Draft Environmental Impact Statement

Paul Milstein Hall and Central Avenue Parking Garage Projects

Cornell University

City of Ithaca
Ithaca, New York

Submitted: July 25, 2008

Accepted for Public Review

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Draft

Environmental Impact Statement

Paul Milstein Hall and

Central Avenue Parking Garage Projects

Cornell University

City of Ithaca
Tompkins County
New York
Submitted: July 25, 2008

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Public Hearing Date: October 28, 2008, 7:30 p.m.

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Executive Summary

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Summary of Draft Environmental Impact Statement
Paul Milstein Hall and Central Avenue Parking Garage Projects
Cornell University
July 25, 2008

Executive Summary

This Draft Environmental Impact Statement (DEIS) was prepared pursuant to a positive declaration of potential environmental significance by the City of Ithaca Planning Board. It follows the Scope adopted thereafter. The applicable citations are Chapter 176 of the City of Ithaca Code, City Environmental Quality Review Ordinance (CEQR), Article 8 of the New York State Environmental Conservation Law, State Environmental Quality Review Act (SEQRA), and Part 617 of Title 6 of the New York State Code of Rules and Regulations.

Description of the Proposed Projects

Cornell and its College of Architecture, Art, and Planning (hereafter referred to as AAP) propose construction of Paul Milstein Hall (hereafter referred to as Milstein Hall), a 59,000 square-foot building that will physically connect Rand and Sibley halls while visually connecting the Foundry to the other AAP buildings. The design will create much-needed flexible contiguous studio space, a 275-seat auditorium, meeting and exhibition space, and a college forum—a signature gallery for collaboration and exhibition that showcases student and faculty work. Milstein Hall will promote and foster new and innovative ways of teaching within AAP. There will be no net increase in the number of students enrolled in the college.

An open outdoor space beneath the cantilevered portion of the building will allow a covered bus shelter and a generous bicycle parking area. Two service drives will be constructed, one from East Avenue to Lincoln Hall, and another from University Avenue to the north side of Sibley Hall.

The scope of work inside Rand and Sibley halls is limited to code-required sprinkler and fire alarm system upgrades. Rand Hall will also receive new ADA toilet rooms, a new ADA elevator and a new mechanical room serving Milstein Hall.

The site will be completely rehabilitated and landscaped, including new ADA compliant walkways. The proposed design for Milstein Hall will remove the on-site trailers and 45 existing parking spaces located to the north of Sibley Hall.

Cornell and its Department of Transportation propose construction of a new parking structure located on an existing surface parking lot north of Tjaden Hall and the west wing of Sibley Hall. The site is approximately 450 feet by 75 feet and adjacent to the Milstein Hall project. The Central Avenue Parking Garage (hereafter referred to as the CAPG) will provide 199 parking spaces in three levels of parking: one surface level and two underground levels. The below-grade levels will incorporate an interior ramp and merge area that will be accessed from Central Avenue. Vehicular access to and from the surface parking level will be from University Avenue.

Potential Significant Environmental Impacts

The Scope for the DEIS was adopted by the City of Ithaca Planning Board at its meeting held December 18, 2007. A copy of the Scope follows this section, as well as a chart that outlines where each item in the scope is located in the DEIS. Below is a summary of the areas of potentially significant adverse environmental impacts as identified in the Scope.

Impacts to Land

Approximately 13,000 cubic yards of pavement, fill, soil and rock will be removed for the construction of Milstein Hall. Approximately 25,000 cubic yards of such material will be removed for the construction of the CAPG. These are typical volumes for construction projects of this scale. Standard excavation methods will be utilized during construction, and foundations and structures for existing buildings will be protected by conventional methods. No negative impacts to the existing buildings adjacent to the project sites are anticipated as a result of excavation work. No environmental contamination of the underlying soils has been identified by the subsurface investigations.

The Fall Creek Gorge lies outside the project boundaries to the north. It is a steeply sloping, forested, rock-faced gorge with little to no underbrush. Existing areas of localized slope failure and erosion are evident, as a result of poor stormwater practices. Excavation, building foundations, and the final weight of the buildings for both projects will not impact the stability of the existing gorge slope. A positive impact of these projects is that the upgrades to the stormwater system will improve conditions at existing local slope failure locations.

Impacts to Stormwater

Stormwater from the project sites is collected by the existing stormwater systems currently flowing to three existing outfalls in Fall Creek. One of the outfalls is contributing to localized slope failures and erosion. In the developed condition, this outfall will be discontinued in order to improve gorge conditions.

The Milstein Hall project proposes just over half an acre of green roof for the new building, resulting in a significant reduction in impervious cover for the 3.5 acre site. When combined with the CAPG, the overall amount of impervious cover is expected to be reduced by approximately 4% below existing conditions. Proposed stormwater systems for both projects are in accordance with DEC regulations and procedures.

Impacts to Air

There will be no significant sources of air emissions within the proposed Milstein Hall building and the CAPG. No fume hoods or regulated HVAC emission sources are planned within either project. Neither project will have boilers, emergency diesel generators, or similar combustion devices.

Proper ventilation is included in the proposed design for the CAPG. As such, there are no negative impacts as a result of vehicular emissions from the parking garage on pedestrians or occupants of adjacent buildings.

The second story of Milstein Hall will slightly reduce air circulation underneath the cantilever. This will minimally increase traffic-generated air pollutant levels in the immediate area under the cantilever; however, air quality will easily meet applicable health standards under all traffic conditions. No negative impacts to air quality in the area as a result of the construction of the proposed Milstein Hall are anticipated.

Sibley and Rand halls are naturally ventilated. Nineteen windows in Sibley Hall and three windows in

Rand Hall will become interior windows as part of the Milstein Hall project. In order to accommodate Sibley's fresh air requirements on the second floor, an air handling unit will be installed. Rand Hall will continue to receive adequate fresh air without the need for mechanical air handling equipment.

Given the local wind climate and the limited height of the proposed Milstein Hall, wind conditions on and around the proposed development are expected to be similar to the existing conditions and are considered appropriate for the expected usage of the area. Studies of the wind conditions in the proposed outdoor spaces underneath the second floor of Milstein Hall have concluded that future wind conditions will be comfortable and adequate for the expected outdoor activities.

Impacts to Vegetation

The sites of Milstein Hall and the CAPG are within an existing highly-developed area. Therefore, there are no significant impacts to any plant or animal habitats or species. The Milstein Hall and CAPG project sites presently consist of less than one acre of tree and lawn plantings and 1.74 acres of paving. Construction of Milstein Hall and the CAPG will result in increased planted areas on site. Milstein Hall will add approximately half an acre of green roof to the area. Construction of the projects will require the removal of trees and vegetation, including seven mature trees (10" diameter at breast height or more). New landscape plantings will be installed on both sites. Left to mature over time, the new plantings will restore the site landscape.

Impacts to Aesthetic Resources

The visible components of the proposed projects will not eliminate or significantly reduce the enjoyment of the aesthetic qualities of Fall Creek or the Arts Quad.

Visual impacts will result from the change in appearance of the project site after development of Milstein Hall. There will be views through Milstein Hall to the side and back facades of Rand and Sibley halls. Milstein Hall will replace views of the parking lot and trailers, and will create pleasing new outdoor spaces. The low-profile building design of Milstein Hall utilizes high-quality, modern materials to differentiate the new architecture from the existing historic buildings.

Views of the CAPG project will remain essentially the same as the existing conditions. The existing surface parking lot will be replaced by the top level of the garage. The removal of the trailers on-site, enhanced landscaping and pedestrian access will improve visual appeal and enjoyment of the site. Views of the grassy slope on the east side of Central Avenue will be replaced with views of the garage entrance.

Impacts to Cultural Resources

Milstein Hall and the CAPG are situated north of the historic Cornell Arts Quad, and south of the Foundry, Fall Creek Gorge, and the Cornell Heights Historic District. Milstein Hall and the CAPG will be located in a culturally sensitive area of campus, but by respectfully locating them in secondary positions, adverse impacts on cultural resources are minimized.

A number of architecturally and/or historically significant resources are located adjacent to or within view of the project site. Milstein Hall has been designed specifically to preserve and be differentiated from the surrounding architecture. The design allows the site to continue to be used for the College of AAP's needs. It successfully addresses the Secretary of the Interior's Standards for Rehabilitation by protection of significant historic features, differentiation of the old from the new, and connecting to the existing buildings in a way that Milstein Hall and the CAPG are fully removable. The placement of Milstein Hall and the CAPG behind Sibley and Tjaden halls preserves the historic significance of these important Arts Quad buildings and the integrity of the Arts Quad itself.

An archaeological resource survey found that the project sites are unlikely to contain any intact archaeological sites. No impacts to archeological resources are anticipated as a result of either project.

Impacts to Transportation, Circulation, Traffic, Parking and Potential Future Transportation Systems

The projects will result in improved access and facilities for pedestrians, the mobility impaired, service, deliveries, emergency vehicles, buses and cyclists. Completion of the CAPG will add approximately 91 parking spaces. Due to the increased availability of parking in this area, there will be approximately 41 additional peak hour morning trips and 68 additional peak hour evening trips to this location. However, since there are only four new employees anticipated due to the projects, most of these trips are already coming to campus. An analysis of the existing operations of the surrounding intersections concluded that no significant negative impacts to traffic are expected as a result of the proposed projects.

Impacts to Day and Nighttime Lighting

Milstein Hall will block some direct sunlight to the Foundry interior. The amount of shade cast by the proposed building varies with the season and time of day. Milstein Hall will impact the daylight reaching the Foundry interior the least during the summer months when direct sunlight will reach the south, east and west facades. During the equinox and winter solstice, when the sun is lower in the southern hemisphere, Milstein Hall will cast a shadow on the Foundry during more of the day.

Throughout the year, portions of the outdoor space under the proposed second floor of Milstein Hall are already shaded by Sibley and Rand halls. Although the new Milstein Hall will increase the area in shade, depending on the time of day and time of year, direct sunlight will still penetrate into the spaces under the second floor. In addition, electric lighting will provide additional ambient light, creating a pleasant environment.

Current nighttime lighting on site is provided by existing fixtures that cause unnecessary glare and light trespass. Light from the existing buildings, roadway and suspension bridge can be seen from across the gorge. Site lighting for the proposed projects will limit spill light and direct glare from fixtures. Existing light levels within the gorge will not increase as a result of the proposed project. A positive impact of the proposed Milstein Hall and the CAPG will be the replacement of some street lighting along University Avenue with fixtures that reduce light trespass and glare.

Noise and Odor Impacts

The proposed facilities are not expected to generate noise or odors above existing ambient conditions.

A sound-absorbent ceiling material is proposed for the underside of the Milstein Hall cantilever. There will be no perceptible increase in noise inside the Foundry as a result of the project.

No impacts to air quality standards are anticipated as a result of the proposed projects. The Milstein Hall cantilever over University Avenue will cause traffic odors to linger a little longer than existing conditions and may possibly increase the perception of odor inside the Foundry when the windows are open; however, wind currents will disperse odors much as they presently do.

Impacts on Growth and Character of the Community

The Milstein Hall addition will not result in an increase in student enrollment. Four new employees are anticipated as a result of the project. These increases are not significant on a community-wide basis and are expected to have no measurable impact on housing, public services, or other community assets.

Milstein Hall and the CAPG are proposed for a highly developed area of campus where previous and current Cornell master plans have consistently called for densification of facilities in order to meet the needs of educational programs. The CAPG is being designed to carry the loading of a building up to three stories (grade level plus two supported levels above grade). There are no specific plans for a building in this location. To add program space for the college, a building may be built here sometime in the future.

Construction Impacts

Milstein Hall construction is expected to take 21-24 months and be completed by January of 2011. The CAPG will be constructed concurrently. It is expected to take 15 months and be completed by October of 2010. University Avenue will be closed for approximately 20 months.

Short-term noise and air quality impacts typical for a construction site can be expected. Cornell students and employees in the buildings adjacent the projects sites will be the most impacted, with diminishing impact as one moves away from the site. The projects will employ best practice controls to minimize construction phase impacts. Construction workers will be provided parking on campus and utilize a shuttle to the project site. Cornell employees with permits for parking in the existing lot will be relocated to other parking locations for the duration of construction. Deliveries of construction materials to the site and removal of materials will result in slight increases in construction vehicle traffic in the vicinity for the duration of construction. The university will develop a communications plan for informing the city and the surrounding neighborhood of planned construction activities.

Adopted Scope for Draft Environmental Impact Statement

Paul Milstein Hall and Central Avenue Parking Garage Projects

Cornell University

December 18, 2007

Executive Summary

Chapter One: Description of the Proposed Action

- 1.1 Introduction
- 1.2 Project Purpose, Need and Benefit
  - 1.2.1 Paul Milstein Hall
  - 1.2.2 Central Avenue Parking Garage *(including both campus planning determinations and City parking requirements)*
- 1.3 Location, Setting and Zoning
- 1.4 Site Layout and Landscape Design
  - 1.4.1 University Avenue Streetscape
  - 1.4.2 Landscape Connections to Central Avenue
  - 1.4.3 Landscape corridor between Tjaden Hall and Sibley Hall
  - 1.4.4 The Foundry
  - 1.4.5 Lincoln Hall access drive
  - 1.4.6 Exterior spaces under Milstein Hall
- 1.5 Architectural Design
  - 1.5.1 Paul Milstein Hall
  - 1.5.2 Central Avenue Parking Garage
- 1.6 Program
  - 1.6.1 Paul Milstein Hall
  - 1.6.2 Central Avenue Parking Garage
- 1.7 Sustainable Design
  - 1.7.1 Paul Milstein Hall
  - 1.7.2 Central Avenue Parking Garage
- 1.8 Site Utilities
  - 1.8.1 Paul Milstein Hall
  - 1.8.2 Central Avenue Parking Garage
- 1.9 Relationship of Proposed Plans to TDMP *(including account of recent gains and losses to campus-wide parking supply)* and Draft Cornell t-GEIS
- 1.10 Relationship of Proposed Plans to Draft Cornell University Comprehensive Master Plan
- 1.11 Facility Operations
  - 1.11.1 Paul Milstein Hall
  - 1.11.2 Central Avenue Parking Garage

Chapter Two: Potential Significant Impacts

Each of the following sections will include, for each topic, descriptions of the 1) existing conditions, 2) impacts of the proposed project, 3) mitigation measures, and 4) unavoidable impacts. Each of the four items listed above are therefore incorporated by this reference.

2.1 Land
  2.1.1 Excavation impacts, or any other impacts, to adjacent slope and Fall Creek Gorge/ Recreational River
  2.1.2 Excavation impacts to adjacent existing buildings
  2.1.3 Excavation methods
  2.1.4 Material disposal
  2.1.5 Any potential impacts associated with disturbing land on and around site of former heating plant
2.2 Stormwater
  2.2.1 Stormwater management
  2.2.2 Stormwater impacts to Fall Creek Gorge/Recreational River
  2.2.3 Capacity of existing stormwater infrastructure
2.3 Air
  2.3.1 Evaluation of increased vehicular emissions from parking garage on pedestrians and occupants of adjacent buildings.
  2.3.2 Evaluation of impacts of vehicular emissions under building cantilever on building occupants
  2.3.3 Evaluation of impacts on required fresh air ventilation in adjacent buildings
  2.3.4 Evaluation of potential wind acceleration effects under Milstein Hall
2.4 Vegetation
  2.4.1 Impacts to vegetation *(to discuss tree removals and additions)*
2.5 Aesthetic Resources *(in each case a-t, an existing condition photograph and proposed condition, simulated image, will be shown)*
  a. View looking east down University Avenue
  b. View looking southeast from pedestrian suspension bridge over Fall Creek
  c. View looking south from 316 Fall Creek Drive (at street front property line)
  d. View looking south from 123 Roberts Place (at street front property line)
  e. View looking south from 127 Roberts Place (at street front property line)
  f. View looking south from 326 Fall Creek Drive (at street front property line)
  g. View looking southwest from Risley Hall
  h. View looking southwest from Thurston Avenue Bridge
  i. View looking west down University Avenue
  j. View looking northwest from Baker Hall
  k. View looking northeast from Arts Quad (toward Paul Milstein Hall)
  l. View looking north from Lincoln Hall showing both Milstein and Sibley Facade
  m. View looking north from Arts Quad (toward Central Avenue Parking Garage)
  n. View from inside the Foundry looking south
  o. View from the Recreational River (within gorge), looking south
  p. View from south rim of gorge looking south

- q. View from north rim of gorge looking south
- r. View looking northeast from entrance to current Johnson Art Museum building
- s. View looking east from entrance to Johnson Art Museum addition
- t. View toward project site from fifth floor (Asia Gallery) of Johnson Art Museum
- u. Animated walkthrough visual simulation will be provided on CD *(this simulation will include, but not be limited to, views of the Central Avenue Parking Garage from the Arts Quad, from the west side of Central Avenue, and from the north side of University Avenue; a 360 degree view from the top surface level of the garage; views of all exterior facades of Milstein Hall; views of all the exterior spaces beneath the second floor of Milstein Hall, seen from multiple points of view; and views of Milstein Hall from the exterior of the Foundry, from the top floor of Sibley Hall and from the top floor of Rand Hall)*

2.6 Cultural Resources

- 2.6.1 Existing Historic Resources
  - a. Lincoln Hall
  - b. Goldwin Smith Hall
  - c. Stimson Hall
  - d. Olin Library
  - e. Uris Library
  - f. Morrill Hall
  - g. McGraw Hall
  - h. White Hall
  - i. Tjaden Hall *(including potential impacts to interior spaces)*
  - j. Sibley Hall *(including potential impacts to interior spaces)*
  - k. Rand Hall *(including potential impacts to interior spaces)*
  - l. The Foundry *(including potential impacts to interior spaces)*
  - m. Johnson Museum of Art
  - n. Baker Laboratory
  - o. Rockefeller Hall
  - p. Andrew Dickson White House
  - q. Risley Hall
  - r. Cornell Heights Historic District
  - s. Arts Quad Historic District as an ensemble
  - t. Arts Quad as a landscape
- 2.6.2 Impact on existing exterior historic structures and surfaces that are proposed as interior space and on areas where new structures attach to old structures
- 2.6.3 Archaeological Resources *(to include Phase 1A archaeological investigation)*

2.7 Transportation and Circulation *(to include description of existing and proposed circulation patterns within and through the project site, including both sides of University Avenue and Central Avenue adjacent to the project site)*

- 2.7.1 Pedestrian Circulation
- 2.7.2 Bicycle Circulation
- 2.7.3 Transit Service
- 2.7.4 Service and Delivery Access
- 2.7.5 Emergency Vehicle Access

- 2.7.6 Potential conflicts between vehicle, delivery, pedestrian and bicycle routes
- 2.7.7 ADA Compliance

2.8 Vehicular Circulation *(Provide a full traffic study to investigate volumes and impacts of two scenarios: 1. Paul Milstein Hall + Central Avenue Parking Garage and 2. Paul Milstein Hall + Surface Parking)*

- 2.8.1 Traffic Conditions and Operation
  - a. University Avenue at West Avenue *(three separate intersections)*
  - b. University Avenue at Central Avenue *(to include a discussion of existing sight lines)*
  - c. Central Avenue and Parking Ramp Entrance
  - d. University Avenue at Sibley/Tjaden Lot access (west)
  - e. University Avenue at Sibley/Tjaden Lot access (east)
  - f. University Avenue/Forest Home Drive at Thurston Avenue/East Avenue
- 2.8.2 Vehicular Service Capacity
  - a. University Avenue at West Avenue *(three separate intersections)*
  - b. University Avenue at Central Avenue
  - c. Central Avenue and Parking Ramp Entrance
  - d. University Avenue at Sibley/Tjaden Lot access (west)
  - e. University Avenue at Sibley/Tjaden Lot access (east)
  - f. University Avenue/Forest Home Drive at Thurston Avenue/East Avenue

- 2.8.3 Structure Over University Avenue
  - a. Safety
  - b. Clearance
  - c. Emergency/Large Vehicle Access
  - d. Utilities and Road Maintenance
  - e. DOT Guidelines

2.9 Other Impacts to current or future transportation systems *(any other potential impacts of the project design, including the cantilever and any re-construction of University Avenue, on current or potential future transportation systems)*

2.10 Parking

- 2.10.1 Transportation Demand Management Program
- 2.10.2 Relationship to Other Long Range Traffic Planning Efforts on the Cornell University Campus
- 2.10.3 Site Parking

2.11 Lighting Impacts

- 2.11.1 Daytime Lighting Impacts *(including a shadow study)*
  - a. Impacts to daylighting within Foundry
  - b. Impacts on outdoor areas covered by the 2nd floor of Milstein *(including the cantilever over University Avenue)*
- 2.11.2 Nighttime Lighting Impacts *(to include night view visual simulations; in each case, a-g, an existing condition photograph and proposed condition, simulated image, will be shown)*
  - a. Project Site
  - b. View looking south from 316 Fall Creek Drive *(at street front property line)*
  - c. View looking south from 123 Roberts Place *(at street front property line)*

Chapter Three: Construction Impacts

Chapter Four: Alternatives to the Proposed Action

  - b. Barkow Leibinger Proposal
  - c. Schwartz-Silver Master Plan Proposal
  - d. OMA Design with Columns
  - e. Essential existing concept modified as necessary to preserve entire proposed program, with no extension over University Avenue
  - f. No Action

4.2 Alternatives to Central Avenue Parking Garage

  - a. Surface lot
  - b. Above ground parking structure
  - c. Entirely underground garage with landscape above
  - d. Horizontal alignment changes to University Avenue integrated into garage design.
  - e. No Action

4.3 University Avenue streetscape with sidewalk on north and south sides.

Chapter Five: Irreversible and Irretrievable Commitment of Resources

5.1 Construction Phase
5.2 Operating Phase

Chapter Six: Growth Inducing Aspects

Appendices

A. Geotechnical Report
B. Stormwater Report
C. Historic Resources Report *(to include a full inventory of each building listed in scope)*
D. Archeology Phase 1A Assessment
E. Traffic Report
F. Shadow Study

Adopted Scope Concordance to Draft Environmental Impact Statement

As the scope outline for the DEIS developed into narrative sections, some additions to the material or minor reorganization of items seemed appropriate to help the document read more clearly and logically. While some of the section numbering may have changed, all of the items required from the scoping document are included in the DEIS. The following section outlines the changes in organization or additions to the document so that a direct comparison to the adopted scope can be made quickly.

Chapter One

In Chapter One, an additional section on Design Process has been included in the narrative as Section 1.6. As a result, all subsequent sections have shifted by one digit. In addition, the site layout and landscape design was moved to Section 1.5. It was more logical for the details of site design to follow after an understanding of the overall project architecture was established. The matrix below correlates each scope item for Chapter One with its current section in the DEIS.

Adopted Scope Item, Chapter One	**DEIS Section**
Executive Summary	Same section
1.1 Introduction	Same section
1.2 Project Purpose, Need and Benefit	Same section
1.2.1 Paul Milstein Hall	Same section
1.2.2 Central Avenue Parking Garage *(including both campus planning determinations and City parking requirements)*	Same section
1.3 Location, Setting and Zoning	Same section
1.4 Site Layout and Landscape Design	1.5
1.4.1 University Avenue streetscape	1.5.1
1.4.2 Landscape Connections to Central Avenue	1.5.2
1.4.3 Landscape Corridor between Tjaden and Sibley Hall	1.5.3
1.4.4 The Foundry	1.5.4
1.4.5 Lincoln Hall Access Drive	1.5.5
1.4.6 Exterior Spaces under Milstein Hall	1.5.6
Additional Section	1.5.7 Milstein Plaza and Sunken Garden
1.5 Architectural Design	1.4
1.5.1 Paul Milstein Hall	1.4.1
1.5.2 Central Avenue Parking Garage	1.4.2
Additional Section	1.6 Design Process
1.6 Program	1.7
1.6.1 Paul Milstein Hall	1.7.1
1.6.2 Central Avenue Parking Garage	1.7.2
1.7 Sustainable Design	1.8
1.7.1 Paul Milstein Hall	1.8.1
1.7.2 Central Avenue Parking Garage	1.8.2
1.8 Site Utilities	1.9

1.8.1 Paul Milstein Hall	1.9.1
1.8.2 Central Avenue Parking Garage	1.9.2
1.9 Relationship of Proposed Plans to TDMP (*including account of recent gains and losses to campus-wide parking supply)* and Draft Cornell t-GEIS	1.10
1.10 Relationship of Proposed Plans to Draft Cornell University Comprehensive Master Plan	1.11
1.11 Facility Operations	1.12
1.11.1 Paul Milstein Hall	1.12.1
1.11.2 Central Avenue Parking Garage	1.12.2

Chapter Two

Two sections of Chapter Two (Cultural Resources, 2.6 and Vehicular Circulation, 2.8) did not readily lend themselves to the organizational format of: A. Existing Conditions; B. Impacts of the Proposed Project; C. Mitigation Measures; and D. Unavoidable Impacts. While each of the above four items is fully addressed in the document, the level of detailed information and analysis included in the narrative made separating the discussion by topic more logical and less disjointed.

Therefore, the format for Section 2.6.1 (Existing Historic Resources) weaves the discussion of potential impacts to historic resources and mitigation measures into the structure of the Secretary of the Interior Standards for Rehabilitation. The parenthetical requests for a discussion of impacts to interior spaces for four of the buildings on the inventory necessitated an additional subsection. Section 2.6.2 was split into two sections in the narrative, in order to more clearly discuss the two topics imbedded in the Adopted Scope.

Section 2.8, Vehicular Circulation, inventories and assesses project impacts at each intersection included in the scope document. Section 2.8.1, Traffic Conditions and Operations, examines the existing roadway conditions, and level of service for the existing intersections studied. Section 2.8.2, Vehicular Service Capacity, discusses the impacts and mitigations of three traffic scenarios:

- Traffic conditions in 2012 if no projects were built;
- Predicted traffic conditions in 2012 if both projects were built; and
- Predicted traffic conditions in 2012 if Milstein Hall and a surface lot were built.

Section 2.10, Parking, was moved to Section 2.9. It was more logical for parking to follow the vehicular circulation section. Therefore, Section 2.9 of the Scope (Other impacts to current or future transportation systems) was re-numbered as Section 2.10.

The matrix below correlates each scope item for Chapter Two with its current section in the DEIS.

Adopted Scope Item, Chapter Two	**DEIS Section**
2.1 Land	Same section Appendix A: Geotechnical Reports
2.1.1 Excavation Impacts, or Any Other Impacts, to Adjacent Slope and Fall Creek Gorge/Recreational River	Same section
2.1.2 Excavation Impacts to Adjacent Existing Buildings	Same section
2.1.3 Excavation Methods	Same section
2.1.4 Material Disposal	Same section
2.1.5 Any Potential Impacts Associated with Disturbing Land On and Around Site of Former Heating Plant	Same section
2.2 Stormwater	Same section Appendix B: Stormwater SWPPP
2.2.1 Stormwater Management	Same section
2.2.2 Stormwater Impacts to Fall Creek Gorge/Recreational River	Same section
2.2.3 Capacity of Existing Stormwater Infrastructure	Same section
2.3 Air	Same section
2.3.1 Evaluation of Increased Vehicular Emissions from Parking Garage on Pedestrians and Occupants of Adjacent Buildings	Same section
2.3.2 Evaluation of Impacts of Vehicular Emissions Under Building Cantilever on Building Occupants	Same section Appendix J: Exhaust Design Review
2.3.3 Evaluation of Impacts on Required Fresh Air Ventilation in Adjacent Buildings	Same section
2.3.4 Evaluation of Potential Wind Acceleration Effects Under Milstein Hall	Same section Appendix I: Wind Evaluation
2.4 Vegetation	Same section
2.4.1 Impacts to Vegetation (*to discuss tree removals and additions*)	Same section
2.5 Aesthetic resources (*in each case a-t, an existing condition photograph and proposed condition, simulated image, will be shown)*	Same section
a. View looking east down University Avenue	Same section
b. View looking southeast from pedestrian suspension bridge over Fall Creek	Same section
c. View looking south from 316 Fall Creek Drive *(at street front property line)*	Same section
d. View looking south from 123 Roberts Place *(at street front property line)*	Same section
e. View looking south from 127 Roberts Place *(at street front property line)*	Same section

Adopted Scope Item, Chapter Two	**DEIS Section**
f. View looking south from 326 Fall Creek Drive *(at street front property line)*	Same section
g. View looking southwest from Risley Hall	Same section
h. View looking southwest from Thurston Avenue Bridge	Same section
i. View looking west down University Avenue	Same section
j. View looking northwest from Baker Hall	Same section
k. View looking northeast from Arts Quad *(toward Paul Milstein Hall)*	Same section
l. View looking north from Lincoln Hall showing both Milstein and Sibley facades	Same section
m. View looking north from Arts Quad *(toward Central Avenue Parking Garage)*	Same section
n. View from inside the Foundry looking south	Same section
o. View from the Recreational River (within gorge) looking south	Same section
p. View from south rim of gorge looking south	Same section
q. View from north rim of gorge looking south	Same section
r. View looking northeast from entrance to current Johnson Art Museum	Same section
s. View toward project site from entrance to Johnson Art Museum addition	Same section
t. View toward project site from fifth floor (Asia Gallery) of Johnson Art Museum	Same section
u. Animated walkthrough visual simulation will be provided on CD *(this simulation will include, but not be limited to, views of the Central Avenue Parking Garage from the Arts Quad, from the west side of Central Avenue, and from the north side of University Avenue; a 360 degree view from the top surface level of the garage; views of all exterior facades of Milstein Hall; views of all the exterior spaces beneath the second floor of Milstein Hall, seen from multiple points of view; and views of Milstein Hall from the exterior of the Foundry, from the top floor of Sibley Hall and from the top floor of Rand Hall)*	Same section *See enclosed CD
2.6 Cultural Resources	Same section
2.6.1 Existing Historic Resources	Same section

Adopted Scope Item, Chapter Two	**DEIS Section**
a. Lincoln Hall b. Goldwin Smith Hall c. Stimson Hall d. Olin Library e. Uris Library f. Morrill Hall g. McGraw Hall h. White Hall i. Tjaden Hall *(including potential impacts to interior spaces)* j. Sibley Hall *(including potential impacts to interior spaces)* k. Rand Hall *(including potential impacts to interior spaces)* l. The Foundry *(including potential impacts to interior spaces)* m. Johnson Museum of Art n. Baker Laboratory o. Rockefeller Hall p. Andrew Dickson White House q. Risley Hall r. Cornell Heights Historic District s. Arts Quad Historic District as an ensemble t. Arts Quad as a landscape	A. Existing Conditions Appendix A: Historic Resources Report includes individual building inventories for a-t. B. Impacts of the Proposed Project on Historic Resources and Mitigation Measures (this section is organized around the framework of the Secretary of the Interior's Standards for Rehabilitation.) C. Unavoidable Impacts 2.6.3 Impact on Existing Interior Spaces
2.6.2 Impact on existing exterior historic structures and surfaces that are proposed as interior space and on areas where new structures attach to old structures	2.6.2 Impact on Exterior Surfaces to be Enclosed 2.6.4 Impact where New Structures Attach to Old
2.6.3 Archaeological Resources (*to include Phase 1A archaeological investigation)*	2.6.5 Appendix D: Archaeology Report
2.7 Transportation and Circulation (*to include description of existing and proposed circulation patterns within and through the project site, including both sides of University Avenue and Central Avenue adjacent to the project site)*	Same section
2.7.1 Pedestrian Circulation	Same section Appendix E: Traffic Report
2.7.2 Bicycle Circulation	Same section Appendix E: Traffic Report
2.7.3 Transit Service	Same section
2.7.4 Service and Delivery Access	Same section
2.7.5 Emergency Vehicle Access	Same section
2.7.6 Potential conflicts between vehicle, delivery, pedestrian and bicycle routes	Same section
2.7.7 ADA Compliance	Same section

Adopted Scope Item, Chapter Two	**DEIS Section**
2.8 Vehicular Circulation (*Provide a full traffic study to investigate volumes and impacts of two scenarios: 1. Paul Milstein Hall + CAPG and 2. Paul Milstein Hall + Surface Parking)*	Same section Appendix E: Traffic Report
2.8.1 Traffic Conditions and Operations	Same section
a. University Avenue at West Avenue (*three separate intersections)* b. University Avenue at Central Avenue (*to include a discussion of existing sight lines)* c. Central Avenue and Parking Ramp Entrance d. University Avenue at Sibley/Tjaden Lot access (west) e. University Avenue at Sibley/Tjaden Lot access (east) f. University Avenue/Forest Home Drive at Thurston Avenue/East Avenue	2.8.1 A. Existing Roadway Conditions 2.8.1 B. Existing Level of Service for all but item c, which is not applicable to the existing condition discussion 2.8.3 Sight Lines at University Avenue and Central Avenue Intersection
2.8.2 Vehicular Service Capacity	Same section
a. University Avenue at West Avenue (*three separate intersections)* b. University Avenue at Central Avenue c. Central Avenue and Parking Ramp Entrance d. University Avenue at Sibley/Tjaden Lot access (west) e. University Avenue at Sibley/Tjaden Lot access (east) f. University Avenue/Forest Home Drive at Thurston Avenue/East Avenue ***Additional Intersection***	A. No-Build + 1 (2012) Conditions B. Build + 1 (2012) Conditions, considered for: 1. Traffic generated from Milstein Hall + CAPG 2. Milstein Hall + surface lot. a-f are included in the level of service analysis. An additional intersection, East Avenue at Lincoln Hall access drive is also included.
2.8.3 Structure over University Avenue	2.8.4
a. Safety	Same section
b. Clearance	Same section
c. Emergency/Large vehicle Access	Same section
d. Utilities and Road Maintenance	Same section
e. DOT Guidelines	Same section
2.9 Other impacts to current or future transportation systems (*any other potential impacts of the project design, including the cantilever and any re-construction of University Avenue, on current or potential future transportation systems)*	2.10

Adopted Scope Item, Chapter Two	**DEIS Section**
2.10 Parking	2.9
2.10.1 Transportation Demand Management Program	2.9.1
2.10.2 Relationship to other long-range traffic planning efforts on the Cornell University campus	2.9.2
2.10.3 Site Parking	2.9.3
2.11 Lighting Impacts	Same section
2.11.1 Daytime Lighting Impacts (*including a shadow study)*	Same section Appendix F: Shade Study
a. Impacts to daylighting within Foundry	2.11.1.1
b. Impacts on outdoor areas covered by the second floor of Milstein (*including the cantilever over University Avenue)*	2.11.1.2
2.11.2 Nighttime Lighting Impacts (*to include night view visual simulations; in each case a-g, an existing condition photograph and proposed condition, simulated image, will be shown)*	Same section Appendix G: Nighttime Lighting Study
a. Project site b. View looking south from 316 Fall Creek Drive *(at street front property line)* c. View looking south from 123 Roberts Place Drive *(at street front property line)* d. View looking south from 127 Roberts Place *(at street front property line)* e. View looking south from 326 Fall Creek Drive *(at street front property line)* f. Arts Quad g. Fall Creek Gorge	2.11.3 Nighttime Visual Simulations Includes views a-g
2.12 Noise and Odor Impacts	Same section
2.12.1 Impacts to the Foundry interior noise level	Same section Appendix H: Acoustic Report
2.12.2 Impacts of increased traffic on odors on Foundry interior	Same section Appendix I: Exhaust Design Review
2.13 Impact on Growth and Character of the Community	Same section
2.13.1 Precedent (*for both campus and surrounding community, of extending a building over a public street)*	Same section
2.13.2 Future Building *(impact of Central Avenue Parking Garage on potential future above-ground development of that site)*	Same section

Chapter Three

Section 3.1 was renamed to more accurately describe construction activities, and was divided into 3.1.1 Paul Milstein Hall and 3.1.2 CAPG to clearly separate construction activities of each project. Each of these subsections address the items as required in the Adopted Scope.

Section 3.3.1, Construction Phase Traffic, inventories and assesses project impacts at each intersection included in the scope document and are included in the level of service analysis found in Appendix E.

Section 3.7 was also subdivided into 3.7.1, Paul Milstein Hall and 3.7.2, CAPG to clearly separate construction impacts to Fall Creek Gorge per project.

The matrix below correlates each scope item for Chapter Three with its current section in the DEIS.

Adopted Scope Item, Chapter Three	**DEIS Section**
3.1 Description of Construction Phasing/Staging and Construction Activities per Each Construction Phase (to include pedestrian, bicycle, vehicular, service and emergency routes, including ADA considerations, for each construction phase)	Same section ***New title:** 3.1 Description of Construction Sequencing and Construction Activities Per Each Construction Phase Section 3.1, divided into: 3.1.1 Paul Milstein Hall 3.1.2 CAPG 3.1.3 University Avenue Closures 3.1.4 Site Staging 3.1.5 Maintaining Service to Existing Buildings During Construction 3.1.6 Circulation Routes 3.1.7 Emergency Routes
3.2 Erosion and Sediment Controls	Same section
3.3 Traffic	Same section

Adopted Scope Item, Chapter Three	**DEIS Section**
3.3.1 Construction Phase Traffic - Description of the proposed construction route(s) under the existing condition and during construction to include Traffic Volume Data, Turning Movements, Intersection Geometry, Level of Service, and Safety Analysis for the Following Intersections: a. University Avenue at Stewart Avenue b. University Avenue at West Avenue *(three separate intersections)* c. University Avenue at Central Avenue d. University Avenue at Sibley/Tjaden Lot access (west) e. University Avenue at Sibley/Tjaden Lot access (east) f. University Avenue/Forest Home Drive at Thurston Avenue/East Avenue g. East Avenue/Tower Road h. East Avenue/Campus Road i. Campus Road/College Avenue j. Campus Road/West Avenue *(three separate intersections)* k. Campus Road/Stewart Avenue *(three separate intersections)*	Same section, renamed: 3.3.1 Construction Phase Traffic a-k are included in the level of service analysis (Appendix E: Traffic Report) and are described in: A. Construction Diversion Conditions B. Impacts of Construction Phase Traffic C. Mitigation Measures D. Unavoidable Impacts
3.4 Construction Phase Parking	Same section
3.5 Construction Air Impacts *(including a description of construction period air quality monitoring)*	Same section
3.6 Construction Noise Impacts	Same section
3.7 Construction Impacts to Fall Creek Gorge	Same section, divided into: 3.7.1 Paul Milstein Hall 3.7.2 CAPG
3.8 Potentially Concurrent Construction Impacts *(consider, as applicable, construction phasing, staging, traffic, parking, pedestrian and emergency routes)*	Same section

Chapter Four

The section on alternatives to Milstein Hall has been reorganized so that the alternate design plans are presented chronologically. All the Milstein Hall alternatives required as per the scoping document are discussed in section 4.1, however, the order of the alternatives has been re-arranged. An additional alternative has also been added to this section.

The CAPG alternatives have been reorganized to provide a more logical flow to the section. All of the CAPG alternatives required by the scoping document are discussed in Section 4.2, only the order has changed. An additional alternative design has been added to this section as well.

An alternate, sequential construction schedule has been added to this section.

The matrix below correlates each scope item for Chapter Four with its current section in the DEIS.

Adopted Scope Item, Chapter Four	**DEIS Section**
4.1 Alternatives to Paul Milstein Hall *(alternative narratives to include architectural and site impacts)*	Same section
a. Steven Holl Proposal	4.1.2
b. Barkow Leibinger Proposal	4.1.3
c. Schwartz/Silver Master Plan Proposal	4.1.1
d. OMA Design with Columns	4.1.4
Additional Section	4.1.5 OMA design at Sibley Hall's Southwest Corner
e. Essential existing concept modified as necessary to preserve entire proposed program with no extension over University Avenue	4.1.6 Renamed: Existing Plan that Preserves Program, Without Extension Over University Avenue
f. No Action	4.1.7
4.2 Alternatives to Central Avenue Parking Garage	Same section
a. Surface Lot	4.2.1
Additional Section	4.2.2 Surface Lot Plus One Underground Level
b. Above ground parking structure	4.2.4
c. Entirely underground garage with landscape above	4.2.3
d. Horizontal alignment changes to University Avenue integrated into garage design	4.2.5
e. No Action	4.2.6
Additional Section	4.3 Non-Concurrent, Sequential Construction
4.3 University Avenue streetscape with sidewalk on north and south sides	4.4 Alternatives to the University Avenue Streetscape 4.4.1

Chapter Five

No changes in organization have been made to Chapter Five. The matrix below correlates each scope item for Chapter Five with its current section in the DEIS.

Adopted Scope Item, Chapter Five	**DEIS Section**
5.1 Construction Phase	Same section
5.2 Operating Phase	Same section

Chapter Six

No changes in organization have been made to Chapter Six. The matrix below correlates each scope item for Chapter Six with its current section in the DEIS.

Adopted Scope Item, Chapter Six	**DEIS Section**
6.1 Growth Inducing Aspects	Same section

Appendices

All required appendices as per the scoping document are included in the DEIS. Four additional appendix reports are included as well.

The matrix below correlates each appendix item required as per the scope with its current section in the DEIS.

Adopted Scope Item, Appendix	**DEIS Section**
Appendix A: Geotechnical Report	Same section
Appendix B: Stormwater Report	Same section ***New title:** Stormwater SWPPP
Appendix C: Historic Resources Report *(to include a full inventory of each building listed in the Scope)*	Same section
Appendix D: Archaeology Phase 1A Assessment	Same section ***New title:** Archaeology Report
Appendix E: Traffic Report	Same section
Appendix F: Shadow Study	Same section ***New title:** Shade Study
Additional Section	Appendix G: Nighttime Lighting Study
Additional Section	Appendix H: Acoustic Report
Additional Section	Appendix I: Wind Evaluation
Additional Section	Appendix J: Exhaust Design Review

CHAPTER ONE:

Description of the Proposed Action

CHAPTER ONE: DESCRIPTION OF THE PROPOSED ACTION

1.1 Introduction

Cornell and its College of Architecture, Art, and Planning (hereafter referred to as AAP) propose construction of Paul Milstein Hall (hereafter referred to as Milstein Hall), a 59,000 square-foot building that will physically connect Rand and Sibley halls while visually connecting the Foundry to the other AAP buildings. There will be no net increase in the number of students enrolled in the college. The design will create much-needed flexible contiguous studio space, a 275-seat auditorium, meeting and exhibition space, and a college forum—a signature gallery for collaboration and exhibition that showcases student and faculty work. Milstein Hall is designed to promote and foster new and innovative ways of teaching within the AAP.

An open outdoor space beneath the cantilevered portion of the building will provide a covered bus shelter and a generous area for bicycle parking. Two new service drives will be constructed; one connecting East Avenue to Lincoln Hall, and the other from University Avenue to the north side of Sibley Hall.

The scope of work inside Rand and Sibley halls is limited to code-required sprinkler and fire alarm system upgrades. Rand Hall will also receive new ADA toilet rooms, a new ADA elevator and a new mechanical room serving Milstein Hall.

The site will be completely rehabilitated and landscaped, including new ADA-compliant walkways. The proposed design will remove the on-site trailers and 45 existing parking spaces located to the north of Sibley Hall.

Cornell and its Department of Transportation is proposing a new parking structure located on an existing surface parking lot north of Tjaden Hall and the west wing of Sibley Hall, on a site approximately 450 feet by 75 feet, adjacent to the proposed Milstein Hall project. The Central Avenue Parking Garage (hereafter referred to as CAPG) will provide approximately 199 parking spaces in three levels of parking: one surface level and two underground levels. The below-grade levels will incorporate an interior ramp and merge area which will be accessed from Central Avenue. Vehicular access to and from the surface parking level will be from University Avenue. Please refer to Figure 1.1.1, Illustrated Site Plan.

Cornell University has prepared this Draft Environmental Impact Statement (DEIS) for the Paul Milstein Hall and the CAPG projects. The DEIS is required to describe potential adverse environmental impacts that can be reasonably anticipated.

The DEIS is submitted pursuant to Chapter 176 of the City of Ithaca Code, City Environmental Quality Review Ordinance (CEQR), New York State Environmental Conservation Law Article 8, State Environmental Quality Review Act (SEQR), Part 617 of Chapter 6 of the New York Code of Rules and Regulations, and the adoption of a Positive Declaration by the City of Ithaca Planning and Development Board on October 30, 2007, and a Scope on December 18, 2007.

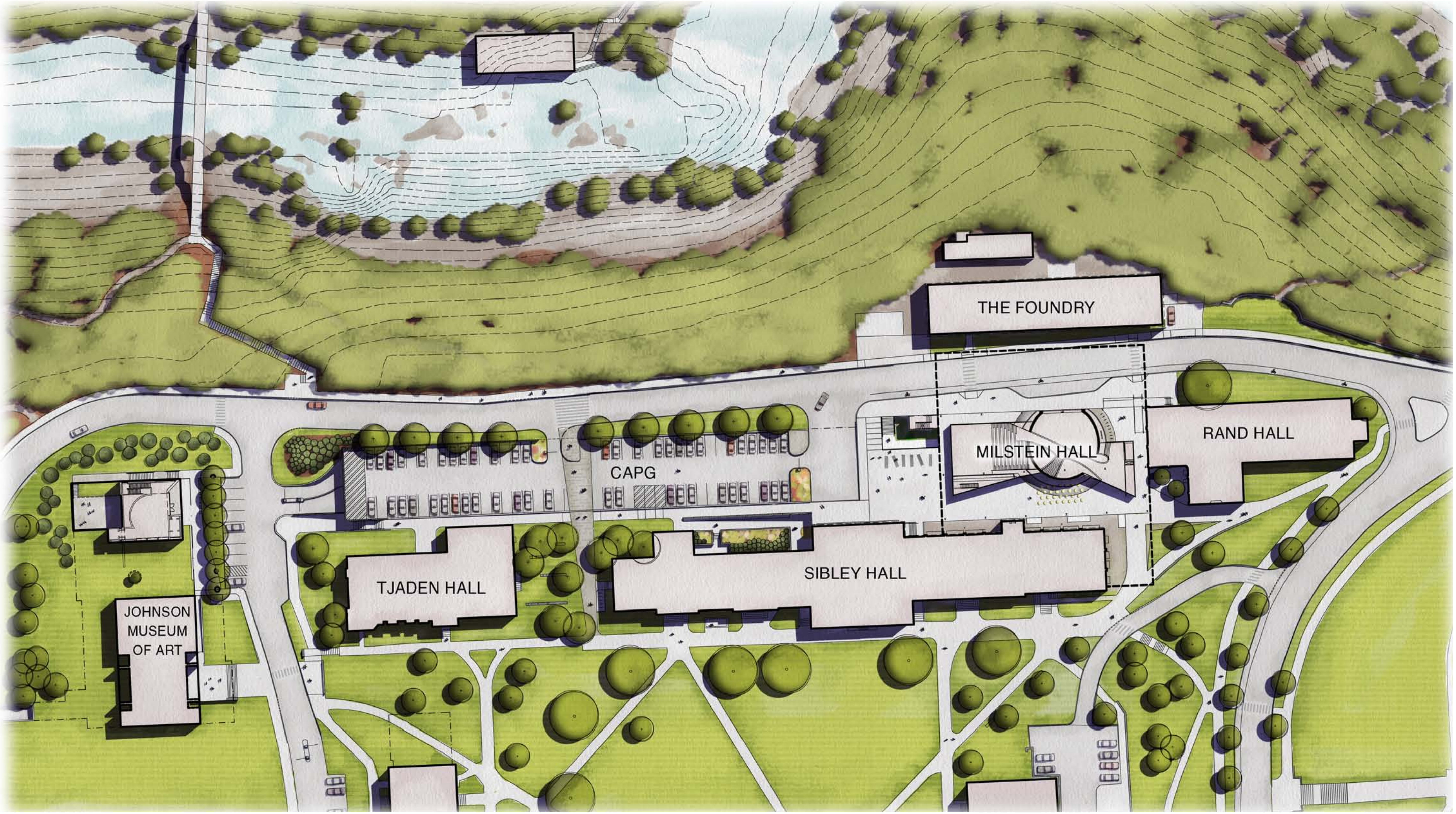


Figure 1.1.1: Illustrated site plan.

1.2 Project Purpose, Need and Benefit

1.2.1 Paul Milstein Hall

Cornell University's top-ranked College of AAP educates future architects, planners and artists. The fundamental purpose of the Milstein Hall project is to provide more space per student. It will expand and enhance the facilities and programs currently provided by AAP. There are approximately 795 students, 55 faculty, and 60 staff currently at the college.

The new building will enable the college to meet accreditation requirements of the National Architectural Accrediting Board (NAAB), maintain its reputation as a top performing institution, and remain competitive with peer institutions.

The Office for Metropolitan Architecture (OMA) has designed Milstein Hall to physically and programmatically integrate AAP's Sibley Hall, Rand Hall and the Foundry. Milstein Hall creates new, flexible, and contiguous learning, work and exhibition space between these existing buildings. This will allow the college to enhance collaboration between students and faculty of the separate departments within AAP and elsewhere in the university, while responding to technological transformations that have occurred over the last decade in the practice and teaching of architecture, art and planning.

<u>Physical Purpose, Need and Benefit:</u>

- Increase the square foot area and quality of studio space available to each student in response to NAAB accreditation requirements;
- Provide a 275-seat open configuration auditorium to replace the auditorium that was removed from Tjaden Hall when it was renovated in 1996;
- Create permanent space for the programs currently housed in the temporary trailers to the north of Sibley Hall;
- Improve the functionality and aesthetics of service access and deliveries to Sibley and Rand halls;
- Improve life-safety systems in Rand Hall, Sibley Hall, and the Foundry;
- Provide an ADA-accessible facility; and
- Enhance sustainable transportation connections through incorporation of bus, pedestrian and bicycle facilities.

<u>Programmatic Purpose, Need and Benefit:</u>

- Create a facility that is in itself an exemplar for the discovery and exploration of contemporary art and architecture;
- Provide space for cultural, educational and social activity where students, faculty and staff interact;
- Engage the most remote AAP facility, the Foundry, drawing it closer to the other three buildings;
- Provide adaptable and flexible spaces for faculty and students to stay current with constant improvements in digital technology;
- Further encourage and support faculty in their research and professional development by providing flexible workspace and enhancing opportunities to interact with students; and
- Build close associations and encourage collaboration between the separate departments of AAP, as well as the university.

1.2.2 Central Avenue Parking Garage

The Milstein Hall project will displace 45 existing parking spaces on site. The construction of the Central Avenue Parking Garage (CAPG) will displace 63 additional spaces and will result in a net addition of 91 spaces to this area of campus. These parking spaces are where demand is greatest. When complete, the CAPG will provide approximately 199 parking spaces in three levels of parking: one surface level and two underground levels immediately to the west of Milstein Hall. Vehicular access to the surface parking level and delivery/service area will be from University Avenue. The below-grade levels will incorporate an interior ramp and merge area which will be accessed from Central Avenue.

Cornell's system of integrated parking management, is continually balanced to provide convenient flexible parking while encouraging alternate modes of access to the campus. When spaces are lost or gained, they cause minor shifts and ripples that are absorbed by the continuous balancing of the system. Accordingly, the CAPG project is proposed by Cornell as an opportune addition rather than as exact replacement for parking that has been or will be eliminated.

The CAPG is located within the U-1 zoning district. The U-1 district also considers the university parking system holistically, requiring parking quantities based on overall demographics rather than based on individual uses or buildings. The April 2008 submission of the *City of Ithaca U-1 Zoning District Section 325-20 G. (10) 2007 – 2008 Parking Report* indicates the university is in compliance with U-1 parking requirements, and will remain so upon completion of Milstein Hall, whether or not the CAPG is constructed.

The CAPG will provide the following benefits:

- Approximately 91 additional parking spaces in central campus, where parking demand is highest;
- Structural capacity to support a building load of three stories (ground floor with two stories above) on top of the parking structure, should the need arise for future development in the area. This is a standard requirement for all potential campus building projects to consider;
- Maximized parking/footprint ratio by locating the majority of parking underground;
- Maintained service to Tjaden and Sibley halls;
- Service access to Sibley and Milstein halls;
- Stair access to the Green Dragon Cafe;
- Clarified pedestrian circulation routes in the area;
- Enhanced pedestrian circulation and entry to/from the Arts Quad; and
- Evening/weekend parking for the Johnson Museum of Art and events located nearby.

Existing parking spaces on-site		Parking spaces displaced by construction		Parking spaces available after project completion		Net parking space gain	
Sibley lot	83	Milstein	45	CAPG top deck	70	Existing	199
Tjaden lot	22	CAPG	63	CAPG B1 level	59	Removed	108
Central Avenue meters	3			CAPG B2 level	70		
Total number of existing parking spaces	108	Total number of parking spaces lost	108	Total number of new parking spaces	199	Net gain	91

Table 1.2.1: Parking at a glance.

1.3 Location, Setting and Zoning

Location

The project sites (sometimes referred to as project site), owned by Cornell University, are located in the City of Ithaca, Tompkins County, New York (see Figure 1.3.1). The combined site area occupies approximately three acres in central campus, north of the Arts Quad (see Figure 1.3.2 and 1.3.3). North of the site are University Avenue, the Foundry building and the Fall Creek Gorge, and beyond the gorge, the Cornell Heights Historic District. The site is roughly bordered to the south by Tjaden and Sibley halls, and the Arts Quad. The western edge of the site is located on Central Avenue, and the eastern edge of the site is located at Rand Hall and East Avenue. Please refer to Figure 1.3.4 for an illustration of the approximate project boundaries.

The project site consists of a paved parking lot with temporary trailers, adjacent tree lawns, and sidewalks. The area currently lacks a cohesive and pleasing identity.

Natural Setting

North of the project site is the Fall Creek Gorge. The gorge will not be disturbed as a part of either project. In this location, Fall Creek has the following governmental and university designations:

Recreational River:

The Recreational River designation found in New York State Department of Environmental Conservation, Environmental Conservation Law Article 15, Title 27 states:

> Recreational Rivers are generally readily accessible, and may have a significant amount of development in their river areas and may have been impounded or diverted in the past. Management of Recreational River areas will be directed to preserving and restoring their natural, cultural, scenic and recreational qualities, except in areas delineated by the Department as communities, which will be managed to avoid adverse environmental impacts and loss of existing river corridor values.

Permitted uses within the Recreational River District are limited to recreational uses such as pedestrian bridges, docks, trails, accessory structures and boathouses. The boundary for the district in this location is the north edge of the sidewalk along University Avenue.

Unique Natural Area (UNA)/ Special Resource Area (SRA):

Fall Creek Gorge is identified as UNA #134 in an inventory initiated and conducted by the Tompkins County Environmental Management Council in conjunction with Cornell Plantations, revised January 2000. A Unique Natural Area is a part of the landscape that has outstanding environmental qualities. Tompkins County Unique Natural Areas have been adopted by the City of Ithaca Common Council and are considered Special Resource Areas (SRA) for the purposes of CEQR. A Special Resource Area does not have setback, height or other construction limitations. Rather, it is a potential trigger for environmental review.

Gorge Protection Zone:

Gorge Protection Zones are specific geographic areas within the U-1 zoning district (See Figure 1.3.5). The Gorge Protection Zone is divided into three designations: A, B and C. Fall Creek, north of the project, is classified as a Gorge Protection Zone A. Gorge Protection Zone A is a ‘no build’ zone, with the exception of trails and associated amenity structures less than 15 feet in height. The

Gorge Protection Zone approximately follows the gorge rim. The Recreational River District overlaps the Gorge Protection Zone.

Cornell Plantations Natural Area:

Beebe Lake and the Fall Creek Gorge are classified by Cornell as part of the natural areas of Cornell Plantations. Located both on and off campus, these natural areas serve a variety of educational purposes, from scenic enjoyment and recreation to research and outdoor classroom.

Historical Setting

South of the project site is the City of Ithaca designated Arts Quad Historic District. North of University Avenue is the Foundry building, a City of Ithaca designated landmark. North of the project site, across the gorge, is the City of Ithaca designated Cornell Heights Historic District. Detailed information about the historical setting can be found in Appendix C: Historical Resources Report.

Zoning

The current zoning classification of the project site is U-1, University Educational. The proposed use is consistent with the present zoning, since it is for an academic purpose. Adjacent land use and zoning classifications within a quarter-mile radius of the project are U-1, R-2a, R-3a, GP-A, GP-B, GP-C and R-U (see Figure 1.3.5). The proposed project will redevelop an existing educational area, which is also consistent with locally adopted land use plans and compatible with adjacent land uses.

Property Ownership

Cornell University owned property is diagrammed in Figure 1.3.6. The closest neighbors are two fraternities southwest of the project areas along University Avenue, and residential homes across the gorge along Fall Creek Drive. University Avenue is a city public right-of-way, although the underlying title to the land belongs to Cornell.

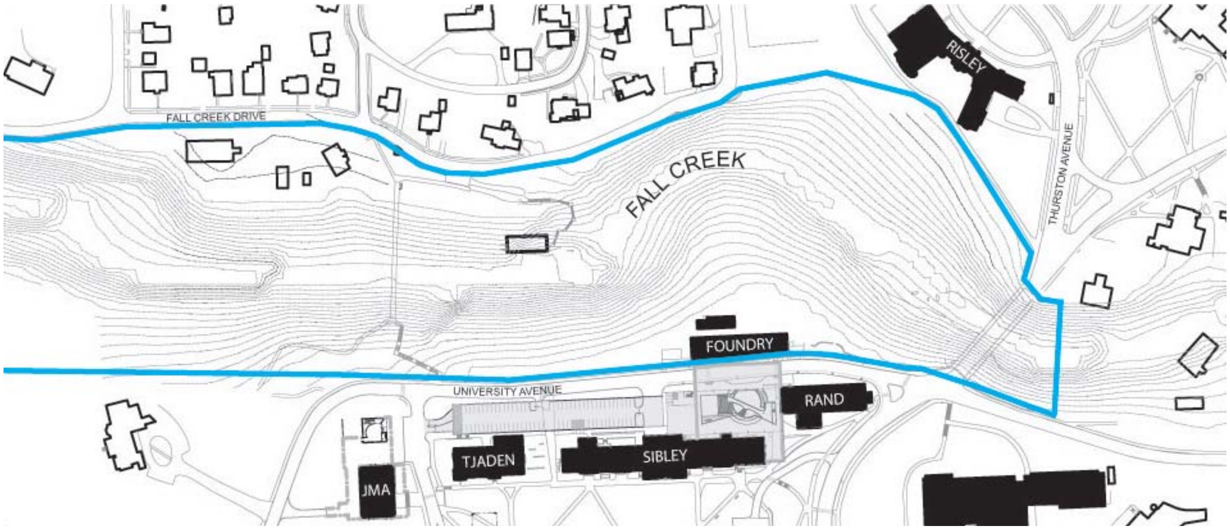


Figure 1.3.1a: Recreational River Diagram. Note: Boundaries drawn are based on the written legal description of recreational river boundary.

Figure 1.3.1: Project location in context with the City of Ithaca.

LEGEND

★ Project Location

Ⓝ North

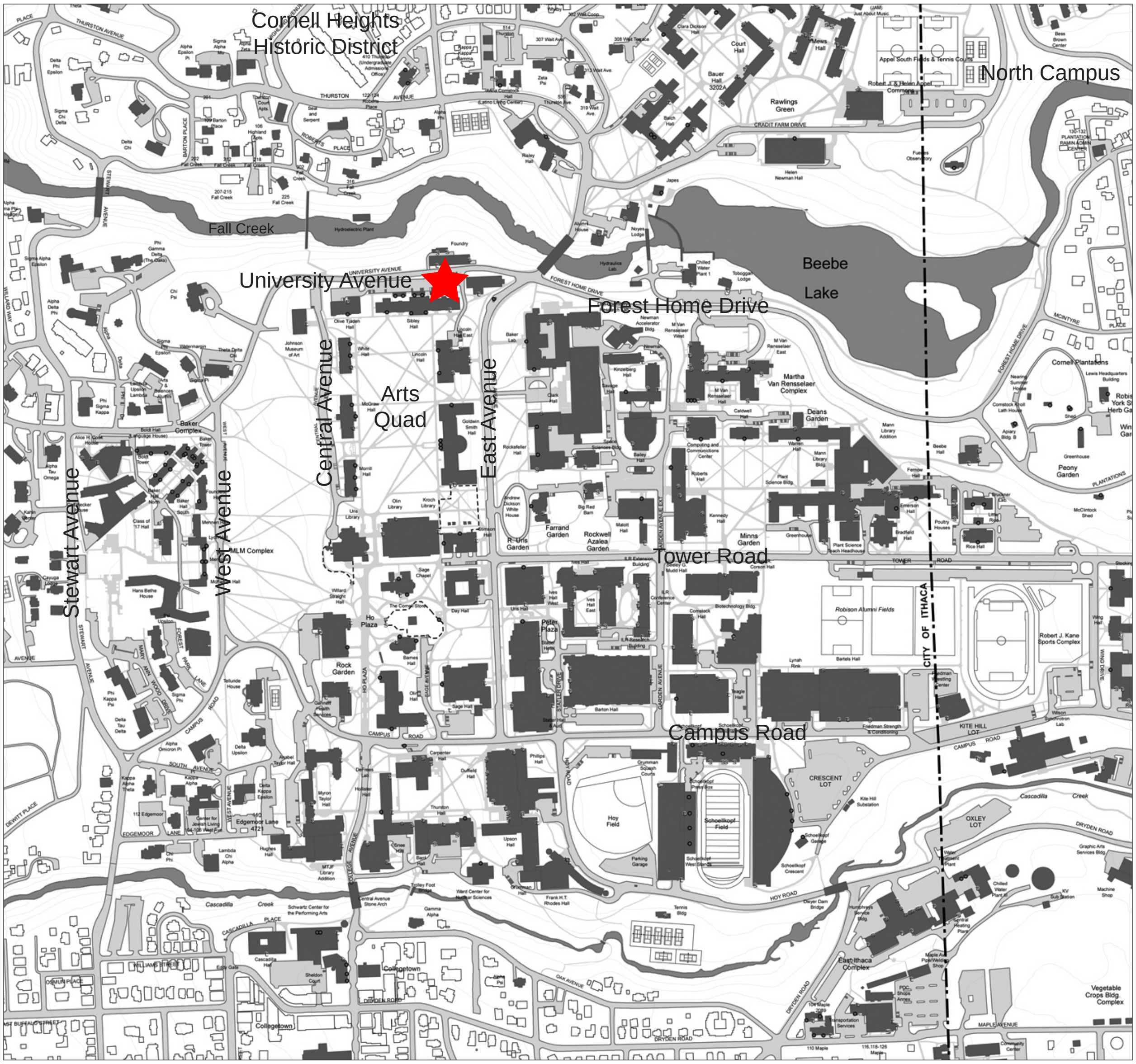


Figure 1.3.2: Project location in context with Cornell University.

LEGEND

★ Project Location

⬆ North

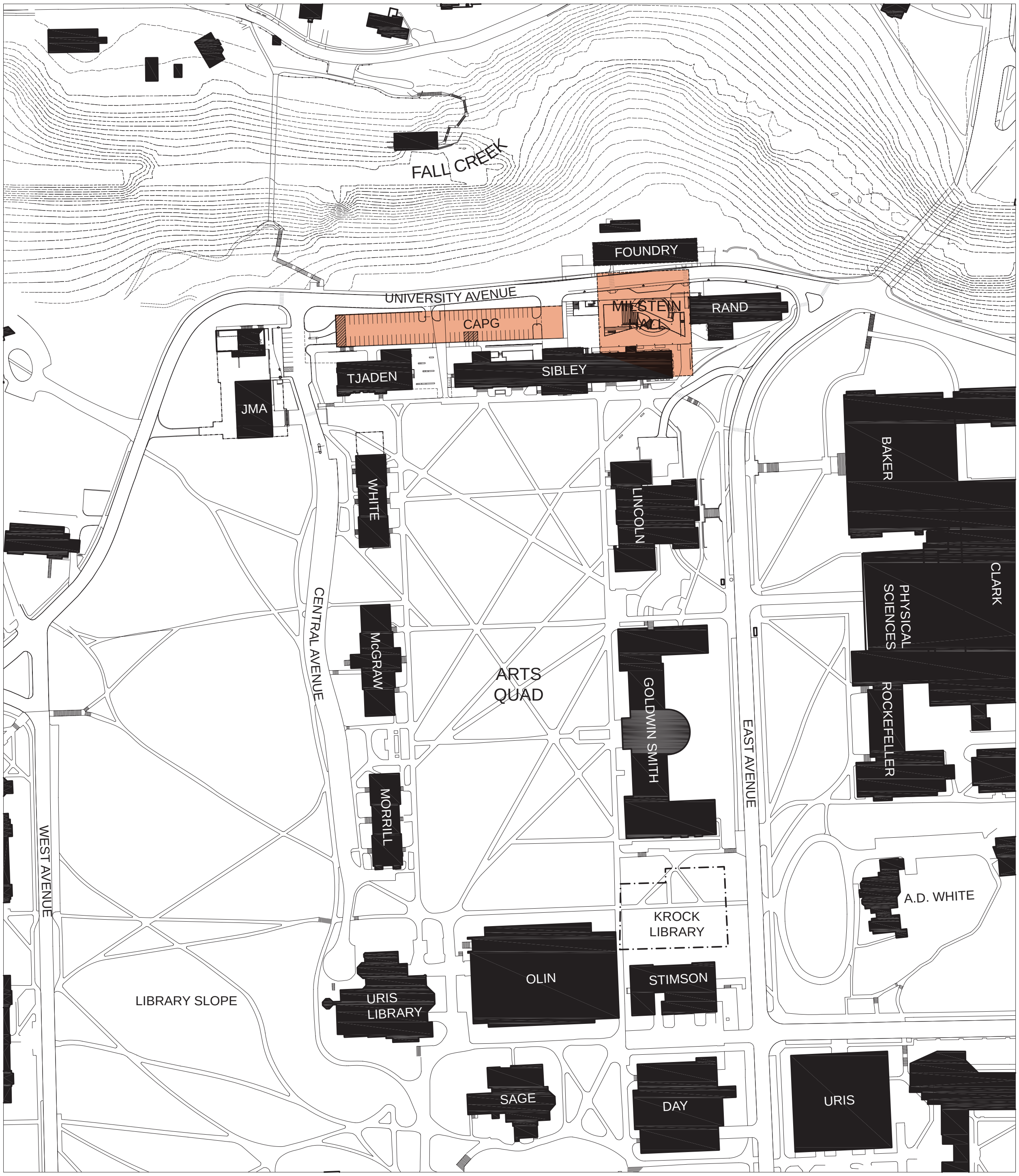


Figure 1.3.3: Project locations in context with the Arts Quad.

LEGEND

🟧 Proposed Buildings

⬛ Existing Building or Approved for Construction

↑ North

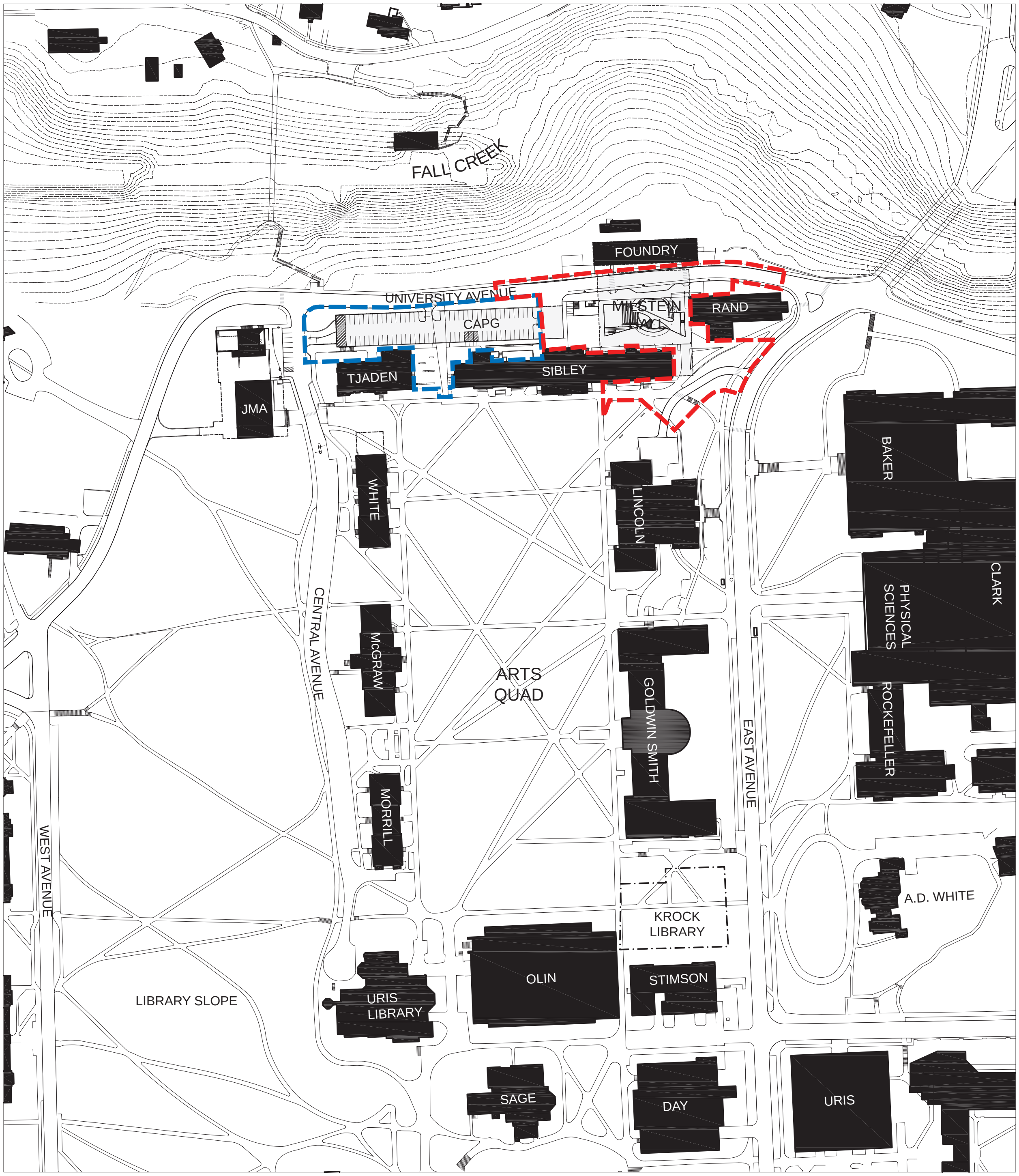


Figure 1.3.4: Approximate project boundaries.

LEGEND

🟥 Milstein Hall Project Boundary

🟦 CAPG Project Boundary

↑ North

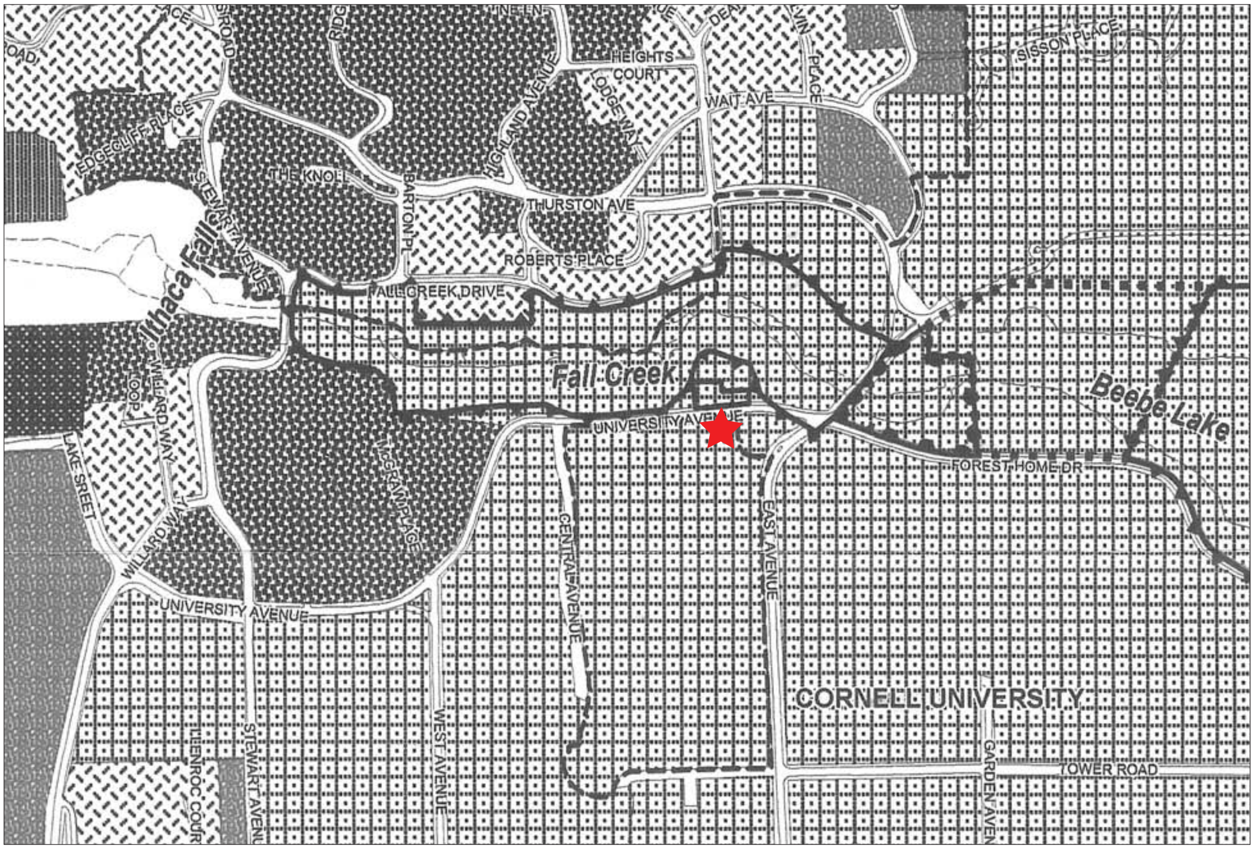


Figure 1.3.5: City of Ithaca Zoning Map, 2003.

LEGEND

▨ R-2a Residential

▨ R-3a Residential

▨ R-U Residential

▦ U-1 University

▭ GP-A Gorge Protection Zone (No-build; trails and trail amenities <15' allowed)

⬚ GP-B Gorge Protection Zone (Max 50' height allowed)

▭ GP-C Gorge Protection Zone (Max 75' height allowed)

⬚ Historic District

★ Project Location

⇧ North

Note: These zoning districts are located within
1/4 mile radius of the project location.

Figure 1.3.6: Property ownership diagram.

LEGEND

—··—·· Property Line

🟩 Campus Property (small portions ground-leased to third parties)

⬛ Campus Building

🟨 Campus Roads

⬆ North

1.4 Architectural Design

1.4.1 Paul Milstein Hall

The architectural design of Milstein Hall plays a significant and important role in the educational purpose and program of the building.

As then-AAP Dean Mohsen Mostafavi said in March, 2007:

> The College of AAP has a very special opportunity to commission an architect to design a building for the college. This is an opportunity that arises rarely, perhaps once in a century, as is indeed the case here. This building should:
>
> - Nurture the discovery- and teamwork-based ways in which architects, artists, and planners are now being educated;
> - Strengthen collaborative research and interactions among the faculty of separate departments of AAP as well as the university; and
> - Be a remarkable work of architecture itself, which enables this vision and interacts respectfully and honestly with its historic surroundings.
>
> As AAP is a college of architecture, art, and planning, it has taken this opportunity very seriously. Students are expected to complete their Cornell education with a superbly tuned sense of the visual and physical world that they live in and will themselves influence, adding an extraordinary dimension to the responsibility. The opportunity will only have been well used if a space is built that is not only **for** the educational program, but also **of** the program; a building that will not only be **for** a purpose, but integral to the very educational experience itself.
>
> With this vision for AAP, the university engaged one of the world's most original and influential architects, Rem Koolhaas of the Netherlands. His buildings are found on virtually every continent and avidly studied by architectural students and historians for their landmark status. The architectural design for Milstein Hall is presented here. (*End of quote.)*

Figure 1.4.1: Visual simulation of Milstein Hall, looking east.

Concept

Cornell's College of AAP is currently confined to linear, compartmentalized corridor buildings that limit the potential for connection or collegiality within and among different departments and programs. The departments of AAP are essentially isolated in four separate buildings. The Art Department is housed in Tjaden Hall and the Foundry, the Planning Department occupies Sibley West, while the Architecture Department lies primarily in Sibley East and in Rand Hall. The Fine Arts Library, together with the Dean's office and the Hartell Gallery, is in the central domed portion of Sibley Hall, effectively keeping the east and west wings of Sibley apart. The addition of Milstein Hall will help to bridge these territorial boundaries, create a new cultural heart of the college, and promote innovative ways of teaching.

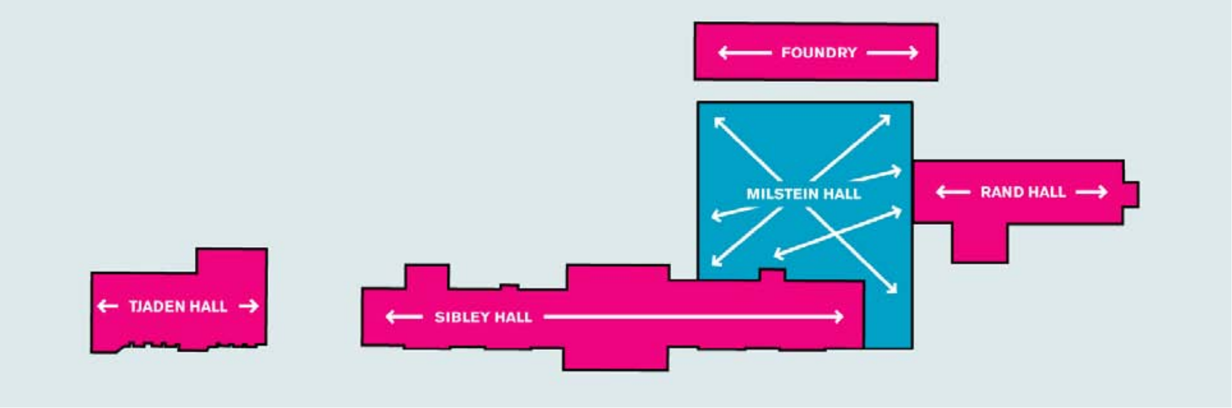


Figure 1.4.2: College integration diagram.

The proposed design consists of an elevated second floor that provides much-needed flexible contiguous studio space for the AAP and internal connections to Sibley and Rand halls. The structure is artfully cantilevered on the north side and southeast corner. The space underneath it is left open to form a pedestrian plaza that provides outdoor gathering and exhibition space protected from the elements, a new entrance at the southeast corner, and a sheltered pedestrian connection to the sculpture studios located in the Foundry. A concrete dome in the center provides the incline for the auditorium seating, supports a generous, inviting stair to the second floor studio space, and creates a domed ceiling to the crit space below. Existing site circulation patterns at ground level are maintained and enhanced by this openness.

In the sub-basement underneath the plaza is an auditorium, exhibition space and crit area. The crit area, located under the dome, is an area where student projects are pinned up on walls and critiqued by professors and invited professionals in a group audience, so that everyone can learn from the "crit."

Figure 1.4.3: Photo of student crit session.

Design Features

Milstein Hall serves the daily activities of the architecture, art and planning studio environment, a blend of physical and digital creative work.

The following are several design features incorporated into the design of Milstein Hall:

- Upper Plate (Second Floor)
- College Forum
- Cantilever
- Dome
- Auditorium
- Sunken Garden
- Elevator
- Work Area and Pod Seating
- Garage Interface
- Exterior Materials and Finishes
- Green Roof

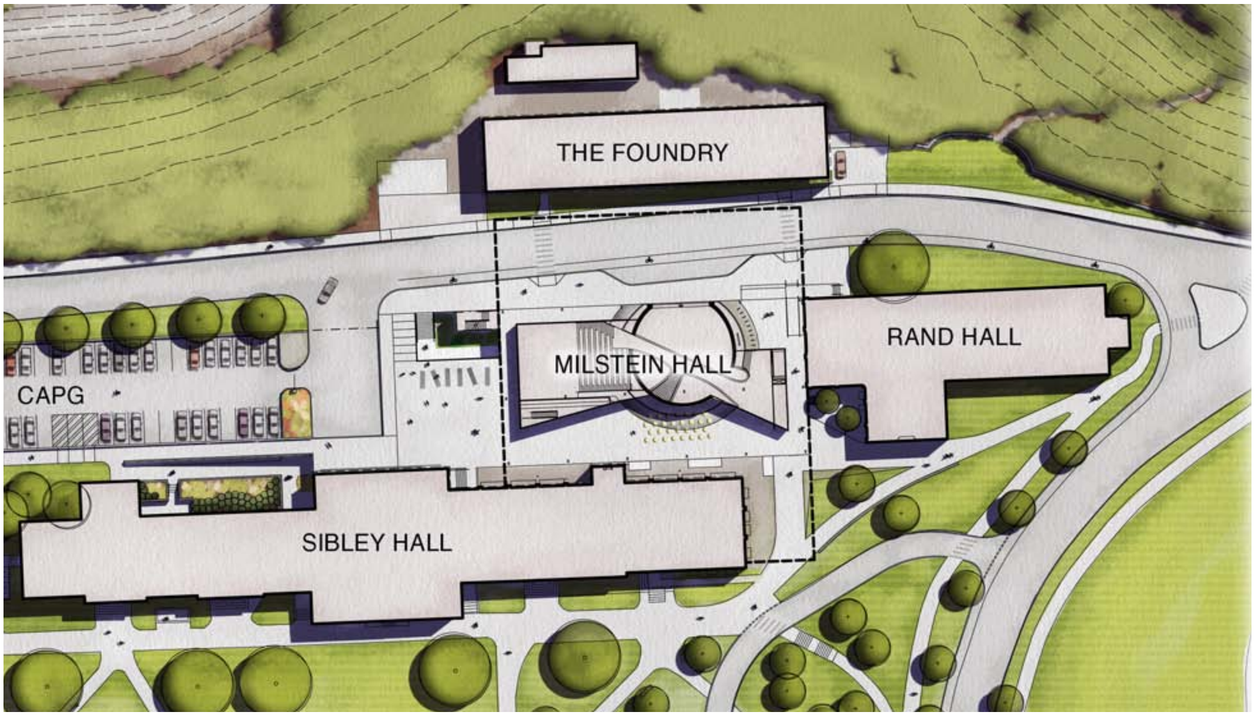


Figure 1.4.4: Illustrated site plan, Milstein Hall.

Current project information, images and updates can be found at http://www.milsteinhall.org. Information has also been on the College of AAP website since the early stages of design.

Upper Plate (Second Floor):

The upper plate provides a large flexible space for studios that are conducive to improvisational interaction among the AAP programs. A variety of zones within the upper plate supports the college's physical and programmatic vision for innovative and collaborative learning:

- AAP Forum
- Flexible studio modules
- Pin up/Crit
- Seminar
- Research
- Technology bar
- Study
- Lounge

Figure 1.4.5: View of upper plate studio space.

Figure 1.4.6: Model view of Milstein Hall's second floor, looking south.

College Forum:

The college forum is a signature gallery for collaboration and exhibition that showcases student and faculty work. It is given a distinct location on the south end of the upper level of Milstein Hall. The configuration of the AAP Forum reinforces the concept of the building as a connector. The library housed on the second floor of Sibley Hall has a direct connection to the Forum, expanding on the use of this space by serving the library with a much needed meeting and lecture room. By extending two trusses, the Forum cantilevers south, marking and creating a covered entry from the pedestrian approach to the Arts Quad. Approaching Milstein Hall from the Thurston Avenue Bridge intersection, the Forum counter-balances the cantilever over University Avenue.

Figure 1.4.7: Model view of Milstein Hall's forum.

Figure 1.4.8: Visual simulation of Milstein Hall's forum.

Cantilever:

In addition to the cantilevered Forum on the south side of the building, the second floor of Milstein Hall also cantilevers over University Avenue. Five exposed structural steel trusses in the second floor of Milstein Hall support the cantilever. To balance the need of open flexible space and the structural demands of a cantilever, an innovative structural design was engineered. The solution was derived by optimizing the diagonal truss members to correspond to the stress diagram over the length of the truss. The result created a hybrid truss where steel members are more diagonal at the highest stress forces (over the cantilever) and gradually become vertical as the stress forces diminish near the center of the floor plan. In its own right, the hybrid truss becomes a laboratory for teaching architects structural design concepts.

Figure 1.4.9: Section of Milstein Hall, looking east.

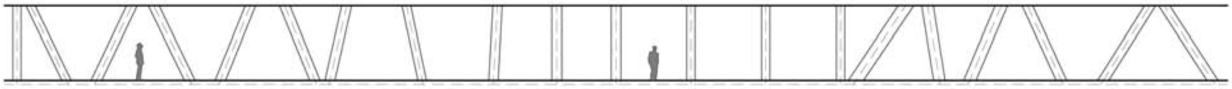


Figure 1.4.10: Section of Milstein Hall's hybrid truss system.

Dome:

The dome below the upper floor of Milstein Hall is a simple uplifting of the exterior plaza surface that connects the upper and lower floors. The exterior of the dome becomes an inhabited surface for public activities. Auditorium seating is located on the west side of the dome, a generous and inviting stair from the lobby to the upper floor on the east side, and a group of fixed seating pods for outdoor meetings on the south side. The double-height space in the lower level, created under the dome, is the center of Milstein Hall, a multi-use space for students and faculty. A glass facade on the north side provides a glimpse into the world of AAP from the sidewalk along University Avenue.

Figure 1.4.11: View of dome from the sidewalk along University Avenue.

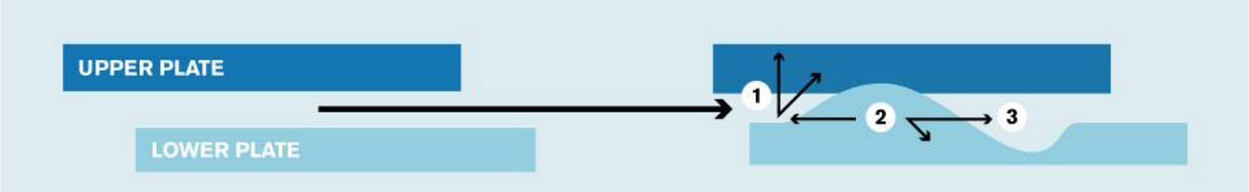


Figure 1.4.12: Diagrammatic section of Milstein Hall. 1. Indicates studio space, 2. Indicates the dome, 3. Indicates the auditorium.

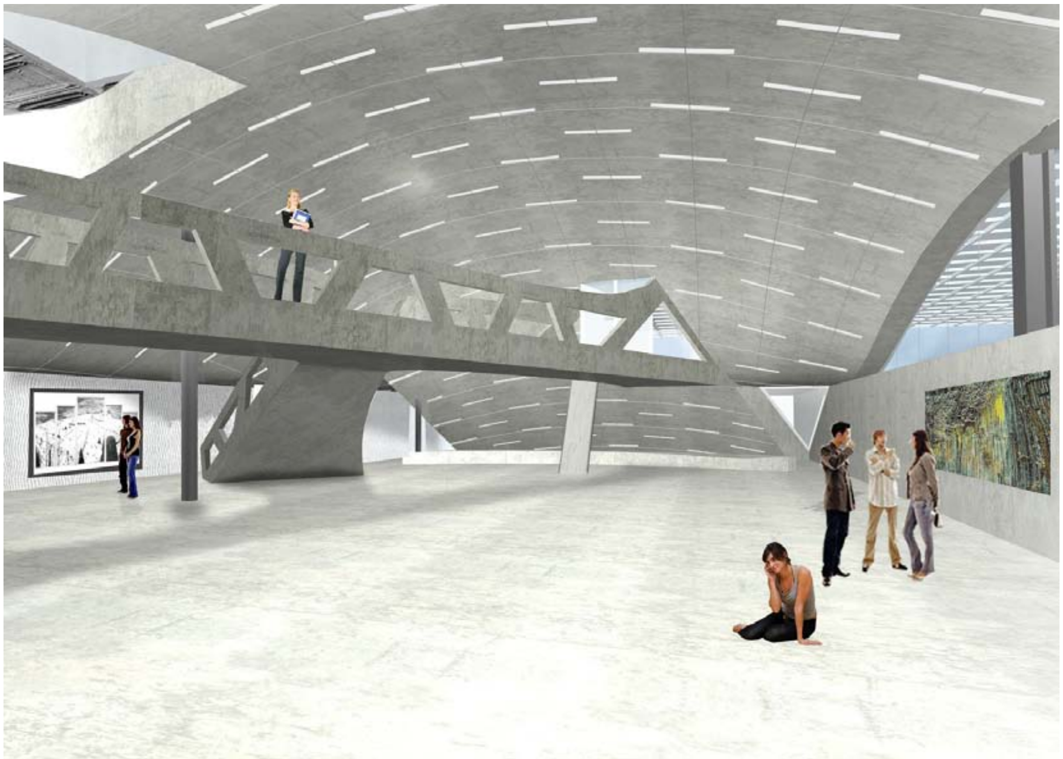


Figure 1.4.13: View of interior dome space.

Auditorium:

Figure 1.4.14: View of the auditorium with the curtains drawn across the glass facades.

The open configuration auditorium is located on the west side of the dome. The presentation area of the auditorium is sunken into the ground at the basement level. The remainder of the auditorium is surrounded on three sides by glass walls that maintain views to the surrounding buildings. It seats 275 and is ADA-accessible.

The auditorium is configured with several roll down screens and projectors, and a flexible sound and voice enhancement system to accommodate the advanced multimedia presentations that are becoming the norm at the college. An interior balcony located on the south side provides space for additional seating and adds to the dynamic nature of the auditorium. Full-height curtains can be drawn across the glass wall during lectures and presentations to darken the room and provide acoustical dampening. When the curtains are open a sliding panel opens up to views of the sunken garden at the west end behind the podium. Fixed seating is located on the incline of the dome while the flat area to the west of the dome has flexible seating. This flat area can also be isolated with large curtains and utilized as a classroom, crit room, exhibition space, or board room.

Figure 1.4.15: View of the auditorium with the curtains open, revealing views to the exterior.

Figure 1.4.16: Bird's-eye view of sunken garden and plaza.

Sunken Garden:

The sunken garden is located on the west side of the auditorium and on the north side of the exhibition space on the lower level. It can be viewed internally from these spaces, and also by pedestrians on the plaza above and from the sidewalk along the south side of University Avenue. It is planted with sumac trees and local grasses, filtering light into the exhibition space and auditorium. An ivy-covered stair tower rises from the garden and connects the underground parking level with the street and Milstein Hall.

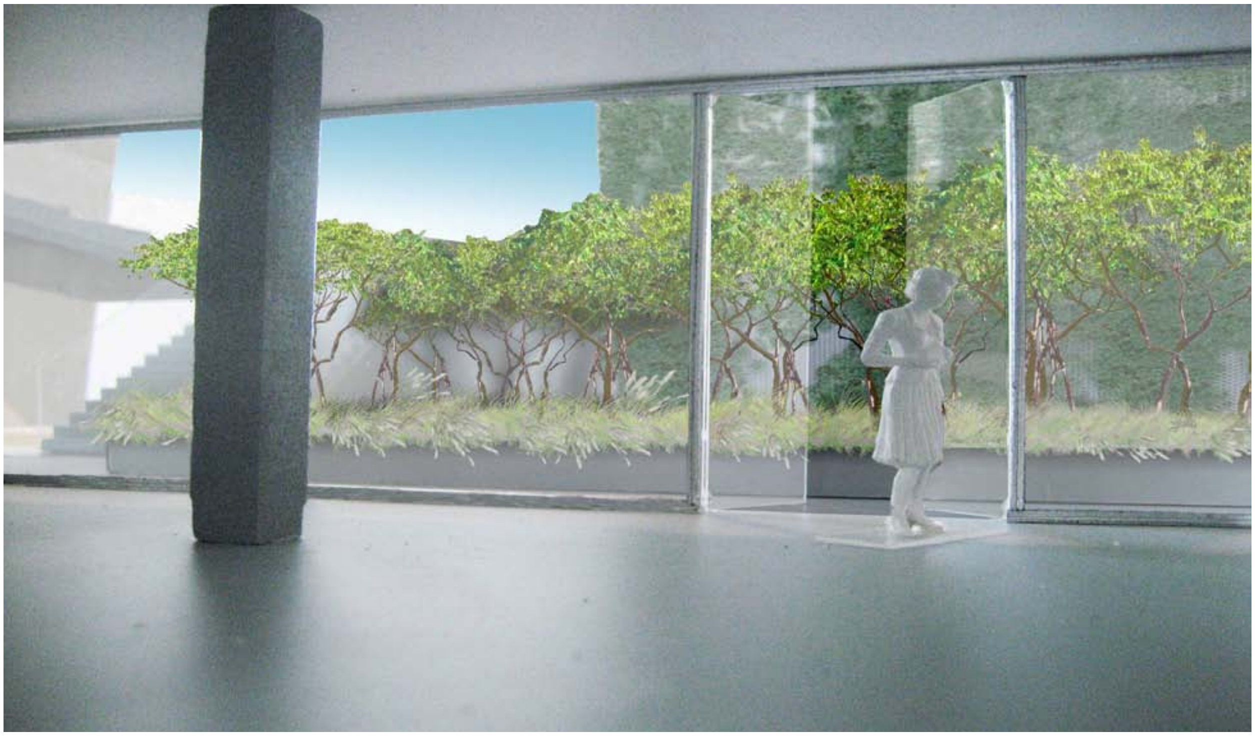


Figure 1.4.17: View of the sunken garden as viewed from the interior, lower level space of Milstein Hall.

Elevator:

An elevator is typically an enclosed, functional box that becomes an invisible element within a building. The Milstein Hall elevator is a three-sided glass room within a glass-enclosed shaft. It will be visible and dynamic. The six foot by 12 foot cab is fitted with a chair and lamp to create a room-like condition, yet it is big enough to transport large models, drawings and equipment between the studios and the lower level dome and exhibition space.

Figure 1.4.18: View of the elevator.

Work Area and Pod Seating:

Two programmed outdoor spaces between Milstein and Sibley Hall expand on the new building's interior facilities. A workspace fitted with tables attached to an embedded track creates a unique opportunity for the creative work of the college to spill outdoors. The track and connected worktables extend from the covered area to the open air plaza to the west; maximum flexibility and function capitalize on the building's unconventional design.

Seating pods situated on the south of the concrete dome add a public urban quality to the covered space. The translucent seating pods invite informal gathering during times when the space is not used for outdoor teaching. The pods are lit from within, adding a sense of warmth, surprise and ambiance to the covered space.

Figure 1.4.19: View of pod seating.

Figure 1.4.20: View of the work area with pod seating in the background, looking east.

Garage Interface:

The plaza on the north side of the Sibley dome, between Milstein Hall and the CAPG, acts as a knuckle coordinating pedestrian circulation and vehicular circulation between Milstein Hall and the CAPG. At grade, pedestrian paths connect the Milstein Hall with the surrounding sidewalk network. They are separated from the driveway entrance to the CAPG and drop-off area. Below grade, this knuckle provides internal connections between the CAPG and Milstein Hall, the CAPG and Sibley Hall, and University Avenue and the Green Dragon Cafe. The sunken garden and exhibition space are located at the interface and enhance these entrances. Garage patrons glimpse the exhibition space through a round window as they enter Milstein from the garage.

Figure 1.4.21: Model view of garage interface, plaza and exterior work space.

Figure 1.4.22: View of the garage interface. The surface level has been removed in this image to show the lower-level connections below grade.

Exterior Materials and Finishes:

Milstein Hall's materials and finishes are expressive of its construction. They are robust and economical. The materials in the upper level are predominantly exposed steel and floor-to-ceiling glass facades. The lower level is constructed of exposed concrete. The upper and lower levels create two different material environments expressive of Milstein Hall's structure and form.

White and grey striated marble frame the top and bottom of the second floor glass facade. The marble sets Milstein Hall apart from the stone and yellow brick of Sibley Hall, and the brown brick of Rand Hall.

Four-foot square, pressed stainless steel panels line the underside of the entire second level. The panels located over University Avenue are sound absorbing to dampen street noise as heard from the pedestrian plaza and surrounding buildings.

Physically, Milstein Hall is a connector between a unique site and existing conditions. In form and materiality, it is a building of its own time.

Figure 1.4.23: View of exterior materials and finishes.

Figure 1.4.24: View of Milstein Hall's exterior materials, including the cantilever and dome features.

Green Roof:

The roof of Milstein Hall is considered another façade of the building, reinforcing the concept of the building as a connector. The entire roof, with the exception of the skylights, is vegetated in a graphic pattern of two types of sedum plantings. The sedum "dots" gradually increase in diameter as they approach the gorge, creating a landscape that is orderly and structured nearest the Arts Quad, and a denser, less structured field as it reaches the gorge.

Given the visibility of the roof from the third floor of Sibley Hall, and from Rand Hall and Baker Lab to the east, a vegetated roof creates a varied, living landscape far more appealing than a ballast roof, and also absorbs water rather than channeling it to the existing stormwater system.

Figure 1.4.25: Visual simulation of Milstein Hall's green roof, looking west from Baker Laboratory.

Three sizes of skylights are arranged in a radial pattern on the roof with the larger ones at the center and smaller ones toward the perimeter of the building. This creates consistent natural light levels across the entire second floor studio space.

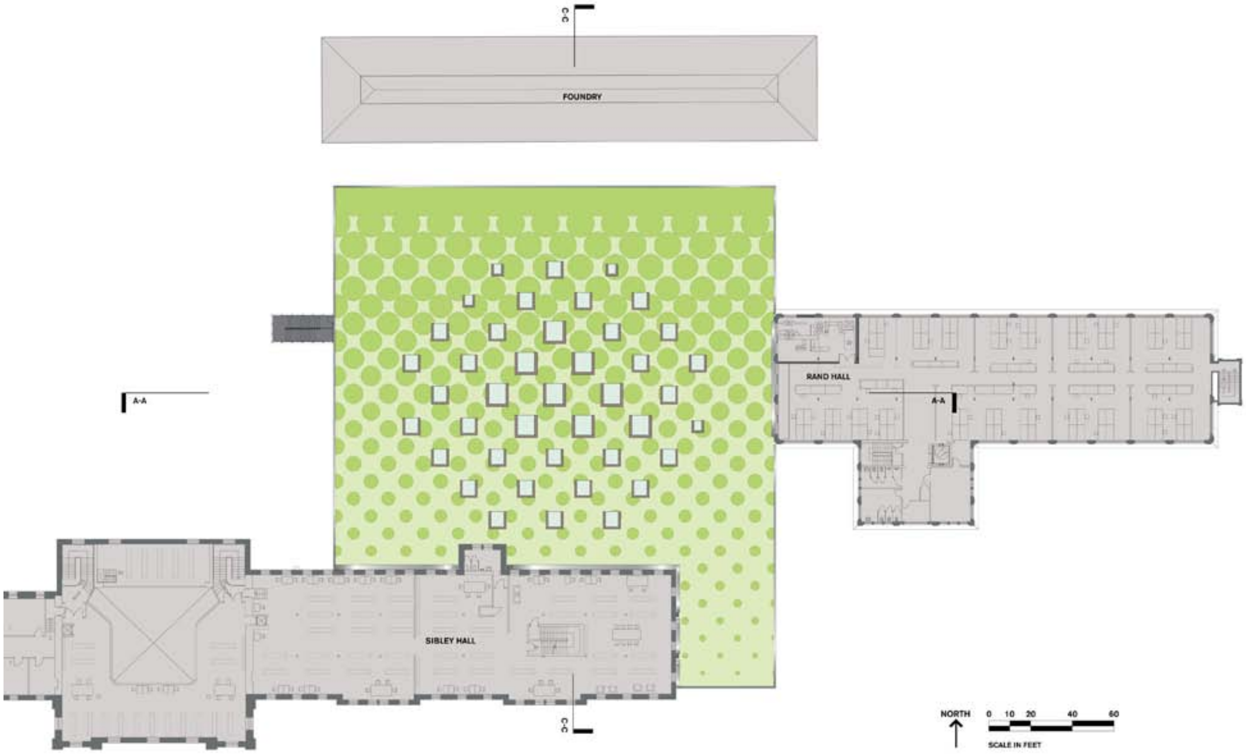


Figure 1.4.26: Plan view of Milstein Hall's green roof.

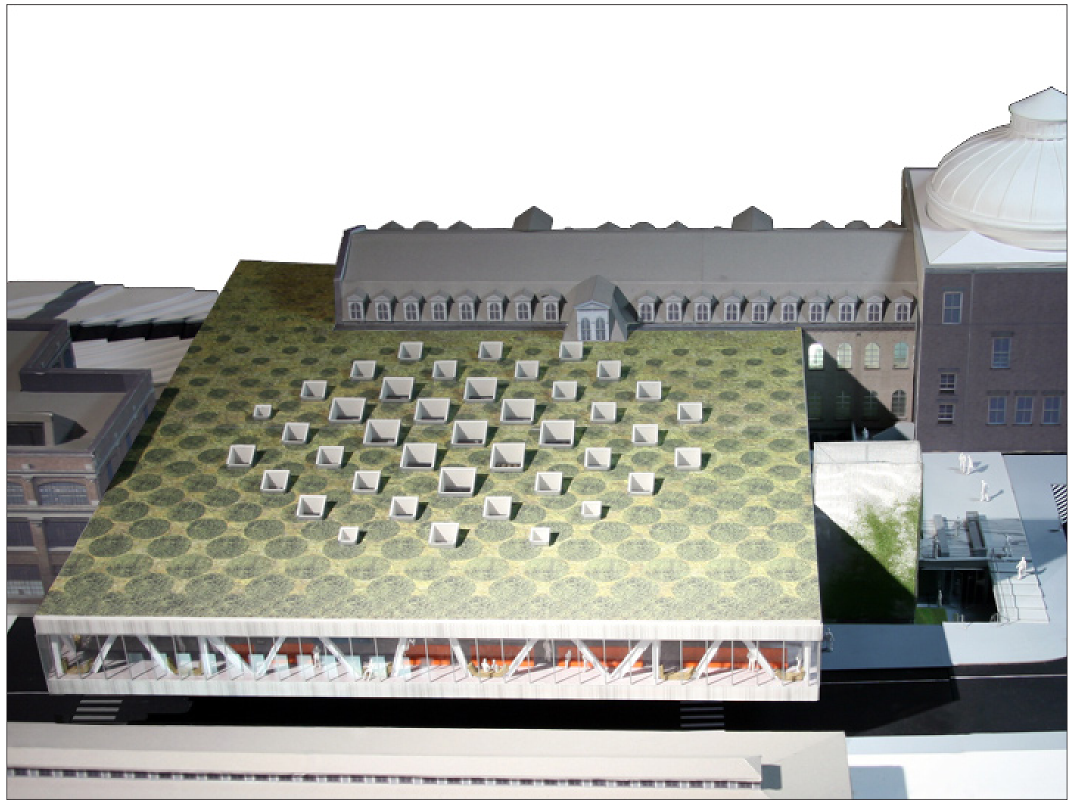


Figure 1.4.27: Model view of Milstein Hall's green roof, looking south.

Figure 1.4.28: Model view of Milstein Hall's second floor, looking south.

Figure 1.4.29: Model view of Milstein Hall's first floor/ground floor, looking south.

Figure 1.4.30: Model view of Milstein Hall's lower level/basement level, looking south.

1.4.2 Central Avenue Parking Garage

Concept

The Central Avenue Parking Garage (CAPG) is proposed for the western portion of the existing surface parking lot north of Sibley Hall and Tjaden Hall, west of Milstein Hall. The area available for the new garage is bordered on the north by University Avenue and on the south by Tjaden and Sibley halls. The parking garage will consist of a three level, 199 space vehicular parking structure. It will replace the existing parking lot with a surface level parking deck and two sub-surface parking levels. The aesthetic intent for the garage is to minimize its visual impact to the extent possible so that Sibley Hall, Tjaden Hall and the new Milstein Hall project remain unobstructed. Please see Figures 1.4.31 - 1.4.36 for illustrated, schematic landscape plans and perspective sketches. See Figures 1.4.37 - 1.4.41 for schematic plans and section views of the CAPG. For photographic visual simulations, please see Section 2.5, Aesthetic Resources.

Site Work

Site work associated with the garage structure includes changes to grading, landscaping, site lighting and pedestrian circulation. The work will be contained entirely within the boundaries of the existing curb lines for University Avenue and Central Avenue, with the exception of a small amount of pavement and curb work necessary to accommodate the new entries and exits for the garage. A bicycle lane along University Avenue is not included as part of the design. It would have to be designed as part of a reconstruction project for the section of University Avenue west of Milstein Hall.

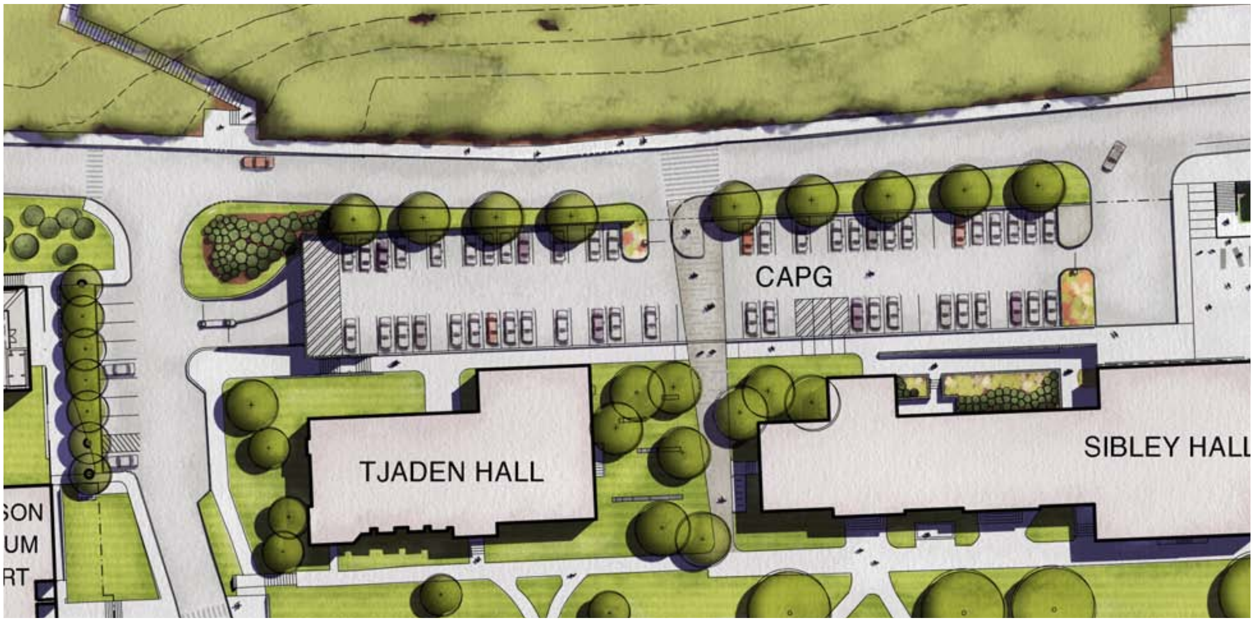


Figure 1.4.31: Illustrated site plan, surface level of the CAPG.

Vehicular Circulation

There are three points of vehicular access to the proposed facility. At grade level the site will work much like it has in the past with a separate gated vehicular entry and exit by way of University Avenue. Vehicles will enter the surface deck of the garage from University Avenue on the east side of the site and will exit at the center of the site back onto University Avenue. Vehicular access to the two lower levels will be from the west by way of Central Avenue. Deliveries and trash removal for Sibley, Tjaden and Milstein halls will be in designated areas within the surface deck of the parking garage.

Figure 1.4.32: Schematic perspective view, University Avenue looking west.

Figure 1.4.33: Schematic perspective view, University Avenue looking east.

<u>Pedestrian Circulation</u>

An accessible pedestrian route will link the east and west ends of the garage, providing a continuous path between Milstein Hall and Tjaden Hall. A set of stairs will continue along the sidewalk axis, connecting Tjaden Hall to the Johnson Museum of Art. This new pedestrian walkway from Central Avenue to Milstein Hall will be built along the southern edge of the parking garage. The walkway will act as a connector encouraging movement between Milstein Plaza, Sibley and Tjaden halls, and the entrance to the Johnson Museum of Art. An accessible route alongside the pedestrian walkway will connect Milstein Hall's lower level to the underground parking levels.

An additional walk that crosses the garage, running north to south, connects the Arts Quad to the sidewalk along the north side of University Avenue.

Accessible parking spaces are provided on the top level of the garage with access to the sidewalk. The walk includes an accessible route from parking to Milstein Hall, Tjaden Hall, the Arts Quad, and the basement door in Sibley Hall. Accessible spaces on the first below grade level will provide access to the lower levels of Sibley and Milstein Halls. As part of the Sibley ADA project, a new elevator will be located inside the building at this entrance.

Figure 1.4.34: Schematic perspective view looking south, pedestrian walkway leading toward Arts Quad.

Grading

The majority of the grades on-site will follow existing grades. The top level of the garage is at roughly the same elevation as the existing surface parking lot. At the western-most edge of the garage, grades are elevated slightly. Berming against the garage wall and planting is included to mitigate the visual height of the garage wall.

Along the north wall of the west wing of Sibley, where the basement doors exit the building, the grades against the building face will be lowered. Foundation underpinning and retaining walls are planned in these locations.

Figure 1.4.35: Schematic perspective view, CAPG, pedestrian connections to Sibley Hall basement and Milstein Hall.

Landscaping

Landscape plans include a tree lawn between the garage and University Avenue and a planted berm at the northwest corner of the garage. Two small sections of green roof are proposed on the roof of the garage, in order to provide some green space in the paved areas.

Low shrubs and sedums are proposed to fill the retaining wall areas against the lower entrances to Sibley Hall. To mitigate the blank face of the concrete retaining wall between the lower entries and the sidewalk at garage deck level, vines will be established along the wall.

Between Tjaden and Sibley halls, a tree-and-lawn campus landscape will be re-established. The existing gravel garden in this location will be replaced by quarry block stone seat walls. This area can be used as a gathering location, seating area and a place for outdoor sculpture. The stone walls will be cut and set in accordance with the golden rectangle (Fibonacci series). As a mathematically structured outdoor piece, made of solid stone, the walls are intended to subtly illustrate the tension between the tree-and-lawn campus and the natural gorge beyond.

Figure 1.4.36: Schematic bird's-eye view looking north, landscape space between Tjaden and Sibley halls and surface level parking.

Site Materials

The east-west pedestrian walkway is proposed as scored concrete. Concrete stairs with simple metal rails are included along this walk. Retaining walls necessary to hold grades against the stairs and ramps are recommended to be concrete as well. The north-south pedestrian walk (and crosswalk) from the Arts Quad to the gorge is proposed as unit pavers. A light gray, smooth surface paver is suggested for the field of the walkway. Dark gray and charcoal pavers with a textured surface are suggested for the accents along the walk. The frequency of the accent pavers increases as one travels from the Arts Quad to the gorge, in recognition of the change in landscape condition from tidy campus quad to wooded, rocky, natural area.

Roadways and the garage surface are proposed as asphalt. Visually, this will lessen the garage's prominence on-site and separate it from the Milstein Plaza and surrounding sidewalks. Curbs on grade are proposed as granite.

Site lighting consists of dual-headed exterior fixtures to illuminate both the roadway and the parking area. Poles are replaced in approximately the same locations as the existing lighting.

Architectural Design Intent

The CAPG is designed to meet a number of practical and aesthetic criteria. Some of the more significant issues were to maintain and add parking spaces following the Milstein Hall project, maintain services to Tjaden and Sibley halls, and enhance circulation around and through the garage and neighboring sites. The design had to solve these issues and integrate the garage into a site that borders significant natural resources and existing buildings.

This scheme maximizes parking and minimizes the impact of the garage on the neighboring sites. For the most part, the grade level acts like is does today with little change in elevation, thereby minimizing the garage's impact. The garage at-grade will follow the natural slope of the site and University Avenue as it moves from a high point at the east end down towards Central Avenue. In order to access the lower levels, the west end of the garage is raised slightly, making the west end façade the most visible portion of the garage. Due to the difference in elevation at this end of the garage a wall or barrier is required to stop a car. A 24-inch high cast-in-place concrete wall, essentially an extension of the concrete structure below, is proposed with a metal railing system extended to 42 inches high to act as the required guard rail. The proposed finish for the exposed exterior concrete at the west end is a board-formed, cast-in-place concrete.

Defined Limits and Restrictions for the Facility

For vehicles entering the two lower levels, the height restriction will be 7'-4". Signage and clearance bars will be employed to notify people of these restrictions. The structure of the garage is designed to take the future loading for a three-story building (ground floor and two supported levels).

