, the estate was converted in 1877 to an asylum

for the treatment of indigent, debilitated, nervous people and inhabitants of the State who were not insane. The Asylum was operated in the village plan which incorporated small residences with central dining, recreation, and vocational buildings. This system encouraged patient individuality and freedom of movement. The Asylum grounds included the Mansion, carriage house, Adams House, and Director's House. In 1983, the complex was converted into the Adams Arboretum Condominiums in 1983.

D. Jamaica Pond

Jamaica Pond is an element within the Olmsted Park System in the City of Boston. Jamaica Pond is the only fresh water body of any size in the City of Boston. Designed by Frederick Law Olmsted, the Pond is one of the important features of the entire Park System and occupies a major portion of the park. The pond is bordered with trees and pathways and is accessible by the JamaicaWay. The pond is still used for its original purpose of boating and fishing.

E. Monument Square Historic District (Jamaicaway, Pond, Centre and Eliot Streets)

Monument Square is a 43 acre area consisting primarily of residences built between 1860 and 1910. A few properties within the area date back to 1755. The area is characterized by predominately suburban development in the Federal, Greek Revival, Italianate, Colonial Revival and Bungalow styles. The district contains several carriage houses, churches and a few commercial structures. The area is a well preserved residential district which illustrates community planning and development through the transformation of the 17th and 18th century village to an area of estates and well-to-do suburban development in the City of Boston.

F. Sumner Hill Historic District (Seaverns and Carolina Avenues, Centre and South Streets, and the Southwest Corridor)

This well-preserved, wood frame, residential area developed in the latter half of the 19th century. The majority of the properties within the district are residential dwelling, however several distinguished brick and stone public buildings are also located with the area. The majority of the buildings within the district are designed in the Italianate, Second Empire, Victorian Gothic, Stick, Queen Anne, Shingle and Colonial Revival styles. The area maintains is architectural quality and has suffered few losses or major alterations.

G. Loring-Greenough House (12 South Street)

Constructed in 1760, the Loring-Greenough House is a Georgian style, center plan house with a symmetrical five-bay facade. The handsome central entrance is flanked by Corinthian pilasters. The hip roof is set above the modillion block cornice. The House is

significant as the last well-preserved example of 18th century country estates in Jamaica Plain. The house was originally built for Commodore Joshua Loring who fled the country in 1775. The house was then occupied by several generations of the Greenough family until 1924 when it was purchased by the Jamaica Plain Tuesday Club. The house is listed on the State and National Registers and is a Massachusetts Landmark under a preservation restriction until 2007.

H. Woodbourne Historic District (Walk Hill Street, Goodway and Wachusett Street)

The Woodbourne Historic District is a nearly intact example of the development of middle-class housing in New England in the first decades of the 20th century. The overall design of the District consists of single and multi-family houses with uniform setbacks and design. The majority of the houses are Queen Anne, Shingle, Craftsman, Arts & Crafts, Colonial Revival and Dutch Colonial styles. The area grew as a streetcar suburb and contains houses designed by local architects Woodbury & Stuart, Frederick Gowing, Mulhall & Holmes, and Murdock Boyle. The area also contains an unusual garden city model houses development by the Boston Dwelling House Company designed by Kilham & Hopkins.

I. Roslindale Congregational Church (25 Cummins Highway)

The Roslindale Congregational Church is a shingle style church constructed in 1893. The design of the church, by James Murray, was influenced by the Richardsonian Romanesque style. The church is a rare example of its type in Boston, and its monumental scale and prominent location in Roslindale Village make it a major landmark in the community. The founding of the congregation also illustrates the migration patterns of Boston's population at the turn of the century.

J. Roslindale Baptist Church (52 Cummins Highway)

Designed by the prominent architectural firm of Silloway and McKay in 1889, the Roslindale Baptist Church is the oldest Baptist church is Roslindale. The wooden, ecclesiastical building was designed in the Stick Style. A Georgian Revival style addition was added later. The church walls exhibit clapboards with overlaid horizontal and vertical boards. Scallop shaped wood shingles enliven the wall surfaces. The pointed arches of the Church windows and moldings are representative of the Stick style's evolution from the Carpenter Gothic style popular at mid-century.

K. Veterans of Foreign Wars (VFW) Parkway

Constructed between 1931 and 1942, the parkway consists of a two and one-half mile, four lane-lane divided roadway. The parkway begins just west of the Arboretum at Centre Street and travels to Spring Street. The roadway is separated by a planted median with edges

trimmed with granite curbing. Mature oak trees are located along both sides of the roadways and within the median. The parkway is a relatively unaltered example of a connecting boulevard designed for the Metropolitan Parks Commission. The Parkway is listed in the National Register of Historic Places as part of the MDC Parkways Thematic Nomination.