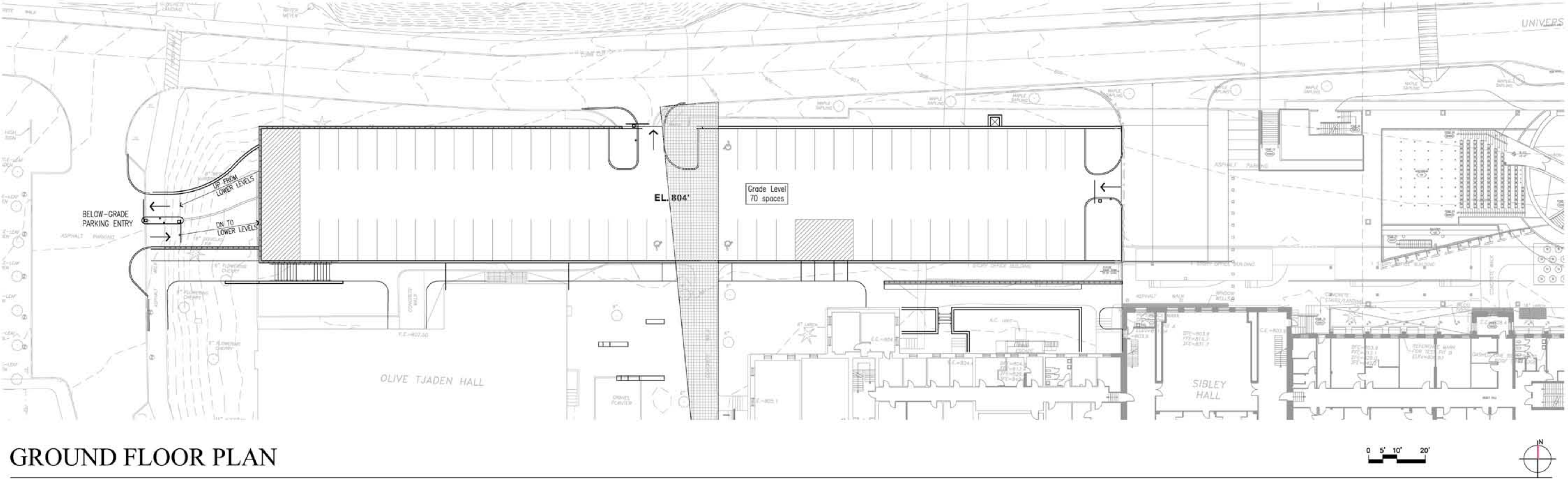
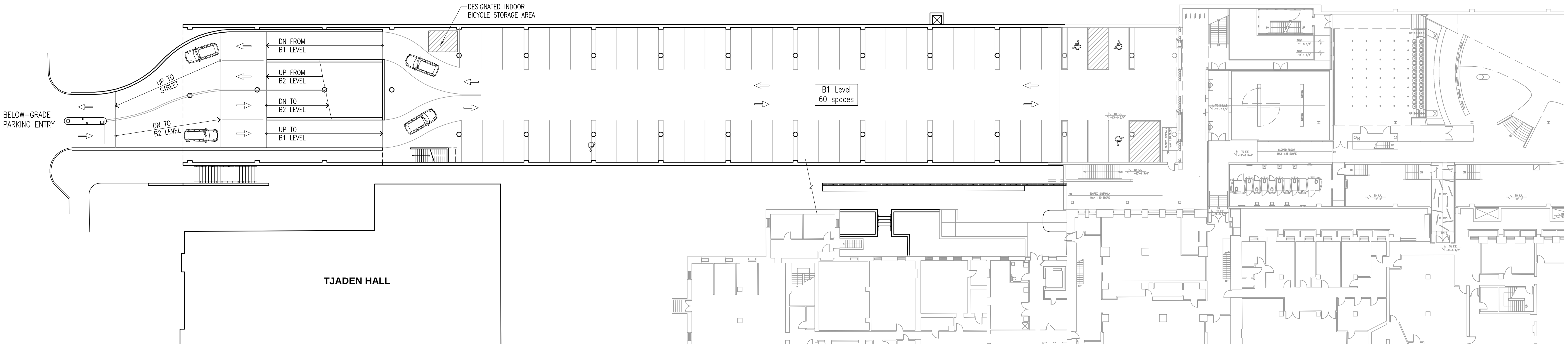
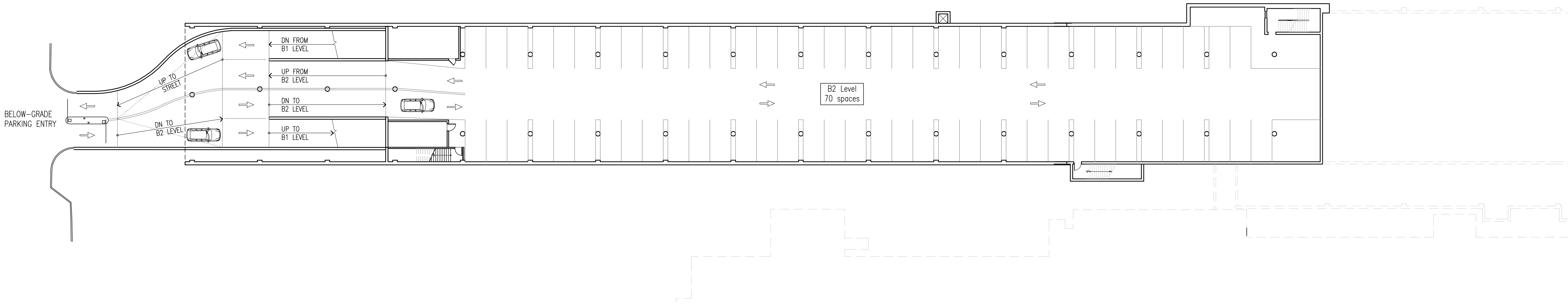


Figure 1.4.37: CAPG surface level (ground floor) plan.



B1 GARAGE LEVEL

Figure 1.4.38: Plan view for the first (B1) lower level of the CAPG.



B2 GARAGE LEVEL

Figure 1.4.39: Plan view for the second (B2) lower level of the CAPG.

Figure 1.4.40: Elevation of CAPG, looking south.

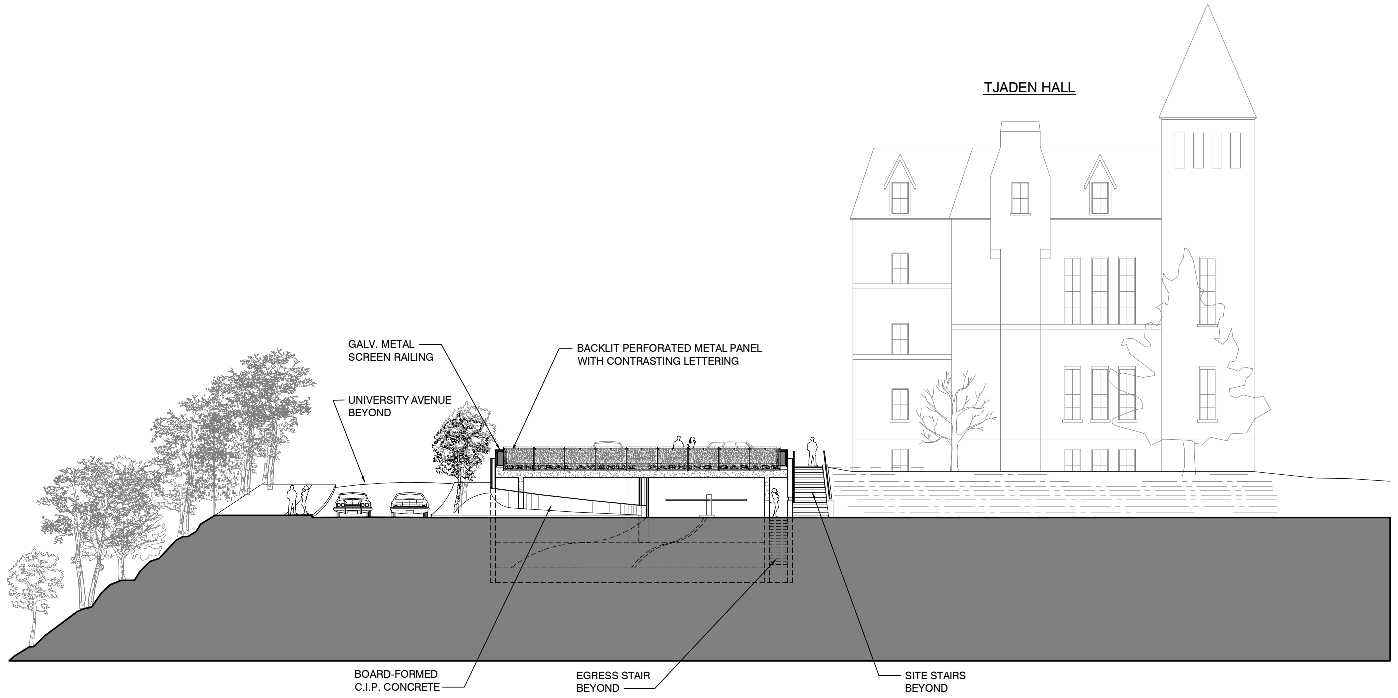


Figure 1.4.41: Elevation of CAPG, looking west.

1.5 Site Layout and Landscape Design

The proposal to develop the north side of Sibley Hall enhances existing campus space. The proposed site plan architecturally and visually engages the four separate AAP buildings (the Foundry, Rand Hall, Sibley Hall and Tjaden Hall). The site plan also enhances site circulation and safety, and provides landscape areas between the college's diverse buildings that connect two major but very different campus spaces, the Arts Quad and Fall Creek Gorge.

Milstein Hall and the CAPG are independent projects, each with their own design and consultant teams. The university engaged an additional consultant team to prepare an overall landscape design that cohesively integrates the two projects into the surrounding campus landscape.

The Milstein Hall project will remove the existing trailers, reconfigure the parking and service drives, and provide pedestrian circulation to the north of Sibley Hall. New site elements will include a covered bus shelter and bicycle parking area adjacent to University Avenue under the cantilevered portion of Milstein Hall, a new service access drive to Lincoln Hall from East Avenue, parking and service access to the north of Sibley Hall from University Avenue, new ADA-compliant walkways and new landscaping throughout. University Avenue will be widened and regraded within the Milstein Hall project boundary in order to accommodate a new east-bound bicycle lane and bus pull-off.

The CAPG will provide 199 parking spaces in three levels of parking: one surface level and two underground levels immediately to the west of Milstein Hall. Vehicular access to the surface parking level and delivery/service area will be from University Avenue. The below-grade levels will incorporate an interior ramp and merge area which will be accessed from Central Avenue.

The project site master plan and conceptual landscape design proposes three major site moves: redirection of pedestrian traffic from University Avenue to the Arts Quad; clarification of east-west circulation; and creation of discrete landscape spaces that give character and purpose to the area.

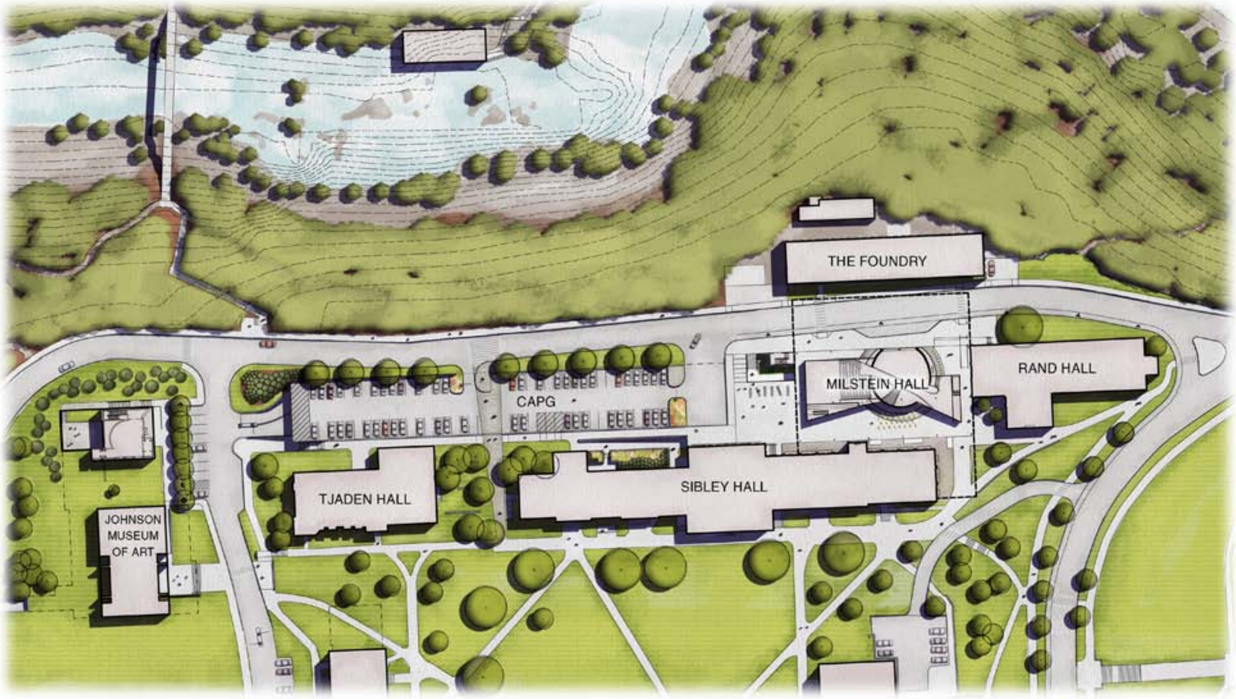


Figure 1.5.1: Illustrated site plan, Milstein Hall and the CAPG.

1.5.1 University Avenue Streetscape

University Avenue is a vehicular east-west circulation route. Site improvements will be made between East and Central avenues as part of the overall landscape design (see Figure 1.5.1, Illustrated Site Plan).

The sidewalk north of University Avenue will remain in its current location. Within the Milstein Hall project limit line, University Avenue will be widened three feet southward for a proposed east-bound bicycle lane. The resulting road will provide two vehicular driving lanes eleven feet wide and one five foot bicycle lane on the south side of the road. The space between the south curb of University Avenue and the north side of the CAPG will be landscaped to soften its edge.

The suspension bridge over Fall Creek is one of three major pedestrian crossings from north campus. At present, crossing the gorge on the suspension bridge – a dramatic experience – leads to an unremarkable entry to central campus from which the Arts Quad is hidden. It currently consists of a small crosswalk from the north side of University Avenue to a narrow sidewalk adjacent to Central Avenue. A new circulation path and crosswalk will direct pedestrians to the Arts Quad, at a high point where the length of the Arts Quad will visually draw the pedestrian into its heart.

Bold surface treatment will designate the University Avenue crosswalk as the primary pedestrian entrance to the Arts Quad from the suspension bridge. This crosswalk will lead pedestrians to a walkway across the surface level of the CAPG, through a landscaped space between Tjaden and Sibley halls, and onto the northern edge of the Arts Quad.

A crosswalk, smaller but nonetheless prominent, will connect the main entrance of the Foundry to the open area and bus stop under the cantilever of Milstein Hall. A second crosswalk will connect the east side of the Foundry to the covered walkway between Rand and Milstein halls, providing direct pedestrian access to lobby of Milstein Hall and the Arts Quad.

1.5.2 Landscape Connections to Central Avenue

A new sidewalk located on the south side of the parking garage will serve as the primary east-west pedestrian circulation route linking East Avenue, Rand Hall, Milstein Hall, Sibley Hall and Tjaden Hall, to the CAPG, Central Avenue and the Johnson Museum of Art. From ground level on Central Avenue and the Johnson Museum of Art, a set of stairs with narrow ramp for wheeling a bicycle, will allow pedestrians to navigate the change in grade. This circulation route will clarify and rationalize existing pedestrian movements within the area and sensibly connect to adjacent circulation patterns and other points on campus.

1.5.3 Landscape Corridor between Tjaden Hall and Sibley Hall

In 1993, the existing landscape area between Tjaden and Sibley halls was installed as a donation garden by AAP alumnae Frances B. Schloss. It is currently an open area consisting of ornamental trees and shrub plantings and a gravel area with seating. The landscape for this area will be renovated to be consistent with the overall landscape plans for Milstein Hall and the CAPG. The creation of a prominent pedestrian path, on-axis between Tjaden and Sibley halls, will strengthen the connection between the Arts Quad and the suspension bridge across Fall Creek Gorge. This decorative paver walkway will be complemented by quarry block seating walls, tree plantings and bicycle rack.

1.5.4 The Foundry

Roadway reconstruction and new sidewalks within the Milstein Hall project limit line will improve pedestrian and vehicular circulation along University Avenue in front of the Foundry as described previously. Since the Foundry was constructed, road improvements have resulted in a gradual raising of grades around the building. Grades at the base of the Foundry will be returned to lower elevations that better relate to the existing doors and building foundation.

1.5.5 Lincoln Hall Access Drive

The existing service drive to the north side of Lincoln Hall currently connects to University Avenue and crosses a major pedestrian corridor from the Thurston Avenue Bridge to the Arts Quad. It will be rebuilt to connect to East Avenue. The new configuration will separate pedestrians from vehicles to create a safer pedestrian environment. This drive will also provide fire truck access to the south side of Sibley Hall.

1.5.6 Exterior Spaces Under Milstein Hall

The cantilevered second level of Milstein Hall will create a unique exterior campus space. This covered area is intended to integrate the open space among the Foundry, Milstein Hall, Rand Hall, and Sibley Hall. The transparency of much of the wall of Milstein Hall at the plaza level will also allow a visual integration of the lobby and auditorium balcony with this exterior space. The covered area between East Sibley and Milstein halls will provide additional space for AAP exhibitions, performance, work, teaching and learning, while maintaining a continuity of pedestrian movement within and through the area. Ceiling-mounted lighting and the use of light-colored materials will provide appropriate levels of ambient light in this area. Sturdy work tables mounted on tracks will allow flexibility in configuring the space. Seating pods, built into the concrete dome will provide seating for small performances, presentations and discussion groups.

The covered space under Milstein Hall adjacent to University Avenue will accommodate a bus pull-off, generous pedestrian circulation space, an informal seating wall, and protected bicycle parking.

1.5.7 Milstein Plaza and Sunken Garden

Milstein Plaza, located to the north of Sibley Hall and west of Milstein Hall, will provide a new outdoor gathering space. This pedestrian plaza will provide views towards the greenery of the Fall Creek Gorge rim, and overlook a sunken garden at the base of the stair tower. Entrance to the lower level of Milstein Hall can be accessed from University Avenue via a stairway from this plaza to the sunken garden.

1.6 Design Process

The purpose of this section is to describe the internal design and approval process for Milstein Hall within Cornell University and the College of AAP.

As is typical with major campus buildings, the Milstein Hall project, designed by the Office for Metropolitan Architecture (OMA), has been through mandatory reviews and approvals by various stakeholders at Cornell University. Several groups and committees within the university and the College of AAP reviewed and/or approved each phase of the project. Authorization is required to proceed to the next phase.

University Process

A major construction proposal on campus for a particular college is usually initiated by the dean in consultation with the college's faculty. As the project develops, it is reviewed and/or approved by the following three university committees: Capital Funding and Priorities Committee (CF&PC), Buildings and Properties Committee of the Cornell University Board of Trustees (B&P), and the Architecture Advisory Committee. In addition, deans seek the advice and support of faculty, students, staff and of college alumni advisory councils. As described in detail below, the Milstein Hall and CAPG projects followed this process.

The **Capital Funding and Priorities Committee** is composed of the two highest-ranking officers of the university, the President and the Provost, together with several key Vice Presidents. One of its missions is to approve site selection and architectural design of every major capital project on campus and present them for approval to the Building and Properties Committee of the University's Board of Trustees. To date, the Milstein Hall design has been approved by this committee at each phase of the project: architect selection, site selection, conceptual design, schematic and design development phase. The CAPG project has followed the same process. The final phase, construction documents, is currently being prepared for both projects.

The **Buildings and Properties Committee** of the university's Board of Trustees is a key committee made up of trustees whose responsibility is to preserve and enhance the built environment on campus. It acts for the university Board of Trustees in building and property matters. Committee members have significant experience in the fields of architecture and construction. They review and approve the design at each phase. Milstein Hall and the CAPG have both been approved through the design development stage.

The **Architectural Advisory Committee** is an independent committee that advises the university president. It is composed of notable architects, landscape architects, planners, and architectural critics. Committee members review design plans for each major construction project on campus, and did so for Milstein Hall and the CAPG.

In addition, the university created the **Milstein and CAPG Executive Committee** to review the project designs. It is chaired by the Executive Vice President, and includes the Dean of AAP, Vice President for Facilities, Director of Transportation Services, Director of Planning, Design and Construction, the University Architect, and the Milstein Hall and CAPG project management team. This group meets regularly to review progress and make project decisions.

College Process

In addition to the university design review process, at the early stages of the project, the College of AAP established two key working groups to assist the dean: the **College Building Committee** and the **Building Advisory Committee**.

The **College Building Committee** is made up of the chairs of each department (Architecture, Art and Planning), the Dean, the Associate Dean and the Assistant Dean. This hands-on working group has met with the designers and project management team for regular updates throughout the design process. The committee gave input and made recommendations. This committee will continue to meet until the end of construction.

The **Building Advisory Committee** is comprised of approximately 20 faculty, staff and students drawn from all three departments of the College. The committee was formed to advise the Dean on Milstein Hall. They met regularly with the College Building Committee members and with OMA, the building architects, to review design plans and provide feedback to the Dean and the design team. While this group met regularly during the conceptual and design development phases, it now meets on an as-needed basis.

In addition, the College of AAP has a **College Advisory Council** that dates almost to the inception of the college, 40 years ago. The College Advisory Council is comprised of approximately 50 of Cornell's most prominent, interested, and engaged alumni from the fields of architecture, art and planning. It meets bi-annually, reviews reports about the college, and provides input on a wide range of topics critical to the overall mission of the college. The College Advisory Council has been engaged in the design process for Milstein Hall as well.

The committees and processes described above are representative of the highly-involved design and approvals process for all major projects on the Cornell campus. The combination of the Dean's leadership, with faculty, student and alumni involvement, support from the university administration, and ultimately the approval of the university's trustees, has resulted in the approval of this project.

Presentations

In the fall of 2006, Rem Koolhaas hosted a well-attended presentation of the design for Milstein Hall. Held in Bailey Hall, the presentation was open to the public.

Throughout the design process, the project model was often assembled for viewing in the Fine Arts Library (Sibley Hall). Presentations to faculty and staff were made at the conclusion of each design phase as well. The model remained on display for a month after each design phase was completed. In addition, continuously updated drawing sets were made available to the College of AAP faculty.

An open house was held on August 21, 2007 for the members of the City of Ithaca Landmarks Preservation Commission, Conservation Advisory Council, and the Planning Board. A second open house was held for members of the Board of Public Works on August 22, 2007. The purpose of these open houses was to introduce board members to the projects, familiarize them with the plans and scale model, and walk the project sites. Mohsen Mostafavi, Dean of AAP at the time, and Stan Taft, the current Interim Dean, were there to talk about Milstein Hall, answer questions, and receive feedback from board members.

Summary

While the ultimate decision to pursue a particular building design rests with the Cornell University Board of Trustees, Cornell always makes an effort to review the project with a wide range of interested parties throughout the design process. To engage the large number of stakeholders in Milstein Hall, over the past three years, literally hundreds of meetings have occurred within Cornell University and the College of AAP.

1.7 Program

1.7.1 Paul Milstein Hall

Milstein Hall has a very ambitious, mission-critical program. In the 1960s, the college organized itself in three of the four buildings it still calls home, as they were vacated by the College of Engineering. With very little renovation or upgrades to them since, AAP has grown in stature and in its need for space. It moved into the forth building, Rand Hall, in the 1970s. By the 1990s it was very apparent that the amount and quality of the facilities allotted per student were sub-standard. The National Architectural Accrediting Board (NAAB) reports also reflected a critical need for AAP to upgrade facilities in the Architecture Department for a variety of needs, particularly for crit space and other spaces designed to foster the ways architecture, art and planning are now being taught. Pin-up spaces or “crit spaces” are critical to the architectural design studio teaching methodology at the AAP. Crit spaces are large rooms that allow the roughly 12 to 15 students in each studio group to simultaneously hang (pin-up) their drawings on the walls. The students present their designs during these critique sessions, which can last between three to six hours, and garner input about their design projects from studio classmates, professors, and visiting critics.

Program Goals:

- Increase the square foot area and quality of studio space available to each student in response to NAAB accreditation requirements;
- Create a facility that is in itself an exemplar of contemporary art and architecture;
- Create a unifying presence - physically, academically and socially - for the college;
- Address changing pedagogical needs for discovery-based creativity, team-based problem solving, and interdisciplinary collaboration; and
- Interact respectfully and honestly with its historic and natural surroundings while remaining intellectually honest about its place in the 21st century.

Overall Program:

- Provide a 275-seat open configuration auditorium to replace the auditorium that was removed from Tjaden Hall when it was renovated in 1996;
- Provide adaptable and flexible spaces for faculty and students to stay current with constant improvements in digital technology;
- Further encourage and support faculty in their research and professional development by providing flexible workspace and enhancing opportunities to interact with students;
- Build close associations and encourage collaboration between the separate departments of AAP and the university at large; and
- Provide space for cultural, educational and social activity where students, faculty and staff interact.

Level by Level Program:

Second Floor:

- Flexible space for studios, critiques and computers;
- AAP Forum: exhibition, presentations, seminars; and
- Connected to studios in Rand Hall and the library in East Sibley Hall.

First Floor (Entry Level/Ground Floor):

- Exterior program space: gathering, exhibition, performance, teaching, working;
- Covered bus stop and bicycle parking;
- Building entrance, interior circulation, sheltered exterior circulation and access to the Foundry; and
- Auditorium balcony.

Basement Level:

- A large critique area in the double-height, domed lobby;
- 275-seat auditorium / lecture hall;
- Exhibition room;
- Exterior program space (sunken garden);
- Mechanical space;
- Toilets; and
- Connection to Sibley Hall's ground and basement levels.

Milstein Hall Program Table

Program	**Area**
Review "Crit" Space	4,120 NASF
Studios	22,088 NASF
Studio Auditorium	240 NASF
AAP Forum	1,578 NASF
Exhibition	1,320 NASF
Auditorium	2,940 NASF
Exterior Covered Workspace	2,020 NASF
Unoccupied Space (Garage)	9,459 NASF
Total Net Assignable Area	43,765 NASF
Total Gross Area	59,000 GSF

Table 1.7.1: Milstein Hall Program Table

Net Assignable Area (NSA) is the sum of all areas on all floors of a building assigned to, or available for assignment to, an occupant or specific use. Net Assignable Area is measured in terms of Net Assignable Square Feet (NASF).

The gross area (GA) is the sum of all areas on all floors of a building included within the outside faces of its exterior walls, including all vertical penetration areas, for circulation and shaft areas that connect one floor to another. Gross area is measured in terms of Gross Square Feet (GSF).

1.7.2 Central Avenue Parking Garage

The CAPG will provide the following programmatic improvements to this area of campus:

- Total parking for 199 passenger vehicles consisting of:
  - Surface parking for approximately 70 vehicles
  - Underground parking for approximately 129 vehicles on two sub-grade levels
  - ADA compliant parking spaces on the surface level parking deck for three vehicles
  - ADA compliant parking at first below grade level for two vehicles
- Service access areas for Milstein, Rand, Sibley, and Tjaden halls;
- Sidewalks for pedestrian circulation against the north walls of Sibley and Tjaden halls;
- Landscaped areas in association with the overall conceptual landscape design plans; and
- ADA grade level access to Sibley and Tjaden halls.

1.8 Sustainable Design

1.8.1 Paul Milstein Hall

The sustainable design goals for Milstein Hall are being met through the use of good design practice to provide a healthy and comfortable environment for the building occupants. Sustainable design initiatives are being guided by the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system. Earning LEED certification is an important goal of the Milstein Hall project. The key sustainable design features included in the design of Milstein Hall are:

1. Reduce energy usage for building heating and cooling:
   a. Utilize cogeneration produced steam for building heating and lake-chilled water for building cooling.
   b. Incorporate energy efficient chilled beams at the ceiling for cooling.
   c. Employ insulated walls and glazing to reduce building air loss.
   d. Employ a vegetated roof to reduce solar heat gain and to reduce building air loss.
2. Reduce energy usage for transportation:
   a. Incorporate existing public transportation network.
   b. Accommodate pedestrians access and bicycle parking.
   c. Specify locally manufactured materials.
3. Reduce energy use for building lighting:
   a. Employ skylights and glazing for natural day-lighting.
   b. Specify energy efficient light fixtures.
4. Reduce energy use for material production:
   a. Employ recycled steel and concrete aggregate.
   b. Employ recycled finish materials where appropriate.
   c. Design building finishes to reduce building material use.
5. Reduce material use and land-fill waste:
   a. Reuse of existing buildings.
   b. Specify contractor sorting and recycling of demolition material.
   c. Reduce construction material packaging.
   d. Design a flexible building to increase long-term use and adaptability.
6. Reduce stormwater pollution:
   a. Employ vegetated roof or stormwater retention system to filter stormwater.
   b. Incorporate quantity and quality stormwater measures.
   c. Specify native plants to eliminate pesticide usage.
7. Reduce water usage:
   a. Specify native plants to reduce irrigation water usage.
   b. Provide a temporary irrigation system for the vegetated roof.
   c. Specify low-flow plumbing fixtures to reduce potable water usage.
8. Increase environmental comfort of building occupants:
   a. Employ radiant slab system and chilled beams.
   b. Employ day-lighting.
   c. Specify low volatile organic compounds (VOC)-emitting material.
   d. Employ outside air system.
   e. Provide visual and direct connections to natural areas.

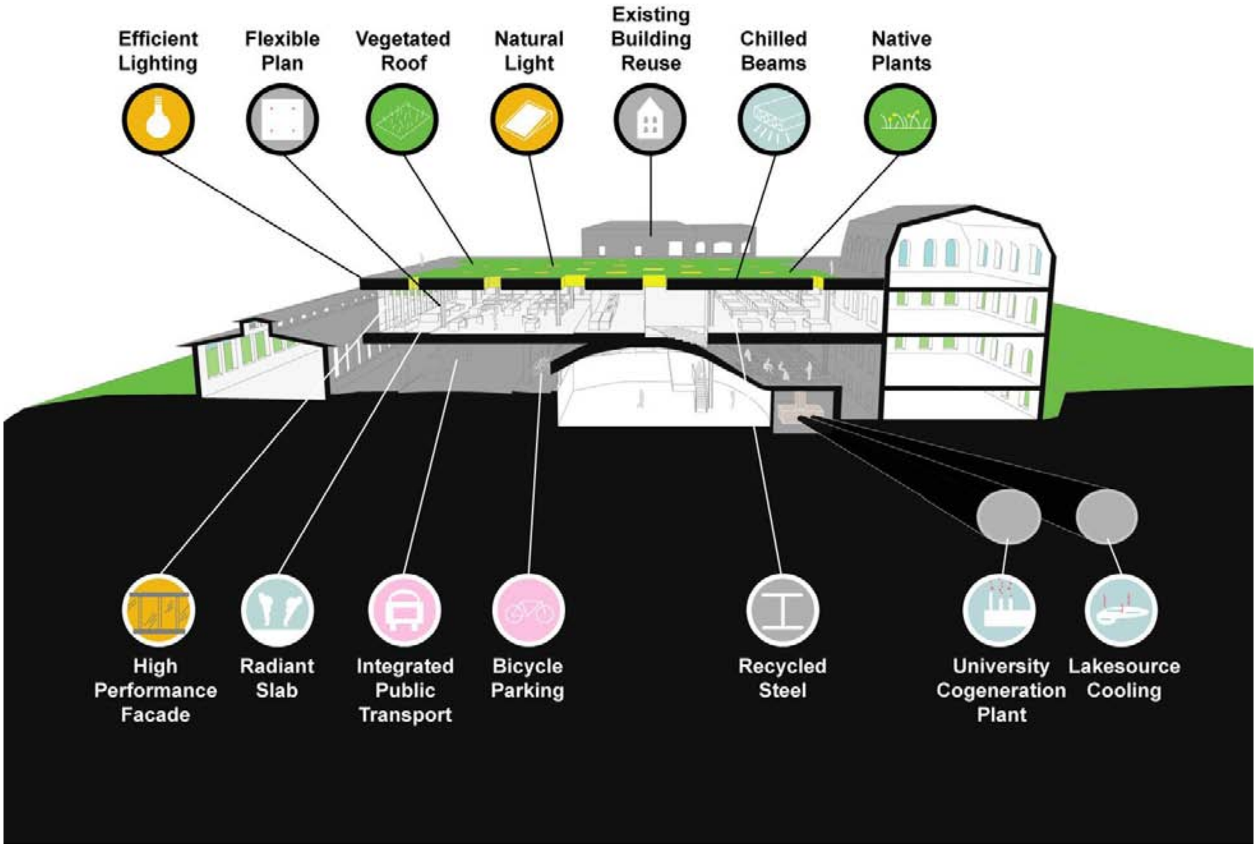


Figure 1.8.1: Sustainable design elements of Milstein Hall.

1.8.2 Central Avenue Parking Garage

Although parking structures by themselves are not eligible for LEED status, sustainable design elements can be incorporated into the design. Sustainable design elements inherent to parking structures that will be incorporated in the CAPG are:

1. Maximize open space by minimizing building footprint: two levels of parking will be built below the surface-grade parking deck, thereby preserving the open space above the parking garage while maintaining views to the Fall Creek Gorge.
2. Minimize daytime energy usage by maximizing natural light penetration: this LEED element is typically used in above-ground, open parking structures. Since the majority of the parking garage will be built below-grade, daylighting of the garage will be difficult. However, steps will be taken to maximize the incidence of natural daylight where possible. Locations under consideration include the entrance to the lower parking levels from Central Avenue, and the stair and ramp to the lower levels of Milstein and Sibley halls.
3. Meter the lighting system for ongoing optimization: this will be done in accordance with the item above.
4. Roof vegetation/landscaping to reduce the heat island effect: the majority of the garage roof will consist of the surface level parking deck. Landscape elements will be appropriately sited around the parking area. A bermed edge is planned along the side of the garage and lower-level entrance to buffer and reduce the visual impact of the garage.
5. Provide internal stormwater sedimentation basin and treatment per DEC water quality requirements.
6. Utilize locally available materials.
7. Specify low VOC-emitting sealers, sealants, and paints.
8. Provide bicycle parking.
9. Provide preferred parking spaces for alternative fuel vehicles.
10. Provide preferred parking spaces for car-pool users.
11. Provide a “bike stair” - a narrow ramp built into the stairs on the west side, to allow bicyclists to dismount and walk along side their rolling bikes instead of carrying them up or down stairs.

1.9 Site Utilities

1.9.1 Paul Milstein Hall

Steam

The existing Cornell steam distribution system located in the Arts Quad has a steam vault 21-11 located north of Lincoln Hall. This vault will have piping modifications for a new six-inch steam and two-inch condensate connection. The six-inch steam and two-inch condensate will be routed to the Milstein Hall mechanical room located at the southeast corner of the building. Inside the mechanical room will be a piping header with valving that will provide steam to Milstein Hall and to Rand Hall. A new three-inch steam and two-inch condensate line will run to the southwest end of Rand Hall. Once inside Rand Hall, a two-inch steam and one-inch condensate line will connect to the steam lines located at the north end of Rand Hall. The installation of the new steam and condensate lines will be phased to avoid outages to the existing buildings in this area. Tie-in valve connections will be installed during the annual steam shutdown period to minimize steam shutdowns where possible and limit the other tie-ins to an eight-hour shutdown.

Chilled Water

The existing Cornell chilled water distribution system located in the Arts Quad has a 12-inch connection on the supply and return lines south of Tjaden Hall. This chilled water line is slated to be extended north of Lincoln Hall during the summer of 2008. A proposed 12-inch chilled water supply will connect Milstein Hall to the chilled water system at the southeast corner of the site with direct buried HDPE piping in sand bedding.

Domestic Water: Potable

The existing domestic water distribution system west of Rand Hall will be removed from the Milstein Hall site. Potable water for the site will be brought from the existing Cornell distribution system (running through the Arts Quad). A new six-inch domestic water line will be brought into both Milstein Hall and Rand Hall. The existing eight-inch Cornell water line located under University Avenue within the project site area is currently not being used. This abandoned line will be valved off and removed during construction. The existing City of Ithaca eight-inch water line located under University Avenue will be replaced with a new eight-inch water line. The City of Ithaca owns this water line and will be responsible for maintenance after it has been newly installed by the Milstein Hall project.

Domestic Water: Fire Protection

A new eight-inch ductile iron fire water line will be connected to the existing fire water pump located in Lincoln Hall and routed northwards and split into two six-inch fire water lines to feed Sibley Hall with two connections complete with post indicator valves, Rand Hall with one connection complete with a post indicator valve, and Milstein Hall with one connection complete with a post indicator valve. A new fire department Storz connection will be located beside the new Lincoln Hall driveway.

Stormwater

The existing 20-inch stormwater line which passes just west of Rand Hall will be replaced with a new stormwater line. Roof drains on the north wall of Sibley Hall and all Milstein Hall drainage will be connected to this new line. The stormwater system is discussed in detail in Section 2.2, Stormwater and in Appendix B, Stormwater SWPPP.

Sanitary

Milstein's sanitary system will exit from the mechanical room area and be routed to the existing Cornell sanitary line located under University Avenue. This eight-inch line is sufficient to accommodate the additional sanitary needs.

Electric

The existing Cornell underground electrical distribution system west of Rand Hall will require relocation and modification. Power will be routed from Vault #37 (located on the north side of University Avenue) into two new electrical rooms in Milstein Hall. Vault #35 will be removed. In addition, a new duct bank will run under the CAPG.

Natural Gas

The existing NYSEG gas line runs under University Avenue. Milstein Hall will connect to the existing NYSEG gas line located under University Avenue.

Telecommunications

The existing underground Cornell telecommunications distribution system has a telecommunication manhole located northwest of Lincoln Hall. A new feed will be provided to Milstein Hall from this location.

1.9.2 Central Avenue Parking Garage

Steam

No steam service to the garage is proposed.

Chilled Water

No chilled water service to the garage is proposed.

Domestic Water: Potable

The Cornell water distribution system includes an eight-inch loop main along University Avenue, which connects to the distribution network in the Arts Quad near the east and west ends of Sibley Hall. The easterly leg of the loop will be discontinued by the Milstein Hall project and the looped main will be taken out of service. The westerly leg of the loop will be removed by the CAPG project and the remaining piping on University Avenue will be removed or abandoned in place. The loop is not believed necessary for the overall operation of the university system. The existing fire hydrant on the CAPG site will be relocated to Central Avenue at the terminus of an eight-inch main extension along the south side of the garage. No disruption in service to existing buildings is expected.

Domestic Water: Fire Protection

Domestic service to the CAPG, if required, will come from the main extension on the south side of the building. Fire service is expected to come from a fire loop originating at the fire pump housed within Lincoln Hall. A portion of the fire loop extension is included in the adjacent Milstein Hall project south of Sibley Hall. This work will be coordinated between the two projects.

Stormwater

The CAPG project will require removal of stormwater piping and structures that currently serve Tjaden Hall, the west wing of Sibley Hall and the existing parking facilities on site. The existing parking lot drainage system will effectively be replaced with the proposed roof drainage of the CAPG. Storm services to Sibley Hall and Tjaden Hall will be reconnected to the proposed site drainage systems. Temporary facilities will maintain continuous service to Tjaden and Sibley halls.

Stormwater from the existing drainage system is currently directed to two outfall pipes that discharge to the Fall Creek Gorge north of University Avenue. The easterly outfall located immediately west of the garage entrance on University Avenue has partially failed and use of this outfall will be discontinued. The storm pipe to this outfall will be capped off and all stormwater runoff from the site will discharge to the westerly outfall.

The westerly outfall is located immediately east of the existing walkway and steps on the south approach to the suspension bridge over the gorge. The piping for this outfall was recently reconstructed in conjunction with the improvements to the bridge approach. Based on the current runoff calculations it is believed the outfall piping has sufficient capacity to drain the proposed catchment area. The proposed system will include one storm line, which will pass through the CAPG from south to north before going west along University Avenue. A second proposed storm line will be routed around the west end of the CAPG. The two lines will connect to the existing westerly outfall at the north edge of University Avenue.

Sanitary Sewer

The CAPG project will require modifications to the sanitary service to Tjaden Hall and the Cornell sanitary sewer main located at the westerly end of the garage parallel to Central Avenue. Both the service and main in this area will be removed and replaced. In addition to Tjaden Hall, the main serves the Foundry, Rand Hall, Baker Lab and the proposed Milstein Hall. Temporary facilities to pump around the proposed improvements will be provided to maintain uninterrupted service to all buildings. The lowest floor in the CAPG is below the elevation of the sanitary main and gravity sewer service to the garage is not possible. This necessitates a sanitary pump station within the garage and a force sewer service line between the garage and the site sanitary system.

Electric

The Milstein Hall project proposes to replace an existing electrical service to Sibley Hall, which is located near the interface of the garage and Milstein Hall projects. This work is expected to be completed by the Milstein Hall project. A section of existing electrical duct bank may need to be lowered and re-located to the west, at the ramp end of the garage.

Natural Gas

The project will likely impact an existing gas line running parallel and south of the curb line of University Avenue. A section of the gas line may need to be relocated in the area where the CAPG is closest to University Avenue. The gas line is believed to be six inches in diameter and owned by NYSEG.

Telecommunications

Detailed electric and telecommunication service requirements and locations for the CAPG have not yet been determined. Blue light phones will be provided at each end of each level.

1.10 Relationship of Proposed Plans to Transportation Demand Management Plan and Draft Cornell t-GEIS

Cornell employs comprehensive management policies for transportation and parking in order to provide a safe, pleasant pedestrian environment. These policies minimize traffic impacts on the character of the campus and surrounding areas, while accommodating the transportation and parking needs of Cornell's community. Major elements of transportation and parking at Cornell are:

Transportation Demand Management (TDM)

Cornell's nationally recognized Transportation Demand Management (TDM) programs encourage walking, bicycling, transit use, and other alternatives to single-occupant vehicle commuting by all members of the campus community. Over 30 percent of faculty and staff commute by public transit or car-pool. 81 percent of graduate students walk, bicycle or use public transit to arrive on campus. 95 percent of undergraduate students walk, bicycle or use public transit to arrive on campus. In 2004 and 2005, the U.S. Environmental Protection Agency recognized Cornell University with an award as one of the Best Workplaces for Commuters in the nation.

Public Transit

In 1996, Cornell, the City of Ithaca, and Tompkins County forged a public-private partnership, Tompkins Consolidated Area Transit (TCAT). In 2005 TCAT became a non-profit organization. Nearly 75 percent of TCAT's passenger trips are accounted for by the Cornell community. Cornell fully subsidizes transit passes for employees and heavily subsidizes transit passes for students. All new-to-Cornell students automatically receive a transit pass at no cost to the student. Cornell subsidizes unlimited rides on all TCAT routes after 6:00 P.M. on weekdays, and all day (and night) on weekends for all matriculated students.

Cornell is an active participant with the Ithaca-Tompkins County Transportation Council (ITCTC) in regional transportation planning. Plans are being developed to enhance existing community park-and-rides served by public transit, and to site additional community park-and-rides.

Parking

Parking on the Cornell campus is treated as part of an integrated, campus-wide system and managed holistically for campus-wide needs, rather than as discrete amounts of parking that would, in a conventional setting, be designated for particular buildings or functions. This approach recognizes that the campus operates 24 hours a day, seven days a week. It also recognizes that many students, employees, or visitors, typically spend time in more than one building each day. If they drive to campus, they leave their vehicles in one location and walk, bike, or take the bus to work, class, dining, and other on-campus facilities during the course of the day, rather than drive to them. Typical ratios and rules for the amount and proximity of parking that would apply to stand-alone buildings or uses do not apply to Cornell's integrated campus setting. Emphasis is placed on creating a campus environment that is readily traversed by foot, bus, bicycle, wheelchair, and other means. As a result, there is less space taken up by parking and less traffic congestion to interfere with pedestrians and bicyclists, than would otherwise be the case.

The management of Cornell's parking system is a dynamic process that works to enhance and balance campus parking need with campus parking supply. Cornell is continually enhancing the supply, usability, aesthetics and safety of parking by proactively redesigning existing parking areas to maximize parking efficiencies. This has enabled Cornell to face the challenge of losses in parking on central campus as buildings have been constructed or expanded. These processes are ongoing. By managing demand through TDM programs (see Section 2.9.1), and monitoring and maintaining a supply that corresponds to anticipated need, Cornell seeks to avoid cumulative adverse parking-related impacts of new construction while accommodating the transportation and parking needs of its community.

In the spring of 2007, Cornell administered a total of 11,535 parking spaces on main campus in approximately 270 parking lots of varying sizes with overlapping uses. Just over 60 percent of these parking spaces are available to commuting employees (some of which are shared with commuting students) and resident students. The remaining spaces are split among a variety of uses, including visitors, loading and drop-off, service and maintenance, fleet vehicles, and departmental uses. As not all of the parking is filled on any given day (not every permit-holder comes to campus every day all day long), Cornell Transportation Services uses these vacancies to respond to daily fluctuations and to accommodate visitors and special event attendees. Although the overall numbers and distribution of parking spaces on campus is constantly changing, the university responds to ongoing changes in demand by adjusting permit-to-space ratios and carefully attending to the replacement of lost parking as necessary.

In general, the main campus parking system contains the following types of parking:

> Parking - Central Campus:
> Approximately 30 percent of the main campus parking supply is located within a five to seven minute walking distance of central campus (the Tower Road/Garden Avenue intersection). Parking on central campus serves visitors, special events, persons with disabilities and service vehicles, and employees.
>
> Parking – Inner Periphery of Main Campus:
> Approximately 40 percent of the main campus parking supply is located on the inner periphery of campus, where it is within a seven to 15 minute walking distance of central campus, and may also be accessed by regular transit service. Inner periphery parking is primarily occupied by employees.
>
> Parking – Outer Periphery of Main Campus:
> Approximately 30 percent of the main campus parking supply is located in the outer periphery of central campus and is primarily accessed by regular transit service. Outer periphery parking locations accommodate the remaining employee driving population, and students. This parking also serves as “surge” space for miscellaneous users, such as visitors and conferees who bring cars to campus.

Proposed Plans and Central Campus Parking

Cornell is constantly adjusting its parking system, both to anticipate the needs of users and to accommodate ongoing construction and renovation projects. Augmenting the overall supply of parking over many years ensures that parking is available to offset losses to parking when new construction and renovation occurs. Due to system-wide management, parking losses are seldom offset on a one-to-one basis within a given area of the campus; rather, the system experiences continuing minor shifts or ripples over time that may be less disruptive to parkers. The augmentation of the parking supply is accomplished through a combination of parking lot renovation for more efficient layout and better landscaping, parking lot expansion, and construction of new parking. For instance, in the last five years nearly 300 parking spaces were eliminated by constructing Duffield Hall, the Statler Hall addition, the Lynah Rink expansion, Bailey Hall, the plaza for Bailey Hall, Weill Hall (Life Science Technology Building), and the Physical Sciences Building. During that same time period, the Hoy Parking Garage vertical expansion, and parking lots adjacent to the Friedman Wrestling Center, Rice Hall, and at the old Oxley site off Route 366, accounted for approximately 350 added parking spaces. These figures do not comprise every loss or addition to parking on the Cornell campus; however, they do provide an overview of the major gains and losses in parking inventory since 2003.

There are a number of capital projects under construction that impact parking currently available on central campus and available in the near future. The construction of the Human Ecology Building and parking garage replacing Martha Van Rensselaer North temporarily displaced 65 spaces on that site, plus 31 spaces in Toboggan Lot being used for staging during construction. With the completion of the parking garage scheduled for January 2011, 252 new parking spaces will be available in central campus.

The University Avenue parking lot built several years ago in conjunction with the West Campus Residential Initiative (WCRI) has been used for construction parking. Following completion of the last WCRI building in the summer of 2008, the 175 space lot will be available for students and staff parking.

The t-GEIS

In the Fall of 2005, Cornell commenced a transportation-focused draft Generic Environmental Impact Statement (t-GEIS) to identify, examine, and evaluate transportation-related impacts and possible mitigations of various hypothetical Cornell population growth scenarios in the next 10 years. The Town of Ithaca Planning Board is lead agency. Local municipalities including the City of Ithaca and Tompkins County are engaged in the process as involved agencies. Unlike the usual application with an Environmental Impact Statement, the t-GEIS does not analyze traffic from a specific development project. Rather, it examines the impacts on transportation systems outside of the main campus due to four different hypothetical Cornell population growth scenarios. The goal of the t-GEIS is to get people, not their cars, to campus. Mitigations will continue to evolve in response to the data and public feedback obtained from the t-GEIS process. Once it is final, the t-GEIS will assist planning boards and agencies in environmental reviews of transportation-related impacts of individual Cornell projects over the next 10 years. The benefit of the t-GEIS to reviewers of individual projects will be an anticipatory, comprehensive overview of impacts, including cumulative impacts, on transportation due to Cornell population growth.

As the t-GEIS is finalized (including public and agency comment), its analyses and mitigations will help shape Cornell's Transportation Impact Mitigation Strategies (TIMS), a policy document that will direct the university's long-term strategies for transportation demand management.

1.11 Relationship of Proposed Plans to the Cornell Master Plan

The Cornell University Board of Trustees approves all building projects of any significance on the Cornell campus. As described in Section 1.6, Design Process, all major building projects including Milstein Hall and the CAPG are subject to an intensive set of steps for internal reviews and approvals before they are brought forward for site plan review. The trustees' project reviews and approvals are guided by the campus master plans and precinct plans, adopted and updated by the board over the years.

The Board of Trustees recently approved *Part 1: Overall Plan, of the Cornell Master Plan for the Ithaca Campus (CMP),* and was in the process of developing *Part 2: Landscape Design Guidelines and Precinct Plans*. Together, they will guide the campus's physical development over the next 30 years and beyond. The CMP will replace the series of Precinct Plans, culminating in the 1992 precinct plan, that the university used for the last several decades to guide the physical development of campus. Like the plans that preceded it, the scope of the current plan, due for completion in 2008, is broad, addressing all facets of the physical campus, including the way Cornell uses its land, the arrangement and scale of buildings, the nature and function of the landscape, the transportation network and the utility systems. The current effort adds the university's sustainability goals to the master plan.

1992 Precinct Plan Guidance

The 1992 Precinct Plan for Precinct 1 encompasses the project area and all the land between East Avenue, Campus Road, West Avenue and Fall Creek. It discusses space allocation, planning constraints, landscape objectives and potential projects in the area. A large portion of Precinct 1 was identified as Protected Green Space (e.g. the Arts Quad and Libe Slope). All the buildings facing the Arts Quad with the exception of Olin Library were rated as “Prime” (the highest ranking) by the Special Areas Committee, while Rand Hall and the Foundry were given an “Undistinguished” ranking. The Precinct Plan recognized the need for more space to house the College of Architecture, Art and Planning, and stated that all the College's buildings (Sibley, Rand, Tjaden and the Foundry) were in need of total renovation. Additionally, the Plan recommended that views from the Arts Quad be interfered with as little as possible and the profile of Sibley, as seen from the Quad, be maintained. It also recognized that new construction should be considered for the college's complex of buildings to meet essential program needs, but that construction be constrained to the east end of the site, preferably to the east side of the Sibley dome. Thus, the design of Milstein Hall, which was commissioned while the 1992 Precinct Plan was in effect, follows its guidelines.

AAP Long-Range Planning

The College of Architecture, Art and Planning (AAP) has not adopted a college master plan. The Schwartz/Silver Master Plan Study (1997) evaluated the feasibility of expanding AAP buildings (see Section 4.1.1). It included a conceptual master plan. While not adopted, small portions of it were implemented and spurred the college's search for a suitable design that has culminated in the proposal for Milstein Hall. The conceptual design for Milstein Hall completed by OMA, included an exercise to envision future development north of Sibley and Tjaden halls. Also not adopted (and too preliminary to have been considered for adoption), it nonetheless was useful to evaluate the long-range potential of the remainder of the site and assure the college that Milstein Hall would not limit flexibility and future expansion of its facilities. This concept envisioned two footprints of future development between Milstein Hall and Central Avenue. An addition north of West Sibley could potentially provide facilities for the City and Regional Planning Department, and an addition north of Tjaden could potentially accommodate space for the Fine Arts Department. Parking would be provided in a below-grade parking structure. Many of these ideas have been incorporated into the approved design plans for Milstein Hall and the CAPG.

The Cornell Master Plan for the Ithaca Campus (CMP)

The 2008 CMP provides the university with an integrated framework to guide its long-term physical development. Driven by academic planning priorities, the master plan provides a set of guidelines for decisions about where to locate the university's research, teaching, residential and recreational programs, and offers a campus-wide frame of reference for the university's current capital plan. It also links local and precinct plan goals to the broader plan, while responding to the unique natural setting of the campus and the character of surrounding neighborhoods. The CMP consists of two documents: *Part 1: Overall Plan* defines the principles, policies, guidelines, strategies and initiatives that apply to the Ithaca campus as a whole; and *Part 2: Landscape Design Guidelines and Precinct Plans* (in draft as of this writing) provides further direction to ensure each new project contributes positively to the campus as a whole, the natural setting and the larger community.

The overall CMP effort was launched in 2006. It is significant that the university's CMP consultant (Urban Strategies, Inc.) and their sub-consultants (Polshek Partnership Architects, Stantec, Inc., and New England Engineering) were asked to review the planning and design efforts then under way, including Milstein Hall, Physical Sciences, and Life Sciences, and provide an outsider's fresh look and feedback to the university.

Development of the campus master plan was guided by five interrelated and mutually-supportive principles. They describe an integrated approach to sustainability, recognizing that the stewardship and development of Cornell's campus must balance academic, social, environmental and economic priorities, over time improving its setting for the benefit of all people and ecosystems. These principles are:

1. **Support the academic mission**
The Cornell campus shall support and cultivate academic success and growth, providing open, collaborative and adaptable environments for teaching, research, service and outreach, the exchange of ideas, and the nurturing of innovation.
2. **Promote stewardship**
Cornell shall respect and manage the physical environment of the campus and its broader land base for the health of the university, its constituencies, its neighbors and the larger regional ecosystem.
3. **Enhance the campus experience**
Cornell's campus shall contain a diversity of inviting, accessible and safe places, for social and cultural interaction, recreation, athletics, and passive enjoyment by faculty, staff, students and visitors. It will maintain and enrich its legacy of memorable landscapes and become a more pedestrian-oriented campus.
4. **Reinforce community**
Cornell shall enhance the community-building aspects of campus. It will broaden housing options, expand the campus's social and cultural infrastructure and promote a healthy, vital greater Ithaca.
5. **Ensure integrative planning and design**
In the planning and design of the campus, Cornell shall integrate disciplines, engage communities, and coordinate academic, development, landscape and infrastructure initiatives.

These principles are further developed through the following chapters of the CMP: Regional Context and Campus Form, Land Use, Campus Landscapes, Transportation and Circulation, and Utilities and Service. This section briefly examines how Milstein Hall and the CAPG respond to the guidance contained within each chapter of the CMP. More specific analysis can be found in Chapter Two of this DEIS.

Regional Context and Campus Form

CMP Guidance

While the campus master plan focuses on the main campus, it was developed within the context of broader environmental, economic and community issues and objectives. As Cornell enhances the qualities of the main campus, managing and making optimal use of its larger land base and contributing positively to its home communities will require the university to:

- *Protect and enhance the gorges and creek systems*
- *Respect and, where feasible, enhance surrounding communities*
- *Reinforce the relationship between the campus and its natural setting*
- *Extend the formal pattern of quads, courts, walks and streets*

Project Response

Milstein's limited footprint at ground level, green roof, and the use of structured parking, to optimize the use of the campus land base, acknowledge the desire to avoid encroachment on the gorge, and minimize impervious surfaces and the resulting environmental impacts on the creek system. By building lower than Sibley and Rand halls, Milstein Hall minimizes its visual impact as seen from the Arts Quad and from Cornell Heights. It does not change the distinctive skyline of the Arts Quad. As infill buildings, Milstein and the CAPG fit behind the formal geometry of the Arts Quad, reinforcing the contrast between the built structure of campus and the organic form of its natural setting. Further, they densify campus, preventing sprawl and maintaining a walkable campus.

Land Use

CMP Guidance

The land use plan promotes a greater integration of uses in strategic locations to facilitate academic interaction, support community building, reduce car travel and generally improve the quality of life on campus. It acknowledges there are infill and redevelopment opportunities in central campus, but the overall capacity to accommodate growth is limited, given the importance of the campus' character and the community's sense of place. The land use plan proposes to:

- *Concentrate academic buildings in the core*
- *Expand the campus social and cultural infrastructure*

Project Response

As described in Section 1.2, the design of Milstein Hall integrates AAP's disciplines architecturally and programmatically. This concentration of the college's academic space is complemented by an open configuration auditorium and contiguous work and exhibition space that creates a social and cultural center for AAP. The new center extends its covered space toward the Foundry (the sculpture studio), located on the far side of University Avenue. The Foundry is the most isolated of the four AAP buildings. The extension of Milstein Hall toward the Foundry and physical connection to Sibley and Rand halls enhances the potential for interactions and improved movement among Milstein Hall and the three existing buildings.

Campus Landscapes

CMP Guidance

As the campus grows and the academic core intensifies, it will be critical to maintain significant existing open spaces. The maintenance and management of existing and historic landscapes and the creation of new ones will beautify the campus and also balance greater density with green space and outdoor amenities.

Project Response
These projects preserve the historic Arts Quad and Fall Creek Gorge by building on or over an existing paved parking lot, roadway, and service areas. The site plan adds a new plaza between Sibley Hall and University Avenue, reinforcing the campus open space system and rejuvenating small exterior spaces adjacent to Sibley.

Transportation and Circulation

CMP Guidance

The Cornell campus must accommodate different modes of travel, while promoting more walking, biking and travel by public transit, which in turn will help to unify the campus. The needs of pedestrians and transit users should be of paramount concern to ensure the development of a truly pedestrian-oriented campus. Hence, the need to:

- *Build and maintain a comprehensive network of sidewalks, pathways and pedestrian connections*
- *Expand and improve the bicycle network and safety*

Project Response
The projects enhance access to this part of campus for all modes of transportation. Additional vehicle parking will be provided in a high-demand part of campus, while a covered bus stop will benefit public transit users. The site plan rationalizes the pedestrian circulation network by creating an east-west pedestrian spine connecting AAP's buildings along their north faces, and by guiding pedestrian crossings of University Avenue to safe, visible locations.

Utilities and Service

CMP Guidance

As the campus continues to grow to support educational and research activities, demands on utility systems, including capacity and reliability, will increase. Ongoing maintenance, upgrading and modifications will be required to meet these demands and support the university's goals:

- *Secure and maintain a permanent network of utility corridors*
- *Locate utility corridors under streets and open spaces*
- *Continue to focus on energy conservation*

Project Response
The utility corridors that will serve these projects will run under University Avenue (City of Ithaca water, NYSEG gas, Cornell storm line and sanitary sewer) or through the Arts Quad (Cornell steam, chilled water, electric and communications) and secure and maintain utility corridors.

Precinct Zones

The CMP divides the main campus into seven precincts, some of which are further divided into zones. Milstein Hall and the CAPG are located in Zone 1 of the Core Campus Precinct. The draft CMP *Part 2, Landscape Design Guidelines and Precinct Plans* provides general guidance and specific parcel development guidelines for this part of campus. According to it, new development in this zone should be limited to highly selected interventions. The CMP identifies Milstein Hall (and an addition to Goldwin Smith Hall) as “in progress,” and defines two development parcels: one, an 8,700 square foot footprint north of Tjaden Hall; and another, a 21,600 square foot footprint north of west Sibley Hall. Both parcels are for academic use with below-grade parking, and a height to match existing structures. The CMP states that the Arts Quad should be kept as free from vehicular traffic as possible in the future, with service to the development sites behind Sibley and Tjaden halls accessed from University Avenue.

The draft general guidelines for Zone 1 reinforce the importance of preserving views between the buildings (e.g. between Tjaden and Sibley halls) from within the Arts Quad to the surrounding landscape. They also acknowledge the primary north-south pedestrian routes to the Arts Quad from the suspension bridge and Thurston Avenue Bridge, with east-west movement along University Avenue being a secondary pedestrian route. East Avenue and University Avenue are identified as bike routes in this zone.

1.12 Facility Operations

1.12.1 Paul Milstein Hall

The teaching of AAP students will occur in several environments within the facility. These include design studios, classroom and seminar rooms, computer classes, critique spaces, exhibition and auditorium space and informal gathering spaces.

Like other educational buildings on the Cornell campus, Milstein Hall will generally be open with unrestricted access during business hours while Cornell is in session. The building is open during restricted hours to designated faculty, students and staff via card access. Connections between Milstein Hall and the Fine Arts Library in Sibley Hall will be open during library hours.

The new 275-seat auditorium space will host approximately 50 public lectures or presentations per year which are programmed by the College of AAP. While these events are open to the public, the majority of the attendees are from the AAP community.

It has been a tradition, since the founding of the Architecture School, that each year, during the spring semester, the freshman architecture students construct a dragon and host a parade. With their upper classmates in tow, they carry the dragon down East Avenue past the Engineering Quad and into the Arts Quad where, with great ceremony, they burn the dragon. The students utilize the Rand Hall wood and metal shop to fabricate the dragon and use the grassy area outside the Rand shop for lay-down space to assemble the dragon. The lay-down space outside the shop will be located inside the Milstein Hall construction fence area. During the construction phase of Milstein Hall, accommodations to provide suitable lay-down space for the dragon will be made in order to continue the tradition. When Milstein Hall is completed, the original lay-down space will have been restored to its previous condition and will be used for future dragon assembly.

1.12.2 Central Avenue Parking Garage

Parking access for faculty, staff and students will be controlled by unsupervised gated operation to those with appropriate permits. Intercom supports to the central campus parking office will allow occasional visitors without permits to be accommodated as appropriate.

In addition to the primary parking use, the surface level of the garage will provide spaces dedicated to service and deliveries for Milstein, Rand, Sibley and Tjaden halls.

ADA spaces in the surface parking level will provide required accessible parking for Milstein Hall, Sibley Hall, Tjaden Hall, and the Foundry, as well as other buildings at the north end of the Arts Quad. Additional ADA spaces on the first below grade level will provide access to Sibley and Tjaden halls.

The CAPG project will include improvements to circulation paths to accommodate the service delivery and handicap accessibility described above.

Blue light phones will be located at both ends of each level of the garage.

CHAPTER TWO:

Potential Significant Impacts

Chapter Two: Potential Significant Impacts

2.1 Land

This section, which covers impacts to land, was written by CME Associates, Inc (authors of the geotechnical report, see Appendix A). Section 2.1.1 covers excavation impacts to the adjacent slope and Fall Creek Gorge and Recreational River. Section 2.1.2 covers excavation impacts to adjacent buildings. Section 2.1.3 covers excavation methods for the construction of the projects. Section 2.1.4 covers the disposal of excavation materials. Section 2.1.5 covers the potential impacts associated with disturbing land on and around the site of the former heating plant.

The existing conditions of the Fall Creek Gorge and earthen slope near the projects' area were described and analyzed by CME geotechnical engineers. Conclusions regarding slope stability are in the "Study and Report for Stability of Earth Slopes North of University Avenue between the Foundry and Johnson Art Museum" (see Appendix A). Subsurface soil conditions for the Milstein Hall project and the CAPG project were analyzed by CME. Recommendations for foundation designs and existing building foundation projection are in Appendix A as well.

2.1.1 Excavation Impacts, or any Other Impacts, to Adjacent Slope and Fall Creek Gorge/Recreational River

A. Existing Condition

The riparian area outside and southerly of the rock-faced gorge is a steeply sloping forested area with little to no underbrush. The ground surface is chiefly covered with tree litter except in areas exhibiting erosional surficial soil loss. Existing shallow, local slope failures are present and are expected to continue with the natural evolution of the gorge. A local slope failure is a term designated for a failure mode where a shallow portion of the slope moves downward. A local slope failure is considered a maintenance problem, since it usually does not affect the overall stability of the slope. However, if local slope failures are not satisfactorily repaired, they can become progressively larger and will become a threat to the stability of the slope. Two existing conditions are suspected to have contributed to existing local slope failures, namely, a broken stormwater pipe northwest of the Foundry, and a stormwater surface overflow from Sibley Hall parking lot to the top of the slope. Man made recreational trails and trail appurtenances (i.e. steps, railings, fences, etc.) criss-cross the area and provide access to the creek bed from the top of the gorge. Some abandoned and in-service utilities, such as pipelines and overhead utility lines, as well as remnants of past waterworks structures are also present.

B. Excavation Impacts on Fall Creek Gorge

Geotechnical reports on slope stability (Appendix A) were commissioned to identify the impact of the CAPG and the Milstein Hall projects on the overall stability of the earthen slope of Fall Creek Gorge. It was determined that excavations, foundation work, and final weight of the buildings for both projects will not impact the stability of the existing slope.

A positive impact of these projects is that the upgrades to the stormwater system will improve conditions at existing local slope failure locations.

C. Mitigation Measures

The Milstein Hall project involves the upgrading and rerouting of existing stormwater facilities which will eliminate a broken outfall pipe suspected of initiating or contributing to an existing local slope failure northwest of the Foundry.

The CAPG project will eliminate current stormwater surface discharge that is suspected to be contributing to an existing local slope failure north of University Avenue across from the current entrance to Sibley Hall's parking lot.

D. Unavoidable Impacts

There are no unavoidable negative impacts to the gorge as a result of either project.

An improvement to gorge conditions is expected as a result of stormwater work associated with the projects.

2.1.2 Excavation Impacts to Adjacent Existing Buildings

A. Existing Condition

There are four existing buildings in close proximity to the Milstein Hall and CAPG projects: Rand, Sibley and Tjaden halls, and the Foundry. Sibley, Tjaden and Rand contain basements with building foundations supported by earth just below basement level. The Foundry does not contain a basement.

B. Excavation Impacts on Buildings

The new project excavations will need to be continued to depths greater than the soil bearing levels of adjacent existing buildings. Existing foundations and structures for buildings with basements (Rand, Sibley and Tjaden halls) will be protected from damage due to loss of earth support. The Foundry will not be impacted by excavation for either project.

C. Mitigation Measures

Existing structures will be protected by conventional methods. Underpinning, sheeting, shoring and bracing methods will be utilized to permanently support existing proximate foundations and to serve as temporary protection and confinement of the project excavation faces.

D. Unavoidable Impacts

There are no unavoidable impacts to adjacent buildings as a result of excavation for this project.

2.1.3 Excavation Methods

A. Existing Condition

The building areas to be excavated consist entirely of existing, man-placed surfacings (i.e. sidewalks, pavements, lawn and landscaped areas) underlain by man-placed earth and miscellaneous fill, underlain by indigenous earth and shale bedrock. There is no natural, undisturbed land area to be excavated.

The site is bounded on all four sides by man made improvements such as buildings, pavements or roads.

B. Impacts from Excavation Methods

Standard excavation methods (for digging and drilling equipment) will be utilized during construction. No blasting is expected to occur. The planned excavations will not intercept the static groundwater table.

The new buildings will occupy the excavated areas. The CAPG is essentially a below-grade structure with its roof being a surface parking lot, thus replacing the existing parking area.

The Milstein Hall building basements will occupy the excavated area and the superstructure will cantilever (overhang) a portion of University Avenue. In the Milstein Hall project area, University Avenue will be reconstructed and roadbed utilities upgraded.

C. Mitigation Measures

Conventional methods to protect adjacent land and the excavation faces, and to confine and reduce the excavation, will be used. Sheeting, shoring and bracing systems will be utilized to preserve and protect the land and improvements existing outside the excavation and serve to confine and define the excavation limits and the construction work site.

D. Unavoidable Impacts

There are no unavoidable impacts as a result of excavation methods.

2.1.4 Material Disposal

A. Existing Condition

Man-placed surfacings, man-placed miscellaneous fill, and natural soil materials exist within the limits of the two building projects. Surfacings include topsoil, organic materials, asphalt, concrete, granite curb, concrete manholes, various pipe utilities, and landscape vegetation. Miscellaneous fill consists chiefly of earth with minor fractions of metal, brick, stone, ash, cinders and wood. Natural soils are sands, silts, gravels and clays.

B. Impacts from Material Disposal

Approximately 13,000 cubic yards of surfacings, miscellaneous fill and natural soil material will be removed for Milstein Hall. Approximately 25,000 cubic yards of surfacings, miscellaneous fill and natural soil material will be removed for the CAPG. All removed material will be disposed off site. The volume of material disposal is approximately 433 truckloads for Milstein over a four month period and 833 truckloads for the CAPG over a two month period (see Chapter Three for construction sequencing and scheduling). These are typical volumes for construction projects of this scale.

After the buildings are constructed, the space between the sheeting and the subsurface walls of the new structures will be backfilled with granular fill.

C. Mitigation Measures

Excavated materials will not be stored on-site and will be excavated and placed into haul vehicles used to transport to off-site disposal locations.

D. Unavoidable Impacts

13,000 cubic yards of excavated materials for Milstein Hall and 25,000 cubic yards of excavated materials for the CAPG will be hauled off-site.

2.1.5 Any Potential Impacts Associated with Disturbing Land on and Around Site of Former Heating Plant

A. Existing Condition

From approximately the 1880s to the 1920s, a coal and wood-fired steam heating plant was used north of Sibley Hall, in what is now the existing surface parking lot. The only remaining, above-grade evidence of the former heating plant is where a brick-arch tunnel daylights near the top of the slope north of University Avenue. Subsurface explorations for the project encountered and sampled miscellaneous building materials and ash and cinders consistent with a coal and/or wood-fired facility, intermixed with earth. Sampled materials were inert and not identified by the exploration crews as having visual or olfactory evidence associated with hazardous waste or petroleum products. No underground tanks are known to exist in the project area. The remains of the brick-arch tunnel will be excavated in the project area and properly backfilled.

B. Impacts From Former Heating Plant

No environmental contamination has been identified by the program explorations. No impacts to or from the former heating plant have been identified. Coal is not classified as a hazardous material or a source of toxic contaminants. Precipitation draining through coal piles can react with sulfides and become acidic, potentially impacting underlying soil and groundwater. Any residual acidity would have been diluted by infiltrating precipitation and groundwater flows over the past three-quarters of a century since the plant was decommissioned. Therefore, the potential for an acidity problem is minimal.

C. Mitigation Measures

No potential impacts associated with the former heating plant were identified which require mitigation.

D. Unavoidable Impacts

No unavoidable impacts to land associated with disturbing land on and around the site of the former heating plant were identified.

2.2 Stormwater

2.2.1 Stormwater Management

A. Existing Condition

The site can be characterized as highly developed with streets, parking areas, walkways and landscaped areas. Impervious surfaces currently cover approximately 63% of the combined site.

B. Impacts on Stormwater Management

Permanent measures to manage stormwater runoff will include a combination of impervious cover reduction and water quality treatment facilities. Since the site has been previously developed, the projects will need to comply with the Standards for Redevelopment Projects as described in Chapter 9 of the New York State Stormwater Management Design Manual. In general, the standards for water quality require treatment of 25% of the existing impervious cover, reduction in imperviousness by 25% or some combination of the two strategies to treat 25% of the site.

The Milstein Hall project proposes approximately 0.55 acres of green roof for the new building, resulting in a significant reduction in impervious cover for this area of the site. When combined with the garage project, the overall amount of impervious cover is expected to be reduced by approximately 4% below existing conditions. In addition to the impervious cover reduction, the projects will need to provide permanent water quality treatment facilities for 21% of the site impervious cover to comply with the treatment requirement of the DEC standards. The permanent treatment facilities will include a buried sand filter with pre-treatment to treat runoff from the garage roof parking pavements and adjacent walks. Since the overall impervious cover will be reduced, no permanent water quantity controls are required.

Taken separately, the Milstein Hall project will reduce the impervious cover on its site by approximately 21%. If the CAPG project does not go forward, the Milstein Hall project will be required to provide water quality treatment for approximately 4% of the impervious cover in order to comply with the standards. In this circumstance, this additional treatment capacity could be provided with a buried sand filter to treat the Sibley service area of the site west of Milstein Hall. This would treat approximately 14% of the site impervious cover, exceeding the 4% requirement. Please see Appendix B for the Stormwater Pollution and Prevention Plan (SWPPP).

C. Mitigation Measures

Temporary measures to control stormwater runoff during construction will be shown on an erosion and sediment plan as part of the SWPPP. The temporary measures will include perimeter silt fencing, inlet protection for storm structures, erosion control blankets, stabilized entrances, sedimentation basin and filter bags. All temporary measures will be designed according to the current New York State Standards and Specifications for Erosion and Sediment Control.

Permanent stormwater measures, as described in Section B of the SWPPP (green roof, sand filter), are designed in accordance with DEC regulations and no negative impacts are anticipated. No additional mitigation measures are necessary.

D. Unavoidable Impacts

There are no unavoidable negative impacts to stormwater as a result of these projects.

2.2.2 Stormwater Impacts to Fall Creek Gorge/Recreational River

A. Existing Condition

Runoff collected by the existing stormwater systems currently flows to three existing outfalls that discharge to the Fall Creek Gorge north of University Avenue. The easterly outfall, located east of the Foundry, generally serves the Milstein Hall site as well as a significant area of campus above. The middle of the three outfalls, located immediately west of the proposed garage entrance on University Avenue, serves the existing parking lot north of the west wing and dome at Sibley Hall as well as portions of the Sibley Hall roof. The piping for this outfall has partially failed and is likely the cause of a recent slope failure north of University Avenue. Continued use of the middle outfall has the potential to further destabilize the slope at this location. The third outfall is located adjacent to the south approach to the pedestrian suspension bridge over Fall Creek and serves the westerly area of the CAPG project site and a significant portion of University Avenue. The piping for this third outfall was recently reconstructed in conjunction with improvements to the bridge approach.

B. Impacts to Fall Creek Gorge/Recreational River

The easterly outfall will see reductions in the volumes and rates of runoff due to the proposed green roof and associated reduction of impervious cover on the Milstein Hall site. Reconstruction of the middle outfall, which has failed, would be very difficult and could exacerbate the potential for erosion or further slope failure. Use of the middle outfall will therefore be discontinued and the storm sewer pipe will be capped off at University Avenue as part of the CAPG project improvements. The catchment currently draining to the middle outfall will be combined with the adjacent catchment, which drains to the westerly outfall. The capacity of the westerly outfall is sufficient to drain the combined catchment.

C. Mitigation Measures

The stormwater plan for the projects will not negatively affect the Fall Creek Gorge and Recreational River. The proposed projects will reduce site imperviousness and therefore reduce rates and quantity of discharge to the gorge. Additionally, the proposed projects will treat a portion of the runoff discharging to Fall Creek, improving water quality. Upgrades to the stormwater system will positively impact the gorge by preventing future localized slope failures due to the existing poor stormwater management practices.

D. Unavoidable Impacts

Unavoidable impacts of these projects include reduced runoff into Fall Creek Gorge, improved water quality and improvements to the stormwater outfalls into the Fall Creek Gorge and Recreational River.

2.2.3 Capacity of Existing Stormwater Infrastructure

A. Existing Condition

The existing storm lines and drainage facilities are adequate to serve the project site.

B. Impacts to Capacity of Existing Stormwater Infrastructure

A significant portion of the existing stormwater infrastructure will be removed and replaced by the respective projects. No adverse impacts to the remaining infrastructure are expected. Stormwater runoff flows to the easterly outfall will be reduced by the Milstein Hall project. Flows to the westerly outfall will be increased, but no adverse impact is expected due to the currently available excess capacity.

C. Mitigation Measures

No further mitigation measures are proposed.

D. Unavoidable Impacts

No unavoidable negative impacts to the existing stormwater infrastructure have been identified.

2.3 Air

The U.S. Environmental Protection Agency (EPA) has identified six principal pollutants that it monitors and for which ambient air quality standards exist. These are described in greater detail below. The EPA considers an area to be an "attainment area" when it has air quality as good as or better than the national ambient air quality standards defined in the Clean Air Act. An area may be an attainment area for one of the six key pollutants, but a non-attainment area for others.

According to the EPA, Tompkins County is an attainment area for all six of the key pollutants described below, and the air quality in the county is generally considered "good."

Air quality is affected by many factors, both natural and human made. Federal and state air quality standards are concerned primarily with human-caused (anthropogenic) air pollution, although ambient air quality is often affected by natural aspects of the environment, such as topography and wind direction. As noted above, the EPA has identified six principal pollutants which it monitors, and for which ambient air quality standards exist:

- Ground Level Ozone
- Carbon Monoxide (CO)
- Nitrogen Dioxide (NO2)
- Sulfur Dioxide (SO2)
- Particulate Matter (PM)
- Lead (Pb)

Sources of these and other pollutants can be fixed in location, such as factories and dry cleaners, or mobile, such as cars, trucks, buses, planes, and trains. In order to help maintain good air quality federal and state governments have established limits on the amounts of pollutants that can be emitted at the "smokestack" for fixed sources and the "tailpipe" for mobile sources. The EPA estimated that in 2000, nationally, mobile sources accounted for as much as 70 percent of these primary pollutants, with on-road vehicles accounting for approximately 60 percent of the total mobile-source pollution for CO, nitrous oxides and volatile organic compounds (VOCs). Additionally, the Department of Energy estimates that transportation accounts for nearly 30 percent of all greenhouse gas emissions, primarily in the form of carbon dioxide (CO2). Carbon dioxide is not considered a pollutant although it is important in understanding greenhouse gas emissions.

These standards have been developed largely for the protection of human health. They are based on a wide body of scientific research and understanding. As these pollutants are gases or very fine particulates, they are generally odorless and invisible. Thus, these standards exist to protect humans from what they would not otherwise know is harming them. The standards are set such that when the air quality within the region meets or exceeds the standards few, if any, people should suffer any short or long-term effects related to these pollutants.

2.3.1 Evaluation of Increased Vehicular Emissions from Parking Garage on Pedestrians and Occupants of Adjacent Buildings

A. Existing Condition

Fresh air intakes for the buildings surrounding the garage are as follows:

Rand Hall: The second and third floors of Rand Hall are naturally ventilated via operable windows.

Several of the spaces such as the computer room and crit space are cooled with window mounted air conditioning units. The offices located on the east side of the first floor level of Rand Hall are provided with fresh air via a fresh air intake located on the west face of Rand Hall. This intake will be maintained underneath the future Milstein Hall second floor plate.

The Foundry: The Foundry is naturally ventilated via operable double-hung windows on each side of the building.

Sibley Hall: The majority of Sibley Hall is naturally ventilated via operable windows. The Milstein Hall addition will enclose operable windows on the north and east side of the east wing of Sibley Hall at the second floor level. Supplemental fresh air will be mechanically provided to this area via a fresh air intake louver which will be located in an existing third floor window. Fresh air is and will continue to be supplied to the Slide Library space located in the basement of Sibley East via a fresh air intake located in an area-way on the north side of the east wing and a fresh air intake located in an area-way at the southeast corner of the east wing.

Tjaden Hall: The fresh air intake for Tjaden Hall is located in an elevated penthouse mechanical room on the roof of the building.

Current parking capacity at Sibley and Tjaden halls is 108 cars.

Johnson Museum of Art: The fresh air intake for the existing Johnson Museum of Art is located at the north side of the main entrance stair. The fresh air intake for the JAM addition is located on the west face of the retaining wall that supports the lawn panel between the addition and the original building.

Milstein Hall: The fresh air intake for the second floor plate of Milstein Hall will be located on the roof of Rand Hall at the west side of the building. The fresh air intake for the ground level and basement of Milstein hall will be located in an areaway space below-grade between the south side of the Milstein Plaza and north side of the Sibley Hall east wing basement.

B. Impacts of Vehicular Emissions from CAPG

Construction of the CAPG is expected to increase parking in this area by approximately 91 cars. The increase in vehicular emissions due to the increase in parking capacity is not expected to negatively impact pedestrians and occupants of adjacent buildings. The garage ventilation exhaust is located away from the adjacent buildings and proposed pedestrian paths.

The ventilation intakes for the east side of the garage levels below grade will be located on the east side of the garage at level two and three. The ventilation on the west side will be provided via the car ramp opening into the lower levels. The ventilation rate for the garage is per code (at a minimum of 1.5 cfm/sf). The discharge space will be located on the north facade of the garage in the lawn along University Avenue. Air discharge locations will be approximately 25 feet away from Tjaden Hall and Sibley Hall, approximately 50 to 60 feet away from the Foundry, and more than 100 feet away from Milstein Hall air intakes. The New York State Building Code (section 405.5.1) requires that any mechanical or gravity ventilation air intake should be minimum of 10 feet away from any active exhaust. The garage discharge will be dispersed in the air without any impact on the potential air intakes of any of the surrounding buildings.

C. Mitigation Measures

Proper ventilation is included in the proposed designs. As such, there are no mitigation measures necessary as a result of vehicular emissions from the CAPG on pedestrians and occupants of adjacent buildings.

D. Unavoidable Impacts

Proper ventilation is included in the proposed designs. As such, there are no unavoidable impacts as a result of vehicular emissions from the CAPG on pedestrians and occupants of adjacent buildings.

2.3.2 Evaluation of Impacts of Vehicular Emissions under Building Cantilever on Building Occupants

RWDI Consulting Engineers & Scientists conducted an analysis to qualitatively estimate the potential air quality impacts from roadway vehicles on University Avenue under the proposed Milstein Hall. This assessment is based on design drawings dated April 18, 2008, a site visit on March 31, 2008, projected traffic information received from Martin /Alexiou /Bryson on April 18, 2008, experience with similar projects, and engineering judgment. The following section summarizes their findings. The full report can be found in Appendix J: Exhaust Design Review.

Automobiles and buses will travel along University Avenue and underneath the proposed cantilevered second level overhang of Milstein Hall. The roadway under the cantilever is approximately 15 feet from the Foundry building, is open on the east and west, and has two openings to the south. This lack of complete enclosure is a positive design feature in terms of vehicular emissions.

Air pollution emission rates and traffic predictions were used to predict ambient concentrations of various air pollutants emitted by automobiles and buses. The air pollutant of most concern for automobiles is carbon monoxide. For diesel buses, the pollutants of most concern are nitrogen oxides and diesel odors.

A. Existing Conditions

The existing ambient air quality conditions at the site are typical of suburban locations near regular roads. Air quality standards relating to air pollutants from automobiles (for carbon monoxide, nitrogen oxides, and particulate matter established by the U.S. EPA and the State of New York) are predicted to be met. Odors from diesel buses around the existing bus stop are present, but are dispersed quickly.

B. Impact of Vehicular Emissions Under Cantilever

The reduced air circulation underneath the cantilever will increase air pollutant levels somewhat in the immediate area under the cantilever, but pollutant levels are still expected to easily meet applicable air quality standards under all traffic conditions within the partially enclosed area. Odors from diesel buses will extend a farther distance from the bus stop, and may create odor complaints at nearby operable windows at the Foundry building if they are open (see Section 2.12.2). Other proposed and existing air intakes are not predicted to be affected by the vehicular emissions.

C. Mitigation Measures

Mitigation measures for the possible odors at the Foundry building include closing of windows close to the bus stop on the south side of the building. Using non-diesel, hybrid engine buses would also eliminate odor complaints.

D. Unavoidable Impacts

Based on the above research, it is RWDI's opinion that there will not be any unavoidable negative impacts to air quality in the area as a result of construction of the proposed Milstein Hall.

2.3.3 Evaluation of Impacts on Required Fresh Air Ventilation on Adjacent Buildings

A. Existing Condition

The second floor of the east wing of Sibley Hall is naturally ventilated by 38 double-hung, wood sashed, operable windows.

The second floor of Rand Hall is naturally ventilated by 30 large and three small operable center-tilt, steel-framed windows.

B. Impacts on Required Fresh Air Ventilation

Nineteen of the 38 windows located on the second floor of the east wing of Sibley Hall will become either internal windows, or doors and lose access to fresh outside air once the Milstein Hall second floor plate is constructed.

Of the 33 operable windows on the second floor of Rand Hall, only three small operable windows on the west side of the building will become internal windows or doors and lose access to fresh outside air once the Milstein Hall second floor plate is constructed.

C. Mitigation Measures

In order to meet the code required fresh air requirements for the Sibley Hall second floor space affected by this change, an air-handling unit will be installed in a closet on the third floor of Sibley Hall, and will provide supplemental fresh air to these spaces. The fresh air intake will be installed in two third-floor windows located at the west end of the row of dormers and on the east side of Sibley. The glass panes will be removed and the fresh air intake louvers will be installed into the existing wood-framed window sashes.

The loss of access to fresh air on the second floor of Rand Hall, due to the removal of three windows, is insignificant. It will not be necessary to mechanically provide fresh air to this space. Naturally ventilated fresh air from the remaining 30 operable windows in Rand will be sufficient to meet building code requirements.

D. Unavoidable Impacts

There are no unavoidable impacts to the fresh air requirements in Sibley and Rand Hall.

2.3.4 Evaluation of Potential Wind Acceleration Effects under Milstein Hall

RWDI Consulting Engineers & Scientists conducted an analysis to qualitatively estimate the potential pedestrian wind conditions on and around the proposed Milstein Hall development. This assessment is based on the local wind climate, design drawings received on April 7 and 9, 2008, a site visit on March 31, 2008, experience with similar projects and engineering judgment. The following section summarizes their findings. The full report can be found in Appendix I: Wind Evaluation.

The wind conditions around the proposed development are assessed by use of pedestrian wind comfort criteria developed at RWDI. The four comfort categories used for this review are described in general terms as follows:

- **Sitting**: Low wind speeds during which one can read a newspaper without having it blown away. These wind speeds are appropriate for outdoor cafes and other amenity spaces that promote sitting.
- **Standing**: Slightly higher wind speeds that are strong enough to rustle leaves. These wind speeds are appropriate at major building entrances, bus stops or other areas, such as a bench along a sidewalk, where people may want to linger but not necessarily sit for extended periods of time.
- **Walking**: Winds that would lift leaves, move litter, hair and loose clothing. Appropriate for sidewalks, intersections, plazas, parks or playing fields where people are more likely to be active and receptive to some wind activity.
- **Uncomfortable**: The effects of wind speeds at this level would range from small trees swaying and wind force being felt on the body to whole trees being in motion and inconvenience being felt when walking. Wind of this magnitude would be considered a nuisance for most activities.

Wind conditions are considered acceptable for sitting, standing or walking if the wind speeds are within their specified ranges at least 80% of the time, or four in five days. An **uncomfortable** designation means that the 80% criterion is not satisfied for any of the above activities.

Safety is also considered by the criteria and is associated with excessive wind speeds that can adversely affect a pedestrian's balance and footing. If winds sufficient to affect a person's balance occur more than two times per summer or winter season, the wind conditions are considered severe. Wind control measures are typically required at locations where winds are rated as uncomfortable or they exceed the wind safety criterion.

A. Existing Condition

Wind data collected at several weather stations in the Ithaca area have been examined. Wind statistics recorded at the Game Farm Road Weather Station between 1998 and 2004 were found to be most representative for the current study. Winds from the southeast, south-southeast, northwest and west directions are considered most prevalent and important for the current assessment, although all wind directions were taken into account in RWDI's desktop assessment.

Existing wind conditions on the site are generally expected to be comfortable for standing or sitting throughout the year. Slightly higher wind speeds are predicted along the walkway between the existing Rand Hall and Sibley Hall, but these wind conditions are expected to be suitable for the intended use (i.e., walking) of the area. Around the existing bus shelter along University Avenue, wind conditions are also expected to be comfortable for standing throughout the year.

B. Impacts of Wind Acceleration

Given the local wind climate and the limited height of the proposed development, wind conditions on and around the proposed Milstein Hall development are expected to be similar to the existing conditions and are considered appropriate for the expected usage of the area. This includes the southeast entry, the east passageway, the pod seating and work spaces, the west plaza and the bus stop and sidewalk along University Avenue. There will be wind flow accelerations in the passageways underneath the proposed building, but their impact will be insignificant, considering the proposed development is only two stories in height and the proposed building massing will always shelter these areas for winds from one or more prevailing wind directions. In addition, no areas are predicted to have uncomfortable wind conditions on or around the proposed development in any season.

C. Mitigation Measures

Wind conditions are generally expected to be appropriate for the expected usage of the area. Pedestrians should be comfortable in this space and wind mitigation measures are not required and are not recommended. However, the design team may consider installing a wind screen and/or a row of trees on the west side of the west plaza if a seating area is planned in this area in the summer.

D. Unavoidable Impacts

Based on the above research, it is RWDI's opinion that there will not be any unavoidable negative impacts to wind conditions in the area as a result of construction of the proposed Milstein Hall.

2.4 Vegetation

2.4.1 Impacts to Vegetation

This section describes existing vegetation on the project sites for Milstein Hall and the CAPG. A discussion of the potential impacts to vegetation based on proposed conditions is included, along with plans for mitigating any impacts.

A. Existing Vegetation on the Milstein Hall and the CAPG Project Sites:

The combined project sites of Milstein Hall and the CAPG currently consist of 1.74 acres of paving and 0.9 acres of landscape space, primarily tree lawns and minor landscape plantings. Existing vegetation includes a variety of deciduous trees such as maple, oak, beech, cherry, and crab apple, as well as a few coniferous evergreens such as fir, cedar and larch.

Existing trees on the Milstein Hall site include five 6” diameter at breast height (dbh) maples, one 8” dbh maple, one 8” dbh oak, one 10” dbh oak, one 12” dbh maple, one 14” dbh oak, two 15” dbh maples, one 16” dbh beech, one 18” dbh ash, one 18” dbh beech, three 18” dbh oaks, and one 24” dbh sycamore.

Existing trees on the CAPG site include two 6” dbh cherries, one 6” dbh crab apple, five 6” dbh dogwoods, three 6” dbh elms, one 6” dbh ginkgo, three 6” dbh maples, one 8” dbh beech, one 8” dbh larch, one 18” dbh fir, and one 18” dbh oak.

Figure 2.4.1 indicates the location of existing trees. Column two of Table 2.4.1, Summary of Trees by Size, indicates the number of existing trees by size.

B. Impacts to Vegetation

Existing trees to remain on the Milstein Hall site include one 15” dbh maple, one 16” dbh beech, one 18” dbh ash, one 18” dbh beech, one 18” dbh oak, and one 24” dbh sycamore.

Existing trees to remain on the CAPG site include one 6” dbh cherry, one 6” dbh elm, one 6” dbh ginkgo, one 8” dbh larch and one 18” dbh oak.

Trees to remain in both project areas will be protected during construction activities to prevent damage and minimize stress injuries to branches, trunks and root systems. Column 3 of Table 2.4.1 indicates existing trees to remain.

A number of trees will be removed to facilitate the construction of Milstein Hall and the CAPG. Trees to be removed for the Milstein Hall project include five 6” dbh maples, one 8” dbh maple, one 8” dbh oak, one 10” dbh oak, one 12” dbh maple, one 14” dbh oak, one 15” dbh maple, and two 18” dbh maples. Two juniper plantings located to the south and east of Rand Hall will also be removed.

Trees to be removed for the CAPG construction include one 6” dbh cherry, one 6” dbh crab apple, five 6” dbh dogwoods, two 6” dbh elms, three 6” dbh maples, one 8” dbh beech, and one 18” dbh fir. An ornamental shrub planting located between Sibley and Tjaden halls will also be removed.

Three groups of juniper and barberry plantings, located to the southeast of Rand Hall, will be removed for the construction of the Lincoln Hall access drive and new pedestrian sidewalks. Two juniper plantings located at the entrance of the exiting surface parking lot will also be removed.

Column four of Table 2.4.1 indicates existing trees to be removed. Figure 2.4.1 indicates the locations of existing trees and shrubs to be removed.

Summary of Trees by Size					
Tree Size (dbh)	Trees Existing	To Remain	To Remove	Proposed Milstein	Proposed CAPG
4”	0	0	0	12	14
6”	20	3	17	0	0
8”	4	1	3	0	0
10”	1	0	1	0	0
12”	1	0	1	0	0
14”	1	0	1	0	0
15”	2	1	1	0	0
16”	1	1	0	0	0
18”	7	4	3	0	0
24”	1	1	0	0	0
Total	38	11	27	12	14

Table 2.4.1: Summary of trees by size.

C. Mitigation Measures

Landscape plans for Milstein Hall and the CAPG projects include new plantings to complement the existing landscape, buildings and parking facilities. These plantings will enhance the overall pedestrian environment and vehicular corridor, while mitigating the removal of existing vegetation. Plants will be selected for adaptability to local site conditions, as well as for ornamental and seasonal interest. In time, they will achieve the size and stature similar to existing trees.

Trees to be removed may be relocated on campus if deemed suitable for transplanting and appropriate for a new location.

The new plantings for Milstein Hall consist of an extensive, vegetated green roof (approximately 24,000 SF/ 0.55 acre), a sunken garden (approximately 500 SF) on the west side of the building, an ivy planting on the expanded aluminum panel stair tower, and ornamental landscape plantings between Rand and Sibley halls and along the south side of the Foundry.

New plantings for the CAPG include a street tree planting on the north side of the garage, ornamental landscape planting on the north side of the garage ramp entrance, two green roof areas on the roof deck (surface level) of the garage (approximately 625 SF), a tree and lawn pedestrian plaza located in-between Tjaden and Sibley halls, and an ornamental landscape planting on the north side of Sibley Hall. See Figure 2.4.2 for the proposed planting diagram.

D. Unavoidable Impacts

Unavoidable impacts will be limited to the visual comparison seen between a landscape comprised of younger, substantially smaller trees and mature trees located nearby. In time, this visual difference will be minimized as the vegetation grows to maturity.

Overall, the additional vegetation on site will positively impact this area. The addition of the vegetated green roof on Milstein Hall will significantly increase the amount of green space in this area. Formalized tree and ornamental landscape plantings along University Avenue will aesthetically improve the east-west pedestrian and vehicular corridor.

Figure 2.4.1: Existing vegetation and removals diagram.

LEGEND

- ○ Existing Tree to Remain
- ● Existing Tree to be Removed
- 🟩 Existing Shrubs to be Removed
- North

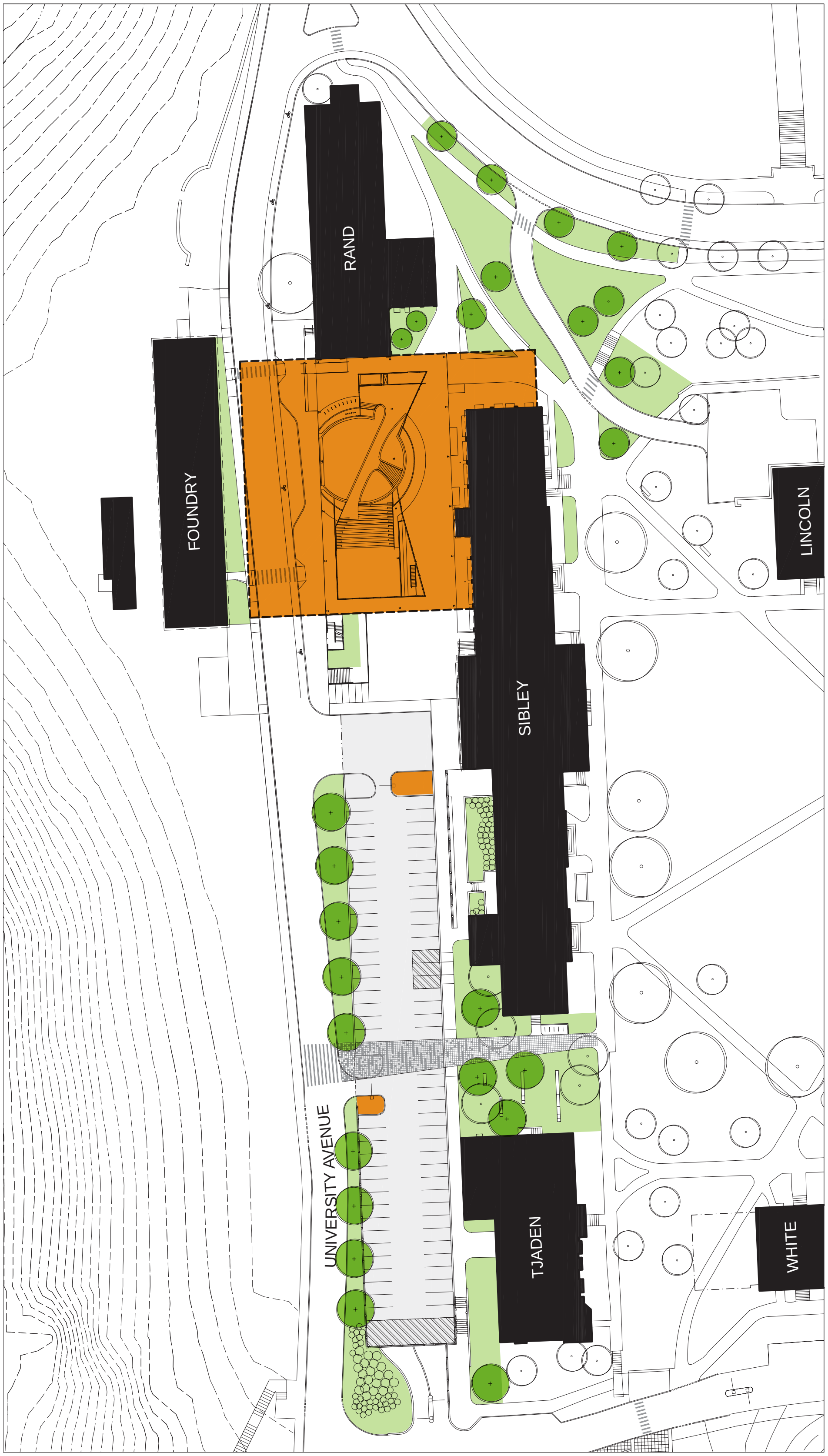


Figure 2.4.2: Proposed planting diagram.

LEGEND

- ○ Existing Tree to Remain
- ● Proposed Tree
- 🟧 Proposed Green Roof Planting
- 🟩 Proposed Ornamental Planting / Lawn

North

2.5 Aesthetic Resources

This section contains images and detailed descriptions of existing and proposed views of the project sites from representative locations as designated by the Scope. Please refer to Figure 2.5.1 for these viewpoint locations (the letter on the figure references the narrative descriptions that follow). Photographs of existing conditions were taken during the early spring of 2007 and 2008. The photographs were taken prior to the budding of trees and vegetation in order to capture the maximum visual impact. Computer generated visual simulations of the proposed views were produced by the animation, art and architecture firm ESKQ, LLC. A summary of visual impacts, mitigation measures and unavoidable impacts is included for each view.

A computer-generated animated walkthrough the proposed projects is provided on a separate CD as part of the DEIS submission. This animated film was produced by ESKQ, LLC. The animated material is intended to communicate the location, scale and massing for the projects while simulating the pedestrian experience.

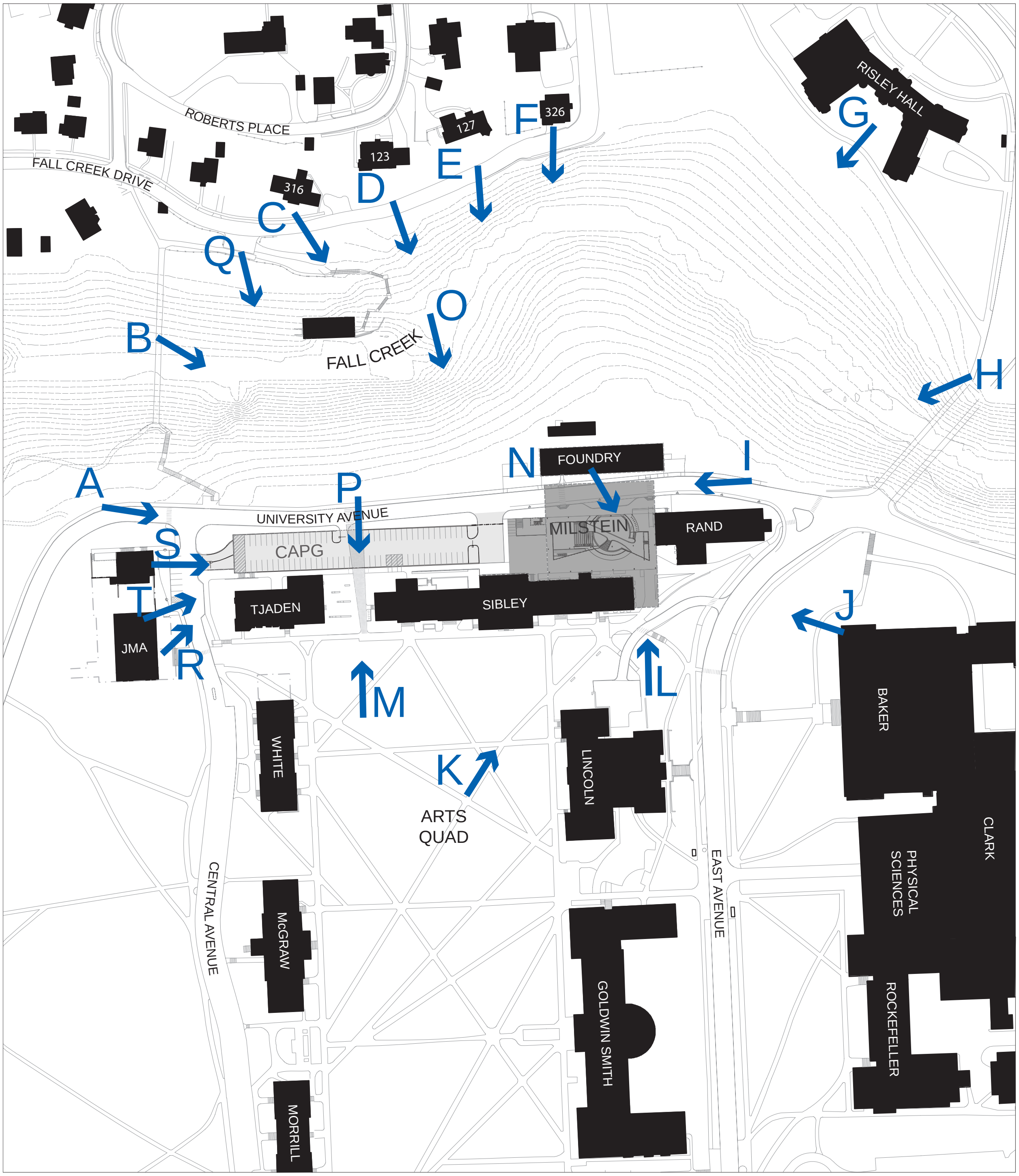


Figure 2.5.1: Aesthetic resources visual simulation locations

LEGEND

→	Daytime Visual Simulation Location
⊕	North

A. View Looking East Down University Avenue

A. Existing Conditions

Existing View

The existing view looking east down University Avenue includes the open lawn to the north of the Johnson Museum of Art, a wayfinding sign on the northwest corner of the intersection with Central Avenue, and metered parking along both sides of Central Avenue in the foreground. In the mid ground, one can see the grass slope and tree lawn to the northwest of Tjaden Hall, the west and north facades of Tjaden Hall, the north facade of Sibley Hall, the west facade of Rand Hall, the surface parking lot to the north of Tjaden and Sibley halls, and the tree lawn along the north side of the parking lot. In the background the north and west facades of Baker Laboratory can be seen.

See Figure 2.5.2 for the existing view.

Proposed View

The entrance to the lower levels of the CAPG will be visible on the east side of Central Avenue. The north and west walls of the CAPG will block views of parked cars on the surface of the garage. Vegetation will be visible on the graded slope located at the northwest corner of the garage. Street trees will also be seen along the north face of the garage along University Avenue.

The west facade of Milstein Hall will be visible in the background.

See Figure 2.5.3 for the proposed view.

B. Summary of Impacts to View

The existing grass slope east of Central Avenue will be replaced with the entrance to the lower levels of the CAPG. The north and west walls of the CAPG will mitigate views of parked cars. The tree lawn along the south side of University Avenue will be maintained and enhanced with new street trees, which will enhance the streetscape and soften the appearance of the CAPG walls.

The cantilevered, west facade of Milstein Hall will be visible, and will block the existing view of Rand Hall from this location. The Sibley Hall dome will remain in full view.

The proposed improvements will not negatively impact important views or significantly reduce the aesthetic qualities of the area.

C. Mitigation Measures

The visual impact of the proposed parking garage will be mitigated by utilizing the existing grade change to locate two-thirds of the CAPG structure below ground.

The visual impact of Milstein Hall will be mitigated by its low profile in respect to the major buildings around it. In addition, the extensive use of glass will allow existing building facades to be seen through Milstein Hall.

D. Unavoidable Impacts

Views from this location will be altered as shown.

Figure 2.5.2: Existing view looking east down University Avenue.

Figure 2.5.3: Proposed view looking east down University Avenue.

B. View Looking Southeast from Pedestrian Suspension Bridge over Fall Creek

A. Existing Conditions

Existing View

The view looking southeast from the pedestrian suspension bridge over Fall Creek includes a small portion of the vegetation along the north rim of the gorge, and the surface of Fall Creek itself in the foreground. In the background, the vegetated south rim and gorge wall of Fall Creek are visible. During the winter months when leaves are off the trees, the north facade of Sibley Hall and the north and west facades of the Foundry are visible, beyond the south rim.

See Figure 2.5.4 for the existing view.

Proposed View

The foreground view will remain unchanged.

The north and west facades of Milstein Hall, including the stair tower, will be visible in the background during the winter months.

The CAPG project will not be visible from this location.

See Figure 2.5.5 for the proposed view.

B. Summary of Impacts to View

The foreground view will remain unchanged.

The north and west facades of Milstein Hall, including the stair tower, will be visible in the background during the winter months.

The proposed improvements will not negatively impact important views or significantly reduce the aesthetic qualities of the area.

C. Mitigation Measures

The visual impact of Milstein Hall will be mitigated by its low profile and use of transparent materials.

D. Unavoidable Impacts

Views from this location will be altered as shown.

Figure 2.5.4: Existing view looking southeast from pedestrian suspension bridge over Fall Creek.

Figure 2.5.5: Proposed view looking southeast from pedestrian suspension bridge over Fall Creek.

C. View Looking South from 316 Fall Creek Drive (at Street-Front Property Line)

A. Existing Conditions

Existing View

The view looking south from 316 Fall Creek Drive, taken at the street-front property line, is of the mixed deciduous and evergreen tree line along the north and south rims of Fall Creek Gorge. During the winter months when the leaves are off the trees, the north facades of Sibley Hall, Tjaden Hall and the Foundry are visible in the background, beyond the south rim.

See Figure 2.5.6 for the existing view.

Proposed View

The foreground view will remain unchanged.

The west facade of Milstein Hall and stair tower will be visible in the background during the winter months.

The CAPG project will not be visible from this location.

See Figure 2.5.7 for the proposed view.

B. Summary of Impacts to View

The foreground view will remain unchanged.

The west facade of Milstein Hall and stair tower will be visible in the background during the winter months.

The proposed improvements will not negatively impact important views or significantly reduce the aesthetic qualities of the area.

C. Mitigation Measures

The visual impact of Milstein Hall will be mitigated by its low profile and use of transparent materials.

D. Unavoidable Impacts

Views from this location will be altered as shown.

Figure 2.5.6: Existing view looking south from 316 Fall Creek Drive.

Figure 2.5.7: Proposed view looking south from 316 Fall Creek Drive.

D. View Looking South from 123 Roberts Place (at Street-Front Property Line Along Fall Creek Drive)

A. Existing Conditions

Existing View

The view looking south from 123 Roberts Place, taken at the street-front property line on Fall Creek Drive, is of the mixed deciduous and evergreen tree line along the north and south rims of Fall Creek Gorge. During the winter months when the leaves are off the trees, the north facades of Sibley Hall, Tjaden Hall and the Foundry are visible in the background, beyond the south rim.

See Figure 2.5.8 for the existing view.

Proposed View

The foreground view will remain unchanged.

The west facade of Milstein Hall and stair tower will be visible in the background during the winter months.

The CAPG project will not be visible from this location.

See Figure 2.5.9 for the proposed view.

B. Summary of Impacts to View

The foreground view will remain unchanged.

The west facade of Milstein Hall and stair tower will be visible in the background during the winter months.

The proposed improvements will not negatively impact important views or significantly reduce the aesthetic qualities of the area.

C. Mitigation Measures

The visual impact of Milstein Hall will be mitigated by its low profile and use of transparent materials.

D. Unavoidable Impacts

Views from this location will be altered as shown.

Figure 2.5.8: Existing view looking south from 123 Roberts Place.

Figure 2.5.9: Proposed view looking south from 123 Roberts Place.

E. View Looking South from 127 Roberts Place (at Street-Front Property Line Along Fall Creek Drive)

A. Existing Conditions

Existing View

The view looking south from 127 Roberts Place, taken at the street-front property line on Fall Creek Drive, is of the mixed deciduous and evergreen tree line along the north and south rims of Fall Creek Gorge. During the winter months when the leaves are off the trees, the north facades of Sibley Hall, Tjaden Hall and the Foundry are visible in the background, beyond the south rim.

See Figure 2.5.10 for the existing view.

Proposed View

The foreground view will remain unchanged.

A small portion of the north and west facades and the stair tower of Milstein Hall will be visible in the background during the winter months.

The CAPG project will not be visible from this location.

See Figure 2.5.11 for the proposed view.

B. Summary of Impacts to View

The foreground view will remain unchanged.

A small portion of the north and west facades and the stair tower of Milstein Hall will be visible in the background during the winter months.

The proposed improvements will not negatively impact important views or significantly reduce the aesthetic qualities of the area.

C. Mitigation Measures

The visual impact of Milstein Hall will be mitigated by its low profile and use of transparent materials.

D. Unavoidable Impacts

Views from this location will be altered as shown.

Figure 2.5.10: Existing view looking south from 127 Roberts Place.

Figure 2.5.11: Proposed view looking south from 127 Roberts Place.

F. View Looking South from 326 Fall Creek Drive (at Street-Front Property Line)

A. Existing Conditions

Existing View

The view looking south from 326 Fall Creek Drive, taken at the street-front property line, is of the deciduous tree line along the north and south rims of Fall Creek Gorge. A stone retaining wall is located in the foreground along the south side of Fall Creek Drive, in front of the vegetation on the north side of the gorge. During the winter months when the leaves are off the trees, the north facade of Sibley Hall is visible in the background, the north facade of the Foundry is obscured by evergreen vegetation.

See Figure 2.5.12 for the existing view.

Proposed View

The foreground view will remain unchanged.

A small portion of the Milstein Hall stair tower and top edge of the north facade will be visible in the background during the winter months.

The CAPG project will not be visible from this location.

See Figure 2.5.13 for the proposed view.

B. Summary of Impacts to View

There are no anticipated significant impacts to the existing view from 326 Fall Creek Drive.

The foreground view will remain unchanged.

A small portion of the Milstein Hall stair tower and top edge of the north facade will be visible in the background during the winter months when leaves are off the trees.

C. Mitigation Measures

The visual impact of Milstein Hall will be mitigated by its low profile and use of transparent materials.

D. Unavoidable Impacts

Views from this location will be altered as shown.

Figure 2.5.12: Existing view looking south from 326 Fall Creek Drive.

Figure 2.5.13: Proposed view looking south from 326 Fall Creek Drive.

G. View Looking Southwest from Risley Hall

A. Existing Conditions

Existing View

The foreground view looking southwest from Risley Hall includes the lawn area to the south of the building, the intersection of concrete sidewalks, and the mature tree line located on the north side of the gorge. During the winter months, when the leaves are off the trees, building forms of the Foundry and Sibley Hall are visible in the background, through the dormant vegetation on the south side of the gorge.

See Figure 2.5.14 for the existing view.

Proposed View

The foreground view will remain unchanged.

The visual simulation illustrates the ghosted outline of the building in order to locate it within the frame of view. This outline does not illustrate what would actually be visible. Due to the existing dense vegetation growing on the north and south sides of Fall Creek Gorge, it is not expected that Milstein Hall will be visible in the background, even in the winter.

The CAPG project will not be visible from this location.

See Figure 2.5.15 for the proposed view.

B. Summary of Impacts to View

The view from this location will not change.

C. Mitigation Measures

No mitigation measures are necessary.

D. Unavoidable Impacts

There are no unavoidable impacts.

Figure 2.5.14: Existing view looking southwest from Risley Hall.

Figure 2.5.15: Proposed view looking southwest from Risley Hall.

H. View Looking Southwest from Thurston Avenue Bridge

A. Existing Conditions

Existing View

The foreground view looking southwest from the Thurston Avenue Bridge includes the stamped concrete sidewalk along the bridge, and the green metal guardrail and archway along the bridge. In the background, beyond the south rim of the gorge, buildings are visible during the winter months when leaves are off the trees. This includes the east and north facades of Lincoln Hall, the east and north facades of Rand Hall, the east and north facades of Sibley Hall including the dome, and the east and north facades of the Foundry.

See Figure 2.5.16 for the existing view.

Proposed View

The foreground view will remain unchanged.

The east and north facades of the Milstein Hall cantilever will be visible during the winter months when leaves are off the trees.

The CAPG project will not be visible from this location.

See Figure 2.5.17 for the proposed view.

B. Summary of Impacts to View

The east and north facades of Milstein Hall will be visible during the winter months when leaves are off the trees. The cantilevered portion of Milstein Hall will block views of Sibley Hall's second floor, but the dome will still be visible above it.

The proposed improvements will not negatively impact important views or significantly reduce the aesthetic qualities of the area.

C. Mitigation Measures

The visual impact of Milstein Hall will be mitigated by its low profile and use of transparent materials.

D. Unavoidable Impacts

Views from this location will be altered as shown.

Figure 2.5.16: Existing view looking southwest from Thurston Avenue Bridge.

Figure 2.5.17: Proposed view looking southwest from Thurston Avenue Bridge.

I. View Looking West down University Avenue

A. Existing Conditions

Existing View

The foreground view looking west down University Avenue includes the north facade of Rand Hall, a sycamore tree to the north of Rand Hall, the asphalt road surface of University Avenue, the concrete sidewalk on the north side of University Avenue, and the south and west facades of the Foundry. The mid ground view includes a portion of the north facade of Sibley Hall, the temporary trailers to the north of Sibley Hall, the surface parking lot to the north of Sibley and Tjaden halls, and the tree lawn and street lights along the south side of University Avenue. In the background, the upper stories of the east and north facades of the Johnson Museum of Art are visible, as is the vegetated south rim of Fall Creek Gorge.

See Figure 2.5.18 for the existing view.

Proposed View

The cantilevered, glass and marble facades of Milstein Hall will be visible from this location. The glass facades will permit views through the interior of the building and provide glimpses of buildings in the background. Visible site amenities will include the lit ceiling plane of the cantilever, the dome and glass facade of the auditorium, the bus stop and bicycle parking area, and pedestrian crosswalks.

A small portion of the CAPG's surface parking lot will be visible in the background.

See Figure 2.5.19 for the proposed view.

B. Summary of Impacts to View

The cantilevered, glass and marble facades of Milstein Hall will be visible from this location.

The proposed improvements will not negatively impact important views or significantly reduce the aesthetic qualities of the area.

C. Mitigation Measures

The visual impact of Milstein Hall will be mitigated by its low profile and use of transparent materials.

The visual impact of the CAPG will be mitigated by the street tree planting along University Avenue.

D. Unavoidable Impacts

Views from this location will be altered as shown.

Figure 2.5.18: Existing view looking west down University Avenue.

Figure 2.5.19: Proposed view looking west down University Avenue.

J. View Looking Northwest from Baker Laboratory

A. Existing Conditions

Existing View

This view includes the northern portion of the Arts Quad, the tree line of Fall Creek Gorge, and Cayuga Lake. The central view includes the south and east facades of Sibley Hall, the dome of Sibley Hall, the spire of Tjaden Hall, the east facade of the Johnson Museum of Art, the south and east facades of Rand Hall, the surface parking lot to the north of Sibley and Tjaden halls, University Avenue, and a portion of the Foundry roof and light monitor. Towards the foreground are views of East Avenue and the existing Lincoln Hall access drive.

See Figure 2.5.20 for the existing view.

Proposed View

The central view will include Milstein Hall's vegetated green roof, the glass and marble east facade of the second level, the upper portion of the stair tower located to the west of Milstein Hall, and the new Lincoln Hall access drive. Views to Cayuga Lake are unobstructed. In addition, views will continue to be provided of the east facade and dome of Sibley Hall, of the Johnson Museum of Art, of Rand Hall, and of a portion of the Foundry's light monitor.

The CAPG will not be visible from this location.

See Figure 2.5.21 for the proposed view.

B. Summary of Impacts to View

The central view will include Milstein Hall's vegetated green roof, replacing views of automobiles.

The proposed improvements will not negatively impact important views or significantly reduce the aesthetic qualities of the area.

C. Mitigation Measures

The visual impact of Milstein Hall is mitigated by the green roof, its low profile and use of transparent materials.

D. Unavoidable Impacts

Views from this location will be altered as shown.

Figure 2.5.20: Existing view looking northwest from Baker Laboratory.

Figure 2.5.21: Proposed view looking northwest from Baker Laboratory.

K. View Looking Northeast from Arts Quad (toward Milstein Hall)

A. Existing Conditions

Existing View

The view looking northeast from the Arts Quad includes the south facade of Sibley Hall, the south facade of Rand Hall and the west facade of Lincoln Hall. Asphalt pedestrian paths connect entrances on the south side of Sibley and Rand halls, and west side of Lincoln Hall, to the Arts Quad. Tree and lawn plantings are adjacent to each building in this location.

See Figure 2.5.22 for the existing view.

Proposed View

A small section of the cantilevered, glass facade of Milstein Hall, set back from the south facade of Sibley Hall, will be visible from this location. A portion of Rand Hall will be obscured by the south facade of Milstein Hall, but will be somewhat visible through the glass facade of Milstein. Pedestrian paths will lead to the plaza space under the south cantilever of Milstein Hall. The tree and lawn plantings will remain.

The CAPG will not be visible from this location.

See Figure 2.5.23 for the proposed view.

B. Summary of Impacts to View

A small section of the cantilevered, glass facade of Milstein Hall will be visible from this location.

The proposed improvements will not negatively impact important views or significantly reduce the aesthetic qualities of the area.

C. Mitigation Measures

The visual impact of Milstein Hall will be mitigated by its modest size in this view, its low profile and use of transparent materials. The visual impact will be mitigated by Milstein Hall's location off the Arts Quad proper.

D. Unavoidable Impacts

Views from this location will be altered as shown.

Figure 2.5.22: Existing view looking northeast from Arts Quad.

Figure 2.5.23: Proposed view looking northeast from Arts Quad.

L. View Looking North from Lincoln Hall Showing Both Milstein and Sibley Facades

A. Existing Conditions

Existing View

The view looking north from Lincoln Hall includes the south facade of Sibley Hall, the ADA ramp in front of Sibley, the south facade of Rand Hall, and an open space in-between them. A retaining wall holding the hillside to the east of the Lincoln Hall access drive is visible in the foreground, to the right. In the background, the south side of the Foundry is visible through this space.

See Figure 2.5.24 for the existing view.

Proposed View

The glass and marble southern facade of Milstein Hall, set back from the south facade of Sibley Hall, will be visible from this location. The ADA ramp in front of Sibley Hall will be removed. Milstein's first level glass facade will be visible. The glass will afford views of Milstein's interior spaces, including the ceiling light grid of the second level and the vertical light tubes on the first level. The glass will permit views through the interior toward Rand Hall and the Foundry in the background.

The CAPG will not be visible from this location.

See Figure 2.5.25 for the proposed view.

B. Summary of Impacts to View

The glass and marble southern facade of Milstein Hall will be visible from this location.

The proposed improvements will not negatively impact important views or significantly reduce the aesthetic qualities of the area.

C. Mitigation Measures

The visual impact of Milstein Hall is mitigated by its modest size in this view, its low profile and use of transparent materials.

D. Unavoidable Impacts

Views from this location will be altered as shown.

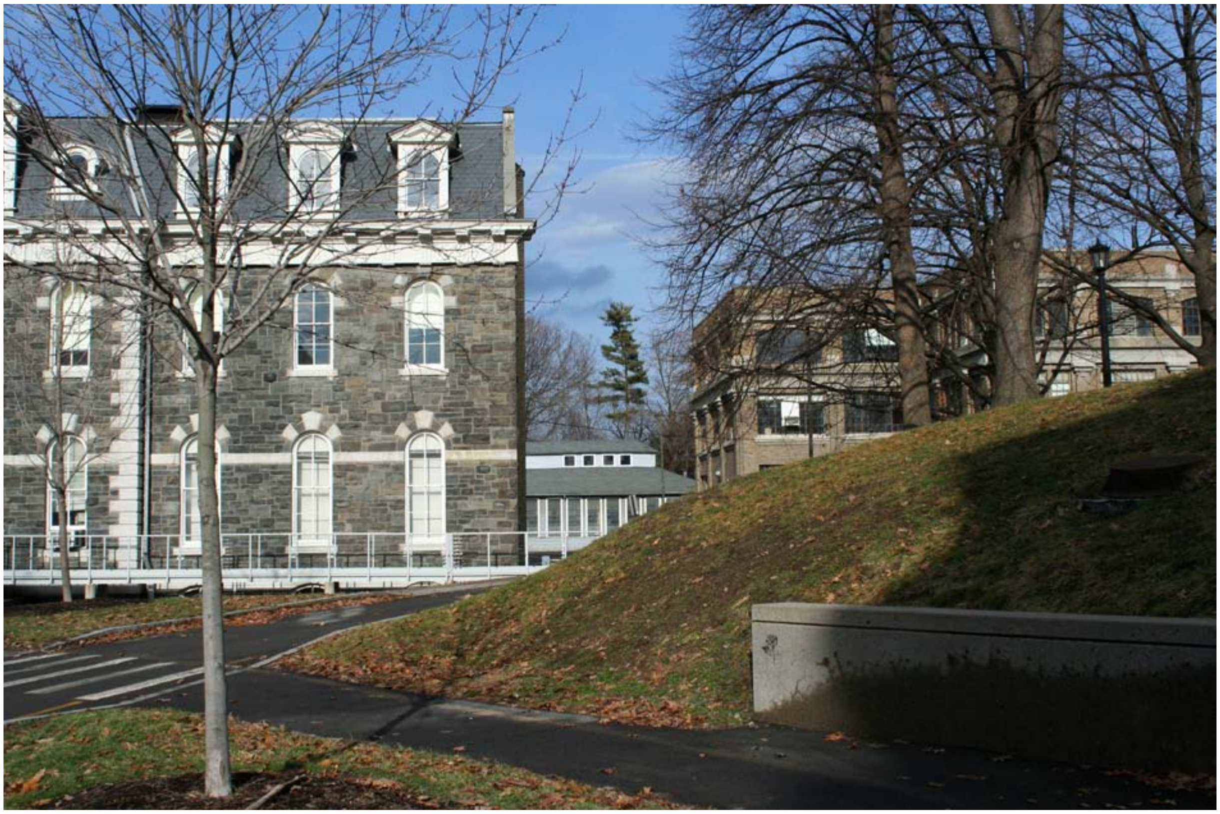


Figure 2.5.24: Existing view looking north from Lincoln Hall.

Figure 2.5.25: Proposed view looking north from Lincoln Hall showing both Milstein and Sibley facades.

M. View Looking North from Arts Quad (toward the CAPG)

A. Existing Conditions

Existing View

In the foreground, the Arts Quad tree and lawn landscape and asphalt pedestrian sidewalk can be seen. In the background, the raised topography of the northern end of the Arts Quad blocks views of the existing surface parking lot. The south facades of Tjaden and Sibley halls are visible, as is the open landscape space between them. See Figure 2.5.26 for the existing view.

Proposed View

Milstein Hall is not visible in this view.

The CAPG surface parking lot will not be visible from this vantage point, due to the elevated ground plane at the northern end of the Arts Quad. The landscape space between Sibley and Tjaden will be enhanced with quarry block seating walls, which will be visible in the background.

See Figure 2.5.27 for the proposed view.

B. Summary of Impacts to View

The CAPG surface parking lot will not be visible from this vantage point. The landscape space between Sibley and Tjaden will be enhanced.

The proposed improvements will not negatively impact important views or significantly reduce the aesthetic qualities of the area.

C. Mitigation Measures

There are no mitigation measures necessary.

D. Unavoidable Impacts

There are no unavoidable impacts.

Figure 2.5.26: Existing view looking north from the Arts Quad toward the CAPG site.

Figure 2.5.27: Proposed view looking north from the Arts Quad toward the CAPG site.

N. View from Inside the Foundry Looking South

A. Existing Conditions

Existing View

The interior view of the Foundry, looking south, reveals the exterior wall of the open classroom, studio, and shop space. The south wall consists of evenly spaced, triple-hung windows along the length of the south facade. The lower third, and some of the middle third, windows are white-washed to provide privacy from the sidewalk and roadway. The windows are separated by painted, wood plank siding. The upper stories of Rand Hall's west facade can be seen through the upper portions of the windows.

See Figure 2.5.28 for the existing view.

Proposed View

The Milstein Hall cantilever will be visible through the upper portions of the south Foundry wall windows. The glass and marble facade of the cantilever will be visible, as will the ceiling plane of the cantilever, and the interior light grid of the second level.

The CAPG is not visible in this view.

See Figure 2.5.29 for the proposed view.

B. Summary of Impacts to View

The Milstein Hall cantilever will be visible through the upper portions of the south Foundry wall windows.

The proposed improvements will not negatively impact important views or significantly reduce the aesthetic qualities of the area.

C. Mitigation Measures

The visual impact of Milstein Hall will be mitigated by its use of light colored materials and unobtrusive light fixtures under the cantilever.

D. Unavoidable Impacts

Views from this location will be altered as shown.

Figure 2.5.28: Existing view from inside the Foundry looking south.

Figure 2.5.29: Proposed view from inside the Foundry looking south.

O. View from the Recreational River (within Gorge) Looking South

A. Existing Conditions

Existing View

The foreground view looking south from the Recreational River is of Fall Creek. The south gorge wall and the vegetated south rim of the gorge are in the background. During the winter months, when the leaves are off the trees, the northeast corner of the Foundry and kiln building are visible through the dormant vegetation in the background, on the south side of the gorge. Sibley's dome is also visible. These building facades are not visible during the summer months when leaves are on the trees. Electric lines that run from the south rim to the hydroelectric building on the north side of Fall Creek are also visible.

See Figure 2.5.30 for the existing view.

Proposed View

A small portion of the northwest corner of Milstein Hall will be visible during the winter months, when leaves are off the trees. It will not be visible during the summer months.

The CAPG will not be visible from this location.

See Figure 2.5.31 for the proposed view.

B. Summary of Impacts to View

There are no significant impacts to the existing view from the Fall Creek Recreational River within the gorge.

The proposed improvements will not negatively impact important views or significantly reduce the aesthetic qualities of the area.

C. Mitigation Measures

There are no mitigation measures necessary.

D. Unavoidable Impacts

There are no unavoidable impacts.

Figure 2.5.30: Existing view from Recreational River (within gorge) looking south.

Figure 2.5.31: Proposed view from Recreational River (within gorge) looking south.

P. View from South Rim of Gorge Looking South

A. Existing Conditions

Existing View

Standing at the south rim of the gorge looking south, the foreground view includes University Avenue and the tree lawn south of the road. The existing surface parking lot and gated exit is visible. In the background, the north and west facades of Sibley Hall and the north and east facades of Tjaden Hall are visible beyond the parking lot. A landscape area, with sidewalk leading to the Arts Quad, is located between these buildings. Olin Library, Uris Library, McGraw Tower, and Morrill Hall are partially visible only during the winter months when leaves are off the trees.

See Figure 2.5.32 for the existing view.

Proposed View

Milstein Hall is not visible in this view.

The surface parking level and gated exit of the CAPG will be visible from this location and similar to existing conditions. A striped pedestrian cross walk on University Avenue will be located in the foreground. It will connect to a pedestrian walkway, consisting of gray toned pavers, that will lead to the Arts Quad. The enhanced landscape space between Sibley and Tjaden halls will be visible in the background.

See Figure 2.5.33 for the proposed view.

B. Summary of Impacts to View

The surface parking level and gated exit of the CAPG will be visible from this location. The addition of the pedestrian walkway is the most visible change in condition. It will have a positive effect of bringing pedestrians to the Arts Quad and high-lighting the importance of this destination.

The proposed improvements will not negatively impact important views or significantly reduce the aesthetic qualities of the area.

C. Mitigation Measures

Views of the parking garage are mitigated by locating most of the structure underground and maintaining existing grades at the surface level parking. Views across the parking area and into the quad are improved with the addition of the pedestrian walkway. The visual impact of the walkway is mitigated by the use of gray toned pavers. The potential impact is also mitigated by the visual organization of the new design, directing the eye to appreciate an axial vista into the Arts Quad that would have gone unnoticed in the existing condition because of the cluttered, undefined foreground.

D. Unavoidable Impacts

Views from this location will be altered as shown.

Figure 2.5.32: Existing view from south rim of gorge looking south.

Figure 2.5.33: Proposed view from south rim of gorge looking south.

Q. View from North Rim of Gorge Looking South

A. Existing Conditions

Existing View

The foreground view looking south from the north rim of the gorge includes the gravel parking area accessed from Fall Creek Drive and the vegetated north gorge rim. The background view includes the south gorge wall and its vegetated rim. During the winter months when the leaves are off the trees, the north and east facades of the Foundry and Sibley Hall are visible, as is the Sibley dome. The majority of these buildings are not visible during the summer months when leaves are on the trees.

See Figure 2.5.34 for the existing view.

Proposed View

The west facade of Milstein Hall will be visible from this location in the winter, when leaves are off the trees. The stair tower will also be visible at this time. In the summer months, views of Milstein will be blocked by the vegetation growing along the gorge.

The CAPG will not be visible from this location.

See Figure 2.5.35 for the proposed view.

B. Summary of Impacts to View

The west facade of Milstein Hall will be visible from this location in the winter, when leaves are off the trees.

The proposed improvements will not negatively impact important views or significantly reduce the aesthetic qualities of the area.

C. Mitigation Measures

The visual impact of Milstein Hall is mitigated by its low profile and use of transparent materials.

D. Unavoidable Impacts

Views from this location will be altered as shown.

Figure 2.5.34: Existing view from north rim of gorge looking south.

Figure 2.5.35: Proposed view from north rim of gorge looking south.

R. View Looking Northeast from Entrance to Current Johnson Museum of Art Building

A. Existing Conditions

Existing View

The foreground view looking northeast from the current Johnson Museum of Art entrance includes the concrete entrance plaza and handrail, and a lawn area with sculpture display. Pedestrian sidewalks, Central Avenue and metered parking on both sides of Central Avenue can be seen in the mid-ground. In the background, on the east side of Central Avenue, a sloped lawn, the west facade of Tjaden Hall, the parking lot to the north of Tjaden Hall, parked vehicles and two dumpsters are visible. Deciduous and coniferous trees are located in the lawn at the southeast corner of the Central Avenue/University Avenue intersection. The landing area for the pedestrian stairway and path to the Fall Creek suspension bridge is visible to the north side of University Avenue.

See Figure 2.5.36 for the existing view.

Proposed View

Milstein Hall will not be visible from this location.

The entrance to the lower levels of the CAPG, on the east side of Central Avenue, will be visible from this location. The west and south walls of the parking structure will block views of parked cars on the surface parking level. A pedestrian walkway, with stairs leading to the upper surface will be visible to the right side (south) of the CAPG vehicle entrance. The CAPG exit gate will also be visible.

See Figure 2.5.37 for the proposed view.

B. Summary of Impacts to View

Milstein Hall will not be visible from this location.

The entrance to the lower levels of the CAPG, on the east side of Central Avenue, will be visible from this location.

The proposed improvements will not negatively impact important views or significantly reduce the aesthetic qualities of the area.

C. Mitigation Measures

The visual impact of the CAPG will be mitigated by its similarity of scale to the existing sloped condition. The west and south walls of the structure will block views of parked vehicles. The dumpsters will be relocated in an interior centralized marshalling room in Sibley Hall, eliminating them from view. The northwest, bermed corner of the CAPG will be planted with evergreen shrubs to visually screen the corner of the parking structure. Street trees will also be planted along University Avenue.

D. Unavoidable Impacts

Views from this location will be altered as shown.

Figure 2.5.36: Existing view looking northeast from the current entrance to the Johnson Museum of Art.

Figure 2.5.37: Proposed view looking northeast from the current entrance to the Johnson Museum of Art.

S. View Looking East from the Johnson Museum of Art Addition's Entrance

A. Existing Conditions

Existing View

The foreground view looking east, from the Johnson Museum of Art addition's entrance (currently in construction), consists of tree lawn and metered parking on the west side of Central Avenue. Background views toward the east side of Central Avenue include metered parking, an asphalt sidewalk, a grass slope connecting the sidewalk to the first level of Tjaden Hall, vehicles parked in the parking lot to the north of Tjaden Hall, two dumpsters, and various deciduous and coniferous trees planted in the lawn to the west and north of the parking lot. Vegetation growing on the south side of the Fall Creek Gorge is also visible.

See Figure 2.5.38 for the existing view.

Proposed View

Milstein Hall will not be visible from this location.

The entrance and exit lanes to the lower levels of the CAPG will be visible from this location. The west facade of the surface deck parking level will also be visible, but will block views of parked cars on the surface. The bermed, northwest corner of the garage will visually mitigate the potential height of the garage wall at the northwest corner.

See Figure 2.5.39 for the proposed view.

B. Summary of Impacts to View

Milstein Hall will not be visible from this location.

The entrance and exit lanes to the lower levels of the CAPG will be visible from this location.

The proposed improvements will not negatively impact important views or significantly reduce the aesthetic qualities of the area.

C. Mitigation Measures

The visual impact of the CAPG will be mitigated by its similarity of scale to the existing sloped condition. The west and south walls of the structure will block views of parked vehicles. The dumpsters will be relocated in an interior centralized marshalling room in Sibley Hall, eliminating them from view. The northwest, bermed corner of the CAPG will be planted with evergreen shrubs to visually screen the corner of the parking structure. Street trees will also be planted along University Avenue.

D. Unavoidable Impacts

Views from this location will be altered as shown.

Figure 2.5.38: Existing view looking east from entrance to Johnson Museum of Art addition.

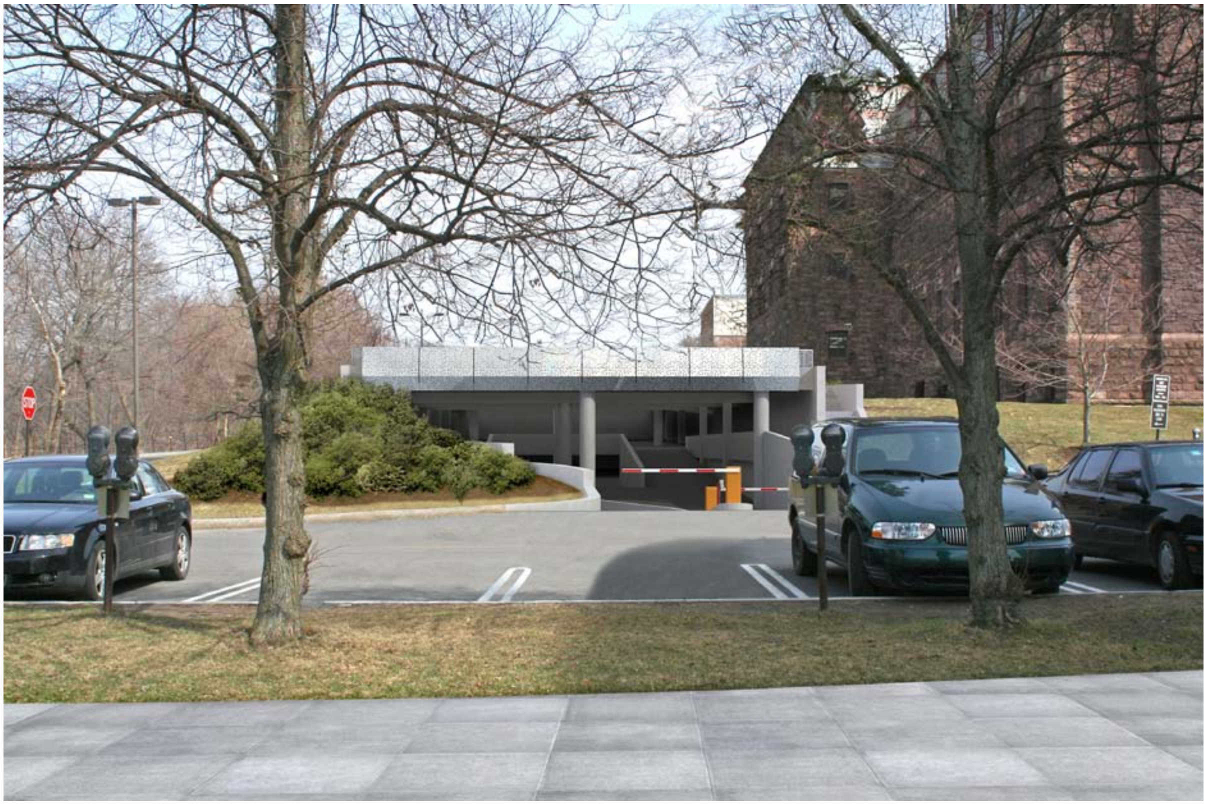


Figure 2.5.39: Proposed view looking east from entrance to Johnson Museum of Art addition.

T. View toward Project Site from Fifth Floor (Asia Gallery) of the Johnson Museum of Art

A. Existing Conditions

Existing View

From the fifth floor Asia Gallery of the Johnson Museum of Art, looking in the northeasterly direction, the foreground view consists of the north-bound lane of Central Avenue, metered parking and the pedestrian sidewalk along the eastern side of Central Avenue, the landing area for the pedestrian stairway and path to the Fall Creek suspension bridge to the north side of University Avenue. The background view includes the west facade of Tjaden Hall, vehicular parking and dumpsters to the north of Tjaden Hall, a tree lawn planted with deciduous and coniferous trees to the north and west of the Tjaden Hall parking lot, University Avenue, and vegetation growing along the south side of the Fall Creek Gorge.

See Figure 2.5.40 for the existing view.

Proposed View

Milstein Hall will not be visible from this location.

The entrance to the lower levels of the CAPG will be visible from this location. The bermed, northwest corner of the garage will visually mitigate the potential height of the garage wall at the northwest corner. The surface level of the CAPG will be visible from this elevated position, affording views to parked vehicles.

See Figure 2.5.41 for the proposed view.

B. Summary of Impacts to View

Milstein Hall will not be visible from this location.

The entrance to the lower levels of the CAPG will be visible from this location.

The proposed improvements will not negatively impact important views or significantly reduce the aesthetic qualities of the area. The important views from the fifth floor of the Johnson Museum of Art are to the north and northwest (Cayuga Lake) rather than to the east (project site).

C. Mitigation Measures

The visual impact of the CAPG will be mitigated by its similarity of scale to the existing sloped condition. The west and south walls of the structure will block views of parked vehicles. The dumpsters will be relocated in an interior centralized marshalling room in Sibley Hall, eliminating them from view. The northwest, bermed corner of the CAPG will be planted with evergreen shrubs to visually screen the parking structure. Street trees will also be planted along University Avenue.

D. Unavoidable Impacts

Views from this location will be altered as shown.

Figure 2.5.40: Existing view toward project site from fifth floor (Asia Gallery) of the Johnson Museum of Art.

Figure 2.5.41: Proposed view toward project site from fifth floor (Asia Gallery) of the Johnson Museum of Art.

U. Animated Walkthrough Visual Simulation

An animated walkthrough is provided on CD to give a sense of the spatial experience of the proposed projects, for the purposes of understanding their locations, scale and massing, as well as basic building forms and materials. Please refer figures 2.5.42 - 2.5.49 that diagram the animated paths included on the CD submitted with the DEIS package.

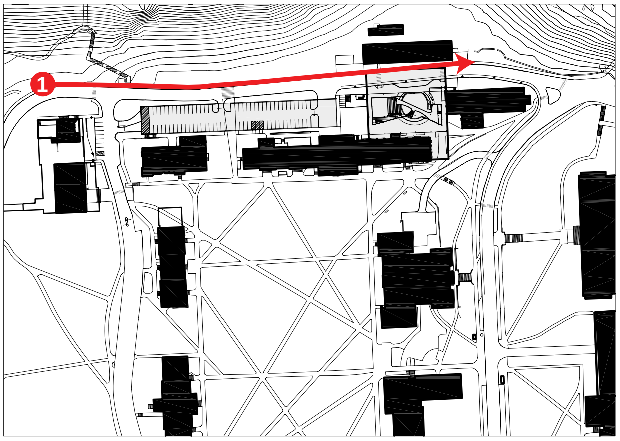


Figure 2.5.42: Animation path, Camera 1.

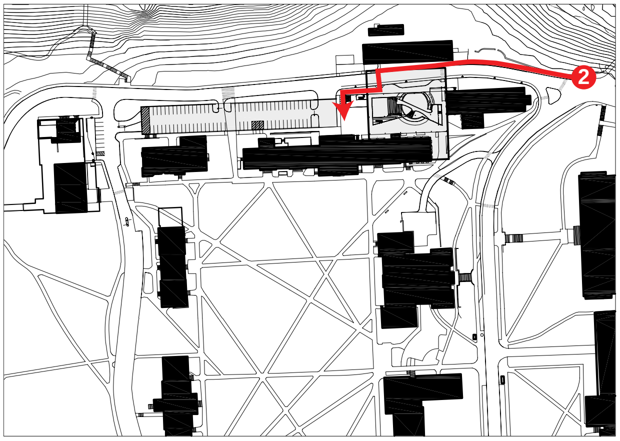


Figure 2.5.43: Animation path, Camera 2.

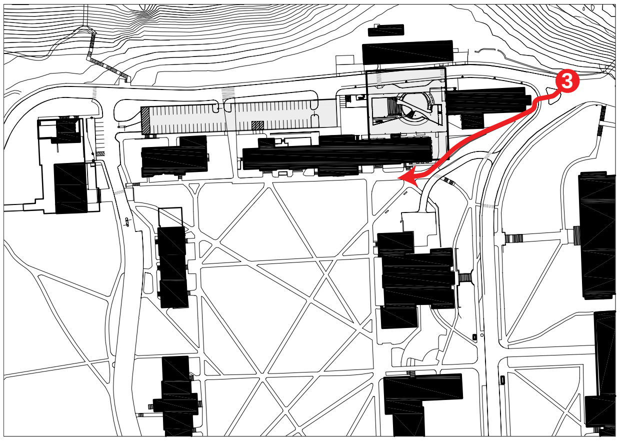


Figure 2.5.44: Animation path, Camera 3.

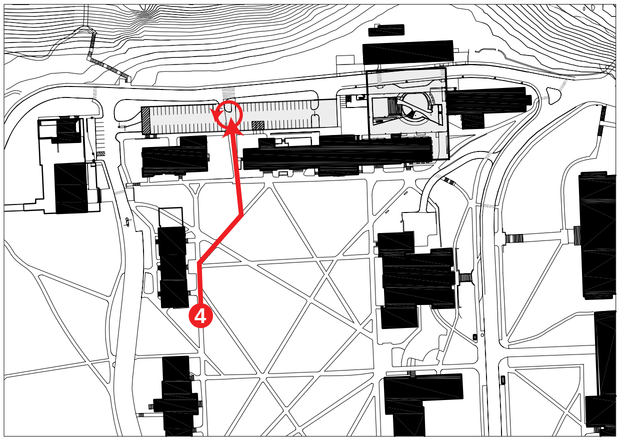


Figure 2.5.45: Animation path, Camera 4.

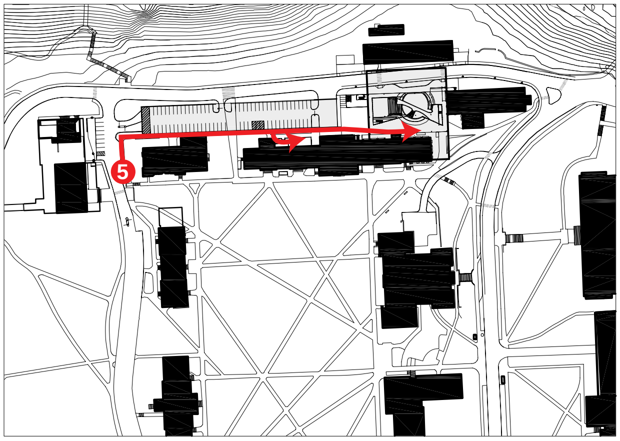


Figure 2.5.46: Animation path, Camera 5.

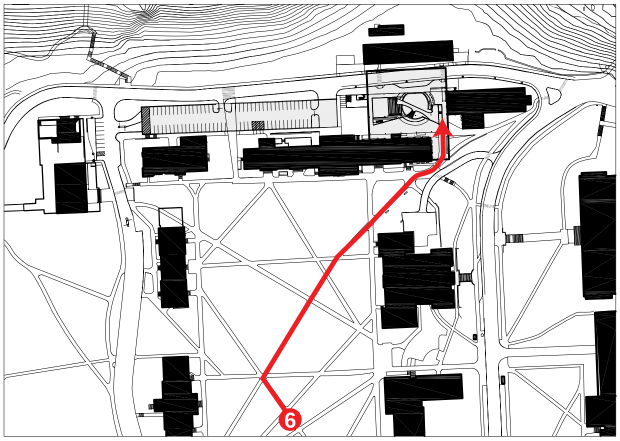


Figure 2.5.47: Animation path, Camera 6.

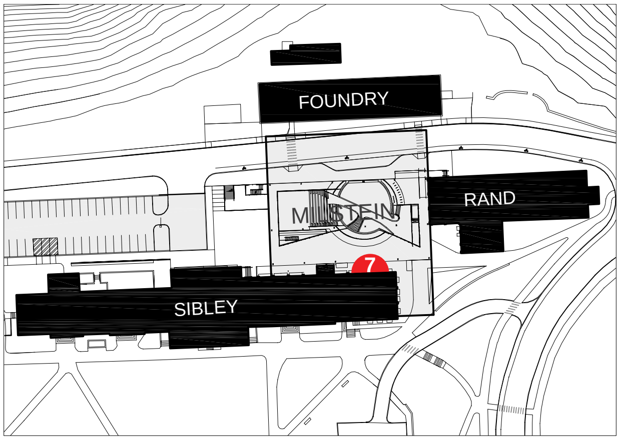


Figure 2.5.48: Animation path, Camera 7.

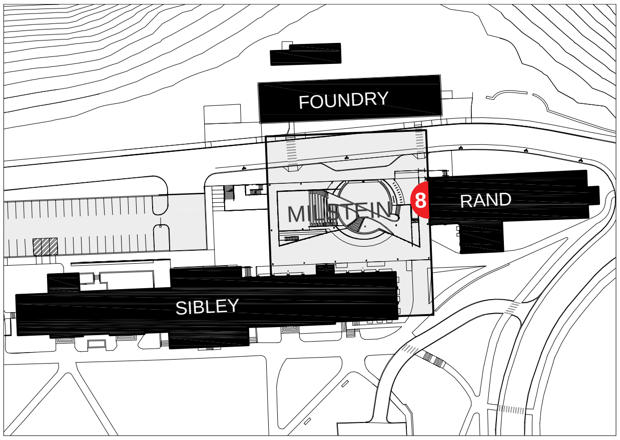


Figure 2.5.49: Animation path, Camera 8.

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● Begin Here ➔ Direction of Travel ↪ 90° Panorama ↻ 360°Panorama ◓ Interior Panorama

2.6 Cultural Resources

The following sections examine the existing cultural resources potentially affected by the Milstein Hall and CAPG projects (sometimes collectively called the project). Section 2.6.1 addresses historic resources; Section 2.6.2, exterior surfaces to be enclosed; Section 2.6.3, interior spaces where new structures attach; Section 2.6.4, where new structures attach to old, and Section 2.6.5, archaeological resources. Each section summarizes existing conditions of the historical or archaeological resource, analyzes potential impacts of the proposed projects on those resources, discusses mitigation measures, and identifies unavoidable impacts.

2.6.1 Existing Historic Resources

This section summarizes the existing historic resources, analyzes the potential impacts to those resources, discusses mitigation measures, and identifies unavoidable impacts of the proposed Milstein Hall and CAPG projects. This section was prepared by Bero Architecture, PC (see Appendix C for firm qualifications and historic preservation projects). Appendix C: Paul Milstein Hall and the Central Avenue Parking Garage Historic Resources Report, also prepared by Bero Architecture, provides a description of the study's methodology, historic overview, and detailed inventory with photographs and narrative description of each building and historic district examined in the study. Figure 2.6.1 indicates the location of all buildings and historic districts included in the study of historic resources.

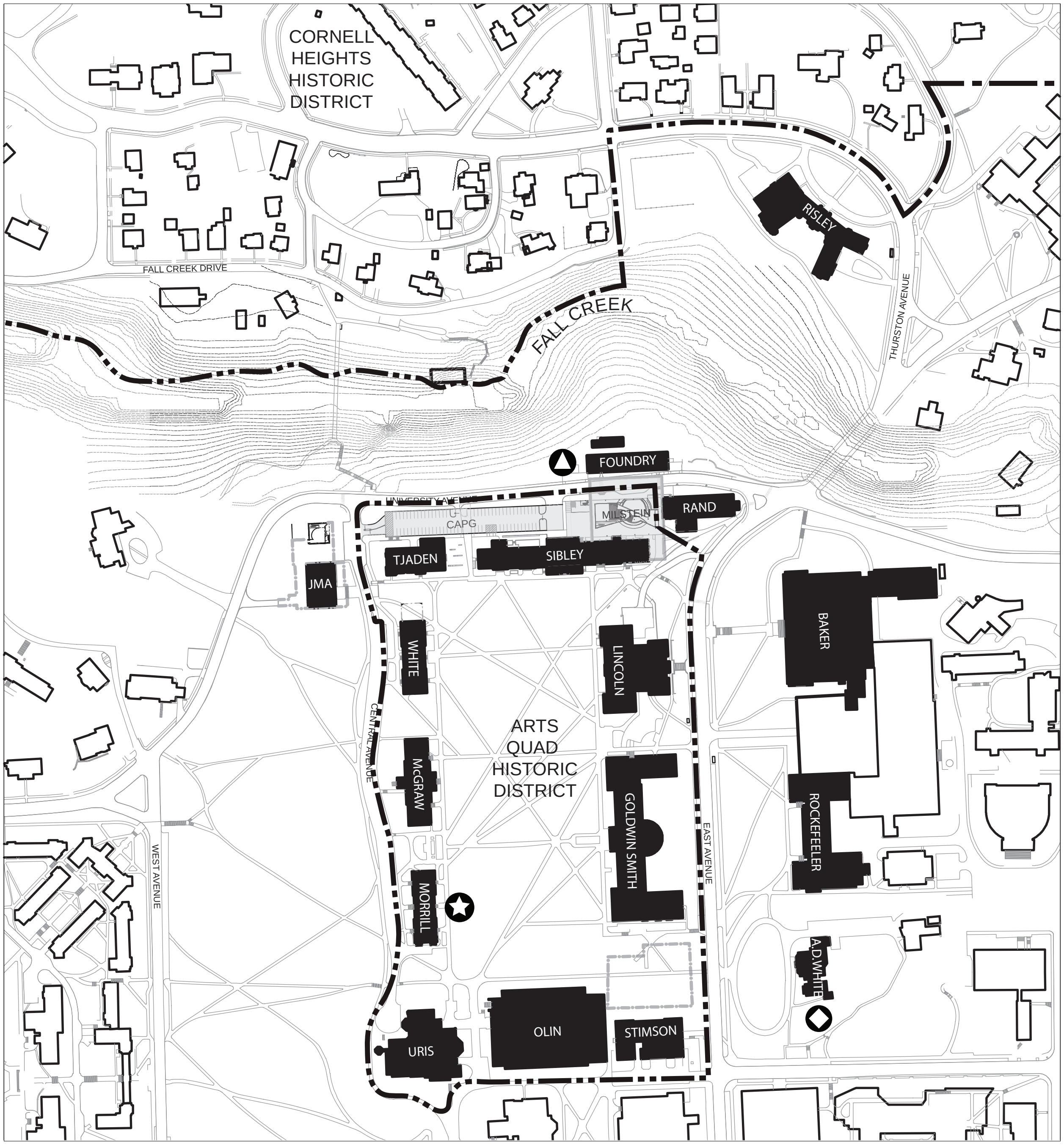

Figure 2.6.1: Historic Resources Inventory

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■ Building Described in Appendix C

▭ Historic District Boundary

▢ Project Sites

★ National Historic Landmark

◆ Individually Listed on National Register of Historic Places

▲ Local Landmark

↑ North

A. Existing Conditions

A number of architecturally and/or historically significant resources are located adjacent to or within view of the project site.

Sibley Hall

Sibley Hall, which occupies a visually prominent site at the north end of the Arts Quadrangle, combines stylistic elements popular at different times during the 31 years of its development. The oldest section, now a portion of the west wing, was built in 1870-71. It was the fourth campus structure and shares many Second Empire stylistic features with the "Old Stone Row," Cornell's three earliest buildings, including cornice lines, rough hewn local stone with lighter stone trim, mansard roof, bracketed cornices, and round-arched windows. This west wing of Sibley was expanded from nine to 15 bays with two additions in the 1880s, maintaining the original stylistic features. In the 1890s, East Sibley (now the east wing) was built as a free-standing structure with a façade nearly identical to the west section. The two were linked in 1902 by the Sibley dome, which uses similar façade materials but employs a neo-classical vocabulary.

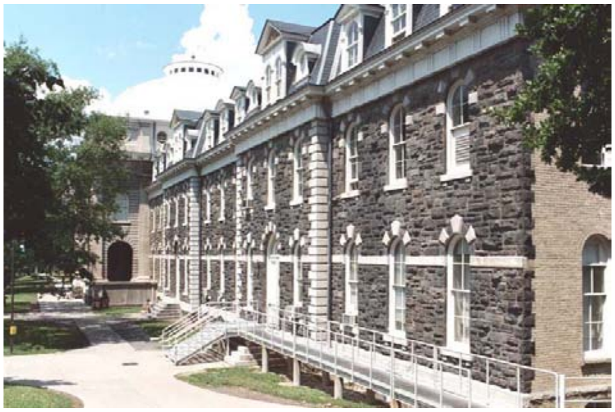

Figure 2.6.2: South stone facade of Sibley trimmed with cut stone, Classical dome beyond.

Figure 2.6.3: Expandable east end of Sibley. The masonry is common brick.

Because they do not face the Arts Quad, the east and north walls of all sections of Sibley Hall are more utilitarian than the principal (south) facades. They employ irregular fenestration, little decoration, and brick rather than stone, except at the west wing of Sibley. The east wall of Sibley is treated in a way similar to the north walls, suggesting an intention to expand in this direction.

Since its original construction, Sibley Hall has formed the boundary between the formal campus quadrangle and a frequently-changing complex of utilitarian structures to the north. This complex included one-story brick buildings containing mechanical laboratories and a foundry (preceding the current timber-framed, wood-sided Foundry) as well as a farmhouse and a student residence building. This complex of buildings served as teaching space for engineering students and also supplied the campus with heating and lighting. By the 1880s, the complex had expanded to form a rough courtyard of one and two story buildings, with a boiler plant at its center providing steam for central campus buildings. Assorted mechanical shops, with continuing changes, remained in use until the 1950s, when the College of Engineering relocated to a new complex of buildings. At this time, these utilitarian buildings, except for what is now called the Foundry, were demolished to create a surface parking lot stretching the full length of the north wall of Sibley Hall.

Sibley Hall is architecturally significant as a contributing element and a focal point in Cornell's Arts

Quadrangle, a locally designated historic district. Its design is the product of three important local architects: Archimedes Russell, who also designed McGraw Hall, Charles Osborne, and Arthur Gibb. Building expansions between 1881 and 1894 all use the original design vocabulary, while the 1902 Sibley dome adds classical elements reflecting the Beaux Arts influences seen elsewhere on the campus such as Goldwin Smith and Rockefeller halls. Of all the early campus buildings, Sibley underwent the most frequent and extensive expansions in its first 30 years. This expansion and composition reflect Cornell's continuing method of physical growth: addition of new buildings in close proximity to earlier buildings, each expressing the arrangement, technology, materials, and popular styles of its era.

Sibley Hall is historically significant as the home of Sibley College, Cornell's first engineering program and an important element in Ezra Cornell's vision of a college offering training in the practical and technological disciplines. After 1885, under the direction of Dr. Robert Henry Thurston, Sibley College became a nationally recognized center for research in mechanical engineering. In response to the college's growth, a 1920s master plan for engineering facilities called for a complete reworking of the north end of campus to create a new engineering complex on the sites of Sibley, Tjaden, Rand and Lincoln halls. This master plan proposed a new Collegiate Gothic complex which would leave only the two earliest sections of Sibley, and Rand, intact. Postponed by the Depression, the plan was ultimately shelved in favor of a new engineering complex on the southern part of the campus built between 1940 and 1965, freeing Sibley to house the College of Architecture, Art and Planning. Together, Tjaden, Sibley and Rand halls and the Foundry, with the near-by Johnson Museum of Art, are now the center for architecture, planning and fine arts education at Cornell.

The proposed Milstein Hall and CAPG are directly north of Sibley Hall. Milstein Hall will abut Sibley East.

Rand Hall

Architecturally, Rand Hall is a three-story, flat-roofed building at the southwest corner of the East Avenue/University Avenue intersection. Built in 1912 to provide technical training space for the Sibley College of Engineering, it has a utilitarian industrial image, softened by simplified neo-classical design elements such as the arched entrance, buff brick pilasters, shallow arched windows, stone trim, and attic story articulation of the third floor. Its rectangular plan (with the long axis parallel to University Avenue) and elevations are relieved by a projection at the south (main) entry. Facades are composed of repetitive bays featuring large multi-paned rolled steel windows on three floors. It is a relatively simple, but handsome, example of early 20th century campus design.

Historically, although not included in the local landmark designation for the adjacent Arts Quad buildings, Rand Hall has a strong association with the Sibley College of Engineering and later with the College of Architecture, Art and Planning.

The proposed Milstein Hall is directly east of, and will abut, Rand Hall.

The Foundry

The Foundry is the only surviving vestige of the 19th century complex of shops which occupied the area north of Sibley Hall. It is a wood-framed building stretching 135 feet along the north side of University Avenue, occupying a narrow plateau between the roadway and Fall Creek Gorge. The Foundry has a simple repetitive façade consisting of a series of tall triple-hung windows above a masonry knee wall. It lacks a formal entrance. The hipped roof has a full length ridge monitor, probably intended for ventilation, hidden inside by the present ceiling. The Foundry in many ways resembles industrial buildings of the period designed to parallel railroad sidings; design was determined almost solely by economy of construction and very little modification to optimize use on this particular site.

The Foundry is listed as an individual landmark by the City of Ithaca in recognition of its status as the last campus example of a small scale, wood-framed industrial building. It is the sole survivor of the many secondary buildings that provided heat and power for the campus and served the Sibley College of Mechanic Arts' emphasis on practical, hands-on engineering. It has a long history of use by the engineering programs but is not typical; most of the engineering shops had non-combustible exterior walls and some were two-story. It has served as the sculpture studio for the College of Architecture, Art and Planning since 1963.

The proposed Milstein Hall is directly south of the Foundry.

Arts Quad

Cornell University's main quadrangle is a City of Ithaca designated historic district. In addition, Morrill Hall is listed as a National Historic Landmark for its significance as the first building of New York's land grant university.

The Arts Quad is a large rectangular lawn planted with informally located deciduous trees and traversed by numerous walkways. The Quad is enclosed by 10 buildings, including a number of the university's oldest structures. See Figure 2.6.4. Morrill Hall, located at the southwest corner of the Quad and completed in 1868, was the first building constructed by the University; Olin Library, completed in 1961, is the most recent quad building.

Figure 2.6.3a: Rand Hall from the south.

Figure 2.6.3b: Rand Hall from the northeast.

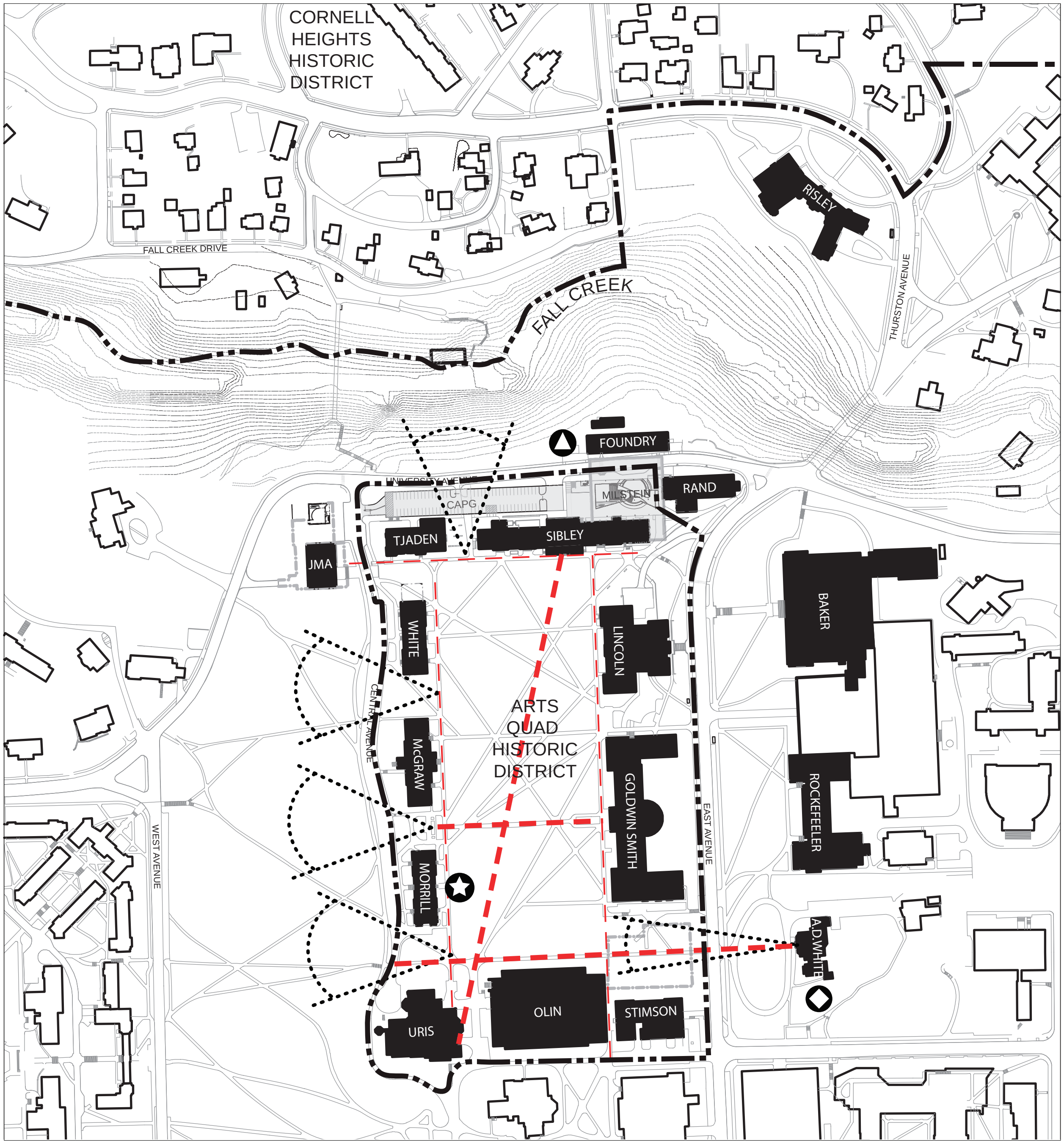

Figure 2.6.4: Arts Quad Visual Axes.

LEGEND

- ■ Building Described in Appendix C
- ⬚ Historic District Boundary
- ▢ Project Sites
- ★ National Historic Landmark
- ◆ Individually Listed on National Register of Historic Places
- ▲ Local Landmark
- ▬ ▬ ▬ Major Arts Quad Visual Axis
- — — — Minor Arts Quad Visual Axis
- ▷ Major Arts Quad View
- ↑ North

Although no new freestanding structures have been constructed since Olin Library was completed, growth and change of the university require growth and change of its physical facilities. The buildings defining the Arts Quad continue to be useful because of continuing adaptation. In addition to constant upgrading of infrastructure, the following are some of the changes to Arts Quad buildings since Olin Library was begun in 1958:

Building	**Year**	**Renovation**
Morrill Hall	1966	Complete interior renovation to accommodate the department of Modern Languages.
McGraw Hall	1972	Extensive renovation.
White Hall	2002	Complete renovation designed by Peter Gisolfi Associates to accommodate the Departments of Government and Near Eastern Studies and the Visual Studies Program.
Tjaden Hall	c.1970 1998	Tower roof removed. Tower roof restored.
	1982	Gallery renovated to accommodate the College of Architecture, Art and Planning.
Sibley Hall	1959	Complete interior renovation to accommodate the College of Architecture, Art and Planning.
Lincoln Hall	1961	Interior renovations to accommodate the departments of Music and Theatre Arts.
	2000	Interior renovations and 19,000 square foot addition designed by Shepley, Bulfinch, Richardson, & Abbott to accommodate the Department of Music.
Goldwin Smith Hall	c.1975	Complete renovation.
Goldwin Smith Hall	1999	First floor corridor renovation.
Stimson Hall	1992	Renovations to accommodate the Kroch Library addition.
Olin Library	1992	Kroch Library addition designed by Shepley, Bulfinch, Richardson, & Abbott consisting of three stories and 97,000 square feet below ground.
Uris Library	1962	Interior renovation
	1982	Gunner Birkirts designed underground reading room added.

Table 2.6.1: Arts Quad Building Renovations.

Although not directly on the Quad, the Johnson Museum of Art, designed by I. M. Pei, was constructed in 1973 and has become a Cornell icon.

Encompassing a variety of architectural styles including Italianate/Second Empire, Romanesque Revival, Beaux Arts, Neoclassical, and Modern, the buildings of the Quad are architecturally distinguished and retain a high degree of integrity. Despite its variety of architectural styles, the Quad is notable for the conscientious effort made to retain an overall harmony; consistent use of stone, cornice lines, building alignments, and proportions distinguishes the Arts Quad from other areas of the campus.

The Arts Quad is an intact example of 19th century campus planning. The arrangement of the original “Old Stone Row” (White, McGraw and Morrill halls) is representative of American mid 19th century campus planning. The transformation of the row of buildings into a quadrangle is typical of the expansion experienced by many colleges during the late 19th and early 20th centuries. Cornell's quadrangle is visually dramatic because the contained views of the man made space inside the Quad contrast sharply with the distant panorama to the west.

In spite of the need for continual changes to buildings defining the Quad, Cornell has carefully maintained the Quad's architectural integrity using a variety of strategies including limiting changes to interiors (Morrill, White, Tjaden), placing additions underground (Uris and Olin), and adding to the back of buildings which front on the Quad (Lincoln and the proposed Milstein Hall). For a more complete discussion of design strategies, please refer to Appendix C: Historic Resources.

The proposed CAPG and Milstein Hall are north of the Quad, behind its northern buildings, Tjaden and Sibley halls. A small sliver of the southeast corner of the proposed Milstein Hall will be visible from the west-central portion of the Quad. Looking north between Tjaden and Sibley, a view of the surface level of the CAPG will replace the view the existing surface parking lot.

Johnson Museum

The Herbert F. Johnson Museum of Art is located at the north end of the Library Slope, west of Tjaden Hall and just off the northwest corner of the Arts Quadrangle. It is a 10 story building (six stories above grade) of poured concrete with a highly sculptural shape. It has become a prominent landmark on the Ithaca skyline. The building offers spectacular views of the campus, the City of Ithaca, Cayuga Lake, and the surrounding land from its top floor exhibit spaces and from the covered outdoor sculpture gallery in the mid-section of the building. The main entrance is on the east, on axis with the sidewalk which passes along the fronts of Tjaden and Sibley halls. While the other facades are organized around a large void at the center of the building (the sculpture gallery), the north façade is a regular grid of large square windows. A small addition north of the Johnson Museum, mostly below grade and not visible from the Quad, is scheduled for construction during 2008-2010.

The Johnson Museum is not yet a locally designated historic landmark, but is a modernist icon within the traditional campus. Its designer, I.M. Pei, is an internationally notable architect of the second half of the 20th century, winning critical acclaim and recognition including the Pritzker Prize in 1983. The Johnson Museum of Art and Pei were recognized with the National Honor Award of the American Institute of Architects in 1975, two years after opening. With its aggressive, gravity-defying sculptural shape in high contrast to the static 19th and early 20th century buildings of the Arts Quad, the Johnson Museum is among the campus' most widely recognized and admired buildings.

The proposed CAPG and Milstein Hall are east of the museum, across Central Avenue and behind Tjaden. From the museum, a view of a small portion of the west end of the CAPG will replace a view of a small portion of the present surface parking lot.

East Avenue Buildings

East of East Avenue are three historic buildings: Baker Laboratory, Rockefeller Hall and the Andrew Dickson White House. During the late 19th century this area was developed with a series of homes known as "Faculty Row," with the 1873 Victorian Gothic A.D. White House being the most elaborate. In the early 20th century, as the Arts Quad was completed and the university needed to expand, this became the location for Cornell's physical sciences facilities. Rockefeller Hall was first of these, built in 1906 as the physics building. The 1921 Baker Laboratory followed, providing a new home for the Chemistry Department. Rockefeller Hall and Baker Laboratory both reflect the Beaux Arts influence that guided campus planning in the first two decades of the 20th century. Both are symmetrical three-story brick buildings with stone trim, set at the edge of the ridge above East Avenue. Baker has more overt classical references including a recessed two-story portico with Ionic columns. The two buildings are linked by the 1965 Clark Hall, which is set back from the building line of Baker and Rockefeller behind an open plaza. A new Physical Sciences building on the site of this plaza is currently under construction.

The carefully restored and furnished A.D. White House is the most significant historic resource on this part of the campus. It is located at the intersection of Tower Road and East Avenue on a hilltop site with a direct view across the south end of the Arts Quad. The setting includes an oval entrance drive and extensive formal gardens east of the house, and serves as an elegant residential-scale oasis within the larger campus that has grown around it. Built as a residence by Cornell co-founder and first president, A.D. White, it continued to serve as a residence for Cornell presidents until 1953, when it was converted to the university's art museum. Since 1973 it has housed the A.D. White Center for the Humanities, providing seminar and meeting space.

Of the three historic East Avenue buildings, only the A.D. White House has local landmark designation; it is also individually listed on the National Register of Historic Places. However, Baker Laboratory and Rockefeller Hall are substantial examples of campus architecture from the Beaux Arts period, historically significant for their association with Cornell's strong physical sciences departments. In addition, all three are associated with architects who made important contributions to the Cornell campus. The A.D. White house was the first campus project of William Henry Miller working with Charles Babcock. These two Ithaca architects designed many prominent campus buildings including Uris Library and McGraw Tower (Miller) and Sage Hall, Sage Chapel, and Tjaden and Lincoln halls (Babcock). Rockefeller Hall was designed by the New York firm of Carrere and Hastings, which designed Goldwin Smith Hall during the same period. Baker Laboratory was designed by Arthur N. Gibb (architect of Sibley dome) along with Day and Klauder.

The proposed CAPG and Milstein Hall are northwest of the East Avenue buildings, across East Avenue and behind Sibley Hall. Much of the east side of Milstein will be concealed by Rand Hall. A small portion of Milstein will be visible from the west side of Baker and the north end of Rockefeller, particularly from the upper floors where the green roof will replace the present view of the surface parking lot. The CAPG will not be visible from the East Avenue buildings.

Cornell Heights

North of Fall Creek Gorge is a residential neighborhood developed between 1898 and 1935. The neighborhood design, progressive for the period, features curving streets, dramatic topography, abundant mature vegetation, and homes in a wide variety of architectural styles. The predominant land use is single-family homes, although there are a few multi-family properties, apartment buildings, Cornell administrative and residential uses, and some fraternity and sorority houses.

Cornell Heights is a local landmark district and is listed on the National Register of Historic Places. The listed neighborhood includes 209 contributing components, mostly single-family homes and outbuildings.

The proposed CAPG and Milstein Hall are south of Cornell Heights and across the Fall Creek Gorge. Since the sight line from the north bank of the gorge to the top of Milstein Hall, is below the tops of trees lining the south bank of the gorge, Milstein will be concealed by leaves except during the winter. During the winter it will be partially visible through the barren trees but its low scale and compact mass make it much less prominent than Sibley. The CAPG will not be visible from Cornell Heights.

Risley Hall

East of Cornell Heights, at the intersection of Thurston and Wait avenues, is Risley Hall, a four-story brick, Jacobean Revival-style dormitory built for Cornell's female students in 1913. It is one of many distinguished revival-style residential buildings built at Cornell during the first half of the 20th century. The architect was William Henry Miller. North and east of Risley Hall are other dormitories which make up Cornell's North Campus. The Cornell Heights Historic District boundaries, drawn to emphasize the smaller-scale residential character of the neighborhood, do not include Risley Hall, although its site was once within the original subdivision. Risley is the tallest building in the Cornell Heights area.

The proposed CAPG and Milstein Hall are located southwest of Risley. Heavy foliage lining both sides of the gorge severely limits visibility across the gorge. Because of relative elevations of the CAPG and Risley, there will be no view of the CAPG from Risley Hall.

B. Impacts of the Proposed Project on Historic Resources and Mitigation Measures

This section evaluates effects of the project on adjacent historic resources, and discusses mitigation measures. The evaluation included the following steps:

- Buildings in the project area were inventoried and their significance evaluated (see Appendix C).
- The Secretary of the Interior's Standards for Rehabilitation, although not required by law to be applied to this project, were recommended by John Bero, of Bero Architecture, the preservation consultant, as appropriate guidelines for the evaluation of impacts on historic resources. The Secretary of the Interior promulgates standards for four "treatments" of historic resources: Preservation, Rehabilitation, Restoration, and Reconstruction. Only the Standards for Rehabilitation deal with adjacent new construction. In addition, the Ithaca Landmarks Preservation Commission also uses these guidelines.
- The proposed designs, as described in Milstein 75% Construction Drawings, dated 18 April, 2008, and the CAPG Schematic Design drawings, dated January, 2008, were analyzed based on the Standards.

The goal in creating the Secretary of the Interior's Standards was to assist the long-term preservation of a property's significance through the preservation of architecturally and historically significant materials and features. The Standards … *pertain to historic buildings of all materials, construction types, sizes, and occupancy, and encompass exteriors and interiors of buildings. They also encompass related landscape features, a building's site and environment, as well as attached, adjacent, or related new construction*[1]. Listed below are The Secretary of the Interior's Standards for Rehabilitation. Following each are comments on the proposed design based on the Standard.

1. A property shall be used for its historic purpose or be placed in a new use that requires minimal change to the defining characteristics of the building and its site and environment.

Impact to Historic Resources Based on Secretary of the Interior's Standard 1:

The property will continued to be used for educational purposes. The use of the east end of the site will

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[1] Quotes from the Secretary of the Interior's Standards for Rehabilitation are italicized.

be changed from parking (in support of educational uses) to an instructional building. Use of the west end will remain parking. Construction of Milstein Hall will not change the use of any buildings, and physical changes to adjacent buildings will be limited as discussed under Standards 2, 5, 9 and 10.

The parking area is a mid-20th century modification of the site and not historically significant. Pedestrians entering and exiting the Arts Quad at the northeast corner are now required to cross a drive serving Lincoln Hall; relocation of the drive will reduce this auto/pedestrian conflict, improve fire truck access to the Quad and comply with ADA requirements for movement through the northeast gateway to the Arts Quad.

At the Sibley dome, grade will be raised to provide grade-level ADA accessibility to the first floor of the east wing of Sibley, fire truck access, below-grade connections to the CAPG, and below-grade connections between Milstein, Sibley and the CAPG.

Mitigation Measures Incorporated into Design Based on Secretary of the Interior's Standard 1:

<u>General</u>

Construction of Milstein Hall will return the east end of the site more nearly to its historic use, as an area where some of the former buildings housed hands-on instructional space for students. The Milstein Hall design does an excellent job of maintaining and improving pedestrian, bicycle and vehicular traffic flow north and northeast of the Arts Quad. The ground level treatment allows pedestrian and bicycle paths to continue to flow around the limited interior space at this level. Traffic on University Avenue is maintained, with the added advantage of a covered bus stop to serve the College of AAP and this part of campus. The relocated drive to Lincoln reduces pedestrian/vehicle conflicts. Surface parking displaced by Milstein Hall is to be replaced or increased by new parking facilities to the west, partly at grade and partly below grade.

<u>Northeast Gateway</u>

Changes to the northeast gateway to the Arts Quad, particularly the new access drive to the small parking area at the northeast corner of Lincoln Hall, will replace the existing access drive between Rand and Sibley halls but will not result in additional traffic or more paved area. Regrading to permit fire truck access to the Arts Quad is required, necessitating the removal of several trees, but the new drive has been laid out to allow for retention of many of the trees and other key landscape features that define this Arts Quad gateway. New trees will be planted in this space. The overall quality of the landscape between Rand and Lincoln halls will remain largely unchanged.

<u>North of Sibley</u>

The area north of Sibley Hall and west of Rand Hall is among the least distinguished landscapes of the campus. This character as the utilitarian "back yard" of Sibley has a long history, going back to the late 19th century when it was the site of a frequently changing collection of workshop structures serving the engineering programs and campus utilities. Since the 1950s, when all of the workshops were demolished (except the Foundry and Rand), it has been used primarily as a surface parking lot. It has significantly less landscaping and aesthetic distinction than the other major close-in parking area serving Arts Quad buildings, west of the Old Stone Row along Central Avenue. In recent years it has also served as the site of several temporary trailers, giving it the quality of a construction site. There are no large trees in this area, and it has no pedestrian-oriented amenities such as ground covers, benches or decorative paving. There is little reason to linger along the rear of Sibley or this section of University Avenue. A change to the character of this area is a positive development.

Although the basement wall of the Sibley dome will be obscured from University Avenue, the wall will remain exposed below-grade and most existing openings will remain unaltered.

University Avenue

University Avenue is a principal vehicular thoroughfare through this part of campus, offering the only vehicular access to the parking lots that serve the Johnson Museum of Art and buildings north and west of the Arts Quad. University Avenue also provides access to two Fall Creek bridges: the Thurston Avenue Bridge and the pedestrian suspension bridge linking the Arts Quad area with Cornell Heights.

Over the years, the pavement of University Avenue has been built up higher than the traditional level and now interferes with stormwater runoff from the Foundry. The result is deterioration of the south masonry knee wall. This rise in pavement has also required adjusting the south entrance walk and replacing the door to the Foundry. Part of the work on University Avenue will include lowering pavement in the vicinity of the Foundry close to its historic elevation, aiding preservation of the building, and permitting replacement of the current south door with one that is more appropriate.

Cantilever of the second floor of Milstein over University Avenue will eliminate support columns adjacent to the Foundry and preserve the traditional alignment of University Avenue. Except for additions of a bicycle lane, an enhanced bus stop to encourage alternate means of transportation, and slightly lowering the grade south of the Foundry, University Avenue will remain unchanged.

By limiting its height to the second floor cornice level of Sibley Hall and by limiting southern expansion to a plane north of Sibley's main façade, Milstein Hall will have minimal effect on the views from the northern part of the Arts Quad. Because the terrain slopes up to the east, the view looking west and northwest from Baker Laboratory, Rockefeller Hall and the A.D. White House will include Milstein's east and south façades. In practical terms, there are enough mature trees on the slope between these buildings and East Avenue, and in the area between Lincoln and Rand halls, that Milstein Hall will be barely, if at all, visible from Rockefeller and the A.D. White House. The view toward Milstein from Baker's main entrance is less obstructed, and the height of this entrance is above the Milstein roof level, making Milstein's roof an element visible from Baker Lab. The green roof of Milstein will be more attractive from Baker Lab than a traditional flat roof, and will be an improvement over the present blacktop.

The view toward Milstein Hall from Risley Hall and Cornell Heights, both north of the Fall Creek Gorge, is completely obscured during the growing season by deciduous trees lining the gorge on both sides. During the summer, the only buildings visible from street level at Cornell Heights are tops of the Johnson Museum and the Tjaden Hall tower; both are significantly higher than Milstein. During the winter, portions of Milstein's second floor may be visible through the trees from across the gorge, but its distance, low roof line and glass-surfaced façade will minimize visibility. (See section 2.5.1, Aesthetic Resources, views B, C, D, E, F, and Q).

The project is substantially in accordance with Standard 1.

2. The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.

Impact to Historic Resources Based on Secretary of the Interior's Standard 2:

Historic Character

The principle man made feature determining the character of this portion of the campus is the Arts Quad. Sibley was designed as the north boundary of the Quad with a high style, formal facade on the south and a utilitarian, informal wall facing north. Service buildings, including Rand and the Foundry, filled the area between Sibley and the Fall Creek Gorge. Under the proposed plan, all of the extant historic features remain.

All boundaries of the Quad are, and have always been, permeable: they permit views to the surrounding areas and pedestrian access between buildings. Openings between the buildings at the north end of the Quad will each be treated differently:

The space between Tjaden and the CAPG will remain visually open; and pedestrian circulation will be accommodated by a sidewalk and crosswalk west of the Central Avenue intersection with University Avenue.

The space between Tjaden and Sibley West will remain visually open: the pedestrian connection defined by walks and crosswalks connecting the north walk of the Quad to the north walk of University Avenue. To direct and protect pedestrians, this walkway will be clearly defined by distinctive paving.

Between Sibley East and Rand, the drive that today serves the Lincoln Hall East parking lot is shown on the 1918 campus map as a secondary connection between University Avenue and East Avenue, serving the loading dock at Rand Hall and the east side of Lincoln. That connection was severed many years ago (plans from the 1940s show it terminating at a parking area east of Lincoln Hall) and the drive now provides access only to the parking area serving East Lincoln. Relocation of the drive will reduce pedestrian/vehicle conflicts at this corner. The space between Sibley East and Rand will remain visually open, permit pedestrian traffic at ground level, and preserve eye-level views of the Foundry, Sibley and Rand. Milstein leaves this area open by use of a small building footprint at ground level and floor-to-ceiling glass walls.

<u>Site Removals</u>

Site removals include the following <u>non-significant features</u>:

- Parking lot;
- Maple saplings north of Sibley;
- Shrubs west of Rand.

Removal of these non-significant features does not affect the integrity of the site.

Site removals include the following <u>significant features</u>:

- Removal of pavement and soil to lower the grade of University Avenue where it passes the Foundry.

This removal is significant because grade is now above its historic level, causing surface stormwater runoff to flow toward the Foundry, and accelerating damage to brick forming the lower portion of its south wall. Lowering the grade to the historic elevation will have a positive impact on preservation of the Foundry.

- Removal of the driveway connection between University and East Lincoln parking.

This removal is significant because it relocates a historic vehicular circulation path and remedies the long-standing pedestrian/vehicle conflict at this location.

These are the minimum site removals required to accommodate Milstein Hall.

Sibley Removals

Removals from Sibley include the following historically non-significant features:

- Access ramp at the southeast corner on the south (Quad) side;
- Access well, stair, and wood cover west of the north pavilion (stair projection) at Sibley East;
- Modern stair, c.1965, at the north junction of Sibley East and Sibley dome;
- Air conditioning compressors north and east of Sibley at grade;
- Modern stairs at the basement and first floor of the north pavilion.

Removal of these historically non-significant features is a positive impact of the Milstein and CAPG projects, assisting maintenance of the integrity of Sibley Hall.

Removals from Sibley East include the following significant features:

North wall:

- Metal cornice and gutter at the junction of Milstein and the north wall of Sibley East to accommodate a water tight expansion joint;
- Third floor wood sash in the dormer adjacent to the dome to accommodate a fresh air intake louver;
- Second floor masonry below four window sills at Sibley East to permit conversion of windows to doors;
- Doors, windows, and masonry at the basement connections between Sibley and Milstein to permit movement between the buildings.

These are the minimum removals required to accommodate Milstein Hall.

East Wall:

- Two masonry second-floor window openings and the masonry beneath and between them to accommodate doors between Sibley and Milstein. Placement of the new doors is determined by the spacing of diagonal truss members in Milstein.

Rand Removals

Removals from Rand include the following non-significant features:

- Obsolete mechanical equipment that penetrates the west wall;
- Localized areas of the roof to accommodate mechanical and elevator equipment;
- Some interior partitioning at the west end of first, second, and third floors to accommodate circulation and mechanical/electrical equipment;
- Non-accessible toilet room fixtures and equipment.

Removal of these non-significant features does not affect the integrity of Rand Hall.

Removals from Rand include the following significant features:

North wall:

- Steel windows at the third floor mechanical room to accommodate fresh air intake louvers;

West wall:

- Bottom portions of steel windows at the third floor to permit adequate vertical distance between the roof of Milstein and the window sills for installation of a water tight expansion joint;
- Steel windows and masonry wall between piers at the second floor bays to accommodate pedestrian, visual, and air interchange;
- Small portions of the projecting nose of the concrete cornice separating the second story from the third to accommodate ducts and expansion joints.

These are the minimum removals required to accommodate Milstein Hall.

Figure 2.6.5: The Museum of the Earth addition contrasts with the historic Paleontological Research Institution building. The addition, which emphasizes differentiation and removability, is clearly a product of its time. This project was reviewed by the State Office of Parks, Recreation, and Historic Preservation and was found to be in compliance with the Secretary of the Interior's Standards for Rehabilitation.

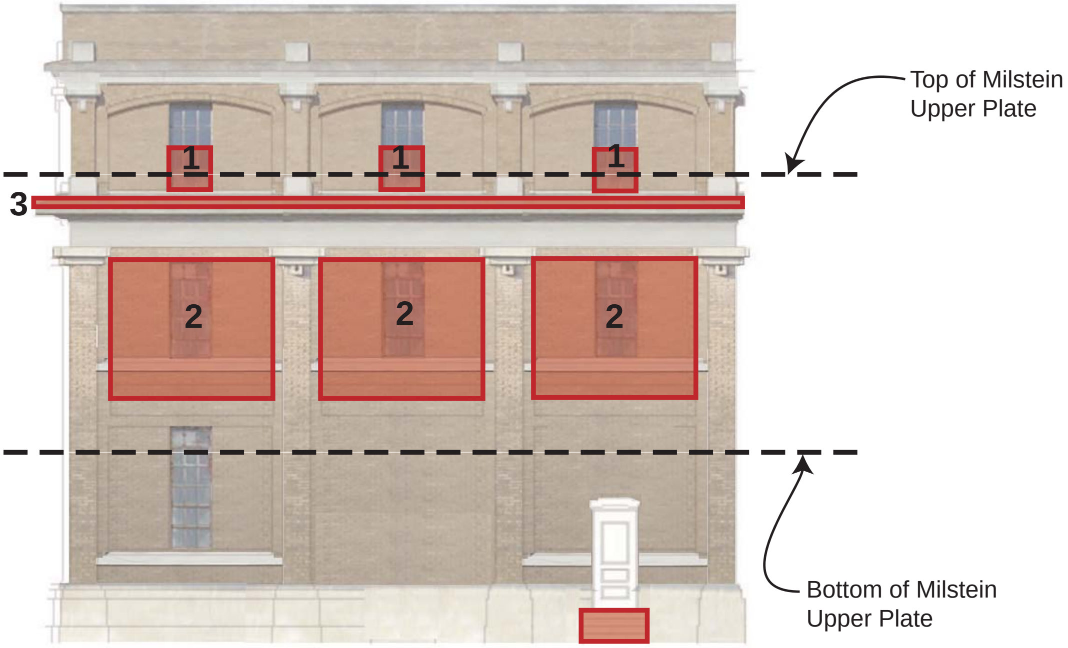
Mitigation Measures Incorporated into Design Based on Secretary of the Interior's Standard 2:

General

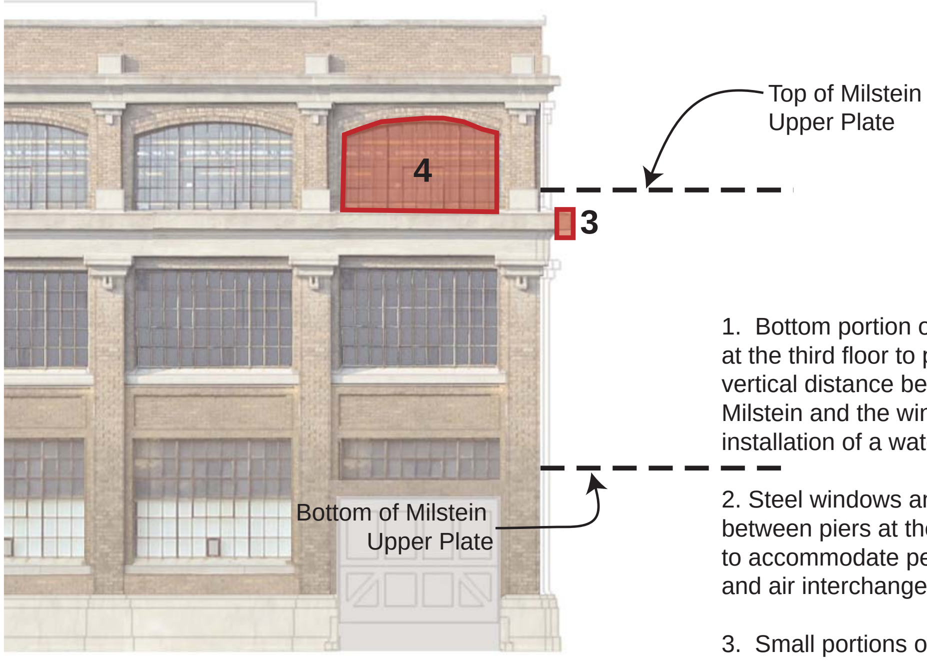
To the extent construction of Milstein restores the historic function it helps restore the historic character of the site. The proposed CAPG will, by stacking automobiles, reduce land dedicated to parking and make room for restoration of the Milstein site to its historic use. This design is preservation-friendly compared to earlier design schemes which proposed demolition of Rand Hall to accommodate programmatic needs.

Great care has been taken in the design to remove only those features of historic buildings required to accommodate the addition. First and third floor exterior walls are affected very little; removals from the second floors are limited. Existing brick exterior walls of Rand and Sibley will remain exposed and the Foundry will remain intact. There are no new, competing, formal entrances. Clear glass will reflect the existing surrounding facades.

The project is substantially in accordance with Standard 2.



Rand Hall: Removals at West Wall



Rand Hall: Removals at North Wall

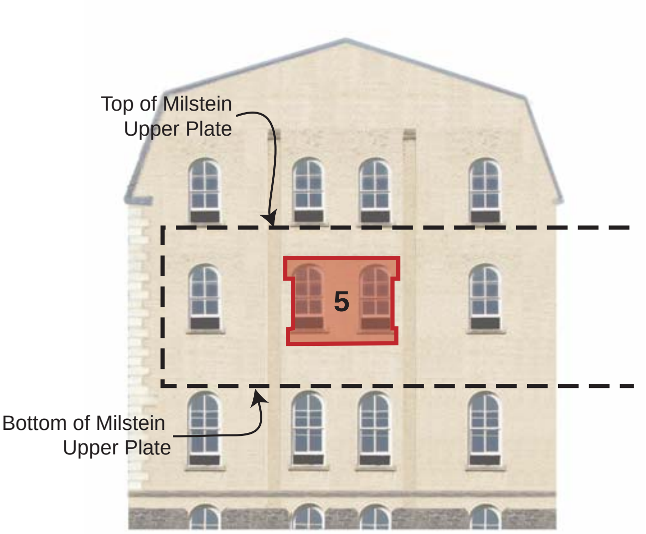
1. Bottom portion of steel windows at the third floor to permit adequate vertical distance between the roof of Milstein and the window sills for installation of a water tight expansion joint

2. Steel windows and masonry wall between piers at the second floor bays to accommodate pedestrian, visual, and air interchange

3. Small portions of the projecting nose of the concrete cornice separating the second story from the third to accommodate ducts and expansion joints

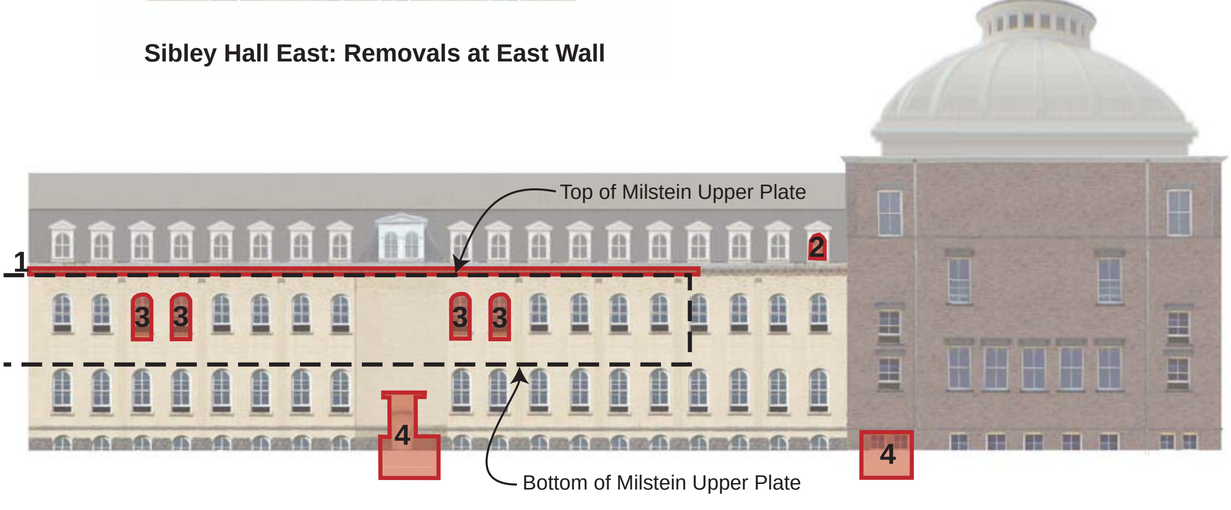
4. Steel windows at the third floor mechanical room to accommodate fresh air intake louvers

Figure 2.7.a: Diagram of Removals to Rand Hall.



Sibley Hall East: Removals at East Wall

1. Metal cornice and gutter at the junction of Milstein and the north wall of Sibley East to accommodate a water tight expansion joint
2. Third floor wood sash in the dormer adjacent to the dome to accommodate a fresh air intake louver
3. Second floor masonry below four window sills at Sibley East to permit conversion of windows to doors
4. Doors, windows, and masonry at the basement connections between Sibley and Milstein to permit movement between the buildings
5. Two masonry second-floor window opendings and the masonry beneath and between them to accommodate the doors between Sibley and Milstein. Placement of the new doors is determined by the spacing of diagonal truss members in Milstein



Sibley Hall East: Removals at North Wall

Figure 2.7.b: Diagram of Removals to Sibley Hall.

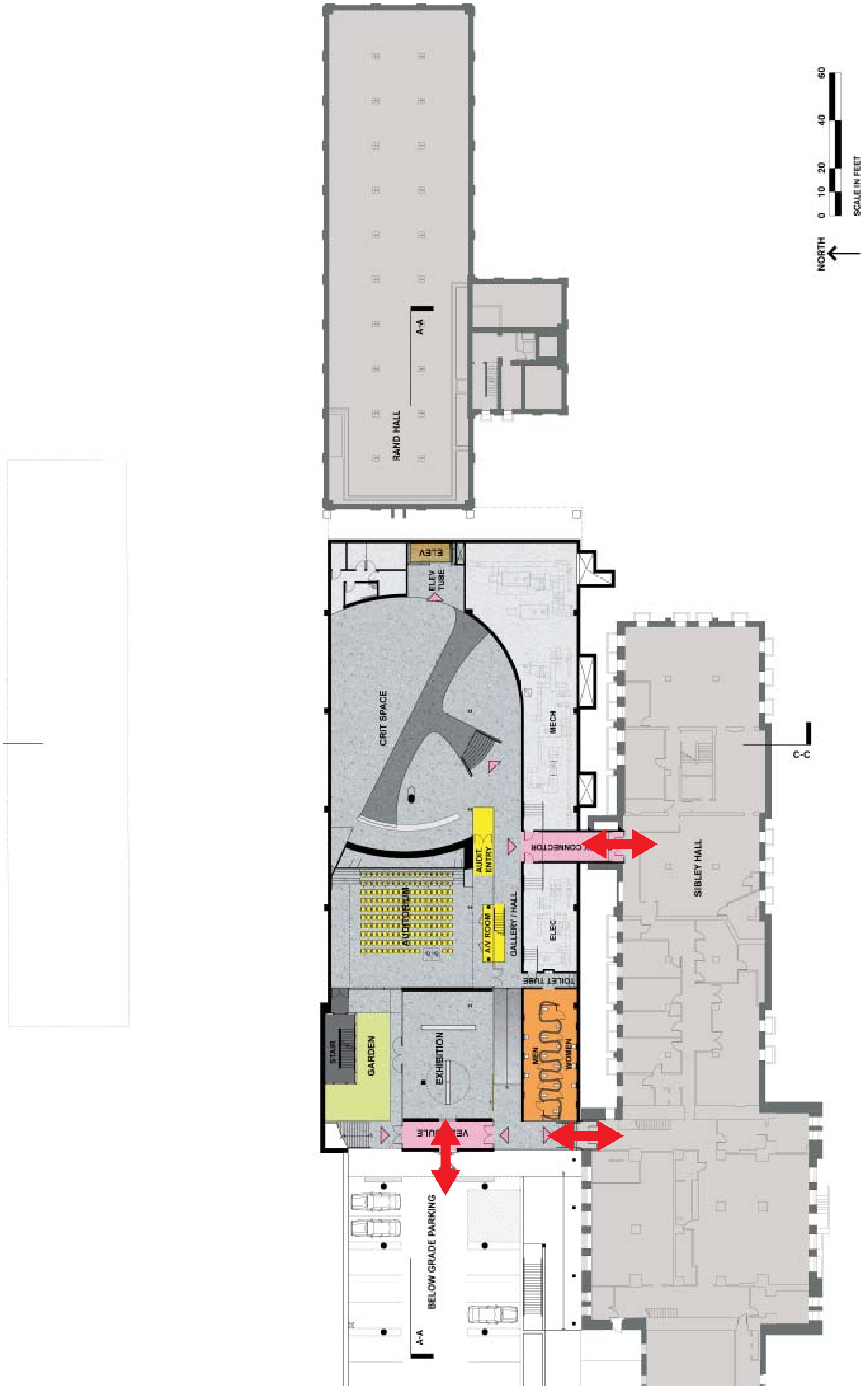


Figure 2.7.c: Basement Plan: Milstein, Sibley, Rand, and CAPG. Red arrows indicate building connections.

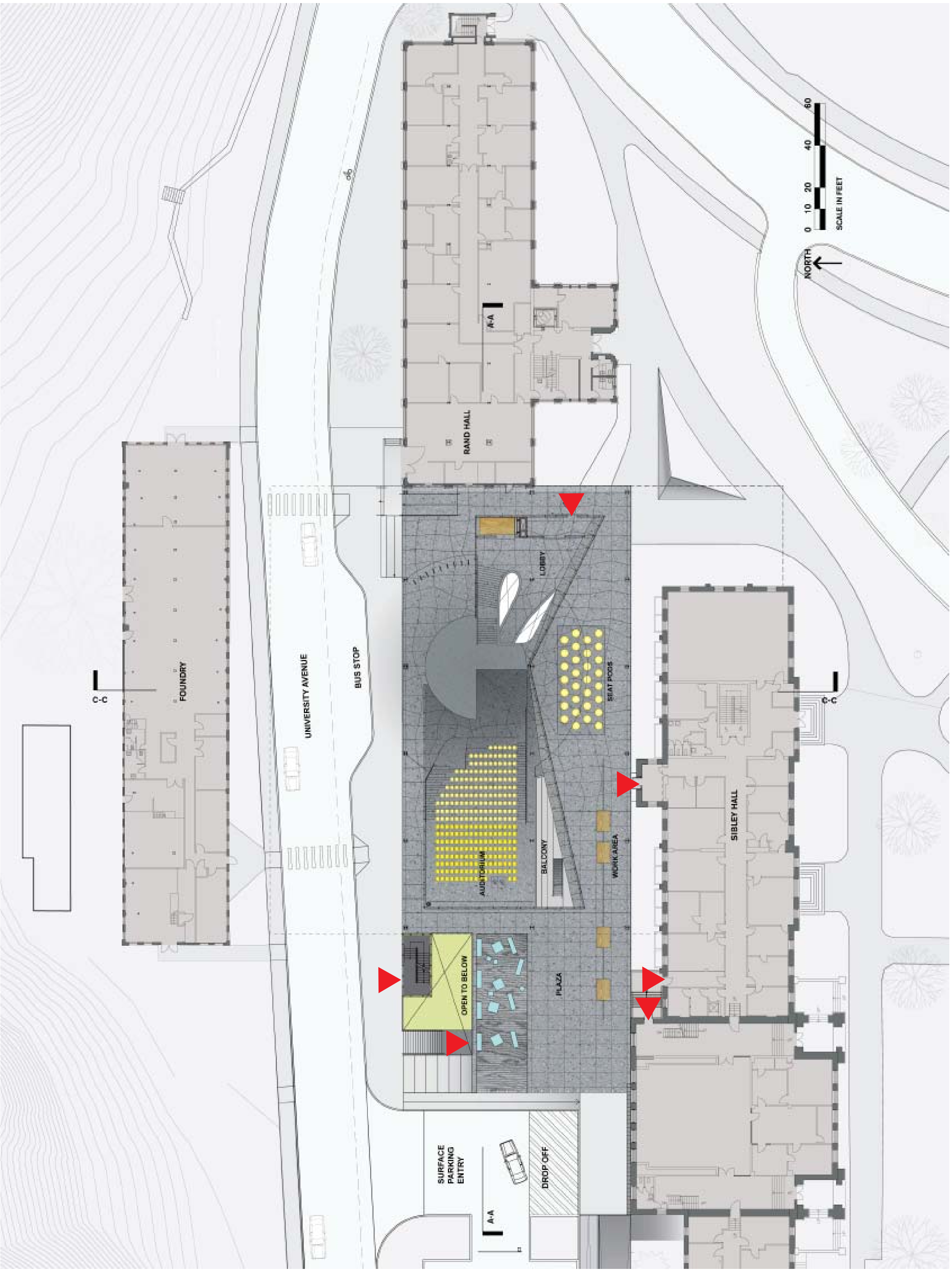


Figure 2.7.d: Ground Floor Plan: Milstein, Sibley, Rand, and CAPG. Red triangles indicate building entrances.

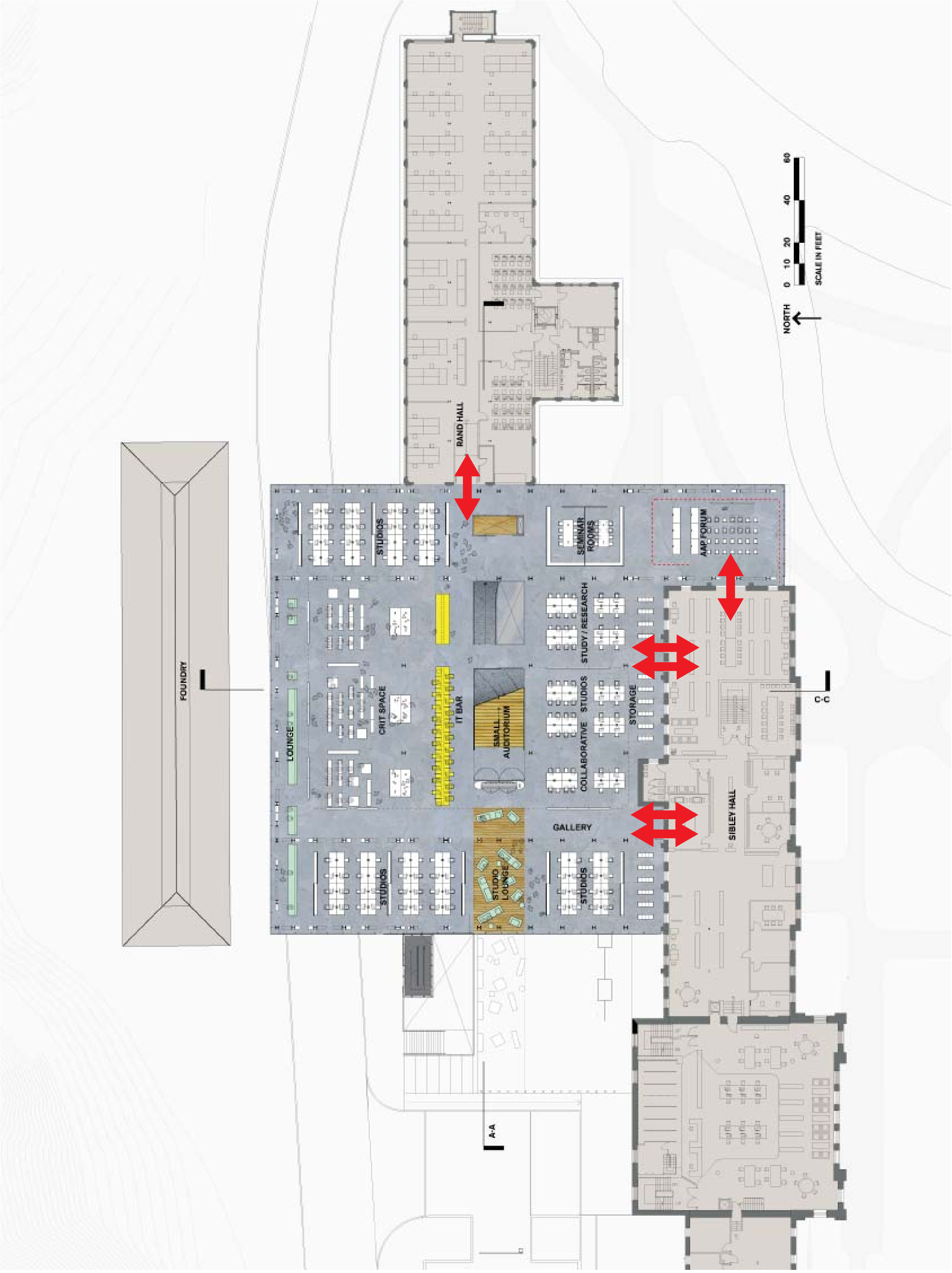


Figure 2.7.e: Upper Plate/Second Floor Plan: Milstein, Sibley, Rand, and CAPG. Red arrows indicate building connections.

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3. Each property shall be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or architectural elements from other buildings, shall not be undertaken.

Impact to Historic Resources Based on Secretary of the Interior's Standard 3:

Construction of Milstein Hall and the CAPG will not require modification of Sibley, Rand, Tjaden, the Foundry or the site in such a way that modifications will be confused with historically significant features or elements.

The ceiling material beneath the second floor is a modern interpretation of a traditional Victorian, pressed-tin ceiling. In this case, it does not create a false sense of history but, rather, is differentiated by its scale and material.

Mitigation Measures Incorporated into Design Based on Secretary of the Interior's Standard 3:

The design of Milstein and CAPG is entirely modern in character and cannot be confused with the older buildings. The view of Milstein from the upper levels of Sibley and Baker will consist primarily of the green roof, punctuated by skylights, which will replace a view of surface parking. No false sense of historical development is created.

The project is substantially in accordance with Standard 3.

4. Most properties change over time; those changes that have acquired historic significance in their own right shall be retained and preserved.

Impact to Historic Resources Based on Secretary of the Interior's Standard 4:

The significance of historic changes can be evaluated the way the significance of individual buildings is evaluated. According to criteria published for the National Register of Historic Places, significance is achieved by 1) association with significant events, 2) association with important persons, and/or 3) by embodying the distinctive characteristics of a type, or method of construction, or that represent the work of a master, or that posses high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction. Although changes have been made to both Sibley and Rand to accommodate changing programs, such as renovation of toilet rooms and other infrastructure at Rand, and construction of exterior stairs at Sibley, none of these changes has been historically or architecturally significant; construction of Milstein Hall will not require the removal or reversal of changes that have acquired historic significance in their own right.

Mitigation Measures Incorporated into Design Based on Secretary of the Interior's Standard 4:

No mitigation is necessary. The project is substantially in accordance with Standard 4.

5. Distinctive features, finishes, and construction techniques or examples of craftsmanship that characterize a property shall be preserved.

Impact to Historic Resources Based on Secretary of the Interior's Standard 5:

The program requires Milstein to bridge between Sibley and Rand. The new building connects to the old and openings permit passage. New mechanical ventilation systems require openings in the historic buildings for fresh air. Weatherproof connections are required at the perimeter where Milstein touches the existing buildings.

At Sibley, doors will be added at the second floor and a louver will be added at the third floor. The cornice will be modified to accommodate a weatherproof connection.

At Rand, the exterior wall affected is the “back” wall where the loading dock was located but is now abandoned. Openings will be made at the second floor to permit passage of people and air. The cornice at the top of the second story must be notched to accommodate expansion joints and ducts. At the third floor, the bottoms of western windows will be modified to accommodate a weatherproof connection; and at the north wall the western-most window will be removed and replaced with an aluminum intake air louver

At Sibley, a small portion of the below-grade basement wall will be exposed to accommodate an entrance ramp and stair from the CAPG.

Mitigation Measures Incorporated into Design Based on Secretary of the Interior’s Standard 5:

Great care has been taken to insert Milstein with minimal impact, including limiting actual contact between the buildings at pedestrian passages to the basement level and to the second floors.

At Sibley, both the north and east walls will be left substantially intact with historic surfaces remaining visible. Except where removed to accommodate necessary pedestrian movement (and one air intake), original windows will be secured in place and visible. At the west wall of the pavilion projecting from the north side of Sibley East, a window will be removed, and the wall bricked-in, in a manner that reveals the location of the original opening. At the second floor, the actual physical connection at vertical junctions will be made with a fabricated expansion joint allowing independent movement of the buildings. The device bridging this joint and providing weather-tightness will be easily removable in accordance with Standard 10. The metal gutter and cornice molding will be removed to accommodate a weatherproof connection.

At the west wall of Rand, more work is proposed than at Sibley to integrate Rand into the complex. On the second floor, a ramp, required because of the lower floor elevation in Rand, will be poured on top of the existing floor so future removal will be easy. Steel windows, brick, and cast concrete will be removed to accommodate air circulation through the south bay, pedestrian circulation through the center bay, and a visual connection through the north bay. Removals will be limited to the center infill of the bays, leaving piers separating bays intact. On the third floor, where it is necessary to accommodate weatherproof flashing and an expansion joint, all three steel windows will be made shorter but the original steel sash will be preserved and restored.

At vertical junctions of Rand, removable expansion joint assemblies will be used but minor removals of deteriorated concrete will be required at ducts and at the corners to accommodate the joint assemblies.

Milstein and CAPG have been carefully designed to avoid removal of distinctive features and finishes, and to avoid obstructing views of historic construction techniques and craftsmanship.

The project is substantially in accordance with Standard 5.

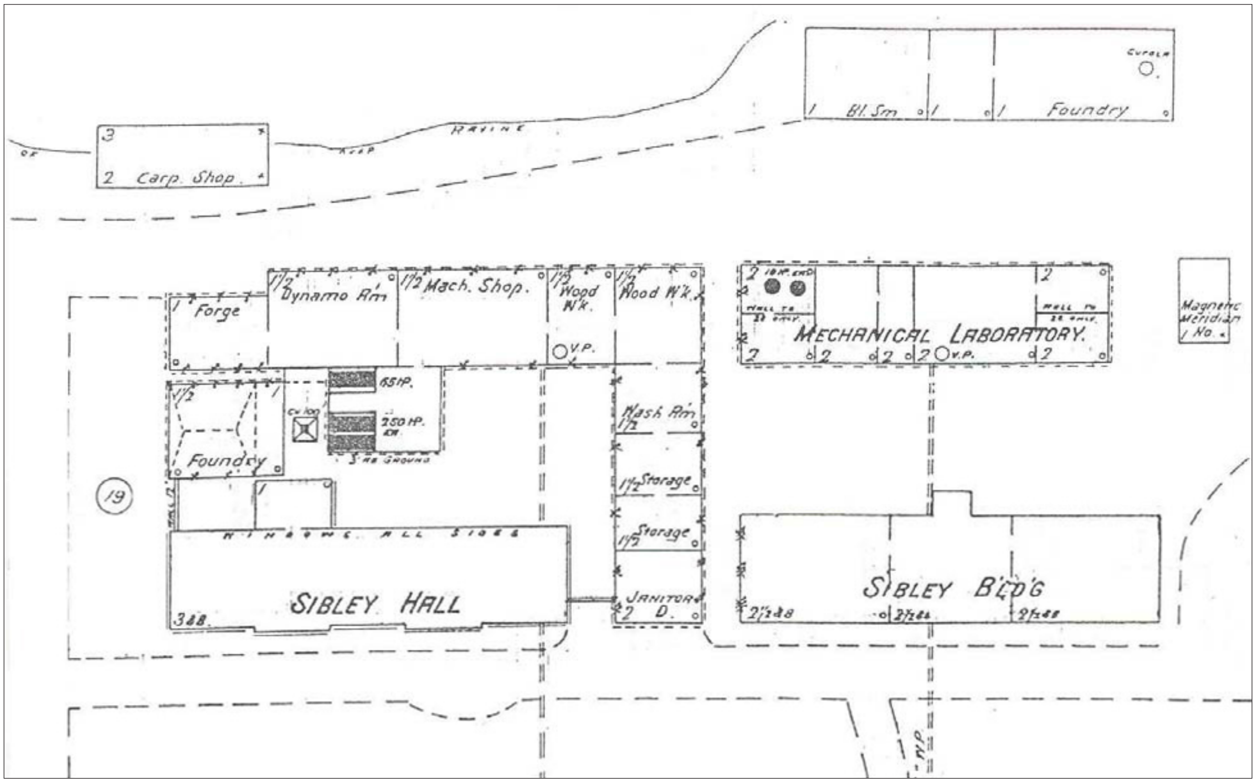

Figure 2.6.6: Portion of 1893 Sanborn Map showing the relative locations of The Foundry (at the top right), Sibley East (at the bottom right) and the Mechanical Laboratory between.

Figure 2.6.7: Ca. 1909 view looking west down University Avenue. The Foundry is on the right, Sibley East on the far left, beyond the porch, and the Mechanical Laboratory between. The Mechanical Laboratory has since been removed and replaced with surface parking.

6. Deteriorated historic features shall be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.

Impact to Historic Resources Based on Secretary of the Interior's Standard 6:

No deteriorated or missing features will be replaced.

Mitigation Measures Incorporated into Design Based on Secretary of the Interior's Standard 6:

No mitigation is necessary. The project is substantially in accordance with Standard 6.

7. Chemical or physical treatments, such as sandblasting, that cause damage to historic materials shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the gentlest means possible.

Impact to Historic Resources Based on Secretary of the Interior's Standard 7:

Accumulated atmospheric pollutants will be removed from exterior walls of Sibley and Rand.

Mitigation Measures Incorporated into Design Based on Secretary of the Interior's Standard 7:

Specifications call for cleaning by the gentlest effective means. Abrasives will not be used. All cleaning materials and techniques will be tested on small areas before being approved for use.

No mitigation is necessary. The project is substantially in accordance with Standard 7.

8. Significant archeological resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken.

Impact to Archeological Resources Based on Secretary of the Interior's Standard 8:

No potential archeological resources have been identified by a Phase IA Archeology Assessment (see Appendix D and section 2.6.5). The ground surface has been previously disturbed and no archeological resources are expected to be discovered or affected.

Mitigation Measures Incorporated into Design Based on Secretary of the Interior's Standard 8:

No mitigation is necessary. The project is substantially in accordance with Standard 8.

9. New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.

Impact to Historic Resources Based on Secretary of the Interior's Standard 9:

The two-story Milstein Hall and the (mostly below-grade) CAPG will replace surface parking and will have minimal impact on historic materials.

Mitigation Measures Incorporated into Design Based on Secretary of the Interior's Standard 9:

In the 19th century, the Mechanical Laboratory between Sibley and the Foundry was a two-story building that formed a visual transition between three-story Sibley and the single-story Foundry.

The proposed design, in effect, restores the missing building between Sibley and the Foundry. Construction of the CAPG permits this restoration by consolidating parking that is now spread the full length of Sibley.

<u>Historic Materials.</u> All existing buildings will be retained. Except for the removals noted under Standard two, historic materials will not be destroyed.

<u>Differentiation.</u> Milstein is differentiated from the buildings originally on the site by being a work of art rather than craft, and from the remaining historic buildings by use of modern materials and forms. (For illustrations of the numerous strategies used on the Cornell campus to minimize impacts of new construction on existing buildings, please refer to the Conclusions section of Appendix C)

The interior of Milstein's second floor will incorporate the exposed north and east exterior walls of Sibley Hall, emphasizing its "infill" character and its respectful posture toward Sibley's historic facades.

The principal façade material for Milstein Hall is glass, with flush stone-clad spandrel panels at the top and bottom of the second floor. The contrast between these materials and those of Sibley and Rand is one of the design factors that distinguishes Milstein from its neighbors and maintains its character as a non-competing, subsidiary, infill structure providing support space to its more substantial neighbors. The use of these modern materials also distinguishes it from the Foundry and reinforces the special role of the Foundry as a vestige of the 19th century campus.

<u>Compatibility.</u> Mass and size of the complex have been minimized by locating about a quarter of Milstein and two-thirds of the CAPG below grade. Milstein is a small, two-story building, with its most prominent mass a simple horizontal rectangle floating above the ground. From the point of view of massing, Milstein does not compete with Sibley or Rand and is clearly differentiated from them. It is also clearly differentiated from the Foundry. Open space beneath Milstein compliments and highlights the scale of the Foundry and preserves eye-level views of the building.

The most significant existing building on the site is Sibley and its most significant façade is the south façade facing the Quad. Milstein will be almost completely invisible from the south. From the east, Milstein is set well back from East Avenue and partially obscured by Rand. From the north, the only visible portion of Milstein, the second floor, is about 170 feet long behind the 190 foot Foundry. Only from the west will the above-ground portions of Milstein be fully visible. The massing, size, and scale are such that the proposed two-story Milstein Hall (like the Foundry) is lower than Sibley and Rand, and is largely concealed in the U-shaped space created by Sibley, Rand, and the Foundry.

The most visible part of the complex, Milstein's second floor, uses glass and stone as its principal façade materials. Glass is neutral: during the day it will reflect the forms, colors, and details of the adjacent historic buildings; and at night its transparency will permit views of the historic facades left exposed inside. From a distance, the stone will read as gray and will echo the gray facades of the Quad.

The use of stamped metal as a ceiling material beneath the second floor may be considered a historical reference, though as far as we know this is not a commonly used material on the Cornell campus and was historically not an exterior material. Its use here contributes to the differentiation of this structure from historic structures around it.

The project is substantially in accordance with Standard 9.

10. New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

Impact to Historic Resources Based on Secretary of the Interior's Standard 10:

Milstein Hall physically connects to Sibley and Rand. Openings must be made in exterior walls to accommodate pedestrians moving between the buildings and passage of utilities.

The CAPG does not physically connect to Sibley or Tjaden. Removals of a fire escape, modern stair landings, and modern metal railings are proposed at Sibley East. Modification of a window well is proposed at Tjaden.

Mitigation Measures Incorporated into Design Based on Secretary of the Interior's Standard 10:

Milstein Hall has been carefully designed to minimize permanent alteration of the existing buildings. Pedestrian passages have been limited to enlarged window openings. If Milstein is removed in the future, restoration required to return the historic buildings to their current condition will be limited to replacement of significant removed features listed under Standard 2, none of which are unique and all of which can be copied from remaining features.

The CAPG does not require modifications of historic materials at either Tjaden or Sibley. If the CAPG is removed, the historic buildings will remain intact.

The project is substantially in accordance with Standard 10.

C. Unavoidable Impacts

Due to its program and use, Milstein Hall will affect the landscape, setting and views. Several impacts of the project appear unavoidable:

1. Views to the north. Although designed for limited visibility from the Arts Quad, Milstein Hall will have a minor affect on views from the northern part of the Quad and toward the Quad from higher buildings to the east. The proposed simple stone and glass façade at the second floor level is different from other Arts Quad construction, intended as a contemporary design for the College of AAP, an expression of the architectural cutting edge. Some will welcome this, others will object.

2. Size and mass. While the portion of Milstein Hall visible from the south and east is very small, its above-ground size is apparent from University Avenue. Extension of the second floor over University Avenue increases its apparent mass from this perspective. The north wall of Sibley East, and the west wall of Rand will be obscured by Milstein; this is unavoidable but they have always been secondary walls, and the road/parking area from which they are now seen is not a distinguished outdoor space.

3. Relation to the Foundry. The proximity of Milstein to the Foundry, and its greater mass, height and sophistication contrast with the historic character of this locally designated landmark. Given the programmatic space requirements and the decision to not remove Rand Hall, there is little that can be done to avoid the juxtaposition of the two buildings. Considering the historical role of the Foundry as a Sibley College support structure, it is not appropriate to make major design changes to Milstein out of deference to the historical and architectural significance of the Foundry, changes that would likely shift a greater impact onto the more historically significant Sibley and Arts Quad. The Foundry will be unaltered by construction of Milstein, and the improvements to University Avenue as a campus access

point (notably the covered bus stop) will elevate the profile and visibility of the Foundry.

The historic setting of the Foundry has been lost by demolition of adjacent shops, installation of a parking lot, and increased traffic on University Avenue. Consequently, the setting is not cited in the historic district nomination as being of historical and architectural importance. While the setting of the Foundry will be unavoidably changed by the project, many changes will be positive and help to return the Foundry, visually, to its historic secondary role as part of an ensemble of buildings behind Sibley.

4. The plaza. An unavoidable effect of the design is to create a large covered plaza space with limited opportunities for planting. The ground level includes a variety of landscape and building features to make this space interesting and lessen what otherwise could be a concourse-like character. Landscape features include a sunken garden, benches, bicycle racks, lighting, and places to gather and work. Building features include spherical illuminated stools, a canted glass façade, and the sculptural dome. On the north side of the dome, the eyebrow-shaped window offers a peek into the interior and hints at Milstein's character as a dynamic architecture and arts facility.

D. Summary of the design evaluation using the Secretary of the Interior's Standards

Adaptation, expansion and rehabilitation of a historic resource are often required to prevent obsolescence and demolition. All agree the best new architecture is to be encouraged while minimizing impact on historic resources. The Secretary of the Interior's Standards have been established with those goals. Interpretation and application of the standards may appear paradoxical. For example, maintenance of historic character is encouraged while imitation of historic features is discouraged.

The design allows the site to continue to be used for the College of AAP's needs. It successfully addresses the Standards by protection of significant historic features, differentiation of the old from the new, and minimizing changes to the existing buildings so that Milstein and the CAPG are fully removable. The placement of Milstein Hall and the CAPG behind Sibley and Tjaden halls preserves the historic significance of these important Arts Quad buildings and the integrity of the Arts Quad itself.

2.6.2 Impact on Exterior Surfaces to be Enclosed

This section evaluates effects of the project on historic exterior surfaces to be enclosed. For discussion of effects of construction other than enclosure, please refer to section 2.6.1, Impacts on Existing Historic Resources

A. Existing conditions

North and east walls of Sibley East, and the west wall of Rand, are exposed to the weather.

B. Impacts of the Proposed Project on Historic Resources

Portions of the exterior north and east walls of Sibley and the west wall of Rand will be enclosed by the second floor of Milstein. Except at the west end of Tjaden, grade will be raised slightly in the vicinity of the CAPG.

Those portions of the existing exterior surfaces that will become interior surfaces will enjoy stabilized temperatures and protection from rain, sun, and wind; normal weathering will cease. Normal expansion and contraction in response to temperature changes will be greatly reduced. Requirements for maintenance will be reduced to periodic painting of windows and periodic cleaning of masonry surfaces. Walls where grade is raised slightly will be similarly protected.

C. Mitigation Measures

All anticipated impacts on enclosed historic surfaces are considered positive. No mitigation measures are included in the design to minimize these impacts.

D. Unavoidable Impacts

Historic surfaces, where protected from weather, will not undergo normal weathering and will endure as long as they are protected.

2.6.3 Impact on Existing Interior Spaces

This section evaluates effects of the project on historic interior spaces adjacent to or near proposed construction.

A. Existing Conditions

Some spaces in Sibley and Rand have exterior walls that will abut Milstein. These walls transmit heat to the exterior in the winter and to the interior in the summer. Operable windows in these walls admit light and air. At the Foundry, tall windows on the south admit light to studios.

At the CAPG, grade will be lowered about four feet along a 96 foot length of Sibley East to accommodate an entrance stair and ramp.

B. Impacts of the Proposed Project on Historic Resources

Views. From Sibley, Rand, and the Foundry views of the parking lot will be replaced with views of Milstein.

The view from the basement of Sibley West will be improved by replacement of window wells with a full-height view of a landscaped courtyard containing the entrance stairs and ramp.

Interior Renovations. No major renovations of architecturally or historically significant interior spaces are proposed. In Sibley, the project incorporates minor changes required to provide access between the buildings. In Rand, in addition to minor changes required to provide access between the buildings, toilet rooms will be renovated on the first and second floors and an elevator installed. Also in Rand, on the second floor, an air plenum and electrical closet will be built against the west wall; on the third floor, an air plenum will be built against the west wall, and the northwest room will contain mechanical equipment serving Milstein Hall. No interior renovations to Tjaden Hall are proposed for either project.

Light and Air. Natural light and ventilation will be blocked where Milstein abuts the existing buildings. At the Foundry, natural light will be reduced by the proximity of Milstein.

At the basement of Sibley West, natural light and air will be increased in the vicinity of the CAPG entrance stair and ramp.

Climate Stabilization. Where exterior walls become interior, they will divide climate-controlled spaces. Heat loss and gain through these walls will be reduced to negligible amounts. At Sibley East, heat loss and gain will increase where the grade is lowered.

C. Mitigation Measures Incorporated into Project Design

This section describes mitigation measures incorporated in the design to reduce negative impacts on interior spaces.