L. Brandegee Estate Stables (165-165A Allandale Street)

The Brandegee Estate Stables consists of one clapboard and one brick stable building. The clapboard building is a large frame seven by five bay building on a raised stone basement. The two-story building has a hip roof, and the façade features pilasters and an arcade defining the bays. The brick stable also has a hip roof and is five by three bays wide. Openings in the building are arched and large doors are located in the end bays. Keystones, quoins and stringcourses embellish the facades. The stables are the only portion of the larger Brandegee Estate located in Boston. The remainder of the estate is in the Town of Brookline.

M. District 13 Police Station and Municipal Court (28 Seaverns Avenue)

Designed by the architect George E. Clough, the District 13 Police Station was constructed in 1874. The Municipal Court Building was added to the Station in the ealry1890's and was designed by E.M. Wheelwright. The High Victorian Police Station and Restrained Georgian Revival Style Courthouse are a rare example of their type in Jamaica Plain. The Police Station exhibits a polychromatic surface of brick, limestone and brownstone. The Municipal Courthouse is characterized by planar surfaces and deeply recessed openings.

N. Forest Hills Cemetery (95 Forest Hills Avenue)

Laid out in 1848 by Alexander Dearborn, the Forest Hills Cemetery consists of an approximately 250 acre cemetery. Designed in the rural garden style popular in the mid-twentieth century, the Forest Hills Cemetery contains curving roads, terraced overlooks, and ornamental features. Thousands of diverse tree species are located within the grounds creating an attractive setting for artfully designed monuments and headstones. Notable burials in the Cemetery include the poet e.e. cummings, abolitionist William Lloyd Garrison, and philanthropist Andrew Carney.

Properties Included in the Inventory of Historic and Archaeological Assets of the Commonwealth

1. Isabella M. Carter House (61 Arborway)

The Isabella M. Carter House is a Tudor Revival style, two and one-half story residential building in the Jamaica Plain neighborhood of Boston. The unusual house, constructed in 1898, is a visual landmark on the Arborway with its brick and stone details and half-timber appearance. The house is located on a large lot and is accentuated with a three-story central tower and large one-story porch.

2. Mary A. Cronin Double House (278 Arborway)

Designed by architect Francis D. Bulman in 1913, the Mary A. Cronin Double House is a three by three bay, stucco covered masonry two-family house with a hipped Mansard roof. The Colonial Revival style building contains projecting Tuscan columned porches. This is one of the few masonry houses on the south side of the Arborway in Jamaica Plain.

3. William G. Gilmore House (356 Arborway)

Constructed in 1897, the William G. Gilmore House is a Colonial Revival style, two-story house with an expansive one-story porch. Situated on a ridge overlooking the Arborway and the Arnold Arboretum, the house was designed as part of the Hampstead Road – Arborway development at the turn of the century.

4. Thomas Downey House (362 Arborway)

The Thomas Downey House was constructed in 1899 and designed by the architect James Murray. The large, Queen Anne Revival style house exhibits may Shingle and Colonial Revival style elements. A large veranda with Tuscan columns and puddingstone plinths create an imposing view from the Arborway. The house is located opposite the main entryway to the Arnold Arboretum and was part of the Arboretum Land Company housing development.

5. West Roxbury District Courthouse (445 Arborway)

The two-story Classical Revival style building consists of a 5-bay main block spanned by large Corinthian columns carrying a full entablature. The City of Boston insignia is located at the center. Designed by the architectural firm of O'Connell and Shaw, the Court House was constructed in 1922. This Court House replaced an older courthouse structure in Jamaica Plain and was one of six courthouses constructed in the City at the time.

6. Swedish Congregational Church (455 Arborway)

The two and one-half story church building was constructed in 1935 under the direction of the architectural firm of Allen, Collens and Willis. The church contains a tower over the nave and a lateral wing. Compound brick buttresses are located on the main façade flanking a circular window over triparte windows and a double door entry. Built for the Swedish Congregational Church, the building is one of very few examples of Moderne institutional architecture in the neighborhood.

7. Bussey Institute – State Biological Laboratory

The complex occupies the eastern slope of Bussey Hill overlooking the Arboretum. The facility is dominated by the MacCready Building, a modern metabolic disorders laboratory. Built in 1969-74, the eight-story reinforced concrete building is clearly visible from the Jamaicaway. The Institute also includes two historic buildings, the Biological Laboratory and the Farm Building dating from 1904 with additions. The Institute is significant for its pioneering role in the identification and prevention of infectious diseases.

8. Stephen Minot Weld House (800 Centre Street)

This two-story, Greek/Gothic Revival style house was constructed by 1847. The front façade has three bays with six over six windows with hood molds and a center door. The house is architecturally notable as a Gothic Revival structure located among more recent residential properties. The surrounding four to five acres of land was once associated with this property.

9. Samuel J. McDougall Three Decker (801 Centre and 6 Holbrook Streets)

Designed by the architect C.A. Russell, the Samuel J. McDougal Three Decker is a Queen Anne/Shingle style multi-family house with a complex cross, gable roof. Located at the street edge, the house is richly detailed with a multiple gable roof, porches, large entrance doors and a third floor overhang. The house is an architecturally distinguished example of Queen Anne style three deckers in the City of Boston.

10. Emil F. Nolte House (803 Centre Street)

The Emil F. Notle House, constructed in 1874, is a small two by two bay Mansard style single family house. The house is detailed with a heavy bracketed cornice and has a decorative hood over the front door. The house is notable for its modestly scaled size in a neighborhood dominated by ca. 1890 multi-family dwellings.

11. William Lovering House (812-814 Centre Street)

This Federal period house is one of the few remaining houses dating to the early 19th century in Jamaica Plain. This residence remains largely intact, but has been sided with asbestos shingle. The house has a hipped roof and two large interior chimneys. The house was recommended for further study by the Boston Landmarks Commission.

12. Charles H. Smith House and Carriage House (960 Centre Street)

The Charles H. Smith House and Carriage House was constructed by 1867. The Mansard roof house is one and one-half story with a central door flanked by pairs of windows. The Queen Anne style Carriage House has clapboard lower walls and multi-pattern shingles and a half-timber effect in the Gable. This is an architecturally notable complex of buildings.

13. John J. Dixwell House (991 Centre Street)

Constructed by 1832, the John J. Dixwell House is a two-story wood frame Federal style house with a five bay front façade and a hip roof. This house is a rare surviving Federal period dwelling that remains largely intact. This house was recommended for listing on the National Register by the Boston Landmarks Commission.

14. John J. Dixwell House (1011 Centre Street)

The two-story Federal period John J. Dixwell House is a five by two bay residential structure with a hip roof. The house has been aluminum sided and the small central portico with square posts has been altered. Two large chimneys are located on the rear wall of the residence. The house was recommended for listing on the National Register of Historic Places by the Boston Landmarks Commission as a rare surviving example of its type and period.

15. A.J. Cross House and Stable (1051 Centre Street)

Constructed by 1896, this Bunglow style house exhibits many Queen Anne style elements. The house stands two and one-half stories with an inset one-story porch. The house is architecturally notable as a rare example of its type in the predominately contemporary suburban neighborhood.

16. A. Seaverns House (22 Orchard Street)

This large, two and one-half story Mansard house was constructed by 1874. The large residential dwelling has an ell-shaped plan with a main block of two-by-two bays and

additions on the rear and side elevations. The front façade is composed of a bracketed octagonal bay window and double door. The house was recommended for listing on the National Register of Historic Places by the Boston Landmarks Commission.

17. Dr. Benjamin Wing House (45 Orchard Street)

The Mansard roof Benjamin Wing House consists of a three by two bay residential dwelling. The two-story house features a central portico with octagonal columns and heavy brackets. Several additions extend off the rear of the house. The house was recommended for listing on the National Register of Historic Places by the Boston Landmarks Commission.

18. Dr. Benjamin Wing House (57 Orchard Street)

This Italianate style, two-story residential structure is a three bay, side gable house. The central bay contains a double door entry and stick style porch. The cornice is supported by decorative brackets and pilasters are located at the corners of the building. The house is an architecturally notable, intact Italianate style house that was recommended for listing on the National Register of Historic Places by the Boston Landmarks Commission.

19. Elizabeth G. Rice Stable (37 Pond Circle/21 Billings Lane)

This Classical Revival style former stable building was designed by the architectural firm of Peabody and Stearns. Constructed on a high stone foundation, the prominent pedimented roof is set above a two-story main elevation. Built in 1901, the former stable has been converted to a residential dwelling. This structure is the only surviving property from the Elizabeth G. Rice Estate of ca. 1900. This property was recommended for further study by the Boston Landmarks Commission.

20. Frances Tomasello House (230 Pond Street)

The Frances Tomasello House was designed by Salvatore Sorgi in 1925. the house is a large Mediterranean style, two-story house. The stucco walls are accentuated by the red tile hip roof and pyramidal tower at the east end. This house is a notable example of the Mediterranean style dwelling in Jamaica Plain.