Views. In Sibley, all exterior window openings will be retained so that views out of the spaces, although changed, will remain. Doors that replace windows will be transparent. At the first and third floors of Rand the windows will also be retained.

Historical precedents exist to support either a flat or a sloped roof on Milstein Hall. The proposed flat roof matches the roof on Rand and is an obvious way to distinguish the new building as subsidiary to Sibley Hall, retaining Sibley's visual prominence and preserving access to light and views for the third floors of Sibley and Rand. The green roof will soften Milstein's visual impact on views from locations above its roof levels, including Baker Laboratory and the upper floors of Lincoln Hall.

At the west end of Tjaden, the rail on the CAPG will be approximately four feet higher than the present grade but the garage will be approximately 30 feet away from the building at this point, and basement window sills are high, so the railing will not obstruct the view.

Light and Air. Artificial light and mechanical ventilation will be provided in all spaces.

Climate stabilization. Stable temperatures are considered a positive impact and no mitigation measures are proposed.

D. Unavoidable Impacts

View. The view of the Foundry from the upper floors of Sibley and Rand will be partially blocked by Milstein.

Light and air. Operable windows with access to the out-of-doors remain in all the major adjacent spaces, but natural ventilation will be replaced with mechanical ventilation. Light intensity will be reduced, for walls that will no longer receive direct sunlight. See Section 2.11.1 for daytime lighting impacts on the Foundry.

Climate stabilization. Energy use will be reduced in interior spaces protected by the new construction.

2.6.4 Impact where New Structures Attach to Old Structures

The potential impacts of the connection points between the proposed projects and the existing buildings are discussed in the previous sections of 2.6.1, Impacts to Historic Resources.

- Standard 2: details the removals necessary between old and new to accommodate the proposed projects
- Standard 5: reviews the preservation of distinctive historical features, details removals at connection points between old and new and discusses the vertical joint connections between Milstein Hall, Sibley and Rand.
- Standard 10: evaluates the removability of the proposed projects.

2.6.5 Archaeological Resources

This section summarizes the existing archaeology resources, analyzes the potential impacts to those resources, discusses mitigation measures, and identifies unavoidable impacts of the proposed Milstein Hall and the CAPG projects. Please refer to Appendix D: Archaeology Phase 1A Assessment for the detailed report conducted for this project.

A. Existing Archaeological Resources

A Phase 1A Cultural Resource Assessment was conducted for the proposed Milstein Hall and the CAPG project sites by the Binghamton Public Archaeology Facility in May of 2007. The assessment consisted of a site files check (literature research), a site walkover, and subsurface soils testing (unscreened shovel probes where appropriate). The background research and site visit indicated the sites as previously disturbed. The archaeological resource survey found that the sites are unlikely to contain any intact archaeological sites and did not recommend any further work.

B. Impacts to Archaeological Resources

Development of the Milstein Hall and the CAPG project sites pose no potential impacts on archaeological resources.

C. Mitigation Measures

No mitigation measures are necessary.

D. Unavoidable Impacts

There are no impacts of any kind to archaeological resources as a result of either project.

2.7 Transportation and Circulation

The following sections discuss transportation and circulation on the Milstein Hall and CAPG project sites. In 2008, Martin/Alexiou/Bryson prepared a Traffic Impact Analysis report (see Appendix E) on which these sections are based. Included are pedestrian circulation, bicycle circulation, transit service, service and delivery access, emergency vehicle access, and potential conflicts between vehicle, delivery, pedestrian and bicycle routes. Potential impacts, mitigation measures and unavoidable impacts are explored for each subsection below.

Up to 30,000 pedestrians and 5,000 cyclists make their way around and through the University's campus on any given day during the academic year. Because of the prominence of alternatives to single-occupancy vehicles as modes of transportation on this campus, it is important to examine the impacts of constructing new buildings and parking facilities on pedestrians and cyclists, in addition to vehicular impacts. This section will give a brief overview of the existing conditions within the study area as they relate to pedestrians and cyclists, and how the proposed project will impact these conditions. Additionally, if needed, mitigation measures to maintain safety and accessibility will be examined. Finally, any unavoidable impacts on pedestrian and bicycle circulation due to construction of the proposed project are discussed.

2.7.1 Pedestrian Circulation

A. Existing Conditions

As is the case on most university campuses, pedestrians make up a large portion of the traffic at any given location. Cornell is no exception, with up to 30,000 pedestrians using the campus daily. Cornell's pedestrian network is made up of almost 60 miles of paved and unpaved walks on campus. Cornell University was a pioneer in installing yellow/green fluorescent in-street pedestrian crossing signs on campus. There are also street signs to remind the public about the prominence of pedestrians on the campus. All roads within the project study area for the Milstein Hall and CAPG projects have sidewalks along at least one side of the roadway, both sides in most cases. Additionally, most intersections have striped pedestrian crosswalks, and the two signalized intersections included in the study have pedestrian signal heads indicating when crossing the street at those locations is allowed.

When AM and PM peak period vehicle turning movement counts were conducted at study area intersections, pedestrian crossing movements were also recorded. Figure 2.7.1 illustrates pedestrian traffic volumes within the study area during the vehicle peak hours (typically 8:00-9:00 AM and 4:00-5:00 PM for this area). A special 7:00 AM – 6:00 PM count was conducted at the University Avenue at Central Avenue intersection to gather an understanding of pedestrian movements to and from the suspension bridge adjacent to the site. This count is included in Figure 2.7.1 as an inset, and shows a heavy demand for pedestrians crossing University Avenue at the suspension bridge (approximately 1200 crossings on a cold February day), with a much smaller volume walking along University Avenue west of the project site. The figure shows how many pedestrians crossed a given approach during the peak hour at other intersections. Exact pedestrian movements (i.e. turning movements) were not recorded.

B. Impacts to Pedestrian Circulation

Once construction for the proposed projects is completed and all roadways are reopened to traffic, there are projected to be no negative impacts to pedestrian circulation, with regards to changes in existing sidewalk facilities.

The sidewalk along the north side of University Avenue will be maintained. In addition, the existing parallel sidewalk, immediately north of Sibley and Tjaden halls and south of the garage will be main-

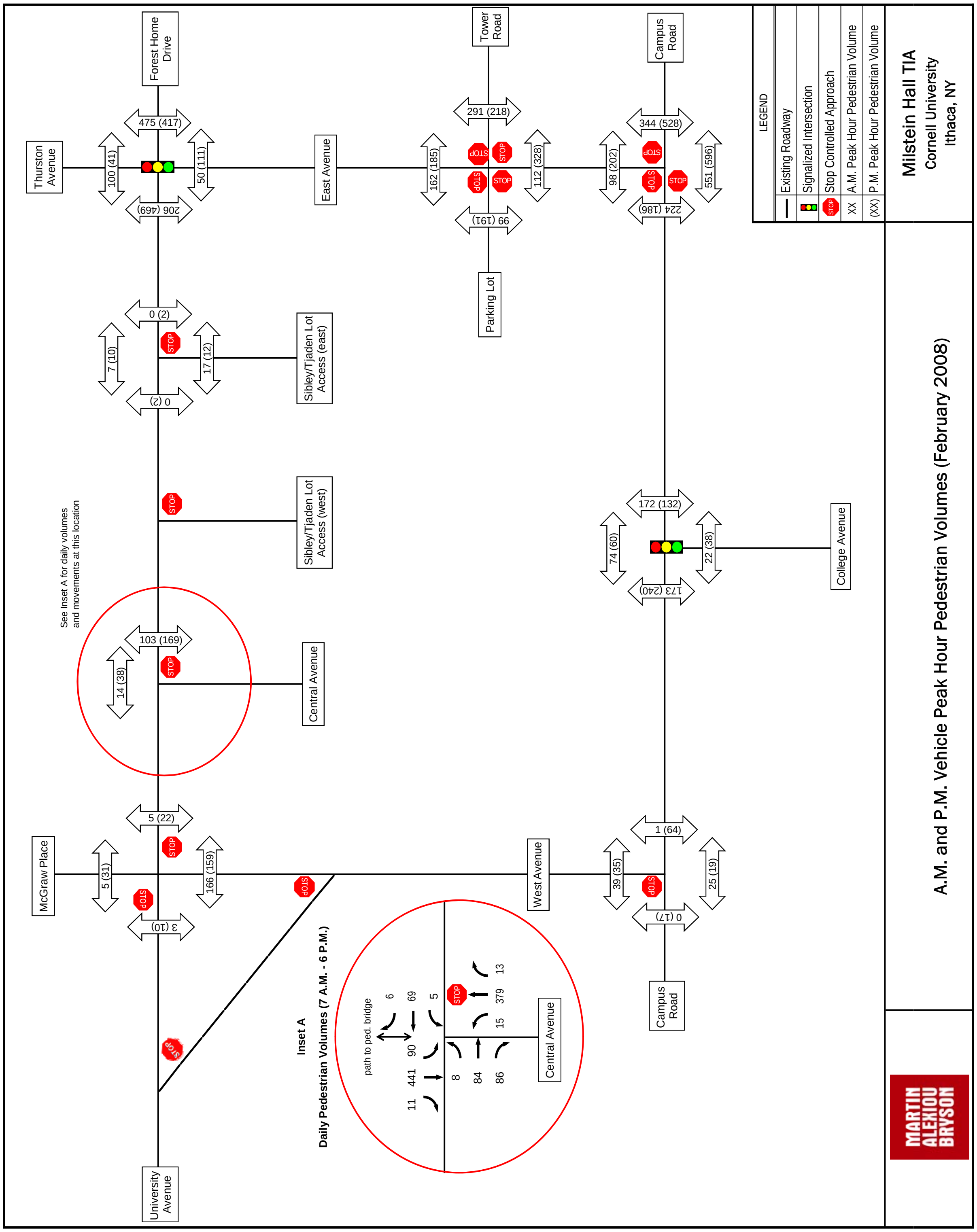

Figure 2.7.1: A.M. and P.M. Vehicle Peak Hour Pedestrian Volumes.

tained and enhanced.

A new high-visibility crosswalk will be located across University Avenue and will continue on a designated pedestrian path across the surface level of the CAPG, providing a straight connection to the pedestrian sidewalks of the Arts Quad. It is likely that the majority of pedestrians crossing University Avenue from the suspension bridge will use this crosswalk, as it provides the most direct route to the Arts Quad.

In order to eliminate conflicts between vehicles using the new CAPG lower level ramp entrance and pedestrians crossing at this location, the existing crosswalk on the east side of the University Avenue/Central Avenue intersection will be relocated to the west side of the intersection. This will connect pedestrians using the suspension bridge over Fall Creek to the entrance of the Johnson Museum of Art. Additionally, the CAPG plans call for a landscaped berm at the southeast quadrant of the same intersection. This will deter pedestrians from crossing University Avenue and walking in front of the garage entrance.

A sidewalk and wide paved area will be constructed along the southern side of University Avenue between Milstein Hall and the Foundry. In addition, two new high visibility crosswalks will be placed across University Avenue between the Foundry and Milstein Hall. Accessible wheelchair curb ramps will be placed at all proposed crosswalk/sidewalk connections.

The driveway access to Lincoln Hall will be moved from University Avenue to East Avenue. This will reduce vehicular conflicts with the large numbers of pedestrians (approximately 2,000 a day) who cross the Thurston Avenue Bridge moving between north campus and the Arts Quad. This relocated driveway will carry a very low traffic volume as it serves only a few parking spaces and service traffic to Lincoln Hall. Its new curb cut on East Avenue has a relatively low volume of pedestrian traffic.

After a review of the pedestrian counts and their origins and destinations, the planned pedestrian facilities within and surrounding the site have been found sufficient to accommodate the flow of pedestrian traffic. Please refer to Figure 2.7.2 for an illustration of all proposed pedestrian sidewalks and crosswalks for the projects.

C. Mitigation Measures

There are no significant negative impacts to pedestrian circulation as a result of these projects; therefore, no additional mitigations measures are necessary.

D. Unavoidable Impacts

There are no unavoidable negative impacts to the pedestrian connections in this area of campus.

Due to the nature of a major construction project, there are certain impacts that are unavoidable with regards to pedestrians during construction (please see Chapter Three, Construction Impacts). Some sidewalks will require temporary closure to allow for construction of pedestrian facilities that will serve the new developments. This will likely result in an increased travel time for pedestrians, as they will be required to use new routes around the construction. However, once construction is fully complete, pedestrians are not projected to experience any negative impacts from this project.

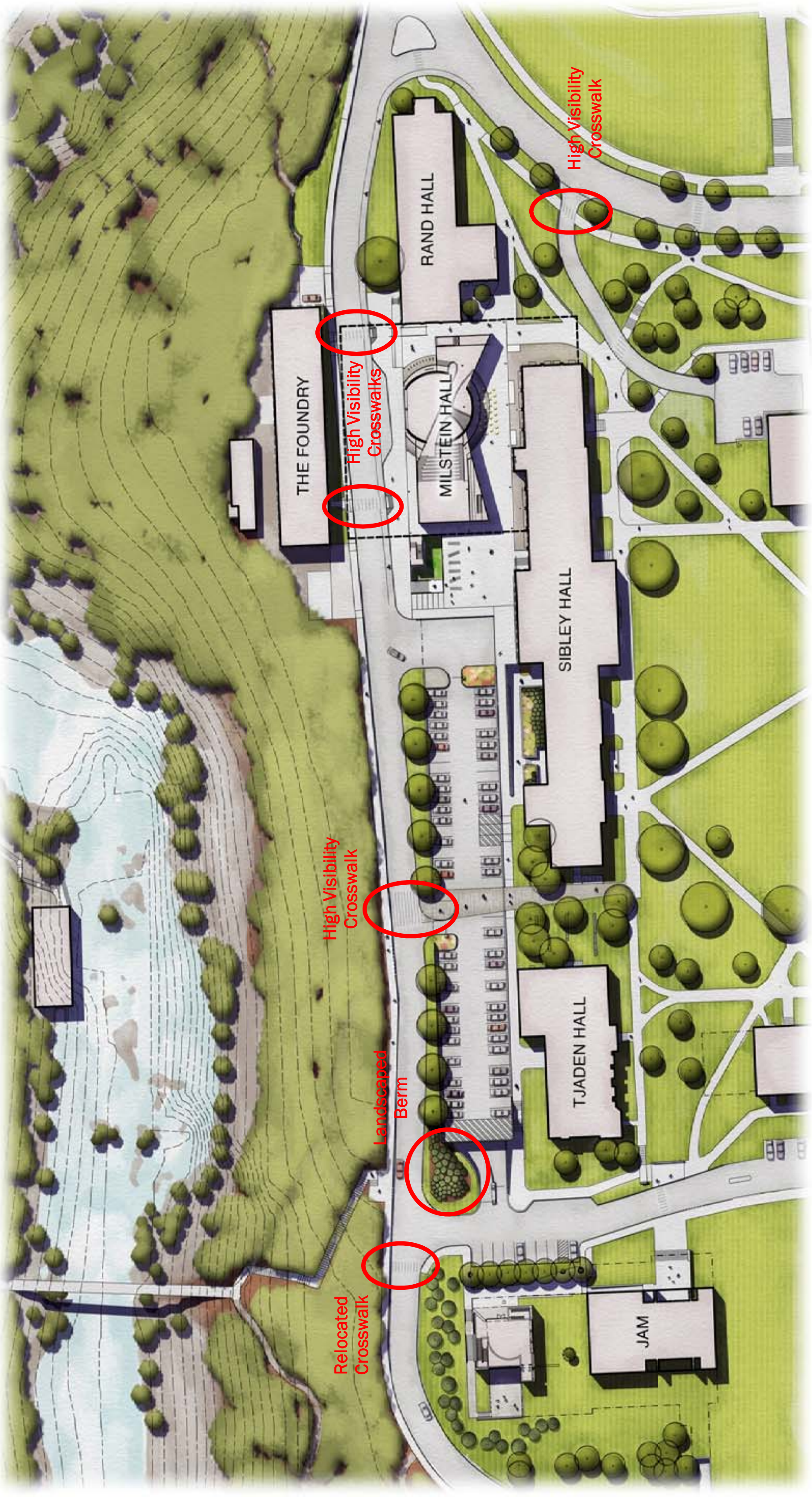

Figure 2.7.2: Site plan illustrating mitigations related to pedestrian circulation.

2.7.2 Bicycle Circulation

A. Existing Conditions

Currently, is it estimated that up to 5,000 bicycles access the Cornell University campus on a daily basis. Cornell University, in turn, has established an extensive bike network on the campus that provides bike racks, bike lanes, and incentives for bike riders to continue biking. In addition, all TCAT buses are equipped with bike racks to encourage passengers to use multi-modal transportation to traverse the campus. Within the project study area, Central Avenue, Campus Road, East Avenue, and University Avenue east of Central Avenue are all designated bike routes. East Avenue, from Campus Road to University Avenue, provides exclusive bike lanes for cyclists. In addition, there are multiple shared use paths (for both pedestrians and cyclists) that crisscross the study area. Within the study area, there are 17 exterior bike racks available for parking bikes. Certain areas are designated as "Dismount Zones" where cyclists are required to get off of their bike and walk, such as the suspension pedestrian bridge over Fall Creek, or especially high pedestrian traffic areas such as the walkway behind Rand Hall. Due to the extensive network, as well as the campus's endorsement of biking as a positive alternative transportation mode, cycling is an integral part of the transportation network on the Cornell University campus. See Figure 2.7.3 for a map of bicycle routes.

B. Impacts to Bicycle Circulation

Once construction for the proposed projects is completed and all roadways are reopened to traffic, bicyclists will be able to traverse the roadway and sidewalks as they do today. Bicyclists regularly using University Avenue will be temporarily negatively impacted while the facility is closed during construction (See Chapter Three: Construction Impacts). There will also be some additional vehicular traffic generated by the proposed site on the surrounding roadways.

C. Mitigation Measures

As part of the Milstein Hall project, a five-foot bicycle lane will be constructed along the south side of University Avenue between East Avenue and the CAPG entrance drive. Bike racks will be provided within the CAPG and under Milstein Hall.

D. Unavoidable Impacts

There are no permanent unavoidable impacts to bicycle circulation as a result of these projects.

At certain times during construction, University Avenue will be closed to through traffic. Temporary alternate bike routes will be established and announced prior to construction of the proposed development (See Chapter Three: Construction Impacts). Once construction is fully complete, cyclists are not projected to experience any long-term negative impacts from this project, as bike facilities will be improved overall.

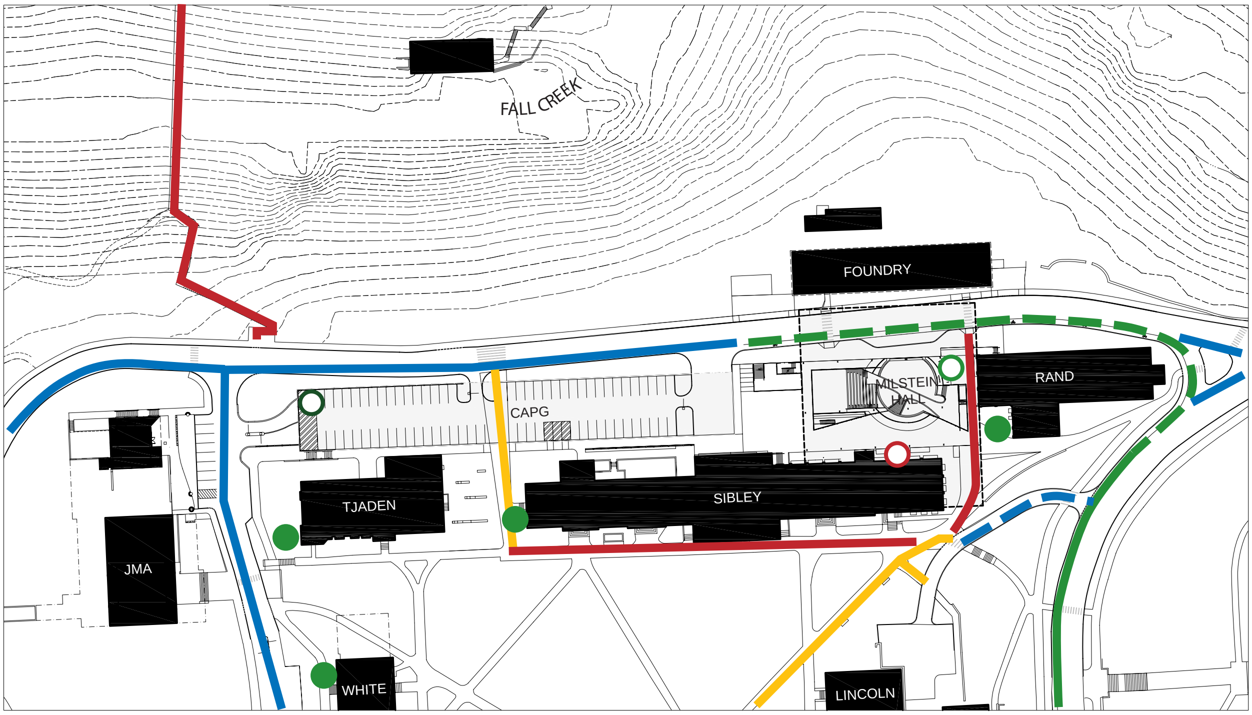

Figure 2.7.3: Existing and proposed bicycle routes.

LEGEND

● Existing Bike Rack Location
○ New Bike Rack Location
○ New Bike Rack Location, Lower Level Garage
○ Relocated Bike Rack

━ Existing Bike Lane (Marked for Exclusive Use by Cyclists)
╍ New Bike Lane
━ Existing Bike Route (Roadways, Parking Lots and Driveways)
╍ New Bike Route
━ Shared Path (Pedestrians and Cyclists)
━ Dismount Zone (Cyclists must walk bike)

North

2.7.3 Transit Service

A. Existing Conditions

Most transit in Tompkins County is operated by Tompkins Consolidated Area Transit (TCAT). TCAT currently operates approximately 40 fixed routes across the county. According to the t-GEIS Travel Survey, approximately 12 percent of Cornell employees, 38% of off-campus graduate students, and 15% of off-campus undergraduate students use the TCAT buses to reach the campus. Several TCAT routes use University Avenue, and individuals traveling to Milstein Hall will be well-positioned to take advantage of these routes.

Figure 2.7.4: Photo of existing bus stop on University Avenue.

An existing bus stop is located on the project site. It sits between the Sibley parking lot and University Avenue, roughly across the street from the Foundry building. A small, nose-in stopping area is provided at this location. When buses are stopped here, the rear of the bus remains in the traffic lane. Currently, Route 10, which provides regular and rapid service between Cornell and downtown, is the main run utilizing this bus stop. Other routes, such as the 85 (day service), 92 (night service), and 93 (night service) also stop here.

The existing bus stop currently consists of a standard glass enclosure located on the street edge with a pull-off area along the street. See Figure 2.7.4.

B. Impacts to Transit Service

The proposed Milstein Hall will positively impact the bus stop on site by providing a longer bus pull-off lane along University Avenue and upgrading the area where people will wait for the bus.

The CAPG project will not have any impact on existing bus stops.

C. Mitigation Measures

The proposed project improves conditions for transit service, and no mitigation measures are necessary.

D. Unavoidable Impacts

There are no unavoidable impacts of the Milstein project. Transit conditions will be improved.

2.7.4 Service and Delivery Access

A. Existing Conditions

Existing service and delivery routes are shown in Figure 2.7.5.

The Foundry currently receives deliveries at the east side of the building. Trash is collected at a single dumpster located in a gravel area on the east side of the building.

The Johnson Museum of Art is serviced from the loading dock that has a driveway entrance off of

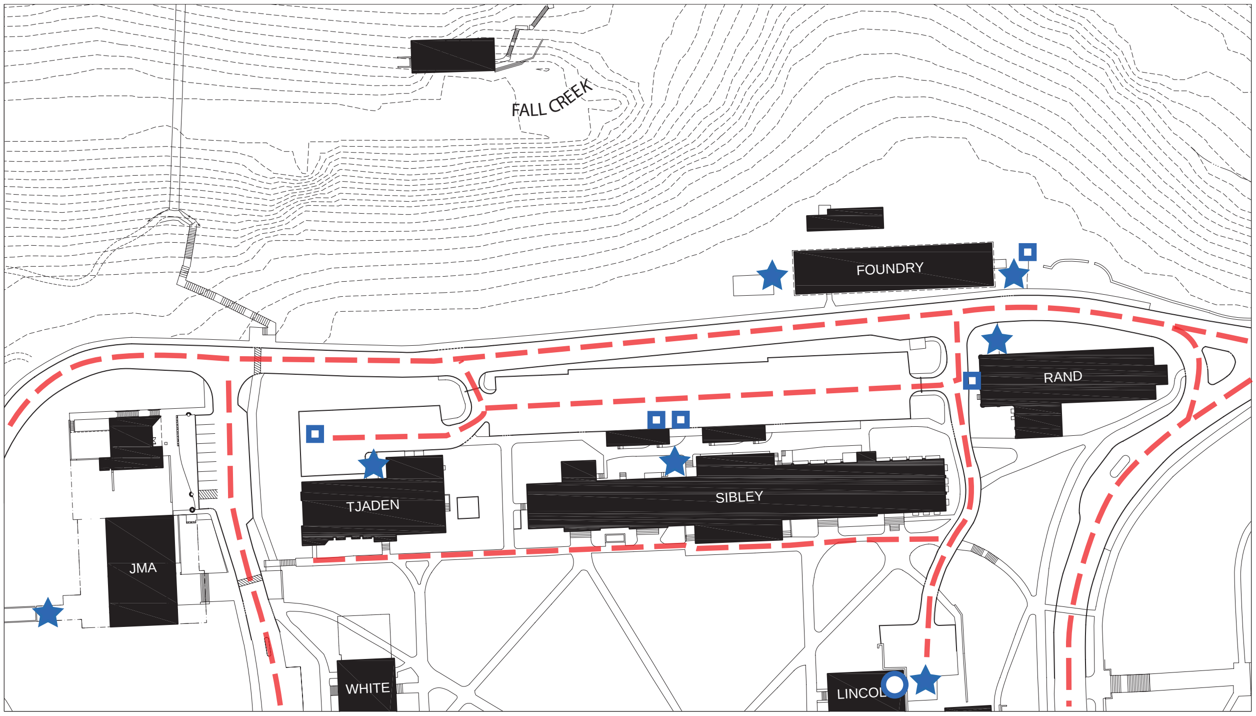

Figure 2.7.5: Existing service, delivery and emergency access.

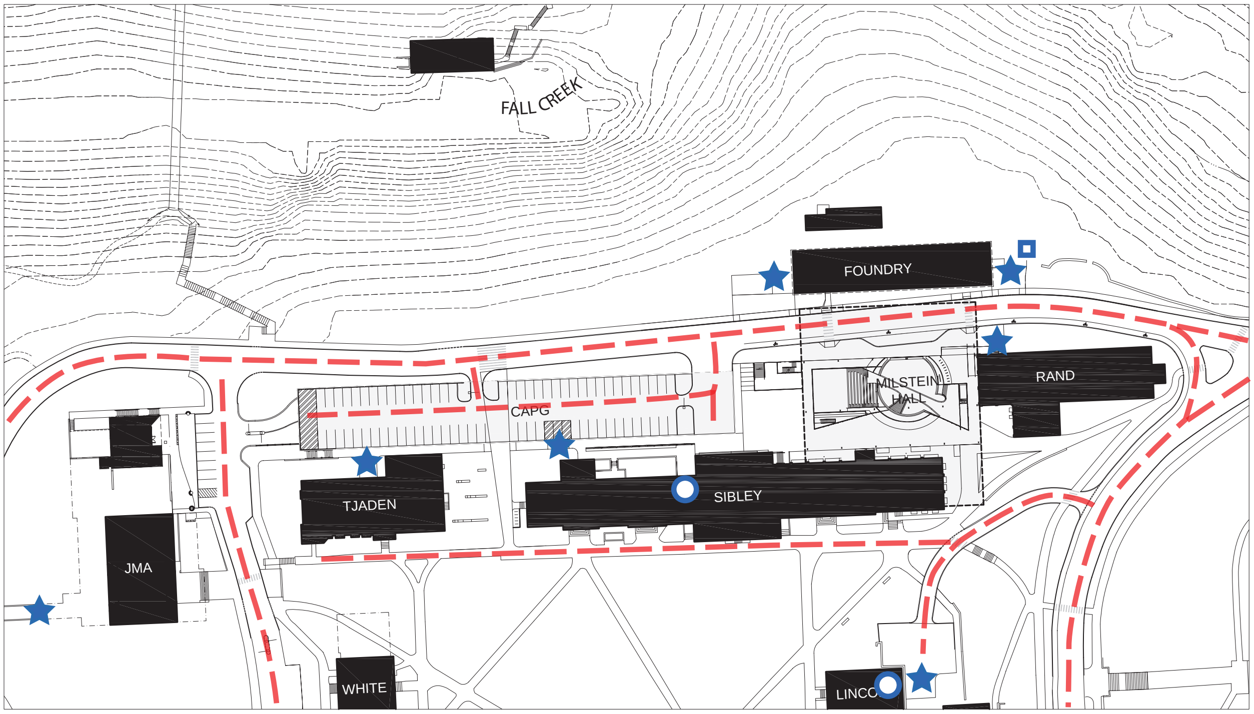

Figure 2.7.6: Proposed service, delivery and emergency access.

LEGEND

★ Service & Delivery Locations
□ Dumpster
○ Interior Marshalling Room
– – Emergency Vehicle Access
⊕ North

University Avenue.

Rand Hall currently receives deliveries near the northwest corner of the building, through the wood shop. Trash is collected at a single dumpster located on the west side of the building next to the driveway to Lincoln Hall.

Sibley Hall currently receives deliveries from the parking lot to the north of the building. The two most active points of delivery are the Green Dragon (a café in Sibley Hall) and the Fine Arts Library (in Sibley Hall). The Green Dragon currently receives approximately 37 deliveries a week, and the Fine Arts library receives approximately 30 mail tubs per week. Trash is collected in two dumpsters located in the parking lot north of the west wing of the building.

Tjaden Hall receives deliveries from the surface lot north of the building. Trash is collected in a single dumpster located on the western edge of the parking lot north of the building.

Lincoln Hall deliveries are located at the northeast corner of the building. Trash is collected at an interior marshalling room.

The types of service and delivery vehicles expected for all buildings include trash and recycling pickup, box-truck and van deliveries, and armored truck visits. Eighteen-wheeler trucks are discouraged from making individual, scheduled deliveries on campus.

B. Impacts to Service and Delivery Access

Proposed service and delivery routes are shown in Figure 2.7.6.

Service and deliveries for Rand, Sibley, Milstein and Tjaden halls will be centralized. Three parking spaces on the top deck of the garage, north of Sibley Hall, will be striped out and marked for service and loading. The garage deck has been designed to accommodate the turning radii and loading necessary for a large garbage truck to enter and exit the proposed driveways. Traffic islands at the gated entrances will include mountable curbs and paved surfacing to allow the extra width necessary for turning maneuvers. Service and delivery vehicles will enter the garage deck and back into the striped service and loading zone. At-grade, ADA-compliant walks and ramps are provided from this location to the entrances at Tjaden, Sibley, Milstein and Rand halls.

All trash and recycling will be marshaled in a dedicated room (part of the Sibley ADA renovation project) in the basement of Sibley Hall. On disposal days, trash and recycling will be wheeled out of the marshalling room and located at the dedicated service and loading area on the top deck of the garage. Rubbish bins will be brought back into the building after they are emptied.

In the event that the garage is not built, the site plan expected for this area would be the same as the existing CAPG plan, only the structure would be an on-grade parking lot. Service and deliveries would be the same as described above.

Service and loading for the Foundry and the Johnson Museum of Art will remain unchanged.

The driveway for service and loading to Lincoln Hall will be relocated from University Avenue to East Avenue. The parking and service area north of Lincoln Hall will remain unchanged.

C. Mitigation Measures

No mitigation measures are necessary for service and delivery access. The proposed projects maintain and improve the existing service and delivery conditions.

D. Unavoidable Impacts

There are no unavoidable negative impacts on service and delivery access due to this project. Four dumpsters currently on site will be removed, but this is generally considered a positive aesthetic move.

2.7.5 Emergency Vehicle Access

A. Existing Conditions

Existing emergency routes are shown in Figure 2.7.5.

Emergency vehicles are able to access Rand Hall from University Avenue, the existing parking lot, and the existing Lincoln Hall access drive. Emergency vehicles are able to access Sibley and Tjaden Halls from the existing parking lot north of the building, and the walkways on the Arts Quad. Access to the Foundry is from University Avenue, and the gravel areas on the east and west sides of the building. Access to Lincoln Hall is from a driveway off University Avenue and from walkways on the Arts Quad.

B. Impacts to Emergency Vehicle Access

Proposed emergency routes are shown in Figure 2.7.6.

In the proposed plans, emergency vehicles will still be able to access Rand Hall from University Avenue, East Avenue and the Lincoln Hall access drive. Sibley and Tjaden will continue to be accessible from the surface level of the parking garage, and the walkways on the Arts Quad. Access to the Foundry will remain unchanged. The access drive to Lincoln Hall will move from University Avenue to East Avenue. This driveway will be graded to comply with City of Ithaca Fire Department recommendations for emergency vehicle access. In addition, at the request of the City of Ithaca Fire Department, some of the Arts Quad walkways and radii south of Sibley and Tjaden halls will be widened to better accommodate emergency access.

The vertical and horizontal clearance allows emergency vehicles, such as fire trucks and ambulances, to pass under Milstein Hall, along University Avenue. The typical height of large emergency vehicles, like a fire engine with ladder, is 14’0”, according to the City of Ithaca Fire Department. Large vehicles such as transit busses and tractor trailers are typically 10’6” and 13’6”, respectively according to the design standards set forth by the American Association of State Highway and Transportation Officials (AASHTO). The actual vertical clearance of this building is 15’1”, which will accommodate large and emergency vehicles.

C. Mitigation Measures

Emergency access to the buildings in the vicinity of the project site will not be negatively impacted as a result of either project.

D. Unavoidable Impacts

There are no unavoidable impacts to emergency vehicle access as a result of either project.

2.7.6 Potential Conflicts between Vehicle, Delivery, Pedestrian and Bicycle Routes

A. Existing Conditions

Existing pedestrian and bicycle routes are illustrated in Figure 2.7.7.

The major point of conflict between pedestrians and vehicles currently occurs along the access road to the Lincoln Hall parking lot. Pedestrians use this driveway as a path to the Arts Quad from University Avenue. In addition, the sidewalks connecting the Thurston Avenue Bridge with the Arts Quad crosses the driveway. Points of potentially major conflict exist for the large number of pedestrians utilizing this path.

A crosswalk across University Avenue from the suspension bridge stairs to Central Avenue has the potential for conflicts between pedestrians and vehicles. The existing crosswalk includes a yellow crosswalk warning sign mounted on a pole, and no striping (the crosswalk was, at one time, striped with white paint, but since the recent resurfacing of the street, the crosswalks have not been re-painted).

Two other points of entry to the Arts Quad are popular access points from University Avenue. There is currently no crosswalk between the Foundry and the bus stop/Rand Hall/Lincoln access drive. In addition, there is no crosswalk from the University Avenue sidewalk to the sidewalks leading into the Arts Quad between Sibley and Tjaden halls. These points of crossing are popular destinations for pedestrians, and because there is no signage or clear crosswalk material, they present a higher potential for conflict with vehicles.

B. Impacts of Proposed Projects

Proposed pedestrian and bicycle routes are illustrated in Figure 2.7.8.

As part of the Milstein Hall site plan, the Lincoln Hall access drive will be moved from University Avenue to East Avenue. This eliminates the pedestrian-vehicle conflicts along the driveway in the existing condition. It also decreases the crossing conflicts, as the pedestrian path to the Arts Quad from Thurston Avenue leads directly into the Arts Quad without crossing the relocated access drive. Most of the pedestrians traveling along this route are headed to the Arts Quad, and so, the number of people crossing the driveway is significantly reduced.

The Milstein Hall project proposes to add two crosswalks across University Avenue to clarify and channel pedestrian crossing areas. The two crossings are located along logical lines of pedestrian travel, from the Arts Quad paths to the Foundry, and from the Foundry door to the Milstein Hall plaza. Crosswalks will be designed to be highly visible, and will include drop curb ramps and signage.

The CAPG project proposes to add one crosswalk across University Avenue, and move the existing crosswalk from the suspension bridge. The existing crosswalk from the suspension bridge to Central Avenue crosses on the east side of the intersection of University and Central avenues. In the proposed plans, crossing in this location would direct pedestrians across the entry and exit ramps for the garage, creating potential for vehicle/pedestrian conflict. Plans for the garage include moving this crosswalk to the west side of the intersection, bringing pedestrians onto the new Johnson Museum of Art sidewalk and landscape area. The CAPG project will also add a prominent crosswalk through the center of the site, connecting the Arts Quad sidewalks (between Tjaden and Sibley) with the garage deck and sidewalk along University Avenue. A wide, highly visible crosswalk, with a change in materials (i.e. unit paver crosswalk with asphalt parking lot) will increase safety and visibility in what is expected to be a heavily used connection between the street, gorge and the Arts Quad. Drop curb ramps and signage are included in the proposed plans as well.

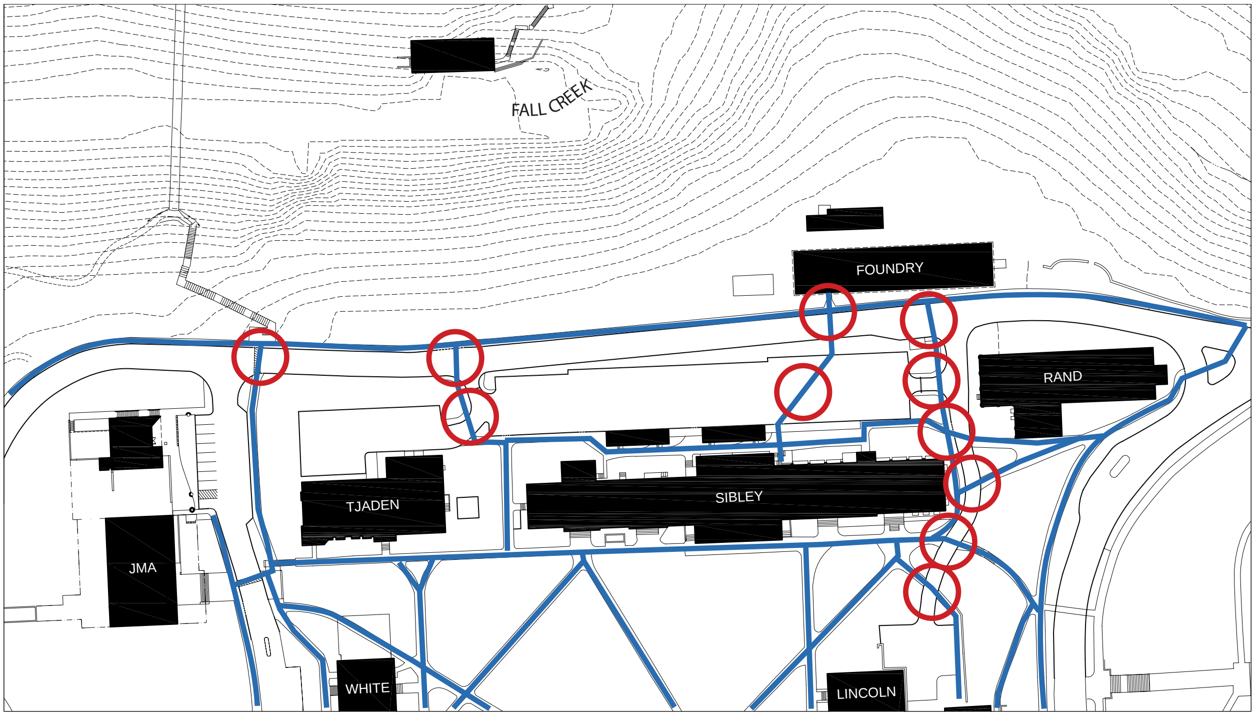

Figure 2.7.7: Existing points of potential pedestrian/vehicular conflict.

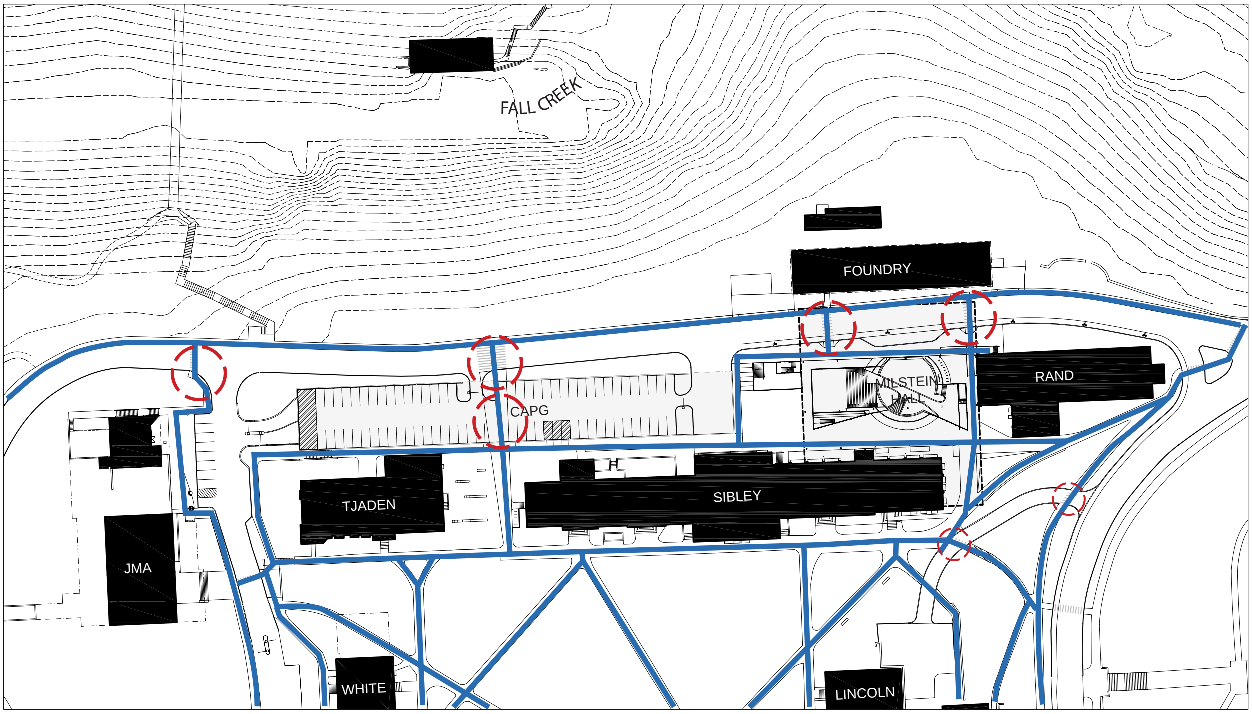

Figure 2.7.8: Mitigated points of potential pedestrian/vehicular conflict.

LEGEND

○ Potential Pedestrian/Vehicular Conflict
With Project Site Boundaries

◌ Mitigated Conflict
High Visibility Crosswalks, Signage and Drop Curbs

— Pedestrian or Bicycle Circulation

⬆ North

C. Mitigation Measures

Highly visible crosswalks will be used to mitigate potential conflicts between vehicle, pedestrian and bicycle routes.

D. Unavoidable Impacts

There are no unavoidable negative impacts to vehicle delivery, pedestrian and bicycle routes.

2.7.7 ADA Compliance

A. Existing Conditions

Existing ADA entrances are shown in Figure 2.7.9.

The Foundry is an ADA-compliant building. Grade level access to the building occurs at the main entrance on the south side of the building.

Rand Hall is not an ADA-compliant building. Grade level access is provided to the first floor of the building at the font entrance on the south side. ADA access to the second and third floor is not provided because of the lack of an elevator.

Sibley Hall is not an ADA-compliant building. The first floor of the east wing of Sibley Hall is accessible via the temporary ramp located at the southeast entrance. The other levels of the building are not accessible due to the lack of elevators.

Tjaden Hall is an ADA-compliant building. Grade level access is provided via the building entrance on the north side of the building. An elevator provides ADA access to all other floors.

Lincoln Hall is an ADA-compliant building. Grade level access is provided via the building entrance on the east side of the building off of East Avenue. An interior elevator provides ADA access to all other floors.

B. Impacts to ADA Compliance

Proposed ADA entrances are shown in Figure 2.7.10.

The Milstein Hall project includes the installation of an elevator inside the south wing of Rand Hall. This will convert the building from an ADA non-compliant building to an ADA-compliant building by providing access to all levels of the building.

The Sibley Hall ADA project (currently under construction) will convert Sibley into an accessible building by the installation of two elevators, one on the east side and one on the west side of the dome volume. These elevators will provide access to all floors of the building.

The Milstein Hall project will improve grade level access to Sibley Hall by allowing the temporary ramp on the south side of the east wing to be removed and replaced by a covered grade level entrance on the north side of the east wing of Sibley Hall. This new ADA entrance will be located close to the east ADA elevator.

The CAPG project will provide additional grade level access to Sibley Hall via an ADA ramp to the basement of the west wing of Sibley Hall, near the new west ADA elevator.

Figure 2.7.9: Existing ADA-accessible buildings and entrances.

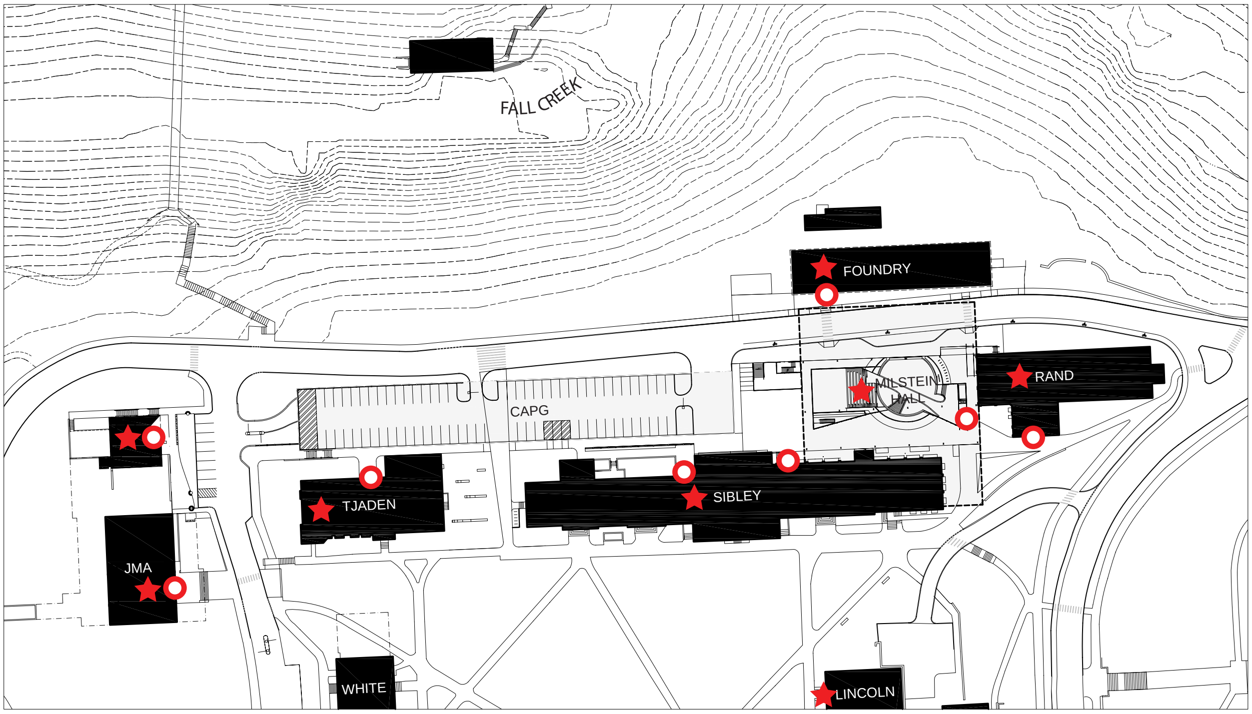

Figure 2.7.10: Proposed ADA-accessible buildings and entrances.

LEGEND

★ ADA Compliant Building

○ ADA Entrance

↑ North

C. Mitigation Measures

The proposed projects improve ADA accessibility for Rand and Sibley halls. No mitigation measures are necessary.

D. Unavoidable Impacts

There are no unavoidable impacts of the proposed projects on ADA accessibility.

2.8 Vehicular Circulation

The following sections address vehicular circulation issues related to the Milstein Hall and CAPG projects. The 2008 Martin/Alexiou/Bryson, PLLC Traffic Impact Analysis report (see Appendix E) provided the analysis for the following sections. Section 2.8.1 describes the existing traffic conditions and operations, Section 2.8.2 evaluates traffic impacts and mitigation measures based on projected vehicular service capacities, and Section 2.8.3 describes vehicular circulation issues related to the building structure over University Avenue.

2.8.1 Existing Traffic Conditions and Operations

A. Existing Roadway Conditions:

University Avenue

- University Avenue is a two-lane roadway with a posted speed limit of 30 miles per hour (mph).
- The land uses along University Avenue within the study area include residence halls and university owned or affiliated fraternity/sorority houses and other residence houses, private apartment houses primarily serving Cornell students, as well as university academic, museum and office buildings.
- University Avenue will provide direct access to the proposed CAPG surface level parking, while providing indirect access via Central Avenue to the two sub-surface parking levels.
- University Avenue, within the vicinity of the proposed project, is a designated bike route; however, there is no exclusive bike lane along this facility.
- University Avenue has a sidewalk along its north side only within the project vicinity.

Figure 2.8.1: Looking west along University Avenue toward the proposed Milstein Hall/CAPG site.

Figure 2.8.2: Eastbound approach of University Avenue at Thurston Avenue/Forest Home Drive/East Avenue intersection.

Thurston Avenue/East Avenue

- Thurston Avenue/East Avenue is a two-lane roadway with a speed limit of 30 mph.
- North of University Avenue, this roadway is named Thurston Avenue, while south of University Avenue, it is called East Avenue.
- Land use along Thurston Avenue is primarily university residence halls, fraternity and sorority houses, and transitions to include private residences in the second and third blocks from the intersection with University Avenue.
- Land use along East Avenue is University academic and administration buildings.
- North of University Avenue (Thurston Avenue), this facility is a designated bike route with no exclusive bike lanes; however, south of University Avenue (East Avenue), the facility is a designated bike route that does have exclusive bike lanes from approximately University Avenue to Campus Road.
- East Avenue has sidewalks along both sides of the street, separated from the roadway by a landscaped buffer.

Figure 2.8.3: Looking south along East Avenue from the Tower Road intersection.

Figure 2.8.4: Northbound approach of East Avenue at the Thurston Avenue/University Avenue intersection.

West Avenue

- West Avenue is a two-lane roadway with a posted speed limit of 25 mph.
- Land use along West Avenue includes university residence halls on the west side of the street and on-street parking and green space on the east side of the street.
- West Avenue is not a designated bike route.
- This roadway has a sidewalk along its western side.

Figure 2.8.5: Looking north along West Avenue toward the University Avenue intersection.

Figure 2.8.6: Southbound approach of West Avenue at the Campus Road intersection.

Central Avenue

- Central Avenue is a two-lane, dead-end roadway with no posted speed limit. Parking along Central Avenue is generally limited to drivers with a parking permit.
- Land use along Central Avenue includes university academic buildings and the Johnson Museum of Art. Central Avenue will provide direct access to the sub-surface parking levels of the proposed parking garage.
- Across the intersection of Central Avenue and University Avenue is a pedestrian suspension bridge that provides a pedestrian connection between residential and campus development on both sides of Fall Creek.
- Central Avenue is a designated bike route; however, there is no exclusive bike lane along this roadway.

Figure 2.8.7: Northbound approach of Central Avenue at the University Avenue intersection.

Figure 2.8.8: Looking south along Central Avenue from the University Avenue intersection.

Campus Road

- Campus Road is a two-lane roadway with a speed limit of 30 mph.
- Land use along Campus Road includes primarily university, academic and other support buildings along the eastern portion, with residence halls and university-owned or affiliated fraternity/sorority residence houses on the western portion.
- Campus Road, within the vicinity of the proposed project, is a designated bike route; however, there is no exclusive bike lane along this roadway.
- There are sidewalks along both sides of Campus Road.

Figure 2.8.9: Westbound approach of Campus Road at the West Avenue intersection.

Figure 2.8.10: Looking west along Campus Road toward the West Avenue intersection.

Stewart Avenue

- Stewart Avenue is a two-lane roadway with a speed limit of 30 mph.
- Land use along Stewart Avenue includes residence halls and university-owned or affiliated residence buildings.
- Stewart Avenue is not a designated bike route.

Figure 2.8.11: Looking south along Stewart Avenue from the University Avenue intersection.

Figure 2.8.12: Looking south along Stewart Avenue from the Campus Road intersection.

Figure 2.8.13 provides a schematic diagram of the roadways near the proposed development and indicates the intersections evaluated for turning movements and level of service.

B. Existing Level of Service

Peak hour level of service (LOS), which measures the adequacy of intersection geometrics and traffic control of a particular intersection or approach for the given turning volumes, was used as the evaluation criterion in this analysis. Levels of service range from A through F, based on the average control delay experienced by vehicles traveling through the intersection during the peak hours. Table 2.8.1 provides a general description of the LOS categories and delay ranges for both signalized and unsignalized intersections. The engineering profession generally accepts LOS D or higher as an acceptable operating condition for signalized intersections in urban areas and LOS C for rural areas. At unsignalized intersections, a LOS E is generally considered acceptable where the side street encounters the delay. Nevertheless, side streets sometimes function at LOS F during peak traffic periods; however, the traffic volumes often do not warrant a traffic signal to assist side street traffic. For the purpose of this study an overall LOS D or worse was considered unacceptable operation for an intersection. For intersections that do not report an overall LOS, mitigation measures were considered when a single approach operated at LOS D or below. This standard was set based on general expectations of the residents of the City of Ithaca and surrounding areas.

Level of Service Descriptions for Intersections

Level of Service	Description	Signalized Intersection	Unsignalized Intersection
A	Little or no delay	< = 10 sec.	< = 10 sec.
B	Short traffic delay	10 - 20 sec.	10 - 15 sec.
C	Average traffic delay	20 - 35 sec.	15 - 25 sec.
D	Long traffic delay	35 - 55 sec.	25 - 35 sec.
E	Very long traffic delay	55 - 80 sec.	35 - 50 sec.
F	Unacceptable delay	> 80 sec.	> 50 sec.

Table 2.8.1: Level of Service Descriptions for Intersections.

In this report, levels of service for a signalized or an all-way stop intersection are reported as an overall LOS, with its lowest operating approach and subsequent LOS also listed. For example: A reported LOS of "B (WB-C)" would indicate that overall the intersection operates at a LOS B, but the individual westbound approach operates at a LOS C. This is because the overall LOS is an average of the individual approaches. For intersections with partial stop control, levels of service are reported based only on the LOS of their lowest operating approach (Example: A reported LOS of "(SB-D)" would indicate that the southbound approach operates at a LOS D and all other approaches operate at a higher level than this approach.

Existing analyses were conducted based on current roadway geometrics and intersection turning movement counts. The turning movement counts were mainly collected in February 2008. As reported in the summary level of service (LOS) table (see Table 2.8.2), all of the intersections within the study area are currently operating at LOS C or better in both the AM and PM peak hours.

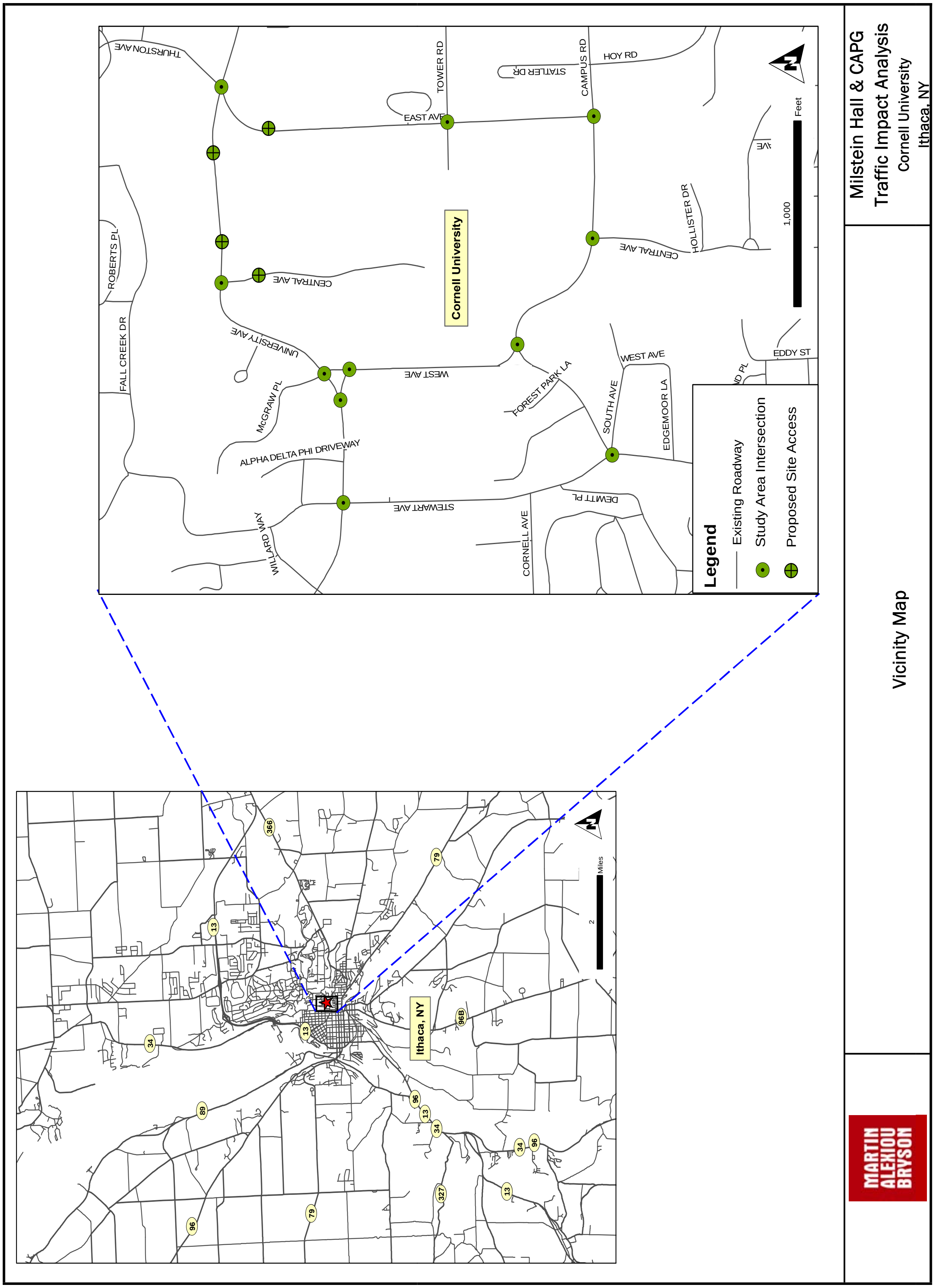

Figure 2.8.13: Vicinity map for Traffic analysis .

Intersection	Traffic Control	Existing (2008)	
		A.M.	**P.M.**
University Avenue/ Forest Home Drive at Thurston Avenue/East Avenue	Signalized	B (EB-C)	B (EB-C)
East Avenue at Tower Road	All-Way Stop	A (SB-A)	B (SB-B)
East Avenue at Campus Road	All-Way Stop	B (EB-B)	B (EB-B)
Campus Road at College Road	Signalized	A (EB-A)	A (WB-B)
Campus Road at West Avenue	Unsignalized	(SB-B)	(SB-B)
West Avenue at University (south)	Unsignalized	(SB-A)	(SB-A)
West Avenue at University (west)	Unsignalized	(NB-B)	(NB-B)
West Avenue at University (north)	Unsignalized	(NB-B)	(SB-C)
University Avenue at Central Avenue	Unsignalized	(NB-B)	(NB-C)
University Avenue at Sibley/ Tjaden Lot (east)	Unsignalized	(NB-A)	(NB-B)
University Avenue at Sibley/ Tjaden Lot (west)	Unsignalized	(NB-B)	(NB-B)
University Avenue at Stewart Avenue	All-Way Stop	B (EB-B)	C (WB-C)
Campus Road at Stewart Avenue	Unsignalized	(WB-A)	(WB-A)
Central Avenue at Parking Ramp Entrance	Future Unsignalized	N/A	N/A
East Avenue at Lincoln Hall Access	Future Unsignalized	N/A	N/A

Legend:
X (Dir-X) = Overall Intersection LOS (Worst Operating Approach - Worst Operating Approach LOS)

Table 2.8.2: Existing Level of Service Results.

2.8.2 Vehicular Service Capacity

This section, based on the traffic report by Martin/Alexiou/Bryson (see Appendix E), describes the projected level of service for intersections impacted by the proposed projects. Analysis was performed under four scenarios: Existing (2008), No-Build plus one year (2012), Build plus one year (2012), and a Construction Detour scenario (see Chapter Three: Construction Impacts for a discussion of the construction detour scenario). The Existing (2008) scenario includes A.M. and P.M. peak hour analyses based on turning movement data predominantly collected in February 2008. The No-Build + 1 (2012) scenario includes existing traffic with projected annual growth to one year after project completion. The Build + 1 (2012) scenario includes the No-Build + 1 (2012) scenario volumes with the addition of site trips generated by the proposed development to one year after project completion.

No-Build + 1 (2012) Conditions

The proposed development is scheduled for concurrent construction; Milstein Hall is projected to open in January 2011, while the CAPG will be completed in October 2010. A general background growth rate of 2.5% was applied annually to the 2008 intersection volumes to reflect 2012 conditions one year after project completion, to simulate a worst-case scenario. This was also the historic rate calculated in the Cornell University transportation-focused Draft Generic Environmental Impact Statement (t-GEIS) to account for past overall background traffic. Using this rate reflects both university and non-university growth in traffic in the area. Currently, there are no approved developments in the immediate vicinity of the area that would substantially impact the traffic prior to the completion of the proposed Milstein Hall and the CAPG.

Level of Service Analysis

Intersection level of service analyses were performed for the typical weekday A.M. and P.M. peak hours using Synchro/SimTraffic Professional Version 7. A summary of the findings for the No-Build + 1 (2012) scenario LOS can be found in Table 2.8.3 and the full Synchro/HCS output can be found in the Traffic Impact Analysis (Appendix E).

Based on the No-Build + 1 (2012) analysis, all of the intersections in the network will see a slight increase in intersection delay, but will not result in any significant traffic performance degradation (i.e., from acceptable LOS to unacceptable LOS).

Level of Service Results Summary

Intersection	Traffic Control	Existing (2008)		No-Build + 1 (2012)		Build (Completed) + 1 (2012)		Construction Diversion	
		A.M.	**P.M.**	**A.M.**	**P.M.**	**A.M.**	**P.M.**	**A.M.**	**P.M.**
University Avenue/ Forest Home Drive at Thurston Avenue/East Avenue	Signalized	B (EB-C)	B (EB-C)	B (EB-C)	B (EB-C)	B (EB-C)	B (EB-C)	A (WB-C)	A (WB-C)
East Avenue at Tower Road	All-Way Stop	A (SB-A)	B (SB-B)	A (SB-A)	B (SB-B)	A (SB-A)	B (SB-B)	A (SB-A)	B (NB-B)
East Avenue at Campus Road	All-Way Stop	B (EB-B)	B (EB-B)	B (EB-B)	B (EB-C)	B (EB-B)	B (EB-C)	C (EB-C)	C (EB-E)
Campus Road at College Road	Signalized	A (EB-A)	A (WB-B)	A (EB-B)	A (WB-B)	A (EB-B)	A (WB-B)	B (EB-B)	B (WB-B)
Campus Road at West Avenue	Unsignalized	(SB-B)	(SB-B)	(SB-B)	(SB-C)	(SB-B)	(SB-C)	(SB-B)	(SB-C)
West Avenue at University (south)	Unsignalized	(SB-A)	(SB-A)	(SB-A)	(SB-A)	(SB-A)	(SB-A)	(SB-A)	(SB-A)
West Avenue at University (west)	Unsignalized	(NB-B)	(NB-B)	(NB-B)	(NB-B)	(NB-B)	(NB-B)	(NB-B)	(NB-B)
West Avenue at University (north)	Unsignalized	(NB-B)	(SB-C)	(NB-B)	(SB-C)	(NB-B)	(SB-C)	(NB-B)	(SB-B)
University Avenue at Central Avenue	Unsignalized	(NB-B)	(NB-C)	(NB-B)	(NB-C)	(NB-B)	(NB-C)	(NB-B)	(NB-B)
University Avenue at Sibley/Tjaden Lot (east)	Unsignalized	(NB-A)	(NB-B)	(NB-A)	(NB-B)	(NB-A)	(NB-B)	N/A	N/A
University Avenue at Sibley/Tjaden Lot (west)	Unsignalized	(NB-B)	(NB-B)	(NB-B)	(NB-B)	(NB-B)	(NB-B)	N/A	N/A
University Avenue at Stewart Avenue	All-Way Stop	B (EB-B)	C (WB-C)	B (EB-B)	C (WB-D)	B (EB-B)	C (WB-E)	A (EB-B)	C (WB-C)
Campus Road at Stewart Avenue	Unsignalized	(WB-A)	(WB-A)	(WB-A)	(WB-B)	(WB-A)	(WB-C)	(WB-A)	(WB-A)
Central Avenue at Parking Ramp Entrance	Future Unsignalized	N/A	N/A	N/A	N/A	(WB-A)	(WB-A)	N/A	N/A
East Avenue at New Lincoln Hall Access	Future Unsignalized	N/A	N/A	N/A	N/A	(EB-B)	(EB_B)	(EB_B)	(EB_B)

Legend:
X (Dir-X) = Overall Intersection LOS (Worst Operating Approach - Worst Operating Approach LOS)

Table 2.8.3: Level of Service Results Summary.

B. Build + 1 (2012) Conditions

The Build + 1 (2012) conditions account for both the No-Build + 1 (2012) traffic and the site traffic generated by the proposed development. All of the intersections in the network will see a slight increase in intersection delay, but will not result in any significant traffic performance degradation (i.e., from acceptable LOS to unacceptable LOS) due to the addition of site trips from the proposed parking garage.

Trip Generation

New trips along University Avenue will generally be regulated by the availability of parking at the CAPG. Trips were generated based on the net gain of parking spaces. The CAPG is projected to have 199 parking spaces; the existing surface lot has 108 spaces. Therefore, the net gain in parking spaces is 91 spaces. Peak hour entering and exiting traffic volumes generated by these additional spaces were calculated using traffic rates gathered from similar parking lots/decks from around Cornell's campus. The data showed that on average there were 0.45 trips per parking space during the A.M. peak hour (0.35 trips/space entering and 0.10 trips/space exiting). During the P.M. peak hour, there were 0.75 trips per parking space (0.35 trips/space entering and 0.40 trips/space exiting). These rates resulted in 41 total new A.M. trips (32 entering, 9 exiting) and 68 total new P.M. trips (32 entering, 36 exiting) for the proposed parking garage.

Trip Distribution and Assignment

The generated site trips were distributed to the study area network as follows:

- 28% to/from the north via Thurston Avenue
- 5% to/from the east via Forest Home Drive
- 7% to/from the east via Tower Road
- 10% to/from the east via Campus Road
- 2% to/from the south via College Avenue
- 19% to/from the south via Stewart Avenue
- 15% to/from the west via University Avenue
- 12% to/from the north via Stewart Avenue
- 2% to/from the west via Cornell Avenue

The above percentages were determined using the existing Sibley/Tjaden lot and Central Avenue distribution percentages applied as part of the t-GEIS, including geocoded addresses, and based on surrounding traffic patterns. The distribution associated with the t-GEIS incorporated the origins and destinations of vehicle trips based on known employee and graduate student addresses. Approximately 40% of the site trips were assumed to use the surface level of the CAPG, while the remaining 60% were assumed to use the two sub-surface levels. Approximately 60% of the turning movement volumes counted at the Sibley/Tjaden surface lot entrance and exit were therefore shifted to the lower level entrance/exit in the Build + 1 (2012) scenario.

During the peak time periods, the site generated traffic will generally account for less than 7% of the total traffic on the four major approach directions, with the exception of University Avenue between the Sibley/Tjaden Lot East Access and East Avenue.

Level of Service Analysis Traffic Impacts from Milstein Hall and the CAPG

The Build + 1 (2012) analysis scenario includes the No-Build + 1 (2012) traffic as well as site generated trips from the proposed development as described previously.

Intersection levels of service analyses were performed for the typical weekday A.M. and P.M. peak hours using Synchro/SimTraffic Professional Version 7. Table 2.8.3 summarizes the findings of the LOS analysis and Appendix B contains the full Synchro/HCS reports of the analyses.

All of the intersections in the network will see a slight increase in intersection delay, but will not result in any significant traffic performance degradation (i.e., from acceptable LOS to unacceptable LOS) due to the addition of site trips from the proposed parking garage. The new Central Avenue ramp entrance to the subsurface portion of the garage is projected to operate at a LOS A for the westbound approach during both peak hours. The one-lane ingress and one-lane egress driveway configuration is projected to sufficiently accommodate vehicle traffic to and from the proposed CAPG surface lot. As is the case in the Existing (2008) scenario, the East Avenue at Campus Road intersection has the potential to experience lower levels of service than reported in the results table due to high pedestrian volumes at this location. However, this worst case scenario is unlikely since the high pedestrian volumes are most likely to occur when most classes are scheduled (mid-morning to mid-afternoon) Overall, the project's impact at this location is very minor (less than five site related vehicles on any approach during a peak hour). In addition, only two locations are projected to experience any change in LOS. Specifically, the average delay for the westbound approach of University Avenue at Stewart Avenue is expected to increase by less than 4 seconds; however, this increase is enough to drop the approach LOS from a D to an E. This small increase, though, does not affect the overall LOS reported for this all-way stop intersection, as it remains a LOS C; therefore, operations are still considered acceptable.

Traffic Impacts of Milstein Hall and Surface Lot Only

If the CAPG is not built, but the Milstein Hall project is, then the loss of parking from the existing Sibley/Tjaden lot due to Milstein Hall is expected to be absorbed into other parking facilities on campus. The completion of Milstein Hall is expected to eliminate approximately 50 of the existing spaces in this surface lot, resulting in less parking availability in the area. If there is less parking available, generally fewer cars will be in the area. Some additional drop-off or loading traffic could be added due to the completion of Milstein Hall only; however, the removal of approximately 50 spaces would offset this potential gain. Consequently, the LOS results would be roughly equal to, or slightly better than, the No-Build + 1 (2012) values shown in Table 2.8.4. As discussed previously, even under the full build out conditions of both projects, no operational issues are projected at any study area intersections. Therefore, it can be concluded that traffic operations will remain acceptable if the CAPG is not built.

C. Mitigation Measures

Traffic operations will remain acceptable. No traffic mitigation measures are proposed.

D. Unavoidable Impacts

A slight increase to traffic is an unavoidable impact of the proposed projects.

2.8.3 Sight Lines at University Avenue and Central Avenue Intersection

Vehicles traveling to and from the lower levels of the CAPG will use University Avenue to access the deck's driveway along Central Avenue. Due to the relatively low traffic volumes projected on both Central Avenue and University Avenue, the intersection is expected to continue to operate at an acceptable level of service. However, as a result to the unique alignment of University Avenue, it is also necessary to review the safety implications at this location.

A. Existing Conditions

University Avenue increases in elevation as it travels east. Recent maps show the roadway climbing 80 feet in elevation between West Avenue and Central Avenue, a distance of less than 900 feet, resulting in an approximate nine percent grade. There is also a horizontal curve as the roadway transitions from the northerly to easterly direction. See Figure 2.8.14.

Figure 2.8.14: Existing sight line along University Avenue looking southwest.

Adequate sight lines currently exist between the northbound and westbound directions as the approaches are straight and there are no substantial obstructions within the sight triangle on the southeastern corner of the intersection. A less than desirable sight line exists between eastbound and northbound vehicles due to the vertical and horizontal curves along University Avenue. Due to the grade and low speeds in the eastbound direction, vehicles have adequate stopping sight distance; however, visual obstructions should be minimized along the southern side of University Avenue as much as possible to give Central Avenue vehicles more time to make a turning maneuver.

B. Impacts to Sight Lines

Vehicles approaching from the south and east have clear sight lines to pedestrians on all corners of the intersection. Vehicles from the west have a shorter sight line due to the vertical and horizontal curves, but still have a sufficient stopping sight distance between the curve and the proposed crosswalk. The stopping sight distance length is reduced for vehicles on this approach due to the uphill grade as well as the low speeds of vehicles traveling up this hill. Advanced warning signs should be maintained on the approach heading east on University Avenue to warn drivers of the potential stop ahead.

From a pedestrian safety standpoint, the volume of pedestrians crossing at this intersection is expected to be reduced in the future with the introduction of the new high-visibility crosswalk located approximately 200 feet east of the suspension bridge path along University Avenue. This crossing would provide a more direct path to most of the Arts Quad and other campus buildings south of University Avenue.

C. Mitigation Measures

To improve vehicle to vehicle sight lines, any obstructions at the corners of the University and Central avenues intersection should be reduced as much as possible. Any landscaping placed on this corner should be no taller than 3.5 feet, which is representative of the height of the driver's eye above the roadway surface. Visual obstructions should be minimized along the southern side of University Avenue as much as possible, to give Central Avenue vehicles more time to make a turning maneuver.

Removal or pruning of an existing willow tree along the southern side of University Avenue and shifting the Johnson Museum of Art sign further back from University Avenue would help maximize this sight line as is visible in Figure 2.8.14. In addition, shifting the existing stop sign and painted stop bar closer to University Avenue would better enable vehicles on Central Avenue to see vehicles approaching along University Avenue.

D. Unavoidable Impacts

There are no unavoidable adverse impacts in regards to sight lines.

2.8.4 Structure Over University Avenue

a. Safety

Structures or other large roadside fixed objects within the clear zone, such as support columns, typically require some type of shielding (typically a barrier) to deflect and or absorb impacts of vehicles in the event a vehicle leaves the road. The particular design selected to for Milstein Hall is a cantilevered option which does not require support columns along the north side of University Avenue. Although more expensive due to the additional structural support required, this design was selected due partly to the safety improvements associated with it, in comparison to other designs. Specifically, the lack of support columns located adjacent to the road removes a potential object that could be struck by a vehicle. Additionally, it removes an obstruction that could block the line of sight between the driver and a crossing pedestrian.

b. Clearance

Vertical Clearance

According to the NYS Building Code, Section 3202.3.3, encroachments over the public right-of-way must be more than 15 feet above the ground. The actual vertical clearance of the proposed cantilevered section of the Milstein Hall building is 15’1”, which satisfies New York State Building Code for structures over roadways. In addition, although this project is not a bridge, the clearance also satisfies NYSDOT design recommendations for bridges over roadways. The proposed vertical clearance will accommodate large vehicles such as fire trucks and ambulances, as well as utility vehicles such as snow plows and street sweepers.

In accordance with the *NYSDOT Bridge Manual*, desirable vertical clearance is 4.45 meters (14’7”) and the absolute minimum is 4.3 meters (14’1”). The profile of the road and deflection of the building above must be taken into account when calculating the clearance space. An additional 6” is desirable for future paving of the road and the application of any raised pedestrian crosswalks or traffic calming measures. Otherwise, it is recommended that the road surface be milled prior to repaving.

Horizontal Clearance

This roadway can be classified as an “urban street” due to the low speed limit and the campus environment with a large number of pedestrians. According to the *AASHTO: A Policy on Geometric Design of Highways*, a curb with a minimum height of 6” should be placed along areas with high pedestrian activity. In addition, a minimum of 1’-6” should be provided between the curb face and any obstructions, including fire hydrants and the building structure, although 2’-0” is preferred (typical extension of a truck mirror). The Milstein Hall project exceeds these requirements.

c. Emergency/Large Vehicle Access

The vertical and horizontal clearance allows emergency vehicles, such as fire trucks and ambulances, to pass under Milstein Hall, along University Avenue. The typical height of large emergency vehicles, like a fire engine with ladder, is 14’0”, according to the Ithaca Fire Department. Large vehicles such as transit busses and tractor trailers are typically 10’6” and 13’6”, respectively according to the design standards set forth by the American Association of State Highway and Transportation Officials (AASHTO). The actual vertical clearance of this building is 15’1”, which will accommodate large and emergency vehicles. If there is an instance when a vehicle larger than these design standards, such as a construction crane, needs to pass along University Avenue, is must be disassembled first or utilize alternate routes.

d. Utilities and Road Maintenance

The clearances needed for utility and maintenance vehicles vary widely based on the task to be preformed. Typically, a backhoe loader or other machines that may be used for roadway maintenance (repaving, pipe repair, etc) do not exceed 14 feet in operating height. In the case that machinery utilizing extendable arms or booms is necessary, there are a variety of specialized, miniature machines available for working within small spaces, and can be assessed on a case by case basis. However, because the vertical and horizontal clearance of Milstein Hall, as it is cantilevered over University Avenue, meets the minimum clearance standards set forth by the State of New York, roadway construction vehicles should not have problems operating under the structure.

The vertical and horizontal clearance also ensures that regular maintenance and utility vehicles, such as street sweepers and snow plows are able to pass under Milstein Hall, along University Avenue when necessary.

e. DOT Guidelines

The roadway improvements and structural design along University Avenue will conform to the NYSDOT engineering standards. The roadway will maintain 11 foot wide travel lanes and a 5 foot wide bicycle lane along the southern side of University Avenue.

In accordance with the NYSDOT Bridge Manual, desirable vertical clearance is 4.45 meters (14’7”) and the absolute minimum is 4.3 meters (14’1”).

2.9 Parking

Parking on the Cornell University campus is a component of a comprehensive management program that balances transportation and parking needs with other environmental and community interests. The university utilizes incentive programs that encourage students, faculty and staff to leave their cars at home and to walk, bike, utilize public transit, carpool, or use other alternative forms of transportation. These incentive programs are described in Section 2.9.1 Transportation Demand Management Program. The university is involved in a number of long-range planning efforts affecting parking, including a transportation-focused Generic Environmental Impact Statement (t-GEIS), and a the Cornell Master Plan for the Ithaca Campus. These and other long-term traffic planning efforts are described in Section 2.9.2. Cornell's on-campus parking program, and specific site parking issues are described in Section 2.9.3, Site Parking.

2.9.1 Transportation Demand Management Program

A. Existing Transportation Demand Management Program

Cornell's nationally recognized Transportation Demand Management (TDM) programs encourage walking, bicycling, transit use, and other alternatives to single-occupant vehicle commuting by all members of the campus community. Over 30% of faculty and staff commute by public transit or carpool. Over 50% of graduate students and 40% of undergraduate students purchase transit passes, while less than 20% of graduate students and 5% of undergraduate students purchase parking permits. As of fall 2007, all matriculating students receive free unlimited rides on all TCAT routes after 6 PM week days, and all day and night Saturday and Sunday. In 2004 and 2005, the U.S. Environmental Protection Agency recognized Cornell University with an award as one of the Best Workplaces for Commuters in the nation.

TDM employee commuting options include:

- Individual Parking Permits - The campus parking system is structured into six tiers. As one gets closer to the central campus, the fees for parking permits increase. The rate structure is intended to help alleviate some of the overcrowding in central campus, make better use of under-utilized parking areas, and encourage more carpooling and use of public transit.
- OmniRide - Cornell offers partially- or fully-subsidized transit passes to its employees who do not purchase campus parking permits. These employees are called OmniRiders. Membership in OmniRide allows employees to take any bus in Tompkins County to any place at any time, and Cornell pays the fare. OmniRiders also receive 10 one-day parking permits every six months, in case they occasionally need to bring a car to campus.
- RideShare - RideShare provides incentives for carpooling with other Cornell employees with a fee and rebate structure.
- Occasional Parker - This program allows employees who don't participate in other programs - because they are dropped off on campus by someone who is not an employee, or because they walk or bicycle to campus everyday - to park on campus 10 days every six months for free.
- Park-and-Ride Lots - Cooperation with transit providers, surrounding municipalities, and other owners of parking facilities has encouraged the creation of Park-and-Ride lots that can be used by OmniRiders and other bus riders or where RideShare and other carpool groups can meet.
- Pedestrian and Bicycle Facilities - A user-friendly network of accessible routes for pedestrians and cyclists is supported by the Campus Bicycle and Pedestrian Committee. The university facilitates bicycling by stressing the 4E's: Engineering, Encouragement, Education, and Enforcement and through a signage and visual information system designed to provide order and

structure to this non-motorized form of transportation. Examples of the 4E's include development of web-based bicycle education programs targeting various user groups and a continuing bicycle parking improvement program.

The university also offers support services, such as Emergency Ride Home for OmniRiders, Red Runner (Cornell's courier service), East Hill Shuttle Service (shuttle bus between central campus and East Hill facilities) and CULift (wheelchair accessible vans) that minimize the need to bring cars to campus, decrease the number of employees driving to meetings or running errands on and off campus, and reduce demand for ADA parking spaces.

Benefits of Program:

- Within a year of its inception, the number of parking permits issued declined by 25%, and ride sharing increased by 10%.
- Combined with a municipal residential parking permit system in surrounding neighborhoods, TDM has reduced traffic to, through, and around the Cornell Campus.
- Cornell University commuters travel approximately 10 million fewer miles per year, and consume 417,000 fewer gallons of fuel. This reduces emissions by approximately 6.5 million pounds of carbon dioxide ($CO2$); 600,000 pounds of carbon monoxide (CO); 35,000 pounds of oxides of nitrogen (NOx); and 60,000 pounds of hydrocarbons.
- A less stressful commute is provided for everyone - either because they are participating in a transit or carpool program, driving in reduced traffic, or both.

B. Impacts of Milstein Hall and the CAPG to TDM

There are no significant negative impacts to TDM due to the proposed projects. Neither project is adding students. Milstein Hall is expected to add approximately four employees. The CAPG is not expected to add any new employees.

A positive impact on TDM is that Milstein Hall will retain and enhance the bus stop on University Avenue. It is also a positive impact that the Milstein project will add a bicycle lane, as well as covered bicycle racks near the bus stop.

C. Mitigation Measures

Since there are no impacts to TDM, there are no additional mitigation measures necessary, other than those that have already been incorporated into the projects. See section listed above.

D. Unavoidable Impacts

There are no unavoidable adverse impacts with respect to the Transportation Demand Management program. Bus, pedestrian and bicycle transit will be improved as a result of the projects.

2.9.2 Relationship to Other Long-Range Traffic Planning Efforts on the Cornell University Campus

A. Existing Long Range Traffic Planning Efforts

t-GEIS

In the fall of 2005, Cornell commenced a transportation-focused Generic Environmental Impact Statement (t-GEIS) to identify, examine, and evaluate transportation-related impacts and possible mitigations of several hypothetical Cornell population growth scenarios in the next 10 years. The Town of Ithaca Planning Board is acting as the lead agency; the City of Ithaca, other area municipalities and Tompkins County, are involved agencies. Unlike a usual application with an Environmental Impact Statement, the t-GEIS does not analyze traffic from a specific development project. By providing an anticipatory, comprehensive review, the t-GEIS will assist planning boards and agencies in environmental reviews of transportation-related impacts of individual Cornell projects in the next 10 years. As the t-GEIS results are finalized, the information will be integrated into campus planning efforts.

The Cornell Master Plan for the Ithaca Campus (CMP)

Cornell University has recently developed the Cornell Master Plan (CMP) that guides the campus's physical development over the next 25 years and beyond. Transportation planning is directly linked to the CMP's guiding principles to promote stewardship, enhance the campus experience, respect neighborhood interests and ensure integrative planning and design. Cornell's CMP considers many aspects of the university's movement systems, focusing on strategies that will make the campus more pedestrian and transit friendly. The following transportation system recommendations are found in the Cornell Master Plan:

> **Enhance Pedestrian Network**
> A pedestrian–oriented campus is one where almost anyone can walk safely and comfortably to almost anywhere they choose, and where they are encouraged to do so. The extension and maintenance of a fine–grained pedestrian network as the campus evolves is essential. This network should include, sidewalks, paths and trails through quads, gardens, and natural areas, shared ped–bike pathways and connections through buildings, and should be kept clear of snow in the winter. In the busiest parts of core campus, pathways should be generous enough to accommodate the high volumes of traffic during class changes. An "accessible–by–all" approach should guide the design of paths, open spaces and buildings.
>
> Pathways and sidewalks should be wide enough to accommodate two-way wheelchair traffic, especially along major pedestrian corridors such as East Avenue and Tower Road. In order to accommodate two-way wheelchair traffic, pathways and sidewalks should be a minimum of six feet wide. Entries to streets from sidewalks should be designed with ADA-compliant pedestrian ramps in all areas of campus. Due to Cornell's unique topography, it is not always practical to provide gently sloping ramps instead of stairways. In these instances, alternative routes that are wheelchair-friendly, via buildings with elevators where possible, should be clearly marked with appropriate signage.
>
> **Reduce Pedestrian–Vehicle Conflicts**
> Interactions between pedestrians and vehicles on campus present the greatest threat to pedestrian safety. In order to increase pedestrian safety, all areas where large pedestrian volumes interact with vehicles should be highly visible. Crosswalks should be clearly defined, either by introducing a new material for crosswalks or by ensuring crosswalks are painted distinctly. Pedestrian signage should also be installed to warn motorists of high pedestrian crossing areas."
>
> **Enhance Bicycle Network and Amenities on Campus**
> Improved bicycle routes are proposed in the CMP to offer added safety and travel efficiency to existing bicycle routes both on campus and within the City of Ithaca. Adding bicycle amenities around campus should go hand–in–hand with completing the bike

network. Bike racks should be located outside of all buildings, with weather protection provided wherever possible. Also, Cornell should continue to work with TCAT to equip all buses with larger capacity bicycle racks.

Work with TCAT to Simplify the Transit System
An important first step is to work with TCAT to optimize and simplify the transit system. TCAT's extensive bus network results in almost 550 buses per day traveling on Tower Road, 300 buses per day on East Avenue and 275 buses per day on College Avenue. The sheer number of buses on campus and the number of routes they serve causes confusion for prospective riders. Optimizing the bus network should significantly reduce bus traffic through campus, which will help to reduce pollution and noise and create a more pleasant walking environment.

One possible strategy for Cornell to explore with TCAT would be to end some routes from outside the campus at the periphery of campus, or at transit hubs located at each end of Tower Road, where users could easily transfer onto campus circulator, described below. At the transit hubs, as well as strategically located transit kiosks, users will have access to easy–to–understand information about routes, schedules and next–bus arrival times. Monitors in the hubs and kiosks could display arrival times for approaching buses. As a long–term goal, Cornell should encourage TCAT to install GPS tracking devices that would allow users to receive instant e–mail or text message updates as to their desired bus's location and scheduled arrival time.

Develop a Campus Circulator
In partnership with TCAT, Cornell should formalize and phase in a campus circulator to provide high-frequency transit service within the campus. The campus circulator should be a smaller shuttle than the current TCAT buses. In order to achieve a high ride-share, the campus circulator must be frequent and provide fast, efficient service to desirable locations. Stops for the campus circulator should be located next to heavily used academic and administrative buildings and large parking facilities.

The campus circulator should ultimately include at least the four interconnected routes described below.

Loop A – Central Campus to/from B Lot
Phase one of the campus circulator should be a loop stretching from the heart of Central Campus to B Lot, running along Tower Road, Campus Road and East Avenue.

Loop B – Central Campus to/from A Lot
Loop B should provide frequent, quick and efficient transit service between Central Campus and A Lot in North Campus via Jessup Road, Triphammer Road and Thurston Avenue.

Loop C – West Campus
Loop C would link Loop A and Central Campus to West Campus and potentially Collegetown. Loop C would circulate around the residential area of West Campus, using Stewart Avenue and West Avenue. Loop C would then connect to the other loops via East Avenue in the core campus.

Loop D – Core Campus to East Hill Village

The existing bus shuttle service between Day Hall and the East Hill Office Building is essentially the precursor to this critical link between Core Campus and evolving East Hill Village.

Ithaca-Tompkins County Transportation Council

Cornell is an active participant with the Ithaca-Tompkins County Transportation Council (ITCTC) in regional transportation planning. Efforts are under way to enhance existing community park-and-rides served by public transit, and to site additional community park-and-ride lots.

B. Project Impacts to Long-Range Traffic Planning Efforts

There are no significant impacts to long-range traffic planning efforts because transportation recommendations within the Cornell Master Plan, consistent with TDM, and t-GEIS documents, involve improvements that are incorporated into the Milstein Hall and CAPG projects. Like these documents, the projects recognize the current necessity of making the campus more pedestrian-oriented, while accommodating the automobile. The Milstein Hall project will maintain and/or improve the existing pedestrian walkways, bicycle facilities and bus network within the project area, and the CAPG will consolidate parking into a structure, increasing the number of parking spaces while decreasing the site footprint. In the long term, the t-GEIS projects that enhancing Cornell's TDM program could reduce the number of vehicles coming onto campus. Site specific traffic impacts are described in Section 2.7, Transportation and Circulation.

Enhance Pedestrian Network

Both projects include updated pedestrian walkways, linking the site to the greater campus and city sidewalk systems. A new sidewalk located on the south side of the parking garage will serve as the primary east-west pedestrian circulation route linking East Avenue, Rand Hall, Milstein Hall, Sibley Hall and Tjaden Hall, to the CAPG, Central Avenue and the Johnson Museum of Art. This circulation route will clarify pedestrian movements in the area and connect to adjacent circulation patterns on campus.

Reduce Pedestrian–Vehicle Conflicts

Potential locations of pedestrian-vehicle conflicts associated with these projects include pedestrian crossings of University Avenue, pedestrian crossings of the vehicle entry and exit drives for the garage, and pedestrian crossings of the parking garage surface. Pedestrian crossings of University Avenue are located to connect the destinations on the north and south side of University Avenue in the most direct, yet safe locations. Bold surface treatment will designate the University Avenue crosswalk as the primary pedestrian entrance to the Arts Quad from the suspension bridge. A pair of crosswalks under Milstein Hall rationalizes pedestrian crossings to the Foundry. The pedestrian circulation system has been designed to avoid any sidewalks crossing the entrance or exit to the parking garage. The only pedestrian route crossing the parking garage surface is the extension of the University Avenue crosswalk; the same bold surface treatment will carry across the garage, clearly marking the pedestrian zone.

Enhance Bicycle Network and Amenities on Campus

Within the project limit lines for Milstein Hall, the addition of a five foot bicycle lane along the south side of University Avenue will enhance the visibility and safety of bicyclists in the project area. Covered bicycle parking will be provided under the cantilever of Milstein Hall.

Work with TCAT to Simplify the Transit System

The existing bus stop on University Avenue will be enhanced with the addition of a covered bus shelter. This will allow the Milstein Hall project to accommodate future improvements to the TCAT bus network and a campus circulator if a future loop is added that would follow University Avenue. The proximity to the infrastructure of Milstein Hall would facilitate future transit information and technology improvements such as interactive kiosks and live bus tracking service.

C. Mitigation Measures

No mitigations are necessary as the Milstein Hall and the CAPG projects are consistent with t-GEIS and the CMP. The projects will continue to support long-range traffic planning efforts.

D. Unavoidable Impacts

There are no unavoidable impacts with respect to the projects' relationship to long-range traffic planning efforts.

2.9.3 Site Parking

A. Existing Site Parking

Two existing surface parking lots are located to the north of Sibley and Tjaden halls and are accessed from University Avenue. Access is controlled by a gate on the east end of the Sibley lot, with the exit located north of the gap between Sibley and Tjaden. There are 83 designated spaces in the Sibley lot and 22 in the Tjaden lot, with several spaces assigned for loading or ADA parking as needed. Parking is by permit only. In addition, five metered parking spaces are located to the west of the surface parking lots, on the east side of Central Avenue.

B. Impacts to Site Parking

Impacts to site parking are positive due to the CAPG. All the existing surface parking will be replaced by 199 structured parking spaces in the CAPG. Three metered spots on Central Avenue will be removed to accommodate the lower garage entry. The surface level of parking will function essentially the same as the current surface lot with the entrance off University Avenue on the east side and the exit located north of the gap between Sibley and Tjaden. The two lower levels of parking will be accessed from Central Avenue through a single entrance and exit drive. The proposed action will increase available parking by 91 spaces. The spaces will be by permit only during weekday business hours; most spaces will be available without a permit during evenings and weekends.

If Milstein Hall is constructed and the CAPG is not, then there will be impacts to site parking but they will not be significant. The surface lot will be reconstructed on the western portion of the site to accommodate 70 parking spaces. Thirty-five existing parking spaces will be lost due to the Milstein Hall project and not replaced on-site. The campus parking system as a whole has enough flexibility to absorb this small loss to parking in this location. See Section 1.10 for a description of the campus parking system.

C. Mitigation Measures

No mitigation measures are necessary. The construction of the CAPG provides additional parking in a part of campus where parking is most limited. The project improves accessibility to the College of AAP buildings for persons with limited mobility.

D. Unavoidable Impacts

Because two out of three levels of parking will be below grade, the underground parking spaces will be limited to passenger vehicles.

If Milstein Hall is constructed and the CAPG is not, then there will be an unavoidable loss of 35 parking spaces in this location.

2.10 Other Impacts to Current or Future Transportation Systems

This section summarizes potential plans for future transportation systems adjacent to Milstein Hall and the CAPG, describes potential impacts to future transportation systems, discusses mitigation measures, and identifies unavoidable impacts of the proposed projects.

A. Plans for Future Transportation Systems

The Cornell Master Plan (CMP), more fully described in Section 1.11, and Section 2.9, is a comprehensive document that considers future transportation plans for Cornell University. Cornell University's Transportation Demand Management program (TDM), and Cornell's draft transportation-focused Generic Environmental Impact Statement (t-GEIS) described in Section 1.10, were considered during the development of the CMP. Cornell's CMP includes all aspects of the university's movement systems, focusing on strategies that will make the campus more pedestrian and transit friendly.

Future transportation systems, such as a trolley or streetcar system or personal rapid transit system (PRT or podcars) as alternate public transit within Tompkins County, were not discussed in the CMP. Such potential future transportation systems are not supported by any firm initiative or current plans for development.

Trolley or Streetcar

The return of the trolley or a streetcar system to Ithaca's public transit network is occasionally mentioned within the community. The Ithaca Street Railway, started as two small electric streetcars in 1887, was gradually expanded from downtown to Collegetown, crossed Cascadilla Creek by today's Engineering Quad, followed East Avenue to the Thurston Avenue Bridge where it crossed Fall Creek, and continued into Cornell Heights. See Figure 2.10.1 for the route map.

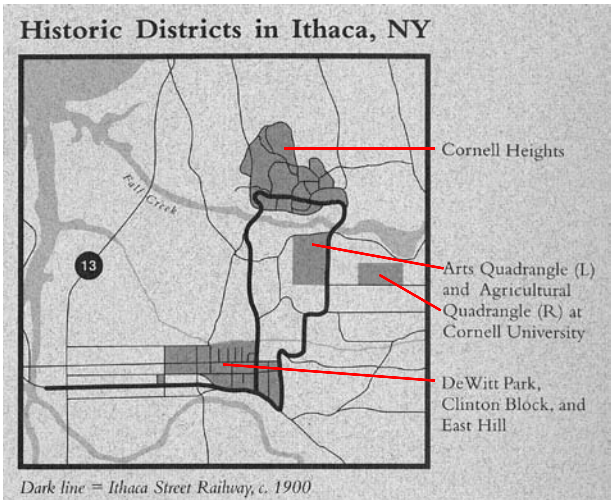

Figure 2.10.1: Historic Ithaca, Inc., map indicating the Ithaca Street Railway, c.1900.

The street railway was reorganized several times, including following a bankruptcy in 1924, and was finally purchased by a bus operator in 1934 who replaced the streetcars with motor buses. The buses followed the streetcar routes as closely as possible, using public streets in place of private right-of-ways as necessary.

Authentic restoration of the historic Ithaca Street Railway would be impractical due to significant building construction over the historic track locations in places like Collegetown and the Engineering Quad. New rail tracks would likely follow existing public streets to approximate the historic trolley route. The practical difficulties of adding tracks, overhead wires and trolley stops within a limited right-of-way space already fully utilized by cars, trucks, buses, bicycles and pedestrians would require challenging engineering and political solutions, not to mention significant funding. In addition, such a system is a fixed-route system and cannot be adapted to changing transportation needs including short-term changes (detours for accidents or road repair).

There is currently no plan or funding to restore the street railway system within the existing transportation infrastructure. The cost of light rail construction varies widely, largely depending on the amount of tunneling and elevated structures required. The *Status of North American Light Rail Projects* survey (2002) showed that costs of most LRT systems range from $15 million per mile to over $100 million per mile. Seattle's light rail system is by far the most expensive in the U.S. at $179 million per mile, since it includes extensive tunneling, elevated sections, and underground stations. At the other end of the scale, four systems (Baltimore MD, Camden NJ, Sacramento CA, and Salt Lake City, UT) incurred costs of less than $20 million per mile. Over the U.S. as a whole, excluding Seattle, new light rail construction costs average about $35 million per mile.

Personal Rapid Transit

The local press has covered recent discussions for personal rapid transit system (PRT) or PodCar as an alternate public transit system within Tompkins County (e.g. *Ithaca Journal*, December 8, 2007 article, "Monorail gets a push in Tompkins"). PodCar is an automated electric mass transit system utilizing small vehicles attached to an elevated guideway network. No PRT system has been constructed anywhere to date. Connect Ithaca, a local group "committed to reversing the destructive patterns of sprawl and auto-centric mobility, and creating an ecologically sustainable, socially equitable and economically vibrant city" has called for a detailed study of this technology to assess its feasibility for Ithaca. However, plans for such a study do not appear to have gone further.

B. Impacts to Plans for Future Transportation Systems

It is not anticipated that Milstein Hall will have an impact on future transportation systems.

The construction of the proposed projects will not preclude the recreation of a trolley line approximating the historic route of the Ithaca Street Railway on East Avenue. The historic trolley route did not travel along University Avenue.

If routing a trolley on University Avenue were proposed in the future, the 15 foot clearance under Milstein Hall would accommodate most streetcars. For example, the technical data for the Portland streetcar (Skoda-Inekon 10T) gives a body height of approximately 11 feet 4 inches and streetcar plus pantograph height range of approximately 13 to 20 feet. A pantograph is the device that transfers power to the trolley by maintaining electrical contact with the contact wire above the streetcar. One streetcar line in Portland, Oregon goes under a building on the Portland State University campus, see Figure 2.10.2.

Figure 2.10.2: Streetcar that passes under a building on the Portland State University campus.

Infrastructure needs for futuristic transportation systems, such as the Personal Rapid Transit system, are undefined at this point. Depending upon the infrastructure size and structural requirements, such a system may need to go over, under or around pre-existing structures such as bridges and buildings.

C. Mitigation Measures

Since these projects will have no known adverse impact on the potential to create the Ithaca Street Railway (trolley) on University Avenue or East Avenue, no mitigation measures are necessary.

D. Unavoidable Impacts

There are no anticipated unavoidable impacts to potential future transportation systems.

2.11 Lighting Impacts

This section summarizes the existing lighting conditions on the Milstein Hall and CAPG project sites. Tillotson Design Associates conducted shading and night lighting studies which examined lighting impacts during the day and night. Section 2.11.1 examines daytime lighting impacts to the Foundry and areas covered by the second floor of Milstein Hall. Section 2.11.2 examines nighttime lighting impacts, including photometrics and visual simulations. Each section provides a discussion of the potential lighting impacts, mitigation measures, and identifies unavoidable impacts of the proposed projects.

2.11.1 Daytime Lighting Impacts

The shading impact of Milstein Hall on the Foundry interior was studied by lighting engineers, Tillotson Design Associates, using a light modeling computer application (see Appendix F: Shade Study). Existing daylighting within the Foundry was measured and renderings were calculated for the existing and proposed conditions during summer solstice (June 21st) and equinox (September 21st) at 9:00 AM, noon, 3:00 PM and 6:00 PM. Light measurements and renderings for existing and proposed conditions were calculated for the winter solstice (December 21st) at 9:00 AM, noon and 3:00 PM (the sun sets in Ithaca at 4:32 PM).

Introduction

Three factors impact daylight contribution: direct sunlight, diffuse skylight and light reflected from the ground. Direct sunlight is defined as the part of the solar radiation (sunlight) that reaches the earth's surface after reduction and dispersion by the atmosphere. Diffuse sunlight is defined as the sunlight that reaches the surface of the earth as a result of being scattered by air molecules, aerosol particles, cloud particles or other particles. The total lumens from direct sunlight and diffuse sunlight can vary significantly depending on the solar azimuth, solar elevation and atmospheric conditions but account for most of the daylight contribution. Light reflected from the ground typically accounts for 10 to 15 percent of the total daylight reaching a window. If snow is covering the ground, the amount of daylight reaching the window from reflected light will increase.

2.11.1.1 Shading Impacts to Daylighting within the Foundry

A. Existing Conditions

The Foundry building is part of the College of AAP. It is currently used as a classroom and studio for sculpture classes. During the spring and fall semesters, two courses, Introduction to Sculpture and Advanced Sculpture, utilize this building. Two sections of each course are offered, one that meets Mondays and Wednesdays, and another that meets on Tuesdays and Thursdays. The introductory sculpture class meets from 8:00 to 11:00 in the morning, and the advanced sculpture class meets from 1:45 to 4:25 in the afternoon. While students may utilize the studio space to work independently on projects in the evenings and on Fridays, no classes are scheduled after 4:25 PM or on Fridays. In the summer, no classes are scheduled in the Foundry.

Evenly spaced windows occur along all four facades of the Foundry. The building interior is organized with large, open studio spaces for students in the east half of the building, with smaller rooms and hallways in the west half. Please refer to Figure 2.11.1 for the Foundry floor plan that illustrates the interior building uses and the locations of the windows, interior and exterior walls of the building.

Currently the south facade of the Foundry receives full sun most of the year and the east and west facades receive full sun in the morning and evening respectively. November through January, Rand Hall and Sibley Hall cast shadows on the Foundry.

Discomfort and disability glare is a serious concern in art studio spaces and is caused by the contrast between a task and direct sunlight through windows. When the eye is focused on a particular task it establishes a level of adaptation to the light. As the eye shifts from one luminance to another (model or drawing to window), it must adapt to the new level.

Too much of a difference between the two levels requires a period of time for the eye to adjust which slows visual performance and, if the difference is great, causes discomfort and fatigue. For good visual performance and comfort, the brightness of any source in the field of view should not exceed a contrast ratio of 5 to 1. During the site visit on February 21, 2008, the brightness of the window was measured at 1,411 footlamberts while brightness of the task plane was 42 footlamberts; a contrast of 34 to 1.

In the morning during the summer months and peaking on June 21st, the south and east facades of the Foundry receive full sun exposure. Much of the morning light is captured in the east room of the building. At noon, the interior light levels at the south side of the building increase as the sun moves perpendicular to the south building face. The light levels in the open studio do not change as the afternoon progresses but the light levels in the east rooms decrease while the west rooms' light levels increase as the sun move west.

During the equinox, when the sun is lower in the southern hemisphere than during the summer solstice, direct sunlight penetrates deeper into the Foundry. In the morning, direct sunlight reaches the south quarter of the open studio. By noon, direct sunlight reaches many areas at the south side of the building. The zones of direct sunlight move from a northwest orientation to a northeast orientation as the sun moves into the western hemisphere later in the afternoon. At 6:00 PM, the west room has high light levels due to direct sunlight penetration, while the east end of the building does not receive direct sunlight.

On winter mornings (9:00 AM on December 21st), the east half of the southern Foundry facade is in the shade of Rand Hall. The southwest rooms of the Foundry are in direct sunlight and the very low solar elevation at this time of year allows very intense direct sunlight through the windows. The south facade of the Foundry receives even more intense direct sunlight at noon. The sun, only 24 degrees above the horizon and almost perpendicular to the south face, reaches more than halfway into the Foundry interior at this time. By 3:00 PM, the Sibley rotunda and dome are shading the center two thirds of the south facade.

B. Impacts to Daylight

Milstein Hall will block direct sunlight to the Foundry. The amount of shade cast by the proposed building varies with the season and time of day. Milstein Hall will impact the daylight reaching the Foundry interior the least during the summer months when direct sunlight will reach the south, east and west facades. During the equinox and winter solstice, when the sun is lower in the southern hemisphere, Milstein Hall will cast a shadow on the Foundry during more of the day. See Figures 2.11.2 - 2.11.4 for plan views of existing and proposed shadow conditions by season and time of day.

The new Milstein Hall will shade the Foundry the least during the summer months. At no point during the summer does Milstein Hall cast a shadow directly onto the Foundry.

On the morning of the equinox, the new Milstein Hall will block direct sunlight to the east third of the Foundry. At noon, Milstein Hall will block all direct sunlight at the south facade. The impact of Milstein Hall on the east room is minimal as Milstein Hall does not yet cast a shadow on this portion of the building. At 3:00 PM, the light levels in the open studio are similar to the noon conditions. By 6:00

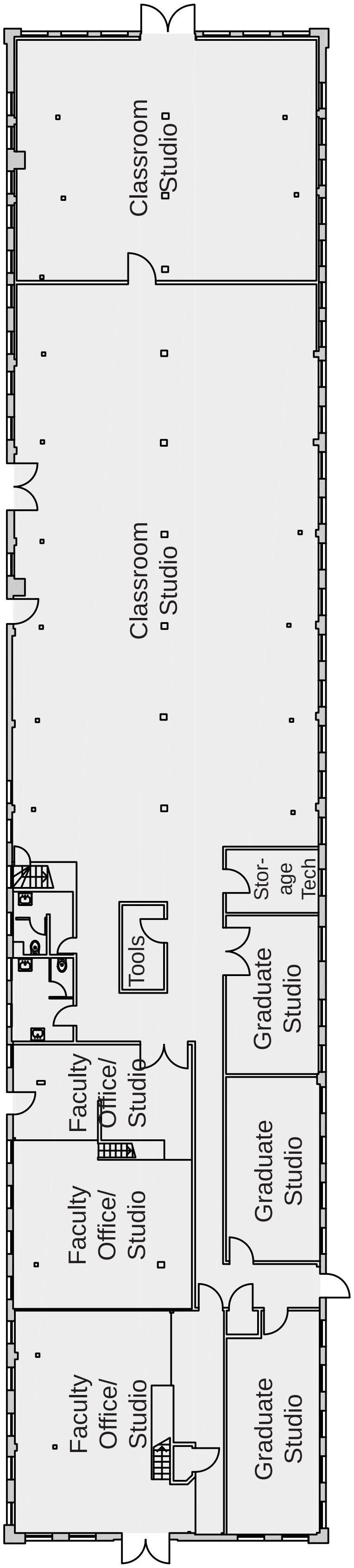

Figure 2.11.1: Foundry floor plan.

PM, the shadow of the new Milstein Hall has moved off the western half of the Foundry.

In the winter, Rand Hall casts a shadow over the east part of the Foundry so the impact from the new Milstein Hall is less at 9:00 in the winter than during the fall. At noon, the new Milstein Hall will block direct sunlight from the interior of the Foundry. Although the Sibley rotunda and dome currently shade two-thirds of the central part of the south facade at 3:00 PM, Milstein Hall will shade the entire facade. Only in the west room, where direct sunlight is not blocked, do the light levels remain unaffected.

Although Milstein Hall will impact interior daylight levels within the Foundry most during the winter, it will also provide the most relief from intense glare. The low angle of the sun in the winter currently positions the sun in the direct field of view of occupants facing south and causes harsh disability and discomfort glare.

Although daylight levels are reduced within the Foundry by the new Milstein Hall, the daylight levels during most of the day and throughout the year will remain appropriate (and in many cases are more appropriate) for an art studio. The Illuminating Engineering Society of North America (IESNA) recommend a range of 30 to 50 footcandles in art studios for tasks ranging from drawing to sculpting. On overcast days when light levels are further reduced, the existing electric lighting will supplement the daylight levels with an additional 35 footcandles.

C. Mitigation Measures

The new Milstein Hall will reduce the daylight levels within the Foundry. Although actual light level reductions vary in each room by time of day and month of the year, there is always some impact to daylight levels in the east room, open studio and south west rooms. A positive impact of the new Milstein Hall will be the reduction of disability and discomfort glare to the occupants of the Foundry as a result of direct sunlight through the windows. The Foundry, even after the construction of Milstein Hall, will be adequately lit for the tasks performed within it. Electric light provides consistent lighting for occupants working in the space day and night.

Improvements to the existing lighting, though not required, would improve light uniformity and increase the visual comfort for occupants of the space. Replacing the existing T12 fluorescent wraparound fixtures with T8 or T5 indirect or semi-indirect fixtures will illuminate the ceiling and reduce the contrast between the interior surfaces and the windows providing better visual comfort for the occupant. Indirect lighting also increases the light level uniformity ratio while virtually eliminating shadows, providing appropriate art studio lighting.

Supplemental daylight could be gained by opening the Foundry ceiling to the clerestory windows. The clerestory will increase the perceived brightness of the interior and emphasize the height and openness of the open studio space. Any new clerestory glazing should provide as much light transmission as possible. Diffuse glass should be studied as an alternate to the clear glazing as it may improve light levels and uniformity.

D. Unavoidable Impacts

An unavoidable impact is that there will be a loss of direct sun and glare to the Foundry interior at certain times of day and certain times of the year.

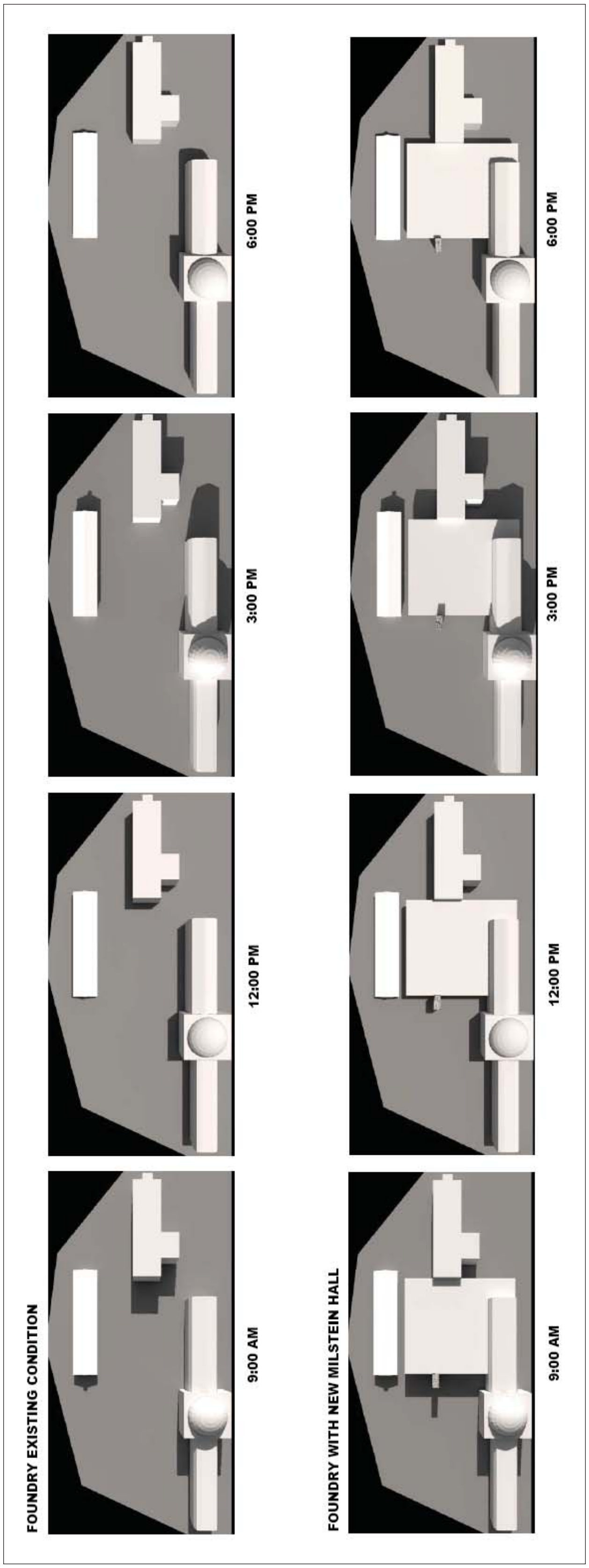

Figure 2.11.2: Plan views of shadows during summer solstice.

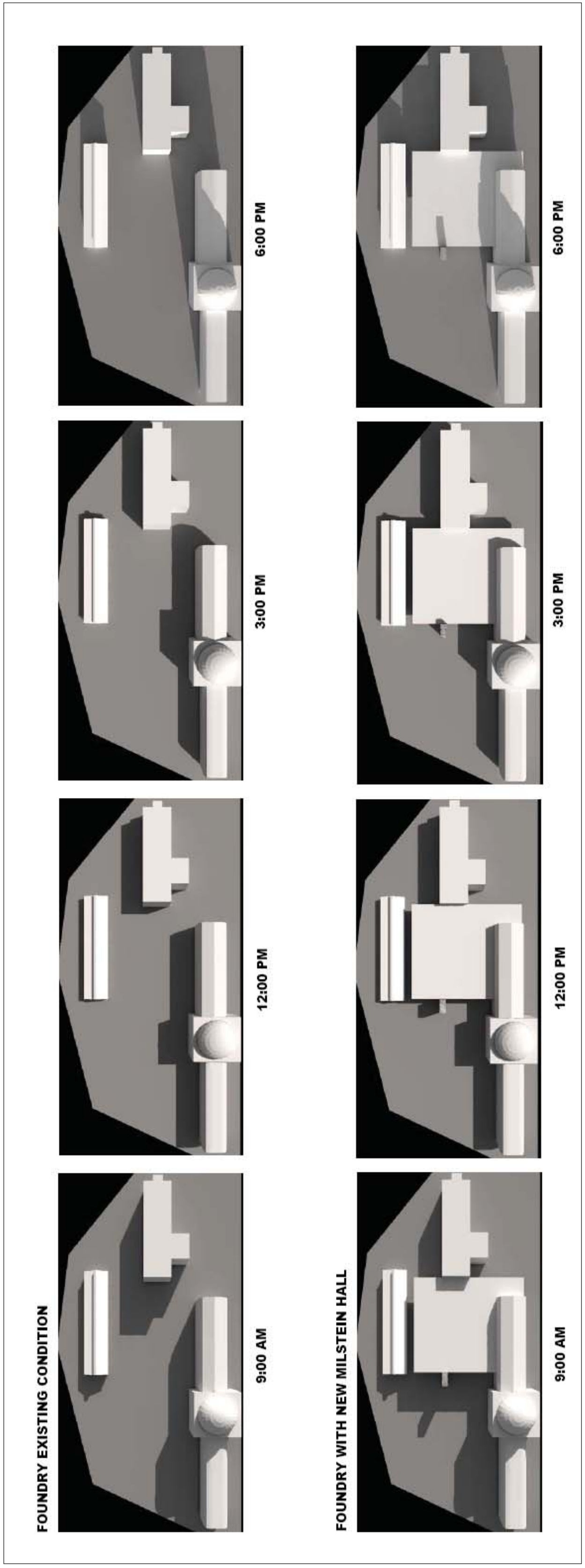

Figure 2.11.3: Plan views of shadows during the equinox.

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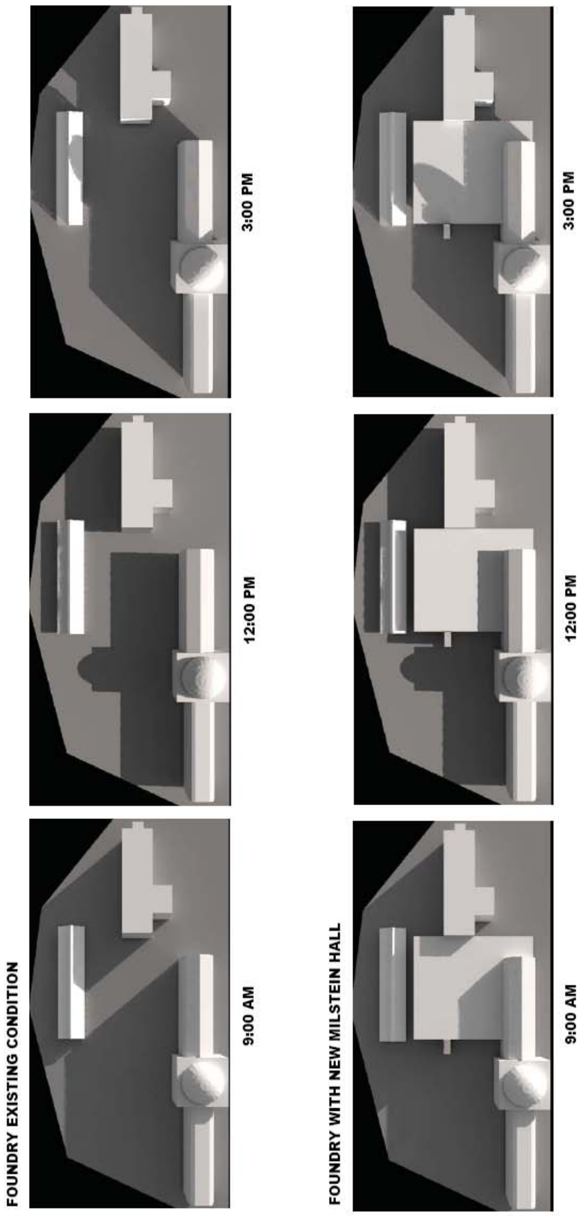

Figure 2.11.4: Plan views of shadows during winter solstice.

2.11.1.2 Impacts on Outdoor Areas Covered by the Second Floor of Milstein Hall

The shading impact of Milstein Hall on the outdoor areas to be covered by the new second floor was studied by lighting engineers, Tillotson Design Associates, using a light modeling computer application. Light measurements and renderings were calculated for the Summer Solstice (June 21st) and Equinox (September 21st) at 9 AM, noon, 3 PM and 6 PM. Existing light measurements and renderings were calculated for the Winter Solstice (December 21st) at 9 AM, noon and 3 PM (the sun sets in Ithaca at 4:32 PM on December 21st).

For the purposes of this section, the open space to the south of the Foundry, the northeast side of Sibley Hall and the west side of Rand Hall will be referred to as the Milstein site. This area is currently occupied by University Avenue, a surface parking lot, and several sidewalks.

Three factors impact daylight contribution: direct sunlight, diffuse skylight and light reflected from the ground. Direct sunlight is defined as the part of the solar radiation (sunlight) that reaches the earth's surface after reduction and dispersion by the atmosphere. Diffuse sunlight is defined as the sunlight that reaches the surface of the earth as a result of being scattered by air molecules, aerosol particles, cloud particles or other particles. The total lumens from direct sunlight and diffuse sunlight can vary significantly depending on the solar azimuth, solar elevation and atmospheric conditions but account for the most of the daylight contribution. Light reflected from the ground typically accounts for 10 to 15 percent of the total daylight reaching a window. If snow is covering the ground, the amount of daylight reaching the window from reflected light will increase.

A. Existing Conditions

Throughout the year, portions of the Milstein Hall site are already shaded by Sibley and Rand halls.

On June 21st, the Milstein Hall site receives very little shading from Sibley Hall except in a narrow zone around the north and east perimeter. At 9:00 AM, Rand Hall casts a shadow to the east edge of the surface parking but otherwise the site is in direct sunlight throughout the day.

At the September 21st equinox, the shadow from Sibley Hall and Rand Hall projects further north due to the lower sun elevation. Throughout most of the day, the shadow from Sibley Hall reaches the southern edge of the surface parking. Rand Hall casts a shadow over small sections of University Avenue with the shadow traveling from north west of the building at 9:00 AM to north east at 6:00 PM.

On December 21st Sibley Hall and Rand Hall cast shadows over much of the Milstein Hall site for most of the day due to the low sun angles. Only a small area between Sibley Hall and Rand Hall and a narrow zone at the southern facade of the Foundry receive direct sunlight at 9:00 AM and noon.

B. Impacts to Daylight

The new Milstein Hall will shade the area beneath it. In the morning at all times of year, direct sunlight will illuminate 30 feet at the southeast and northeast corners nearest the perimeter of the covered plaza. Light levels in this zone are only slightly lower than the light levels of the existing condition due to a loss of diffuse sunlight. At noon during all times of year, all direct sunlight is blocked from entering the covered plaza by the east wing and rotunda of Sibley Hall. By 3:00 PM during the summer solstice and equinox, direct sunlight once again enters the covered plaza at the west perimeter with light levels similar to those of the existing condition. At 3:00 PM during the winter solstice, the solar elevation is only 13 degrees above the horizon and, as in the existing condition, all direct sunlight is blocked by Sibley Hall. During the summer solstice and equinox, the distance of direct sunlight penetration increases at 6:00 PM when the sun elevation is lower in the western sky. See Figures 2.11.5 - 2.11.7 for plan views of existing and proposed shadow conditions by season and time of day.

Although Milstein Hall shades the area it covers from direct sunlight, the high ceiling will allow diffuse sunlight and interreflected light to travel deep into the outdoor space. Light levels decrease steadily from the perimeter to the dome at the center of the Milstein Hall. Perimeter areas not in direct sunlight average between 100-200 footcandles of daylight throughout the year and daylight levels nearer the dome average between 30-60 footcandles.

The Milstein site is already in shadow from Sibley and Rand halls at certain times of year. The addition of lighting will increase the amount of light for certain parts of the site. During the winter, a formerly cold and shadowy area will be lit by the cantilever downlights and other site features (fiber-optic seating mounds). During the summer, users of the site will be protected from the harsh rays of the sun under the shade of the cantilever.

Along University Avenue, the cantilever downlights will provide a lit environment 24 hours a day, ensuring safe lighting conditions for drivers and pedestrian users of this portion of the site.

C. Mitigation Measures

The shading impact of the new Milstein Hall is of most concern at University Avenue. The high contrast ratio between the roadway to be covered by Milstein and the roadway in direct sunlight means that driver's eyes may have difficulty adapting to the lower light levels at the east and west vehicular entry, making it more difficult to see obstacles. Although supplemental lighting is not necessary as obstacles are visible from their silhouette against the exit portal, electric lighting is provided by downlights over the roadway to supplement the daylight by 12-15 footcandles and improve pedestrian and vehicular visibility. Although the lighting is completely adequate, a textural change or speed bumps in the pavement could be added to alert drivers to the pedestrian crosswalks and ensure slower speeds at this section of roadway.

A positive impact of the location of Milstein Hall over University Avenue is the shading from intense glare caused by direct sunlight in the field of view when traveling east in the morning and west in the afternoon and evening. Glare from the sun at low solar elevations can blind drivers, rendering them unable to see obstacles. The new Milstein Hall will screen this glare and increase the safety of drivers as well as pedestrians in cross walks near to and under Milstein.

D. Unavoidable Impacts

It is an unavoidable impact that Milstein Hall will shade much of the direct sunlight to the plaza. Nonetheless, diffuse and interreflected sunlight will penetrate deep into the covered space. Electric lighting will provide additional light in the covered plaza, creating a unique environment where occupants are sheltered from the elements.

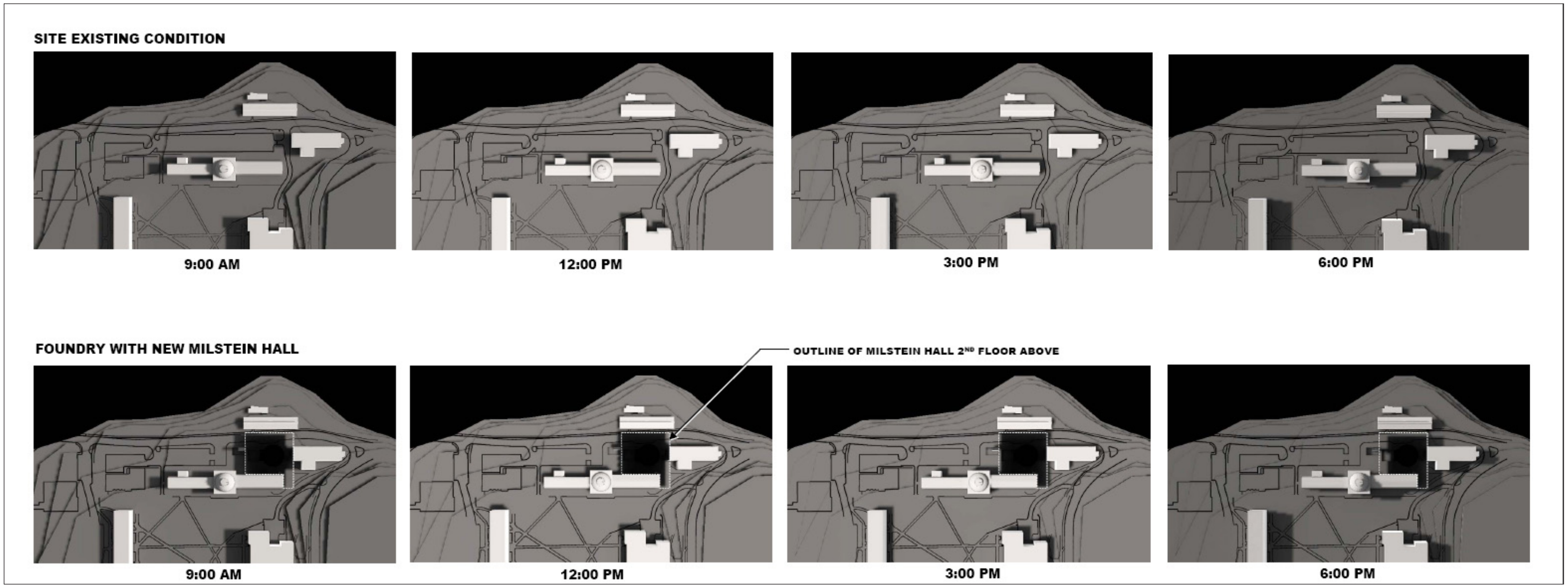

Figure 2.11.5: Site rendering of shading during summer solstice.

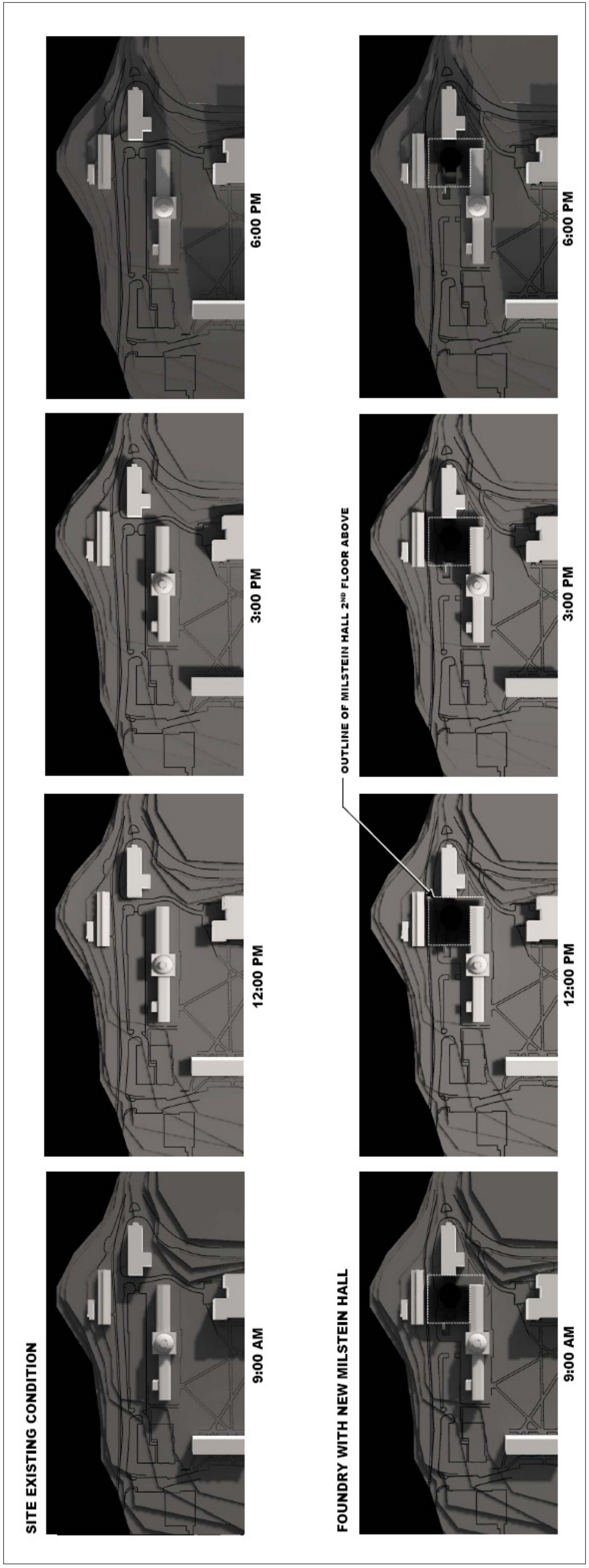

Figure 2.11.6: Site rendering of shading during the equinox.

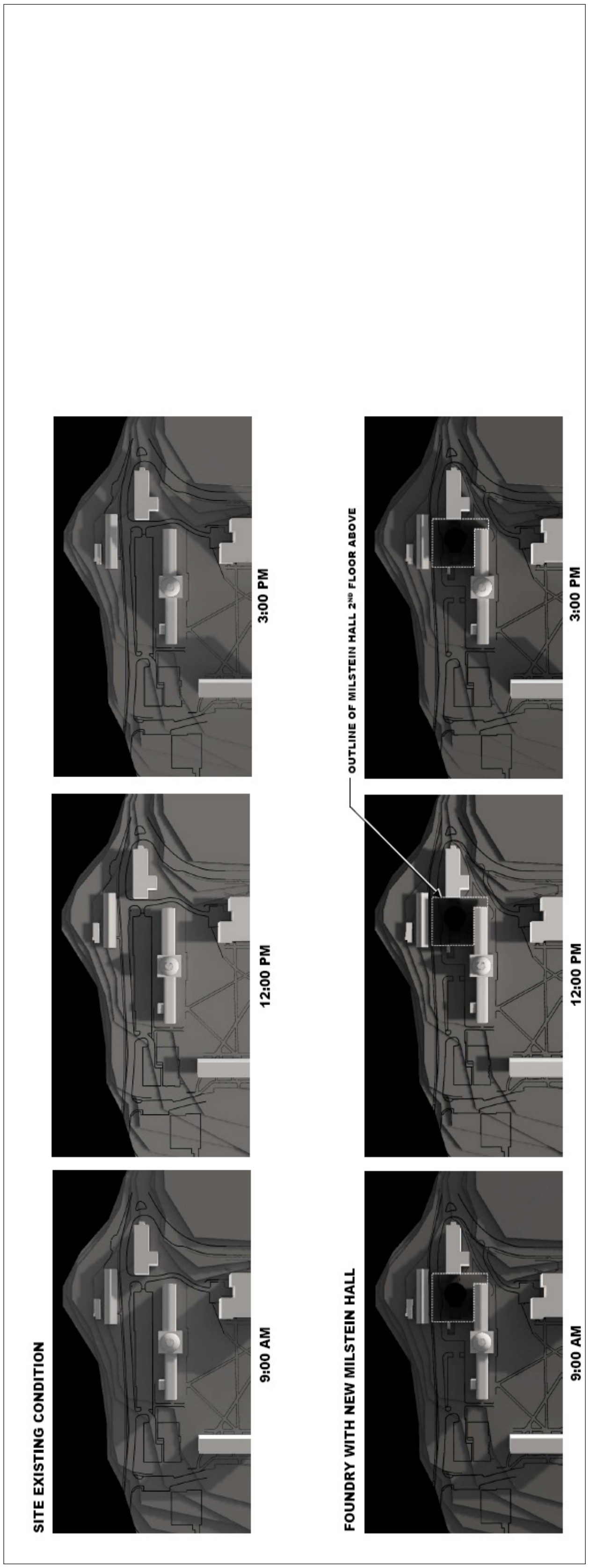

Figure 2.11.7: Site rendering of shading during winter solstice.

2.11.2 Nighttime Lighting Impacts

This section summarizes the existing nighttime lighting conditions on the Milstein Hall and CAPG project sites. Lighting engineers Tillotson Design Associates conducted a nighttime lighting study (see Appendix G). A discussion of the potential nighttime lighting impacts, mitigation measures, and unavoidable impacts of the proposed projects is included.

The existing nighttime condition report was recorded during the February 21, 2008 site visit by Tillotson Design. Sky conditions were clear with a full moon. All light-level readings were recorded 36" above the ground or floor. Small areas of the ground were covered with snow, but most of the ground was bare and dry. Light levels and luminance values were studied with a light modeling computer application. Light fixture locations and types were based on the 50% Construction Document lighting design for Milstein Hall and schematic design documents for CAPG.

A. Existing Conditions

The existing site is illuminated with seven different types of exterior fixtures that create unnecessary spill light and glare. Light fixtures in the area include the standard Cornell street box fixture, standard Cornell pedestrian Gothic fixture, building mounted lights/wall packs, building mounted flood lights, pathway lighting, bridge lighting and cobra head fixtures.

The standard Cornell University street box fixture used at University Avenue is a 400-watt, metal halide fixture head mounted on a 30 foot pole. See Figure 2.11.8. These full-cutoff fixtures are spaced on the south side of University Avenue with two heads mounted on each pole in a 180° orientation. The fixture spacing ranges from 110 to 130 feet on center. Light levels at the south curb of the roadway range from 6.25 to 6.5 footcandles directly beneath the fixtures and 0.25 footcandles between fixtures. Light levels at the north curb range from 1.5 to 2 footcandles directly across the road from the fixtures and 0.15 to 0.25 between fixtures. The tall mounting height of the fixture and high wattage of the lamp add unnecessary spill light to the gorge and cause the fixtures to be glary from the north side of the gorge.

Cornell University's standard pedestrian pole is a 100-watt, Gothic-styled fixture, mounted on a 12-15 foot pole. See Figure 2.11.9. These are cutoff fixtures. Pedestrian scale fixtures are located in the vicinity of Milstein Hall site at the parking lot north of Lincoln Hall and the pathway to East Avenue east of Sibley Hall.

Facade mounted 100-watt metal halide wall packs are located near most of the doors of Sibley Hall. See Figure 2.11.10. These fixtures illuminate the area near the doors but have no shielding and cause objectionable glare. Fixtures mounted to the roof of Sibley Hall and all of the other buildings surrounding the Arts Quad light the Quad and provide between 0.5 and 0.25 footcandles. See Figure 2.11.11. These fixtures are also unshielded and are extremely glary.

There are no exterior lights on the south facade of the Foundry fronting University Avenue. Light near the south entry door is provided by the street lights on the south side of University Avenue (see Figure 2.11.8). Wall packs with 100- and 175-watt metal halide lamps are mounted on the east and north facades of the Foundry to illuminate the parking area and alley (see Figure 2.11.10). The wall pack mounted to the east facade is visible from Fall Creek Drive and contributes spill light to the gorge in its immediate vicinity. The wall packs mounted on the north facade are not visible from Fall Creek Drive and do not contribute light to the gorge because the kiln shed north of the Foundry blocks the view and light.

The pathway from University Avenue to the pedestrian suspension bridge is illuminated with metal halide flood lights mounted on poles between 10 and 20 feet in height. See Figure 2.11.12. Light levels on the pathway range from 1 – 2 footcandles. The flood lights at the path are unshielded and aimed into the gorge causing excessive light trespass into the gorge and glare from Fall Creek Drive.

The pedestrian bridge and suspension towers are illuminated with 400-watt flood lights mounted to the towers. See Figure 2.11.13. Light levels average 7.4 footcandles near the south side of the bridge and 0.05 footcandles at the center of the bridge. The high aiming angle and excessive wattage of the fixtures lighting the walkway make them very glary to pedestrians on the bridge and from Fall Creek Drive.

Cobra head streetlights are located at varying spacing along the south side of Fall Creek Drive. See Figure 2.11.14. The fixtures are unshielded and extremely glary from the nearby residences. In addition, their spacing creates disparate light levels on the roadway; as high as 1.2 footcandles near the fixtures and as low as zero footcandles between fixtures.

The surface brightness of the ground measured within the gorge ranges from zero to 0.3 footlamberts (a footlambert is a measure of brightness equal to the amount of luminous intensity reflected from any given surface). This is caused by light pollution from fixtures on the pedestrian path, suspension bridge and, to a lesser extent, the buildings and roadway lights outside of the gorge. Interior light from the windows and the wall mounted fixture on the hydroelectric plant at the bottom of the gorge also contribute light. A barely perceptible amount of light is contributed by moonlight, but these levels were below the minimum range of the light meter used for the site survey.

B. Impacts to Nighttime Lighting

Milstein Hall will minimally increase light levels to the immediately adjacent site, but will not increase light levels beyond 250 feet from the building. Fall Creek Gorge will not be impacted. This section evaluates light trespass for the winter condition when there are no leaves on the trees. The conditions will improve during the summer, when there are more leaves on the trees to block light from Milstein Hall.

The new Milstein Hall has two ceiling planes that will contribute light to the surrounding site. The outdoor area covered by the second floor of Milstein is illuminated with recessed 50 watt downlights mounted in the ceiling, spaced eight feet on center. These downlights provide average light levels of 13 footcandles on the ground plane with light levels near the perimeter of the covered plaza decreasing to eight footcandles on average. The controlled optics of the lamp will contain all of the direct light within the footprint of the building. Only light reflected from the ground and ceiling contribute low levels of illumination to the adjacent site. The downlight reflector blocks the view of the lamp beyond 45° from vertical so that the lamps are not visible beyond 11 feet from the downlights. The light levels create a pleasant exterior environment that will draw people into the covered plaza and allow it to be used for many activities from studying to casual lectures and gatherings. The downlights continue over the roadway to unify the covered plaza and increase pedestrian safety at the crosswalks.

The interior second floor studio is illuminated with a staggered grid of custom fluorescent pendants. The light from these fixtures is evenly distributed with full candela cutoff at 68° from vertical. A small amount of light from these fixtures exits through the curtain wall providing low levels of illumination to the surrounding site. These lights are controlled by a dimming system and astronomical time clock. When the second level studio space is unoccupied, the lights will be dimmed to 10% output, further reducing the light trespass (see Figure 2.11.16).

Spill light from the ground and second floor lighting increase light levels by an average of one to four footcandles in a 50 foot zone nearest the perimeter of the new Milstein Hall (see Figure 2.11.15). The spill light provides the ambient light at the pedestrian pathways near the building and service plaza. Light levels 50 to 80 feet from the perimeter of the building will increase an average of 0.5 - 1 foot-

Figure 2.11.8: Standard Cornell University street box fixture.

Figure 2.11.9: Standard Cornell University pedestrian pole fixture.

Figure 2.11.10: Building mounted light fixture/wall pack.

Figure 2.11.11: Building mounted flood light.

Figure 2.11.12: Pedestrian pathway floodlight.

Figure 2.11.13: Suspension bridge flood lights.

Figure 2.11.14: Cobra head street lights.

candle. Light levels 80 to 250 feet beyond the building perimeter increase an average of 0.1 - 0.5 footcandles. No additional light will be contributed to the site or gorge beyond 250 feet from Milstein Hall.

The Foundry will block most of the spill light north of Milstein Hall from the gorge. It will also limit the view of Milstein Hall from Fall Creek Drive in an 80° zone northeast of the building. Sibley Hall will block most of the spill light into the Arts Quad. Only 40 feet of the Milstein Hall facade due east of Sibley will be visible from the Arts Quad. Rand Hall and the hill east of Milstein Hall will restrict the spill light to within 125 feet from the east facade.

The new Milstein Hall will most often be viewed from the ground level or from across the gorge making the ceiling planes of the ground and second floor the most visible surfaces. The luminance of the new Milstein Hall ground floor ceiling averages two footlamberts and the second floor ceiling averages 16 footlamberts. Brightness or luminance is the amount of luminous intensity (light) being reflected from any given surface measured as a footlambert. The gray finish of the second floor ceiling reduces the brightness of the surface when compared with the white ceilings of Sibley Hall, Rand Hall and the Foundry. The footlambert levels of the new Milstein Hall ceiling will be similar to those of Sibley and Rand Hall and less than those of Tjaden Hall and the Foundry. The brightness of any object is relative to its brightness compared with other objects in the field of view and the immediate background. The Milstein Hall brightness will be significantly less than that of the existing streetlights, pedestrian poles, wall packs and flood lights also in the field of view. Although the second floor has glazing on the north, east and west facades facing the gorge, the new Milstein Hall will contribute less light trespass and visual brightness than the existing exterior fixtures.

Source	**Footlambert Reading**
Milstein Hall - ground floor ceiling	2
Milstein Hall - second floor ceiling	16
Rand Hall - third floor window	7.33
Sibley Hall - third floor window	9.39
Sibley Hall - second floor window	10.19
Tjaden Hall - second floor window	25.22
The Foundry - ground floor window	35.4
Suspension Bridge - flood light mounted on tower	467
Cornell standard pedestrian pole - Gothic style	685
Cornell standard street light - University Avenue	782
Arts Quad flood light - mounted to Sibley Hall	69,000

Table 2.11.1: Footlambert reading comparisons.

The CAPG project will replace the existing roadway and parking pole lights along University Avenue. The new pole lights will be 20 feet tall, dual head fixtures.

Precision optics will allow the lamp wattage to be reduced from the existing 400 watts to 175 watt metal halide lamps. The 10 foot shorter pole height and low lamp wattage will reduce glare while maintaining the required light levels on the roadway, the surface parking and the sidewalk on the north side of University Avenue. The new fixtures will be significantly less visible and glary from the north side of the gorge and will contribute less spill light than the existing fixture.

C. Mitigation Measures

Site lighting has been designed to minimize spill light outside the building perimeter and limit direct glare from fixtures. Although Milstein Hall will provide additional light levels to the area immediately adjacent to the new building, spill light from the building will not increase light levels in the gorge beyond 250 feet from the building. Nighttime illumination levels at the plaza will provide a safe and pleasant environment without providing unnecessary spill light. There are no further mitigation measures necessary as a result of the Milstein project.

The brightness of the ceiling surfaces visible outside the building will be of similar brightness to Sibley and Rand Hall and will not be offensive. Spill light and views of Milstein Hall will be further reduced in the summer when leaves are on the trees.

As a result of the CAPG project, site lighting conditions along University Avenue will be improved. No further mitigation measures are necessary.

D. Unavoidable Impacts

There are no unavoidable impacts. Site lighting conditions will be improved as a result of the proposed action.

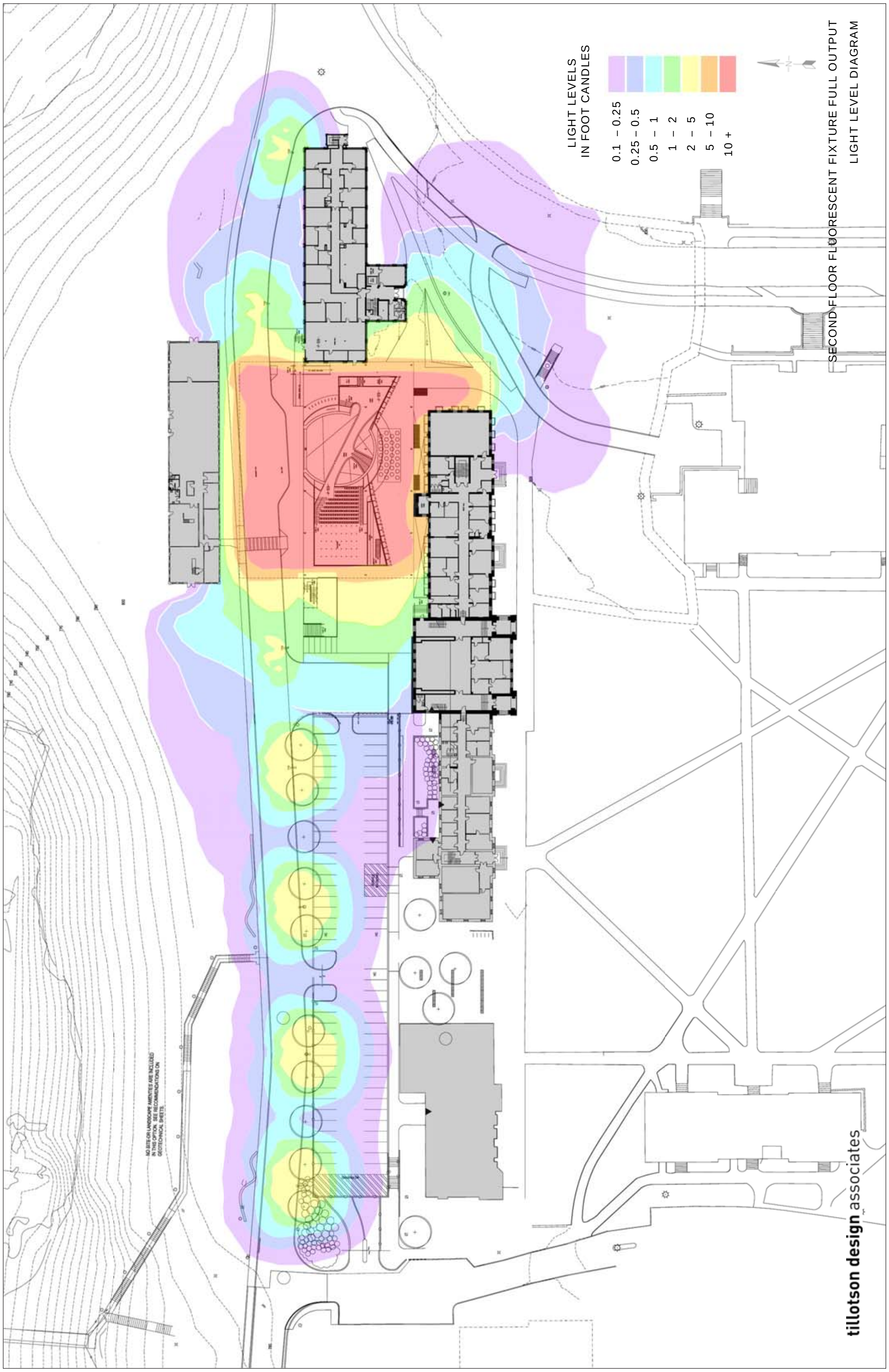

Figure 2.11.15: Second floor fluorescent fixture full output.

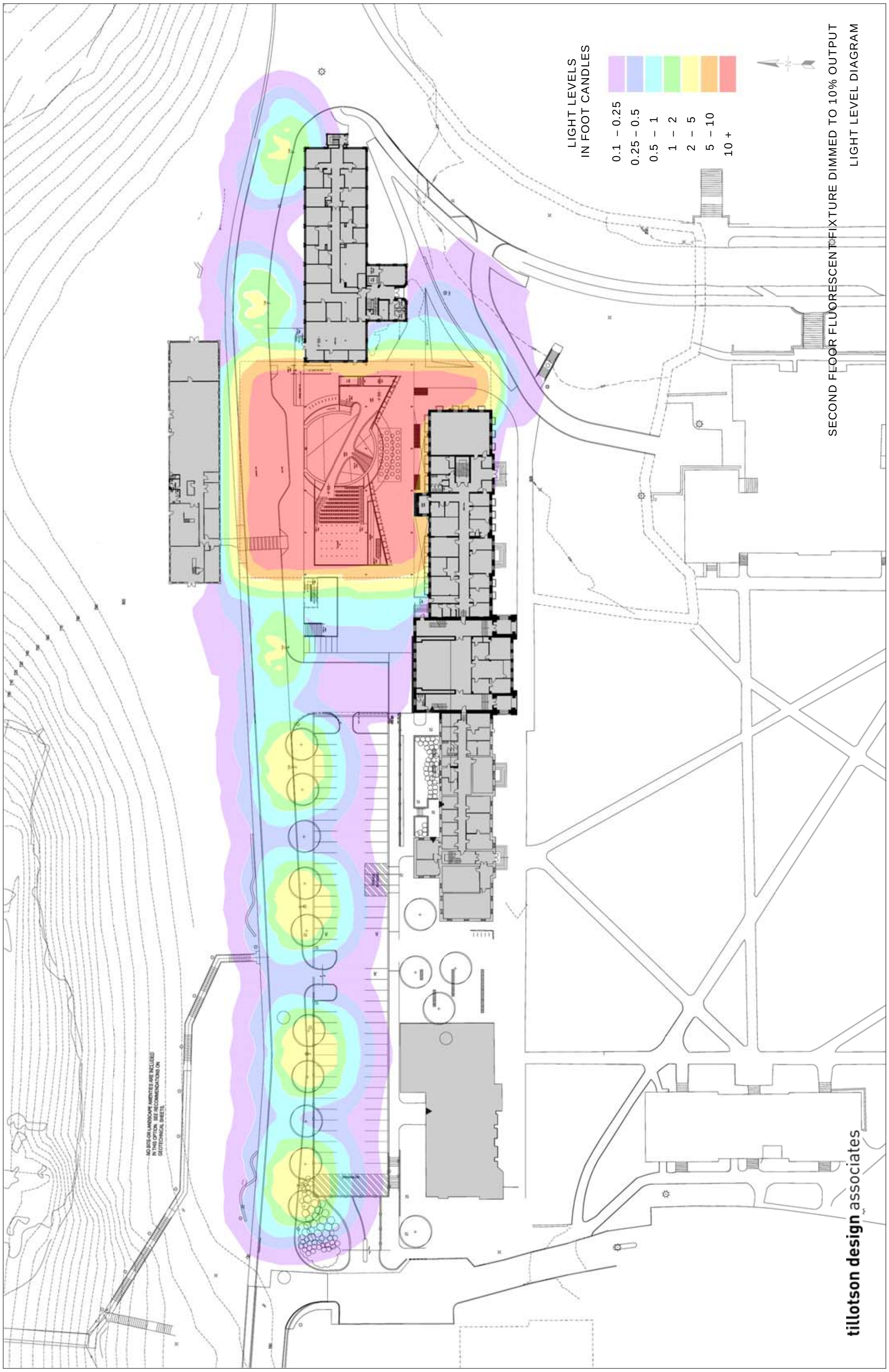

Figure 2.11.16: Second floor fluorescent fixture dimmed to 10% output.

2.11.3 Nighttime Visual Simulations

This section contains descriptions of existing and proposed nighttime views of the project sites from representative viewpoints, as designated in the Scope, in order to examine potential aesthetic impacts caused by nighttime project lighting. In order to simulate the greatest visual impacts, photographs of existing nighttime conditions were taken in spring of 2008, prior to tree leaf bud break. Visual simulations of the proposed conditions were provided by ESKQ and reviewed by lighting engineers, Tillotson Design Associates. Computer modeling utilized actual light levels of the proposed project fixtures to generate as accurate a simulation of the proposed conditions as possible. The human eye has a dynamic range of visual perception far greater than any film or digital camera can capture. For example, if you stood outside for half an hour during a full moon, your eyes would adjust to be able to see a level of detail that is beyond what a camera can produce. The following images simulate night lighting experiences as accurately as possible.

A discussion of the potential nighttime lighting impacts, mitigation measures, and unavoidable impacts of the proposed projects is included for each viewpoint. Please refer to Figure 2.11.17 for locations of the nighttime visual simulations.

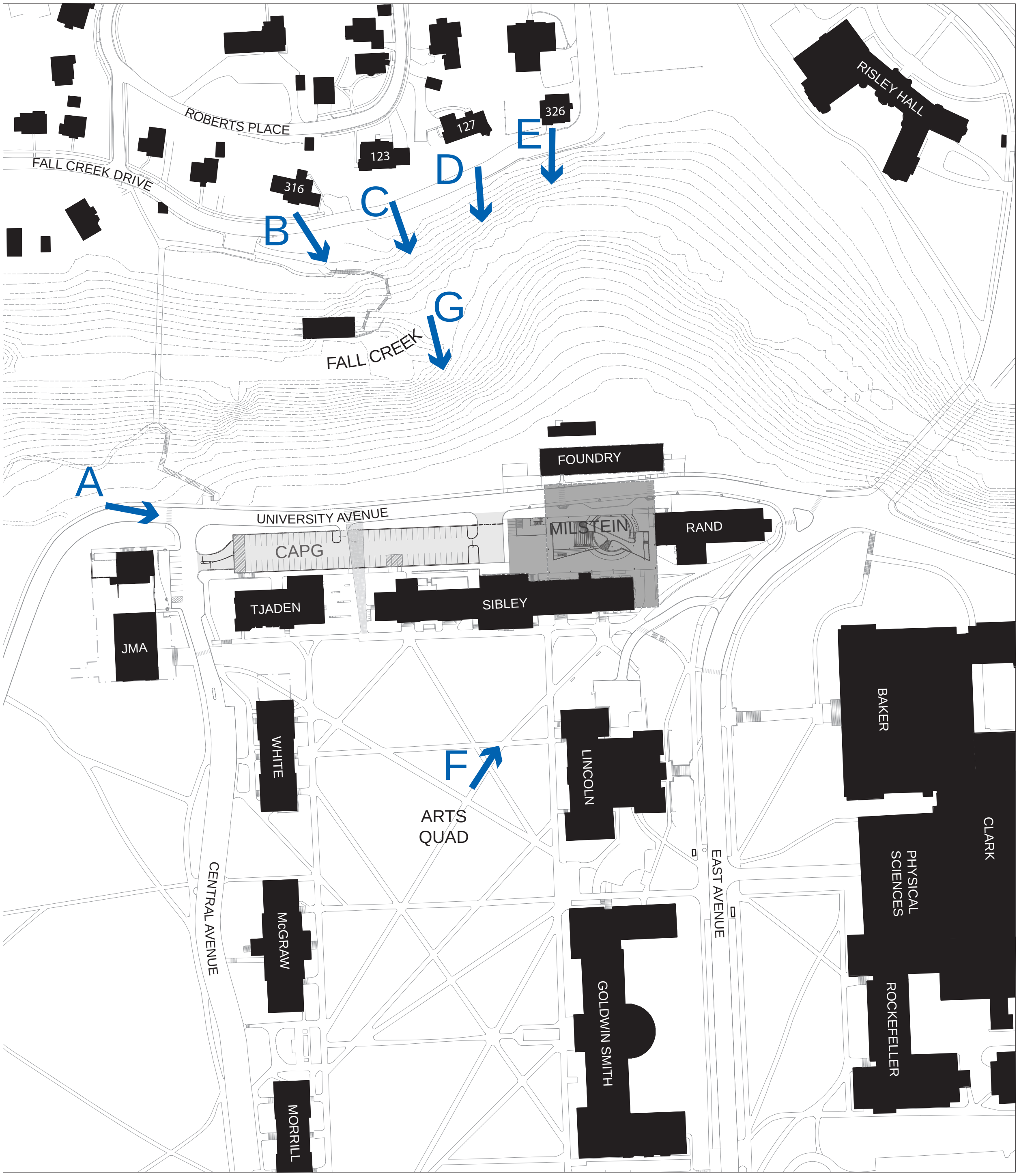

Figure 2.11.17: Nighttime visual simulation locations.

LEGEND

→ Nighttime Visual Simulation Location

⬆ North

A. Project Site

A. Existing Conditions

Existing View

Looking toward the Milstein Hall and CAPG project sites, the interior and exterior lighting along the north and west facades of Tjaden, Sibley and Rand halls is visible. Street lights and their associated glare along University Avenue are also visible.

See Figure 2.11.18 for the existing view.

Proposed View

The proposed nighttime view of the project sites will include additional interior lighting along the west facade of Milstein Hall. Some light from second floor windows along the north side of Sibley Hall and the west side of Rand Hall will be blocked by Milstein Hall. The cantilevered portion of the building over University Avenue will be lit to provide safety and navigational direction to vehicles and pedestrians. Some light will be emitted through the skylights on the second floor of the building.

The existing street lights along University Avenue will be replaced with sharp-cutoff fixtures that will provide lighting for the street and for the surface parking level of the CAPG.

The lighted entrance to the lower levels of the CAPG will be visible.

See Figure 2.11.19 for the proposed view.

B. Summary of Impacts to View

Milstein Hall will increase the nighttime light levels in the area immediately adjacent to the building.

The lighted entrance to the lower levels of the CAPG will be visible.

C. Mitigation Measures

Lighting for both projects has been designed to limit spill and reduce glare.

Exterior lighting from Milstein Hall will be dimmed during the evening hours in order to minimize nighttime lighting impacts. An exterior curtain wall, if closed across the glass facade, will block light emanating from the auditorium space of Milstein Hall.

The CAPG entrance fixtures and associated roadway fixtures will be lower and produce less glare than the existing light poles.

D. Unavoidable Impacts

Additional building light is an unavoidable impact of these projects, as it is essential to provide safe and adequate light levels for users of the project sites. However, streetlight glare and height of light poles will be reduced.

Figure 2.11.18: Existing view looking southeast toward the project sites.

Figure 2.11.19: Proposed view looking southeast toward the project sites.

B. View Looking South from 316 Fall Creek Drive (at Street-Front Property Line)

A. Existing Conditions

Existing View

The immediate nighttime view from the street-front property line of 316 Fall Creek Drive is of the trees and vegetation growing on the north bank of Fall Creek Gorge. A street light along Fall Creek Drive casts an orange-yellow glow on the surrounding vegetation and street signage. Interior and exterior lights along the north facade of Sibley Hall, and from the Foundry are visible in the background across the gorge. Glare from wall pack mounted lights on Sibley and the Foundry is visible across the gorge. These lights will be less visible during the summer months, as vegetation growing along the north and south sides of the gorge will buffer views of the buildings from this vantage point. The glow in the upper left-hand corner of the image is from the moon.

See Figure 2.11.20 for the existing view.

Proposed View

Interior lights along the north and west facades of Milstein Hall will be visible. Exterior lights under the cantilever will be visible.

See Figure 2.11.21 for the proposed view.

B. Summary of Impacts to View

Lighting for Milstein Hall and the CAPG will minimally increase site light levels. Some of this light will be visible from the street-front property line of 316 Fall Creek Drive during the winter months when leaves are off the trees. The impact from nighttime light will be significantly reduced when leaves are on the trees.

C. Mitigation Measures

Lighting for both projects has been designed to limit spill and reduce glare.

Exterior lighting from Milstein Hall will be dimmed during the evening hours in order to minimize nighttime lighting impacts.

D. Unavoidable Impacts

Additional building light is an unavoidable impact of these projects, as it is essential to provide safe and adequate light levels for users of the project sites. It is unavoidable that some of this light will be visible at certain times of year from the street-front property of 316 Fall Creek Drive.

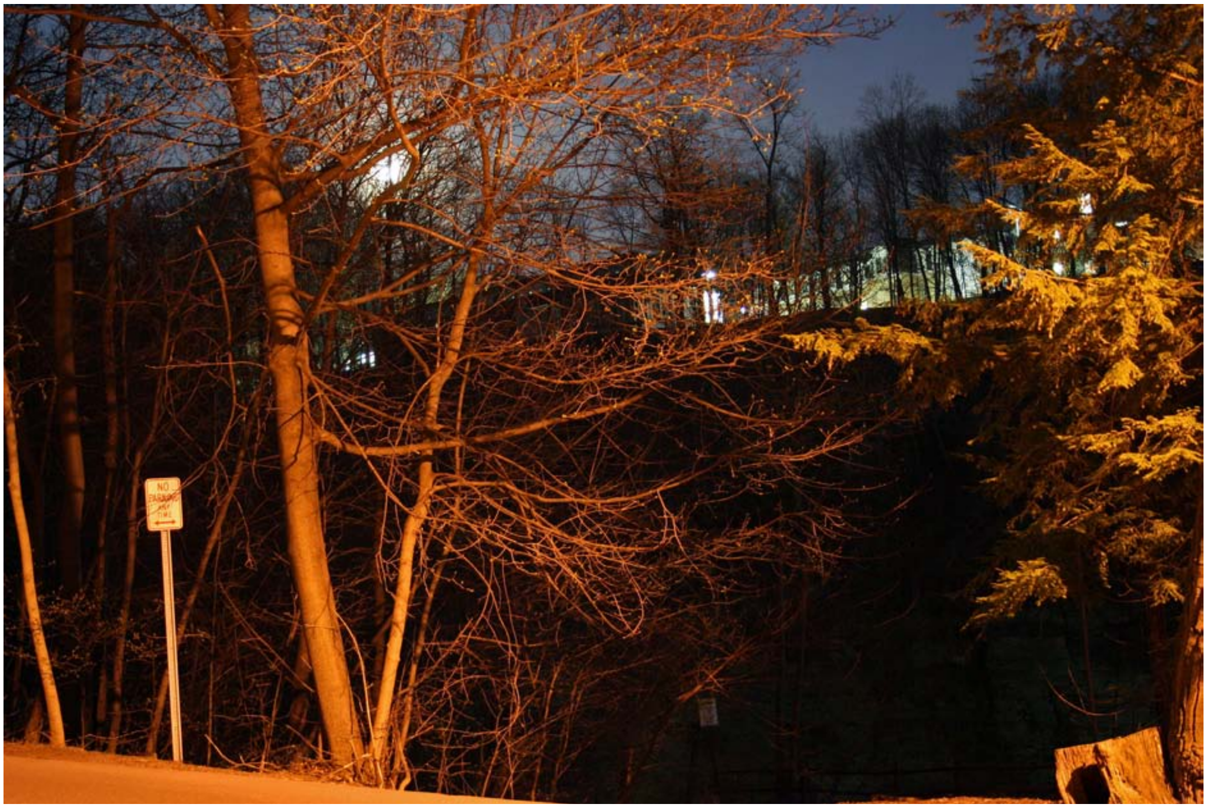

Figure 2.11.20: Existing view looking south from 316 Fall Creek Drive (at street-front property line).

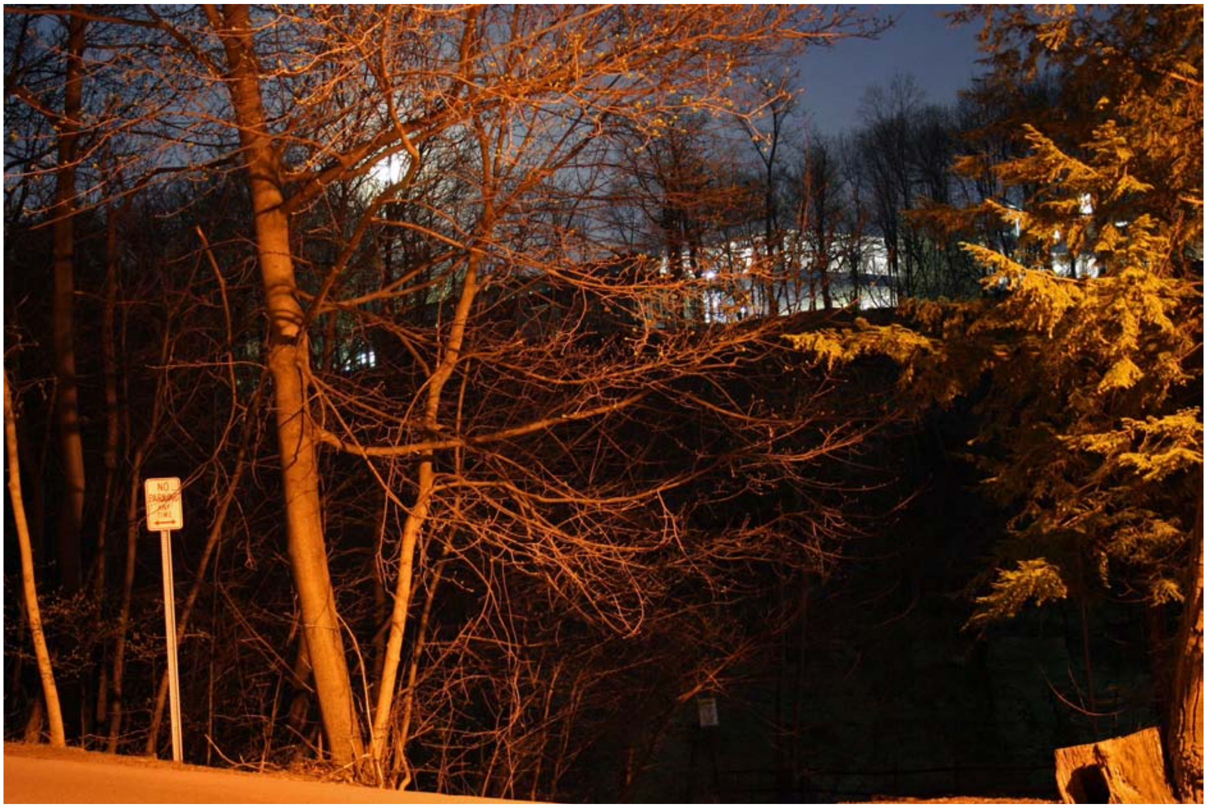

Figure 2.11.21: Proposed view looking south from 316 Fall Creek Drive (at street-front property line).

C. View Looking South from 123 Roberts Place (at Street-Front Property Line)

A. Existing Conditions

Existing View

The immediate nighttime view from the street-front property line of 123 Roberts Place, taken at the street-front property line on Fall Creek Drive, is of the trees and vegetation growing on the north bank of Fall Creek Gorge. A street light along Fall Creek Drive casts an orange-yellow glow on the surrounding vegetation and street signage. Interior and exterior lights along the north facade of Sibley Hall, and along the from the Foundry are visible across the gorge. These lights will be less visible during the summer months, as vegetation growing along the north and south sides of the gorge will buffer views of the buildings from this vantage point.

See Figure 2.11.22 for the existing view.

Proposed View

Interior lights along the north and west facades of Milstein Hall will be visible. Exterior lights under the cantilever will be visible. Exterior light from the stair tower will also be visible.

See Figure 2.11.23 for the proposed view.

B. Summary of Impacts to View

Lighting for Milstein Hall and the CAPG will minimally increase site light levels. Some of this light will be visible from the street-front property line of 123 Roberts Place during the winter months when leaves are off the trees. The impact from night-time light will be significantly reduced when leaves are on the trees.

C. Mitigation Measures

Lighting for both projects has been designed to limit spill and reduce glare.

Exterior lighting from Milstein Hall will be dimmed during the evening hours in order to minimize nighttime impacts.

D. Unavoidable Impacts

Additional building light is an unavoidable impact of these projects, as it is essential to provide safe and adequate light levels for users of the project sites. It is unavoidable that some of this light will be visible at certain times of year from the street-front property of 123 Roberts Place.

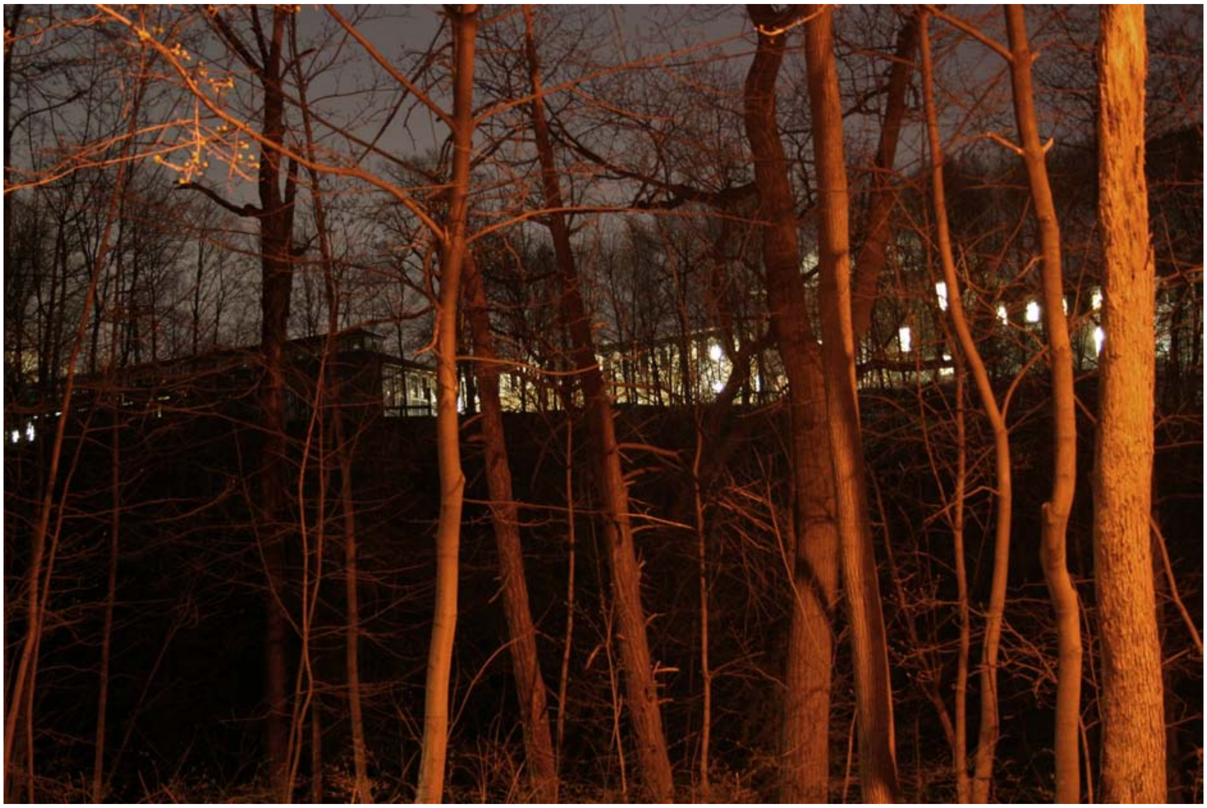

Figure 2.11.22: Existing view looking south from 123 Roberts Place Drive (at street-front property line).

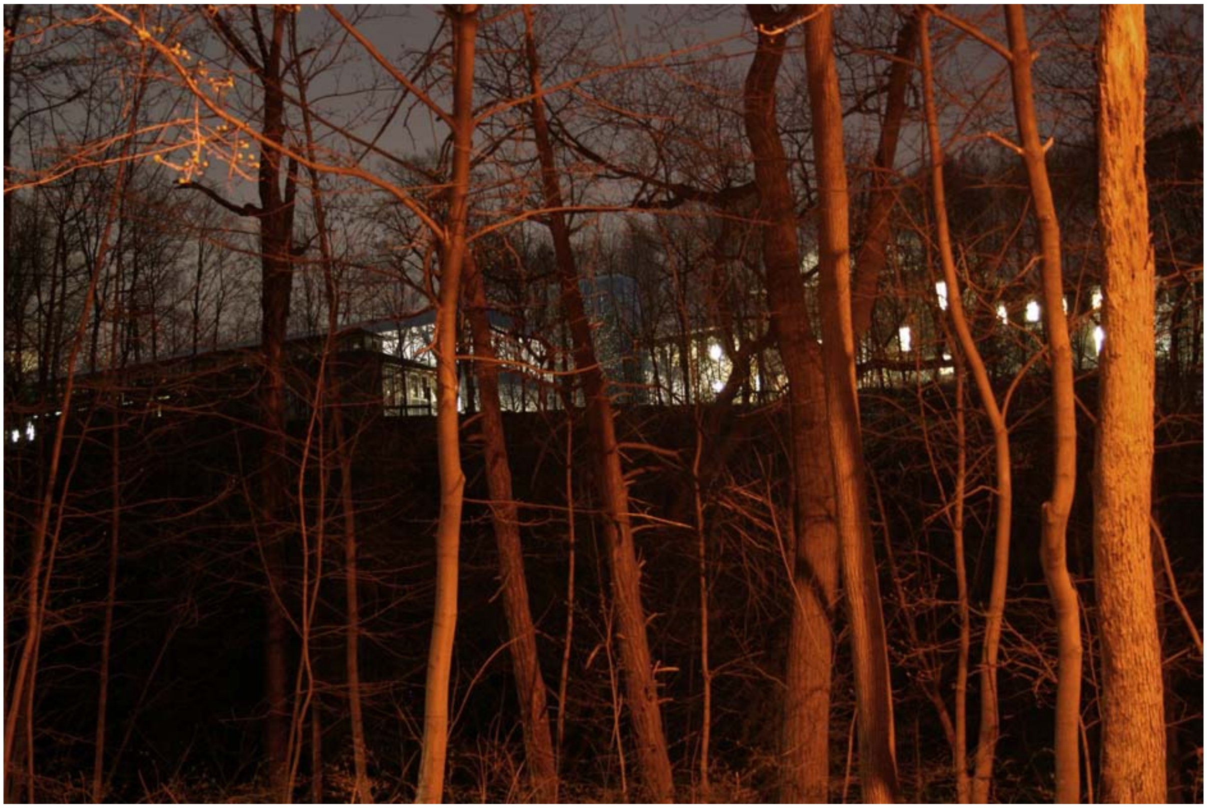

Figure 2.11.23: Proposed view looking south from 123 Roberts Place Drive (at street-front property line).

D. View Looking South from 127 Roberts Place (at Street-Front Property Line)

A. Existing Conditions

Existing View

The immediate nighttime view from the street-front property line of 127 Roberts Place, taken at the street-front property line on Fall Creek Drive, is of the trees and vegetation growing on the north bank of Fall Creek Gorge. Interior and exterior lights along the north facade of Sibley Hall are visible across the gorge. These lights will be less visible during the summer months, as vegetation growing along the north and south sides of the gorge will buffer views of the buildings from this vantage point.

See Figure 2.11.24 for the existing view.

Proposed View

A small amount of interior and exterior light from the west facade of Milstein Hall will be visible. Most of the view of the building is blocked by evergreen trees.

Replacement street lights along University Avenue, in proximity to the CAPG, may be visible. However, they will be lower and produce less glare.

See Figure 2.11.25 for the proposed view.

B. Summary of Impacts to View

Lighting for Milstein Hall and the CAPG will minimally increase site light levels. Some of this light will be visible from the street-front property line of 127 Roberts Place during the winter months when leaves are off the trees. The impact from nighttime light will be significantly reduced when leaves are on the trees.

C. Mitigation Measures

Lighting for both projects has been designed to limit spill and reduce glare.

Exterior lighting from Milstein Hall will be dimmed during the evening hours in order to minimize nighttime lighting impacts.

CAPG entrance fixtures and associated roadway fixtures will be lower and produce less glare than the existing light poles.

D. Unavoidable Impacts

Additional building light is an unavoidable impact of these projects, as it is essential to provide safe and adequate light levels for users of the project sites. It is unavoidable that some of this light will be visible at certain times of year from the street-front property of 127 Roberts Place. Streetlight glare and height of light poles will be reduced.

Figure 2.11.24: Existing view looking south from 127 Roberts Place Drive (at street-front property line).

Figure 2.11.25: Proposed view looking south from 127 Roberts Place Drive (at street-front property line).

E. View Looking South from 326 Fall Creek Drive (at Street-Front Property Line)

A. Existing Conditions

Existing View

The immediate nighttime view from the street-front property line of 326 Fall Creek Drive, is of the trees and vegetation growing on the north bank of Fall Creek Gorge. Interior and exterior lights along the north facade of Sibley Hall, including exterior uplights on the dome, are visible across the gorge. These lights will be less visible during the summer months, as vegetation growing along the north and south sides of the gorge will buffer views of the buildings from this vantage point.

See Figure 2.11.26 for the existing view.

Proposed View

Milstein Hall will not be visible from this location, as existing evergreen vegetation will block it from view.

Replacement street lights along University Avenue, in proximity to the CAPG, may be visible. However, they will be lower and produce less glare.

See Figure 2.11.27 for the proposed view.

B. Summary of Impacts to View

Lighting for the CAPG will minimally increase site light levels. Some of this light will be visible from the street-front property line of 326 Fall Creek Drive during the winter months when leaves are off the trees. The impact from night time light will be significantly reduced when leaves are on the trees.

C. Mitigation Measures

Lighting for both projects has been designed to limit spill and reduce glare.

The CAPG entrance fixtures and associated roadway fixtures will be lower and produce less glare than the existing light poles.

D. Unavoidable Impacts

There are no unavoidable impacts. Streetlight glare and height of light poles will be reduced.

Figure 2.11.26: Existing view looking south from 326 Fall Creek Drive (at street-front property line).

Figure 2.11.27: Proposed view looking south from 326 Fall Creek Drive (at street-front property line).

F. Arts Quad

A. Existing Conditions

Existing View

The immediate nighttime view as seen from the Arts Quad looking northeast, is of the interior and exterior lighting along the south facade of Sibley and Rand halls, and exterior lighting along the west facade of Lincoln Hall. Blue safety lights are also visible. During the summer months when the mature trees on the Arts Quad are in full leaf, the visibility of the interior building lights will be reduced.

See Figure 2.11.28 for the existing view.

Proposed View

Interior light from the south facade of Milstein Hall will be visible from this location. Exterior light from under the south facades cantilever will also be visible.

The CAPG will not be visible from this location.

See Figure 2.11.29 for the proposed view.

B. Summary of Impacts to View

The lights for Milstein Hall will minimally increase light levels as seen from the Arts Quad. During the summer when leaves are on the trees, the impact from nighttime light will be minimized.

C. Mitigation Measures

Exterior lighting from Milstein Hall will be dimmed during the evening hours in order to minimize nighttime lighting impacts.

D. Unavoidable Impacts

Additional building light is an unavoidable impact of these projects, as it is essential to provide safe and adequate light levels for users of the project sites. It is unavoidable that some of this light will be visible from the northeastern portion of the Arts Quad.

Figure 2.11.28: Existing view looking northeast from the Arts Quad.

Figure 2.11.29: Proposed view looking northeast from the Arts Quad.

G. Fall Creek Gorge

A. Existing Conditions

Existing View

A street light on the south side of University Avenue is visible at night, as seen from within the Fall Creek Gorge. Its glare illuminates the north and west facades of the Foundry. Street light glare is minimized during the summer months, when the vegetation is in full leaf.

See Figure 2.11.30 for the existing view.

Proposed View

A small amount of exterior light from Milstein Hall may be visible during the winter months, when leaves are off the trees. It will be further minimized when leaves are on the trees.

The existing street lights along University Avenue will be replaced with sharp-cutoff fixtures that will provide lighting for the street and for the surface parking level of the CAPG.

No light spill from either project enters the gorge.

See Figure 2.11.31 for the proposed view.

B. Summary of Impacts to View

The lights for Milstein Hall will minimally increase light levels as seen from the Fall Creek Gorge. The CAPG project will replace the existing streetlight, currently the brightest object in the field of view, with a lower one that will not be visible from within the gorge. When leaves are on the trees, the impact from nighttime light will be imperceptible. No light spill from either project will enter the gorge.

C. Mitigation Measures

Lighting for both projects has been designed to limit spill and reduce glare.

The CAPG entrance fixtures and associated roadway fixtures will be lower than the existing light poles and out of the field of view.

D. Unavoidable Impacts

Additional building light is an unavoidable impact of these projects, as it is essential to provide safe and adequate light levels for users of the project sites. Street light glare and height of light poles will be reduced.

Figure 2.11.30: Existing view looking southeast from Fall Creek Gorge.

Figure 2.11.31: Proposed view looking southeast from Fall Creek Gorge.

2.12 Noise and Odor Impacts

2.12.1 Impacts to the Foundry Interior Noise Level

This section studies the question of whether the proposed Milstein Hall cantilever will increase noise levels inside the Foundry. In 2008, the acoustical engineering firm DHV B.V., provided a detailed analysis of the noise impact that the Milstein Hall cantilever design may have on the Foundry. Four noise receivers were placed along the south facade of the Foundry and two noise receivers were placed in the location of the north facade of Milstein Hall to measure and record existing noise levels. The modelled noise source for the proposed condition incorporated the loudest anticipated typical transit bus accelerating and braking (approximately 105 dB(A) at the source of the sound) at the bus stop, which is approximately 27 feet from the face of the Foundry.

For comparison purposes, three sound scenarios were modeled:

- Existing conditions
- Milstein Hall with sound-reflective ceiling
- Milstein Hall with sound-absorbing ceiling

DHV B.V.'s detailed analysis can be found in Appendix G: Acoustic Report.

Noise can be defined as any disagreeable or unwanted sound. Sound is quantified in units called decibels (dB). The loudness of sounds (that is, how loud they seem to humans) varies from person to person, so there is no precise definition of loudness. The degree of disturbance or annoyance of unwanted sound depends on the amount of intruding noise, the relationship to background noise, and the type of activity occurring when the noise is heard, and the distance between the source and the receptor. Table 2.12.1 illustrates a range of common sounds and shows the corresponding loudness, measured in decibels (dB).

A sound pressure change of three decibels is barely perceptible to the human ear, while a sound pressure change of five decibels is readily perceptible. An increase in sound pressure levels of 10 decibels is perceived twice as loud, and a decrease in sound pressure levels of 10 decibels is half as loud. Noise levels decrease with the square of the distance away from the source, meaning residents in homes and buildings close to a street or roadway perceive a much louder street noise than those set back even a modest distance.

Decibel Levels of Common Sounds

		Sound Description	Pain Level
DECIBELS (dB)	140	Shotgun blast, jet 100 feet away at take-off Motor test chamber	Pain Human hearing pain threshold
	130	--- Severe thunder, pneumatic jackhammer Hockey crowd Amplified rock music	--- Uncomfortably loud
	110	---	---
	100	Textile loom Subway train, elevated train, farm tractor Power lawn mower, newspaper press	
	90	---	---
	80	Diesel truck 40 mph, 50 feet away Crowded restaurant, garbage disposal Average factory, vacuum cleaner Passenger car 50 mph, 50 feet away	Moderately loud
	70	---	---
	60	Quiet typewriter Singing birds, window air conditioner Quiet automobile	
	50	--- Household refrigerator Quiet office	--- Very quiet
	40	---	---
	30	Average home Dripping faucet Whisper 5 feet away	
	20	Light rainfall, rustle of leaves Whisper	Average persons' threshold of hearing Just audible
	10	---	---
	0		Threshold for acute hearing

Sources: World Book Encyclopedia, Rand McNally Atlas of the Human Body, Encyclopedia Americana, "Industrial Noise and Hearing Conversation" by J.B. Olishifski and E.R. Harford (Researched by N. Jane Hunt and published in the Chicago Tribune in an illustrated graphic by Tom Heinz.)

Table 2.12.1: Decibel Levels of Common Sounds.

A. Existing Conditions

The Foundry is approximately 22-33 feet from the center line of University Avenue, which is approximately 27 feet wide. The distance between the south face of the Foundry and the north face of Rand Hall is approximately 67 feet.

As a means to provide privacy for the occupants of the Foundry, the windows on the south side of the building are almost always shut and white-washed on the lower two-thirds of the window. The closed windows buffer exterior noise.

Existing ambient noise in this area is produced by vehicular traffic. The sound pressure level one would experience standing next to a typical transit bus is estimated at 105 dB(A). In the existing condition, the equivalent sound pressure level (SPL) at the Foundry facade is 65.3 dB(A) with a peak level of 75.3 dB(A).

B. Noise Impacts of Proposed Project

The south side of the Foundry will be approximately 15 feet from the north side of Milstein Hall's cantilever. Approximately 66 feet of road and sidewalk width will separate these two buildings at street level. The underside of the cantilever will be a minimum of 15 feet above the road surface.

The study evaluated two cantilever scenarios, one with a sound-reflective ceiling and one with a sound-absorbing ceiling under the second story of Milstein Hall. The scenario with the reflective ceiling produced sound pressure levels at the Foundry facade 4.6 dB(A) higher than existing conditions. The scenario with the sound-absorbing ceiling recorded sound pressure levels at the Foundry facade 1.0 dB(A) higher than existing conditions. Milstein Hall design documents currently include the sound-absorbing ceiling in the plans.

As shown in table 2.12.1, at 20 decibels, noise enters the 'just audible' range, comparable to a whisper or light rainfall. The increase of 1.0 dB(A) at the exterior facade of the Foundry will not be perceptible.

Based on the existing Foundry facade construction, the interior noise level within the Foundry caused by a normal bus was estimated. As sound travels through the facade, levels will be decreased by 24 to 29 dB(A). The proposed project will increase interior noise levels in the Foundry by approximately one decibel. As stated above, this increase will not be noticeable.

C. Mitigation Measures

The use of a sound-absorbing ceiling for the Milstein cantilever fully mitigates impacts to noise levels inside the Foundry.

If the current traditional bus were replaced by a hybrid bus, the sound level could be expected to decrease between 4 and 8 dB(A).

D. Unavoidable Impacts

There are no unavoidable impacts to the Foundry interior due to noise impacts from either project.

2.12.2 Impacts of Increased Traffic Odors to the Foundry Interior

Odor concerns are also discussed in section 2.3.2, Evaluation of Impacts of Vehicular Emissions Under Building Cantilever on Building Occupants.

A. Existing Conditions

The Foundry is located approximately 11 to 21 feet from the north curb of University Avenue (11 feet from its southeast corner, 21 feet from its southwest corner), a well-used road in the City of Ithaca. The Foundry has operable windows on all sides. As a means to provide privacy for the occupants of the Foundry, the windows on the south side of the building are almost always shut and white-washed on the lower two-thirds of the window. The closed windows generally prevent traffic odors from entering the building.

University Avenue is a conduit for several bus routes, and there is a bus stop across the street from the Foundry on the south side of University Avenue. The existing traffic counts for the section of University Avenue can be found in the traffic report (Appendix E). Odors from vehicular emissions and from diesel buses around the existing bus stop are present, but dispersed quickly.

B. Impact of Increased Traffic Odors

Bus traffic will not increase as a result of the proposed project. In the most conservative estimations, (peak hour, PM), the maximum number of vehicles added to University Avenue as a result of both projects in front of the Foundry is 32, a 7% increase or one extra car every two minutes. Therefore, it is not expected that a significant increase in odors will be generated by the proposed projects.

Automobiles and buses will travel along University Avenue and underneath the proposed cantilevered second level of Milstein Hall. The area under the cantilever is approximately 15 feet from the Foundry building, is open on the east and west, and has two openings to the south (see Figure 2.12.1). The cantilever will cause odors to linger a little longer than in existing conditions, however, because of the lack of complete enclosure under the cantilever, wind currents will enter the space and disperse odors. Existing odors from diesel buses will extend a farther distance from the bus stop than they currently do, and may create odor complaints at nearby operable windows at the Foundry building if they are open. Other proposed and existing air intakes will not be affected by the vehicular emissions.

C. Mitigation Measures

Mitigation measures for the possible odors at the Foundry building include closing of windows close to the bus stop on the south side of the Foundry building. Using non-diesel, hybrid engine buses would also eliminate odor complaints.

D. Unavoidable Impacts

Perceived odor from diesel buses may be increased when the Foundry windows are open.

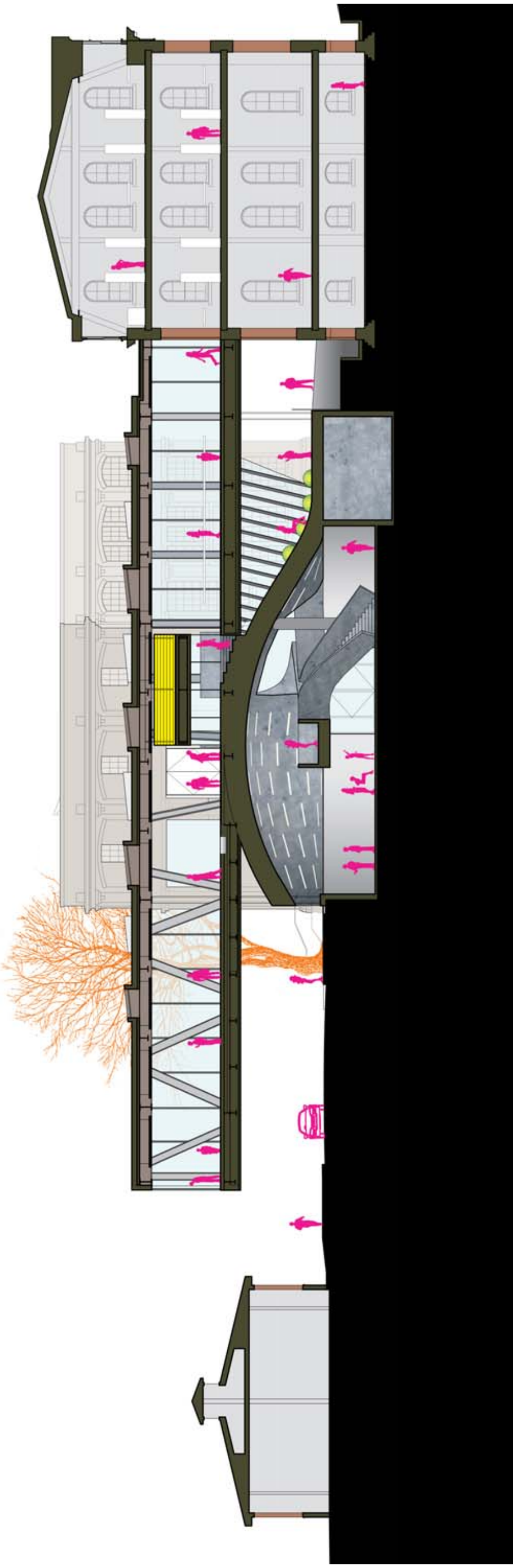

Figure 2.12.1: Section view of Milstein Hall.

2.13 Impact on Growth and Character of Community

2.13.1 Precedent (for both Campus and Surrounding Community, of Extending a Building Over a Public Street)

A. Existing Conditions

Examples have long existed for structures over public streets. Second, third, and higher stories of buildings were often corbelled over medieval city streets in Europe and elsewhere. In some places the upper stories almost touched, in others they were completely conjoined over the public street. Defensive structures and later homes were often built over the gated entrance streets of walled cities. The practice of cantilevering a structure over a street, sidewalk, or alley was not uncommon in dense urban areas around the world, including in the United States, until the late 19th century, when skyscrapers allowed more efficient use of prime real estate. With the modern era came concerns for fire prevention, natural light, air circulation, and other factors. The use of cantilevered stories has since decreased in vernacular architecture and undistinguished sites. Cantilevers are now often limited to building designs and sites of distinction, where improved materials and structural techniques allow dramatic architectural statements with cantilevers.

Bridges are the most common examples of structures that extend over public rights of way. They are virtually a fact of life in an urbanized society. Bridges typically allow one right-of-way to cross another for transportation purposes, usually at right angles, where it is desirable to allow unimpeded through-passage and avoid an at-grade intersection of the two. They can be for roads, railroad tracks, rivers, canals, pedestrian paths, or a combination of these. The location and clearance of bridges over public rights of way are limited by the need to reasonably preserve the ability of vehicles to pass beneath them or, in the case of oversized vehicles, to go around them by another route that is reasonably nearby. Locally, some bridge heights listed in “Tompkins County Freight Transportation Study” prepared for Ithaca-Tompkins County Transportation Council, April 2002, by Sear Brown are:

13’-0”	RR bridge of NYS Rt. 366 Varna
14’-0”	Triphammer Road Bridge over NYS Rt. 13
14’-0”	Cayuga Heights Road Bridge over NYS Rt. 13

While not so common as bridges, buildings are also built over public streets locally and around New York State. The New York State Uniform Fire Prevention and Building Code anticipates that buildings might be constructed over roads or sidewalks and requires that they clear the paved surface by no less than 15 feet.

Modern structures over public roads, other than bridges, can be desirable and feasible for a variety of reasons. They share at least one characteristic with bridges: providing a space for through passage beneath them. Additional reasons could include:

- Gaining space in a particular location, often where it is scarce;
- Improving the proportion or efficiency of building layout;
- Connecting adjoining uses at upper levels;
- Covering outdoor space, including grade level entrances, against the elements; and
- Designing architecture of its time, often differentiating the building from its surroundings

In the City of Ithaca, a projecting bay over the public sidewalk was built into the right-of-way of East Seneca Street in the 1970s, as part of the expansion of the former Citizens Savings Bank Building. In

Collegetown, the public entrance to the city parking garage passes beneath the Eddygate Apartments. Until recently, there was a structure over East Green Street connecting the upper levels of a parking structure on one side of the street with a ramp structure on the other side. On the Cornell campus there are examples of buildings with pedestrian walkways beneath them at Clark Hall, Mann Library, Balch Hall, and Roberts-Kennedy Halls. While they are not over public streets, they illustrate situations in which it was desirable to construct or connect a building at an upper level, and retain an unimpeded through passage at grade beneath it.

Around upstate New York there are many examples of building structures over public streets. The New York State Library and Museum building, anchoring one end of the Empire State Plaza, is constructed over Madison Avenue/US Rt. 20 in Albany. In the City of Buffalo, a substantial addition to the Erie County Public Library is built over Ellicott Street between Broadway and Clinton Streets. At Syracuse Square in Syracuse, a portion of Hotel Syracuse is constructed over Onondaga Street. It serves as reception and conference space, and also connects spaces on either side of the road.

On the campus of Portland State University, there appears to be a two-story structure over a public trolley line (see Figure 2.10.2).

The above examples in Albany, Buffalo, and Syracuse are all likely cases of one or a combination of the first four reasons for building over a public street. Examples of the last reason, architectural distinctiveness, may or may not be combined with the other reasons, but buildings stand out for the last reason alone. The Minneapolis Central Public Library, designed by Cesar Pelli, is such an example. Ironically, Frank Lloyd Wright originally designed the Guggenheim Museum in New York City, with its iconic spiral, to cantilever generously over the public right-of-way. Over the protests of Wright, the spiral had to be compressed to stay within the lot line, and its full potential for architectural distinction was lost as a result. (Barnes, *Remarks on Continuity and Change*, 1965).

B. Potential Impacts of the Proposed Project with Respect to Precedent

Planning boards and other land use regulatory bodies are generally not bound by precedent in the approval of particular projects. The approval of a given feature in one site plan does not bind the reviewing body to approve the same feature in another site plan proposal. All land use decisions are individual, just as every piece of land is unique, and each must be based on the application of the decision criteria to a particular site. For this reason, a decision concerning one location can have little or no precedential influence in another location.

Even if there were a possibility for precedential effect, the circumstances under which it would be feasible to construct a building such as Milstein Hall over a public street in other locations in the City of Ithaca are extremely limited. All three of the following criteria would have to be present simultaneously:

- **The developer would have to own the fee title to the roadbed of the adjoining street,** in order to own the air rights through which the building will extend, or to otherwise acquire the air rights. This situation is extremely rare in the City of Ithaca, where almost all roads are platted, meaning that the City owns the fee title to the roadbed. However, in the case of the proposed Milstein Hall, Cornell owns the fee title to the roadbed, and thus, the air rights above the height of normal vehicular travel.
- **The developer would have to own the land on both sides of the public street**, opposite each other in order to have air rights above the entire width of the road (i.e., each side owns only to the center line of the road). While not unheard of, this situation is still uncommon. It is most

likely to occur where the owner is an institution or otherwise has a business reason for owning a cluster of contiguous properties or parcels.

- **The site would have to be zoned to permit building without any front yard setback** from the public street. This situation is not common among municipal zoning districts. In the City of Ithaca, only the B2, B4, CBD, WED2, and WF districts are entirely free of a minimum setback from the public street. As far as can be ascertained from available records, all the streets in the listed zoning districts are platted streets. This means that the owner of an adjoining building lot does not own fee title to the roadbed. The lack of air rights over either the street or the sidewalk in these no-setback districts would preclude a cantilever unless the air rights were first obtained from the City of Ithaca. In the U-1 district, where Milstein Hall is proposed, there are setback requirements where a residential district adjoins the U-1 district, but the rest of the U-1 district, including the site of the proposed Milstein Hall, does not have a minimum set back requirement.

The site of the proposed Milstein Hall has all three of these criteria. Having one or two of the above criteria present would be unlikely, but the co-incidence of all three would be extremely rare elsewhere in the City of Ithaca.

Additionally, for a developer to consider building over a public street would require the presence of highly compelling factors that are sufficient to overcome the higher cost of structurally supporting a cantilevered building over a street. Such incentives might be present where other land is not available or extremely costly, or where pre-existing uses must remain, but be expanded in their present location.

As discussed in Section 1.2, it is critical that the College of AAP stay in the academic core of the campus. Students in the College of AAP are required to take elective courses in other colleges of the university. In particular, proximity to the Johnson Museum of Art and to the College of Arts and Sciences, which offer many of the classes in history of art and history of architecture, is a significant attribute of AAP's present location, and provides a compelling reason to expand AAP facilities behind Sibley Hall.

Being already invested in four existing buildings (the Foundry, Tjaden, Sibley, and Rand halls containing approximately 180,000 GSF in aggregate) compounds the importance of the present location for the College of AAP. It is extremely difficult to "pick up and move" an entire college of a university to another location. The moving of the Johnson School from Mallott Hall to Sage Hall over a decade ago was the last remaining opportunity to move an entire school or college (albeit a very small one in that case). The last major moves on the Cornell campus occurred when academic space requirements were far smaller, and more undeveloped land was still available. The luxury of such flexibility has not existed for roughly 70 years, when the Engineering College began to move to the Engineering Quad. Nonetheless, the possibility of locating a new site for AAP was thoroughly investigated, but none could be identified. The idea of disbanding the college and dispersing the programs of AAP to other colleges within the university was also examined very seriously by academic policy-makers, but likewise ultimately rejected as infeasible and counter-productive. The only feasible alternative is to expand the existing facilities of AAP in the limited space behind its major facilities, in a manner than preserves the Arts Quad and the existing AAP buildings' important contributions to the historic context of the Arts Quad.

Environmental impacts of Milstein Hall and the CAPG have been identified and discussed throughout this document, including the potential impacts on historic resources, transportation, and other topics. Without having any precedential effect, *per se*, there is no environmental impact with respect to extending the proposed Milstein Hall over a public road, that has not been fully explored in these other sections.

C. Mitigation Measures with Respect to Precedent

There are no environmental impacts with respect to precedent and therefore no mitigation measures.

D. Unavoidable Impacts with Respect to Precedent

There are no environmental impacts with respect to precedent and therefore no unavoidable impacts.

2.13.2 Future Building

Impact of CAPG on Future Above-Ground Development of that Site

The CAPG structural system is being designed to carry the loading from a building of up to three stories: grade level plus two supported floors above grade. The structure is being designed so that a building could be located anywhere along the length of the garage beginning at the west edge of Sibley dome.

The decision to add structural capacity was based on the general principal that good engineering practice will take into account potential future contingencies. No specific design for a building or group of buildings is currently under consideration. The Cornell Campus Master Plan does show this site as a potential location for future development, as do several of the master plan concept designs completed (but not adopted) for the College of AAP in the past.

The buildings envisioned by the college would be used to extend available program space. No increase in student enrollment is anticipated. There is no significant impact to the growth and character of the community.

CHAPTER THREE:
Construction Impacts

Chapter Three: Construction Impacts

This chapter discusses potential impacts during the construction of Milstein Hall and the CAPG. Section 3.1 describes the construction sequencing, staging and activities for each construction phase; Section 3.2 describes erosion and sediment control measures to be taken during construction; Section 3.3 describes impacts to traffic during construction; Section 3.4 describes construction phase parking; Section 3.5 describes impacts to air during construction; Section 3.6 describes noise impacts due to construction; Section 3.7 describes construction impacts to Fall Creek Gorge and; Section 3.8 describes potentially concurrent construction projects while Milstein Hall and the CAPG are built.

3.1 Description of Construction Sequencing and Construction Activities Per Each Construction Phase

This section describes the construction time lines for Milstein Hall and the CAPG. Included in this section are descriptions of anticipated construction sequencing, site staging, maintenance of service to existing buildings, circulation for pedestrians and bicyclists, ADA accessibility, and emergency routes during construction.

The information contained within this chapter is based on the assumption that construction for Milstein Hall will commence in January of 2009, and construction for the CAPG will likely commence approximately seven months later. The projects will then be constructed concurrently, with completion of the CAPG by October of 2010 and Milstein Hall by January of 2011. However, the exact amount of time between commencements of each project may vary depending on the contractor's recommendations for efficient construction sequencing.

Construction Sequencing

Construction Activity	Duration	Start	Complete
Milstein Hall Addition	21-24 months	January 2009	January 2011
CAPG	15 months	July 2009	October 2010
Lincoln Hall Access Drive	3 months	February 2009	April 2009
University Avenue closed (from East Avenue to Central Avenue)	20 months	March 2009	November 2010

Table 3.1.1: Construction Sequence.

3.1.1 Paul Milstein Hall

The construction of the Milstein Hall project involves building the new Milstein Hall addition, constructing a new access drive to Lincoln Hall from East Avenue, upgrading and installing utilities within the project site and in the Arts Quad south of Sibley Hall, and the constructing the garage interface to the north of the Sibley dome. The construction work is expected to take approximately 21-24 months. The construction work will not be phased, but will occur during the construction sequence described below and outlined in Table 3.1.1 above.

Milstein Hall Addition: This section of work will take 21-24 months and is proposed to occur from January 2009 to January 2011. Foundation work will occur during the first seven months of construction and will be followed by seven months of steel erection. The remaining seven to 10 months will involve the installation of mechanical systems, exterior cladding, roofing, and interior finishes and fit-out.

The interior renovation work in Rand and Sibley halls, necessary to interface with Milstein Hall, will be five months in duration. In order to minimize impacts on building occupants during the academic year, this work will be timed during the second summer of construction.

Lincoln Hall Access Drive: The existing Lincoln Hall access drive west of Rand Hall will be removed early in the construction sequencing to facilitate utility and foundation work for Milstein Hall. In order to minimize the disruption of services and deliveries to the Lincoln Hall service area, the new Lincoln Hall access drive will be completed from February 2009 to April 2009. Service and delivery access to Lincoln Hall will be restored at the completion of this work. Although service and delivery access to Lincoln Hall will be temporarily disrupted during the construction of the new access drive, the contractor will be required to facilitate service and deliveries through the construction site during this period.

Access to the ADA parking spaces located in the Lincoln Hall service area parking lot will be blocked while the access drive is being built. Replacement ADA spaces will be temporarily located on Central Avenue during this period. Cornell's Transportation Services will provide additional means of transportation, if needed, between these parking lots and the parkers' destinations.

Project road work on East Avenue, to install the Lincoln Hall access drive, will take approximately two to three months to complete. During this period, the north-bound lane of East Avenue will remain open, while the south-bound lane will experience occasional, temporary closures; at these times, a flag person will be on site to direct traffic in both directions.

3.1.2 CAPG Construction Sequencing

The construction of the CAPG project involves building the new parking garage, utility work within the project site, road work on University Avenue, construction of sidewalks, stairs, and other site improvements. Construction is expected to take approximately 15 months.

Construction will begin with mobilization, site preparation, demolition, and utility work for an expected duration of approximately three months. Most of the existing utilities on site will need to be removed before excavation work for the garage can begin. Temporary facilities, including pumps, will be used to maintain storm and sanitary services until the proposed improvements are completed. The project will install as much of the proposed improvements as possible before excavation for the garage begins. No significant disruption in service to existing buildings is expected. Upon completion of this preparatory work; sheeting and shoring, excavation, and the construction of the garage foundation and superstructure will begin. This portion of the work is expected to take about six months. The remaining six months will involve the installation of mechanical and electrical systems, waterproofing, finishing and fit-out for the garage.

3.1.3 University Avenue Closures

University Avenue, between East Avenue and Central Avenue, will be closed for 20 months during the construction of Milstein Hall and the CAPG. A construction fence will be erected along the north curb line of University Avenue from the east side of Central Avenue to the west face of Rand Hall as extended north. See the following sections for specific descriptions of the impacts of University Avenue closures on service, circulation routes (pedestrian, bicycle, ADA) and emergency vehicle access.

3.1.4 Site Staging

Site staging will occur within the limits of the site construction fence. Please refer to Figure 3.1.1 for the Milstein Hall and CAPG construction boundary and limits of site work.

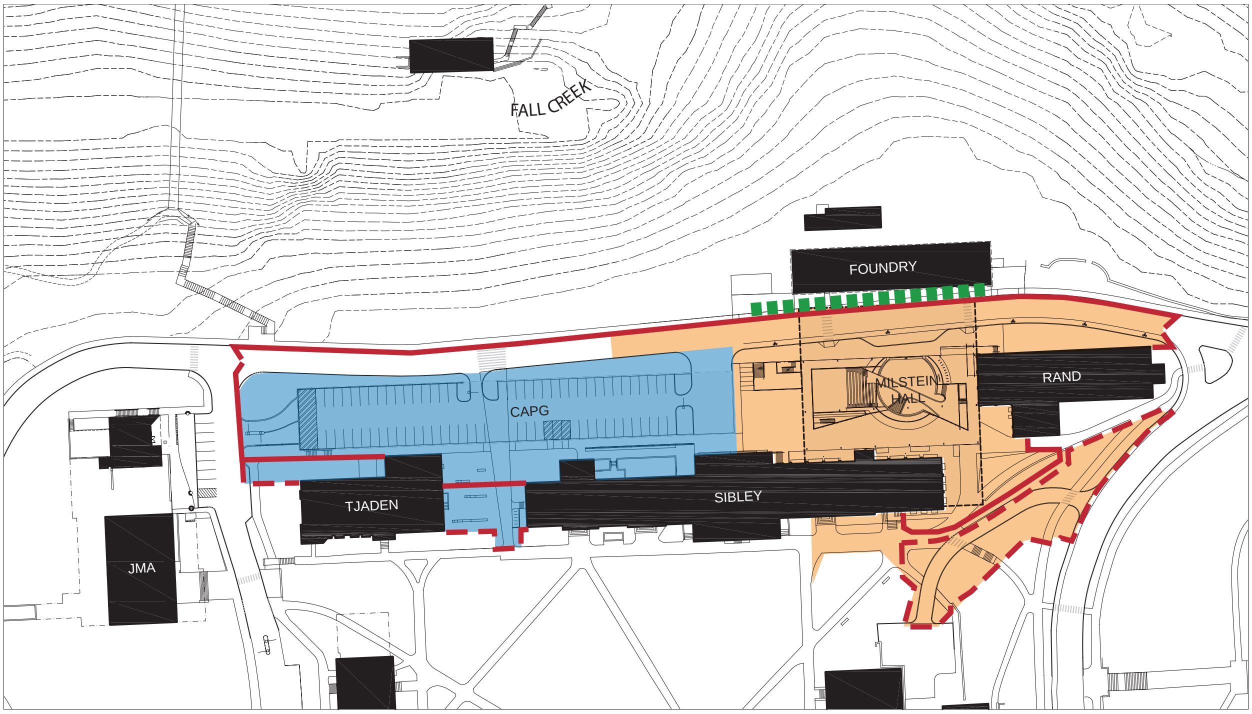

Figure 3.1.1: Construction boundary and limits of site work.

LEGEND

━━━ Permanent Construction Fence

╍╍╍ Temporary Construction Fence

▪▪▪ Scaffolding Tunnel

🟧 Limits of Site Work - Milstein Hall

🟦 Limits of Site Work - CAPG

↑ North

3.1.5 Maintaining Service to Existing Buildings During Construction

A. Existing Conditions

See Section 2.7.4, Service and Delivery Access, for descriptions of existing service and delivery access conditions.

B. Impacts to Service to Existing Buildings During Construction

The existing service access to Sibley Hall, Rand Hall, Lincoln Hall and the Foundry will be temporarily altered during construction of Milstein Hall and the CAPG. Service will continue to be provided for each building and is described below. Please see Figure 3.1.2 for service locations during construction.

Sibley Hall: The existing service entrance on the northeast side of the dome, accessed from the parking lot, will be blocked off. Temporary service will occur at the existing southeast entrance to Sibley Hall.

Rand Hall: Service will continue to be provided at the shop door located on the northwest corner of the building. The contractor will coordinate and facilitate deliveries and service through the construction site.

The Foundry: The existing service drive on the west side of the building will be blocked during construction. Service to the building will be accommodated at the east service entrance, which is the currently the main service entrance.

Lincoln Hall: Service will be provided at the existing loading dock. During periods of construction, where the loading dock is within the construction area fencing, the contractor will coordinate site access with delivery and service vehicles. Use of the existing loading dock for all purposes, including trash disposal and recycling, will be maintained throughout construction.

Tjaden Hall: Service will be provided from Central Avenue to Tjaden Hall’s north entrance via temporary walkways.

Central Avenue buildings: Service to Central Avenue buildings will not be affected by either project construction.

C. Mitigation Measures

Overall, the negative impacts to service will be temporary and not significant.

D. Unavoidable Impacts

There will be unavoidable detours in service to existing buildings during construction, as is typical of construction projects of this scale and duration.

3.1.6 Circulation Routes

The existing pedestrian, bicycle, and ADA-accessible routes in the vicinity of the construction site will be rerouted around the construction site. A construction fence will be installed to protect pedestrians and bicyclists from entering the construction area. Existing and proposed construction circulation routes for pedestrians, bicyclists and ADA access are described below and illustrated in Figure 3.1.2.

Pedestrian Circulation:

A. Existing Conditions

All roads within the project study area for the Milstein Hall and CAPG project sites have sidewalks along at least one side of the roadway, both sides in most cases. Additionally, most intersections have striped pedestrian crosswalks. The signalized intersection at University Avenue/Forest Home Drive and Thurston Avenue/East Avenue has pedestrian signal heads indicating when crossing the street at that location is allowed.

Existing east-west pedestrian circulation routes:

- Sidewalk located on the north side of University Avenue
- Sidewalk located on the north side of Sibley and Tjaden halls
- Sidewalk located on the south side of Sibley and Tjaden halls
- Multiple shared-use paths (with bicycles) located within the Arts Quad

Existing north-south pedestrian circulation routes:

- Sidewalks located along East Avenue
- Sidewalks located along Central Avenue
- Sidewalk located between Sibley and Tjaden halls
- Pedestrian path leading toward suspension bridge over Fall Creek
- Multiple shared-use paths (with bicycles) located within the Arts Quad

B. Impacts to Pedestrian Circulation Routes

Impacts to pedestrian circulation routes will occur during construction of Milstein Hall and the CAPG, as is typical with construction projects of this scale and duration.

Access from the Thurston Avenue Bridge to the Arts Quad will be provided via temporary fenced walkways.

The east-west sidewalk located to the north side of University Avenue will be open to pedestrians and separated from the construction site by an eight-foot high chain-link fence. Electric lighting will be provided along the fence as necessary to replace any street lamps that are removed from the south side of University Avenue. Where the sidewalk passes between the Milstein Hall site and the Foundry a temporary scaffolding tunnel will be provided to protect pedestrians. The tunnel will be structurally engineered and will have electric lighting. From time to time, this portion of the sidewalk may be temporally closed for special construction operations. Temporary signage and/or flag persons will alert pedestrians to such temporary closures.

The existing sidewalk along the north side of Tjaden and Sibley halls currently services informal building entrances and the parking lot. This sidewalk is located within the construction fence and will be closed for the full construction period. East-west pedestrian movement between buildings will be accommodated on the north side of this group of buildings.

A portion of the sidewalk along the east side of Central Avenue will be closed for the duration of the project. Pedestrian movement southward from the suspension bridge stair will be relocated to the west side of Central Avenue.

C. Mitigation Measures

Alternate routes will be provided as indicated above. Signage and other communications will alert pedestrians to recommended detour routes. Temporary signage will alert pedestrians when there are changes to the established detour routes.

D. Unavoidable Impacts

There will be unavoidable detours in pedestrian circulation, as is typical of construction projects of this scale and duration.

Bicycle Circulation:

A. Existing Conditions

Central Avenue, Campus Road, East Avenue and University Avenue east of Central Avenue are all designated bike routes. East Avenue, from Campus Road to University Avenue, provides an exclusive bike lane for cyclists. In addition, there are multiple shared-use paths (for both pedestrians and cyclists) that crisscross the central campus.

B. Impacts to Bicycle Circulation Routes

The designated bicycle route located on University Avenue, east of Central Avenue, will be blocked by the construction site for 20 months. Bicyclists heading east will be re-routed through the Arts Quad to the temporary sidewalk located at the northeast corner of the Arts Quad. Bicyclists heading west on University Avenue will be re-routed through the northeast corner of the Arts Quad along a temporary fenced shared-use path and connect back to University Avenue at Central Avenue.

See Figure 3.1.2 for proposed bicycle detours.

C. Mitigations

Alternate routes will be provided as indicated above. Signage and other communications will alert bicyclists to recommended detour routes. Temporary signage will alert bicyclists when there are changes to the established detour routes.

D. Unavoidable Impacts

There will be unavoidable detours in bicycle circulation, as is typical of construction projects of this scale and duration.

ADA Accessibility:

A. Existing Conditions

Existing accessible building locations:

- ADA ramp located on southeast entrance to Sibley Hall

- Entrance located on the north side of Lincoln Hall
- Entrance located on the south side of Rand Hall
- Entrance located on the south side of the Foundry
- Entrance located on the north side of Tjaden Hall
- Ramp to the entrance of the Johnson Museum of Art
- ADA parking spaces in the parking lot to the north of Tjaden Hall
- Metered ADA parking spaces on the west side of Central Avenue

B. Impacts to ADA accessibility

Access to Sibley Hall will continue to be provided at the main entrances on the south side of the building. The existing ADA ramp located at the southeast corner of Sibley Hall will be replaced with a temporary ramp on the west side of this entrance, as the existing ramp will be within the construction fence area.

Existing ADA access points to Rand Hall, the Foundry, Lincoln Hall and Tjaden Hall will be maintained at all times during construction. These locations are indicated on Figure 3.1.2.

Access to Tjaden Hall will be provided by a temporary boardwalk at the west side of Tjaden to the existing north accessible entrance.

ADA parking spaces located in the parking lot to the north of the Tjaden Hall will be removed during construction. Replacement ADA spaces will be temporarily located in the parking area along Central Avenue.

Metered, ADA parking spaces located on the west side of Central Avenue (for Johnson Museum of Art patrons) will not be impacted by construction.

C. Mitigation Measures

Alternate routes will be provided as indicated above. Signage and other communications will indicate ADA-accessible entrances and routes.

D. Unavoidable Impacts

There will be unavoidable detours for ADA accessibility, as is typical of construction projects of this scale and duration. Access to affected facilities will be maintained at all times.

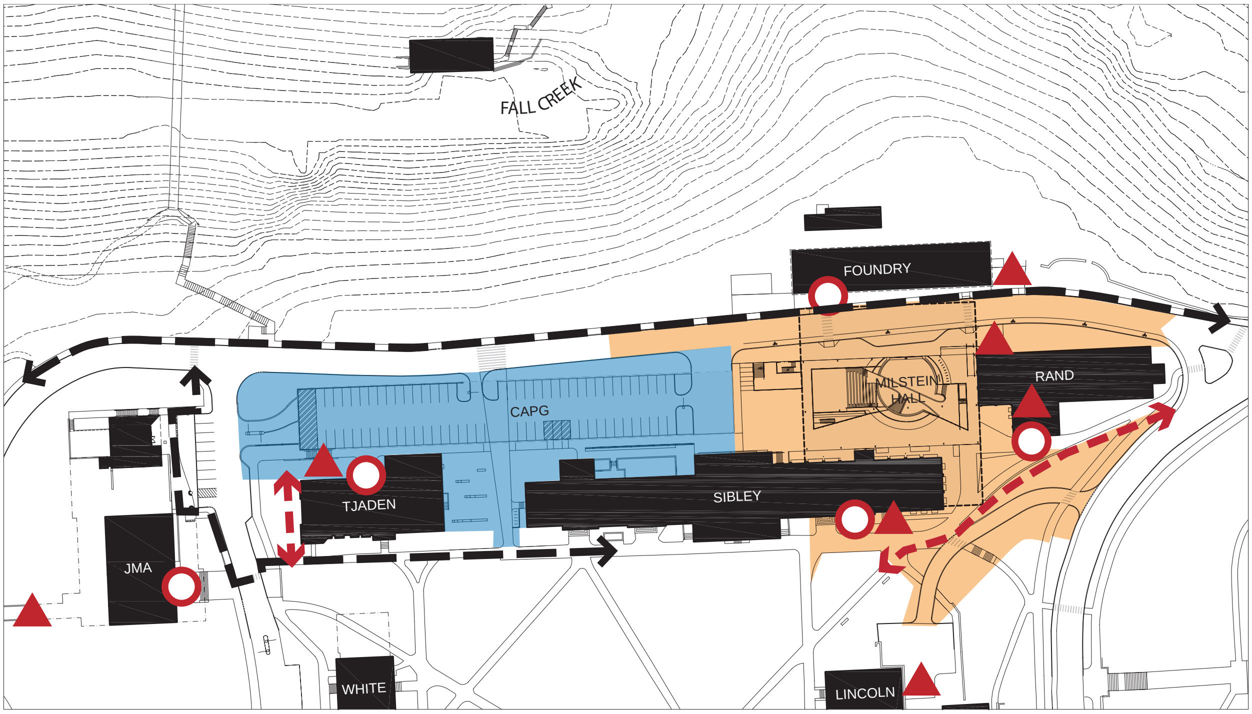

Figure 3.1.2: Circulation routes and service locations during construction.

LEGEND

- – – → Pedestrian/Bicycle Route During Construction
- ← – – → Temporary Sidewalk During Construction
- ○ Open ADA Entrance
- ▲ Service Location During Construction
- 🟧 Limits of Site Work - Milstein Hall
- 🟦 Limits of Site Work - CAPG
- ↑ North

3.1.7 Emergency Routes

A. Existing Conditions

See Section 2.7.5, Emergency Vehicle Access, for description of existing conditions pertaining to emergency vehicle access.

B. Impacts to Emergency Routes

For 20 months University Avenue will be closed between the east side of Central Avenue and the west face of Rand Hall as extended north. During this period, emergency vehicles will be re-routed via West Avenue, Campus Road, and East Avenue. Emergency access to the Arts Quad will be provided via Central Avenue and East Avenue.

C. Mitigation Measures

Prior to construction, as is typical for construction projects, the contractor will meet with the City of Ithaca Fire Department to coordinate access to the construction site, adjacent buildings, and the Arts Quad. Special emergency access during Cornell events, such as Dragon Day, Slope Day, commencement, move-in day, AAP reunions, etc, will also be coordinated with the city.

University representatives attend the monthly City of Ithaca Planning and Coordinating Committee meeting (PCC) to coordinate road closures and emergency routes on campus. In addition, the university's Summer Operations Committee compiles information on programs and university operations that typically occur during the late spring and summer months when the majority of roadwork occurs. This information is shared with the university representatives who attend the PCC meetings. Meetings are also organized, on a project-by-project basis, with representatives of the City of Ithaca Fire Department, Cornell Environmental Health and Safety, Cornell Police, Bangs Ambulance, and Cornell Transportation to coordinate emergency access around construction sites and road closures. These meetings are in place to make sure that access for emergency responders is maintained.

D. Unavoidable Impacts

There will be unavoidable detours of emergency routes, as is typical of construction projects of this scale and duration.

3.2 Erosion and Sediment Controls During Construction

A. Existing Conditions

Stormwater collected by the existing storm system currently flows to three different outfalls that discharge to the Fall Creek Gorge north of University Avenue. The easterly outfall, located east of the Foundry, generally serves the Milstein Hall site as well as a significant area of campus above the site. This outfall is expected to see reductions in the volumes and rates of runoff due to the proposed green roof and associated reduction in impervious cover on the Milstein Hall site. The middle outfall, located immediately west of the garage entrance on University Avenue, has partially failed and its use will be discontinued. The storm pipe for the middle outfall will be capped off. Stormwater from its catchment area will be collected by the proposed site storm system and redirected to the westerly outfall. The westerly outfall is located immediately east of the existing walkway and steps on the south approach to the pedestrian bridge over Fall Creek. Based on the current runoff calculations the piping for this outfall has sufficient capacity to drain the associated catchment area. Stormwater systems are also discussed in Section 2.2, Stormwater.

B. Construction Impacts of Erosion and Sediment Controls

The proposed projects will disturb approximately 3.5 acres of land and will be required to obtain a DEC State Pollutant Discharge Elimination System (SPDES) permit which includes submission of a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP includes temporary measures to control runoff during construction as well as permanent measures to provide water quality and quantity treatment following completion of the projects. A copy of the SWPPP can be found in Appendix B. Temporary measures to control stormwater runoff during construction of the projects are shown on the Erosion and Sediment Control Plan as part of the SWPPP (Appendix B).

At no time will untreated construction run-off be allowed to enter Fall Creek or leave the site. All erosion and sediment control measures have been designed according to the current New York State Standards and Specifications for Erosion and Sediment Control. Erosion and sediment control measures to prevent exposed soils from leaving the construction site will be:

- Perimeter silt fencing
- Inlet protection for storm structures
- Stabilized entrances (truck tracking pads)
- Sediment basin
- Filter bags

Existing stormwater service will not be interrupted during construction. The contractor will be required to maintain the existing stormwater system. This will be achieved either by installing new piping before existing piping is removed, or by providing temporary water conveyance while existing lines are updated.

During construction, it will be necessary to remove standing water (dewatering) from open excavation areas. All water pumped out of excavated areas will flow to on-site erosion and sediment controls (for example: filter bags, sediment basin).

C. Mitigation Measures

As described above, the projects will comply with DEC regulations for erosion and sediment control during construction. No additional mitigation measures are necessary.

D. Unavoidable Impacts

There are no unavoidable construction impacts to stormwater.

3.3 Traffic

3.3.1 Construction Phase Traffic

The following section describes proposed construction route(s) under the existing conditions and during construction. Martin/Alexiou/Bryson, PLLC provided the analysis for this section and its report can be referenced in Appendix E, Traffic Impact Analysis. Traffic volume data, turning movements, intersection geometry, level of service, and safety was analyzed. Please refer to Appendix E for the entire Traffic Impact Analysis report.

A. Construction Diversion Conditions

For the majority of the expected construction for Milstein Hall and the CAPG, University Avenue will be closed to through traffic between East Avenue and Central Avenue. The traffic analysis and findings are based on University Avenue closure from March of 2009 to November of 2010.

The Construction Diversion scenario examines conditions of the roadway network during the final period of garage construction that has University Avenue completely closed to through traffic. Volumes were derived by using the No-Build +1 (2012) scenario as a base, and diverting vehicles that normally would use University Avenue within the proposed construction area. Rerouting the traffic was conducted iteratively by isolating and then removing the Central Avenue, McGraw Place, Sibley/Tjaden-bound traffic, and then general through traffic that passes through the construction area. When University Avenue closes temporarily, traffic will generally shift to the proposed detour route shown in Figure 3.3.1; however some through traffic may use alternate routes, such as Thurston Avenue to the Stewart Avenue Bridge, which are outside of the study area. Selecting the route for the specific movements was predicted using available traffic and destination information. In addition, some construction-related traffic was added in this scenario. The precise level of construction-related traffic will be highly dependent on the specific operation occurring. Cornell University staff will work with appropriate city and town officials to develop strategies for managing the construction traffic, including identifying the appropriate routes between the designated truck routes and the project site. For this analysis, the truck traffic was assumed to enter from the west via University Avenue.

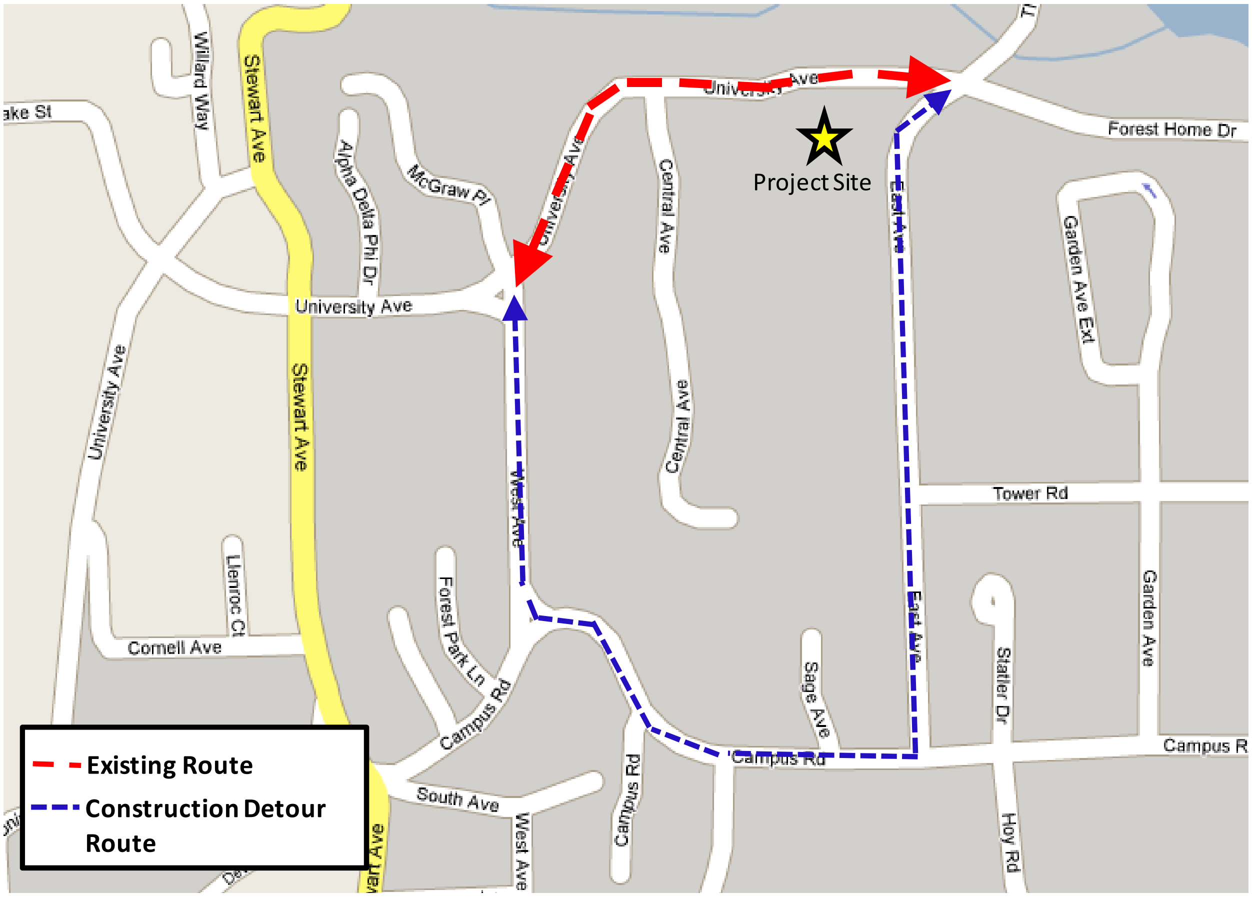

Figure 3.3.1: University Avenue detour during construction.