21. Stephen Heath House (242 Pond Street)

Constructed between 1849 and 1859, the Stephen Heath House is an Italianate, two and one-half story residence. The gable end walls feature octagonal bay windows on the first story. The side porch is embellished with square posts with simple capitals. This house is a good example of Italianate architecture in Jamaica Plain.

22. Ebenezer Murray House (258 Pond Street/85 May Street)

This Italianate, two-story residence was constructed between 1848 and 1859. The T-shaped house has a hip roof and a octagonal bay windows. The attic story includes arched windows located on the southeast and northeast elevations. This building is architecturally notable within a area of predominately 1920-1960's housing.

23. Benjamin May House (63 May Street)

Constructed by 1849, the Benjamin May House is a two-story wood frame residential building designed in the Italianate style. The three bay front façade contains a central entrance defined by a fan light and leaded glass sidelights. Noteworthy for its associations with the May Family, the house was recommended for listing on the National Register of Historic Places by the Boston Landmarks Commission.

24. Benjamin R. Nichols House (180 Moss Hill Road)

This substantial Italianate style, two-story house contains a central block with two projecting wings. The wood frame wall surfaces are scored to resemble ashlar. The house is embellished with quoins and a one-story porch with wooden posts extends across the southeast and southwest sides. The house is a notable example of the large estates of well-to-do Bostonians in the 1850's. The house was recommended for listing on the National Register of Historic Places by the Boston Landmarks Commission.

25. Alfred Bowditch House (32 Woodland Street)

The Alfred Bowditch House was constructed by 1896 as a Shingle style, single family dwelling. The two and one-half story house features prominent roof gables and clapboard lower walls and shingled upper walls. A small porch is inset on eth rear of the ell-plan of the house. This is an outstanding representation of the Shingle style in Jamaica Plain and was recommended for listing on the National Register of Historic Places by the Boston Landmarks Commission.

26. Catherine Broderick – Adelbert Durkee House (48 Goldsmith Street)

Constructed in ca. 1830, the Catherine Broderick – Adelbert Durkee House appears to be a Federal period house updated with Italianate details. The two-story wood frame house is five bays wide and two bays deep. The house has a central door with a projecting bracketed hood, fluted pilasters and dentil moldings. Located in an area dominated by three deckers, the house appears to have been moved to this site sometime in the 1890's.

27. Joseph P. Cleve House (15 Custer Street)

Built by 1874, this Mansard style house has an ell-shaped plan and is two stories with an inset one-story porch with chamfered posts on wooden pedestals. The Joseph P. Cleve House is architecturally notable for its scale in a mostly modestly scaled, densely built single family house neighborhood in Jamaica Plain.

28. St. Thomas Aquinas Roman Catholic High School (13 St. Joseph Street)

The St. Thomas Aquinas Roman Catholic High School was constructed in 1927 in the Modern Gothic style. The red brick school building is two stories tall with stone trim and Gothic ornament. The building exhibits tracery effect spandrels and symmetrical façade. The façade is composed of five party, each with further vertical division. A central main entry is defined by a decorative monumental arch.

29. Martin Craffey House (34 Jamaica Street)

The Italianate style, two-story wood frame Martin Craffey House is a three-bay gable front house. The side entry is set beneath a bracketed hood. Representative of other Italianate houses along Jamaica Street, this was one of many houses constructed in the 1870's and 80's when Jamaica Street was opened to development.

30. John Patton House (53 Jamaica Street)

This small one and one-half story gable end cottage is part of an irregular grouping of workers cottages along Jamaica Street. Constructed between 1874 and 1884, the only ornament on the house is an bracketed door hood. This house is representative of several small workers cottages that were constructed along the circular path of Jamaica Street.

31. L.H. Ford House (9 Hampstead Road)

Designed by Samuel Rantin and Son, the L.H. Lord House is a compact Queen Anne style house with a richly detailed front porch. The two-story residential building has a round conically capped corner tower set beside the main hip roof house. Constructed in 1907, the house was built on land owned by the Arboretum Land Company.

32. Anton Koerner House (27 Hampstead Road)

This two-family, two-story house was designed in the Queen Anne/Colonial Revival styles. The front elevation exhibits a Tuscan columned porch and shallow two-story rounded bays.

The steeply pitched hip roof is interrupted by a projecting center gable. Constructed in 1907, the house is part of an eclectic collection of turn of the century houses.

33. John M. Costello House (36 Hampstead Road)

The John M. Costello House was constructed in 1908 by T.J. Lyons. The two-story, Queen Anne/Colonial Revival style house has a central projecting porch accentuated with Ionic columns. A single, wide, pedimented dormer projects from the center of the hip roof. The house is part of an eclectic collection of turn of the century houses.