B. Impacts of Construction Phase Traffic

Level of Service:

As shown in Table 3.3.1, most of the intersections in the network will see a slight increase in intersection delay, but will not result in any significant traffic performance degradation i.e., there will be no drop from acceptable level of service (LOS) to unacceptable LOS due to the construction diversions. Because of the significantly reduced volume accessing University Avenue at the Thurston Avenue/East Avenue intersection, this signalized intersection will actually see a slight improvement in LOS. The all-way stop controlled intersection of East Avenue and Campus Road will drop to a LOS C during both peak hours; however, this drop still leaves the intersection operating acceptably overall.

Construction Diversion Level of Service					
Intersection	**Traffic Control**	**Existing (2008)**		**Construction Diversion**	
		A.M.	**P.M.**	**A.M.**	**P.M.**
University Avenue/Forest Home Drive at Thurston Avenue/East Avenue	Signalized	B (EB_C)	B (EB-C)	A (WB-C)	A (WB_C)
East Avenue at Tower Road	All-Way Stop	A (SB-A)	B (SB-B)	A (SB-A)	B (NB-B)
East Avenue at Campus Road	All-Way Stop	B (EB-B)	B (EB-B)	C (EB-C)	C (EB-E)
Campus Road at College Road	Signalized	A (EB-A)	A (WB-B)	B (EB-B)	B (WB-B)
Campus Road at West Avenue	Unsignalized	(SB-B)	(SB-B)	(SB-B)	(SB-C)
West Avenue at University (south)	Unsignalized	(SB-A)	(SB-A)	(SB-A)	(SB-A)
West Avenue at University (west)	Unsignalized	(NB-B)	(NB-B)	(NB-B)	(NB-B)
West Avenue at University (north)	Unsignalized	(NB-B)	(SB-C)	(NB-B)	(SB-B)
University Avenue at Central Avenue	Unsignalized	(NB-B)	(NB-C)	(NB-B)	(NB-B)
University Avenue at Sibley/Tjaden Lot (west)	Unsignalized	(NB-A)	(NB-B)	N/A	N/A
University Avenue at Sibley/Tjaden Lot (east)	Unsignalized	(NB-B)	(NB-B)	N/A	N/A
University Avenue at Stewart Avenue	All-Way Stop	B (EB-B)	C (WB-C)	A (EB-B)	C (WB-C)
Campus Road at Stewart Avenue	Unsignalized	(WB-A)	(WB-A)	(WB-A)	(WB-A)
Central Avenue at Parking Ramp Entrance	Future Unsignalized	N/A	N/A	N/A	N/A
East Avenue at New Lincoln Hall Access	Future Unsignalized	N/A	N/A	(EB-B)	(EB_B)

Legend: X (Dir-X) =
Overall Intersection LOS (Worst Operating Approach - Worst Operating Approach LOS)

Table 3.3.1: Construction Diversion Level of Service

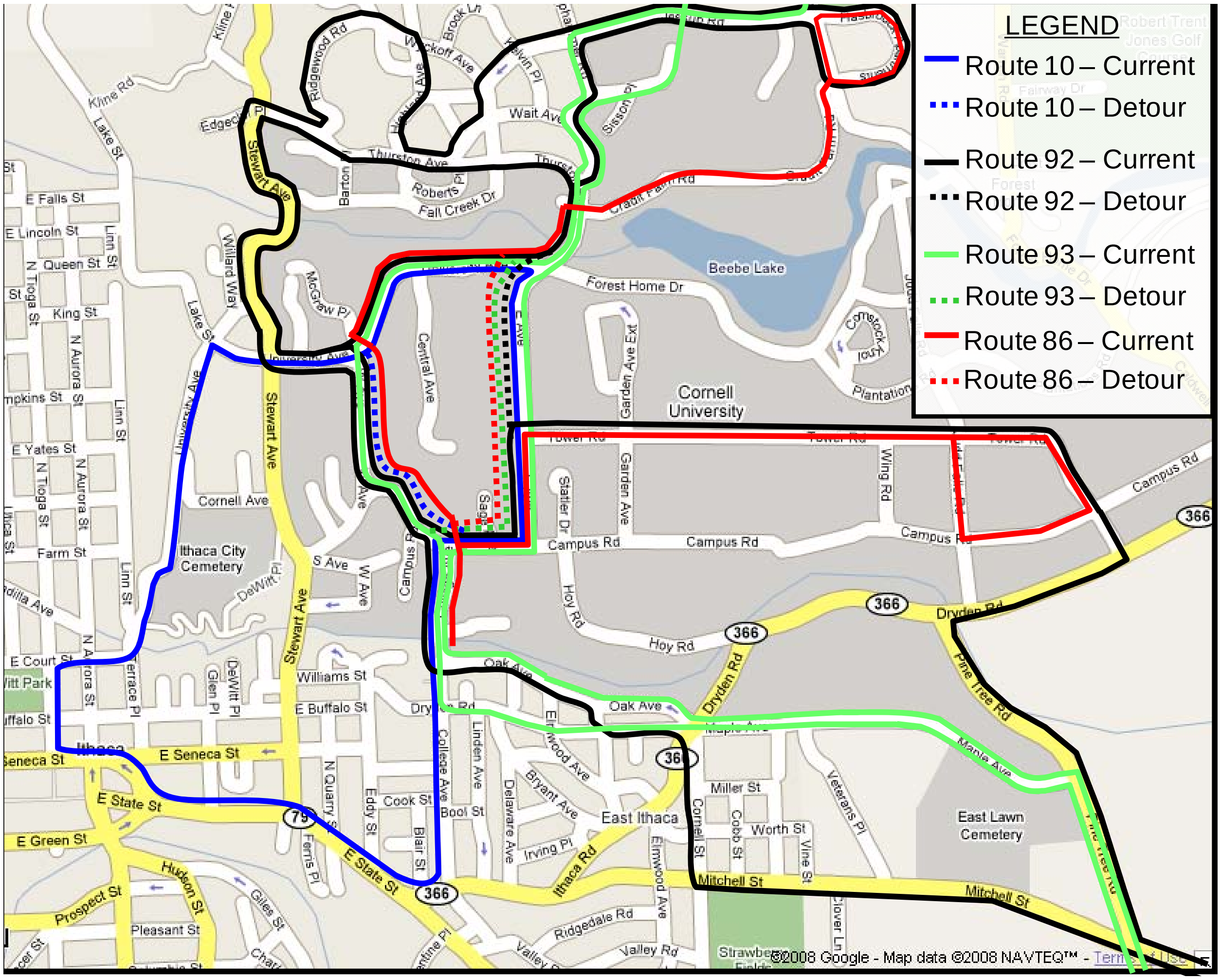

Figure 3.3.2: TCAT bus routes along University Avenue and potential detour routes during construction.

Public Transit:

Transit in Tompkins County is operated primarily by Tompkins Consolidated Area Transit (TCAT). TCAT currently operates approximately 40 fixed routes across the County. According to the t-GEIS Travel Survey, approximately 12 percent of Cornell employees, 38% of off-campus graduate students, and 15% of off-campus undergraduate students use the TCAT buses to reach the campus. Several TCAT routes use University Avenue. A 50 foot bus pull-off will be constructed on the southern side of University Avenue next to and under the cantilever for Milstein Hall.

The temporary closure of University Avenue during the construction of Milstein Hall and the CAPG will impact the TCAT routes that regularly use that roadway. Specifically, Route 10 which provides regular and rapid service between Cornell and downtown uses University Avenue and has a bus stop just west of Rand Hall. There are a few other routes such as the 86 (day service), 92 (night service), and 93 (night service) that also use University Avenue. Cornell University transportation staff is working with TCAT officials to determine the most appropriate detour route according to the needs of the patrons of the route. Any number of roadway facilities surrounding University Avenue, such as West Avenue, East Avenue, Thurston Avenue, and Stewart Avenue may be used for transit and already accommodate buses for other TCAT routes. Figure 3.3.2 illustrates the transit routes and a potential alternate path for each transit route.

C. Mitigation Measures

In the scenarios analyzed by Martin/Alexiou/Bryson, all intersections are expected to operate at an acceptable level of service during construction. No measures are necessary to mitigate temporary conditions at impacted intersections during construction. Area neighborhood groups will be contacted and updated on road closures and detours.

D. Unavoidable Impacts

Most of the intersections in the network will see a slight increase in intersection delay, but it will not result in any significant traffic performance degradation.

3.4 Construction Phase Parking

Parking on the Cornell University campus, including construction parking, is addressed through a comprehensive management program that balances transportation and parking needs with other environmental and community interests as described in Section 2.9, Parking, of this document. The management of Cornell's parking system is a dynamic process. The system has embraced opportunities to enhance the supply, usability, landscaping and safety of parking by proactively redesigning and expanding existing parking areas to maximize parking efficiencies. This has enabled Cornell to face the challenge of losses in parking on central campus as buildings have been constructed or expanded, including the temporary displacement of parking spaces during construction projects, and the need to accommodate parking for the contractors, project managers and officials associated with the construction project.

A. Existing Site Parking

There are two connected surface parking lots to the north of Sibley and Tjaden halls that will be directly impacted by the construction of Milstein Hall and the CAPG. There are 83 designated spaces in the Sibley lot and 22 in the Tjaden lot, with several spaces assigned for loading or handicap parking as needed. Parking is by permit, which allows users to park in specific lots on central campus. There are five metered parking spaces on the east side of Central Avenue and nine spaces on the west side of Central Avenue, in the vicinity of the Johnson Museum of Art.

B. Impacts of Construction Parking

All the existing site parking (108 spaces) in the Sibley and Tjaden lots will be impacted during the construction of these two projects. In addition, there will be a temporary increase in demand for parking by contractors and other personnel associated with the construction of Milstein Hall and CAPG.

Construction for Milstein Hall and CAPG will use the Sibley and Tjaden lots for staging and construction activities. This will require the temporary displacement of all parking during the construction period. With the exception of those with handicap permits, the existing users of these spaces will be accommodated in the existing, temporary 40 space parking lot just across the Thurston Avenue Bridge by Risley Hall, with the remaining 68 spaces absorbed by the existing Thurston lot behind Anna Comstock Hall, and other lots on campus. Parking for those with handicap permits will be provided in parking lots along Central Avenue.

There will be limited parking for construction workers and managers within the staging area. Parking for the majority of the construction work force will be provided in the contractor parking lot located on Palm Road, with shuttle service to the construction site.

C. Mitigation Measures

All impacts to parking during construction will be mitigated as described above. All parking permit holders displaced by both projects will be accommodated elsewhere on campus throughout the construction period. All construction workers commuting to the site will be provided off-site, campus parking and shuttle service to the construction site.

D. Unavoidable Impacts

Temporary relocation of the existing parking spaces in the Sibley and Tjaden lots is an unavoidable impact due to the construction of Milstein Hall and the CAPG. However, there will be a net increase 91 parking spaces, at project completion, as a result of the CAPG project.

3.5 Construction Air Impacts

A. Existing Conditions

The existing ambient air quality conditions at the site are typical of suburban locations near regular roads. Air quality standards relating to air pollutants from automobiles (for carbon monoxide, nitrogen oxides, and particulate matter established by the U.S. EPA and the State of New York) are predicted to be met. Odors from diesel buses around the existing bus stop are present but are dispersed quickly.

Rand Hall: The second and third floors of Rand Hall are naturally ventilated via operable windows. Several of the spaces such as the computer room and crit space are cooled with window mounted air conditioning units. The offices located on the east side of the first floor level of Rand Hall are provided with fresh air via a fresh air intake located on the west face of Rand Hall.

Sibley Hall: The majority of Sibley Hall is naturally ventilated via operable windows. A small quantity of fresh air is also supplied to the Slide Library space located in the Sibley East basement via a fresh air intake located on the south side. Fresh air is supplied to a computer room located in the west wing of Sibley via a fresh air intake on the north side.

The Foundry: The Foundry is naturally ventilated via operable, double-hung windows on each side of the building.

Tjaden Hall: The fresh air intake for Tjaden Hall is located in an elevated penthouse mechanical room on the roof of the building.

Johnson Museum of Art: The fresh air intake for the existing Johnson Museum of Art is located at the north side of the main entrance stair. The fresh air intake for the Johnson Museum of Art addition is located on the west face of the retaining wall that supports the lawn panel between the addition and the original building.

B. Impacts to Air

The proposed projects do not include construction practices that will significantly impact air quality. Some increase of suspended dust particles is unavoidable during aspects of construction. The amount of construction-generated dust depends on several factors including soil conditions, moisture content, amount of time soils are exposed to the wind and sun, weather related factors and construction practices.

Exhaust from construction equipment will be present, but is not expected to significantly affect air quality.

Milstein Hall: Work on the Milstein Hall site will occur over a 21-24 month period. Ground clearing, excavation, selective building demolition and surface disturbance resulting from movement of materials and machinery will result in increased amounts of total suspended particulates (TSP) on and near the site. Demolition and removal of hazardous materials is not anticipated as a result of this project. Asbestos, or other regulated materials have not been found in the areas of the existing buildings slated for modifications or removals. No air quality monitoring during construction will occur, as long as no remediation work is required. In the event that a small amount of unexpected hazardous material is encountered during the work (discovering an interior or underground pipe wrapped in asbestos, for example), the appropriate and required remediation procedures and techniques will be employed (including air quality monitoring) in the specific area of concern to ensure the safety of the construction crew and the public at large. No blasting will occur.

CAPG: Construction of the CAPG will take approximately 15 months to complete, concurrent with the

Milstein Hall construction. Clearing, earthwork and excavation will create the potential for increased dirt and dust particles in the air on and near the site. Sheeting and shoring, excavation and the construction of the garage foundation and superstructure is expected to last six months. The remaining five to six months will involve the installation of mechanical systems, waterproofing, painting and fit-out. After this six month period, no additional disturbance to air quality will occur from the CAPG project site. No blasting will occur.

No significant construction impacts to air quality are expected as a result of the projects.

C. Mitigation Measures

Materials requiring remediation (i.e., asbestos) are not present in the locations slated for selective interior building demolition. It is not anticipated that abatement of hazardous materials will be required as part of these projects.

During construction mechanical fresh air intakes serving the Rand Hall offices, the Sibley Slide Library, and Sibley computer room will be protected or rerouted to prevent construction dust from entering the system.

Dust-control measures during construction of Milstein Hall and the CAPG may include:

- Wetting down the site on a regular basis to minimize dust;
- Maintaining crushed stone tracking pads at all entrances to the construction site;
- Reseeding disturbed areas quickly, so as to minimize bare exposed soils on site;
- Keeping adjacent roads clear of mud and debris; and
- Requiring trucks to be covered.

To minimize impacts to air from exhaust fumes, no diesel-powered generators will be allowed on-site and the use of gas-powered generators or compressors will be avoided to the extent possible; specifications will require contractors not use generators.

D. Unavoidable Impacts

Some increase in total suspended air particles (TSP) is an unavoidable aspect of construction activity.

3.6 Construction Noise Impacts

Noise can be defined as any disagreeable or unwanted sound. Sound is quantified in units called decibels (dB). The loudness of sounds (that is, how loud they seem to humans) varies from person to person, so there is no precise definition of loudness. The degree of disturbance or annoyance of unwanted sound depends on the amount of intruding noise, the relationship to background noise, the type of activity occurring when the noise is heard, and the distance between the source and the receptor. Table 2.12.1 (refer to Chapter Two) illustrates a range of sounds and shows the corresponding loudness, measured in decibels (dB).

A sound pressure change of three decibels is barely perceptible to the human ear, while a sound pressure change of five decibels is readily perceptible. An increase in sound pressure levels of 10 decibels is perceived twice as loud, and a decrease in sound pressure levels of 10 decibels is half as loud.

Noise levels decrease with the square of the distance away from the source, meaning occupants in homes or buildings close to a noise source perceive a much louder noise than those set back even a modest distance. For example, if you were standing right next to a subway train, the noise level would be approximately 100 dB. If you moved approximately 130 feet away from the subway, the noise level would drop to 55 or 60 dB (comparable to singing birds, wind, air conditioning or a quiet automobile). If you move even further, approximately 550 feet away, the noise level would drop to 44 dB (equivalent to a quiet office).

A. Existing Conditions

Current noise activity in the project area includes vehicular and pedestrian traffic on University Avenue, East Avenue and Central Avenue, as well as activities associated with academic building operations. The closest private residence is across the gorge, approximately 550 feet from project noise sources.

B. Noise Impacts

Noise, as a result of normal construction activities, is inevitable and will impact the project area for the duration of construction. Noise levels resulting from construction will vary depending on location and the stage of the project.

Noise levels will be typical for a project of this size, phase and scope. The movement of trucks and excavation equipment is expected to be the largest source of generated noise. The biggest impact of construction noise will be on students and staff working in buildings nearby. It is expected that construction noise during some phases of construction will be audible to nearby residences across Fall Creek Gorge. Since the closest home is approximately 550 feet from the project site, any noise reaching the residences is not likely to be significant.

The project will comply with the City of Ithaca noise ordinance.

C. Mitigation Measures

Construction noise will be muffled to the extent possible and will not exceed levels allowed by law. Although local codes allow construction activity daily from 7:30 A.M. to 10:00 P.M., exterior noise-generating construction activities will be restricted, when feasible, to the hours of 7:30 A.M. to 7:00 P.M. in order to minimize impact on the community. In addition, noise-producing construction activities may be further restricted during exams.

The university will communicate with nearby building occupants to notify them of upcoming construction activities and work with NYSEG and other local utilities providers in order to minimize the noise impacts of their work. The university will work closely with the contractor to implement Best Management Practices (BMP) for noise reduction to the extent possible. BMP mitigation measures listed by New York State Department of Environmental Conservation (NYS DEC) that may be utilized include:

- Source reduction (mufflers, dampeners, electric motors instead of air compressors);
- Duration reductions (limiting days, hours, times);
- Equipment located inside buildings to dampen noise

D. Unavoidable Impacts

Noise as a result of normal construction activities is unavoidable, and will impact the project area for the duration of construction.

3.7 Construction Impacts to Fall Creek Gorge

3.7.1 Paul Milstein Hall

A. Existing Conditions

The Fall Creek Gorge is a natural area on the Cornell University campus, and categorized as a Unique Natural Area (UNA) by the county. Fall Creek is also categorized by the State of New York as a Recreational River. In addition, this section of Fall Creek is designated by the City of Ithaca as a gorge protection zone. Please refer to Section 1.3, Location, Setting and Zoning, for a full description of the above designations. The Foundry, located immediately north of the Milstein Hall site and outside the construction fence, is a grandfathered site within the Fall Creek Gorge that predates these designations. The sidewalk on the north side of University Avenue is not within the Recreational River boundary.

B. Impacts of Construction on Fall Creek

Excavation for the Milstein Hall project will have no negative impact on the stability of the Fall Creek Gorge (see Section 2.1, Land). Proper erosion and sediment control measures will mitigate stormwater impacts on the Fall Creek Gorge (see Section 3.2, Erosion and Sediment Controls during Construction). Some construction activity associated with building the north side of Milstein Hall, such as the boom from the crane operating on site, will be visible from across the gorge.

During the final phase of construction, the construction fence will be removed to allow the feathering-in of the grading up to the sidewalk and reconstructed roadway to accommodate drainage improvements. This work could extend up to 15 feet to the north of the southern Recreational River boundary, but will be limited to in-kind restoration and repair of the existing Foundry gravel driveways or existing flat lawn panels of this grandfathered site within the Fall Creek Gorge.

Milstein Hall construction activity will not impact the south edge of the gorge tree-line that runs along University Avenue.

A crane will be located on site to erect the steel structure. The crane will be located within the construction fence lines and will not be located inside the Recreational River boundary.

C. Mitigation Measures

The contractor will be directed to stay out of the Recreational River boundary except to feather-in grades and landscape in connection with the Foundry.

D. Unavoidable Impacts

In order to construct Milstein Hall, the contractor will need access to the exterior of the building as it is built. The extent of this access has been limited to the bare minimum as described above.

3.7.2 Central Avenue Parking Garage

The CAPG project entails building the new parking garage on the south side of University Avenue with some utility work within the project site and University Avenue. Construction of the CAPG will not impact the Fall Creek Gorge. Construction activity will not take place in the gorge and the limits of construction will keep construction activity away from the gorge.

A. Existing Conditions

The northern-most limit of the project site will be the north curb line of University Avenue. The Fall Creek Recreational River boundary is the north side of the north sidewalk along University Avenue. The sidewalk along this edge is approximately six feet wide providing a buffer between the gorge and the limits of construction.

B. Impacts of Construction on Fall Creek

Excavation for the CAPG project will have no negative impact on the stability of the Fall Creek Gorge (see Section 2.1, Land). Construction activity will be limited to utility work under University Avenue and the construction of the garage on the site south of University Avenue. There will be no equipment or construction activity in the gorge. Sheet piling, excavation, and other construction activities required to construct the parking garage will occur south of University Avenue. For control of stormwater run-off, please refer to Section 3.2, Erosion and Sediment Controls.

C. Mitigation Measures

Construction will take place outside the limits of the Fall Creek Gorge. No mitigation measures are necessary.

D. Unavoidable Impacts

There are no unavoidable construction impacts to the Fall Creek Gorge as a result of the CAPG.

3.8 Impacts of Potentially Concurrent Construction

A. Potentially Concurrent Construction Projects

The construction period for Milstein Hall is anticipated to begin in January of 2009 and run through January of 2011. Construction for the CAPG is anticipated to begin approximately seven months after Milstein Hall, with completion expected by October of 2010. Additional potentially concurrent construction projects planned during the construction of Milstein Hall and the CAPG include other central campus building projects, campus transportation and infrastructure projects, and City of Ithaca road projects. Each is listed in the tables below.

Central Campus Building Projects

Building Project	**Construction Timeline**	**Construction Detail/Activity**	**Potential Impact**
Physical Sciences	Ongoing through January 2011	Staging Area	East Avenue lawn
		Construction Delivery Route	Tower Road to East Avenue, up lawn
		Parking	63 spaces, permanently displaced
		Road Closure	Occasional lane closures on East Avenue
		Sidewalk Closure	East-west walkway between Baker Lab and Rockefeller Hall
		Bike Route	Same as road closure
		Bus Route/Stop	Bus stop on east side of East Avenue
		Emergency Access	Provided by new walkway from East Avenue
Martha Van Rensselaer North Replacement	Ongoing through January 2011	Staging Area	Both sides of Forest Home Drive
		Construction Delivery Route	University Avenue and Tower Road
		Parking	Temporary displacement of 65 spaces in Martha Van Rensselaer North replacement lot, plus 31 spaces in Toboggan Lot
		Road Closure	Possible short-term lane closure on Forest Home Drive
		Sidewalk Closure	No impact
		Bike Route	No impact
		Bus Route/Stop	No impact

Table 3.8.1: Potentially Concurrent Central Campus Building Projects.

Central Campus Building Projects			
Building Project	**Construction Timeline**	**Construction Detail/Activity**	**Potential Impact**
		Emergency Access	No impact
Johnson Museum of Art	September 2008 to January 2010	Staging Area	Lawn south of Johnson Museum, west of Central Avenue
		Construction Delivery Route	University Avenue
		Parking	Temporary loss of seven metered spaces on Central Avenue
		Road Closure	Possible short-term lane closure on Central Avenue
		Sidewalk Closure	North-south sidewalk from main entry of Johnson Museum to University Avenue, closed
		Bike Route	No impact
		Bus Route/Stop	No impact
		Emergency Access	No impact
Humanities Building	June 2010 through June 2012 (Tentative)	Staging Area	Lawn between Lincoln and Goldwin Smith halls
		Construction Delivery Route	Tower Road
		Parking	No impact
		Road Closure	Possible short-term lane closure on East Avenue
		Sidewalk Closure	Sidewalk on west side of East Avenue closed from Lincoln to Goldwin Smith halls
		Bike Route	Same as road closure
		Bus Route/Stop	Same as road closure
		Emergency Access	No impact
Milstein Hall/CAPG	December 2008 to October 2010	Staging Area	Parking lot north of Sibley Hall’s west wing, Tjaden Hall and University Avenue north of the project site
		Construction Delivery Route	University Avenue

Table 3.8.1: Potentially Concurrent Central Campus Building Projects.

Central Campus Building Projects			
Building Project	**Construction Timeline**	**Construction Detail/Activity**	**Potential Impact**
		Parking	Permanent displacement of 105 spaces in the parking lot north of Sibley Hall and three metered spaces on Central Avenue.
		Road Closure	University Avenue closed from East Avenue to Central Avenue
		Bike Route	Same as road closures
		Bus Route/Stop	Same as road closures
University Health Services Facility	January 2010 to May 2013 (Tentative)	Staging Area	Between Gannett and Campus Road
		Construction Deliveries	Campus Road
		Road Closure	Campus Road closed to one-way traffic
		Road Closure	Campus Road closed to all traffic
		Parking	27 spaces permanently displaced
		Sidewalk Closure	East-West Campus Road
		Bike Route	Same as road closures
		Bus Route	Same as road closures
		Emergency Access	No impact

Table 3.8.1: Potentially Concurrent Central Campus Building Projects.

Campus Infrastructure Projects	**Construction Timeline**
Campus Road reconstruction east of Garden Avenue to Wing Drive	Summer 2009
East Avenue utility upgrade	Spring/Summer 2009 (tentative)

Table 3.8.2: Potentially Concurrent Infrastructure Projects.

City of Ithaca Road Projects	**Construction Timeline**
University Avenue Reconstruction from Linn Street to Lake Street	Unknown
Triphammer Road Reconstruction	Unknown

Table 3.8.3: Potentially Concurrent City of Ithaca Road Projects.

B. Impacts of Concurrent Construction Projects

Construction impacts of concurrent construction projects, particularly those impacts that extend outside of the project's construction and staging area, have been evaluated for potential overlapping or compounding impacts. These include parking loss, and closures and detours for vehicle, transit, bicycle, and pedestrian routes.

Parking Loss:

The concurrent construction of Milstein Hall and the CAPG, Physical Sciences, University Health Services, and the Human Ecology building and parking garage will temporarily impact the parking available on central campus. During the construction period for the proposed projects, a total of 294 spaces will be displaced (63 at Physical Sciences, 96 at Martha Van Rensselaer, 27 at University Health Services Facility, and 108 at Milstein/CAPG).

Road or lane closures:

Three projects will require temporary lane closures on East Avenue: Milstein Hall and the CAPG, Physical Sciences and the Humanities Building. For short periods of time, Milstein Hall and the Humanities Building projects will temporarily impact the south-bound lane of East Avenue, while Physical Sciences project will impact the north-bound lane of East Avenue. Lane closures on East Avenue will impact vehicles, transit, and bicycle traffic using that lane. In addition, the adjoining sidewalk will also be impacted.

C. Mitigation Measures

Parking Loss:

As discussed in Sections 1.10, Relationship of Proposed Plans to TDMP and Draft Cornell t-GEIS and 3.4, Construction Phase Parking, users of these parking spaces will be accommodated on other parts of campus during the construction period. With the completion of the parking garage scheduled for spring of 2012, 451 new parking spaces will be available on central campus (199 at CAPG and 252 at the Martha Van Rensselear parking garage) and the Tobbogan lot (31 spaces) will be re-opened for a total of 482. This results in a net gain of 188 spaces.

Road or lane closures:

The three projects that will require temporary lane closures on East Avenue (Milstein Hall, Physical Sciences and the Humanities Building) will coordinate schedules to insure that traffic flow is maintained on East Avenue at all times. Flag people will be provided as necessary to guide traffic during lane closures.

D. Unavoidable Impacts

Temporary traffic delays and pedestrian detours will be necessary during lane closures.

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CHAPTER FOUR:

Alternatives to the Proposed Action

Chapter Four: Alternatives to the Proposed Action

Prior to Cornell's approval of the current OMA design, three alternative plans were developed and rejected by the university for the Milstein Hall project. Each proposal was prepared by a respected architectural firm. The first design was developed in 1997 by Schwartz/Silver Architects. The second, was through a design competition sponsored by the university in 2001, developed and won by Steven Holl Architects. The third was developed in 2003 by Barkow Leibinger Architects.

In addition, with respect to the present Milstein design by OMA, two alternates were investigated in 2007 but rejected. One considered an alternate using columns on the far side of University Avenue, and another considered alternates for the south facade.

The building and site designs for each rejected alternative are described below, including a brief summary as to why the design was rejected.

4.1 Alternatives to Paul Milstein Hall

4.1.1 Schwartz/Silver Master Plan Study

Background

In 1997, Cornell hired the Boston firm of Schwartz/Silver to evaluate the feasibility of expanding College of AAP building facilities and prepare a conceptual master plan. This concept plan included ideas for building additions and interior renovations to Sibley Hall, Rand Hall, Tjaden Hall and the Foundry.

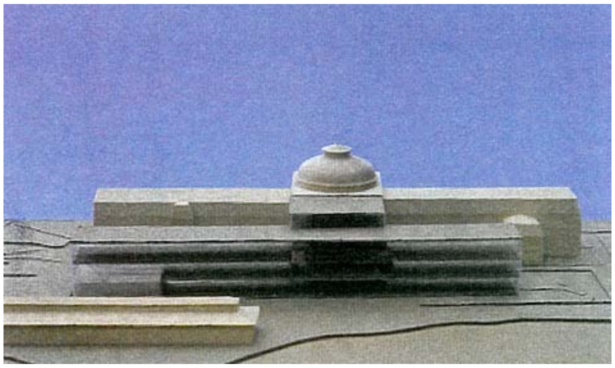


Figure 4.1.1: Model view looking south, bar scheme.

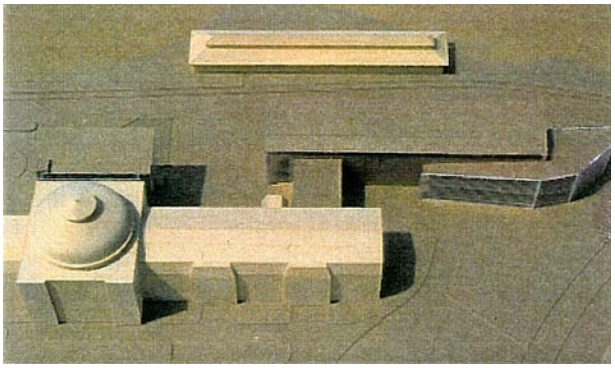


Figure 4.1.2: Model view looking north, bayonet scheme.

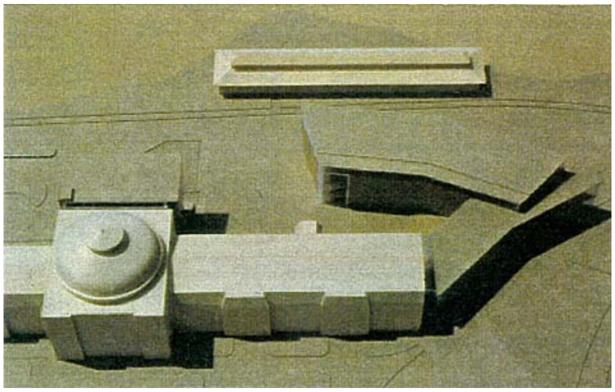


Figure 4.1.3: Model view looking north, boomerang scheme.

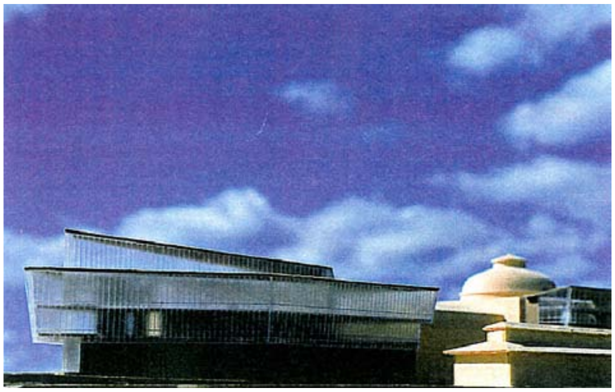


Figure 4.1.4: Model view looking southwest, free-standing building scheme to replace Rand Hall.

Building Design

The feasibility study examined several possibilities for additional building spaces. These included a conceptual examination of bar-shaped, bayonet-shaped, boomerang-shaped and freestanding structures. Please refer to Figures 4.1.1-4.1.4 for images of these building schemes.

The master plan study ultimately proposed the addition of a glass structure to the north side of the Sibley Hall dome. This addition included an auditorium, gallery, library and study spaces. It also included a grand stair entrance on the north side of Sibley Hall with an accessible ramp and large sculpture terrace. Please refer to Figure 4.1.5 for an image of the proposed addition.

An addition to the roof of Rand Hall was proposed as well, consisting of a glass-enclosed penthouse. This large, open-floor, loft space would house thesis studios and a large crit room. Additional studio space was proposed in a long mezzanine level set against the north wall. Please refer to Figure 4.1.6.

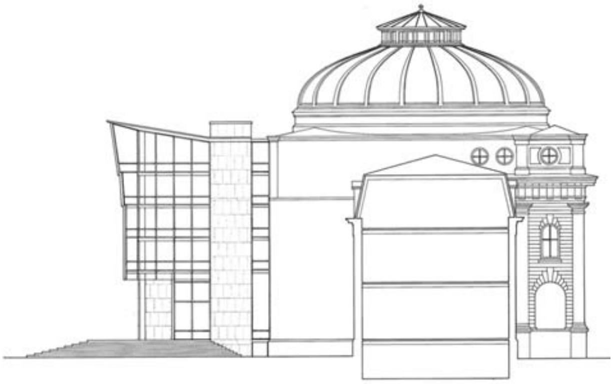


Figure 4.1.5: Section view, Schwartz/Silver glass structure addition to the north side of Sibley Hall dome.

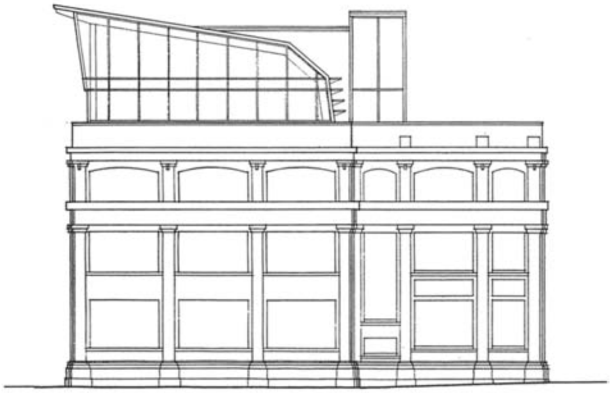


Figure 4.1.6: Section view, Schwartz/Silver glass structure addition to the roof of Rand Hall.

The study also included suggestions for interior renovations to all four of the college occupied buildings. Based on this study, small renovations occurred in Sibley Hall, Rand Hall and the Foundry. A major structural renovation was proposed (and completed) for Tjaden Hall to reorganize programmatic space and correct for code, life safety and accessibility issues.

Site Plans

The majority of the site for the Schwartz/Silver plan consisted of building or parking areas. See Figure 4.1.7. This was due to the university's need to provide the same, if not more, parking spaces in the area. Two separate parking lots were considered, one on each side of the glass structure addition on the north side of Sibley Hall. In an attempt to increase parking efficiency, the lot to the west was widened to provide three parking bays. However, the amount of parking available in these two areas was less than the existing surface lot provided. In response, the master plan considered the addition of an above-ground, multi-tiered parking structure behind Tjaden Hall to take advantage of the natural drop in grade at west end of the site.

Reason(s) Not Chosen

While the College of AAP utilized the study's recommendations to renovate portions of Tjaden, Sibley, Rand and the Foundry, it did not find any of the overall directions recommended by the study to be satisfactory for expanding program space. As the study was a preliminary examination of the site and

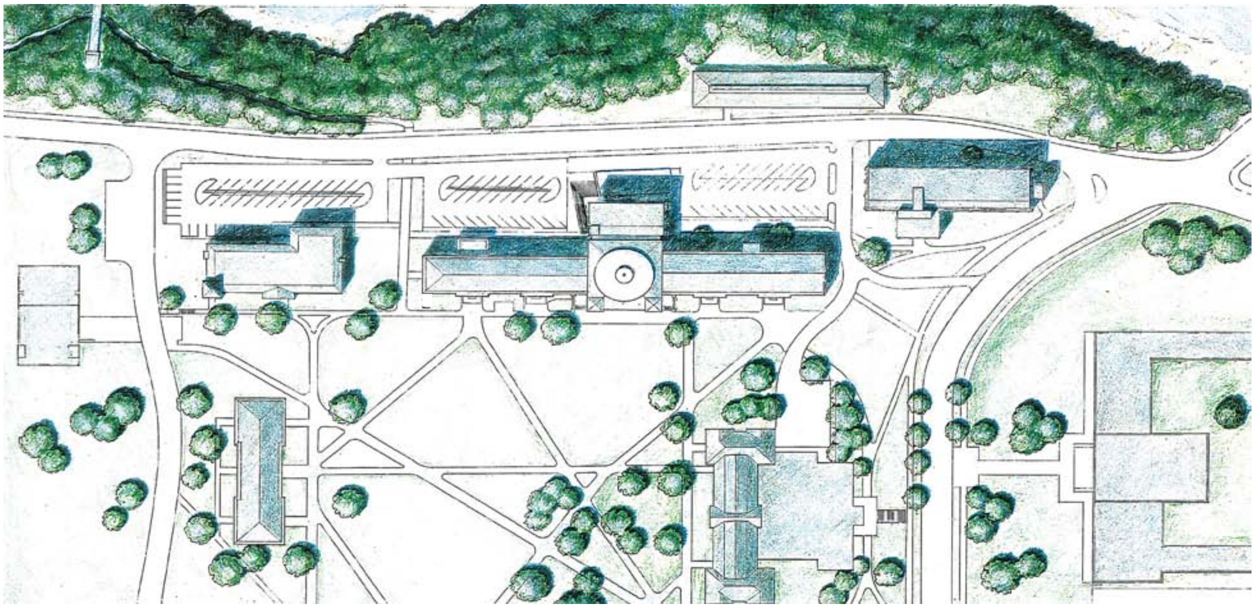


Figure 4.1.7: Schwartz/Silver site plan.

buildings, no one concept was fully fleshed out. Some left Rand Hall in place, others demolished it. Service, access and parking were not fully resolved. The separate additions tended to further fragment rather than unify the college's programs. None of them addressed the need to promote interdisciplinary studies.

The process of working through the ideas with Schwartz/Silver clarified the college's need to engage in a detailed program study, in order to more accurately identify and categorize the college's spatial, technological, and interdisciplinary needs.

Potential Historic Impacts of Proposal

The Schwartz/Silver design had a smaller footprint than the current designs of Milstein Hall and the CAPG but preserved and expanded the 1950s parking lot. The Schwartz/Silver modifications to the exterior of both Sibley and Rand were removable without impairing the integrity of the original buildings. However, the modifications to Sibley and Rand were more prominent than in the current OMA design according to historic resources consultant John Bero, of Bero Architecture. At Sibley, they affected the center dome section, and at Rand they were atop the building, changing its profile.

The Schwartz/Silver design called for irreversibly lowering the first floor of the Sibley dome section to align with the first floors of the wings. The current proposal makes only the minimum changes needed to accommodate access between the buildings.

In the Schwartz/Silver design, the issues of compatibility were dealt with by concealment of the auditorium and by contrast. The stone cladding for the base of the Schwartz/Silver addition to Sibley was a veneer, a fundamentally different feel from the stone of Sibley, according to John Bero. The requirement to differentiate old from new and acknowledge changes as products of their time was recognized by this design.

While the potential negative impacts to historic resources of this rejected scheme were minor, adding to the important dome section of Sibley and changing the profile of Rand by the addition of a fourth story had undesirable impacts on these two historic resources. Moreover, while the additions created needed space, they did not unite the separated facilities or programs. The design was rejected.

4.1.2 Steven Holl Proposal

Background

In the fall of 2000, Steven Holl Architects of New York was chosen as the winner by a distinguished, external jury in a design competition commissioned by the university. It was becoming increasingly urgent for the university to construct a new building that would provide additional space to correct the deficiencies identified by the National Architectural Accrediting Board.

Building Design

Steven Holl's proposal demolished Rand Hall and erected a single vertical structure in its place. The building was a seven story "cube" that had studio space on a number of levels. An addition made of similar material was proposed to the north side of the Sibley dome. The two structures were connected by an underground tunnel. Holl compared the design concept of the new building to the Johnson Museum, as both buildings were vertical boxes located just outside of the Arts Quad. Holl proposed a luminous building, constructed of structural glass and aluminum, to play off the concrete mass of the Johnson Museum of Art. Please refer to Figures 4.1.8, 4.1.9 and 4.1.10 for images of the proposed building.

Figure 4.1.8: Visual simulation, Steven Holl proposal, looking west.

Figure 4.1.9: Visual simulation, Steven Holl proposal, looking east.

Figure 4.1.10: Visual simulation, Steven Holl proposal, looking north.

Site Plans

The Holl proposal attempted to create a campus gateway at the Thurston Avenue Bridge, with pedestrian passage at the building's ground plane. See Figure 4.1.11. The placement of the building outside the northeast corner of the Arts Quad reflected the position of the Johnson Museum of Art, outside the northwest corner of the Arts Quad. Similar to the Johnson Museum of Art, views from the studios focused on Fall Creek Gorge, Cayuga Lake, and elsewhere on campus. The existing parking lot remained on site.

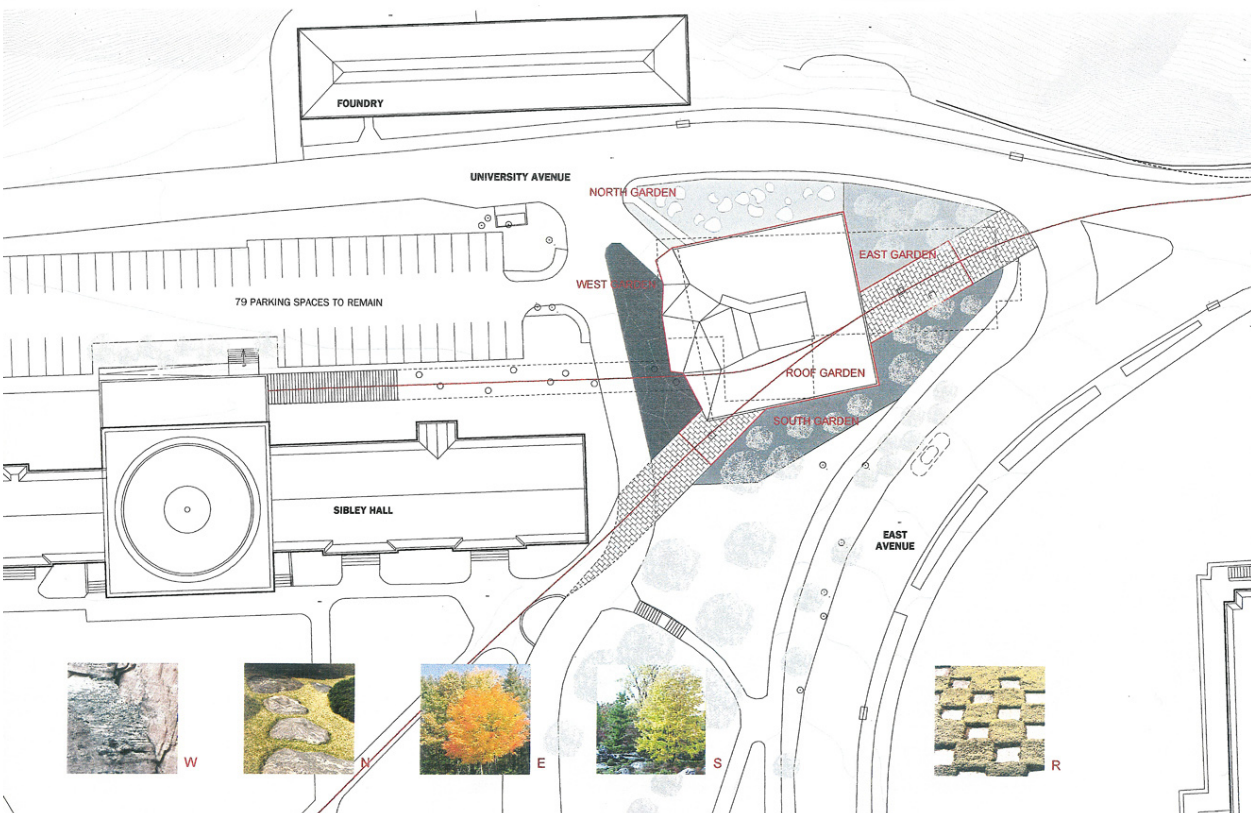


Figure 4.1.11: Site Plan, Steven Holl proposal.

Reason(s) Not Chosen

Although an external jury selected this as the winning design, the university rejected it for several reasons. Among them, it called for the demolition of Rand Hall, which faculty and students strongly connected to and wanted to keep. Scale and massing of the building were larger than other buildings on or near the Arts Quad; at seven stories, it would have been one floor higher than the Johnson Museum of Art.

Pedagogically, studios dispersed over many floors are difficult to use effectively for teaching. Studio spaces were isolated from other studios, the workshop and computer facilities. Faculty and students wanted a studio layout that would be on one floor to promote collaboration across disciplines of the college, as well as across different class years, even integrating graduate and undergraduate studios. The college felt that Holl's stacked studio arrangement failed to address this programmatic need.

Potential Historic Impacts of Holl's Proposal

According to John Bero, of Bero Architecture, the historic preservation consultant, the Holl design had greater impacts on historic resources than the rather modest proposal for the present designs of Milstein Hall and the CAPG do. The Holl design would have demolished Rand Hall. The Holl building was to be a "gateway" and, because of its mass, and particularly its height at seven stories, it would have affected the scale of this area in a major way. It would have changed the setting of the Foundry, which was historically part of a complex of low scale (one- and two-story) buildings serving programs in Sibley Hall, and Rand itself. It broke the roof plane established by Sibley and Lincoln halls for buildings beyond that corner of the Arts Quad.

The Holl proposal required removal of Rand Hall; although Rand Hall is not officially designated as a historic building, its removal was unacceptable to the university.

Like the current design for Milstein Hall, the Holl design for the addition to Sibley Hall's dome section was modest, clearly a product of its time, and removable without compromising the integrity of the historic building. However, the Holl design, like the Schwartz/Silver design, made unacceptable changes to the prominent dome section of Sibley.

Regarding the site, except for the loss of Rand, little was changed from the present arrangement. The 1950s parking lot and related pedestrian and auto circulation remained largely intact. However it did not correct long-standing pedestrian and vehicle conflicts. By contrast, the present Milstein Hall design creates better pedestrian circulation and the CAPG proposal compacts the parking in a three-level structure with two levels concealed underground. Concealment of automobiles is considered a positive impact when trying to preserve or restore the historic aspects of an early twentieth-century site.

In the Holl design, the exterior structural glass channels planned to sheath most of the new work contrasting strongly with old masonry walls with no attempt to imitate original materials or details. Like the present proposal, this use of contrasting materials helped to differentiate new from old.

The permanent loss of Rand Hall, together with the scheme's failure to unite the colleges' scattered program spaces, caused the rejection of the Holl design.

4.1.3 Barkow Leibinger Proposal

Background

From 2002-2003, the university retained the German architecture firm of Barkow Leibinger to design a new building.

Building Design

The Barkow Leibinger design consisted of a linear, three-story, bar building. The length of the building required the demolition of Rand Hall. It did not connect to Sibley Hall. It occupied the majority of the parking lot to the north of Sibley and Tjaden halls. It was intended to house studios, galleries, and an auditorium necessary for the college. Please refer to Figures 4.1.12 - 4.1.15 for images of the proposed building.

The scale of the Barkow Leibinger building remained under the height of the Sibley Hall dome as a means to respect the scale of the Arts Quad and its associated buildings. The Sibley dome would remain visible from both north and south of campus. However, at three stories, it competed with the three stories of Sibley's east wing and failed to moderate to the one story height of the Foundry. The building was highest on the east side, as a means to establish a gateway presence at the intersection of University Avenue and Thurston Avenue. A cantilevered portion of the building marked a threshold entrance to the Arts Quad at this location and included a landscaped terrace.

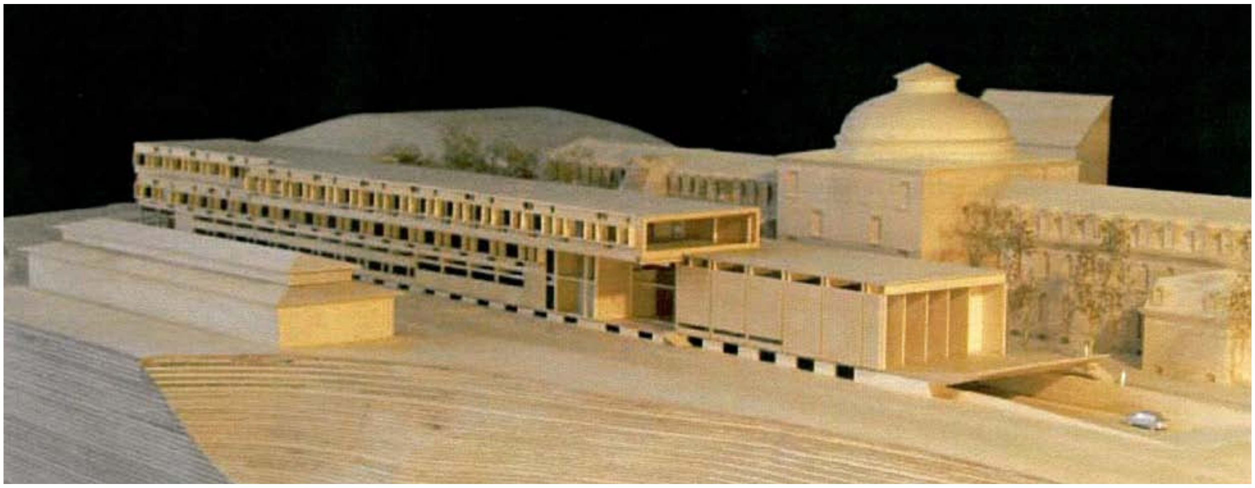


Figure 4.1.12: Model view, Barkow Leibinger proposal looking southeast.

Figure 4.1.13: Model view, Barkow Leibinger proposal looking northeast from the Arts Quad.

Figure 4.1.14: Barkow Leibinger proposal looking southwest from the Thurston Avenue Bridge.

Figure 4.1.15: Barkow Leibinger proposal looking east from University Avenue.

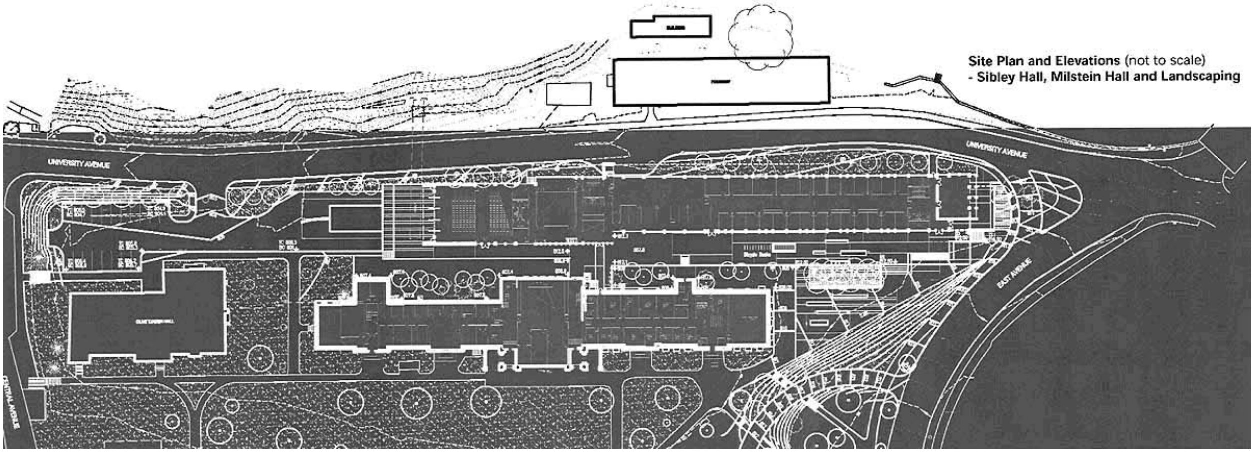


Figure 4.1.16: Site plan, Barkow Leibinger proposal.

<u>Site Plan</u>

As the majority of the Barkow Leibinger site was dedicated to the building itself; very little site was left for landscaping and pedestrian circulation. A small surface lot remained behind Tjaden and structured parking below the building was proposed as well. See Figure 4.1.16 for an image of the site plan.

<u>Reason(s) Not Chosen</u>

The Barkow Leibinger proposal was rejected because the mass of the building, at a full three stories and approximately 570 feet long, did not relate to Sibley or the Foundry. Two-thirds of the back of Sibley Hall was obscured. It did not connect to Sibley Hall. The linear building layout was not conducive to collaborative work among students and faculty in studio space. Very little open space was available for pedestrian circulation through the site and along University Avenue. The proposal also called for the demolition of Rand Hall.

<u>Potential Historic Impacts of Proposal</u>

This design replaced Rand Hall and much of the parking lot with a relatively large building having plan proportions roughly mirroring those of Sibley, but shifted to the east. According to John Bero, of Bero Architecture, the historic preservation consultant, the plan view of the Barkow Leibinger design imitates the historic use of the site, since the area occupied by this building was once occupied by workshops (including Rand Hall) serving the academic programs in Sibley (see Figure 4.1.17). However, at three stories, it did not effectively “step down” from the three stories and dome of Sibley to the single story of the Foundry.

Like the current Milstein proposal and other proposals described here, exterior materials, metals and glass, contrasted with old masonry to differentiate new from old.

The major negative impact to historic resources of this rejected scheme was the permanent loss of Rand Hall. Positive impacts included restoration of much of the site to its historic use and concealment of some automobile parking by placing it below grade. Overall, its linear proportions and failure to connect effectively to Sibley caused its rejection.

Figure 4.1.17: Aerial photo showing historic workshop locations behind Sibley Hall, c.1950.

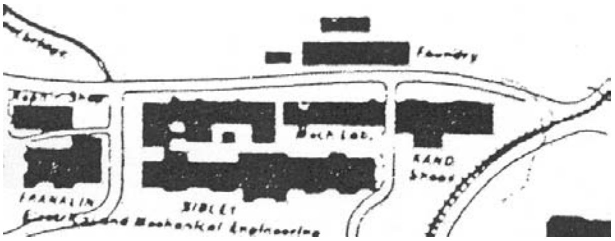


Figure 4.1.18: Map illustrating historic workshop locations behind Sibley Hall, c.1929.

4.1.4 OMA Design with Columns

Background

In 2005 OMA was chosen to develop plans for Milstein Hall. An alternate to the current cantilevered building design was studied. The design incorporated six structural columns supporting the extension of the second floor over University Avenue. Please refer to Figures 4.1.19 - 4.1.21 for images of the previously proposed design.

Building Design

The columned scheme located six structural columns with protective guardrails on the north side of University Avenue, 15 feet south of the Foundry.

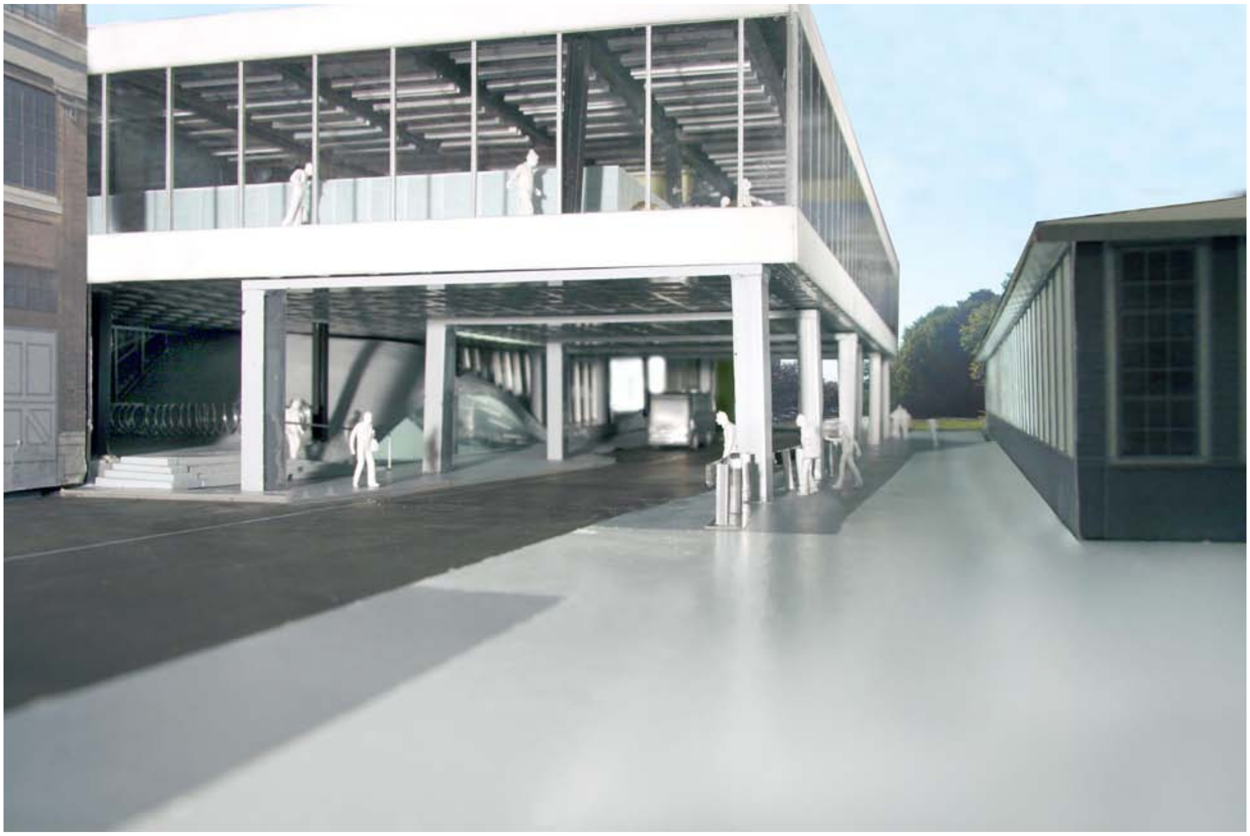


Figure 4.1.19: Model view looking west, previous OMA design plan with columns and guardrails.

Figure 4.1.20: Model view looking west, previous OMA design plan with columns and guardrails.

Figure 4.1.21: Model view looking west, previous OMA design plan with columns and guardrails.

Site Plan

The columned scheme required a slight realignment of University Avenue, a public right-of-way, to provide adequate sight and safety distances.

Reason(s) Not Chosen

The decision to change the structural design to a cantilevered scheme for the building span over University Avenue occurred near the end of the Design Development phase of the project. This decision was the result of a thorough analysis of the advantages and disadvantages between the two systems.

The columned scheme would cost substantially less than the cantilevered scheme and would also be less technically challenging to design and build. However, by the end of the Design Development phase it became apparent that there were several advantages to pursuing a cantilevered scheme that warranted the additional cost and technical challenges. The cantilevered scheme would:

- Mitigate impacts on the Foundry
- Improve sight lines and pedestrian safety
- Improve aesthetics by removing guard rails
- Prevent deterioration due to road salt
- Create superior architectural design
- Illustrate an innovative structural design, making the building a teaching tool

See Figure 4.1.22 for an elevation view of Milstein Hall's hybrid truss system.

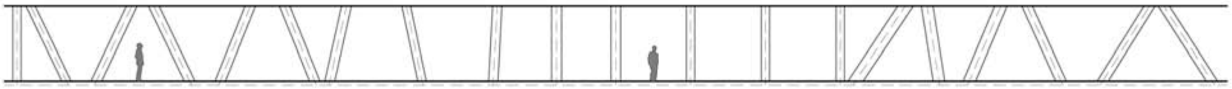


Figure 4.1.22: Elevation view of Milstein Hall's hybrid truss system.

A letter from Leslie Chatterton on behalf of the Ithaca Landmarks Preservation Commission (ILPC) dated May 3, 2007, raised concern about the impact that six columns on the north side of University Avenue may have on the Foundry. After creating visual simulations comparing the columned scheme to the cantilevered scheme and consulting with historic preservation consultant John Bero, of Bero Architecture, the university determined that removing the columns would mitigate the ILPC's concern about impact on the Foundry.

The university was also concerned about pedestrian and vehicular safety issues, as well as long-term maintenance issues associated with concrete-encased steel columns located two feet from the edge of the roadway. The cantilevered scheme mitigates these issues by opening sight lines and creating a safer pedestrian environment under the cantilever. Additionally, from a long-term maintenance standpoint, it is advantageous to not have major structural columns exposed to corrosive road salt.

The columned scheme required a slight realignment of University Avenue and, in turn, an agreement with the City of Ithaca to make changes to the existing public right-of-way. Given the long history of negotiations between the City of Ithaca and Cornell over University Avenue, it became clear that the columned scheme would significantly delay the approvals process and the construction start date. Considering the added construction cost escalation that would result from this significant schedule delay, the cantilevered scheme, which does not encroach on the existing right of way, presented itself as the clearest path to constructing Milstein Hall within a reasonable time frame. It was also critical to meeting the timetable for AAP facility improvements to maintain accreditation from the National Architectural Accrediting Board (NAAB). From an architectural standpoint, replacing the six columns with a cantilever produces a more compelling and original building design. The openness under the cantilever strengthens the simplicity of the second floor above, and the attractiveness of the space beneath it. The cantilever is accomplished by embedding five hybrid diagonal trusses into the floor-to-ceiling depth of the second floor. The hybrid nature of the diagonal truss system allows the diagonal truss members in the middle of the floor plan to be oriented more vertically, thus improving the functionality and flexibility of the interior space. The hybrid truss is visible from both the interior and exterior of the building through the glass curtain wall. It is itself a unique expression of innovative structural design. The varying angles of the diagonal truss members are linked to the structural stresses experienced at each location. In its own right, the hybrid truss becomes a laboratory for teaching future architects these structural design concepts. Please refer to Figure 4.1.21 for an image of the hybrid truss system.

Potential Historic Impacts of OMA Design with Columns Proposal

The ILPC letter dated May 3, 2007 specifically noted, “ILPC members stated that the height and scale of Milstein overpowers the Foundry, a situation exacerbated by placing the one-story piers within 10 to 15 feet of the Foundry’s south façade. The current configuration obscures the view of the Foundry from Sibley and from within the new building.” *Note: The closest pier in this alternate was 15 feet from the Foundry.*

According to John Bero, of Bero Architecture, the historic preservation consultant, the view of the Foundry from Sibley was historically blocked by intervening workshops but removing columns will help mitigate the university’s and the ILPC’s concern by opening eye-level views and reducing impediments to pedestrians crossing University Avenue.

4.1.5 OMA Design at Sibley Hall's Southwest Corner

Background

OMA developed alternate locations for the south façade of the current design of the cantilevered forum space at the southwest corner of Milstein Hall. Particular attention was paid to building design and details at this important juncture between old and new.

Building Design

The current design scheme, which preserves the historic cornice, is shown in Figure 4.1.25.

Following are the two rejected design iterations:

1. A "flush" scheme where the south façade of the Forum cantilever was flush with the south façade of the east wing of Sibley Hall. See Figure 4.1.23.

2. An "Alignment with Quoins" scheme where the south façade of the Forum cantilever was pulled approximately 12 inches back to the north of the south façade of the east wing of Sibley Hall and aligned with the stone quoins that wrap the corner of East Sibley. This scheme did not expose any yellow brick between the south façade of Milstein and the south façade of Sibley. See Figure 4.1.24.

Reason(s) Not Chosen

The "flush" scheme was developed early in the design process and was included in the sketch plan review presentation to the Ithaca Landmarks Preservation Commission (ILPC) in the fall of 2007. Concerns were raised by members of the ILPC regarding the relationship of the south façade of the forum space to the south façade of Sibley. ILPC members discussed the importance of the interface between a building addition and a historic building. The quality of the detailing of this interface has an impact on the success of the project from a historic preservation standpoint. With this in mind, the university and OMA, along with guidance from John Bero, determined that pulling the forum space back approximately one foot from the face of Sibley would reduce the amount of historic cornice that would have to be removed.

In response, this "Alignment with Quoins" scheme was further developed and detailed. See Figure 4.1.24. However, during a comprehensive historic preservation review of the Milstein Hall project with the Cornell team, OMA, and John Bero, it became evident that a small section of historic cornice that wraps the southeast corner of Sibley East would have to be removed to construct the "Alignment with Quoins" scheme, and it was rejected. In order to recognize the supporting nature of Milstein and minimize removal of historic materials, it was decided, based on John Bero's recommendation, to move the south facade of the forum space north a full 3' 1" from the south face of Sibley, deferring to Sibley and fully retaining and preserving the historic cornice.

Potential Historic Impacts of Proposal

The two rejected design schemes required removal of more historic material than necessary. The proposed setback position of Milstein's facade recognizes the functional and historic relationship of the buildings and is consistent with the Secretary of the Interior's Standard 2 that states, "...[t]he removal of historic materials or alteration of features and spaces that characterize a property shall be avoided."

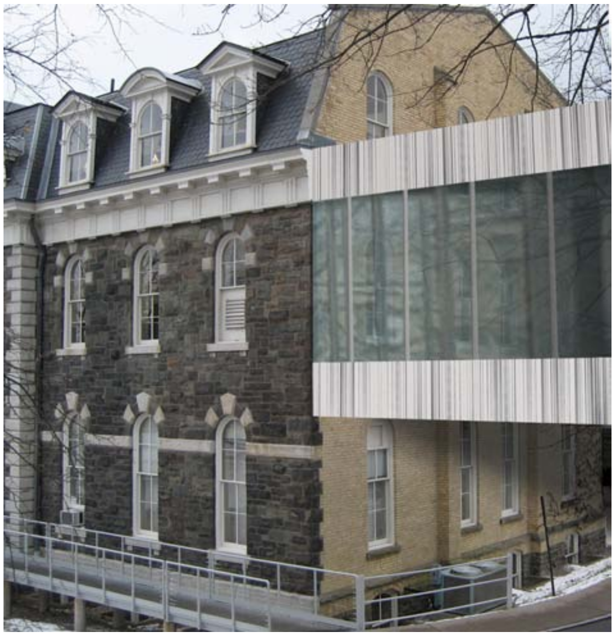


Figure 4.1.23: "Flush" design scheme for the south facade of Milstein at Sibley's southwest corner.

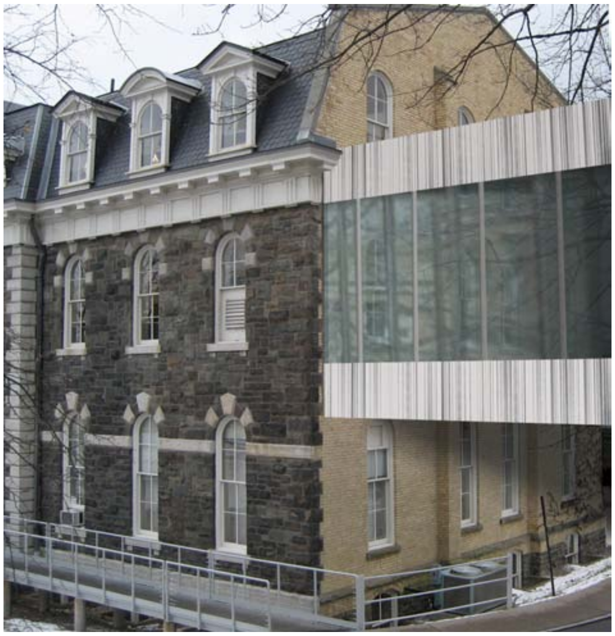


Figure 4.1.24: "Alignment with Quoins" design scheme for the south facade of Milstein at Sibley's southwest corner.

Figure 4.1.25: "Preserved Cornice." Current design scheme for the south facade of Milstein at Sibley's southwest corner. Red arrow indicates preserved cornice.

Note: Only the upper plate and cornice are modeled in these views. Other alterations to existing conditions are not represented in this image. For instance, the ADA ramp will be removed.

4.1.6 Existing Plan that Preserves Program, Without Extension over University Avenue

Background

The existing plan includes approximately 8,500 square feet of necessary studio space cantilevered over University Avenue. As the need for this programmatic space is critical, reducing the square footage is not an acceptable option for the college. Moreover, the layout of the second floor is integral to the original inspiration and concept of the building design: an upper plane hovering in space over a lower plane, which uplifts in a single fluid gesture to meet the underside of the upper plane.

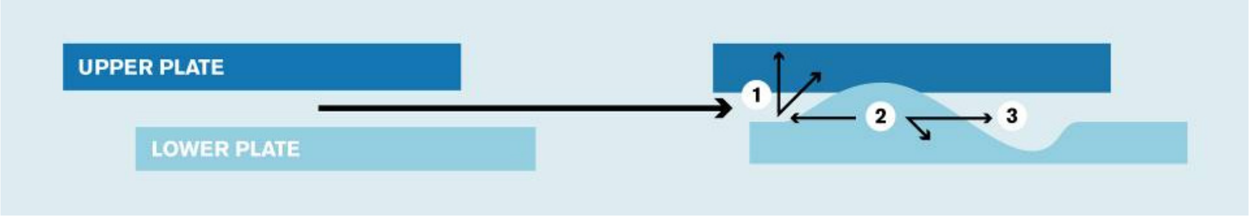


Figure 4.1.26: Diagram of Milstein Hall's programmatic space.

Figure 4.1.27: View of Milstein Hall, looking east.

Cutting off the cantilever would not constitute a reasonable adjustment in design or be acceptable to either the university or the architect. However, the City of Ithaca Planning Board in formulating the Scope of the Environmental Impact Statement included the request that Cornell add to the section on alternatives, an alternative to the "existing plan which preserves program, without extension over University Avenue."

Given the site constraints, there are three basic configurations that could accommodate the program without extension over University Avenue:

- Increase the building height to three stories
- Infill the first floor with occupied space
- Extend Milstein's second floor 100 feet to the west

Description and Discussion of Configurations

Increase the height to three stories

This configuration adds a third floor to the building, creating an additional 8,500 square feet above the second floor. This would have a negative impact on the programmatic layout and pedagogical goals of the college, just as the previous rejected schemes did. Separating the program into two floors conflicts with the college's critical goal of locating studios on one floor to foster interdisciplinary collaboration. The addition of a third floor would cause the height of the building to be as high as the wings of Sibley Hall, and obscure from the north the central volume of the dome.

According to John Bero, of Bero Architecture, the historic preservation consultant, a two-story building historically occupied the site. The Schwartz/Silver, Holl and Barkow Leibinger schemes included elements that were four-, seven- and three-stories tall, respectively. Although located out of the Quad and in the traditional service yard, the heights of these schemes made them less deferential to the surrounding buildings and taller than the original service buildings which occupied this site. Limiting Milstein's height to two stories matches historical use and improves compatibility with the existing buildings by reducing its prominence.

Infill the first floor with occupied space

This configuration locates 8,500 square feet in the open space under the second floor. However, due to the structural arrangement of this floor, the studio space as a unit would not fit in this location because entrance, reception and circulation space also needs to go on a first floor. As in the previous configuration, studio spaces would have to be separated from those on the second floor, and thus conflict with the college's critical goal that studios be located on one floor for interdisciplinary collaboration. Filling in the open space under the second floor would also block pedestrian pathways between the Arts Quad, Foundry, and north campus.

Figures 4.1.17 and 4.1.18 shows use of the site before support facilities for Sibley programs were removed to accommodate automobiles. According to John Bero, of Bero Architecture, the area was almost completely occupied by the central power plant and workshops. Vehicles moved between Rand and a two-story workshop; and pedestrian circulation was possible between Sibley dome and the Foundry. Views of the Foundry from the interior of Sibley were hidden. From a historical perspective alone, filling in the ground floor is a possible strategy to restore the site to its historic arrangement, and properly relegates the Foundry to its historic utilitarian status.

Extend Milstein's second floor 100 feet to the west

This configuration involves extending the second floor to the west by 100 feet. Although the studio space is maintained at this level, the second floor would overlap half of the domed section of Sibley Hall. Ending the building at this location would not follow classical or modernist principles of design. The domed section of Sibley is dominant even from the north view because its footprint extends prominently beyond the two wings of Sibley. At ground level, the service and parking entry designed for the area north of Sibley would need to move west, eliminating a portion of the parking facilities in that area.

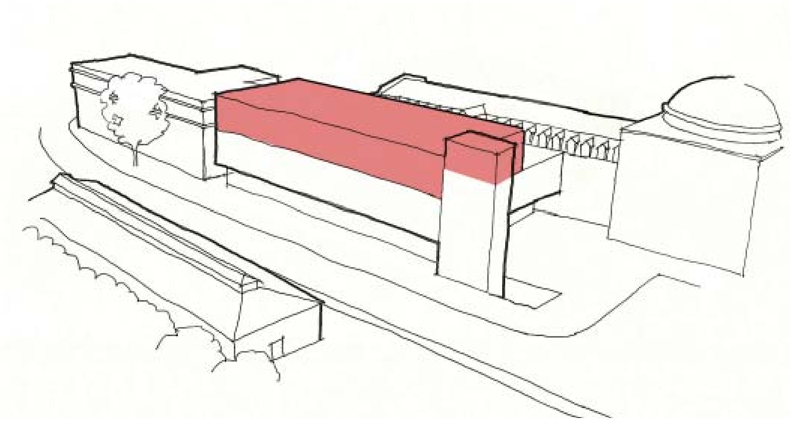


Figure 4.1.27a: Massing Diagram; Increase height to three stories.

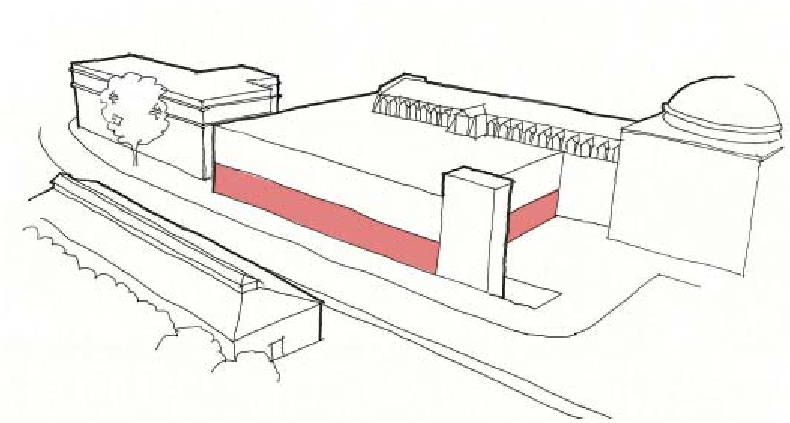


Figure 4.1.27b: Massing Diagram; Infill first floor.

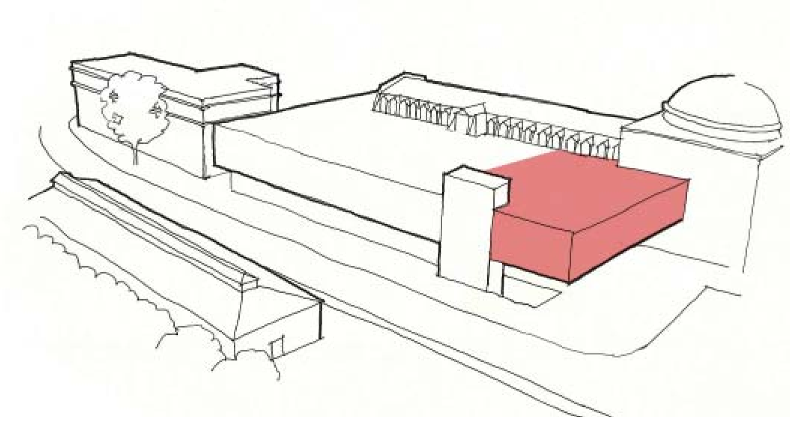


Figure 4.1.27c: Massing Diagram; Extend second floor west.

The organization of the site would lose its intrinsic logic and efficiency.

Historically, according to John Bero, of Bero Architecture, workshops obscured the view of Sibley from the north and the Foundry from the south. Milstein Hall and the CAPG will occupy the area used by the support buildings, but the CAPG's low height does not match the height of earlier buildings. Milstein's second-story occupies only the northern portion of the site, east of the west end of the Foundry; only here is the addition two-stories tall, roughly matching the height of earlier construction. Expanding Milstein's second floor westward is a valid strategy to help restore the site to its historic use and ambiance, and to properly relegate the Foundry to its historic utilitarian status.

Cornell believes this configuration would engulf the domed section of Sibley, causing it to lose its iconic identity from the north. The physical connection between the new building and the existing volume under the dome would be problematic because the floor levels below the dome are a half story higher than the floor levels of Sibley East and the new Milstein building. Each of the back corners of the volume under the dome contains stairwells. Extensive removals would be required to make a physical connection between the old and new buildings.

For these reasons, none of the above configurations would be acceptable to the university or the architect.

4.1.7 No Action

The College of AAP has been under severe pressure for a number of years by the National Architectural Accrediting Board (NAAB) to improve the physical facilities for its highly regarded Department of Architecture. The NAAB conducts surveys of each accredited architecture school on a five year cycle. A key excerpt from the 1998 NAAB report states:

> The physical facilities devoted to the program in architecture have serious deficiencies that are detrimental to the quality of the program. Few, if any, of these are new. The 1983 NAAB team report called the facilities "atrocious - below minimum standards." The 1988 NAAB team report said, "... this [the 1983 characterization of the facilities] continues to be the case." The 1993 NAAB team reported, "...the deplorable conditions of the physical facilities..."

If no action is taken to improve the facilities, the College of Architecture stands to lose its National Accreditation. The NAAB is scheduled to survey the Department of Architecture in the fall of 2008. It is not an option for the university to take no action to enhance and expand the college's facilities.

4.2 Alternatives to the Central Avenue Parking Garage

4.2.1 Surface Lot

Background

This alternative consisted of developing a new grade-level parking area in the locations currently occupied by surface parking behind Sibley and Tjaden halls, less the area to be occupied by Milstein Hall. This alternative was not pursued by the university, for the reasons indicated below.

Parking Design/Site Plan

The parking and site design for this alternative would be similar to the grade-level design of the proposed parking garage. Parking could be provided for approximately 70 vehicles. The entrance and exit drives would be from University Avenue. Pedestrian walkways, accessible parking spaces, and delivery areas could all be developed as in the proposed garage plan. The widening of the lot area behind Tjaden would most likely require a retaining structure and protective guardrails around the northwest corner due to grade differences.

Reason(s) Not Chosen

There would be a net loss of 35 parking spaces from the number currently provided in an area that experiences a high demand for parking. Compared to the proposed parking garage, this design would provide 130 fewer parking spaces. The new campus master plan is recommending that opportunities to increase parking in and around central campus by developing underground parking and parking under new buildings should be seized wherever possible. Long-term concepts for buildings behind West Sibley and Tjaden halls, if developed, would likely completely remove all available surface parking at the site.

4.2.2 Surface Lot and One Underground Level

Background

This alternative consisted of developing a new parking garage with grade level parking and one level of underground parking; similar to the proposed garage but without the second underground level of parking. This alternative was seriously considered by the university during the concept design phase of the proposed project, but was also rejected.

Parking Design/Site Plan

The parking and site design for this alternative would be similar to the proposed parking garage. The grade-level entrance and exit drives would be from University Avenue. Since only one underground level would be accessed from Central Avenue, the ramp system would be simpler and shorter and the saved area converted to additional parking spaces. Parking could be provided for approximately 160 vehicles. Pedestrian walkways, accessible parking spaces, and delivery areas could all be developed as in the proposed garage plan.

Reason(s) Not Chosen

The university would have a net gain of approximately 55 parking spaces from the number currently provided in the existing lots in this area. Compared to the proposed parking garage this design would provide 40 fewer parking spaces. The parking needs of the area, and the relative inefficiencies of adding only one below-grade level when compared with adding two below-grade levels were the primary reasons this option was not selected.

4.2.3 Entirely Underground Garage with Landscape Above

Background

The City of Ithaca Planning Board in formulating the Scope of the Environmental Impact Statement included the request that Cornell add this alternative "Entirely underground garage with landscape above" to the garage alternatives section. There is not enough width on site to construct the ramping system necessary to locate three levels of parking below grade (see Section 4.2.4). The proposed deck level of parking works because of the existing change of grade and the entrance along University Avenue. As such, this alternative considers developing a parking garage with two levels of underground parking, similar to the proposed garage, but without grade-level parking. Grade level would be developed as a landscaped area. For the reasons indicated below, this is not an acceptable alternative for the university.

Parking Design/Site Plan

The parking design for this alternative would be similar to the below-grade structure of the proposed parking garage. The two underground levels would be accessed from Central Avenue with a ramp system like the one proposed. Parking could be provided for approximately 130 vehicles. The landscaped area at grade would still need to be developed to provide for some accessible parking spaces, as well as service and delivery areas behind Tjaden and Sibley, with access from University Avenue.

Reason(s) Not Chosen

The university would have a net gain of only 25 parking spaces from the number currently provided in the existing lots in this area. Compared to the proposed parking garage this design would provide 70 fewer parking spaces, yet have the same cost as constructing the proposed design *plus* the cost of a very difficult landscaping condition at grade. The technical restrictions of providing landscaping above a structure would increase the cost and limit the kinds of landscaping possible. Moreover, the landscaped area would be limited by the necessity of providing roadways and paved areas for accessible parking and deliveries.

4.2.4 Above-Ground Parking Structure

Background

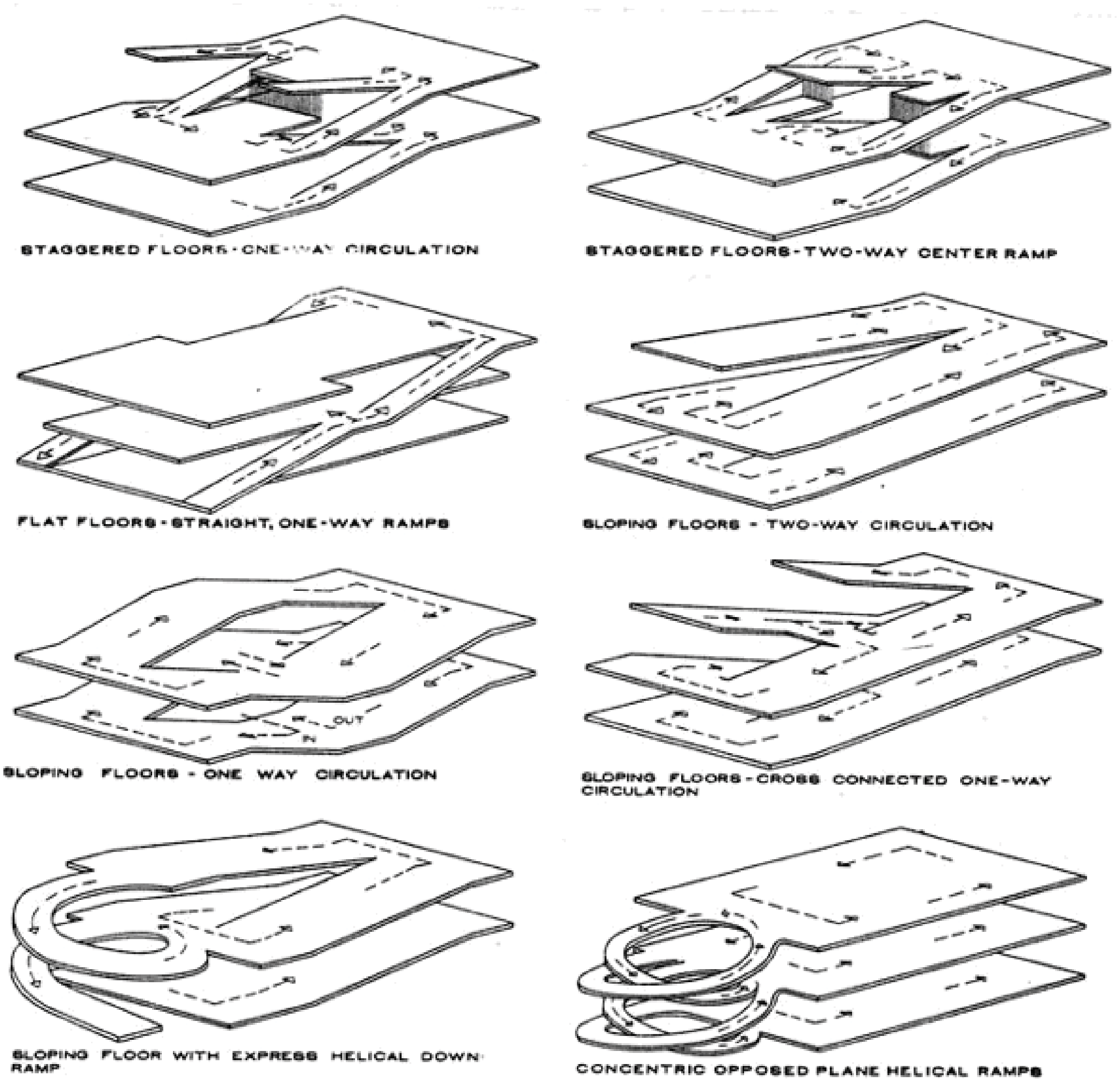
This alternative consisted of developing a new multi-story, above-grade parking garage. This alternative is not possible within the existing site constraints.

Parking Design/Site Plan

The long, narrow geometry of the site does not allow room to develop vertical circulation for vehicles. A variety of ramp schemes have been invented over the years (see Figure 4.2.1 for an illustration), but all require about twice the 60' width available at this site. The only reason the proposed CAPG plan works is because it is underground and uses the existing change in grade and separate entrances on University and Central avenues.

Reason(s) Not Chosen

Even if it were possible to build a multi-story above-ground garage here, there are reasons not to do so. An above-grade structure would block any long-term potential for academic buildings behind West Sibley and Tjaden halls. An above-ground parking garage would not suit the aesthetics of the area, has the potential to compromise views of the gorge and Fall Creek Natural Area, and make circulation from



STAGGERED FLOORS - ONE-WAY CIRCULATION

STAGGERED FLOORS - TWO-WAY CENTER RAMP

FLAT FLOORS - STRAIGHT, ONE-WAY RAMPS

SLOPING FLOORS - TWO-WAY CIRCULATION

SLOPING FLOORS - ONE WAY CIRCULATION

SLOPING FLOORS - CROSS CONNECTED ONE-WAY CIRCULATION

SLOPING FLOOR WITH EXPRESS HELICAL DOWN RAMP

CONCENTRIC OPPOSED PLANE HELICAL RAMPS

Figure 4.2.1: Options for parking ramp schemes (Architectural Graphic Standards).

the Arts Quad to the suspension bridge difficult.

4.2.5 Horizontal Alignment Changes and Streetscape Improvements to University Avenue Integrated into Garage Design

Background

The location of the Fall Creek Gorge edge causes University Avenue to veer south as it passes by West Sibley and Tjaden halls. At the narrowest point, the distance between Tjaden Hall and the south curb line of University Avenue is 76 feet. This pinch point allows the current design plans for the garage to include a maximum seven foot tree lawn along the south University Avenue curb line, the minimum garage building (60 feet in width), and an eight-foot walkway between the garage and the face of Tjaden Hall.

Parking Design/Site Plan

If future reconstruction of University Avenue included a slight realignment of the roadway to eliminate this pinch point, the additional width could accommodate a bicycle lane as well as a tree lawn along University Avenue, and allow for the potential to move the garage northward a few feet to provide greater separation between the structure of the garage and the north face of Tjaden Hall.

Reason(s) Not Chosen

Cornell's offer to reconstruct University Avenue is contingent upon the City of Ithaca's discontinuance of University Avenue as a public right-of-way and Cornell taking over the road. In order to remove the pinch point and shift the garage northward, design a pleasing streetscape environment and meet the construction schedule for the garage, the application for a separate site plan and other approvals necessary to reconstruct and re-align University Avenue would need to be made and under way for this alternative to fit into the time schedule. However, the decision about whether or not to discontinue University Avenue has not been made yet by the City of Ithaca. The reason this alternative is not incorporated in the current plans is that the ownership, maintenance and approvals issues with the City of Ithaca have not been resolved in time for the Milstein Hall and CAPG construction schedule.

4.2.6 No Action

Background

This alternative considers the option of leaving the existing surface parking behind Sibley and Tjaden halls, less the area to be occupied by Milstein Hall. It is the alternative presented in 4.2.1, Surface Lot, and is discussed in that section.

4.3 Non-Concurrent, Sequential Construction Schedule

Background

The current construction schedule scenario (Chapter Three) proposes to construct Milstein Hall and then the CAPG project concurrently. An alternative to the proposed schedule is to construct Milstein Hall first and then build the CAPG project once Milstein Hall is completed.

Alternate Construction Sequence

An alternate construction strategy would involve constructing both projects sequentially. The construction time frame for the non-concurrent construction of Milstein Hall and the CAPG project would be approximately 38 months total duration. The Milstein Hall project would take approximately 21-24 months to complete, followed by approximately 15 months for the CAPG project.

A sequential schedule would lengthen the period of time that the area is subject to expected typical construction disturbances such as dust, noise, road closures and detours. A comparison of the proposed and alternate construction schedules is included in Table 4.3.1 below.

	Sequential Construction (Alternate)	**Concurrent Construction (Chapter 3)**
Total Construction Period	**38 months** 23 months for Milstein Hall *followed by* 15 months for CAPG	**23 months**
University Avenue Closure (East Avenue to Central Avenue)	**32 months** 3 months of east-bound closure for Milstein Hall *followed by* 14 months full closure for Milstein Hall *followed by* 15 months east-bound closure for CAPG	**20 months**

Table 4.3.1: Comparison of construction schedules.

Reason(s) Not Chosen

Constructing the projects sequentially adds approximately one year to the construction schedule, lengthening the duration of disturbance in the area and closing University Avenue for a longer period of time. It is for this reason that the alternate was rejected. However, due to the need for the College of AAP to maintain accreditation for the department of Architecture, if the approvals for the CAPG are not granted within the Milstein Hall timeline, this non-concurrent construction schedule would be followed.

4.4 Alternatives to the University Avenue Streetscape

4.4.1 University Avenue Streetscape with Sidewalk on North and South Sides

Background

At the request of the City of Ithaca, this section examines the impacts of constructing a sidewalk along the south side of University Avenue.

Design/Plans and Site Impacts

There is already an east-west pedestrian circulation along the sidewalk on the north side of University Avenue. The CAPG plans accommodate the east-west movement of pedestrians along the north face of Sibley and Tjaden halls, essentially where it currently exists. Limited space allows for either a tree lawn or sidewalk along the south side of University Avenue north of Tjaden Hall; there is not room for both.

Advantages of sidewalks on both north and south sides of the street:

- Street cross-section is consistent with typical city street standards and expectations of drivers and pedestrians;
- Provides a third east-west pedestrian route in this block of University Avenue.

Disadvantages of sidewalks on both north and south sides of street:

- Eliminates adequate planting space for street trees along a section of the south side of University Avenue;
- Eliminates space for snow storage along a section of the south side of University Avenue;
- Requires pedestrians to cross University Avenue in order to continue west on University Avenue;
- Adds impervious surface, increasing storm water runoff, decreasing water quality and contributing to a greater heat island effect;
- Eliminates the ability to berm against the garage, increasing the visual impact of the exterior wall.

See Figure 4.4.1 for an illustrated plan indicating sidewalks on the north and south sides of University Avenue.

Reason(s) Not Chosen

The revised alternative was rejected because the disadvantages outweighed any benefits of adding a new sidewalk to the south side of University Avenue.

This section of University Avenue differs from a typical city street in several ways: both sides of the entire block are owned by the same entity (Cornell University), and the close proximity of Fall Creek Gorge limits development to the north. Unlike a typical city street where the only option for general pedestrian circulation is within the public right of way, the existing land ownership pattern provides greater options for accommodating pedestrian paths, and pedestrian circulation can be designed in a more holistic manner.

Pedestrian movement in this area can be analyzed as two types: persons passing through on their way to other destinations and internal circulation within the College of AAP.

Persons Passing Through

East-west movement:

An east-west sidewalk is located on the north side of University Avenue. There is no sidewalk along the south side of University Avenue in this area, or on the south side of Forest Home Drive to the east. If a sidewalk along the south side were provided along the CAPG, it would be orphaned, ending at Central and East avenues. In addition, the south sidewalk would provide a less appealing pedestrian experience, as the limited space between the curb and the adjacent structures severely limits opportunities for plantings or other amenities. The north sidewalk's proximity to, and views of, the Fall Creek Gorge natural area affords a more desirable pedestrian experience.

North-south movement:

The majority of pedestrian traffic using the sidewalk on the north side of University Avenue uses it as a link in its north-south travel between the Arts Quad to the south and destinations to the north such as the suspension bridge, Cornell Heights, and north campus. Therefore, a goal of the CAPG's proposal for pedestrian circulation is to enhance and clarify the connections between this north-south circulation and the sidewalk on the north side of University Avenue.

The current design plan includes a bermed tree lawn that mitigates the amount of exposed garage wall along University Avenue. Replacement of the sloped green space with a flat sidewalk would increase the visual impact of the exterior wall.

Internal Circulation within the College of AAP

Internal circulation within the College of AAP, i.e., movement among Tjaden, Sibley, Rand and the Foundry, accounts for a significant proportion of pedestrian traffic along this corridor. The Foundry is the only structure in the college that has a major entrance on University Avenue. The rest of these buildings have their primary entrances facing south, with service and (in the case of Sibley and Tjaden) secondary entrances on the north side fronting on the proposed CAPG. Therefore, University Avenue is rarely used for internal pedestrian circulation. By physically connecting Sibley and Rand halls and extending north towards the Foundry, the structure of Milstein Hall will serve as a hub for pedestrian movements. It reinforces and enhances the east-west pedestrian spine that exists connecting the main (south) entrance to Rand to the secondary entrances along the north face of Sibley and Tjaden. With the construction of the CAPG, this pedestrian spine will be extended west to Central Avenue, offering a walking route that is safer, more convenient and more aesthetically pleasing than a sidewalk on the south curb of University Avenue.

Cornell University's design and construction standards stipulate a minimum walk width of six feet (eight feet along curb edges of parking lots and where pedestrian traffic is high). Adding a new sidewalk on the south side of University Avenue would eliminate adequate planting space for street trees and increase the project's impervious surface. This would be inconsistent with the sustainability design goals of this project and the university. The environmental and aesthetic benefits of street trees – to regulate and moderate climate, filter pollutants from air and water, reduce storm water runoff and erosion, calm traffic, frame vistas and screen less desirable views – are important components of the overall site design for the college, university and the public. The additional impervious surface of the sidewalk would contribute to increased quantity and reduced quality of storm water runoff. In addition, it would eliminate space available for snow storage along a section of University Avenue.

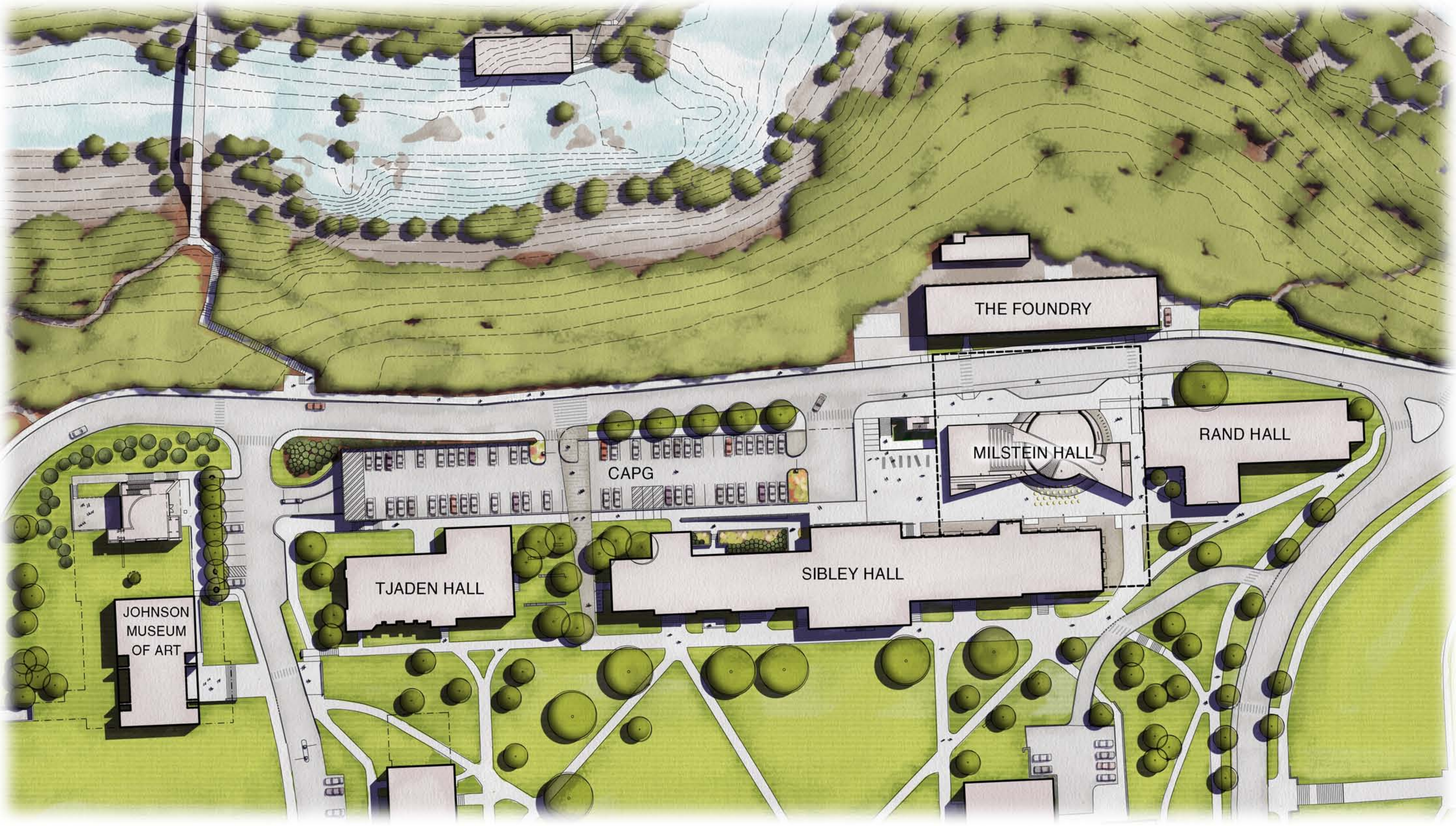


Figure 4.4.1: University Avenue streetscape proposal, with sidewalk on north and south sides of the street

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CHAPTER FIVE:

Irreversible and Irretrievable Commitment of Resources

Chapter Five: Irreversible and Irretrievable Commitment of Resources

The purpose of this section is to identify irreversible and irretrievable commitments of environmental resources required to execute the proposed action. The section is divided into the construction phase and operation phase of the new facilities.

5.1 Construction Phase

The construction phase of the proposed action will require building materials to be used in the erection of new buildings and associated site work. Materials required include: masonry materials such as concrete and stone; metals such as steel, aluminum and copper; petroleum products such as those contained in asphalt and fuel for construction equipment; glass; and synthetics such as contained in insulation and carpeting. The sustainable design initiatives used in the specification of the building and site materials are intended to minimize the impact on the environment from manufacturing and shipping of the construction materials. No shortage of materials is anticipated that could result in a negative impact on other projects.

5.2 Operating Phase

The operation of the proposed action will require use of energy and other natural resources such as water. Energy supplied to the project is permanently lost to the surrounding environment. Energy to heat and air condition the proposed building will be minimized by a highly efficient heating and cooling system. The building will have radiant floor heating, served by the proposed University Combined Heat and Power Plant, and chilled beams supplied with chilled water from the Cornell University Lake Source Cooling System. The CAPG will not require heat or air conditioning. The energy consumption will not have a significant effect on the community's fuel sources or be a significant drain on the existing Cornell capacity. Therefore, no shortage of energy supply for the community is expected to occur as a result of these projects.

Several resources will be utilized by the projects' occupants. These include water and sewage disposal facilities, solid waste facilities and management procedures, police and fire protection and medical services. Currently, Rand, Sibley and Tjaden halls and the Foundry uses all of these facilities and services. Since the overall student population is not increasing, it is expected that there will be no significant increase in the commitment of operating resources.

CHAPTER SIX:

Growth Inducing Aspects

Chapter Six: Growth Inducing Aspects

6.1 Growth Inducing Aspects

The Milstein Hall and the CAPG projects are enhancements of an existing educational use. In the case of Milstein Hall, it provides more space per capita, and does not result in an increase in student enrollment. The CAPG project is intended to meet parking needs within central campus. It is anticipated that approximately four new jobs will be added following the construction phase as a result of Milstein Hall, and no new jobs as a result of the CAPG. This increase is not significant on a community-wide basis, and is expected to have little or no measurable impact on housing, public services, or other community assets.

The projects will slightly increase the need for fire protection and police services police services largely provided by Cornell University. The existing fire and police capacities are sufficient to handle the projected increase of demand. This increase will be somewhat mitigated by the modernization and consolidation of fire alarm and fire protection systems.

There are no other growth inducing aspects related to either project.

Draft Environmental Impact Statement

Paul Milstein Hall and Central Avenue Parking Garage Projects

Cornell University

City of Ithaca
Ithaca, New York

APPENDICES

Submitted: July 25, 2008

Accepted for Public Review

TWLA
Trowbridge
& Wolf
Landscape Architects LLP

APPENDIX A: Geotechnical Reports

CME Associates, Inc

1. **Milstein Hall Subsurface Exploration and Geotechnical Report (and its appendices)**
2. **CAPG Geotechnical Engineering Report (and its appendices)**
3. **Fall Creek Gorge Slope Stability Report (and its appendices)**

Subsurface Exploration
and
Geotechnical Report

CORNELL UNIVERSITY MILSTEIN HALL PROJECT
Ithaca, New York

Prepared For: (Client)

Cornell University
Planning Design and Construction
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CME Report Number: 26000B-02-0707
July 12, 2007

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Report No. 26000B-02-0707

APPENDICES

Subsurface Exploration and Geotechnical Report
Milstein Hall at Cornell University
Ithaca, New York
CME Report No.: 26000B-02-0707

1.0 INTRODUCTION

CME Associates, Inc. (CME) has completed a recent limited Subsurface Exploration and Laboratory Test Program for the site of the proposed College of Art, Architecture and Planning at Cornell University (Client) to be known as Milstein Hall.

CME previously provided services to the project as envisioned in 2003, for the architectural firm of Barkow Leibinger of Berlin, Germany, and issued Subsurface Exploration and Geotechnical Report, CME Report No. 25357B-01-0603 in June of 2003.

In July of 2006, Mr. Andrew Magre, AIA, Project Manager for Cornell University, asked CME to continue geotechnical engineering services on the Milstein Hall Project, with a new project program and new Design Team headed by the Office for Metropolitan Architecture (OMA).

In June 2007, Cornell University provided CME with 100% Design Development Drawings by OMA, dated 4/16/07, and on July 10, 2007, the Parking Interface Drawings by OMA, dated 6/06/07.

CME and Cornell University entered into Contract #C07106, on June 9, 2007 for subsurface exploration and geotechnical engineering services. The specifics of CME's scope of service are given in the Contract, and include a recently completed subsurface exploration and testing program, a contemporaneous engineering evaluation and an updated report tailored to the existing project program.

This Report is the update and addresses the following issues.

- Deep foundations for the footprint to overlie University Avenue, where existing underground utilities-to-remain constrict or encroach on planned foundations.
- Permanent drainage consideration for the basement.
- Support methods, such as underpinning, needed to protect existing proximate foundations.
- Lateral earth pressure consideration for basement and subsurface walls.

This Report compiles the results of all of the (historic) pertinent field and laboratory data applicable to the current project program. This Report includes the professional interpretations and engineering recommendations relevant to specified geotechnical aspects of the proposed project as specifically contracted for in the geotechnical services agreement.

2.0 EXISTING CONDITIONS

Three existing conditions which may significantly impact the design and construction of Milstein Hall were considered by CME. They are:

- The foundations of the East Wing, North and East Faces of Sibley Hall.
- The foundations of the West Face of Rand Hall.
- The condition of the natural earth slope above Fall Creek Gorge, North of University Avenue and just West of the Foundry.

Elevations in this Report are referenced to Project Datum where Plaza Level is given as Elevation 813.1 which equals Architectural Elevation (0.00').

2.1 Sibley Hall Foundations

The Sibley Hall foundations were investigated by excavation of four (4) Test Pits, labeled TP-A, TP-B, TP-C and TP-D. These test pit logs and photo documentation are given in previously issued CME Report No. 26000B-01-0307 (and appended hereto). A limited visual examination of Sibley Hall by CME's Christopher R. Paolini, P.E. was also made and the results are attached (see "Sibley Hall Examination Report" in Appendix B).

The foundations at the exterior wall were found to be wet-laid cut-stone footers and wall, over an irregular thickness of cement mortar. Soil bearing grade varies from about elevation 802.5 (-10.6') to elevation 801.3 (-11.8'). Based on the test pit measurements and our computations, it appears that these foundations bear at less than one tsf on loose to medium compact Silty SAND.

The Examination Report notes several areas of cracking at the exterior brick façade and evidence of distress cracking to stone foundation walls. It is not known if this cracking is due to poor foundation performance or the lack of adequate stiffness and control joints in the masonry structure, since most of the distress is noted at window and door openings or near corners. It is important to note that, where the mortar-to-stone bond is broken in these masonry foundation walls at several locations, these walls exist in a weakened condition.

2.2 Rand Hall Foundations

The Rand Hall Foundations were investigated by excavation of Test Pits TP-1 and TP-2 (in 2003) and TP-E and TP-F (in 2007). The foundation consists of a concrete wall on a concrete footing. The measurements taken indicate that these footings bear on stiff to hard Sandy SILT at levels ranging from elevation 804.8 (-8.3') to elevation 807.8 (-5.3'). The Rand Hall foundation walls and cut stone brick sill were examined from the exterior of the building. Building distress commonly associated with poor foundation performance was not observed in these elements.

2.3 Wooded Slope of Fall Creek Gorge

The wooded earth slope between University Ave and Fall Creek Gorge in the vicinity of the Milstein Hall project was examined by this engineer in 2003, 2006, and July 2007. The slope exhibits erosion channels, several near-surface slides, and tree roots are exposed in areas. The most significant slide and an area of concern is located north of the concrete pavement slab situated west of the Foundry. The slope below this area is eroded and near-vertical for about 15 feet in height. The trees nearest the slab are undercut exposing two or more feet of root-mat. This slope could fail at any time. A drain-tile is located here, which is a leading cause of this condition. A large mass of concrete is present under the slab, adding to the weight (mass) of the upgradient area. A few photos are included in Appendix B relative to this area. It is recommended that study and evaluation to correct this condition be initiated.

3.0 SURFACE EXPLORATION

3.1 Methods, Logs and Locations

The exploration logs which are considered relevant to the current project program are shown below. Test Pit logs are given in Appendix A. Test Boring logs are given in Appendix C.

Exploration Period	Applicable Explorations
2003	Borings B-2, B-3, B-4, B-5, B-6, B-7, and B-9
2003	Test Pits TP-1 and TP-2
2006	Test Pits TP-2A', TP-4A', TP-6A' and TP-7A'
2007	Test Pits TP-A to TP-F
2007	Borings B07-10 and B07-11A

The borings were advanced using hollow stem augers and a truck mounted rotary exploration drill. Soil sampling and Standard Penetration Testing (SPT) was conducted with a 1-3/8 inch inside diameter split barrel sampler driven by an automatic hammer weighing 140 pounds and free falling through a distance of 30 inches in conformance with ASTM Standard Method D1586. Rock sampling was accomplished with a 2-inch N-series double barrel diamond core bit and wireline tools in conformance with ASTM Standard Method D2113 using plain water as coolant. The Test Pits were excavated by rubber tire backhoe supplied with Operator by Cornell University.

A CME Geologist visually examined each sample retrieved and a portion was placed and sealed in a glass jar for later use. Soil classification is accomplished visually by the geologist using the Burmister System. Rock samples are also visually classified according to the standard terminology given in the document entitled “General Information & Key to Test Boring Logs,” located in Appendix C.

A Log is prepared for each exploration using the methods and terminology given in the Key. All of these logs are attached. The location of each as-drilled exploration is shown on the attached “Boring Location Sketch” labeled BL-1.

The CME project engineer selected samples for laboratory analysis and tests. Laboratory tests are conducted according to the ASTM Standard Methods given in the attached lab test reports entitled “Laboratory Test Summary”, one from 2003 and another from 2007 (see Appendix D).

3.2 Subsurface Profile

The summaries presented in this report are an interpretation of the exploration logs by the CME project engineer. The site subsurface conditions are characterized from existing grade to help those working on the project to generally visualize the subsurface conditions.

***Generalized Subsurface Profile**

Thickness of Layer in feet	**Depth to bottom of Layer in Feet**	**Generalized Overall Description And Characterization of Layer**
0 to 2	0 to 2	**Surfacings** such as lawn, topsoil, asphalt pavement, sidewalks and gravel.
3 to 7	4 to 8	**Unprepared Miscellaneous Fill** such as earth, slag, brick, cinders, and miscellaneous debris. Underground utilities (both active and abandoned) are also present in this layer.
4 to 22	12 to 28	**Normally Consolidated Lakebed Sands, Gravels and Silts** laid down by sedimentation in prehistoric glacial lake environment. The deposits are generally poorly-graded, unconsolidated, and non-plastic. SPT-N values range from 2 to 32. These erratically bedded deposits exist in discrete and indiscrete layers or may transition gradually between strata classes. Unified soil classes are SP, SM, SW, GP, GM, and ML. Groundwater is likely to perch in the layer, especially where sand overlies less pervious silt.
16 to 26	31 to 55	**Preconsolidated and slightly plastic Lakebed Clayey Silts, Silts and Silty fine Sands** form a mantle over Till or Bedrock at this site. The surface of this stratum dips westerly towards the valley. SPT-N values vary from 6 to over 100. Natural water content is generally near to dry of plastic limit. Groundwater is likely to perch on this relatively tight stratum. Unified Soil Classes are ML, CL, and SP.
0 to 9	37	**Glacial Till** or **Boulder Till** was identified in one boring only, just above weathered bedrock. This intermittent stratum is very dense and compact. Till is indicated by embedded boulders, cobbles and/or gravel in a tight clayey silt matrix. SPT resistance is over 100 blows/foot and drive sample recovery is poor due to the high content of oversize stones.
2 to 21	33 to 75	**Very Weathered Bedrock** was drilled and sampled with earth tools. Retrieved samples indicate parent rock consisting of dark grey Shale. SPT-N is typically over 100.
over 5	Unconfirmed	**Weathered, Thinly Bedded Medium Hard Shale Bedrock.** Rock sampling and classification using the Rock Quality Designation (RQD) indicates the upper 3 to 5 feet in-situ rock quality varies from very poor to fair. RQD generally increases with depth.

* Subsurface Profile is an interpretation by Marcus A. Rotundo, P.E. and may not represent actual field condition. Please refer to the attached exploration logs for detailed information at specific locations and elevations.

3.3 Groundwater Observations

Groundwater was observed in five of the nine CME Borings advanced for this program. Observed groundwater levels in Borings B-5, B-6, B-7, B-9, and B-11A vary from 18.5 to 34.7 feet depth (elevations -23.8 to -34.4) and are interpreted to represent a perched water condition. The static groundwater table was not encountered by this program.

A perched water condition occurs where groundwater flows and collects in a more pervious soil overlying a relatively impervious material. At the Milstein Hall site, water is present in Sandy soil immediately above tight Clayey soil.

Test Pit TP-1 encountered a (dry) drain tile near to the footing of Rand Hall. Test Pit TP-D encountered a wet perforated drain pipe in a problem drainage area at the East side of Sibley Hall. Shallow drains from existing buildings may convey water even though the drain may have been dry during the CME exploration.

Since the Milstein Hall site is situated on a bench near the top of a very steep hillside at the edge of the Fall Creek Gorge, it is likely that groundwater is flowing generally northerly and easterly towards the Gorge. Observations of groundwater in test borings indicate the presence of perched water conditions where more pervious strata exist over less pervious strata. The levels at which these conditions exist vary significantly and the presence and flow of groundwater depend upon many conditions, such as but not limited to, seasonal changes, prevailing climate, precipitation, and nearby construction operations. Therefore, it is likely that groundwater conditions observed or experienced at other times will vary from those given here.

3.4 Characterization and Importance

It is important to characterize the subsurface materials which will be exposed, worked with, or affect the planned project program.