34. William Winchester House (14 Seaverns Avenue)

The Greek Revival/Carpenter Gothic cottage exhibits a three-bay main façade with Doric columned porch. The porch supports an overhanging second floor gable. This house is one of several modestly scaled cottages constructed in the 1840's and 50's attributed to Benjamin Armstrong.

35. John E. and George H. Williams House (18 Seaverns Avenue)

Attributed to Benjamin Armstrong, this simple late Federal period Greek Revival style wood frame vernacular dwelling was constructed in 1845-46. The house exhibits a central hall plan with a rear wing. The five-bay main façade is detailed with narrow corner boards. Fascia boards run the length of the front and rear facades. The projecting enclosed trance is a later addition.

36. Benjamin Armstrong House (20 Seaverns House)

This two and one-half story Greek Revival style residential building was constructed in 1845-46. The four bay, gable end house has a large front porch which is likely a later replacement. Simple corner boards define the edges of the building. This house is one of the earliest properties constructed on the Seaverns Avenue – Green Street development and attributed to Benjamin Armstrong, a local builder.

37. Benjamin Armstrong House (4 Maple Place)

Constructed in 1846-56 and attributed to Benjamin Armstrong, the one and one-half story cottage is located at the foot of the Maple Place cul-de-sac. Likely originally built as a Greek Revival style cottage the house has been altered with the addition of a porch and dormers. The decorative front porch features simple posts, curved bracing, Tuscan columns surmounted by a pediment.

38. JH Rowe Farm Worker's Double House (76-82 Child Street and 17-23 Lee Street)

The area is comprised of two groups of double frame rowhouses at the Lee Street and Childs Street corner. Characterized by unadorned clapboard and single covered walls, the buildings contain paired entrances, porches with turned posts and simply adorned windows and low hip roofs. Constructed between 1874 and 1890, these laborers houses are examples of the unique worker housing in Jamaica Plain during this period.

39. John A. McAlay Three Decker (16 Verona Street)

Designed and constructed in 1928 by the architectural firm of Winebaum and Wexler, the John A. McAlay Three Decker is a noteworthy example of three decker housing in Jamaica Plain. The three-story, Colonial Revival style three decker exhibits a robust three tier Doric columned front porch. Each of the three floors is divided by narrow horizontal wood banding and the windows are simply framed.

40. John Ryan House (85 McBride Street)

This two and one-half story dwelling consists of three dwelling units. Characterized by simple ornamentation and a gable roof, the house was constructed in 1866-74 and is an interesting example of this type of worker housing constructed in Jamaica Plain at mid-century.

41. Thomas Lally Double House (101-103 McBride Street)

This simple, two story gable roof two-family house was constructed ca. 1864. The four bay main façade features two entranced with bracketed door hoods. Originally the home of a local gardener, Thomas Lally, the house is a typical example of double houses along McBride Street in Jamaica Plain.

42. Benjamin J. French House (19 Rosemary Street)

Designed by Benjamin French, this two and one-half story, Queen Anne style house is a gable front house. The house features a projecting entrance porch and two-story octagonal bay. An A-shaped gable with deep cornice is accentuated with scrolled brackets. This well-preserved, 1901, two-family house was built by and for Jamaica Plain carpenter/builder Benjamin J. French.

43. St. Thomas Aquinas Roman Catholic Church and Rectory (91 South Street)

Designed by architect Patrick C. Keeley for the Roman Catholic Archdiocese of Boston, the St. Thomas Aquinas Catholic Church is a red brick church building with a Basilican plan constructed in 1873. The steeply pitched gable roof has shallower pitched sections over the side aisles. Clerestory windows and front corner towers crowned by copper pinnacles accentuate the building. The school, convent and rectory were constructed in the same year.

44. Orchard Hill Road Area (24-74 and 29-75 Orchard Hill Road)

This area consists of a collection of 19th and early 20th century houses developed in three distinct phases. Number 40 is an example of the earliest phase of development when the roadway was only a driveway extending up the hill. This Greek Revival style house is a remnant of this earliest phase. By 1874, the St. Andrew Ukranian Orthodox Church was located on the road. By 1890, the second phase of development involved the sub-division of a large parcel of land. Several Queen Anne and Colonial Revival style houses were constructed during this period. The third phase of development occurred when the roadway was extended bringing the construction of multiple Colonial Revival style houses. Many of the houses constructed during this period were designed by local architect Harold Duffie. This area is recommended for listing on the National Register of Historic Places by the Boston Landmarks Commission.

45. Yale Terrace Area (16-18 to 60, 21-45 Yale Terrace)

Yale Terrace was constructed between 1858-1874 and is an architecturally significant grouping of residential buildings. The houses on this street include several Second Empire and Italianate style residences. A two and one-half story double house overlooks Morton Street, while a two-story Second Empire style barn is located at Number 39. The development may have had some association with the nearby Forest Hill Cemetery. The area was recommended for listing on the National Register of Historic Places and as an Architectural Conservation District by the Boston Landmarks Commission.

46. Tower Street Area (10-86 and 11-87 Tower Street)

The Tower Street area is located at the foot of Orchard Hill and dead ends at the grounds of the Forest Hill Cemetery. The Tower Street area is part of the most densely developed portions of Forest Hills. The local contracting firm of Thomas Minton is attributed to many of the properties in this area. The majority of houses constructed on this street were developed between 1900 and 1905. The houses consist of two and one-half story, two-family houses with pedimented gables and two-tier porches; three and one-half story, three-

family houses with pedimented gables and three-tier porches; and three story three deckers with flat roofs.

47. Woodlawn Street Area (6-80 and 7-83 Woodlawn Street)

The Woodlawn Street area is located at the foot of Orchard Hill and dead ends at the grounds of the Forest Hill Cemetery. The Tower Street area is part of the most densely developed portions of Forest Hills. The local contracting firm of Thomas Minton is attributed to many of the properties in this area. The majority of houses constructed on this street were developed between 1900 and 1910. The houses consist of three deckers with flat or pedimented roofs. Local architects James Murray and James Hutchinson designed several properties on the street. The three-bay, center entry, single family Second Empire style house is an anomaly on the street. Many of the houses on the street have been altered with the addition of siding and porch removal.

48. Weld Hill Street Area (6-76 and 7-75 Weld Hill Street)

The Weld Hill Street area is located at the foot of Orchard Hill and dead ends at the grounds of the Forest Hill Cemetery. The Tower Street area is part of the most densely developed portions of Forest Hills. The local contracting firm of Thomas Minton is attributed to many of the properties in this area. The majority of houses constructed on this street were developed between 1890 and 1910. The majority of the houses are multi-family properties including three deckers and gabled two-family houses.

49. Charles Emmel Two Family Area (45-47 Wenham Street and 5-7 Craft Street)

These four houses were constructed in 1896-1899. These four houses were designed in the Colonial Revival style and are noteworthy for their ornamental detail. 45 and 47 Wenham Street are semi-detached, two-family houses with a parapet brick party wall. Directly behind are the two houses at 5 and 7 Craft Street. The facades of the buildings contain bracketed overhanging eaves with paneled soffits with cornices with egg and dart moldings.

50. St. Andrew the Apostle Roman Catholic Complex (Walk Hill and Wachusett Streets)

The St. Andrew the Apostle Roman Catholic Complex includes the Church, Rectory, Convent, School and Parish Hall. The complex of building is consistent with the size, scale, materials and landscaping of the surrounding residential neighborhood. Most of the buildings have low-slung profiles that take advantage of the sloping terrain. The complex is understated in scale and appearance and are constructed in the English Revival style, Second Empire, Greek Revival, and Colonial Revival styles.

51. Engine House (16-18 Walk Hill Street)

This two-story, brick building was constructed in 1909. Little is known about the Engine House which was converted into apartments in 1964. The Arts & Crafts building may have been designed by the architects Mollard and Booth. The building exhibits overhanging eaves and triangular knee braces, buttresses and decorative brickwork.

52. Thomas Minton Building (2-16 Hyde Park Avenue)

The three-story commercial and residential block is thirteen by four bays wide. The Thomas Minton Building was designed by architect G.A. Cahill in 1897. The building exhibits a prominent stone cornice with dentils and a wide frieze. Double height pilasters are set between recessed windows and an entablature reads "Minton Building 1897" on the main façade. Rear porches were added to the building in 1916 and were designed by James Hutchinson.

53. James Travers Double House (3841 Washington Street)

Located in an area of spotty and mixed commercial and residential development near the Forest Hills MBTA Station, the James Travers Double House is a two and one-half story double house. The double pile structure with interior brick chimneys has a four bay façade with two paired entrances recessed at the center of the building. This house, constructed by 1896, is a good example of 19th century double houses in Roslindale.

54. Puritan Ice Cream Company (3895 Washington Street)

This two-story, red brick industrial building was designed in 1918 by the architect John J. Smith. This three by five bay factory building has double height paneled brick piers topped with stone orbs. The building was once home to the Puritan Ice Cream Company which produced ice cream from this location during the first decades of the 20th century.

55. Bussey Bridge (South Street at Archdale over MBTA)

Constructed in 1887 to traverse the railroad tracks, the Bussey Bridge is stone arch bridge carrying the railroad tracks over South Street at Archdale Road. The Bridge is located in the landscaped setting of the Arnold Arboretum. Named after Benjamin Bussey, the Bridge bisected his property which had recently been willed to Harvard University. The Bridge is recommended for individual listing on the National Register and as a Local Landmark by the Boston Landmarks Commission.