The Miscellaneous Fill and Fill soils present over the entire site consist of various classes of earth, and were generally imported from off-site sources. The Fill is mostly earth and contains fractions of inert materials such as ash, cinders, bricks, stones and other foreign matter. In-place Miscellaneous Fill and Fill has no bearing capacity (according to the Building Code), and should, therefore, be removed where it is discovered to be situated below planned new footing foundations. Fill material may be sorted, stockpiled and re-used when it is tested and found to meet the backfill quality criteria given later in this report.

The loose to medium compact upper lakebed Sands and Gravels are generally present below the existing surficial fill materials. These materials may also be sorted, stockpiled and considered for re-use.

The lower Lakebed Silts, Clayey Silts and Silty Fine Sands will generally be too dirty and sensitive to water content to plan for re-use. Lab testing indicates these materials to exist at a moisture content above optimum with plasticity index from 3 to 11%.

Excavation to the B1 (-10.67’) and B1 Mechanical (-14.0’) Levels of Milstein Hall will chiefly expose loose fine Sands and non-plastic Silts. These soils exhibit low shear strength, low bearing capacity, poor trafficability for rubber-tire vehicles, and will tend to become soft and muddy when wet and subjected to normal construction traffic.

Excavation to the B3 level (-30.67') will chiefly expose stiff to hard Silty Clays and Clayey Silts which are slightly plastic. These soils exhibit moderate shear strength and good trafficability for rubber-tire vehicles, but will tend to become sticky or slippery when wet. Groundwater tends to perch on top of this soil stratum, so excavation faces will tend to bleed water, softening the lower portions, and undermining the upper portions, resulting in sloughing and caving.

Fair quality Bedrock (as measured by RQD. See Table 4 in Key-Appendix C) is indicated by the borings to be present at elevation 730 (-83) to elevation 776 (-37). The Bedrock surface is indicated to dip irregularly towards the Northwest. Unconfined compressive strength of selected core specimens indicates a nominal compressive strength of 900 tsf.

4.0 SITE SEISMIC CONSIDERATIONS

The CME Borings were advanced to bedrock to enable subsurface characterization to 100 feet in depth. Analysis of these data and interpretations of the 2002 Building Code of New York State (BC-NYS), Section 1615, was made. It is our professional opinion that the Milstein Hall site is defined as a stiff soil profile representative of a Site Class "D". The explorations did not reveal soils vulnerable to liquefaction, potential failure or collapse under seismic loading.

The North American Datum of 1927 site coordinates are approximately N42.451, W76.484.

Considering the above noted coordinates and the site class, we used the BC-NYS to calculate the adjusted maximum considered earthquake spectral response acceleration parameters. The site coefficient F_A is 1.60, thus the adjusted maximum considered earthquake spectral response acceleration for short period, S_{MS}, is 0.286g. The site coefficient F_V is 2.40, thus the adjusted maximum considered earthquake spectral response acceleration for 1-second period, S_{M1} is 0.167g.

CME reviewed the 16Apr07 100% DD Drawing S200, "*Design Load Parameters*", and found the Seismic Design Data given there to be consistent with CME's recommendations.

5.0 FOUNDATIONS

5.1 General Considerations

The 100% DD Foundation Plan shows spread and continuous footings bearing at elevation 803.1 (-10.0') to elevation 796.1 (-17.0'). These footings were sized based on a presumptive bearing pressure of 2 tsf. In a telephone conversation on 7/18/07 with Mr. Alastair Elliott of Robert Silman Associates, P.C. the Project Structural Engineer, this engineer expressed that footings bearing at this presumptive pressure are predicted to settle in excess of one (1) inch. We also discussed the use of Drilled Pier foundations necessitated by existing site conditions and restraints. It was agreed that CME would present in this Report an allowable bearing pressure for spread footings and recommendations for Drilled Pier foundations. It was decided that further interaction and analysis subsequent to this report would be necessary.

The Parking Garage located below the Milstein Plaza was also discussed with Mr. Elliott, however he was unsure of the limits of contracted design responsibility here. It was decided that specific geotechnical recommendations for this underground parking would have to come later.

5.2 Spread Footings

Spread and continuous footings bearing at or below elevation 780 (-33.1') may be proportioned using an allowable bearing pressure of two (2) tsf and are subject to a minimum width of 4 feet. Footings bearing above elevation 780 (-33.1') should be proportioned based on an allowable bearing pressure of one (1) tsf and are subject to a minimum width of 2'-3". Footings exposed to freezing temperatures should be founded such that at least 4'-6" of cover exists, measured from bottom of footing (or grade beam) to adjacent exterior final grade. Interior footings should be situated such that at least 6 inches is present between top of footing and bottom of slab-on-grade.

Footings sized and positioned according to these recommendations are predicted to settle less than about one inch. Differential settlement measured between two adjacent footings is predicted to be less than about three-quarters of an inch.

5.3 Drilled Piers

Drilled Piers are recommended to support the column loads at the following locations:

Location	Reason
AA-1 thru AA-7	Proximate Utilities
AB.3-2 and B-2	Excavation for Parking Level B3
B-6.8 and C-6.8	Proximate Rand Hall
D-2 thru D-7	Proximate Sibley Hall
E-6 and E-7	Proximate Sibley Hall

Using the footing sizes given on the Foundation Plan, we computed gravity loads at foundation level ranging from about 250 kips to 800 kips. An efficient Drilled Pier element would be a 3 foot diameter straight shaft which is socketed into competent bedrock and derives its axial load capacity through skin resistance along the full-diameter bedrock socket. It is recommended that the following table be utilized to determine required length of socket. Note that the minimum socket length is one (1) foot.

Service Capacity of 3-foot Diameter Drilled Shafts With Full Diameter Bedrock Socket

Length of Competent Bedrock Socket (feet)	Service Capicity (kips)
1.0 (minimum)	235
1.5	352
2.0	470
2.5	588
3.0	705
3.5	823

Competent Bedrock is defined as that which exhibits a Rock Quality Designation (RQD-see Table 4 in the "Key" in Appendix C) of 35% or more. Using the CME Boring logs to define competent bedrock, we see that it is generally located at 3 feet to 5 feet below first contact, except at Boring B07-11A where it is indicated at 21 feet below first contact. Actual Bedrock surface elevation, competent bedrock elevation, and bearing surface must be determined in the field while drilling the shafts. This determination should be made by the CME Professional Geotechnical Engineer (PGE).

CME will provide estimated length and planned bottom of Drilled Piers, once the Foundation Plans are revised to Construction Documents and a Drilled Pier Schedule is to be prepared.

Straight Shaft Drilled Piers should be designed to have a shaft diameter that is not less than 36- inches. Drilled Piers should be designed and constructed consistent with current technology using recognized standards such as ACI 336.3R, Design and Construction of Drilled Piers, as well as with Sections 1808 and 1812 of the 2002 Building Code of New York State.

We recommend that ACI 336.1-01, Standard Specification for the Construction of Drilled Piers, be used as the reference standard shell specification for this project. Following preparation, please forward the Drilled Pier Plan, Schedule and Specification to us in electronic format, for us to review, edit and return to you. Allow one week for us to review and edit.

Drilled Piers and footing foundations designed and installed according to this report are predicted to settle less than about one-quarter of an inch (1/4”) due to compression of the bearing stratum. Elastic shortening of the concrete shaft should be added to this estimate to obtain totals at top of drilled shaft level. Load testing of installed drilled piers is not required.

A Pre-Installation (Preconstruction) meeting for Drilled Piers is strongly recommended. The excerpt from the ADSC “*Drilled Shaft Inspector’s Manual*” given in Appendix E, sums up the issue and topics of discussion at the Preconstruction Meeting.

5.4 Existing Proximate Foundations

5.4.1 Rand Hall

According to the 100% DD Plans, there is about 10 feet from the West Face of Rand Hall to the East Wall of Milstein. Numerous subsurface utilities exist and this space is to be used as a utility corridor. Rand Hall west wall footing appears to bear between elevation -6.0 and elevation -8.3’. The Milstein east wall footings appear to bear at -17.0’ and higher although it is not clear what elevation the Elevator pit will be founded at.

Support of the west wall of Rand Hall by underpinning and excavation shoring and bracing will be necessary, so a technology that can accomplish both in one element is desirable. In addition, the system should be one that can be installed from existing on grade surface and does not require significant pre-excavation (so utilities can remain until decommissioned).

5.4.2 Sibley Hall

Drilled piers are recommended for those foundations along line D near Sibley Hall, because of several reasons, not limited to those given below

- ✓ To eliminate the overlap in zone of influence of existing Sibley and new foundations.
- ✓ To reduce the excavation footprint and depth in the vicinity of Sibley Hall.
- ✓ To maximize the distance between the new, lower foundations and existing, higher foundation.

The Sibley Hall North face footing appears to be a wet laid rubble foundation bearing at elevation -11.8 to elevation -10.6, on loose to medium compact Silty Sand or Silt. This fine grained soil must be confined laterally in order to support the existing foundation loads. If the confining pressure is reduced or lost, the soil will spread laterally resulting in loss of support for the Sibley foundations.

5.4.3 Underpinning and Excavation Support

Underpinning which can also serve as excavation support is most desirable for this project. The desirable characteristics of a suitable system are:

- ✓ Can be installed in advance of excavation and utility decommissioning.
- ✓ Can be targeted.
- ✓ Can be installed from (or near) existing on grade surface.
- ✓ Provides positive permanent support to existing foundations.
- ✓ Is relatively stiff and inflexible.
- ✓ Will essentially cut-off perched groundwater.

A method called Jet Grouting appears to be suitable for this project. Jet Grouting is a method which mixes the soil in-place with Portland Cement and can be accomplished from existing on-grade surface by drilling the holes on an angle and vertically to create an underpin and soil-cement wall.

Jet Grouting is a contract specialty which requires an experienced geotechnical contractor and specialized equipment, however, there are few contractors that work in the Northeast, so competitive pricing can be obtained. For bidding purposes, the contract documents should show the location and extent of the work, specify the method, specify the submittals/ shop drawings bear the seal and signature of a Licensed Professional Engineer currently registered in New York State, and state the minimum requirements for professional liability insurance.

The submission should be reviewed by the CME PGE for completeness and conformance to the design intent. The installation must be monitored and tested, thus the Jet Grouting installation becomes an item on the Schedule of Special Inspection and Structural Tests, as mandated by the Building Code.

CME will be pleased to assist the Design Team in Contract Document preparation for the Jet Grouting.

5.5 Basement Permanent Drainage

Permanent drainage for all perimeter basement walls is recommended. Due to space limitations and the likelihood of perched groundwater conditions at various levels of the basement walls, a Prefabricated Drainage Composite consisting of a vertical drainage blanket and integral footing drain on the outside of the wall is most desirable.

The Prefabricated Drainage Composite combined with a cold, fluid-applied waterproofing application consisting of an Aliphatic Modified Polyurethane, should provide adequate protection against water intrusion through the basement walls.

5.6 Lateral Earth Pressure

The design parameters given in this section assume that:

- ✓ All subsurface walls will have drainage installed on exterior.
- ✓ Backfill will be installed in a quality controlled manner.
- ✓ The surface at exterior final grade will be nearly level.
- ✓ Adjacent or proximate structure will be underpinned so as not to impart a lateral pressure on these walls

Maximum Gravity Unit Weight of Backfill: 135 pcf
Backfill Class: Granular or On-Site borrow, mixed grain sizes, dense enough to cause low permeability, conforming to USCS Classes: GW, GM, GC, GP, SW, SP, and SC.
Internal Friction Angle (phi): not less than 25 degrees, cohesionless
Friction Factor for Sliding: 0.45 (applied factor of safety = 1.0)
Equivalent Active Fluid Pressure: 55 pcf
Equivalent Passive Fluid Pressure: 330 pcf
Surcharge Load: Permanent adjacent surface surcharges adjacent to the below-grade walls shall also be considered to impose lateral earth pressure on below-grade walls. This lateral pressure can be computed as 25% of the surcharge pressure, and will act to a depth equal to the width (measured perpendicular to wall) of adjacent surcharge.

5.7 Re-Use of On-Site Borrow Soil

On-site Borrow proposed for re-use as Fill Material shall contain no trash, debris or stones over 3 inches in least dimension. Fill Material shall contain not more than 15% by weight of material finer than a Number 200 mesh sieve, and shall exhibit a Plasticity Index of 5 or less.

6.0 IMPORTANT OTHER CONSIDERATIONS

6.1 Recommendations are Preliminary

The construction recommendations given in this report are preliminary and are based on the data and information made available to CME at time of preparation of this report. CME will continue to consult with Cornell University and the Design Team during the preparation of this Construction Documents, as part of the basic services given in our agreement with Client.

6.2 Standard of Care and Warranty

We have endeavored to conduct these services in a manner consistent with the level of care and skill ordinarily exercised by members of the geotechnical engineering profession practicing contemporaneously under similar conditions in the locality of the project. No other representation, express or implied is made. Under no circumstances is any warranty, express or implied, made in connection with the providing of geotechnical engineering services.

6.3 Closing Comments

It is a violation of *New York State Education Law, Article 145, Section 7209*, for any person unless he is acting under the direction of a licensed professional to alter this document in any way. Alterations must have the Seal Affixed along with a description of the alterations, the signature and date.

Please do not hesitate to contact our office (phone 315.668.0242) when you have any questions regarding this report, its conclusions, its recommendations, or its application to actual field conditions revealed during construction.

Marcus A. Rotundo, P.E.

Navaratnam Anasthas, I.E.

Addendum No. 1 to Subsurface Exploration
and Geotechnical Report
Paul Milstein Hall Project at Cornell University
CME Report No. 26000B-03-1207
Page 1 of 2

5.3 Drilled Piers

This report replaces the Drilled Pier recommendations given in Section 5.3 of CME Report No. 26000B-02-0707.

5.3.1 Background

On July 12, 2007, CME Associates, Inc. (CME) issued the Subsurface Exploration and Geotechnical Report (Number 26000B-02-0707) for the Cornell University **Milstein Hall Project**. Subsequent to issuance of that Report, there have been significant changes to the superstructure framing and to the parking garage to be located under a portion of the new building. In addition, an Axial Load Test of Drilled Shaft on Bedrock Report (LoadTest, Inc. Report LT-9290 for McKinney Drilling, on Test Shaft #1, October 28, 2006) for the Physical Sciences Project was provided by Cornell University to CME. In addition, CME completed a subsurface exploration and testing program for the Central Avenue Parking Garage Project (see CME Report No. 26054B-01-0807, 8/31/07).

5.3.2 Drilled Piers

Based on the new framing, Robert Silman Associates (RSA-Project Structural Engineer) provided new loadings to CME via email November 16, 2007. In consideration of the new loads, and the applicable other resource information, CME recommends that Drilled Piers be utilized for all Milstein Hall foundations.

In consideration of the new loadings provided by RSA, it is recommended that Drilled Pier Nominal Diameter be computed based on an Allowable Contact Pressure on Sound Bedrock of One Hundred kips per square foot (100ksf). The minimum diameter of Drilled Shaft for this project shall be 2 feet. The weight of concrete below top of shaft may be ignored when sizing the drilled piers.

Sound Bedrock is defined as that which exhibits a Rock Quality Designation (RQD-See Table 4 in the "Key" in Appendix C) of 35% or more. The CME boring logs indicate that there is a layer of decomposed or very weathered caprock present over competent bedrock approximately 3 to 5 feet thick. A **Drilled Pier Excavation Detail** similar to the one attached is recommended to be placed on the Foundation Plan.

First contact with bedrock, sound bedrock elevation, and final bearing elevation must be determined in the field while drilling the shafts. These determinations should be made by the CME Professional Geotechnical Engineer.

A Drilled Pier Schedule should also be prepared and placed on the Foundation Plans. As a minimum, the Schedule should contain the following information:

<table>
<tr><th colspan="6">DRILLED PIER SCHEDULE</th></tr>
<tr><th>Mark</th><th>Diameter</th><th>Top Elevation</th><th>Bottom Elevation</th><th>Reinforcing</th><th>Remarks</th></tr>
<tr><td colspan="6">where:
Mark is given as “DP-number” numerical starting from 1.
Diameter is given in Inches (minimum size is 24”, in 6” increments up to 96” in diameter).
Top Elevation is the Top of Concrete of Drilled Pier.
Bottom Elevation is the Planned Bottom of Concrete of Drilled Pier. Actual bottom to be determined in the field by the Professional Geotechnical Engineer.
Reinforcing is the designated reinforcing given in the Reinforcing Schedule.
Remarks are special numbered or lettered notes for special or particular circumstances.</td></tr>
</table>

CME will provide Planned Bottom Elevation of Drilled Piers, once the Foundation Plans are revised to Construction Documents and a Drilled Pier Schedule is presented to us.

Drilled Piers and footing foundations designed and installed according to ACI 336.1 and this report are predicted to settle less than about one–half of an inch (1/2”) due to compression of the bearing stratum. Elastic shortening of the concrete shaft should be added to this estimate to obtain totals at top of drilled shaft level. Load testing of installed drilled piers is not required.

A Pre-Installation (Preconstruction) meeting for Drilled Piers is required. The Specification Writer should include “Drilled Piers” under Preinstallation Conference Items in Section 01 43 00 - Quality Assurance.

All other terms, conditions, limitations, and recommendations of the original report apply.

Marcus Rotundo

By: Marcus A. Rotundo, P.E.

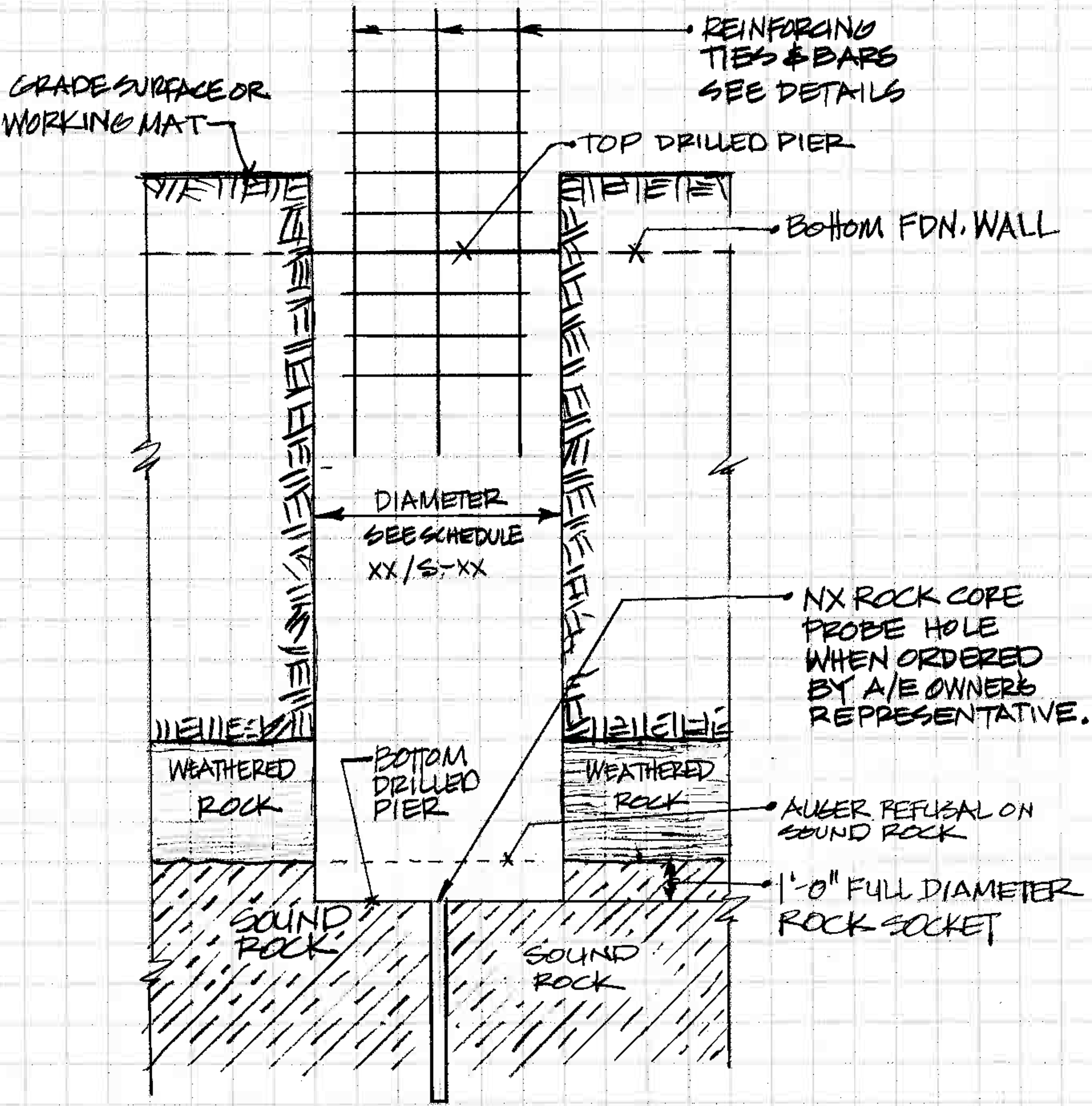
December 4, 2007
date

Attachment Listing: Drilled Pier Excavation Detail (1 of 1 page)

CME Associates Inc.
Construction Materials Evaluation

Central Square, New York 13036

JOB PAUL MILSTEIN HALL
SHEET NO. 1 OF 1
CALCULATED BY MAROTUNDO DATE 12.04.2007
REVISED BY: MAROTUNDO DATE 4.12.2008
ATTACHMENT TO CME REPT NO. 26000B-03-1207



DRILLED PIER EXCAVATION DETAIL

NOT TO SCALE REVISED 4.14.2008

ATTACHMENT TO CME REPT# 26000E-18-0408

CME
Associates, Inc.

Subsurface Exploration
and
Geotechnical Report

CORNELL UNIVERSITY MILSTEIN HALL PROJECT

Appendices

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	Photographs of Slope Northwest of Foundry	3
C	2003 – Boring Logs B-2, B-3, B-4, B-5, B-6, B-7, and B-9	14
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	2007 – Photographs of Bedrock Core Specimens	2
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	General Information and Key to Test Boring Logs	4
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CME
Associates, Inc.

Subsurface Exploration
and
Geotechnical Report

CORNELL UNIVERSITY MILSTEIN HALL PROJECT

APPENDIX A

CME Associates, Inc.

P.O. Box 1824
Cicero, New York 13039
(315) 698-9315
(315) 698-9319 (Fax)

www.cmeassociates.com

March 28, 2007

Cornell University
Planning, Design and Construction
201 Humphreys Service Building
Ithaca, New York 14853

Attn: Mr. Andrew Magre, AIA, Project Manager

Re: Test Pit Exploration Report
Milstein Hall College Architecture, Art and Planning
Ithaca, New York
CME Report No.: 26000B-01-0307
Page 1 of 2

Gentlepeople:

CME representatives, John Wight and Tom Hamilton, were on-site March 13th and 14th, 2007 to observe and document Test Pits excavated by the Cornell University Physical Plant Staff, at locations designated on Plan CSK-01 by Robert Silman Associates, P.C, Project Structural Engineer. Actual Test Pit locations vary from what is shown on plan from CSK-01, due to owner access issues and utility conflicts. Actual locations and elevations were surveyed by representatives of T.G. Miller and supplied to CME in a Cadd drawing file, with the project base map.

Attached you will find the Test Pit Profiles prepared by CME based on field measurements of the existing foundations for Sibley and Rand Halls, as well as other subsurface conditions revealed at the Test Pit locations, TP-A through TP-F. A Location Sketch is also attached showing actual Test Pit locations. Color Test Pit Photographs were taken, and selected photos are presented as attachments, as well.

Please note, the structural foundation elements encountered were often irregular in dimension. The measurements shown on the logs indicate the extents and limits encountered at the Test Pit locations only.

Please feel free to contact the undersigned with any questions you may have.

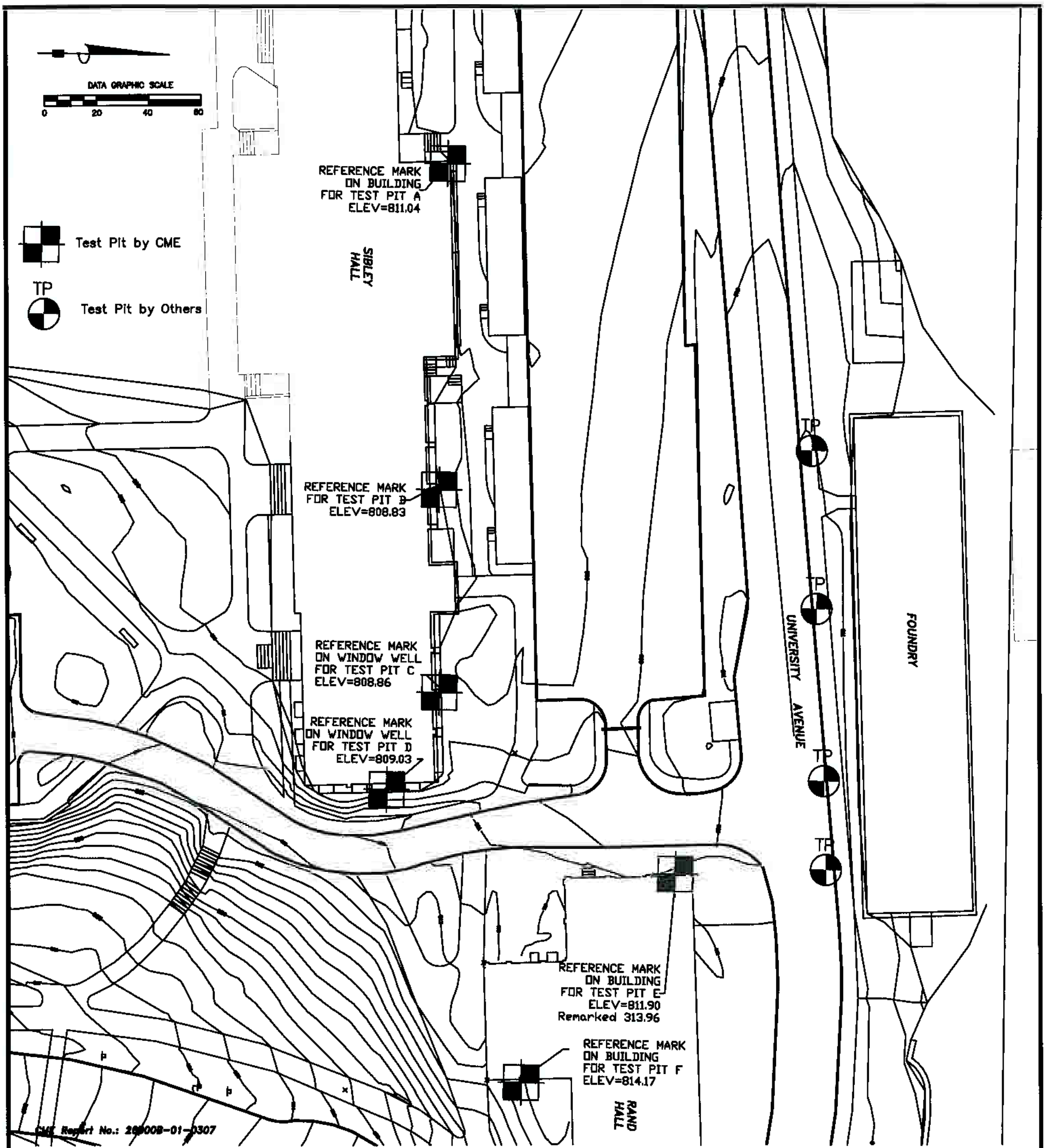
Respectfully Submitted,
CME Associates, Inc.

John P. Wight
Civil Engineer

Respectfully Submitted,
CME Associates, Inc.

Marcus A. Rotundo, P.E.
Senior Geotechnical Engineer

Attachments: CME Test Pit Location Sketch, BL-1 (1 page)
CME Subsurface Exploration-Test Pit Logs, TP-A through TP-F (6 pages)
CME Color Photographs of Test Pits TP-A through TP-F (5 pages)
CME's *General Information & Key to Test Boring Logs* (2 pages-2 sided)



Exploration observed by CME Associates, Inc.; during the period from 03-13-07 to 03-14-07.

SHEET NO.

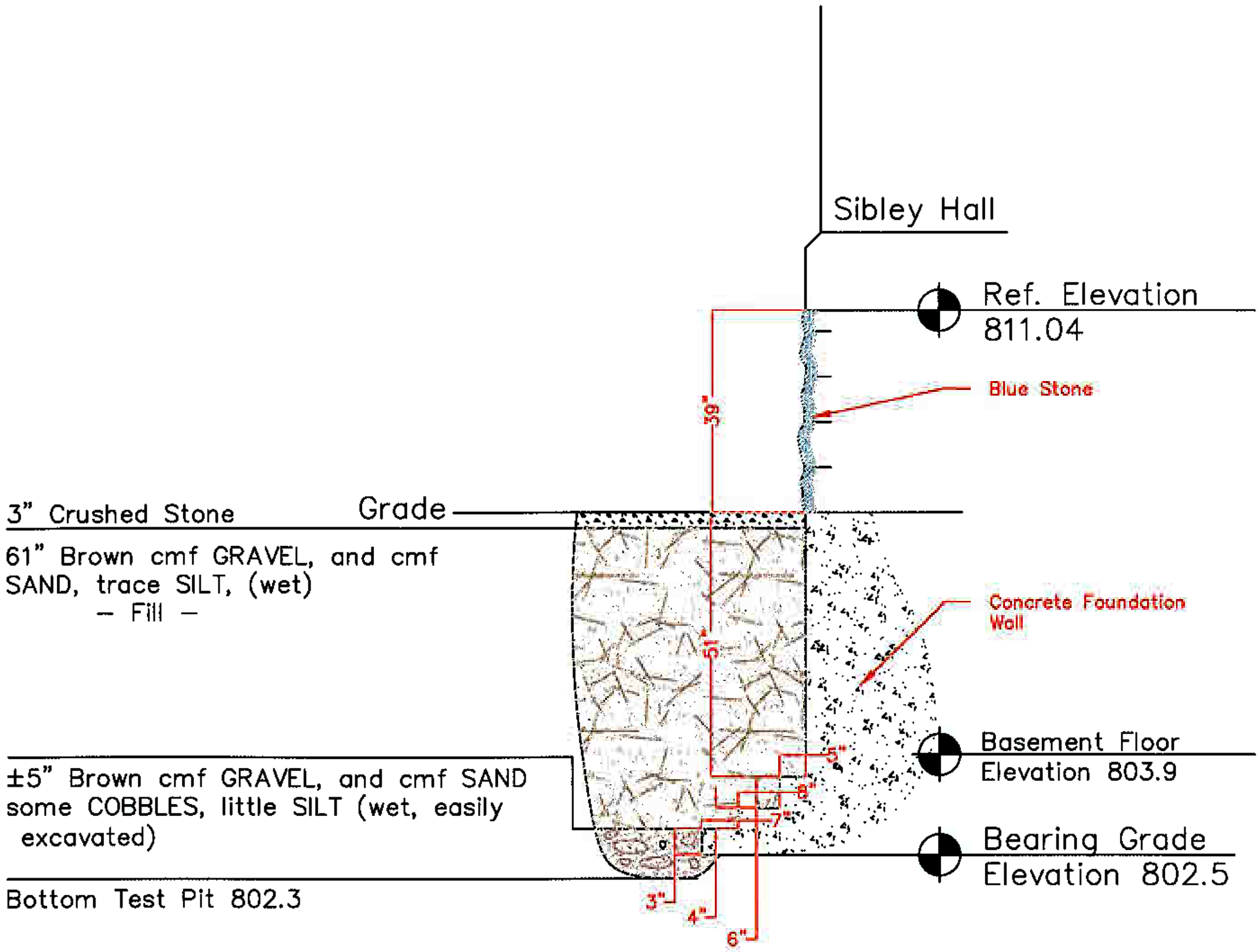
BL-1

03-15-07
26000
jpw

Test Pit Location Sketch
Milstein Hall Cornell University
University Avenue
Ithaca, Tompkins Co., New York

CME Associates, Inc.
Construction Materials Evaluation
P.O.Box 1824
Cicero, New York 13039-1824
[315] 698-9315 FAX: [315] 698-9319

Notes:
1) Existing Surface Condition: Crushed Stone.
2) Excavated with Yanmar V035 mini-excavator with 24" GP bucket.
3) No groundwater observed.
4) Soil conditions encountered and shown below represent the area of backfill from previous construction. Soil conditions further away from the structure may vary.
5) Test Pits excavated by crew from Cornell University Physical Plant.



Test Pit "A" Profile

CME Report No.: 260008-01-0307

Exploration observed by CME Associates, Inc.; during the period from 03-13-07 to 03-14-07.

SHEET NO.
TP-A

03-15-07
26000
Jpw

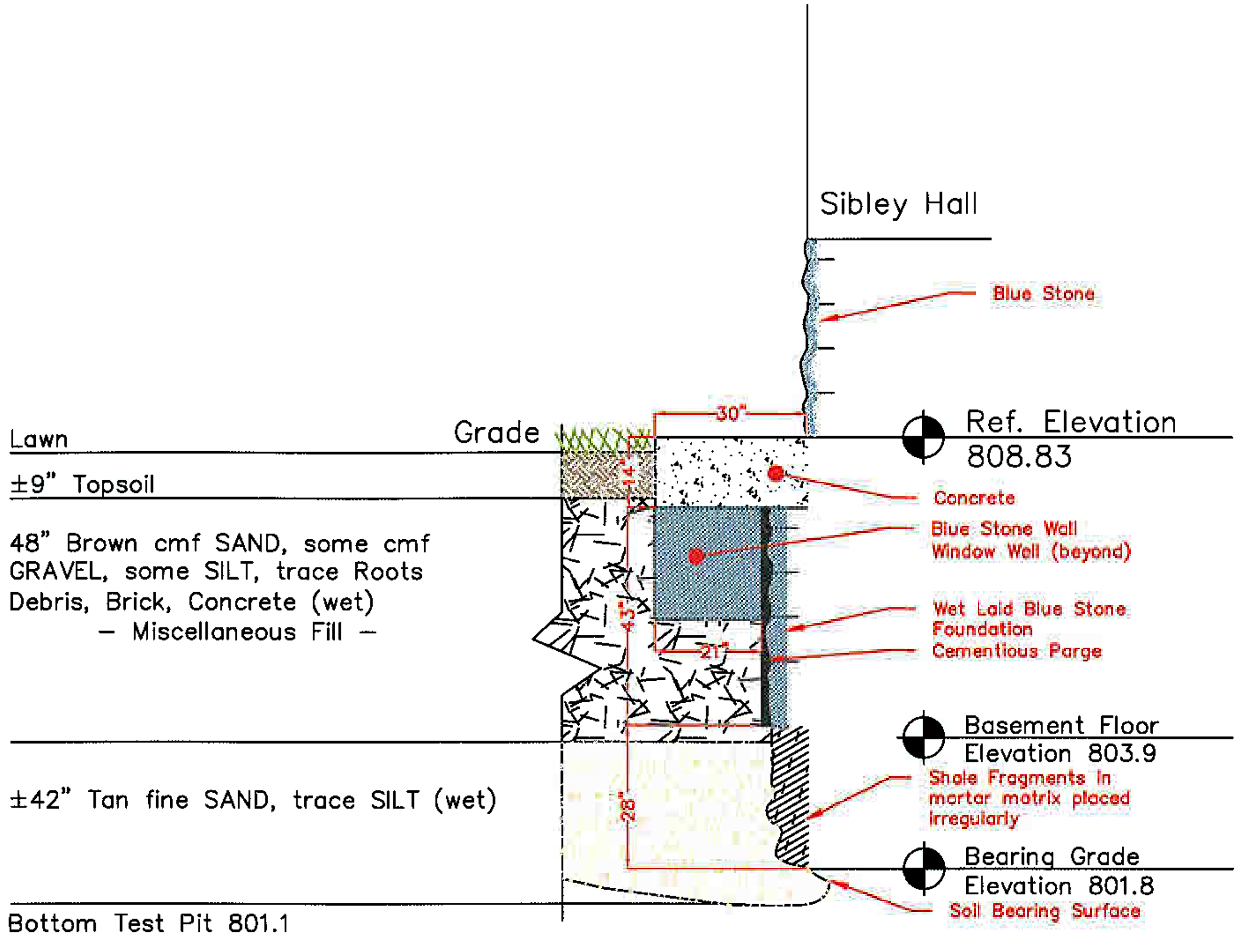
Test Pit Profile Sketch
Milstein Hall Cornell University
University Avenue
Ithaca, Tompkins Co., New York

CME Associates, Inc.
Construction Materials Evaluation
P.O.Box 1824
Cicero, New York 13039-1824
[315] 698-9315 FAX: [315] 698-9319

Test Pit – A

Test Pit – A

Notes:
1) Existing Surface Condition: Lawn.
2) Excavated with Yanmar V035 mini-excavator with 24" GP bucket.
3) No groundwater observed.
4) Soil conditions encountered and shown below represent the area of backfill from previous construction. Soil conditions further away from the structure may vary.
5) Test Pits excavated by crew from Cornell University Physical Plant.



Test Pit "B" Profile

CME Report No.: 260008-01-0307

Exploration observed by CME Associates, Inc.; during the period from 03-13-07 to 03-14-07.

SHEET NO.
TP-B

03-15-07
26000
Jpw

Test Pit Profile Sketch
Milstein Hall Cornell University
University Avenue
Ithaca, Tompkins Co., New York

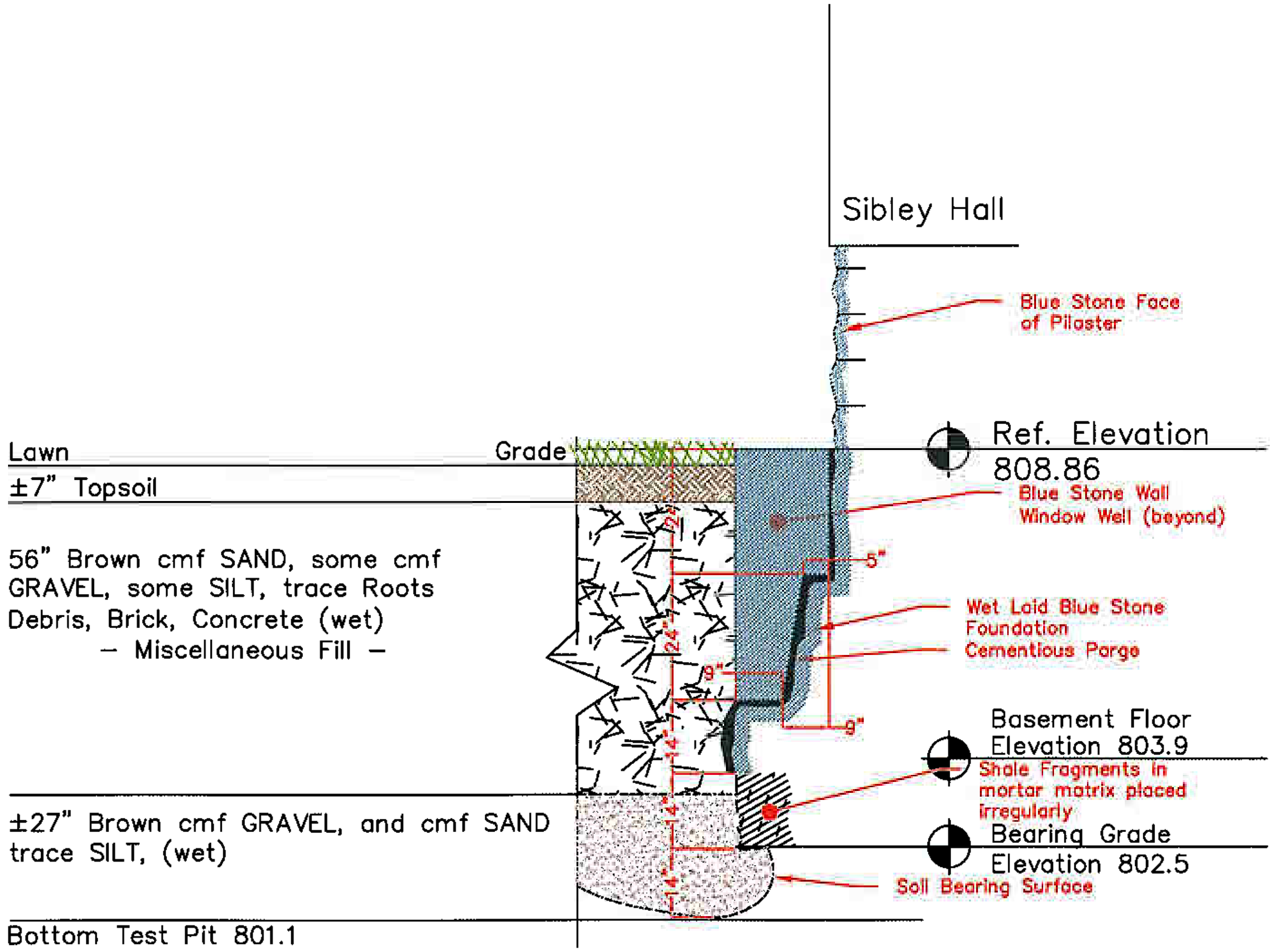
CME Associates, Inc.
Construction Materials Evaluation
P.O.Box 1824
Cicero, New York 13039-1824
[315] 698-9315 FAX: [315] 698-9319

Test Pit –B

Test Pit – B

Notes:

1) Existing Surface Condition: Lawn.
2) Excavated with Yanmar V035 mini-excavator with 24" GP bucket.
3) No groundwater observed.
4) Soil conditions encountered and shown below represent the area of backfill from previous construction. Soil conditions further away from the structure may vary.
5) Test Pits excavated by crew from Cornell University Physical Plant.



Test Pit "C" Profile

CME Report No.: 26000B-01-0307

Exploration observed by CME Associates, Inc.; during the period from 03-13-07 to 03-14-07.

SHEET NO.
TP–C

03-15-07
26000
Jpw

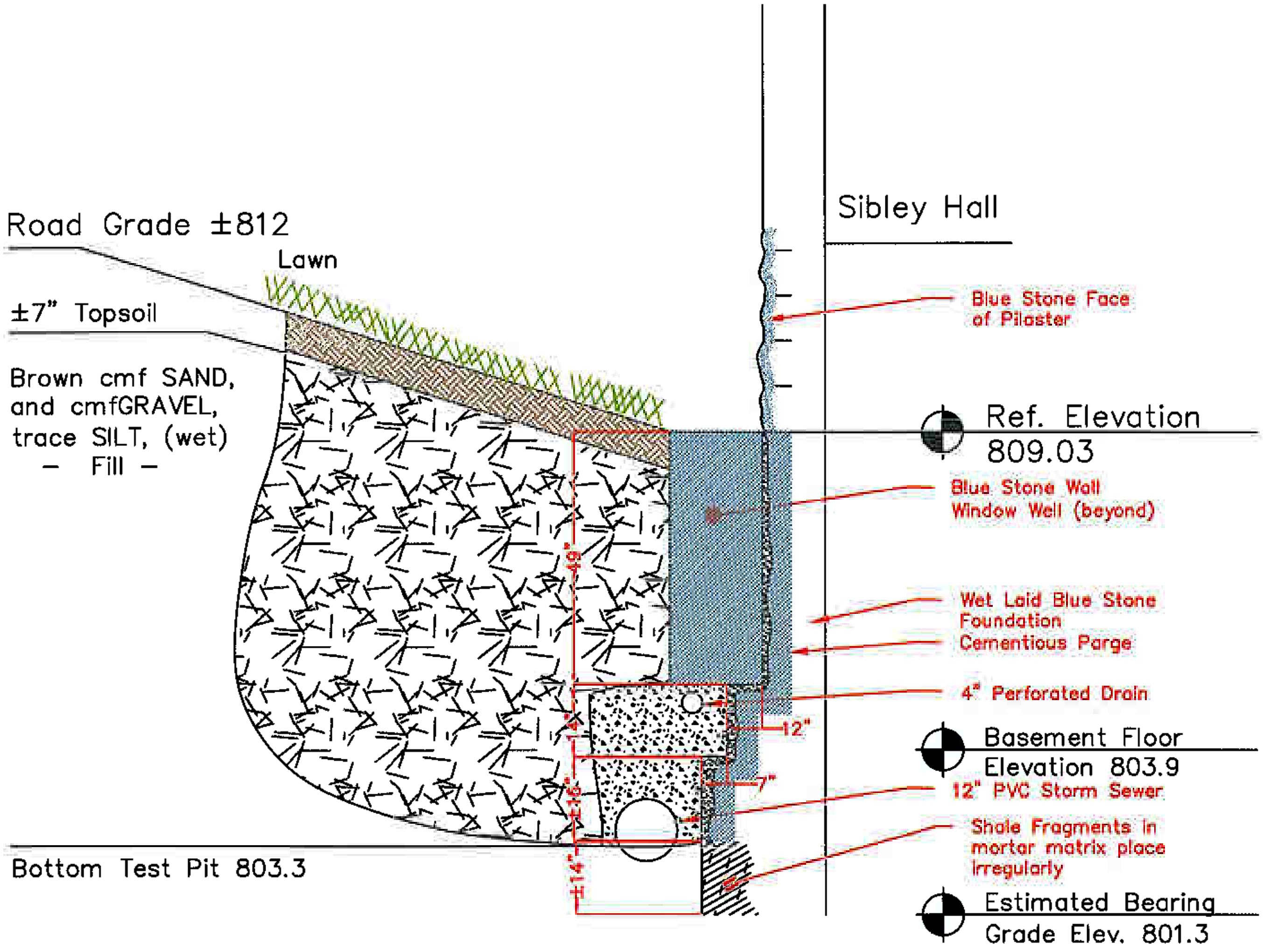
Test Pit Profile Sketch
Milstein Hall Cornell University
University Avenue
Ithaca, Tompkins Co., New York

CME Associates, Inc.
Construction Materials Evaluation
P.O.Box 1824
Cicero, New York 13039–1824
[315] 698–9315 FAX: [315] 698–9319

Test Pit – C

Test Pit – C

Notes:
1) Existing Surface Condition: Lawn.
2) Excavated with Case 580 TLB with 24" GP bucket.
3) No groundwater observed.
4) Soil conditions encountered and shown below represent the area of backfill from previous construction. Soil conditions further away from the structure may vary.
5) Test Pits excavated by crew from Cornell University Physical Plant.
6) Test Pit started to cave before bearing surface was encountered. Bearing Grade was estimated by probing.



Test Pit "D" Profile

CME Report No.: 26000B-01-0307

Exploration observed by CME Associates, Inc.; during the period from 03-13-07 to 03-14-07.

SHEET NO.
TP-D

03-15-07
26000
Jpw

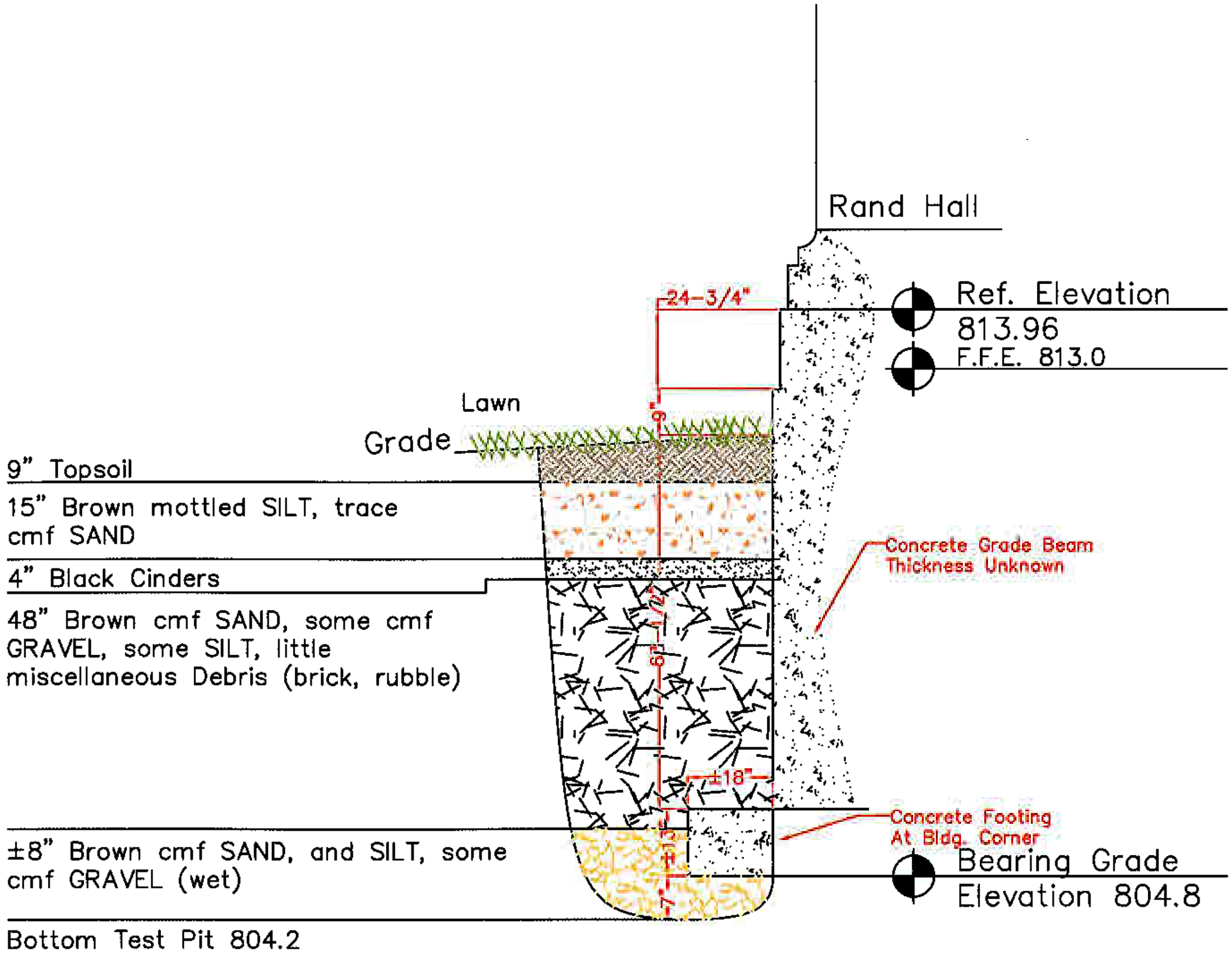
Test Pit Profile Sketch
Milstein Hall Cornell University
University Avenue
Ithaca, Tompkins Co., New York

CME Associates, Inc.
Construction Materials Evaluation
P.O.Box 1824
Cicero, New York 13039-1824
[315] 698-9315 FAX: [315] 698-9319

Test Pit – D

Test Pit – D

Notes:
1) Existing Surface Condition: Lawn.
2) Excavated with Case 580 TLB with 24" GP bucket.
3) No groundwater observed.
4) Soil conditions encountered and shown below represent the area of backfill from previous construction. Soil conditions further away from the structure may vary.
5) Test Pits excavated by crew from Cornell University Physical Plant.



Test Pit "E" Profile

CME Report No.: 260008-01-0307

Exploration observed by CME Associates, Inc.; during the period from 03-13-07 to 03-14-07.

SHEET NO.
TP-E

03-15-07
26000
jpw

Test Pit Profile Sketch
Milstein Hall Cornell University
University Avenue
Ithaca, Tompkins Co., New York

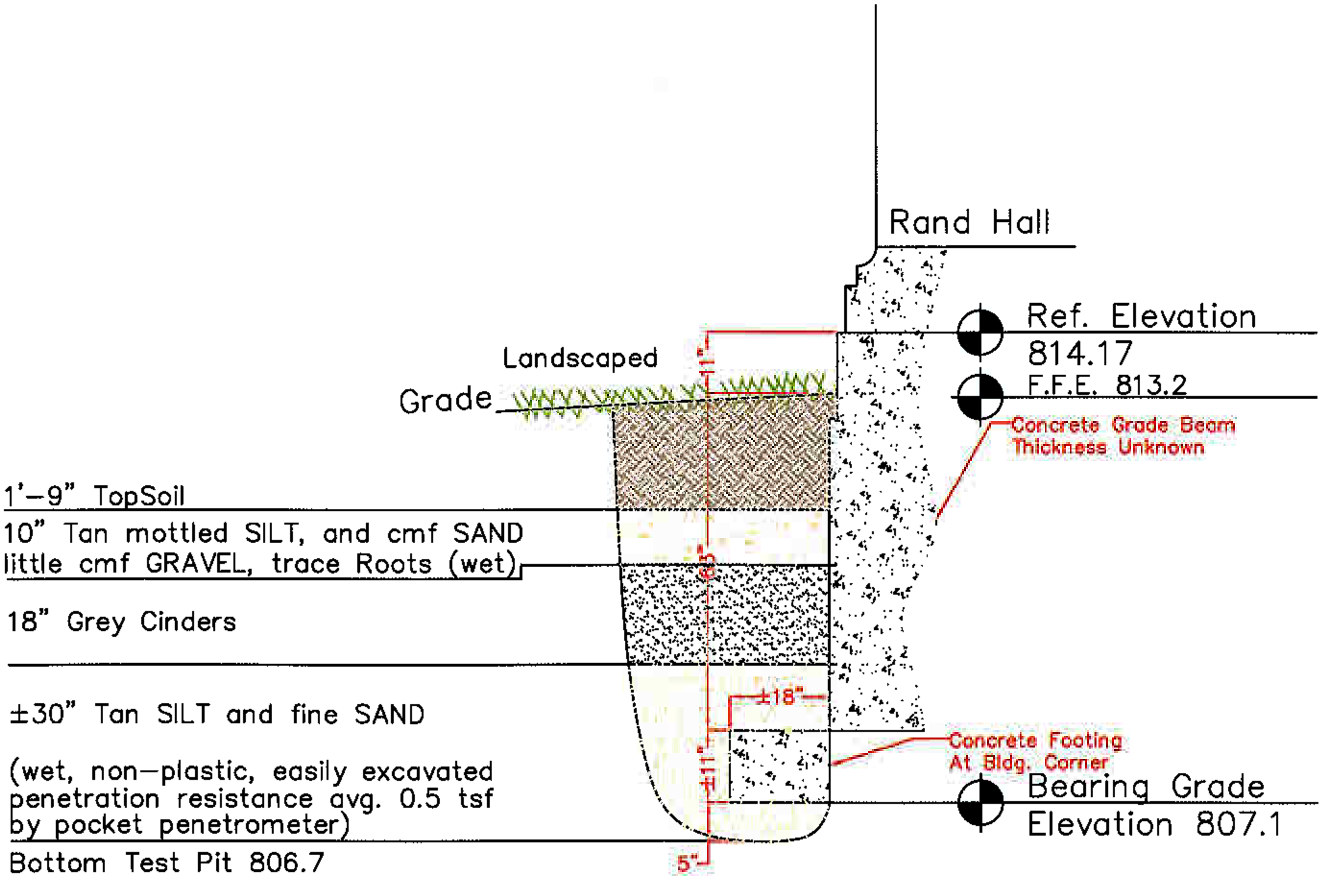
CME Associates, Inc.
Construction Materials Evaluation
P.O.Box 1824
Cicero, New York 13039-1824
[315] 698-9315 FAX: [315] 698-9319

Test Pit – E

Test Pit – F

Notes:

1) Existing Surface Condition: Lawn.
2) Excavated with Yanmar V035 mini–excavator with 24" GP bucket.
3) No groundwater observed.
4) Soil conditions encountered and shown below represent the area of backfill from previous construction. Soil conditions further away from the structure may vary.
5) Test Pits excavated by crew from Cornell University Physical Plant.



Test Pit "F" Profile

CME Report No.: 26000B–01–0307

Exploration observed by CME Associates, Inc.; during the period from 03–13–07 to 03–14–07.

SHEET NO.

TP–F

03–15–07
26000
Jpw

Test Pit Profile Sketch
Milstein Hall Cornell University
University Avenue
Ithaca, Tompkins Co., New York

CME Associates, Inc.
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GENERAL INFORMATION & KEY TO TEST BORING LOGS

The **Subsurface Exploration - Test Boring Logs produced by CME Associates, Inc.** present the observations and mechanical data collected by the driller while at the site, supplemented, at times, by classification of the materials removed from the borings as determined through visual identification by technicians in the laboratory. It is cautioned that the materials removed from the borings represent only a fraction of the total volume of the deposits at the site and may not necessarily be representative of the subsurface conditions between adjacent borings or between the sampled intervals. The data presented on the Exploration Logs together with the recovered samples will provide a basis for evaluating the character of the subsurface conditions relative to the proposed construction. The evaluation must consider all the recorded details and their significance relative to each other. Often, analyses of standard boring data indicate the need for additional testing and sampling procedures to more accurately evaluate the subsurface conditions. Any evaluations of the contents of CME's report and the recovered samples must be performed by Licensed Professionals having experience in Soil Mechanics and Foundation Engineering. The information presented in this Key defines some of the procedures and terms used on the CME Exploration Logs to describe the conditions encountered. Refer to the Log on page 3 for key number.

Key No.	Description
1.	The figures in the **DEPTH SCALE** column define the vertical scale of the Boring Log.
2.	**CASING BLOWS/FOOT** - shows the number of blows required to advance the casing a distance of 12 inches. The casing size, the hammer weight and the length of drop are noted under the **Methods of Investigation.** If the casing is advanced by means other than driving, the method of advancement will be indicated under **Methods of Investigation** at the top of the Log. If Hollow Stem Augers or Coring is used, it will be so noted in this column.
3.	The **SAMPLE I.D.** is used for identification on the sample containers and in the Laboratory Test Report or Summary.
4.	The **DEPTH OF SAMPLE** column gives the exact depth range from which a sample was recovered.
5.	The **SAMPLE TYPE/RECOVERY** column is used to signify the various type of sample attempt. "SS" is Split Spoon, "P" is piston tube, "U" is Undisturbed tube. For soil samples, the recovered length of the sample is also indicated, in inches. If a rock core sample is taken, the core bit size designation is given here.
6.	**BLOWS ON SAMPLER** - shows the results of the "Standard Penetration Test (SPT) ASTM D1586", recording the number of blows required to drive a split spoon sampler into the soil beneath the casing. The number of blows required for each six inches of penetration is recorded. The total number of blows required for the 6 inch to 18 inch interval is summarized in the **SPT "N"** column and represents the "Standard Penetration Number". The outside diameter of the sampler, the hammer weight and the length of drop are noted in the **Methods of Investigation** portion of the log. A "WH" or "WR" in this column indicates that the sample spoon advanced the 6 inch interval under **W**eight of **H**ammer or **W**eight of **R**ods, respectively.
7.	The **DEPTH OF CHANGE** column designates the depth (in feet) that the driller noted a compactness or stratum change. In soft materials or soil strata exhibiting a consistent relative density, it is difficult for the driller to determine the exact change from one stratum to the next. In addition, a grading or gradual change may exist. In such cases the depth noted is approximate or estimated only and may be represented by a dashed line.
8.	**CLASSIFICATION OF MATERIAL** - **Soil materials** encountered and sampled are described by the driller on the original log. Notes of driller observations are also placed in this column. Recovered samples may also be visually classified by a Soil Technician upon receipt in the Laboratory. Visual sample classification is by Burmister System and strata may be classified additionally by the Unified System. The Burmister System is a type of visual-manual textural classification estimated by the Driller or Technician on the basis of weight-fraction of the recovered soil. See Table 1 **"Classification of Materials"**. The description of the relative soil compactness or consistency is based upon the standard penetration number as defined in Table 2. The description of the soil moisture condition is described as dry, moist, wet, or saturated. Water used to advance the boring may have affected the in-situ moisture content of the sample. Special terms are used as required to describe materials in greater detail, such terms are listed in ASTM D653. When sampling gravelly soils with a standard two-inch O.D. Split Spoon, the true percentage of gravel is often not recovered due to the relatively small sampler diameter. The presence of boulders, cobbles, and large gravel is sometimes, but not necessarily, detected by an evaluation of the casing and sampler blows or through the "action" of the drill rig as reported by the driller.

8. **CLASSIFICATION OF MATERIAL** (continued)
The Description of **Rock** is based upon the recovered rock core. Terms frequently used in the description are included in Table 3. The length of core run is defined as length of penetration between retreivals of the corebarrel from the bore hole, expressed in inches. The core recovery expresses the length of core recovered from the core barrel per core run, in percent. The size core barrel used is noted in **Column 5**. The more commonly used sizes of core barrels are denoted "AX" and "NX". An "NX" core, being larger in diameter than "AX" core, often produces better recovery, and is frequently utilized where accurate information regarding the geologic conditions and engineering properties is needed. A better estimate of in-situ rock quality is provided by a *modified core recovery ratio* known as the **"Rock Quality Designation" (RQD)**. This ratio is determined by considering only pieces of core that are at least 4 inches long and are hard and sound. Breaks obviously caused by drilling are ignored. The diameter of the core should preferably be not less than 2 inches (NX). The percentage ratio between the total length of such core recovered and the length of core drilled on a given run is the RQD. Table 4 gives the rock quality description as related to the **RQD**.

9. The **SPT "N"** or **RQD** is given in this column as applicable to the specific sample taken. In Very Compact coarse grained soils the N-value may be indicated as 50+, and in Hard fine-grained soils the N-value may be indicated as 30+. This typically means that the blow count was achieved prior to driving the sampler the entire 6 inch interval or the sampler refused further penetration. For "NX" rock cores, the RQD is reported here, expressed in percent.

10. **GROUND WATER OBSERVATIONS** and timing noted by the driller are shown in this section. It is important to realize that the reliability of the water level observations depend upon the soil type (water does not readily stabilize in a hole through fine grained soils), and that drill water used to advance the borings may have influenced the observations. Ground water levels typically fluctuate seasonally so those noted on the log are only representative of that exhibited during the period of time noted on the log. One or more perched or trapped water levels may exist in the ground seasonally. All the available readings should be evaluated. If definite conclusions cannot be made, it is often prudent to examine the conditions more thoroughly through test pit excavations or ground water observation well installations.

TABLE 1 - VISUAL CLASSIFICATION OF MATERIALS (BURMISTER)

GROUP	**TEXTURAL CLASSIFICATION SIZES**
BOULDERS	larger than 12" diameter
COBBLES	12" diameter to 3" sieve
GRAVEL	3" - coarse - 1" - medium - 1/2" - fine - #4 sieve
SAND	#4 - coarse - #10 - medium - #40 - fine - #200 sieve
SILT	#200 sieve (0.074mm) to 0.005mm size (see below *)
CLAY	0.005mm size to 0.001mm size (see below *)

ABBREVIATIONS	**PERCENT OF TOTAL SAMPLE BY WEIGHT**	
f - fine	and	35 to 50%
m - medium	some	20 to 35%
c - coarse	little	10 to 20%
	trace	0 to 10%

***PLASTICITY DESCRIPTIONS**

TERM	**PLASTICITY INDEX**	**DRY STRENGTH**	**FIELD TEST**
Non-plastic	0 - 3	Very low	falls apart easily
Slightly plastic	4 - 15	Slight	easily crushed by fingers
Plastic	15 - 30	Medium	difficult to crush
Highly plastic	31 or more	High	impossible to crush with fingers

TABLE 2 - DESCRIPTION OF SOIL COMPACTNESS OR CONSISTENCY based on SPT "N"*

Primary Soil Type	Descriptive Term of Compactness	Range of Standard Penetration Resistance (N)
COARSE GRAINED SOILS	Very loose	less than 4 blows per foot
(More than half of Material is larger than No. 200 sieve size.)	Loose	4 to 10
	Medium compact	10 to 30
	Compact	30 to 50
	Very compact	Greater than 50
FINE GRAINED SOILS	**Descriptive Term of Consistency**	**Range of Standard Penetration Resistance (N)**
(More than half of material is smaller than No. 200 sieve size.)	Very soft	less than 2 blows per foot
	Soft	2 to 4
	Medium stiff	4 to 8
	Stiff	8 to 15
	Very stiff	15 to 30
	Hard	Greater than 30

*The number of blows of 140 pound weight falling 30 inches to drive 2 inch O.D., 1-3/8 inch I.D. sampler 12 inches is defined as the Standard Penetration Resistance designated "N".

TABLE 3 - ROCK CLASSIFICATION TERMS

Rock Classification Terms		Field Test or Meaning of Term
Hardness	Soft	Scratched by fingernail
	Medium Hard	Scratched easily by penknife
	Hard	Scratched with difficulty by penknife
	Very Hard	Cannot be scratched by penknife
Weathering	Very Weathered Weathered Sound	Judged from the relative amounts of disintegration, iron staining, core recovery, clay seams, etc.
Bedding (Natural Breaks in Rock Layers)	Laminated	less than 1inch
	Thinly bedded	1inch to 4 inches
	Bedded	4 inches to 12 inches
	Thickly bedded	12 inches to 36 inches
	Massive	greater than 36 inches

TABLE 4

Relation of Rock Quality Designation (RQD) and in-situ Rock Quality

RQD (%)	**Rock Quality Term Used**
90 to 100	Excellent
75 to 90	Good
50 to 75	Fair
25 to 50	Poor
0 to 25	Very Poor

BORING NO.: B-1 Page 1 of 1

SUBSURFACE EXPLORATION - TEST BORING LOG

Project:
Client:
Location of Boring:

Report No.:
Date Started: **Finished:**
Elevation of Surface of Boring:

METHODS OF INVESTIGATION

Casing: 3-1/4" I.D. Hollow Stem Auger **Hammer:**
Other:
Soil Sampler: 2" O.D. Split Barrel **Rod Size:**
Sampler Hammer: Wt. 140 lbs. **Fall:** 30 in.
Make & Model of Drill Rig:

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
	While drilling		
	Before casing removed		
	After casing removed		

LOG OF BORING SAMPLES | **CLASSIFICATION OF MATERIAL**

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	To	Sample Type/ Recovery (inches)	Blows on Sampler Per 6 inches	Depth of Change (feet)	**f** - fine **m** - medium **c** - coarse **and** - 35 to 50% **some** - 20 to 35% **little** - 10 to 20% **trace** - 0 to 10%	STP "N" or RQD
1	2	3	4	4	5	6	7	8	9

Denotes Key Number (see page 1)

CME Associates, Inc.

Test Pit Log Summary

Excavation by Cornell University on 7/26/06
Logged by: Marcus A. Rotundo, P.E.
Weather: Sunny, 95°F, humid
Client: Cornell University

Mr. Andrew Magre of CU requested that an engineer log four (4) Test excavations made by Cornell University Staff along the north curb line of University Avenue. Surveying service is T.G. Miller Engineers and Surveyors. Mr. Robert Silman, P.E. was also present. All test pits were terminated on buried utilities and these utilities were surveyed horizontally and vertically by T.G. Miller representatives. A Location Sketch by OMA 7/20/06, sheet TP-01 is attached.

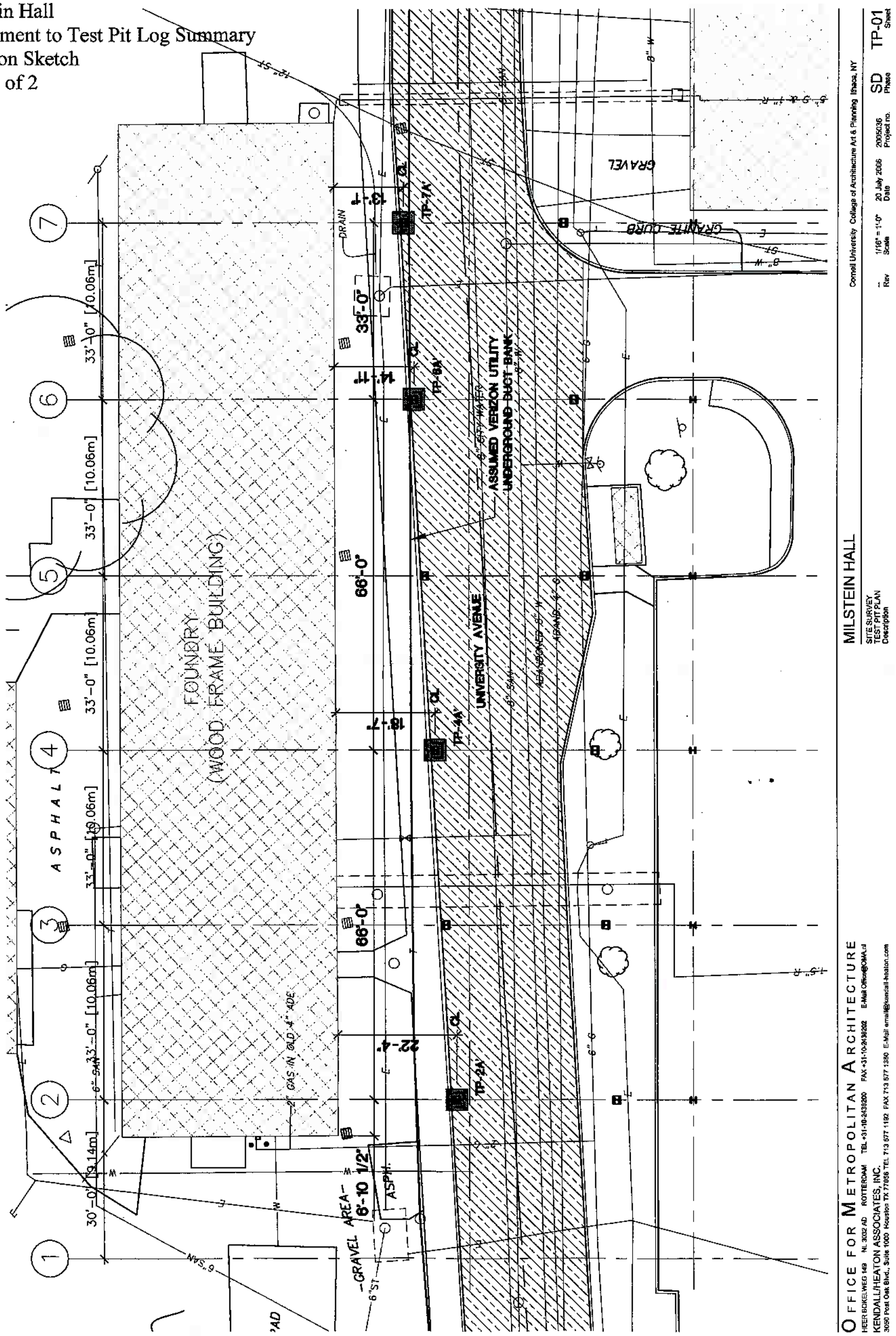
TP2A[1]	Road Grade Elevation
4.5 inches	Asphalt Pavement
2 feet	Grey cmf GRAVEL, and cmf SAND, trace SILT, FILL, moist
	Light Brown cmf SAND, some cmf GRAVEL, trace SILT, moist Bottom TP at 4.5 feet

TP4A[1]	Road Grade Elevation
6.5 inches	Asphalt Pavement
1.8 feet	Grey cmf GRAVEL, and cmf SAND, trace SILT, FILL, moist
3.3 feet	Grey-Brown cmf GRAVEL, and cmf SAND, little SILT, FILL, moist to wet
	Tan/Light Brown SILT, some fine SAND, saturated from weeping water above. Bottom TP at 4 feet

TP6A[1]	Road Grade Elevation
7 inches	Asphalt Pavement
1.5 feet	Brown cmf GRAVEL, and cmf SAND, trace SILT, FILL, moist
2.7 feet	Brown/Grey cmf GRAVEL, and cmf SAND, trace SILT, FILL, moist
	Light Brown mf SAND, some cmf GRAVEL, trace SILT, trace COBBLE, moist Bottom TP at 4.5 feet

TP7A[1]	Road Grade Elevation
5 inches	Asphalt Pavement
10 inches	Oiled cmf GRAVEL and cmf SAND
1.7 feet	Grey cmf GRAVEL, and cmf SAND, trace CINDERS, trace SILT, FILL, moist
3.7 feet	Brown/Grey cmf GRAVEL, and cmf SAND, trace SILT, FILL, moist
	Light Brown SILT, some fine SAND, wet Bottom TP at 4 feet

CME Report No. 26000B-02-0707
Milstein Hall
Attachment to Test Pit Log Summary
Location Sketch
Page 2 of 2



CME
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P.O. Box 554
Central Square, New York 13036
(315) 668-3868
(315) 676-3150 (Fax)

www.cmeassociates.com

TEST PIT LOG

Project:	Milstein Hall at Cornell University, Ithaca, New York	**Report No.:**	**25357B-01-0603**
		Location of Test Pit:	See Boring Location Sketch
Client:	Barkow Leibinger Architekten	**Ground Elevation:**	811.3'
		Date	**Start:** 05/20/03 **Finish:** 05/20/03
Test Pit No. TP-1	Sheet 1 of 2	**Representative:**	Candace Cean, Staff Geologist

Ground Water Observations

Date	Time	Depth
05/20/03		None Noted

DEPTH (Feet)	SAMPLE NUMBER	DEPTH OF SAMPLE FROM (FEET)	DEPTH OF SAMPLE TO (FEET)	DEPTH OF CHANGE (FEET)	NOTES OR PIT PROFILE	CLASSIFICATION OF MATERIAL f - FINE and 35-50% m - MEDIUM some 20-35% c - COARSE little 10-20% trace 0-10%
0				0.5		Topsoil (moist)
				1.0		Brown cmf SAND, some SILT, trace cmf GRAVEL (moist) ~ FILL ~
5						Brown cmf SAND, some cmf GRAVEL, trace SILT, trace Miscellaneous Debris (BRICK, SLAG, ASPHALT) (moist) ~ MISCELLANEOUS FILL ~ *Note 2: Top of footer noted at 4.0' below grade-conventional spread footing (1.0 foot thick).*
10						Bottom of Test Pit @ 5.4'

REMARKS:

1. Test Pit was excavated with John Deere model 310 SE four-wheel-drive backhoe.
2. Refer to sheet 2 of 2 for measurements of Rand Hall foundations.

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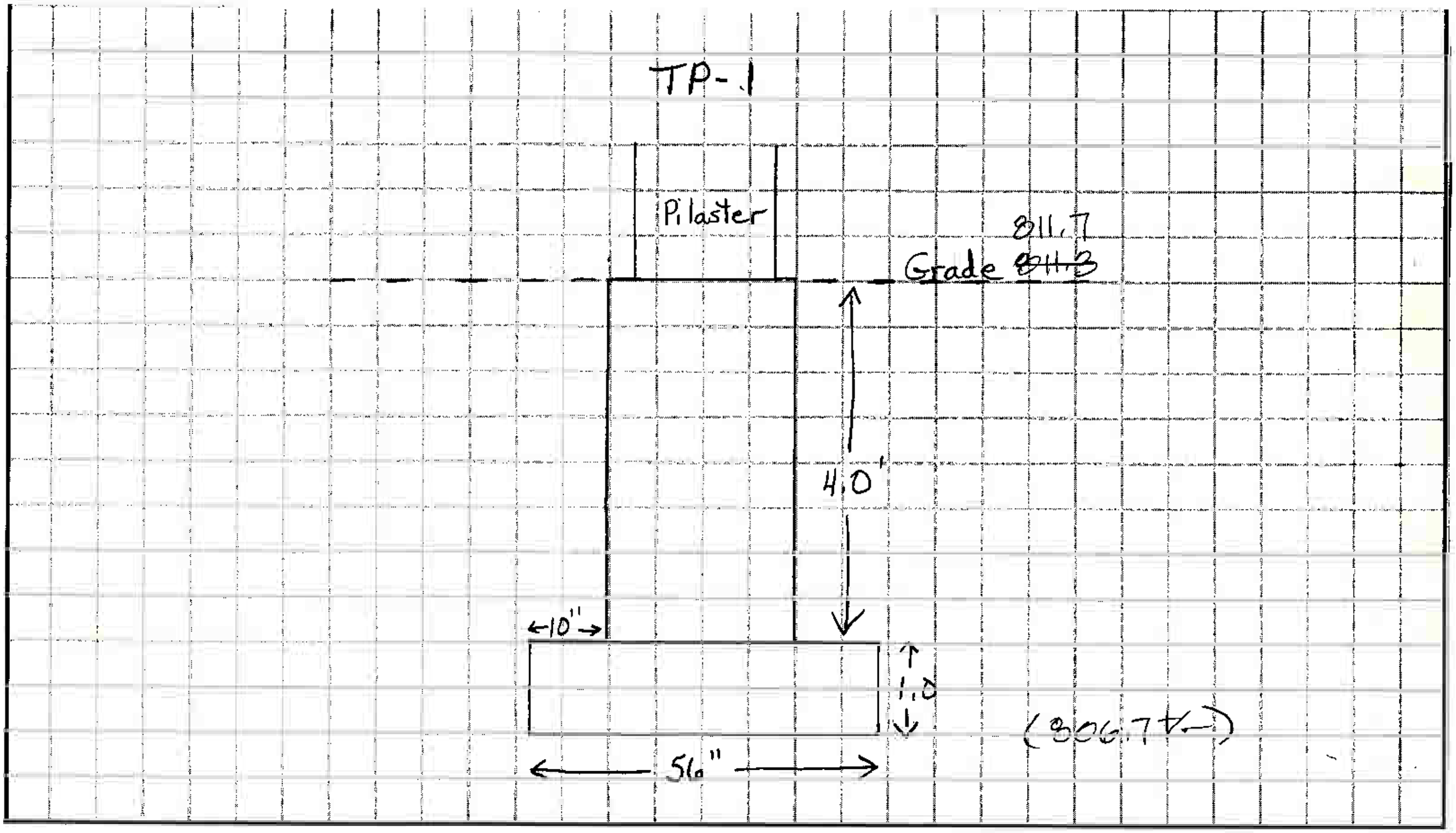

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(315) 676-3150 (Fax)

www.cmeassociates.com

TEST PIT LOG

Project: Milstein Hall at Cornell University, Ithaca, New York		**Report No.:**	**25357B-01-0603**
		Location of Test Pit:	See Boring Location Sketch
Client: Barkow Leibinger Architekten		**Ground Elevation:**	814.1'
		Date	**Start:** 05/20/03 **Finish:** 05/20/03
Test Pit No. TP-2	Sheet 1 of 2	**Representative:**	Candace Cean, Staff Geologist

Ground Water Observations

Date	**Time**	**Depth**
05/20/03		None Noted

DEPTH (Feet)	SAMPLE NUMBER	DEPTH OF SAMPLE		DEPTH OF CHANGE (FEET)	NOTES OR PIT PROFILE	CLASSIFICATION OF MATERIAL
		FROM (FEET)	TO (FEET)			f - FINE and 35-50% m - MEDIUM some 20-35% c - COARSE little 10-20% trace 0-10%
0				0.5		Topsoil (moist)
						Brown cmf SAND, little cmf GRAVEL, trace SILT, little Miscellaneous Debris (METAL , GLASS, BRICK, SLAG, DRAIN TILE) (moist) ~ MISCELLANEOUS FILL ~ *Note 2: Top of footer noted at 2.7' below grade, Bottom footer at 6.7' below grade.*
5						
						Bottom of Test Pit @ 6.7'
10						

REMARKS:

1. Test Pit was excavated with John Deere model 310 SE four-wheel-drive backhoe.
2. Refer to sheet 2 of 2 for measurements of Rand Hall foundations.

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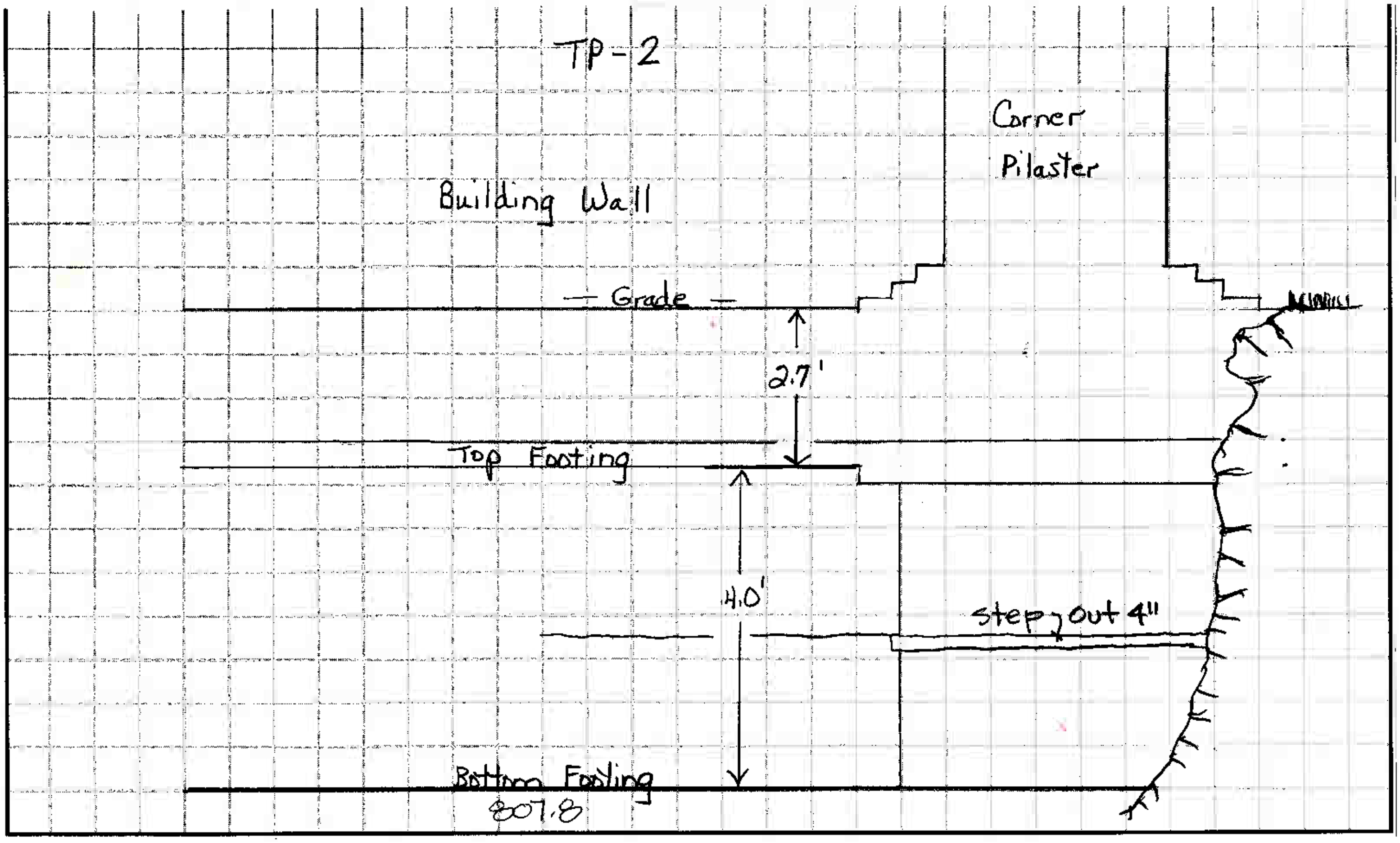


CME Associates, Inc.

Subsurface Exploration
and
Geotechnical Report

CORNELL UNIVERSITY MILSTEIN HALL PROJECT

APPENDIX B

Sibley Hall Examination Report

CME Geotechnical Engineer, Christopher R. Paolini, P.E., along with CME's John Wight, visited the Cornell University Campus on 06/27/07 to visually examine portions of the exposed foundation wall and stone and brick veneer walls of the existing Sibley Hall, for signs of distress, i.e. cracking, movement, etc. The area of particular interest is shown on attached Drawing 1, which is the North wall of Sibley Hall on the East side, which faces the future Milstein Hall and proposed CAAP Parking Garage (Photo 1).

Sibley Hall is oriented in the East/West direction and is located on the South side of the Arts Quadrangle. The building is reported to be a wood framed, bearing wall structure, with exterior walls consisting of stone and brick veneer. On the outside, the North wall, East of the center section, exposes a laid up stone foundation wall with a light tan brick veneer above. Milstein Hall is planned to be constructed as close as about seven feet to the existing North wall of Sibley Hall.

It has been reported by Ryan Biggs Associates, P.C. in a report entitled, *"Sibley Hall-Masonry Evaluation of West End"* dated, May 2002, that the existing building has experienced settlement. Please refer to said report for details. Since building settlement has been reported, and since the exterior stone and brick veneer walls have experienced cracking in the mortar joints, as well as some observable movement, CME representatives desired to observe these details first hand.

The site visit made by the CME team on 06/27/07 was not meant to be a thorough examination of the exterior walls, nor was it meant to be a structural condition survey. Please note the following:

- Observations from the outside were made from ground level only.
- No Cornell personnel were with us on-site during our site visit.
- CME has not been provided with any existing plans of Sibley Hall.
- No destructive or non-destructive testing was conducted by CME personnel on the elements described herein.
- Observations made were limited to portions of the North wall, only.

Distressed items that were observed are noted below:

- Limestone window sills are cracked, in areas (Photo 2), and have deformed in other areas (Photo 3).

- Cracking was observed in the foundation wall, that propogates into the brick veneer (Photos 4 and 5). Note that cracking runs through the brick and stone, outside of the mortar joints. Also note the different colors (shades of gray) in the mortar in the foundation wall joints. This is indicative of repointing.

- Evidence of repointing was noted at several locations in the foundation wall (Photo 6). This is likely the result of cracks being filled-in over the years.

- At the North Wall of Nodule A (Photo 7), the stone wall and brick veneer appear to have moved (settled) as evidenced by the waviness of these elements (along the horizontal plane). Also note the repointing of the mortar joints in the foundation wall.

- Cracking through the mortar joints was observed above the lower window on the West wall of Nodule A (Photos 8 and 9). This window sill is also shown in photo 2.

- The CME crew entered Nodule A and looked West, out the same window as noted in Photos 8 and 9 (Photos 10 and 11), on the West wall of Nodule A. Cracking was observed through the painted brick and mortar joints, above the top of the window.

Attachment Listing:

11-Photos taken 6/27/07 of Sibley Hall – North Side/East of Dome

PHOTO 1 - Looking South, at the North wall of Sibley Hall, on East side

PHOTO 2 - Looking East,
West wall of Nodule A

PHOTO 3 - Looking South, North wall of Sibley Hall, just West of Nodule A

PHOTO 4 - North wall of Sibley Hall, just East of the center section of the Hall.

PHOTO 5 - Close-up of Photo 4

PHOTO 6 - Looking South,
North wall of Nodule A

PHOTO 7 - Looking South at the North wall of Nodule A. Note the waviness, along the horizontal plane of the stone and brick veneer.

PHOTO 8 - Looking East, cracking noted in mortar joints on West wall of Nodule A, above lower window. See Photo 9 for a close-up view.

PHOTO 9 - Close-up of Photo 8

PHOTO 10 - Looking West from inside Nodule A, through the window on the West wall. Cracking is observed above the window. See Photo 11 for a close-up.

PHOTO 11 - Close-up cracking of Photo 10

Slope Northwest of Foundry – note exposed roots and large eroded area in center.
07.13.07

Slope NW of Foundry. Note Drain Tile at center.
07.13.07

Slope NW of Foundry – note Drain Tile and undercut area at 10 o’clock.
07.13.07

North edge of slab NW of Foundry – note concrete fill at center of photo.
07.13.07

Looking east at concrete fill, slab and slope NW of Foundry.
07.13.07

CME
Associates, Inc.

Subsurface Exploration
and
Geotechnical Report

CORNELL UNIVERSITY MILSTEIN HALL PROJECT

APPENDIX C

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Milstein Hall at Cornell University, Ithaca, New York
Report No.: 25357B-01-0603/26000B-02-0707
Client: Barkow Leibinger Architekten/Cornell University
Date Started: 05/21/03 **Finished:** 05/21/03
Location of Boring: See Boring Location Sketch
Elevation of Surface of Boring: 808.7' (-4.4')

METHODS OF INVESTIGATION

Casing: 3-1/4" ID H. Stem Auger
Driller: Dave Lyons
Casing Hammer:
Driller: Beau Fletcher
Other:
Inspector: Candace Cean
Soil Sampler: 2" OD Split Barrel
Rod Size: AWJ
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: CME 55 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
05/21/03	While drilling	None Noted	23.5'
05/21/03	Before casing removed	None Noted	47.0'
05/21/03	After casing removed	None Noted	out
05/21/03	After casing removed	caved @ 20.6'	out

LOG OF BORING SAMPLES

CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – **c**oarse **m** – **m**edium **f** – **f**ine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
0	XXX	1a	0.0	0.5	SS/10	2-3-6-13	0.5	Topsoil (moist)	
	H	1b	0.5	2.0				Brown SILT, little cmf SAND (moist)	9
	O	2	2.0	4.0	SS/14	7-5-10-10		Brown cmf SAND, some SILT, little mf GRAVEL, trace BRICK (moist)	15
	L						4.0	~ MISCELLANEOUS FILL ~	
		3	4.0	6.0	SS/12	11-9-13-8		Brown cmf GRAVEL and cmf SAND, trace SILT (moist, medium compact)	22
5	L								
	O	4	6.0	8.0	SS/8	7-7-14-21		Similar Soil (moist, medium compact)	21
	W								
		5	8.0	10.0	SS/10	12-14-18-28		Similar Soil (moist, compact)	32
10		6	10.0	12.0	SS/14	12-20-21-18		Similar Soil (moist, compact)	41
	S								
		7	12.0	14.0	SS/8	15-13-17-21		Similar Soil (moist, compact)	30
	T								
	E	8	14.0	16.0	SS/10	10-9-9-10		Similar Soil (moist, medium compact)	18
15	M								
		9	16.0	18.0	SS/6	10-8-6-7		Similar Soil (moist, medium compact)	14
							18.0		
		10	18.0	20.0	SS/18	4-3-3-4		Brown fine SAND, trace SILT (moist, loose)	6
	A								
20									
	U								
	G								
		11	23.5	25.0	SS/16	8-10-6		Similar Soil (wet, medium compact)	16
	E								
25	R							Continued on page 2	

*****SS – Split Spoon, U – Undisturbed Tube, C - Core
Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – **c**oarse **m** – **m**edium **f** – **f**ine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
	O						28.0		
	L	12	28.5	30.0	SS/18	3-3-6		Grey SILT and CLAY, trace cmf SAND (moist, stiff)	9
	L								
30									
	O								
	W								
		13	33.5	35.0	SS/18	6-12-23		Grey SILT, trace CLAY, trace fine SAND (moist, hard)	35
35	S								
	T								
	E								
		14	38.5	40.0	SS/18	20-21-17		Grey SILT, little fine SAND (moist, hard)	38
	M								
40									
	A	15a	43.5	44.5	SS/12	5-6-100@3”	44.5	Grey SILT, some CLAY, little mf GRAVEL, little cmf SAND (moist, stiff)	
	U	15b	44.5	45.0				Grey SHALE fragments (dry)	100+
45									
	G								
	E							*Auger Refusal @ 47.0’*	
		16	47.0	47.1	SS/0	100@1”		No Recovery	100+
	R							~ Probable Bedrock ~	
	XXX							Bottom of Boring @ 47.1’	
50									

*****SS – Split Spoon, U – Undisturbed Tube

Remarks:

SUBSURFACE EXPLORATION – TEST BORING LOG

Project:	Milstein Hall at Cornell University, Ithaca, New York	**Report No.:**	25357B-01-0603/26000B-02-0707
Client:	Barkow Leibinger Architekten/Cornell University	**Date Started:**	05/20/03 **Finished:** 05/21/03
Location of Boring:	See Boring Location Sketch	**Elevation of Surface of Boring:**	810.4' (-2.7')

METHODS OF INVESTIGATION

Casing:	3-1/4" ID H. Stem Auger	**Driller:**	Dave Lyons
Casing Hammer:		**Driller:**	Beau Fletcher
Other:		**Inspector:**	Candace Cean
Soil Sampler:	2" OD Split Barrel	**Rod Size:**	AWJ
Sampler Hammer: Wt.	140 lbs./Auto	**Fall:**	30 in.
Make & Model of Drill Rig:	CME 55 Truck Mounted		

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
05/20/03	While drilling	None Noted	34.5'
05/21/03	Before casing removed	None Noted	33.4'
05/21/03	After casing removed	None Noted	out
05/21/03	After casing removed	caved @ 25.6'	out

LOG OF BORING SAMPLES **CLASSIFICATION OF MATERIAL**

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – **c**oarse **m** – **m**edium **f** – **f**ine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
0	XXX	1a	0.0	0.3	SS/12	3-4-4-7	0.3	Topsoil (moist)	
	H	1b	0.3	2.0				Brown cmf SAND, some cmf GRAVEL, little SILT (moist)	8
	O	2	2.0	4.0	SS/14	8-12-6-3		Brown cmf SAND and SILT, little mf GRAVEL (moist)	18
	L								
		3	4.0	6.0	SS/12	3-4-6-11		Brown cmf SAND and mf GRAVEL, trace SILT, trace ROOTS (moist)	10
5	L								
							6.0	~ FILL ~	
	O	4	6.0	8.0	SS/2	9-10-6-3		Grey cmf GRAVEL, trace cmf SAND (moist, medium compact)	16
	W								
		5	8.0	10.0	SS/6	3-4-5-4		Brown cmf SAND, some SILT, little mf GRAVEL (wet, loose)	9
10		6	10.0	12.0	SS/6	3-4-2-3		Similar Soil (moist, loose)	6
	S						12.0		
		7	12.0	14.0	SS/18	3-4-3-3		Brown fine SAND, little SILT (saturated, loose)	7
	T								
	E	8	14.0	16.0	SS/18	4-3-4-9		Similar Soil (saturated, loose)	7
15	M								
							16.0		
		9	16.0	18.0	SS/18	7-6-5-7		Grey SILT, some CLAY, trace cmf SAND (moist, stiff)	11
		10	18.0	20.0	SS/16	3-5-8-12		Grey SILT, little CLAY, trace cmf SAND (moist, stiff)	13
	A								
20									
	U								
	G								
		11	23.5	25.0	SS/16	5-7-8		Similar Soil with trace cmf GRAVEL (moist, very stiff)	15
	E								
25	R							Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – **c**oarse **m** – **m**edium **f** – **f**ine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
		12	28.5	30.0	SS/14	7-7-7		Grey SILT, little cmf GRAVEL, trace CLAY, trace cmf SAND (moist, stiff)	14
30	S								
							32.0		
								Auger Refusal @ 34.4'	
	A	13	34.4	34.5	SS/1	100@1"		Grey SHALE fragments (dry) ~ Probable Bedrock ~	100+
35	XXX							Bottom of Boring @ 34.5'	
40									
45									
50									

*****SS – Split Spoon, U – Undisturbed Tube

Remarks:

SUBSURFACE EXPLORATION – TEST BORING LOG

Project:	Milstein Hall at Cornell University, Ithaca, New York	**Report No.:**	25357B-01-0603/ 26000B-02-0707
Client:	Barkow Leibinger Architekten/ Cornell University	**Date Started:**	05/21/03 **Finished:** 05/21/03
Location of Boring:	See Boring Location Sketch	**Elevation of Surface of Boring:**	811.7’ (-1.4’)

METHODS OF INVESTIGATION

Casing:	3-1/4” ID H. Stem Auger	**Driller:**	Dave Lyons
Casing Hammer:		**Driller:**	Beau Fletcher
Other:		**Inspector:**	Candace Cean
Soil Sampler:	2” OD Split Barrel	**Rod Size:**	AWJ
Sampler Hammer: Wt.	140 lbs./Auto	**Fall:**	30 in.
Make & Model of Drill Rig:	CME 55 Truck Mounted		

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
05/21/03	While drilling	None Noted	10.0’
05/21/03	Before casing removed	None Noted	33.1’
05/21/03	After casing removed	None Noted	out
05/21/03	After casing removed	caved @ 29.3’	out

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – **c**oarse **m** – **m**edium **f** – **f**ine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT “N” or RQD
0	XXX	1a	0.0	0.5	SS/12	3-2-1-2	0.5	Topsoil (moist)	
	H	1b	0.5	2.0				Brown SILT, some cmf SAND, trace mf GRAVEL (moist)	3
	O	2	2.0	4.0	SS/14	1-1-2-2		Brown cmf SAND and SILT, trace mf GRAVEL, trace SLAG (moist)	3
	L								
		3	4.0	6.0	SS/20	2-2-2-5		Brown cmf SAND, some SILT, trace mf GRAVEL (moist)	4
5	L								
							6.0	~ FILL ~	
	O	4	6.0	8.0	SS/16	4-4-4-6		Brown cmf GRAVEL and cmf SAND, trace SILT (moist, loose)	8
	W								
		5	8.0	10.0	SS/16	5-6-10-9		Brown cmf SAND and SILT, some cmf GRAVEL, trace CLAY (moist, medium compact)	16
10		6	10.0	12.0	SS/16	8-12-7-7		Brown cmf GRAVEL and cmf SAND, little SILT (wet, medium compact)	19
	S						12.0		
		7	12.0	14.0	SS/18	10-10-15-20		Grey SILT, little CLAY, trace cmf SAND, trace mf GRAVEL (moist, very stiff)	25
	T								
	E	8	14.0	16.0	SS/18	7-12-16-19		Grey SILT, little CLAY, little cmf SAND, trace mf GRAVEL (moist, very stiff)	28
15	M								
		9	16.0	18.0	SS/4	16-14-16-16		Similar Soil (moist, hard)	30
		10	18.0	20.0	SS/18	5-6-8-11		Similar Soil (moist, stiff)	14
	A								
20									
	U								
							23.0		
	G								
		11	23.5	25.0	SS/18	10-11-18		Grey SILT, some CLAY, trace fine SAND (wet, very stiff)	29
	E								
25	R							Continued on page 2	

***SS** – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – **c**oarse **m** – **m**edium **f** – **f**ine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
							28.0		
		12	28.5	30.0	SS/18	4-12-21		Grey SILT and cmf SAND, little cmf GRAVEL, trace SHALE fragments (moist, hard)	33
	S								
30									
							31.0		
								Auger Refusal @ 33.1'	
		13	33.1	33.2	SS/1	100@1"		Grey SHALE fragments (dry)	100+
	A							~ Probable Bedrock ~	
	XXX							Bottom of Boring @ 34.5'	
35									
40									
45									
50									

*****SS – Split Spoon, U – Undisturbed Tube

Remarks:

CME Associates, Inc. **BORING NO.: B-5** Page 1 of 2

SUBSURFACE EXPLORATION – TEST BORING LOG

Project:	Milstein Hall at Cornell University, Ithaca, New York	**Report No.:**	25357B-01-0603/ 26000B-02-0707
Client:	Barkow Leibinger Architekten/ Cornell University	**Date Started:**	05/20/03 **Finished:** 05/20/03
Location of Boring:	See Boring Location Sketch	**Elevation of Surface of Boring:**	816.5’ (3.4’)

METHODS OF INVESTIGATION

Casing:	3-1/4” ID H. Stem Auger	**Driller:**	Dave Lyons
Casing Hammer:		**Driller:**	Beau Fletcher
Other:		**Inspector:**	Candace Cean
Soil Sampler:	2” OD Split Barrel	**Rod Size:**	AWJ
Sampler Hammer: Wt.	140 lbs./Auto	**Fall:**	30 in.
Make & Model of Drill Rig:	CME 55 Truck Mounted		

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
05/20/03	While drilling	None Noted	10.0’
05/20/03	Before casing removed	34.7’	37.9’
05/20/03	After casing removed	None Noted	out
05/20/03	After casing removed	caved @ 27.7’	out

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – **c**oarse **m** – **m**edium **f** – **f**ine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT “N” or RQD
			From	To					
0	XXX						0.5	6” Asphalt Pavement	
	H	1	0.5	2.0	SS/6	7-7-4		Grey Run-of-Crush GRAVEL (moist)	11
							2.0	~ FILL ~	
	O	2	2.0	4.0	SS/10	4-3-3-2		Brown cmf SAND, some SILT (moist)	6
							4.0	~ FILL ~	
	L	3	4.0	6.0	SS/10	1-2-1-4		Brown cmf SAND and SILT, trace cmf GRAVEL (moist, very loose)	3
5	L								
	O	4	6.0	8.0	SS/12	7-7-6-5		Similar Soil (moist, medium compact)	13
	W								
		5	8.0	10.0	SS/18	3-3-4-4		Brown mf SAND, little SILT, trace fine GRAVEL (moist, loose)	7
							10.0		
10		6	10.0	12.0	SS/16	3-4-3-5		Brown SILT, little CLAY, trace cmf SAND (wet, medium stiff)	7
	S						12.0		
		7	12.0	14.0	SS/18	4-5-7-8		Grey CLAY, little SILT, trace mf GRAVEL, trace cmf SAND (moist, stiff)	12
	T								
	E	8	14.0	16.0	SS/22	2-4-5-7		Similar Soil (moist, stiff)	9
15	M								
		9	16.0	18.0	SS/23	7-8-10-11		Similar Soil (moist, very stiff)	18
		10	18.0	20.0	SS/20	3-5-7-10		Similar Soil (moist, stiff)	12
	A								
20									
	U								
							23.0		
	G								
		11	23.5	25.0	SS/16	11-14-9		Grey fine SAND, some SILT (moist, medium compact)	23
	E								
25	R							Continued on page 2	

*****SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

CME Associates, Inc. **Report No.: 25357B-01-0503 BORING NO.: B-5** Page 2 of 2

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – **c**oarse **m** – **m**edium **f** – **f**ine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
	O								
	L						28.0		
	L								
	O	12	28.5	30.0	SS/16	5-6-8		Grey CLAY, some SILT, trace mf GRAVEL, trace cmf SAND (moist, stiff)	14
	W								
30									
	S								
	T								
	E								
	M								
		13	33.5	35.0	SS/12	6-8-57		Similar Soil with trace SHALE fragments (moist, hard)	65
35	A						34.5		
	U								
	G							*Auger Refusal @ 37.9*	
	E	14	37.9	38.0	SS/0.5	100@1”		Grey SHALE fragments (wet)	100+
	R							~ Probable Bedrock ~	
	XXX							Bottom of Boring @ 38.0’	
40									
45									
50									

*****SS – Split Spoon, U – Undisturbed Tube

Remarks:

CME Associates, Inc. **BORING NO.: B-6** Page 1 of 2

SUBSURFACE EXPLORATION – TEST BORING LOG

Project:	Milstein Hall at Cornell University, Ithaca, New York	**Report No.:**	25357B-01-0603/26000B-02-0707
Client:	Barkow Leibinger Architekten/Cornell University	**Date Started:**	05/20/03 **Finished:** 05/20/03
Location of Boring:	See Boring Location Sketch	**Elevation of Surface of Boring:**	808.6' (-4.5’)

METHODS OF INVESTIGATION

Casing:	3-1/4” ID H. Stem Auger	**Driller:**	Dave Lyons
Casing Hammer:		**Driller:**	Beau Fletcher
Other:		**Inspector:**	Candace Cean
Soil Sampler:	2” OD Split Barrel	**Rod Size:**	AWJ
Sampler Hammer: Wt.	140 lbs./Auto	**Fall:**	30 in.
Make & Model of Drill Rig:	CME 55 Truck Mounted		

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
05/20/03	While drilling	None Noted	10.0’
05/20/03	Before casing removed	29.9’	33.4’
05/20/03	After casing removed	28.7’	out
05/20/03	After casing removed	caved @ 28.7’	out

LOG OF BORING SAMPLES

CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT “N” or RQD
			From	To					
0	XXX	1a	0.0	0.5	SS/10	2-5-5-6	0.5	Topsoil (moist)	
	H	1b	0.5	2.0				Brown cmf SAND and cmf GRAVEL, trace SILT (moist)	10
	O	2	2.0	4.0	SS/3	4-5-4-3		Similar Material (moist)	9
	L	3	4.0	6.0	SS/8	4-5-5-5		Similar Material (moist)	10
5	L							~ FILL ~	
	O	4	6.0	8.0	SS/6	5-6-8-5		Similar Material (moist)	14
	W						8.0		
		5	8.0	10.0	SS/18	12-5-5-5		Brown mf SAND, trace SILT (moist, medium compact)	10
10		6	10.0	12.0	SS/18	5-4-4-4		Brown fine SAND, trace SILT (saturated, loose)	8
	S						12.0		
		7	12.0	14.0	SS/16	3-4-8-10		Brown SILT, trace CLAY, trace fine SAND (moist, stiff)	12
	T						14.0		
	E	8	14.0	16.0	SS/20	5-4-6-8		Grey CLAY, trace SILT (moist, stiff)	10
15	M								
							16.0		
		9	16.0	18.0	SS/22	7-10-13-16		Grey SILT, trace CLAY (moist, very stiff)	23
		10	18.0	20.0	SS/14	11-13-21-27		Similar Soil (moist, hard)	34
	A								
20									
	U								
							23.0		
	G								
		11	23.5	25.0	SS/18	4-7-9		Grey CLAY, little SILT, trace cmf SAND, trace mf GRAVEL (moist, very stiff)	16
	E								
25	R							Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – **c**oarse **m** – **m**edium **f** – **f**ine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
							28.0		
		12	28.5	30.0	SS/14	9-14-13		Grey SILT, some cmf GRAVEL, some cmf SAND, trace CLAY (moist, very stiff)	27
30	S								
							31.0		
								Auger Refusal @ 33.4'	
	A	13	33.4	33.5	SS/0.5	100@1"		Grey SHALE fragments (wet) ~ Probable Bedrock ~	100+
	XXX							Bottom of Boring @ 33.5'	
35									
40									
45									
50									

*****SS – Split Spoon, U – Undisturbed Tube

Remarks:

CME Associates, Inc. **BORING NO.: B-7** Page 1 of 2

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Milstein Hall at Cornell University, Ithaca, New York
Report No.: 25357B-01-0603/ 26000B-02-0707
Client: Barkow Leibinger Architekten/ Cornell University
Date Started: 05/19/03 **Finished:** 05/19/03
Location of Boring: See Boring Location Sketch
Elevation of Surface of Boring: 807.1' (-6.0')

METHODS OF INVESTIGATION

Casing: 3-1/4" ID H. Stem Auger
Driller: Dave Lyons
Casing Hammer:
Driller: Beau Fletcher
Other: NQ-Core Barrel
Inspector: Candace Cean
Soil Sampler: 2" OD Split Barrel
Rod Size: AWJ
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: CME 55 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
05/19/03	While drilling	24.3'	28.5'
05/19/03	Before casing removed	29.5'	42.6'
05/19/03	Before casing removed	Water added for coring	

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine and – 35 to 50 % some – 20 to 35 % little – 10 to 20 % trace – 0 to 10 %	SPT "N" or RQD
			From	To					
0	XXX						0.3	4" Asphalt Pavement	
	H	1	0.5	2.0	SS/5	2-7-8		Brown cmf SAND and cmf GRAVEL, trace SILT, trace ASPHALT (moist)	15
	O	2	2.0	4.0	SS/7	7-8-5-9		Similar Material with trace BRICK (moist)	13
	L	3	4.0	6.0	SS/3	7-5-4-4		Similar Material (moist)	9
5	L							~ MISCELLANEOUS FILL ~	
	O	4	6.0	8.0	SS/2	5-6-8-10		Similar Material (wet)	14
	W	5a	8.0	8.5	SS/18	8-7-7-11		Similar Material (moist)	
							8.5		
		5b	8.5	10.0				Brown fine SAND, trace SILT (moist, medium compact)	14
10		6	10.0	12.0	SS/16	6-8-9-9		Brown fine SAND, little SILT (moist, medium compact)	17
	S								
		7	12.0	14.0	SS/18	9-10-12-10		Similar Soil (moist, medium compact)	22
	T								
	E	8	14.0	16.0	SS/16	4-4-5-5		Brown fine SAND, trace SILT (moist, loose)	9
15	M								
		9	16.0	18.0	SS/14	5-5-4-4		Similar Soil (moist, loose)	9
							18.0		
		10	18.0	20.0	SS/14	5-3-4-5		Brown SILT, some fine SAND (wet, medium stiff)	7
	A								
20									
	U								
	G								
		11	23.5	25.0	SS/14	2-2-2		Similar Soil (saturated, medium stiff)	4
	E								
25	R							Continued on page 2	

*****SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
	O								
	L						28.0		
	L								
	O	12	28.5	30.0	SS/12	2-2-3		Grey SILT, some CLAY, trace cmf SAND	5
	W							(saturated, medium stiff)	
30									
		13a	33.5	34.0	SS/16	9-12-19	34.0	Similar Soil (saturated, hard)	
		13b	34.0	35.0				Grey SILT, trace fine SAND, trace CLAY	31
								(moist, hard)	
35									
	S								
	T								
	E								
	M								
		14a	38.5	39.5	SS/10	5-10-100@2"	39.5	Similar Soil (moist, hard)	
		14b	39.5	39.7				Grey SHALE fragments (dry)	100+
40									
		15	42.6	42.6	SS/0	100@0"		No Recovery	100+
							42.6	*Auger Refusal @ 42.6'*	
		R1	42.6	47.6	C/60	NQ-Core		Grey, medium hard, weathered, thinly bedded	64%
								SHALE BEDROCK	
	A							Recovery: 60"/60" = 100%	
	U							RQD: 38.5"/60" = 64%	
45	G							12 Pieces, 1-1/2" Chips & Fragments	
	E								
	R								
	XXX							Bottom of Boring @ 47.6'	
50									

*****SS – Split Spoon, U – Undisturbed Tube

Remarks:

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Milstein Hall at Cornell University, Ithaca, New York
Report No.: 25357B-01-0603/26000B-02-0707
Client: Barkow Leibinger Architekten/Cornell University
Date Started: 05/19/03 **Finished:** 05/20/03
Location of Boring: See Boring Location Sketch
Elevation of Surface of Boring: 807.8' (-5.3')

METHODS OF INVESTIGATION

Casing:	3-1/4" ID H. Stem Auger	**Driller:**	Dave Lyons
Casing Hammer:		**Driller:**	Beau Fletcher
Other:		**Inspector:**	Candace Cean
Soil Sampler:	2" OD Split Barrel	**Rod Size:**	AWJ
Sampler Hammer: Wt.	140 lbs./Auto	**Fall:**	30 in.
Make & Model of Drill Rig:	CME 55 Truck Mounted		

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
05/20/03	While drilling	18.5'	18.0'
05/20/03	Before casing removed	None Noted	37.6'
05/20/03	After casing removed	None Noted	out
05/20/03	After casing removed	caved @ 16.4'	out

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – **c**oarse **m** – **m**edium **f** – **f**ine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
0	XXX						0.3	3" Asphalt Pavement	
	H	1	0.5	2.0	SS/12	5-7-4		Brown cmf SAND, some cmf GRAVEL, trace SILT, trace BRICK, trace ASPHALT (moist)	11
	O								
		2	2.0	4.0	SS/4	6-9-8-6		Similar Material (moist)	17
	L							~ MISCELLANEOUS FILL ~	
		3	4.0	6.0	SS/8	7-7-5-4		Similar Material (moist)	12
5	L								
							6.0		
	O	4	6.0	8.0	SS/10	4-4-1-2		Brown fine SAND, some SILT (wet, loose)	5
	W								
		5	8.0	10.0	SS/16	2-2-2-2		Brown fine SAND, trace SILT (moist, loose)	4
10		6	10.0	12.0	SS/18	2-2-2-2		Similar Soil (moist, loose)	4
	S						12.0		
		7	12.0	14.0	SS/22	2-2-3-2		Brown SILT, little fine SAND (moist, medium stiff)	5
	T								
							14.0		
	E	8	14.0	16.0	SS/22	3-3-2-3		Brown fine SAND, trace SILT (moist, loose)	5
15	M								
		9	16.0	18.0	SS/22	2-1-1-2		Brown fine SAND, some SILT (saturated, very loose)	2
		10a	18.0	19.5	SS/22	3-5-3-3	19.5	Similar Soil (saturated, loose)	
		10b	19.5	20.0				Brown CLAY, little SILT, trace fine SAND (moist, stiff)	8
	A								
20									
	U								
	G								
		11	23.5	25.0	SS/16	4-7-10		Grey SILT, little CLAY, little mf GRAVEL, trace cmf SAND (moist, very stiff)	17
	E								
25	R							Continued on page 2	

*****SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – **c**oarse **m** – **m**edium **f** – **f**ine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT “N” or RQD
			From	To					
25	H							Continued from page 1	
	O								
	L								
	L								
	O	12	28.5	30.0	SS/18	5-10-9		Grey SILT, trace CLAY (moist, very stiff)	19
	W								
30									
	S								
	T								
	E								
	M	13a	33.5	34.5	SS/16	7-7-100@4”		Brown SILT, little CLAY, trace cmf SAND	
							34.5	(moist, very stiff)	
		13b	34.5	34.8				Grey weathered SHALE fragments (moist)	100+
35	A								
	U								
	G							*Auger Refusal @ 37.6’*	
	E	14	37.6	37.7	SS/0.5”	100@1”		Grey SHALE fragments (dry)	100+
	R							~ Probable Bedrock ~	
	XXX							Bottom of Boring @ 37.7’	
40									
45									
50									

*****SS – Split Spoon, U – Undisturbed Tube

Remarks:

CME Associates, Inc. **BORING NO.: B07-10** Page 1 of 2

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Milstein Hall, Cornell University, Ithaca, New York **Report No.:** 26000B-02-0707
Client: Cornell University **Date Started:** 06/01/07 **Finished:** 06/01/07
Location of Boring: Offset Boring 2' N and 7' E, due to utilities **Elevation of Surface of Boring:** 810.8’ (-2.3’)