56. Roslindale Village Area (Belgrade, Corinth, Cummins Highway, Poplar, South, Washington Streets)

The Roslindale Village Area is significant for its notable 19th century commercial structures. Located in Roslindale's institutional and commercial center, the Village was the transportation nexus between outlying suburbs and downtown Boston. The area includes The Roslindale Congregational Church, Boston Elevated Railway Substation, and several Classical Revival style commercial blocks. The Village was determined eligible for listing on the National Register of Historic Places by the Boston Landmarks Commission and the Massachusetts Historical Commission.

57. Roslindale High School (120 Poplar Street)

The Classical Revival style Roslindale High School was constructed in 1926. Designed by C. Howard Walker & Son, the three-story building has two protecting two-story wings. The red brick school building is detailed with brick pilasters with stone capitals. The frontispiece includes stone Corinthian columns and pilasters with a full entablature. The City insignia is located on a stone panel over the doorway.

58. 644 South Street

This two-story Italianate house, from ca. 1865, has a hipped roof with a center gable. This well-preserved example of Civil War era construction is distinguished from all surrounding structures of the same style, materials and period. The house may have been part of the original Bussey Estate, much of which is now the Arnold Arboretum. The house may have been constructed by a Bussey heir prior to the transfer of ownership to Harvard University. The house may be eligible for listing in the National Register of Historic Places.

59. Boston Edison Substation (669 South Street)

Designed by Bigelow & Wadsworth, the Boston Edison Substation was constructed in 1911 for the Boston Electric Illuminating Company. The Neo-Classical substation has a one-story raised basement with a five bay façade with three keyed and arched window openings flanked by rectangular openings. The substation is an important example of the industrial building in Roslindale and is the first substation in the Nation to be fully operated by women during World War I.

60. Charles W. Whittemore House (11 Bexley Road)

This two and one-half-story Greek Revival style house has a pedimented gable façade with a wide frieze, dentiled cornice and wood corner quoins. The three-bay façade with a side hall plan has long windows and a projecting porch. Constructed by 1873, the house is a

well-preserved example of its type. The house is significant as a remnant of Roslindale's pre-annexation residential development.

61. Charles Sumner Elementary School (15 Basile Street)

Constructed ca. 1933, the Charles Sumner School is a two-story Georgian Revival style, U-shaped building with a forecourt fronting Basile Street. The building has corner quoins and is constructed in red brick. In 1937, architect Thomas F. McDonough designed six additional classrooms and a storeroom which were added to the building. The school is significant as a public school in Roslindale Village.

62. John Basile House (38 Basile Street)

Constructed in 1935, the John Basile House is two and one-half stories and is set on a stone foundation. The ashlar stone single-family house is unique in a neighborhood of predominately two-family houses. A local contractor, John Basile designed and built this house for himself. A 1947 stucco garage was added to the property in 1947.

63. Samuel F. Dearborne House (47 Florence Street)

This two and one-half story, Italianate house has a three-bay façade and an interior brick chimney. Constructed in the second half of the 19th century, the house has bracketed eaves and a center entry beneath a wide bracketed porch with bracketed posts and plain balusters. Dearborn was a local apothecary in Roslindale.

64. William Macomber House (8 Florence Street)

This eclectic Colonial Revival style house has many Craftsman style influences. Constructed by 1905, the William Macomber House is two and one-half stories and three by two bays wide. The overhanging eaves have triangular knee braces and the center entry is flanked by bay windows with bracketed cornices and paneled aprons. A garage, constructed in 1937, was added to the property and constructed in a similar style as the house.

65. Ann Mahoney House (2-4 Florence Street)

Designed by James G. Hutchinson in 1902, the Ann Mahoney House is a two and one-half story Colonial Revival style house with a three bay façade. A slightly projecting gabled center pavilion contains a Palladian window on the second floor. Porches are located on three sides of the house. The house is considered one of the best preserved high style Colonial Revival houses in Roslindale.

66. Elias Bowthorpe House (43 Prospect Street)

Constructed by 1874, the Elias Bowthorpe House is a one and one-half story Second Empire style cottage. The small cottage has bracketed bay windows with dentiled cornices. This cottage is considered an excellent example of its type and is representative of the first phase of residential development that had begun outside of Roslindale Village before the annexation to Boston.

67. James Ryan House (37 Fairview Street)

This two and one-half story, Queen Anne style house displays the influence of the Shingle and Colonial Revival styles. The house, constructed in 1898 and designed by James Murray, has a projecting pedimented porch and a center entry. Two-story bay windows are located beneath the cross gables on the north and south sides. The house is considered a good example of the integration of late 19th century details into a single building. This was one of several properties constructed on the former Skinner Estate that was subdivided in the early 1880's.

68. HJ Lang House (31 Fairview Street)

The HJ Lang house was designed by George Dame in 1906. The two and one-half story vernacular Colonial Revival style house has a two-bay asymmetrical façade. A prominent cross gable with returns is located within the roof. The size and scale of this house is typical of others of this period on Fairview Street. This was one of several properties constructed on the former Skinner Estate that was subdivided in the early 1880's.

69. Ashfield Street Area (9-43 and 10-38 Ashfield Street)

Ashfield Street was developed in the 1890's following the subdivision of the former Skinner Estate. Most houses on Ashfield Street are vernacular interpretations of the Queen Anne and Colonial Revival styles. The earliest development occurred mid-block, but by the late 1890's the south and north sides have been developed. The majority of the houses are wood shingled with gable, cross gable and hip roofs. Some houses have been sided in asbestos and aluminum siding.

70. Symmes Street Area (9-49 and 10-50 Symmes Street)

Symmes Street was developed in the 1890's following the subdivision of the former Skinner Estate. Most houses on Symmes Street are vernacular interpretations of the Queen Anne and Colonial Revival styles. Most of the houses on Symmes Street are two-family dwellings. The majority of the houses are wood shingled with gable, cross gable and hip roofs and are

two and one-half stories high. Some houses have been sided in asbestos and aluminum siding.

71. Centre-South Street Area (814-870 and 825-871 South Street)

Located near Roslindale Village, this section of South Street was not developed until the early 20th century when the former Skinner Estate was subdivided for development. The area is predominately one and two-family houses. Some institutional structures are also located within the area. Most properties are constructed in the Colonial Revival, early 20th century vernacular and late Gothic Revival styles.

72. Longfellow Elementary School (885 South Street)

Designed by the architectural firm of Walker & Kimball, the Longfellow Elementary School was constructed in 1897 with an addition added in 1914. The three-story Classical revival style school has two main blocks with hipped roofs. Cast stone string courses, brick pilasters, and elaborate brick and stone gabled dormers make this a distinguished school building. The school was recommended for individual listing on the National Register of Historic Places by the Boston Landmarks Commission.

73. AM Celute House (903 South Street)

The AM Celute House was constructed in 1899 by James Murray. This Gambrel roofed, Colonial revival style house has a three bay façade with an end bay entry. A shingle porch wraps around the northeast corner of the building. The house is a good example of the cross-Gambrel style in Roslindale.

74. CS Keith Row Houses (49, 51 and 53 Walter Street)

This block of three single family houses were constructed by ca. 1896. the two and one-half story Colonial Revival style houses share party walls and have tall brick chimneys protruding from the roofline. The hip roof with center cross gabled pavilion displays stucco and decorative half-timbering in the gable end. Overhanging eaves and paired oversized brackets accentuate the facades.

75. Fletcher Street Area (46-106 Fletcher Street)

The Fletcher Street area consists of a group of fifteen houses constructed between 1900 and 1915. The houses, constructed in the Colonial Revival and Craftsman style were built on the former Bradford Estate following its subdivision in 1892. Several of the two and two and one-half story houses were designed by local architect Harold Duffie.

76. MBTA Bus Shelter (Centre Street at VFW Parkway)

Constructed in 1938-1939, this brick and concrete bus shelter is located along Centre Street near the VFW Parkway. Set at the western edge of the Arnold Arboretum, this bus shelter has a high concrete basement where the ground slopes away at the rear. The standing seam metal roof is supported by three brick walls. The Neo-Classical style shelter has paneled corner posts at each edge of the opening and was built as a WPA project.

77. Theo and Eva Snow House (30 Farquar Street)

The two and one-half story, Queen Anne style Theo and Eva Snow House has a hipped roof with projecting pedimented cross gables. The three-bay façade on this 1894 house has an end-bay entry and projecting porch with turned posts, brackets and balusters. This is one of the best-detailed houses in this section of Roslindale. Farquhar Street was laid out after the sub-division of the Bradford Estate.

78. Stephen Allen Gardner's House (64 Allandale Street)

Constructed between 1858 and 1874, the Stephen Allen Gardner's House is a two and one-half story dwelling with a five bay façade with a broad gable. This vernacular Italianate house is a remnant of the 19th century estate construction in this area of the City. The location of this house, far from the large mansion of the Stephen Allen Estate, suggests it was a gardener's or other ancillary dwelling on the estate.