METHODS OF INVESTIGATION

Casing: 4-1/4" ID H. Stem Auger **Driller:** Dan Gates
Casing Hammer: **Driller:** Karl Allen
Other: **Inspector:** Natalie Meneilly
Soil Sampler: 2" OD Split Barrel **Rod Size:** AWJ
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: Diedrich D120 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
06/01/07	While drilling	None Noted	18.0'
06/01/07	Before casing removed	None Noted	40.4'
06/01/07	After casing removed	See Remark 1	
06/01/07	After casing removed		

LOG OF BORING SAMPLES **CLASSIFICATION OF MATERIAL**

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – **c**oarse **m** – **m**edium **f** – **f**ine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT “N” or RQD
			From	To					
0	XXX	1a	0.0	1.3	SS/10	8-7-6		Brown SILT, some cmf GRAVEL, little cmf SAND with CINDERS (moist)	13
	H								
		1b	1.3	1.5				CINDERS and BRICK, little cmf SAND (moist)	
	O							~ Miscellaneous Fill ~	
	L								
5		2a	5.0	6.0	SS/10	2-4-9		Black CINDERS, little SILT, trace BRICK,	13
	L						6.0	trace cmf GRAVEL (moist)	
		2b	6.0	6.5				Brown SILT, some cmf SAND, little cmf GRAVEL (moist, stiff)	
	O								
	W								
10		3	10.0	12.0	SS/9	13-14-14-12		Dark Grey Mottled SILT, some cmf SAND, trace cmf GRAVEL (moist, very stiff)	28
	S								
							12.0	*~ Augering gravelly @ 10.0' ~*	
	T	4	12.0	14.0	SS/13	18-22-26-11		Brown cmf GRAVEL, some cmf SAND, trace SILT (moist, compact)	48
	E	5	14.0	14.3	SS/½	100@4"		Grey cmf GRAVEL, little cmf SAND (moist, very compact)	
15	M							*~ Augered through probable Cobble @ 14.2' ~*	
		6a	16.0	16.8	SS/*	43-46-10-6		Brown cmf GRAVEL, little cmf SAND (moist,	56
							16.8	very compact)	
		6b	16.8	18.0				Brown CLAY, some SILT, trace cmf SAND with interlayered fine SAND seams (moist,	
	A							hard)	
		7	18.0	20.0	SS/8	20-29-30-8		Similar Soil (wet, very stiff)	
	U	8a	20.6	22.0	SS/14	23-13-13-14		Brown Mottled CLAY, some SILT, trace cmf	59
20								SAND (moist, very stiff)	26
	G	8b	20.6	22.0				Grey Similar Soil (moist, very stiff)	
		9a	22.0	22.2	SS/*	30-17-24-36		1" recovery w/2" spoon – 1st Attempt Grey	41
	E							SILT (moist)	
		9b	22.2	24.0				Brown/Grey Mottled CLAY, some SILT, little	
	R							cmf GRAVEL, little cmf SAND (moist, hard)	
25								Continued on Page 2	

*****SS – Split Spoon, U – Undisturbed Tube, C – Core
* 3" Spoon Used for Second Attempt
Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – **c**oarse **m** – **m**edium **f** – **f**ine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
	H	10a	24.0	24.5	SS/24	26-22-24-27		Continued from Page 1 Brown/Grey Mottled CLAY, some SILT, trace cmf SAND, trace cmf GRAVEL (moist to wet, hard)	46
		10b	24.5	26.0			28.0	Grey SILT, trace fine SAND (moist, hard)	
30		11	28.5	30.0	SS/8	27-19-82		Grey/Brown cmf GRAVEL, some SILT, little CLAY, trace cmf SAND (moist, very compact) *~ Augering harder @ 32.2' ~*	101
35	S	12	32.2	32.7	SS/3	100@5"	37.0	Brown cmf GRAVEL (moist, very compact) ~ Augering easier @ 32.4', then gravelly again @ 32.7' ~ ~ Glacial Till ~ Grey SHALE fragments noted in auger cuttings	100+
	A	13	37.5	37.8	SS/2	100@4"	40.4	Grey SHALE fragments (moist) ~ Very Weathered Rock ~ *~ Auger Refusal @ 39.9' ~*	100+
40	XXX	14	39.9	40.4	SS/2	100@5"		Grey SHALE fragments (moist)	100+
45	C O R E	R1	40.4	45.4		NQ-Core		Rec: 60/60 = 100% RQD: 53/60 = 88% 9 Pieces, ½" Chips & Fragments Grey, medium hard to hard, weathered bedded SHALE BEDROCK with ¼" thick mud seam at 42.0' and vertical fracture noted at 41.2' No loss of return water, Cores at about 1 foot per minute at 300 psi.	88%
50	XXX							Bottom of Boring @ 45.4'	

*****SS – Split Spoon, U – Undisturbed Tube

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Milstein Hall, Cornell University, Ithaca, New York
Client: Cornell University
Location of Boring: See Boring Location Sketch
Report No.: 26000B-02-0707
Date Started: 05/29/07 **Finished:** 05/31/07
Elevation of Surface of Boring: 809.8’ (-3.3’)

METHODS OF INVESTIGATION

Casing: 4-1/4" ID H. Stem Auger
Casing Hammer:
Other:
Soil Sampler: 2" OD Split Barrel
Sampler Hammer: Wt. 140 lbs./Auto
Driller: Dan Gates
Driller: Karl Allen
Inspector: Natalie Meneilly
Rod Size: AWJ
Fall: 30 in.
Make & Model of Drill Rig: Diedrich D120 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
05/29/07	While drilling	24.8'	24.0'
05/31/07	Before casing removed	23.7'	70.2'
05/31/07	After casing removed	See Remark 1	

Additional Groundwater Observations on Page 4

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – **c**oarse **m** – **m**edium **f** – **f**ine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT “N” or RQD
0	XXX						0.05	Asphalt Pavement (<1")	
		1a	0.0	1.0	SS/16	11-8-8		Crushed Stone and CINDERS	16
		1b	1.0	1.5				Brown SILT, little cmf SAND, trace mf	
	H							GRAVEL (moist	
								~ Miscellaneous Fill ~	
	O								
							5.0		
5	L	2	5.0	6.5	SS/*	4-6-7		Brown mf GRAVEL, some cmf SAND, little	13
								SILT (moist, medium compact)	
	L								
	O								
	W								
10		3	10.0	12.0	SS/16	34-34-15-16		Brown cmf GRAVEL, some SILT, little cmf	49
								SAND (moist, compact)	
	S								
		4	12.0	14.0	SS/16	20-17-15-21		Brown cmf GRAVEL, some cmf SAND, little	32
	T							SILT (moist, compact)	
	E								
15		5	14.0	16.0	SS/15	47-16-12-9		Similar Soil (moist, medium compact)	28
	M								
		6a	16.0	16.7	SS/13	14-12-8-7	16.7	Similar Soil (moist, medium compact)	20
		6b	16.7	18.0				Brown fine SAND, trace SILT (moist, medium	
								compact)	
	A								
		7	18.0	20.0	SS/16	4-4-6-7		Brown fine SAND, little SILT (moist, medium	10
	U							compact)	
20									
	G								
		8	20.0	22.0	SS/16	8-11-12-16		Similar Soil (moist to wet, medium compact)	23
	E								
		9	22.0	24.0	SS/18	7-12-14-19		Brown mf SAND, some SILT, trace CLAY	26
	R							(wet to saturated, medium compact)	
25								Continued on Page 2	

*****SS – Split Spoon, U – Undisturbed Tube, C – Core
* 3" Spoon Used for Second Attempt
Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – **c**oarse **m** – **m**edium **f** – **f**ine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
								Continued from Page 1	
	H	10	24.0	26.0	SS/20	8-13-12-12		Brown fine SAND, some SILT (wet to saturated medium compact)	25
	O	11	26.0	28.0	SS/18	6-10-12-15	28.0	Similar Soil (saturated, medium compact)	22
	L	12a	28.0	28.5	SS/18	4-12-12-16	28.5	Brown CLAY, little SILT, trace mf SAND, (moist, very stiff)	24
30	L	12b	28.5	29.1			29.1	Brown fine SAND, little SILT (wet, medium compact)	
	O	12c	29.1	29.4			29.4	Brown CLAY, little SILT, trace mf SAND (moist, very stiff)	
	W	12d	29.4	29.6			29.6	Brown fine SAND, little SILT (moist, medium compact)	
		12e	29.6	30.0			30.0	Mottled Brown CLAY, little SILT (moist, very stiff)	
35		13a	30.0	30.3	SS/12	4-8-12-16	30.3	Brown fine SAND, little SILT (moist, medium compact)	20
	S	13b	30.3	31.0				Brown Mottled CLAY, little SILT (moist, very stiff)	
	T	13c	31.0	32.0				Grey Similar Soil (moist, very stiff)	
		14a	32.0	32.8	SS/12	9-11-17-23		Brown Mottled Similar Soil (moist, very stiff)	28
	E	14b	32.8	34.0				Grey CLAY with interlayered SILT, trace fine SAND (moist, very stiff)	
40	M	15	37.5	39.0	SS/14	8-9-12		Grey CLAY, little SILT, little cmf SAND (moist, very stiff)	21
		16	42.5	44.0	SS/16	11-11-13		Grey SILT, little CLAY (wet, very stiff)	24
	A								
45	U	17	44.5	45.0	SS/18	2-3-6		Reddish Grey CLAY, little SILT, trace cmf GRAVEL (moist, stiff)	9
	G								
	E	18a	48.5	49.0	SS/19	5-48-45		Grey SILT, trace CLAY (wet, stiff)	
	R	18b	49.0	50.0				Grey SILT, some cmf GRAVEL, little CLAY, trace cmf SAND (moist, hard)	93
50								Continued on Page 3	

*****SS – Split Spoon, U – Undisturbed Tube

CME Associates, Inc. **Report No.: 26000B-02-0607** **BORING NO.: B07-11A** Page 3 of 4

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – **c**oarse **m** – **m**edium **f** – **f**ine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
								Continued from Page 2	
	H O L	19a	53.5	54.2	SS/16	14-12-31	54.2	Grey SILT, some CLAY, trace cmf SAND, trace fine GRAVEL (moist, very stiff)	
55	L O W	19b	54.2	55.0				Grey weathered SHALE fragments (moist)	43
		20a	58.5	59.0	SS/6	33-100@3"		Grey weathered SHALE fragments, some SILT (moist)	100+
		20b	59.0	59.3				Grey weathered SHALE (moist)	
60	S T E M							~ Very Weathered Bedrock ~	
		21	63.5	65.0	SS/10	14-25-67		Grey weathered SHALE, little SILT (moist)	92
65	A U G E R								
		22	68.5	70.0	SS/10	23-73-100@5"	70.2	Similar SHALE (moist) *~ Augered to 70.2' ~*	100+
70	XXX C O R E	R1	70.2	75.2		NQ-Core		Rec: 28/60 = 47% RQD: 0/60 = 0% 6 Pieces, 21" Chips & Fragments Grey, medium hard, very weathered thinly SHALE BEDROCK No loss of return water noted. Cores at about 0.3 to 1 foot per minute at 300 psi.	0%
75								Continued on Page 4	

*****SS – Split Spoon, U – Undisturbed Tube, C - Core

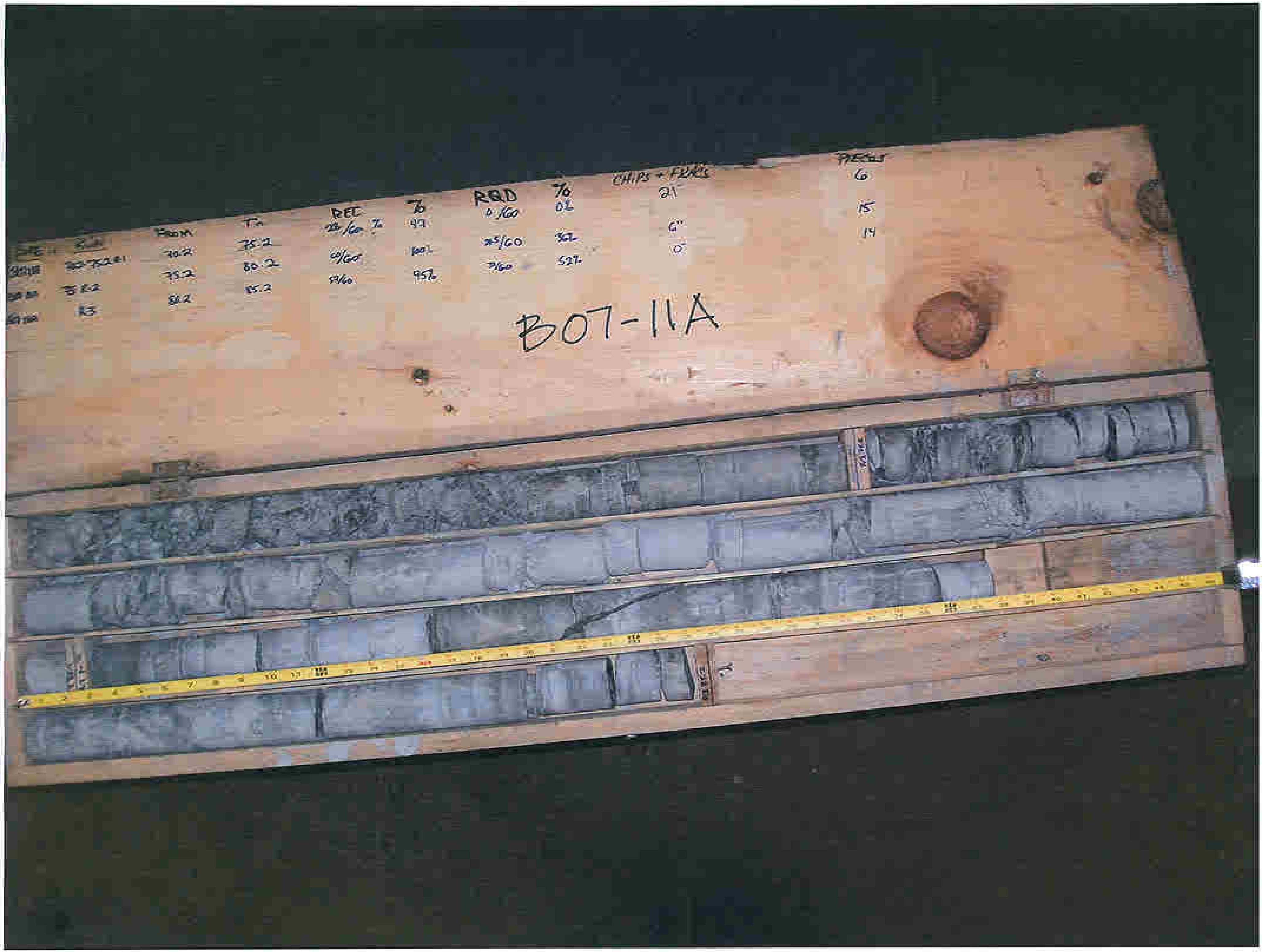
Remarks:

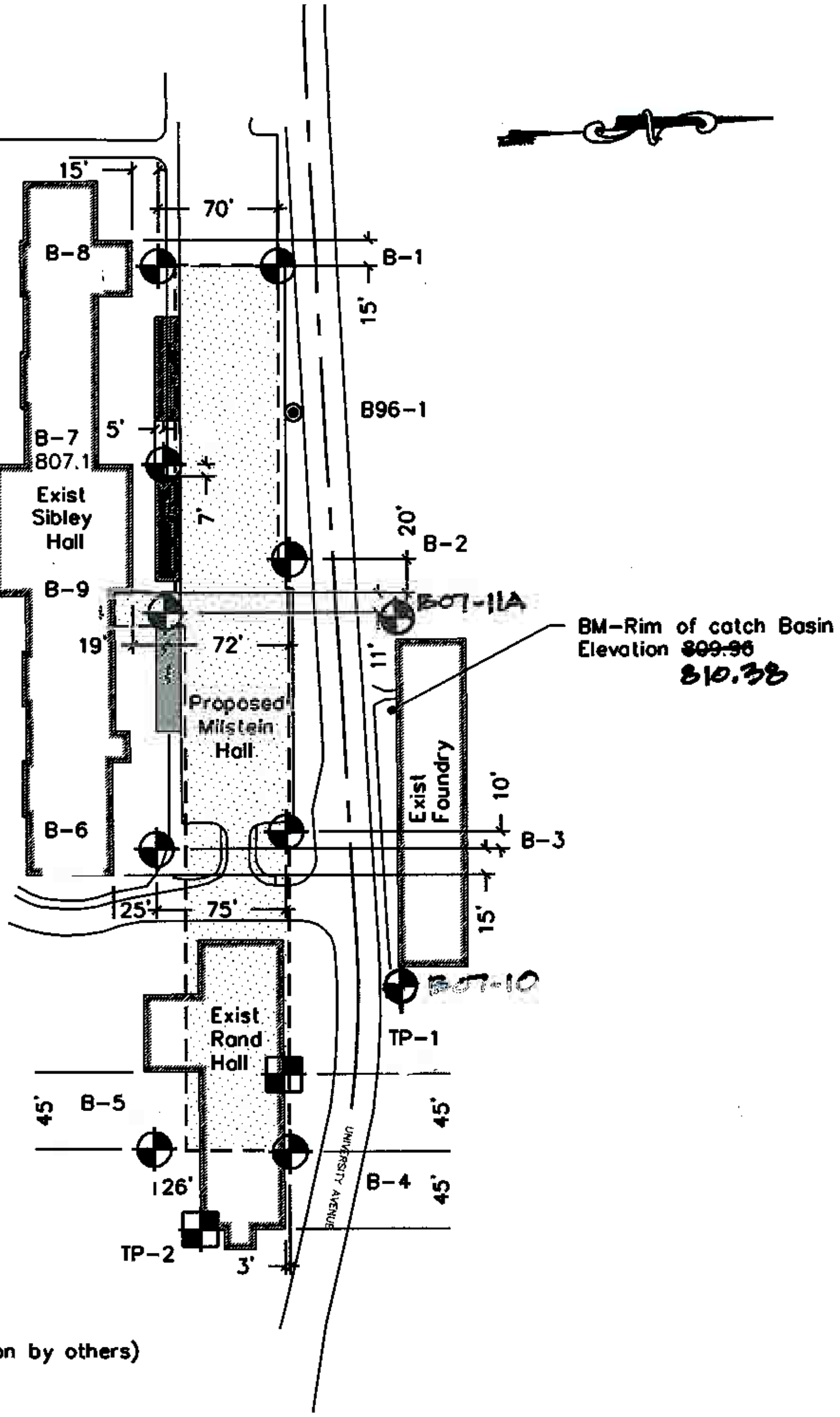
LOG OF BORING SAMPLES								CLASSIFICATION OF MATERIAL	
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – **c**oarse **m** – **m**edium **f** – **f**ine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
								Continued from Page 3	
		R2	75.2	80.2		NQ-Core		Rec: 60/60 = 100%	36%
	C							RQD: 21.5/60 = 36%	
								15 Pieces, 6" Chips & Fragments	
	O							Grey, medium hard, weathered, thinly bedded SHALE BEDROCK with mud seam noted at 77.8'. No loss of return water.	
80									
	R	R3	80.2	85.2		NQ-Core		Rec: 57/60 = 95%	52%
								RQD: 31/60 = 52%	
								14 Pieces, 0" Chips & Fragments	
	E							Grey, medium hard, weathered, thinly bedded to bedded SHALE BEDROCK	
								No loss of return water.	
								Cored at 0.3 to 1 foot per minute at 300 psi.	
85	XXX							Bottom of Boring 85.2'	
90									
95									
100									

*****SS – Split Spoon, U – Undisturbed Tube, C – Core

Groundwater Observations: First wet to saturated sample noted on 05/29/07 at 22.0. No water noted in borehole after 10 minutes. Water first noted in borehole at 24.8' with augers at 24.0'. After 10 minutes water was noted at 23.6', augers at 24.0'. Drilled and sampled to 70.2' and left borehole open. Water was noted on 05/30/07 at 23.7'. Upon arrival on 05/31/07, water was noted at 23.6 feet. NQ Core to 85.2', water noted (after coring) at 18.9' on 05/31/07.


B-#
Run
From
To
Recovery
RQD
B07-10
R1
40.4
45.4
60/60-100%
53/60-88%
9
1/3"
B07-10


B07-11A
FROM
TO
REC
%
RQD
%
CHIPS + FLAKS
PIECES
70.2
75.2
75.2
80.2
80.2
85.2
60/60
100%
95%
0/60
0%
25/60
52%
21"
6"
0"
6
15
14



REVISED: 07/12/2007

● Boring Locations (previous exploration by others)

▚ Test Pit Location typ.

⊕ Boring Location typ.

Exploration Performed by CME Associates, Inc.; during the period from 05/19/03 to 05/21/03. and 06/2007.

SHEET NO.
BL-1

1"= 100'
06/02/03
25357/26000
jpw

Boring Location Sketch
Milstein Hall at Cornell University
University Avenue
Ithaca, Tompkins Co., New York

CME Associates, Inc.
Construction Materials Evaluation
P.O.Box 554 Central Square
New York 13036-0554
[315] 668-3868, FAX:[315] 676-3150

GENERAL INFORMATION & KEY TO TEST BORING LOGS

The **Subsurface Exploration - Test Boring Logs produced by CME Associates, Inc.** present the observations and mechanical data collected by the driller while at the site, supplemented, at times, by classification of the materials removed from the borings as determined through visual identification by technicians in the laboratory. It is cautioned that the materials removed from the borings represent only a fraction of the total volume of the deposits at the site and may not necessarily be representative of the subsurface conditions between adjacent borings or between the sampled intervals. The data presented on the Exploration Logs together with the recovered samples will provide a basis for evaluating the character of the subsurface conditions relative to the proposed construction. The evaluation must consider all the recorded details and their significance relative to each other. Often, analyses of standard boring data indicate the need for additional testing and sampling procedures to more accurately evaluate the subsurface conditions. Any evaluations of the contents of CME's report and the recovered samples must be performed by Licensed Professionals having experience in Soil Mechanics and Foundation Engineering. The information presented in this Key defines some of the procedures and terms used on the CME Exploration Logs to describe the conditions encountered. Refer to the Log on page 3 for key number.

Key No.	Description
1.	The figures in the **DEPTH SCALE** column define the vertical scale of the Boring Log.
2.	**CASING BLOWS/FOOT** - shows the number of blows required to advance the casing a distance of 12 inches. The casing size, the hammer weight and the length of drop are noted under the **Methods of Investigation**. If the casing is advanced by means other than driving, the method of advancement will be indicated under **Methods of Investigation** at the top of the Log. If Hollow Stem Augers or Coring is used, it will be so noted in this column.
3.	The **SAMPLE I.D.** is used for identification on the sample containers and in the Laboratory Test Report or Summary.
4.	The **DEPTH OF SAMPLE** column gives the exact depth range from which a sample was recovered.
5.	The **SAMPLE TYPE/RECOVERY** column is used to signify the various type of sample attempt. "SS" is Split Spoon, "P" is piston tube, "U" is Undisturbed tube. For soil samples, the recovered length of the sample is also indicated, in inches. If a rock core sample is taken, the core bit size designation is given here.
6.	**BLOWS ON SAMPLER** - shows the results of the "Standard Penetration Test (SPT) ASTM D1586", recording the number of blows required to drive a split spoon sampler into the soil beneath the casing. The number of blows required for each six inches of penetration is recorded. The total number of blows required for the 6 inch to 18 inch interval is summarized in the **SPT "N"** column and represents the "Standard Penetration Number". The outside diameter of the sampler, the hammer weight and the length of drop are noted in the **Methods of Investigation** portion of the log. A "WH" or "WR" in this column indicates that the sample spoon advanced the 6 inch interval under **Weight of Hammer** or **Weight of Rods**, respectively.
7.	The **DEPTH OF CHANGE** column designates the depth (in feet) that the driller noted a compactness or stratum change. In soft materials or soil strata exhibiting a consistent relative density, it is difficult for the driller to determine the exact change from one stratum to the next. In addition, a grading or gradual change may exist. In such cases the depth noted is approximate or estimated only and may be represented by a dashed line.
8.	**CLASSIFICATION OF MATERIAL - Soil materials** encountered and sampled are described by the driller on the original log. Notes of driller observations are also placed in this column. Recovered samples may also be visually classified by a Soil Technician upon receipt in the Laboratory. Visual sample classification is by Burmister System and strata may be classified additionally by the Unified System. The Burmister System is a type of visual-manual textural classification estimated by the Driller or Technician on the basis of weight-fraction of the recovered soil. See Table 1 **"Classification of Materials"**. The description of the relative soil compactness or consistency is based upon the standard penetration number as defined in Table 2. The description of the soil moisture condition is described as dry, moist, wet, or saturated. Water used to advance the boring may have affected the in-situ moisture content of the sample. Special terms are used as required to describe materials in greater detail, such terms are listed in ASTM D653. When sampling gravelly soils with a standard two-inch O.D. Split Spoon, the true percentage of gravel is often not recovered due to the relatively small sampler diameter. The presence of boulders, cobbles, and large gravel is sometimes, but not necessarily, detected by an evaluation of the casing and sampler blows or through the "action" of the drill rig as reported by the driller.

8. **CLASSIFICATION OF MATERIAL** (continued)
The Description of **Rock** is based upon the recovered rock core. Terms frequently used in the description are included in Table 3. The length of core run is defined as length of penetration between retreivals of the corebarrel from the bore hole, expressed in inches. The core recovery expresses the length of core recovered from the core barrel per core run, in percent. The size core barrel used is noted in **Column 5**. The more commonly used sizes of core barrels are denoted "AX" and "NX". An "NX" core, being larger in diameter than "AX" core, often produces better recovery, and is frequently utilized where accurate information regarding the geologic conditions and engineering properties is needed. A better estimate of in-situ rock quality is provided by a *modified core recovery ratio* known as the **"Rock Quality Designation" (RQD)**. This ratio is determined by considering only pieces of core that are at least 4 inches long and are hard and sound. Breaks obviously caused by drilling are ignored. The diameter of the core should preferably be not less than 2 inches (NX). The percentage ratio between the total length of such core recovered and the length of core drilled on a given run is the RQD. Table 4 gives the rock quality description as related to the **RQD**.

9. The **SPT "N"** or **RQD** is given in this column as applicable to the specific sample taken. In Very Compact coarse grained soils the N-value may be indicated as 50+, and in Hard fine-grained soils the N-value may be indicated as 30+. This typically means that the blow count was achieved prior to driving the sampler the entire 6 inch interval or the sampler refused further penetration. For "NX" rock cores, the RQD is reported here, expressed in percent.

10. **GROUND WATER OBSERVATIONS** and timing noted by the driller are shown in this section. It is important to realize that the reliability of the water level observations depend upon the soil type (water does not readily stabilize in a hole through fine grained soils), and that drill water used to advance the borings may have influenced the observations. Ground water levels typically fluctuate seasonally so those noted on the log are only representative of that exhibited during the period of time noted on the log. One or more perched or trapped water levels may exist in the ground seasonally. All the available readings should be evaluated. If definite conclusions cannot be made, it is often prudent to examine the conditions more thoroughly through test pit excavations or ground water observation well installations.

TABLE 1 - VISUAL CLASSIFICATION OF MATERIALS (BURMISTER)

GROUP	**TEXTURAL CLASSIFICATION SIZES**
BOULDERS	larger than 12" diameter
COBBLES	12" diameter to 3" sieve
GRAVEL	3" - coarse - 1" - medium - 1/2" - fine - #4 sieve
SAND	#4 - coarse - #10 - medium - #40 - fine - #200 sieve
SILT	#200 sieve (0.074mm) to 0.005mm size (see below *)
CLAY	0.005mm size to 0.001mm size (see below *)

ABBREVIATIONS	**PERCENT OF TOTAL SAMPLE BY WEIGHT**	
f - fine	and	35 to 50%
m - medium	some	20 to 35%
c - coarse	little	10 to 20%
	trace	0 to 10%

***PLASTICITY DESCRIPTIONS**

TERM	**PLASTICITY INDEX**	**DRY STRENGTH**	**FIELD TEST**
Non-plastic	0 - 3	Very low	falls apart easily
Slightly plastic	4 - 15	Slight	easily crushed by fingers
Plastic	15 - 30	Medium	difficult to crush
Highly plastic	31 or more	High	impossible to crush with fingers

TABLE 2 - DESCRIPTION OF SOIL COMPACTNESS OR CONSISTENCY based on SPT "N"*

Primary Soil Type	**Descriptive Term of Compactness**	**Range of Standard Penetration Resistance (N)**
COARSE GRAINED SOILS	Very loose	less than 4 blows per foot
(More than half of Material is larger than No. 200 sieve size.)	Loose	4 to 10
	Medium compact	10 to 30
	Compact	30 to 50
	Very compact	Greater than 50
FINE GRAINED SOILS	**Descriptive Term of Consistency**	**Range of Standard Penetration Resistance (N)**
(More than half of material is smaller than No. 200 sieve size.)	Very soft	less than 2 blows per foot
	Soft	2 to 4
	Medium stiff	4 to 8
	Stiff	8 to 15
	Very stiff	15 to 30
	Hard	Greater than 30

*The number of blows of 140 pound weight falling 30 inches to drive 2 inch O.D., 1-3/8 inch I.D. sampler 12 inches is defined as the Standard Penetration Resistance designated "N".

TABLE 3 - ROCK CLASSIFICATION TERMS

Rock Classification Terms		**Field Test or Meaning of Term**
Hardness	Soft	Scratched by fingernail
	Medium Hard	Scratched easily by penknife
	Hard	Scratched with difficulty by penknife
	Very Hard	Cannot be scratched by penknife
Weathering	Very Weathered Weathered Sound	Judged from the relative amounts of disintegration, iron staining, core recovery, clay seams, etc.
Bedding (Natural Breaks in Rock Layers)	Laminated	less than 1inch
	Thinly bedded	1inch to 4 inches
	Bedded	4 inches to 12 inches
	Thickly bedded	12 inches to 36 inches
	Massive	greater than 36 inches

TABLE 4
Relation of Rock Quality Designation (RQD) and in-situ Rock Quality

RQD (%)	Rock Quality Term Used
90 to 100	Excellent
75 to 90	Good
50 to 75	Fair
25 to 50	Poor
0 to 25	Very Poor

BORING NO.: B-1 Page 1 of 1

SUBSURFACE EXPLORATION - TEST BORING LOG

Project:
Client:
Location of Boring:

Report No.:
Date Started: **Finished:**
Elevation of Surface of Boring:

METHODS OF INVESTIGATION

Casing: 3-1/4" I.D. Hollow Stem Auger **Hammer:**
Other:
Soil Sampler: 2" O.D. Split Barrel **Rod Size:**
Sampler Hammer: Wt. 140 lbs. **Fall:** 30 in.
Make & Model of Drill Rig:

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
	While drilling		
	Before casing removed		
	After casing removed		

LOG OF BORING SAMPLES / **CLASSIFICATION OF MATERIAL**

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (inches)	Blows on Sampler Per 6 inches	Depth of Change (feet)	f - fine m - medium c - coarse **and** - 35 to 50% **some** - 20 to 35% **little** - 10 to 20% **trace** - 0 to 10%	STP "N" or RQD
1	2	3	4	4	5	6	7	8	9

Denotes Key Number (see page 1)

CME Associates, Inc.

Subsurface Exploration
and
Geotechnical Report

CORNELL UNIVERSITY MILSTEIN HALL PROJECT

APPENDIX D

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CME Associates, Inc.

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LABORATORY TEST SUMMARY
Cornell University, Ithaca, New York
Milstein Hall College of Architecture, Art, & Planning
CME Report No.: 26000B-02-0607
June 18, 2007
Page 1 of 2

A CME Representative obtained samples for use at the above referenced project. The samples were delivered to CME's Cicero facility, an AASHTO AMRL[1] accredited laboratory, for a Soil Mechanical Analysis and Rock Core Compression Testing. The results are as follows:

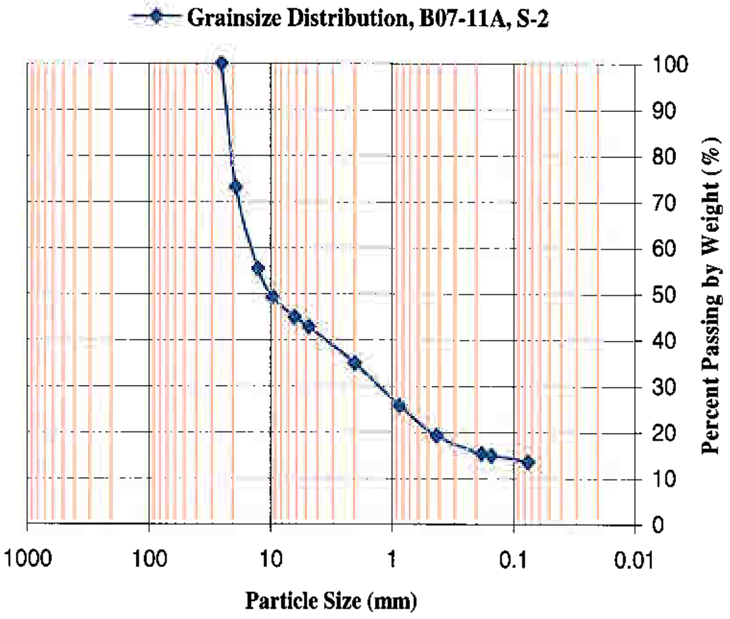
I. Material Identification

Boring #	Sample #	Depth Below Grade (ft.)	Classification
B07-11A	S-2	5.0-6.5	Brown mf GRAVEL, some cmf SAND, trace SILT, trace CLAY ~ USCS Group Symbol GM (Silty gravel with sand)
B07-11A	S-9	22.0-24.0	Brown mf SAND, some SILT ~ USCS Group Symbol SM (Silty sand)

II. Mechanical Analysis (ASTM C136 & C117)

Sample ID: B07-11A, S-2

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
1"	25.0	100
3/4"	19.0	73
1/2"	12.5	55
3/8"	9.50	49
1/4"	6.25	45
No.4	4.75	43
No.10	2.00	35
No.20	0.85	26
No.40	0.425	19
No.80	0.18	15
No.100	0.15	15
No.200	0.075	13



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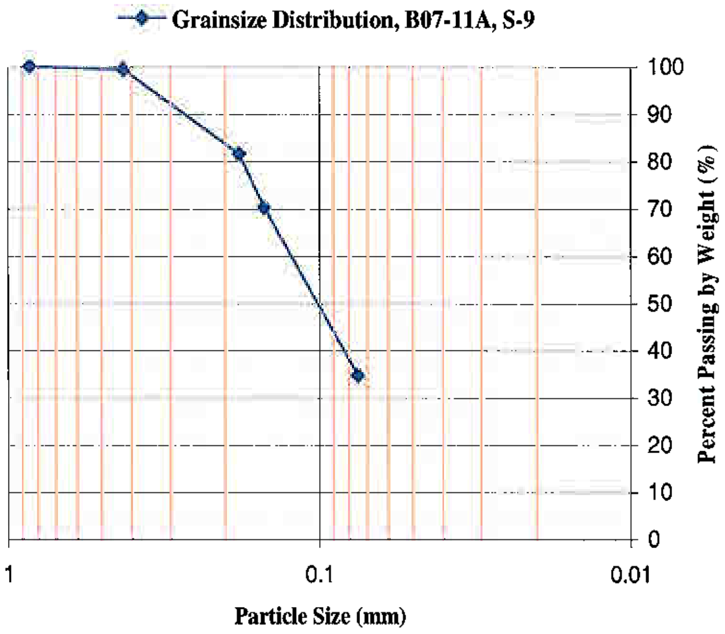
[1] AMRL - American Association of State Highway & Transportation Officials (AASHTO) Materials Reference Laboratory. AMRL is a Federal Agency having jurisdiction to assess laboratory competence according to the standards of the United States. CME Cicero accreditation includes tests of Portland Cement Concrete, Aggregate and Soil Materials. www.amrl.net

Sample ID: **B07-11A, S-9**

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
No.20	0.85	100
No.40	0.425	99
No.80	0.18	82
No.100	0.15	70
No.200	0.075	35



III. Bedrock Core Compression Testing:

Boring Number/ Sample Number	Depth Below Grade (ft.)	Trimmed Length (in.)	Diameter of Core (in.)	Length to Diameter Ratio	Maximum Compressive Load (lbs)	Cross Sectional Area (in^2)	Unconfined Compressive Strength (tsf)
B-07-10 (C-1)	41.5	4.010	1.98	2.03	39000	3.08	910
B-07-11A (C-2)	77.2	4.010	1.98	2.03	57000	3.08	1330
B-07-11A (C-3)	79.7	3.975	1.98	2.01	41000	3.08	960

Please feel free to contact our office if you have any questions.

Niel W. Zuern
Assistant Division Manager

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LABORATORY TEST SUMMARY

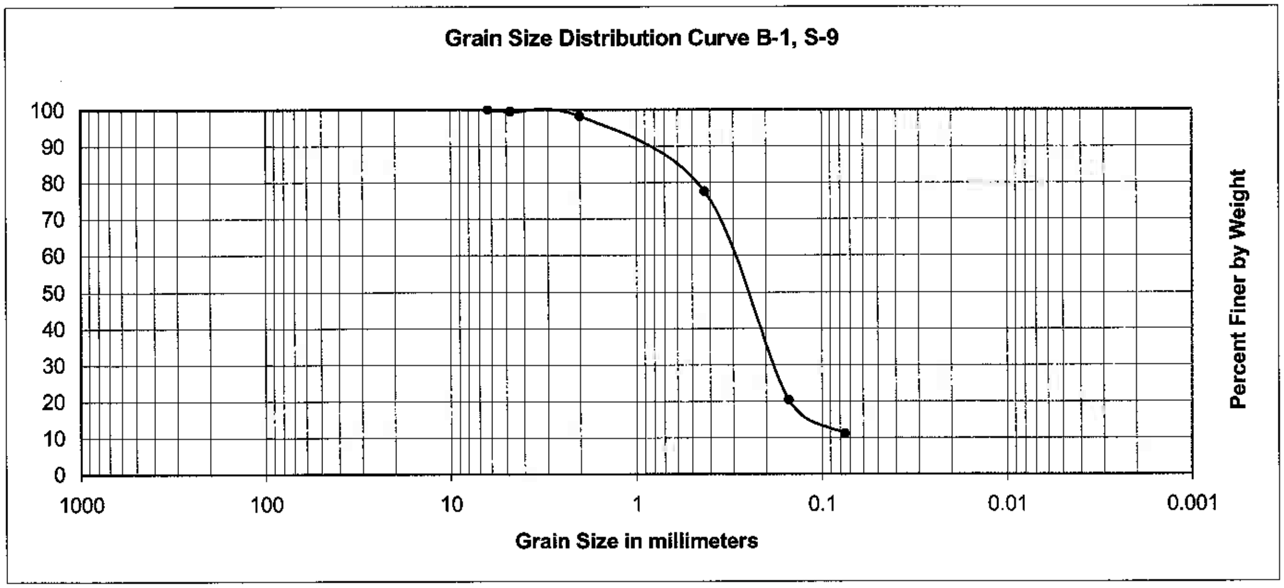
Barkow Leibinger Architects
Milstein Hall at Cornell University, Ithaca, NY
CME Report No.: 25357B-01-0603
June 4, 2003
Page 1 of 4

CME Representatives obtained samples from soil borings advanced as part of a Subsurface Exploration Program conducted for the subject project. Selected samples were subjected to laboratory testing at CME's Central Square Facility, an AASHTO AMRL accredited laboratory. The results are presented below:

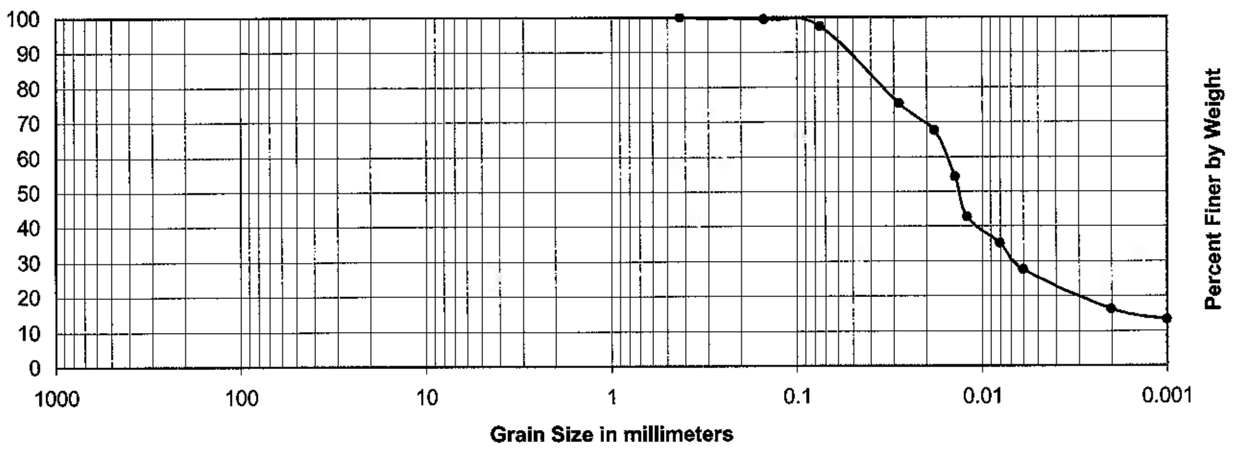
Mechanical Analysis with Hydrometer (ASTM D1140 and D422):

B = Boring Number, S = Sample Number

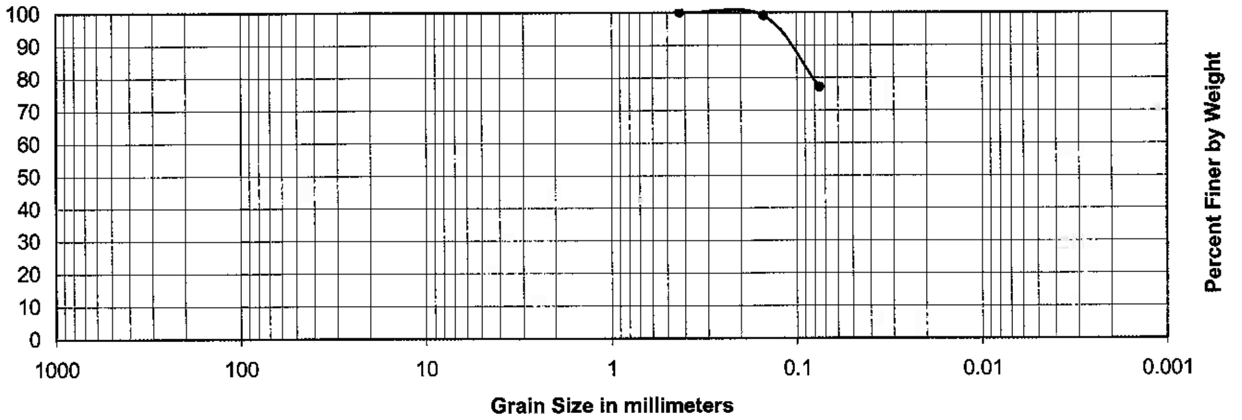
		Percent Passing by Weight			
Sieve	Size (mm)	B-1, S-9	B-4, S-11	B-7, S-11	B-9, S-9
1"	25.0				
3/4"	19.0				
1/2"	12.5				
¼"	9.4	100			
No. 4	4.75	99			
No. 10	2.0	98			
No. 40	0.850	78	100	100	100
No. 200	0.075	11.0	97.5	77.0	34.0
Hydrometer	Analysis				
	0.074	-	97	-	-
	0.005	-	25	-	-
	0.001	-	13	-	-


Grain Size Distribution Curve B-1, S-9

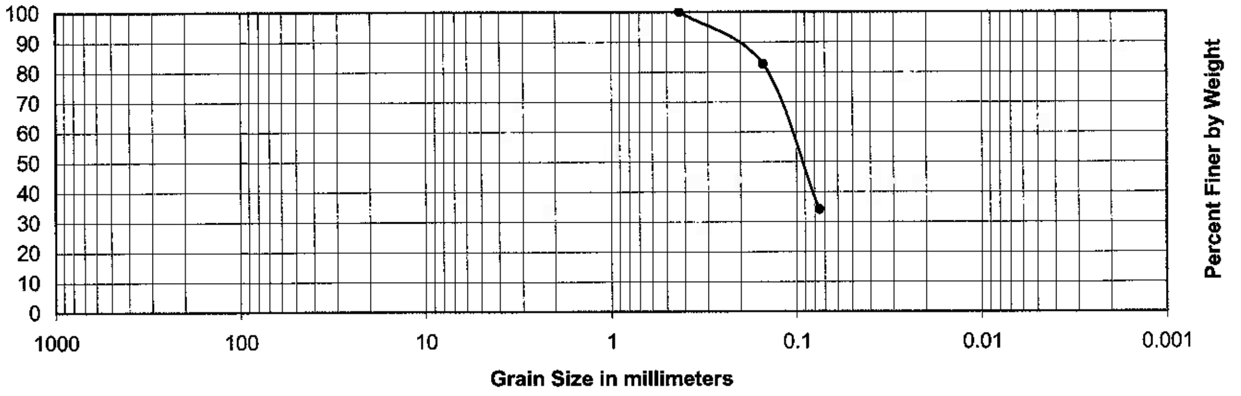
Grain Size Distribution Curve B-4, S-11



Grain Size Distribution Curve B-7, S-11



Grain Size Distribution Curve B-9, S-9



Atterberg Limits, Natural Moisture and Unified Classification Group Symbol (ASTM D4318, D2216 & D2487):

B = Boring Number, S = Sample Number

Boring No., Sample No.	Liquid Limit	Plastic Limit	Plasticity Index	Natural Moisture Content (%)	USCS (Unified) Group*
B-1, S-13	27	16	11	19.7	CL
B-1, S-15	18	15	3	14.7	CL
B-4, S-10	24	16	8	17.6	CL

* Portion of sample passing #10 mesh sieve.

Natural Moisture Content (ASTM D2216):

Boring No., Sample No.	Depth Below Grade (ft)	Natural Moisture Content (%)
B-1, S-9	16.0 – 18.0	3.8
B-1, S-13	33.5 – 35.0	19.7
B-1, S-15	43.0 – 43.5	14.7
B-4, S-10	18.0 – 20.0	17.6
B-4, S-11	23.5 – 25.0	17.4
B-7, S-11	23.5 – 25.0	29.6
B-9, S-1	0.5 – 2.0	9.2
B-9, S-2	2.0 – 4.0	11.3
B-9, S-3	4.0 – 6.0	7.8
B-9, S-4	6.0 – 8.0	27.8
B-9, S-5	8.0 – 10.0	14.5
B-9, S-6	10.0 – 12.0	15.3
B-9, S-7	12.0 – 14.0	23.6
B-9, S-8	14.0 – 16.0	17.5
B-9, S-9	16.0 – 18.0	29.9
B-9, S-10a	18.0 – 19.5	26.3
B-9, S-10b	19.5 – 20.0	27.7
B-9, S-11	23.5 – 25.0	18.9
B-9, S-12	28.5 – 30.0	16.2
B-9, S-13a	33.5 – 34.5	15.3
B-9, S-13b	34.5 – 34.8	1.8
B-9, S-14	37.6 – 37.7	0.7

Specific Gravity Determination (ASTM C128):

Boring No., Sample No.	Depth Below Grade (ft)	Specific Gravity
B-4, S-11	23.5 – 25.0	2.78

Bedrock Core Compression Testing (ASTM D4543 & D2936):

Core Identification & Measurements:

Boring No., Run No.	Depth Below Grade (ft)	Date Tested	Trimmed Length (in)	Diameter of Core (in)	Length to Diameter (note 5)
B-7, R-1	42.6 – 47.6	05/30/03	4.040	1.990	2.0

Compression Test Results:

Boring No., Run No.	Maximum Compressive Load (lbs)	Cross Sectional Area (in^2)	Compressive Strength (tsf)
B-7, R-1	27,500	3.11	965

Notes for Bedrock Core Compression Testing:

1. The specimens were soaked in water for at least 24 hours before compression testing.
2. Specimens were tested in the moisture condition immediately following removal from water bath.
3. The direction of application of the load on the specimen was applied perpendicular with respect to the horizontal plane of the surface drilled.
4. Specimens were loaded at a rate of approximately 50 lbs per second.
5. Length to diameter refers to the specimen trimmed length divided by its diameter.

By: Valerie M. Goettel, Laboratory Supervisor

CME
Associates, Inc.

Subsurface Exploration
and
Geotechnical Report

CORNELL UNIVERSITY MILSTEIN HALL PROJECT

APPENDIX E

Excerpt from the ADSC *"Drilled Shaft Inspector's Manual"*

PRECONSTRUCTION MEETING

No matter how well specifications have been written and plans have been drawn, it is always advisable to have a preconstruction meeting with the architect-engineer, owner's representative (if different from the architect-engineer), the contractor, the geotechnical engineer and the inspector. On major projects, it is sometimes advisable to have an initial meeting with the design team to review design criteria and then to include the contractor to review construction procedures.

At the preconstruction meeting, the contractor should review his planned procedures and sequence. The geotechnical engineer should indicate the inspection method required and the contractor should indicate any problems he might see with this method. Also, the chain of communication should be reviewed so that the proper people are kept adequately informed of the project status. Procedures for changing design criteria, if necessary, should be reviewed. The limits of authority of the inspector should be clarified, particularly with regard to his authority to request additional work (i.e. excavation to reach suitable bearing material) and for which there is a contract pay item or any other work that may be an extra to the contract.

Criteria for the acceptance of the bearing surfaces, including testing, should be reviewed at the preconstruction meeting.

If the inspector is going to have special responsibility or authority with regard to record keeping on obstruction time or need for and use of permanent casing, this should be agreed to at the preconstruction meeting.

Agreement should be reached and definitions and the need for and extent of documentation for pay items, e.g. auger refusal, obstructions, rock removal, etc.

It is also helpful if procedures for a dispute resolution are reviewed at this time so that work isn't stopped at a later date because of misunderstandings on changed conditions claims.

Contractors should be required to notify the inspector and others as specified, or as determined, of anything they believe is an extra. This notification should be in writing at the time of occurrence and no claims should be permitted after a specified time limit.

Subsurface Exploration Report

Central Avenue Parking Garage at Cornell University
Ithaca, New York

Prepared For: (Client)

Cornell University
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Prepared By: (Geotechnical Engineer)

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CME Report No.: 26054B-01-0807
August 31, 2007

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Report No. 26054B-01-0807

Appendices:

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Subsurface Exploration Report
Central Avenue Parking Garage at Cornell University
Ithaca, New York
CME Report No.: 26054B-01-0807
Page 1 of 8

1.0 INTRODUCTION

CME Associates, Inc. (CME) has completed a Subsurface Exploration Program for the proposed Central Avenue Parking Garage Project at Cornell University (CAPG). The intent of CME's work is to collect geological and geotechnical information that can be utilized for geotechnical engineering and foundation design for the proposed construction.

This exploration, analysis and report have been provided pursuant to the authorization, of CME Proposal/Agreement Number 05.2505 by Desman Associates (Desman-Project Architect) acting as agent for Cornell University (Client). Foundation design recommendations and other geotechnical engineering recommendations contracted by the agreement will follow under separate cover.

2.0 PROPOSED DEVELOPMENT

The proposed development will include a 3-level (one grade-level and two underground levels) Parking Garage situated over the existing asphalt pavement parking lot, between University Avenue and existing Tjaden and Sibley Halls. The proposed Central Avenue Parking Garage will extend from the West end of the proposed Milstein Hall, and a portion of the lowest underground parking level will extend below Milstein Hall. The portion of the Central Avenue Parking Garage below Milstein Hall will be designed and constructed as part of the Milstein Hall project.

Please refer to the attached Boring Location Sketch, labeled BL-1, for details of the proposed project scheme, at the time of this report preparation. Loading information on a preliminary structural grid was provided to CME by Desman. Based on the loading information, maximum unfactored column loadings will be 805 kips for columns on Line B and C, and 125 kips for columns on Line A and D. Maximum unfactored wall loadings along Line A and D will be 7.25 kips/foot.

3.0 SUBSURFACE EXPLORATION

3.1 Overview

CME's 2007 subsurface exploration consisted of advancing 11 Test Borings, labeled B-1 (2007) through B-11 (2007), excavating four (4) Test Pits, labeled TP-J through TP-M, Seismic Downhole Shear Wave Velocity Testing in one borehole, labeled B-3a (2007), and conducting laboratory testing. Please note that the originally proposed exploration program was modified during the exploration phase, based on the findings of the subsurface soil and groundwater conditions. The originally proposed groundwater monitoring wells were deleted from the program, due to the fact that CME identified two existing groundwater monitoring wells at the project site, just West of the West end of the proposed Parking Garage. Originally proposed boring depths and locations were adjusted, and three additional Test Borings were included into the exploration program to obtain optimum subsurface information.

Subsurface information obtained from CME's 2003 exploration program, conducted for the originally proposed Milstein Hall Project, as envisioned in 2003, were reviewed, and relevant information are included in this report. Test Boring Logs, labeled B-1 (2003), B-2 (2003), B-7 (2003), B-8 (2003) and B-9 (2003) of the 2003 exploration are also attached to this report.

A review of subsurface information presented in a report entitled *"University Avenue Rehabilitation"*, dated November 22, 1996, prepared by Gary L. Wood, P.E., was made, and subsurface information in Test Boring B96-1 is included in the Generalized Subsurface Profiles, attached to this report.

CME also measured groundwater levels in the existing groundwater monitoring wells installed by others. These monitoring wells are labeled as MWB-1 and MWB-2 and approximate locations are shown on the attached Boring Location Sketch, BL-1.

3.2 Exploration Means and Methods

This section focuses on the 2007 exploration program conducted between 07/16/07 and 08/28/07, for the proposed Central Avenue Parking Garage Project.

3.2.1 Test Boring Exploration

The Test Boring locations were selected by the CME Geotechnical Engineer. The boring locations were staked in the field by CME, based on a Site Plan, labeled B100, *Scheme B Site Plan, Section & Plans*, dated December 2006, provided to CME by Client. Please refer to the attached Boring Location Sketch, labeled BL-1, for the as-drilled boring locations.

Elevation at grade at each exploration location was determined by CME using standard survey equipment and referencing an on-site Benchmark being the rim of a catch basin, denoted as BM-1 on the Boring Location Sketch BL-1. This Benchmark is designated elevation 810.40.

The borings were advanced using either a Diedrich Model D120 or a Central Mine Equipment Model 55 rotary exploration drill rig, equipped with 3-¼" or 4-¼" I.D. hollow stem augers. Soil Sampling and Standard Penetration Testing (SPT) were conducted utilizing a 140-pound automatic (mechanical) hammer dropping through a distance of 30 inches to drive a 2-inch O.D. split barrel sampler. This test method is described in ASTM Standard Practice D-1586.

The boring samples were logged and visually classified in the field by the CME Driller, and a portion of each soil sample was placed and sealed in a glass jar. The visual soil classifications were made using the modified Burmister Classification System as described in the attached document entitled *"General Information & Key to Test Boring Logs"* (referenced herein as *Key*). The soil classifications were later reviewed by a CME Geotechnical Engineer in CME's Cicero AMRL[1] Accredited Laboratory.

Bedrock cores were extracted at four boring locations, once borings had penetrated into the bedrock, and upon auger and sampler refusal. An NQ wireline core barrel was used to extract the cores in general conformance with ASTM D-2113 *"Standard Practice for Diamond Core Drilling for Site Investigation"*. A CME Geologist and the CME Geotechnical Engineer examined each rock core, evaluated rock quality, and provided a classification using the terminology outlined in Tables 3 and 4 of the attached *Key*. Bedrock cores were placed in segmented wooden core boxes. Photographs of each core have been attached to this report.

3.2.2 Laboratory Testing Program

The CME Geotechnical Engineer selected the Boring samples that were subjected to laboratory testing in the CME Cicero AMRL Accredited Laboratory. The intent of the laboratory testing was to index each soil stratum and to also provide geotechnical parameters of the soil. Please refer to the attached Laboratory Test Summary, labeled CME Report Number 26054B-01-0807, for test results.

3.2.3 Test Pit Exploration

A limited Test Pit exploration was conducted on 08/28/07. The primary purpose of the Test Pit exploration was to evaluate the existing Sibley Hall and Tjaden Hall foundation bearing conditions, along the North walls of these buildings, closest to the proposed Central Avenue Parking Garage. One Test Pit was excavated near the proposed Central Avenue Parking Garage West access ramp area. The Test Pit locations were selcted by the CME Geotechnical Engineer. Elevation at grade at Test Pit locations was determined by CME using standard survey equipment an referencing and on-site Benchmark being the finish floor at the grade-level North entrance of Tjaden Hall, denoted as BM-2 on the attached Boring Location Sketch, labeled BL-1. This Benchmark is designated elevation 807.5. Please refer to BL-1 for Test Pit locations and elevations.

Upon utility clearance by Cornell University and others, the Test Pits were excavated by others using a JCB Model 215S rubber-tire mounted backhoe, equipped with a 24" wide general purpose bucket. All Test Pits, except TP-K, were backfilled to grade in about one to two feet thick lifts with each lift compacted using the backhoe bucket. Excavation for Test Pit TP-K broke an existing electric conduit at about 33" below existing grade. Mr. Chuck Porter of Cornell University was informed of this immediately. As directed by Mr. Porter this hole was backfilled to about a foot below the electric conduit level. The excavation was fenced by Cornell University personnel using stakes and caution tape, before CME left the site.

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[1] **AMRL** – American Association of State Highway & Transportation Officials (AASHTO) Materials Reference Laboratory. AMRL is a Federal Agency having jurisdiction to assess laboratory competence according to the Standards of the United States. **CME** Cicero accreditation includes tests of Portland Cement Concrete, Aggregate and Soil Materials. www.amrl.net

CME Geotechnical Engineer, Mr. Anasthas Navaratnam, I.E. was on-site during the Test Pit exploration. Mr. Navaratnam met with Mr. Porter at the site before excavating the Test Pits, and went through with him the proposed Test Pit locations. Mr. Porter spray-painted a location for TP-M, and stated that TP-J, TP-K and TP-L locations are clear for excavation. Mr. Porter also mentioned that there may be footing drains along the North wall of Sibley Hall, where TP-L is planned. Mr. Navaratnam requested Mr. Porter to stay on-site during the excavation. Mr. Porter stated he does not have to be present on-site, and requested Mr. Navaratnam to contact him, if needed.

Mr. Navaratnam sampled and classified soils and prepared the attached Test Pit logs, labeled TP-J through TP-M. Please refer to the attached Test Pit Logs and Photographs for details.

3.2.4 Seismic Shear Wave Velocity Survey

CME conducted a Seismic Downhole Shear Wave Velocity Survey in a cased borehole, labeled B-3a (2007), to obtain a Seismic Shear Wave Velocity profile to be used for seismic site class evaluation for this project. The results of this work are presented in the attached Seismic Shear Wave Velocity Testing Report, labeled CME Report 26054B-01-0807.

4.0 SUMMARY OF SUBSURFACE SOIL, BEDROCK AND GROUNDWATER

4.1 Geologic Deposition

The site is located on top of a slope, which drops down to the Fall Creek Gorge, in a narrow strip of land between University Avenue and the existing Sibley and Tjaden Halls, and presently occupies an asphalt pavement parking lot. The site is occupied by several underground utilities. The surficial soils to several feet are disturbed, and consist of re-worked earth or man-placed fill.

The natural stratigraphy at this site consists of sedimentary Bedrock overlain by Glaciolacustrine overburden soils, consisting of Glacial Till, overlain by pre-consolidated (i.e. has seen past pressure greater than present overburden pressure) Lacustrine Clays and Silts (Clayey Silt and Silty Clay), overlain by normally-consolidated (i.e. has not seen past pressure greater than present overburden pressure) Lacustrine Sands, Gravels and Silts (Silty Sand and Gravel, Silty Sand and Sandy Silt).

4.2 Surface and Subsurface Soil Profile

The subsurface soil and groundwater conditions have been interpreted from the data obtained by CME through the Test Boring Program. The depths and thicknesses of subsurface strata given in this section have been interpolated between Test Borings. It is possible for the subsurface conditions between the sampling intervals and the Test Boring locations to vary from that inferred and/or given in this section. For detailed information at specific locations and depths, please refer to the attached CME Subsurface Exploration-Test Boring Logs and the Generalized Subsurface Profiles, labeled SP-1 to SP-3.

The site generally slopes down towards the Northwest and approximately ten feet of elevational relief is noted across the proposed Central Avenue Parking Garage footprint.

Topsoil or Asphalt Pavement was penetrated in the CME Test Borings to 0.3 to 0.5 feet depth. Below surfacings, a five layer stratigraphy was identified in the CME Borings, which is described below. Please refer to the attached *Generalized Subsurface Profiles* for a graphical illustration of the information presented herein.

Stratum 1 – Fill/Miscellaneous Fill

Below surfacings, Fill or Miscellaneous Fill was penetrated to 2 to 9 feet below grade. The Miscellaneous Fill is an unprepared, random composite of soil mixed with lesser amount of debris such as Brick, Cinders, Asphalt, etc. The fill is a composite of Silt, Sand and Gravel that had no identifiable debris.

Stratum 2 – Lacustrine Sands, Silts and Gravels

This stratum consists of Silty Sand and Gravel, Sandy Silt and Silty Sand layers, which resulted from a lake sedimentation process in a glacial lake environment. The thickness of this stratum increases from about 10 feet, near the East end of the site, to about 37 feet, near the West end of the site. These deposits are normally-consolidated and non-plastic and have USCS[2] Classes SP, SM, SW, GP, and GM. The Silty Sand and Sandy Silt are poorly graded, consist primarily of particles with a grain size close to that of fine Sands. Based on Standard Penetration Testing (SPT), the Sandy and Gravelly intervals of this stratum have a relative density of very loose to very compact, and the Silty intervals are medium stiff to hard in consistency.

Stratum 3 – Lacustrine Clays and Silts

Below Stratum-2, Silty Clay and Clayey Silt layers were identified, which are a lacustrine sediment formed by deep glacial, or post-glacial lake deposition. This deposit thickens across the site from the Southeast corner to the Northwest corner. The thickness increases from about 4 feet, near the Southeast corner of the site to about 29 feet, near the Northwest corner of the site. The attached Generalized Subsurface Profiles, visually illustrates the extreme variation of the thickness and depth of this Stratum.

The consistency of this stratum varies from medium stiff to hard, based on SPT, with the medium stiff intervals, generally found in the upper portion of this Stratum. Atterberg Limits testing conducted on several soil samples retrieved from this Stratum indicate that this Stratum is slightly-plastic to plastic and has a USCS Class of CL (Lean Clay). Natural Moisture Content testing performed on the Atterberg Limits samples revealed that the moisture content is generally well below the liquid limit of the soil. This may indicate that the Clay exists in-place in a pre-consolidated state. According to Cornell University resources, the Over Consolidation Ratio (OCR) of similar strata around the Cornell Campus area is 1.2 to 1.5.

The CME Geotechnical Engineer also conducted pocket penetrometer tests on multiple soil samples obtained from this Stratum. Pocket penetrometer test results give an idea of the unconfined compressive strength of the respective samples. Please refer to Table 1 below for Pocket Penetrometer Test Results.

TABLE 1: Pocket Penetrometer Test Results

Boring I.D.	Sample I.D.	Pocket Penetrometer Test Results (tsf)	Boring I.D.	Sample I.D.	Pocket Penetrometer Test Results (tsf)
B-2	S-17	3.5	B-5	S-14	1.0
B-2	S-21	1.6	B-5	S-15	1.3
B-3	S-16b	1.5	B-5	S-19	2.5
B-4	S-16	2.8	B-6	S-10b	1.2
B-4	S-17	2.3	B-6	S-12	1.0
B-4	S-18	3.0	B-6	S-13	1.0
B-5	S-13	1.5	B-7	S-13	1.0

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[2] USCS = Unified Soil Classification System

Stratum 4 – Glacial Till

Below Stratum-3, Glacial Till was encountered. This soil is a dense composite of Silt, Clay, Sand, Gravel and Cobbles, formed from glacial deposition and subsequent consolidation by the glacier. Thickness of this layer ranges from 5 feet to over 32 feet. This soil has a consistency of very stiff to hard, based on SPT.

Stratum 5 – Shale Bedrock

Below Stratum-4, highly weathered or decomposed Bedrock was penetrated, using standard earth drilling tools, to about one to five feet, where auger and sampler refusal was noted. Material retrieved from the split-spoon sampler consisted of Rock fragments and/or Rock flour. SPT N values in this layer were over 100.

Bedrock cores were obtained during this program (2007 exploration) from four Test Borings, labeled B-1 (2007), B-2 (2007), B-5 (2007) and B-6 (2007). Two five-foot cores were obtained from each of these Test Borings. Summary of Bedrock core information from this program, the 2003 Exploration Program (by CME) and from the 1996 Exploration Program (by Gary L. Wood, P.E.) are presented in Table 2.

Unconfined Compression Testing conducted on a Bedrock core specimen obtained from B-7 (2003) indicates an Unconfined Compressive Strength of 965 tsf.

TABLE 2: Bedrock Core Information

Test Boring I.D.	**Elevation at Grade[1]**	**Top of Rock Core**		**Recovery (%)**		**RQD[2] (%)**		**Bedrock Classification[3]**
		Depth (ft)	**Elev.**	**Run 1**	**Run 2**	**Run 1**	**Run 2**	
B-96-1	810.0	50.5	759.5	96		18		Grey, soft, highly weathered, thickly bedded, Shale Bedrock of very poor quality
B-7 (2003)	807.1	42.6	764.5	100		64		Grey, medium hard, weathered, thinly bedded Shale Bedrock of fair quality
B-1 (2007)	801.4	74.3	727.1	100		28		Grey, medium hard, weathered, bedded Shale Bedrock of poor quality
		79.3	722.1		100		57	Grey, medium hard, very weathered to weathered, bedded Shale Bedrock of fair quality. (Note A)
B-2 (2007)	808.2	82.5	725.7	100		87		Grey, medium hard, weathered, bedded Shale Bedrock of good quality
		87.5	720.7		100		97	Grey medium hard, weathered, bedded Shale Bedrock of excellent quality.
B-5 (2007)	806.7	67.8	738.9	100		25		Grey, soft to medium hard, very weathered, thinly bedded Shale Bedrock of poor quality.
		72.8	733.9		100		62	Grey, medium hard, weathered, bedded Shale Bedrock of fair quality.
B-6 (2007)	807.9	38.7	769.2	100		73		Grey, medium hard, weathered, bedded Shale Bedrock of fair quality.
		43.7	764.2		100		88	Grey, medium hard, weathered, bedded Shale Bedrock of good quality.

1. Elevation at grade at CME Test Borings was determined by CME, referencing an on-site Benchmark BM-1, as noted on the attached Boring Location Sketch, BL-1. Elevation at grade at Boring B96-1 was taken from Garry L. Wood, P.E., Boring Log.
2. RQD = Rock Quality Designation
3. Please refer to the attached *Key* for description of names and nomenclature used to classify bedrock.

Note A. Two mud seams of about 2 inches of total thickness were noted.

4.3 Groundwater Observations

Groundwater level observations and measurements were made by the CME Drillers when groundwater accumulated in the boreholes. The CME Drillers also noted water levels inside the boreholes during advancement and following casing removal. The Driller logging the samples noted whether samples retrieved were dry, moist, wet or saturated. Additionally, CME measured groundwater levels in the existing monitoring wells at the site.

Groundwater levels measured in the Test Borings are identified in the attached Generalized Subsurface Profiles. These measurements were made during the brief exploration period and were likely not stabilized to static level at most locations. Groundwater measurements taken in the monitoring wells, labeled MWB-1 and MWB-2, installed by others, indicate groundwater levels at elevations 756.9 and 757.3, respectively.

Measured groundwater levels in CME Test Borings are generally above or closer to the interface between the Sandy Lacustrine deposits and the Clayey Lacustrine deposits, and are interpreted as perched groundwater level. Please refer to the attached Generalized Subsurface Profiles, for a graphical illustration of this condition. Perched groundwater conditions occur when more previous soil overlies less pervious soil, and when the more previous soil is wet or saturated. The attached subsurface profiles indicate the likelihood of groundwater flowing generally in the Northerly and Westerly directions towards the Fall Creek Gorge.

The conditions and times of groundwater level observations are noted on the individual Test Boring logs. Groundwater fluctuations should be expected to occur at this site depending on several factors such as rainfall, seasonal changes, prevailing climate, ambient weather conditions, and adjacent construction operations, among other factors.

5.0 EXISTING FOUNDATIONS AND UNDERGROUND TUNNEL

5.1 Tjaden Hall

The Test Pit exploration revealed existing Tjaden Hall footing foundations bearing at elevation 800.6 and 800.1 at Test Pit locations TP-J and TP-K, respectively. Please refer to the attached Test Pit Logs and Photographs for details. The foundations are found to consist of wet-laid cut stone footers and wall. The footings appear to have been placed over a cement mortar or concrete layer of irregular thickness. Bearing soils were found to be Brown Silty Sand and Gravel and appear to be in a medium compact state.

5.2 Sibley Hall

Test Pit TP-L could not be completed to expose Sibley Hall foundations due to reason noted in Report Section 3.2.3. Test Pit TP-A excavated in March 2007 (to expose North wall foundations of Sibley East Wing), as part of the Milstein Hall Project, indicates footing bearing at elevation 802.5 feet, at this location. The footing consisted of wet-laid cut stone placed over irregular thickness of cement mortar. Bearing soils consisted of Silty Clobbly Sand and Gravel. Please refer to attached Test Pit Log TPA and Photographs for details.

5.3 Existing Underground Tunnel

A red brick and mortar, arch tunnel is noted to terminate North of University Avenue (photograph attached). The tunnel is about 6 feet wide by 8 feet high and is in excellent condition within 30 feet of terminus. This tunnel runs southerly under University Avenue and through the proposed Central Avenue Parking Garage footprint. The tunnel floor appears to daylight near the elevation 795 contour. The tunnel runs southerly from outlet to about the South curb of the parking lot roughly 90 feet East of the West wall of Sibley Hall. The tunnel is shown on Milstein Hall (16Apr07) 100% DD Drawing C102.

Please contact our office if you have any questions regarding this report.

Dione L. Craft for
Anasthas Navaratnam, I.E.

Marcus Rotundo
Marcus A. Rotundo, P.E.

Appendices:
- A. Test Boring Location Sketch, Generalized Subsurface Profiles and Rock Core Photographs
- B. Test Boring Logs and General Information & Key to Test Boring Logs
- C. Test Pit Logs and Test Pit Photographs
- D. Laboratory Test Summaries
- E. Seismic Shear Wave Velocity Test Report
- F. Existing Underground Tunnel

CME Associates, Inc.

Subsurface Exploration Report
Central Avenue Parking Garage at Cornell University
Ithaca, New York
CME Report No.: 26054B-01-0807

APPENDICES

Appendix	**Contents**	**Pages**
A	2007-Test Boring Location Sketch, labeled BL-1	1
	2007-Generalized Subsurface Profiles, labeled SP-1 through SP-3	3
	2007-Rock Core Photographs	2
B	2007-Test Boring Logs, B-1 (2007) through B-11 (2007)	30
	2003-Test Boring Logs, B-1 (2003), B-2 (2003), B-7 (2003) and B-9 (2003)	12
	1996-Test Boring Log, B96-1	1
	General Information & Key to Test Boring Logs (Key)	4
C	2007 Test Pit Logs, TP-J through TP-M	4
	2007 Test Pit Photographs	7
	2003 Test Pit Log, TP-A and Photographs	2
D	2007-Laboratory Test Summary, CME Report 26054B-01-0807	8
	2003-Laboraty Test Summary, CME Report 25357B-01-0603	4
E	2007-Seismic Shear Wave Velocity Test Report, CME Report 26054B-01-0807	23
F	Existing Underground Tunnel	1

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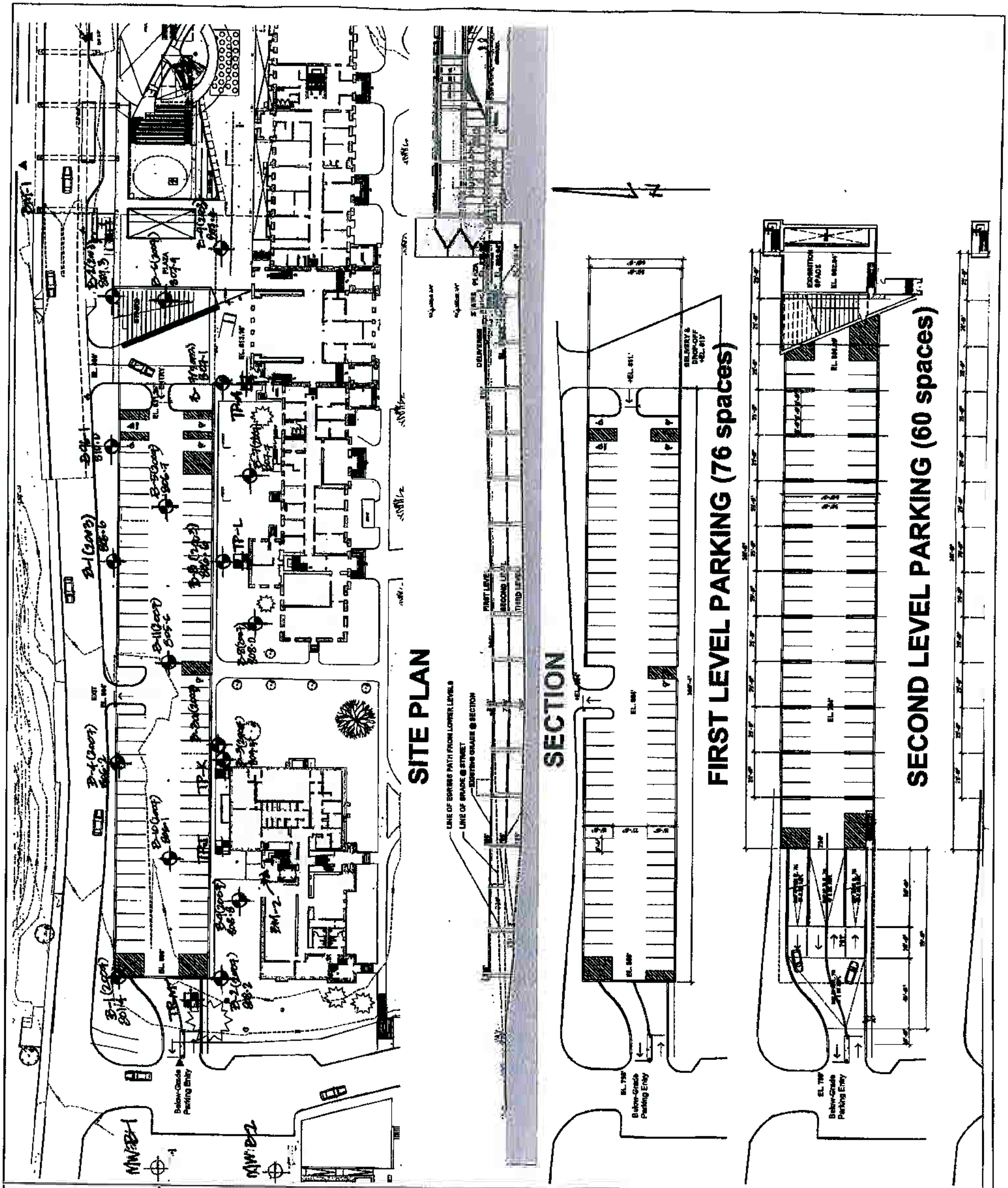
Associates, Inc.

Subsurface Exploration Report
Central Avenue Parking Garage at Cornell University
Ithaca, New York
CME Report No.: 26054B-01-0807

APPENDIX - A



Sheet No.

BL-1

Scale: 1"=80'
08/29/07
26064
na

Boring Location Sketch
Central Avenue Parking Garage
at Cornell University
Ithaca, New York

CME Associates, Inc.
Construction Materials Evaluation
P.O.Box 1824 Cicero
New York 13039-1824
(315) 698-9315 FAX: (315) 698-9319

CME Associates, Inc.

Construction Materials Evaluation

P.O. Box 1824
Cicero, New York 13039
315-698-9315

CME REPORT NO. 1 260548-01-0807

PROJECT NAME CAPG PARKING GARAGE, ITHACA, NY
CLIENT NAME CORNELL UNIVERSITY
JOB # 26054 SHEET 1 OF 3
CALC. BY ANAS DATE 08-16-07 CHECK ______ DATE ______
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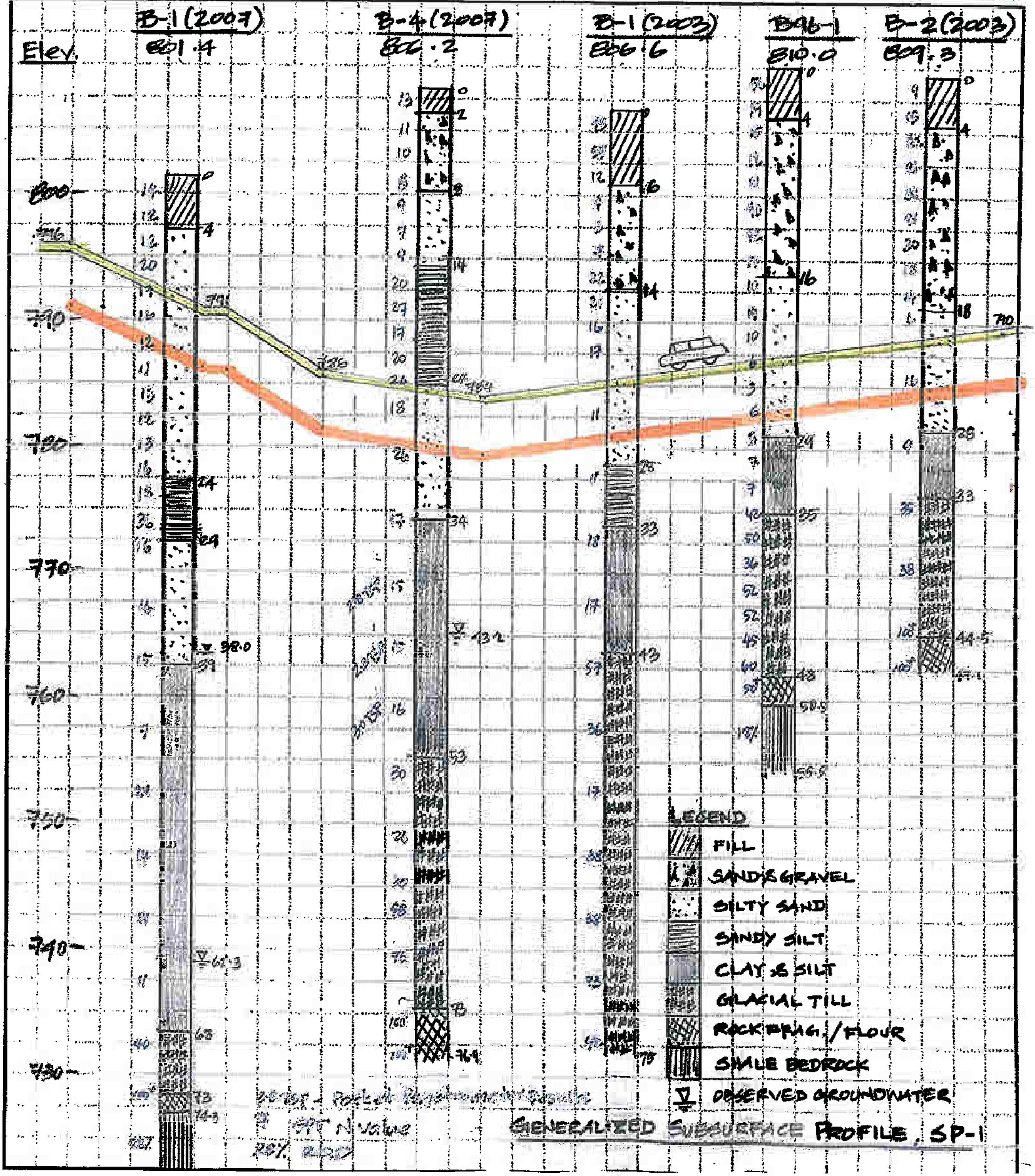

GENERALIZED SUBSURFACE PROFILE, SP-1

CME Associates, Inc.

Construction Materials Evaluation

P.O. Box 1824
Cicero, New York 13039
315-698-9315

CME REPORT NO.: 26054B-01-0807

PROJECT NAME CAPG PARKING GARAGE, ITHACA, NY

CLIENT NAME CORNELL UNIVERSITY

JOB # 26054 SHEET 2 OF 3

CALC. BY ANAS DATE 08-16-07 CHECK DATE

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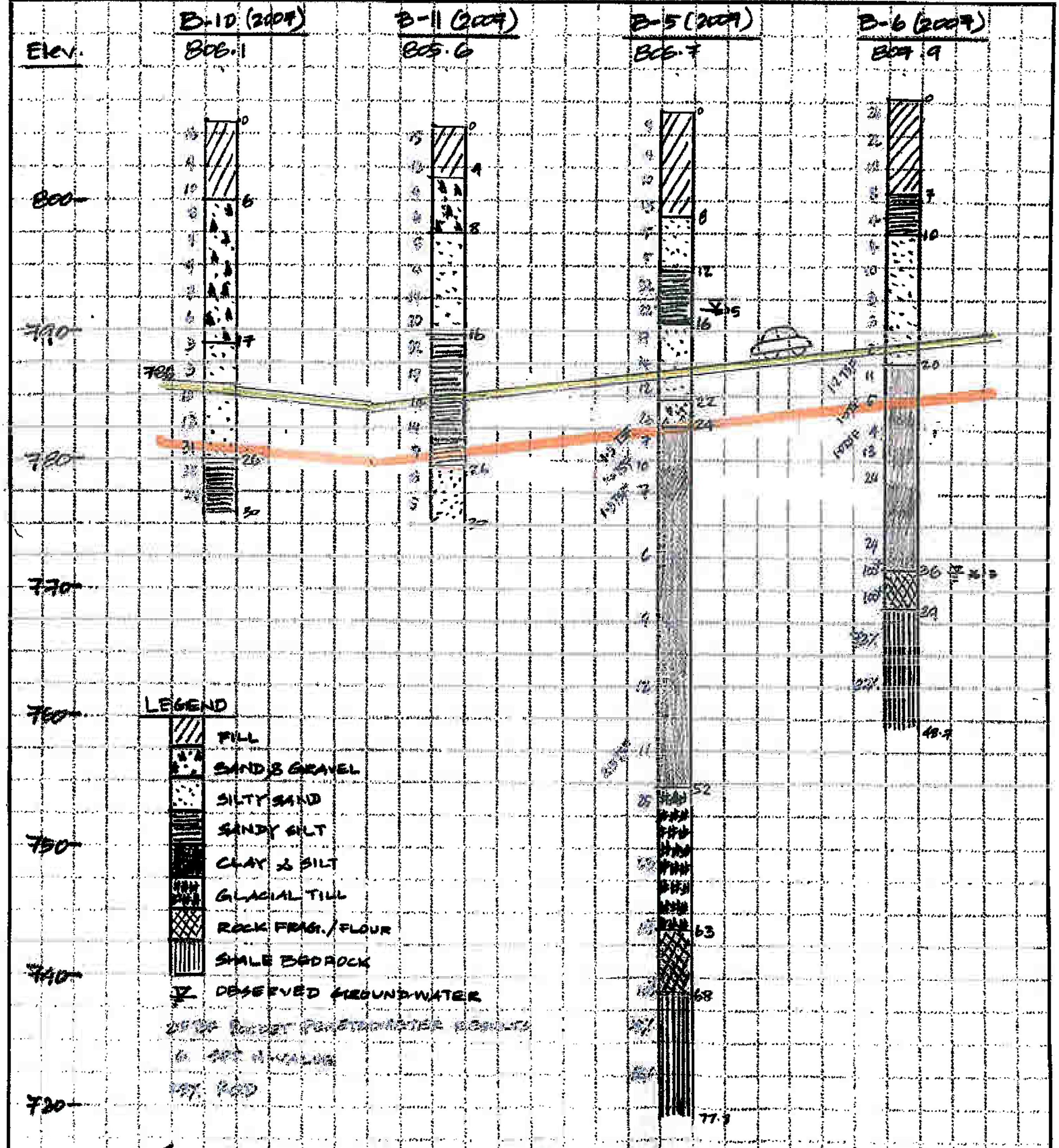
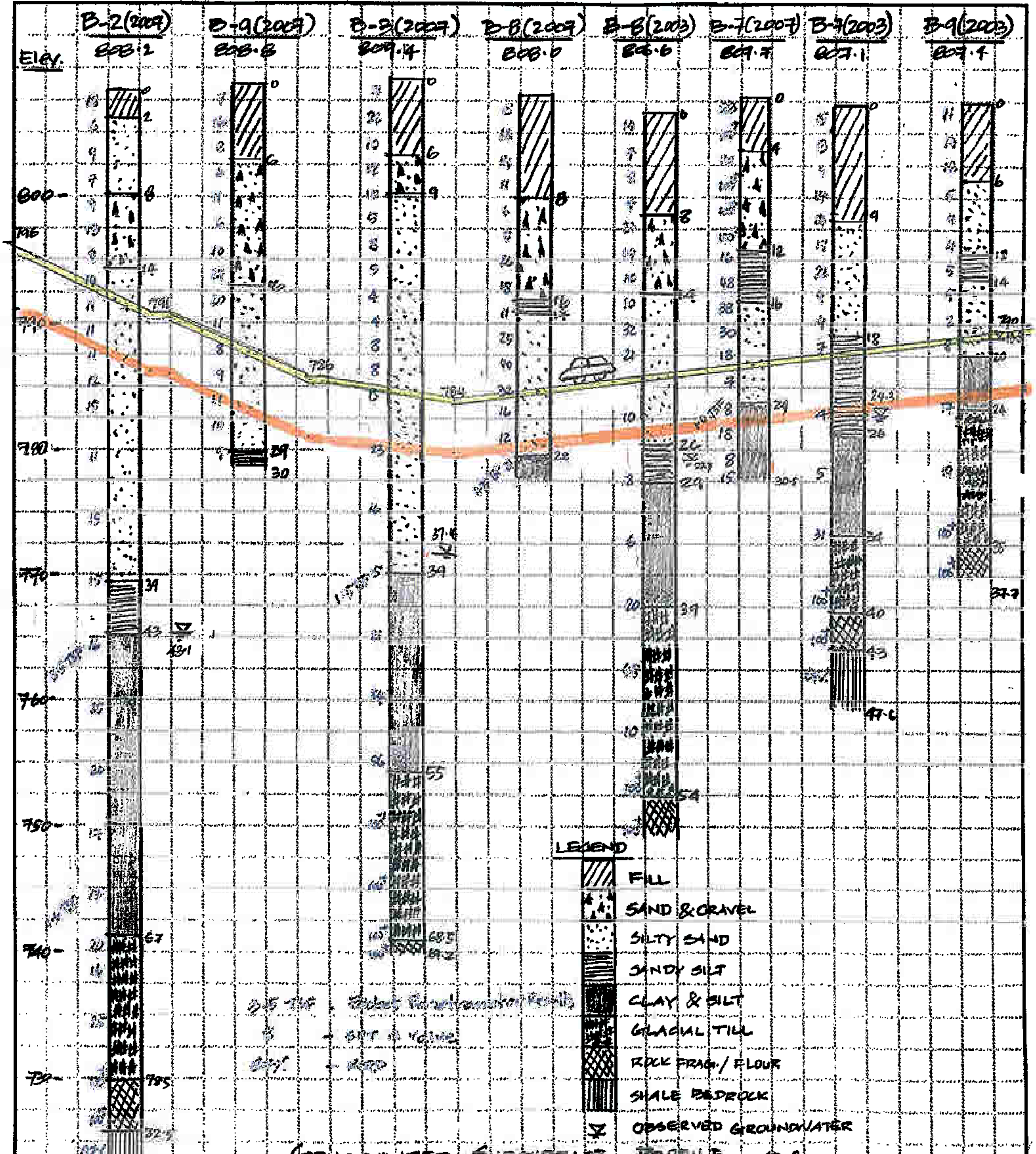


GENERALIZED SUBSURFACE PROFILE SP-2

CME Associates, Inc.
Construction Materials Evaluation
P.O. Box 1824
Cicero, New York 13039
315-698-9315

CME REPORT No. : 26054B-01-0807

PROJECT NAME CAPG PARKING GARAGE, ITHACA, NY
CLIENT NAME CORNELL UNIVERSITY
JOB # 26054 SHEET 3 OF 3
CALC. BY ANAS DATE 08-16-07 CHECK ____ DATE ____
SCALE VERTICAL: 1"=10' HORIZONTAL: N.T.S.



GENERALIZED SUBSURFACE PROFILE SP-3

Central Avenue Parking Garage – Bedrock Core Photographs

Page 1 of 2

Central Avenue Parking Garage – Bedrock Core Photographs
Page 2 of 2

Subsurface Exploration Report
Central Avenue Parking Garage at Cornell University
Ithaca, New York
CME Report No.: 26054B-01-0807

APPENDIX - B

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SUBSURFACE EXPLORATION – TEST BORING LOG

Project:	CAPG at Cornell University, Ithaca, NY	**Report No.:**	26054B-01-0807
Client:	Desman Associates	**Date Started:** 08/08/07	**Finished:** 08/08/07
Location of Boring:	See Boring Location Sketch	**Elevation of Surface of Boring:**	801.4'

METHODS OF INVESTIGATION

Casing:	3-1/4" ID H. Stem Auger	**Driller:**	Al Linstruth
Casing Hammer:		**Driller:**	Tom McCarthy
Other:		**Inspector:**	
Soil Sampler:	2" OD Split Barrel	**Rod Size:**	AWJ
Sampler Hammer: Wt.	140 lbs./Auto	**Fall:**	30 in.
Make & Model of Drill Rig:	Diedrich D120 Truck Mounted		

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
08/08/07	While drilling	62.3'	74.3'
08/08/07	Before casing removed	Cored	74.3'
08/08/07	After casing removed	See Remark 1	
08/08/07	After casing removed		

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
0	XXX	1a	0.0	0.5	SS/14	4-5-9-6	0.5	Topsoil (moist)	
	H	1b	0.5	2.0				Brown SILT, some cmf SAND, little cmf GRAVEL, trace BRICK, trace ROOT HAIRS (moist, stiff)	14
	O								
		2	2.0	4.0	SS/16	8-5-7-6		Similar Soil (moist, stiff)	12
	L						4.0	~ Unprepared Miscellaneous Fill ~	
		3	4.0	6.0	SS/16	7-6-6-10		Brown mf SAND, trace SILT (moist, medium compact)	12
5	L								
	O	4	6.0	8.0	SS/24	7-10-10-10		Similar Soil (moist, medium compact)	20
	W								
		5	8.0	10.0	SS/24	6-8-9-9		Brown cmf SAND, trace SILT (moist, medium compact)	17
10		6	10.0	12.0	SS/20	8-9-7-6		Similar Soil (moist, medium compact)	16
	S								
	T	7	12.0	14.0	SS/20	5-6-6-7		Brown cmf SAND, little SILT (moist, medium compact)	12
	E								
		8	14.0	16.0	SS/18	4-6-5-6		Brown cmf SAND, some SILT (moist, medium compact)	11
15	M								
		9	16.0	18.0	SS/20	8-7-6-6		Similar Soil (moist, medium compact)	13
		10	18.0	20.0	SS/20	5-6-6-7		Brown cmf SAND, trace SILT (moist, medium compact)	12
	A								
20	U	11a	20.0	20.8	SS/18	6-7-6-6		Similar Soil (moist, medium compact)	
		11b	20.8	22.0				Brown fine SAND and some SILT (moist, stiff)	13
	G								
		12	22.0	24.0	SS/20	5-8-8-10		Similar Soil (moist, very stiff)	16
	E						24.0		
		13	24.0	26.0	SS/24	5-8-10-16		Brown SILT, some fine SAND (moist, very stiff)	18
	R								
25								Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
		14a	26.0	27.5	SS/24	16-18-18-15	27.5	Brown SILT, some fine SAND (moist, very stiff)	
	O	14b	27.5	28.0				Brown mf SAND, trace SILT (moist, compact)	36
	L						28.0		
		15a	28.0	29.2	SS/18	7-8-8-9		Brown SILT, trace fine SAND (moist, very stiff)	16
	L	15b	29.2	30.0				Brown mf SAND, trace SILT (moist, medium compact)	
30									
	O								
	W								
		16	33.0	35.0	SS/20	8-8-8-9		Similar Soil (wet, medium compact)	16
35									
	S								
	T								
		17a	38.0	39.3	SS/-	7-8-7-15		Brown fine SAND, some SILT (saturated, medium compact)	15
	E						39.3		
		17b	39.3	40.0				Brown SILT, trace CLAY (saturated, stiff)	
	M								
40									
							43.0		
	A	18	43.0	45.0	SS/20	1-3-4-6		Grey CLAY, little cmf SAND, trace SILT (wet, medium stiff)	7
	U								
45									
	G								
	E								
	R	19	48.0	49.5	SS/16	7-11-16		Grey SILT, trace CLAY (moist, very stiff)	27
50								Continued on page 3	

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

LOG OF BORING SAMPLES							**CLASSIFICATION OF MATERIAL**		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
50	H O							Continued from page 2	
	L	20	53.0	54.5	SS/10	5-6-8		Grey CLAY, trace SILT (moist, stiff)	14
55	L O W	21	58.0	60.0	SS/0	6-7-7-8		Grey SILT and CLAY (wet, stiff)	14
60	S T	22	63.5	65.0	SS/22	5-5-6		Grey CLAY, trace cmf SAND, trace SILT (wet, stiff)	11
65	E M						68.0		
	A	23	68.0	69.5	SS/18	5-15-25		Grey CLAY, some cmf SAND, little SILT, trace cmf GRAVEL (wet, hard)	40
70	U G						73.0	~ Glacial Till ~	
	E	24	73.0	73.4	SS/4	100@5"		Grey ROCK fragments and SILT (moist)	100+
	R XXX	25	74.3	74.3	SS/0	100@0"		*Auger Refusal @ 74.3'*	
75								Continued on page 4	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

CME Associates, Inc. **Report No.: 26054B-01-0807 BORING NO.: B-1(2007)** Page 4 of 4

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse **and** – 35 to 50 % m – medium **some** – 20 to 35 % f – fine **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
75								Continued from page 3	
		R1	74.3	79.3	C/60	NQ-Core		Grey, medium hard, weathered, bedded SHALE BEDROCK	28%
	C							Recovery: 60"/60" = 100% RQD: 17"/60" = 28%	
	O							20 Pieces, 2½" Chips & Fragments	
80	R	R2	79.3	84.3	C/60	NQ-Core		Grey, medium hard, very weathered to weathered, bedded SHALE BEDROCK with mud seams (*See Remark 1*)	57%
	E							Recovery: 60"/60" = 100% RQD: 34"/60" = 57% 17 Pieces, 0" Chips & Fragments	
85	XXX							Bottom of Boring @ 84.3'	
90									
95									
100									

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. Two mud seams of about 2 inches in total thickness was noted.

CME Associates, Inc. **BORING NO.: B-2 (2007)** Page 1 of 4

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: CAPG at Cornell University, Ithaca, NY **Report No.:** 26054B-01-0807
Client: Desman Associates **Date Started:** 07/16/07 **Finished:** 07/18/07
Location of Boring: See Boring Location Sketch **Elevation of Surface of Boring:** 808.2'

METHODS OF INVESTIGATION

Casing: 3-1/4" ID H. Stem Auger **Driller:** Wayne Earl
Casing Hammer: **Driller:** Karl Allen
Other: **Inspector:**
Soil Sampler: 2" OD Split Barrel **Rod Size:** AWJ
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: CME 55 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
07/16/07	While drilling	43.1'	43.5'
07/18/07	Before casing removed	82.5'	42.3'
07/18/07	After casing removed	See Remark 1	
07/18/07	After casing removed		

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
0	XXX	1a	0.0	0.3	SS/14	2-9-9-9	0.3	Topsoil (moist)	
	H	1b	0.3	2.0				Brown cmf SAND and SILT, trace ORGANICS, trace BRICK (moist)	18
	O						2.0	~ Unprepared Miscellaneous Fill ~	
		2	2.0	4.0	SS/12	3-4-2-2		Brown cmf SAND and SILT, trace mf GRAVEL (moist, loose)	6
	L								
		3	4.0	6.0	SS/13	3-5-4-4		Brown cmf SAND and SILT, little cmf GRAVEL (moist, loose)	9
5	L								
	O	4	6.0	8.0	SS/11	3-5-2-6		Brown cmf SAND and SILT (moist, loose)	7
	W								
		5	8.0	10.0	SS/12	6-5-4-4		Brown cmf SAND, little mf GRAVEL, little SILT (moist to wet, loose)	9
10		6	10.0	12.0	SS/12	6-5-8-11		Brown cmf SAND, some cmf GRAVEL, little SILT (moist, medium compact)	13
	S								
	T	7	12.0	14.0	SS/8	6-5-3-12		Similar Soil (moist, loose)	8
	E						14.0		
		8	14.0	16.0	SS/16	2-7-7-8		Brown cmf SAND, little SILT, trace fine GRAVEL (moist, medium compact)	14
15	M								
		9	16.0	18.0	SS/15	6-6-5-5		Brown mf SAND, little SILT (moist, medium compact)	11
		10	18.0	20.0	SS/14	3-5-6-6		Similar Soil (moist, medium compact)	11
	A								
20	U	11	20.0	22.0	SS/22	7-6-5-6		Similar Soil (moist, medium compact)	11
	G								
		12	22.0	24.0	SS/18	7-6-6-6		Brown cmf SAND, little SILT, trace mf GRAVEL (moist, medium compact)	12
	E								
		13	24.0	26.0	SS/20	6-7-8-9		Brown mf SAND, little SILT (moist, medium compact)	15
	R								
25								Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
	O								
	L								
		14	28.5	30.0	SS/16	5-6-5-6		Brown mf SAND, little SILT (moist, medium compact)	11
	L								
30									
	O								
	W								
		15	33.5	35.0	SS/17	6-7-8		Similar Soil (moist, medium compact)	15
35									
	S								
	T								
		16a	38.5	39.2	SS/14	7-8-7		Brown mf SAND and SILT (moist, medium compact)	
	E						39.2		
		16b	39.2	40.0				Brown SILT and fine SAND, trace CLAY (saturated, very stiff)	15
	M								
40									
							43.0		
	A	17	43.5	45.0	SS/16	6-8-8		Brown CLAY and SILT, trace mf SAND (wet, very stiff)	16
	U								
45									
	G								
	E								
	R	18	48.5	50.0	SS/15	6-12-13		Grey SILT, little CLAY (moist, very stiff)	25
50								Continued on page 3	

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

LOG OF BORING SAMPLES							**CLASSIFICATION OF MATERIAL**		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
50								Continued from page 2	
	H								
	O								
		19	53.5	55.0	SS/18	12-12-8		Grey SILT, little CLAY (moist, very stiff)	20
	L								
55	L								
	O								
	W								
		20a	58.5	59.5	SS/14	12-11-6	59.5	Grey SILT, trace CLAY (moist, very stiff)	
		20b	59.5	60.0				Grey CLAY and SILT (moist, very stiff)	17
60									
	S								
	T								
		21	63.5	65.0	SS/17	4-7-6		Similar Soil (wet, stiff)	13
	E								
65	M								
							67.0		
		22	67.1	68.6	SS/17	6-9-11		Grey SILT and CLAY, trace mf SAND, trace fine GRAVEL (moist, very stiff)	20
	A								
		23	69.0	70.5	SS/16	7-8-8		Similar Soil (moist, very stiff)	16
70	U								
								~ Glacial Till ~	
	G								
	E	24	73.5	75.0	SS/15	6-12-13		Grey SILT and cmf SAND, little mf GRAVEL, trace CLAY (moist, very stiff)	25
	R								
75								Continued on page 4	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
75	H							Continued from page 3	
	S	25a	78.0	78.5	SS/8	39-100@5"	78.5	Brown SILT and cmf SAND, some cmf GRAVEL (moist, hard)	
		25b	78.5	78.9				Grey/Brown cmf GRAVEL and ROCK fragments, little SILT (moist)	100+
80									
	A XXX	26	82.5	82.5	SS/0	100@0"	82.5	Grey ROCK fragments and flour (dry) *Auger Refusal @ 82.5'*	100+
	C	R1	82.5	87.5	C/60	NQ-Core		Grey, medium hard, weathered, bedded SHALE BEDROCK Recovery: 60"/60" = 100% RQD: 52"/60" = 87% 9 Pieces, 0" Chips & Fragments	87%
85	O								
	R	R2	87.5	92.5	C/60	NQ-Core		Grey, medium hard, weathered, bedded SHALE BEDROCK Recovery: 60"/60" = 100% RQD: 58"/60" = 97% 6 Pieces, 0" Chips & Fragments	97%
	E								
90									
	XXX							Bottom of Boring @ 92.5'	
95									
100									

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

CME Associates, Inc. **BORING NO.: B-3 (2007)** Page 1 of 3

SUBSURFACE EXPLORATION – TEST BORING LOG

Project:	CAPG at Cornell University, Ithaca, NY	**Report No.:**	26054B-01-0807
Client:	Desman Associates	**Date Started:**	07/24/07
		Finished:	07/25/07
Location of Boring:	See Boring Location Sketch	**Elevation of Surface of Boring:**	809.4’

METHODS OF INVESTIGATION

Casing:	3-1/4” ID H. Stem Auger	**Driller:**	Wayne Earl
Casing Hammer:		**Driller:**	Karl Allen
Other:		**Inspector:**	
Soil Sampler:	2” OD Split Barrel	**Rod Size:**	AWJ
Sampler Hammer: Wt.	140 lbs./Auto	**Fall:**	30 in.
Make & Model of Drill Rig:	CME 55 Truck Mounted		

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
07/24/07	While drilling	37.4’	40.0’
07/24/07	Before casing removed	43.2’	69.2’
07/25/07	After casing removed	See Remark 1	
07/25/07	After casing removed		

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

c – coarse, **m** – medium, **f** – fine; **and** – 35 to 50 %, **some** – 20 to 35 %, **little** – 10 to 20 %, **trace** – 0 to 10 %

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	Classification of Material	SPT “N” or RQD
0	XXX	1a	0.0	0.5	SS/16	2-2-5-8	0.5	Topsoil (moist)	
	H	1b	0.5	2.0				Brown SILT, some cmf SAND, trace ORGANICS (moist)	7
	O	2	2.0	4.0	SS/8	8-12-10-8		Brown cmf SAND and SILT, little fine GRAVEL, little BRICK (moist)	22
	L							~ Unprepared Miscellaneous Fill ~	
		3	4.0	6.0	SS/10	4-5-5-4		Brown cmf SAND and SILT, little mf GRAVEL, trace BRICK (moist)	10
5	L								
							6.0		
	O	4	6.0	8.0	SS/12	4-6-6-6		Brown cmf SAND, some cmf GRAVEL, some SILT (moist, medium compact)	12
	W	5a	8.0	9.4	SS/16	4-5-5-5	9.4	Brown cmf SAND, some SILT, little cmf GRAVEL (moist, medium compact)	
		5b	9.4	10.0				Brown mf SAND, some SILT (moist, medium compact)	10
10		6	10.0	12.0	SS/14	3-2-3-2		Brown SILT, trace fine SAND (moist, medium stiff)	5
	S								
	T	7	12.0	14.0	SS/14	3-4-4-4		Brown fine SAND, some SILT (moist, loose)	8
	E								
		8	14.0	16.0	SS/12	3-2-3-2		Brown mf SAND, little SILT (moist, loose)	5
15	M								
		9	16.0	18.0	SS/18	2-2-2-2		Brown fine SAND and SILT (moist, loose)	4
		10	18.0	20.0	SS/16	2-2-2-3		Brown mf SAND, some SILT (moist, loose)	4
	A								
20	U	11	20.0	22.0	SS/16	2-3-5-21		Brown fine SAND and SILT, trace fine GRAVEL (moist, loose)	8
	G								
		12	22.0	24.0	SS/20	3-4-4-4		Brown fine SAND, some SILT (moist, loose)	8
	E								
		13	24.0	26.0	SS/18	2-3-5-5		Similar Soil (moist, loose)	8
	R								
25								Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
	O								
	L								
		14	28.5	30.0	SS/16	8-11-12		Brown mf SAND, some SILT (moist, medium compact)	23
	L								
30									
	O								
	W								
		15	33.5	35.0	SS/18	4-7-9		Brown mf SAND, little SILT (saturated, medium compact)	16
35									
	S								
	T								
	E	16a	38.5	39.0	SS/14	2-3-2	39.0	Similar Soil (saturated, loose)	
		16b	39.0	4.0				Grey CLAY, little SILT (moist, medium stiff)	5
	M								
40									
	A	17	43.5	45.0	SS/14	7-9-12		Grey SILT, little CLAY (moist, very stiff)	21
	U								
45									
	G								
	E								
	R	18	48.5	50.0	SS/14	4-12-22		Grey SILT, trace CLAY (moist, hard)	34
50								Continued on page 3	

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

LOG OF BORING SAMPLES							**CLASSIFICATION OF MATERIAL**		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
50	H							Continued from page 2	
	O								
	L	19a	53.5	54.7	SS/16	15-28-28	54.7	Grey SILT, trace CLAY (moist, hard)	
		19b	54.7	55.0				Grey fine SAND and SILT (saturated, very compact)	56
	L								
55									
	O								
	W								
		20	58.5	58.8	SS/3	100@3"		Grey SILT, some cmf GRAVEL, little cmf SAND, trace CLAY (moist, hard)	100+
	S								
60	T								
	E							~ Glacial Till ~	
	M								
		21	63.5	64.1	SS/4	30-100@5"		Grey SILT and cmf SAND, little cmf GRAVEL, trace ROCK fragments (moist, hard)	100+
	A								
65									
	U								
							68.5		
	G	22	68.5	68.5	SS/0	100@0"		Grey ROCK fragments	100+
	E								
		23	69.2	69.2	SS/0	100@0"		No Recovery	100+
	R							*Auger & Sampler Refusal @ 69.2'*	
70	XXX							Bottom of Boring @ 69.2'	-
75									

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: CAPG at Cornell University, Ithaca, NY **Report No.:** 26054B-01-0807
Client: Desman Associates **Date Started:** 07/23/07 **Finished:** 07/23/07
Location of Boring: See Boring Location Sketch **Elevation of Surface of Boring:** 806.2’

METHODS OF INVESTIGATION

Casing: 3-1/4” ID H. Stem Auger **Driller:** Wayne Earl
Casing Hammer: **Driller:** Karl Allen
Other: **Inspector:**
Soil Sampler: 2” OD Split Barrel **Rod Size:** AWJ
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: CME 55 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
07/23/07	While drilling	43.2’	43.5’
07/23/07	Before casing removed	48.1’	76.9’
07/23/07	After casing removed	See Remark 1	
07/23/07	After casing removed		

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT “N” or RQD
0	XXX	1a	0.0	0.5	SS/16	2-4-9-8	0.5	Topsoil (moist)	
	H	1b	0.5	2.0			2.0	Brown cmf SAND, some cmf GRAVEL, some SILT, trace ORGANICS (moist) ~ Fill ~	13
	O	2	2.0	4.0	SS/12	7-6-5-6		Brown cmf SAND, some SILT, little mf GRAVEL (moist, medium compact)	11
	L								
		3	4.0	6.0	SS/10	4-5-5-4		Similar Soil (moist, medium compact)	10
5	L								
	O	4	6.0	8.0	SS/10	4-5-3-3		Similar Soil (moist, loose)	8
	W						8.0		
		5	8.0	10.0	SS/14	4-5-4-5		Brown fine SAND, some SILT (moist, loose)	9
10		6	10.0	12.0	SS/16	3-4-3-3		Brown mf SAND, trace SILT (moist, loose)	7
	S								
	T	7	12.0	14.0	SS/14	3-4-5-4		Similar Soil (moist, loose)	9
	E						14.0		
		8	14.0	16.0	SS/20	7-9-11-12		Brown SILT, some fine SAND (moist, very stiff)	20
15	M								
		9	16.0	18.0	SS/22	11-13-14-16		Similar Soil (moist, very stiff	27
		10a	18.0	19.7	SS/22	7-8-9-11	19.7	Similar Soil (moist, very stiff)	
	A	10b	19.7	20.0				Brown fine SAND, trace SILT (moist, medium compact)	17
20	U	11a	20.0	20.5	SS/20	9-9-11-11	20.5	Similar Soil (moist, medium compact)	
		11b	20.5	22.0				Brown SILT, little mf SAND (moist, very stiff)	20
	G								
		12	22.0	24.0	SS/18	11-12-14-14		Similar Soil (moist, very stiff)	26
	E	13a	24.0	24.4	SS/16	8-8-10-8	24.4	Similar Soil (moist, very stiff)	
		13b	24.4	26.0				Brown fine SAND, trace SILT (moist, medium compact)	18
	R								
25								Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

CME Associates, Inc. Report No.: 26054B-01-0807 BORING NO.: B-4 (2007) Page 2 of 4

LOG OF BORING SAMPLES								CLASSIFICATION OF MATERIAL	
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
	O								
	L								
		14	28.5	30.0	SS/18	11-12-14-14		Brown fine SAND and SILT (moist, very stiff)	26
	L								
30									
	O								
	W								
		15a	33.5	34.4	SS/16	8-8-9	34.4	Similar Soil (wet, medium compact)	
		15b	34.4	35.0				Brown SILT, trace CLAY (moist, very stiff)	17
35									
	S								
	T								
	E	16	38.5	40.0	SS/18	5-7-8		Grey CLAY and SILT (moist, very stiff)	15
	M								
40									
	A	17	43.5	45.0	SS/16	5-8-7		Similar Soil (moist, very stiff)	15
	U								
45									
	G								
	E								
	R	18	48.5	50.0	SS/16	7-8-8		Grey SILT and CLAY (moist, very stiff)	16
50								Continued on page 3	

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
50	H							Continued from page 2	
	O						53.0		
	L	19	53.5	55.0	SS/14	8-11-19		Grey SILT, little CLAY, little cmf SAND, trace fine GRAVEL (moist, hard)	30
	L								
55									
	O							~ Glacial Till ~	
	W								
		20	58.5	60.0	SS/16	11-12-14		Grey SILT, little CLAY, little mf SAND, trace cmf GRAVEL (moist, very stiff)	26
	S								
60	T								
	E								
		21a	62.7	62.8	SS/16	11-16-14		Grey SILT and cmf SAND, trace fine GRAVEL (moist, hard)	30
	M								
		21b	62.8	63.6				Grey SILT, some cmf SAND, some mf GRAVEL, trace CLAY (moist, hard)	
	A	22	64.0	65.5	SS/14	11-24-34		Grey SILT, some cmf SAND, some mf GRAVEL (moist, hard)	58
65									
	U								
	G	23a	68.5	69.6	SS/12	24-24-52		Grey SILT and mf SAND, trace mf GRAVEL (moist, hard)	76
	E	23b	69.6	70.0				Grey SILT and cmf GRAVEL, little ROCK fragments (moist, hard)	
	R								
70	XXX								
							73.0		
		24	73.5	74.4	SS/8	87-100@4"		Grey cmf SAND, some ROCK fragments, little SILT (moist)	100+
75								Continued on page 4	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
75	H							Continued from page 3	
	S	25	76.9	76.9	SS/0	100@0"		No Recovery	100+
	A							*Auger & Sampler Refusal @ 76.9'*	
	XXX							Bottom of Boring @ 76.9'	
80									
85									
90									
95									
100									

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

CME Associates, Inc. **BORING NO.: B-5 (2007)** Page 1 of 3

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: CAPG at Cornell University, Ithaca, NY **Report No.:** 26054B-01-0807
Client: Desman Associates **Date Started:** 08/02/07 **Finished:** 08/03/07
Location of Boring: See Boring Location Sketch **Elevation of Surface of Boring:** 806.7’

METHODS OF INVESTIGATION

Casing: 4-1/4” ID H. Stem Auger **Driller:** Al Linstruth
Casing Hammer: **Driller:** Tom McCarthy
Other: **Inspector:**
Soil Sampler: 2” OD Split Barrel **Rod Size:** AWJ
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: Diedrich D120 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
08/02/07	While drilling	None Noted	57.5’
08/03/07	Before casing removed	15.0’	67.8’
08/03/07	After casing removed	See Remark 1	
08/03/07	After casing removed		

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

c – coarse, m – medium, f – fine; **and** – 35 to 50 %, **some** – 20 to 35 %, **little** – 10 to 20 %, **trace** – 0 to 10 %

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	Classification of Material	SPT “N” or RQD
0	XXX						0.5	2” Asphalt Pavement, 3” Tar and Stone	
	H	1	0.5	2.0	SS/10	12-8-1		Brown SILT, some cmf SAND, some cmf GRAVEL, trace BRICK (moist)	9
	O	2	2.0	4.0	SS/6	2-2-2-2		Brown cmf SAND, some cmf GRAVEL, little BRICK, trace SILT (moist)	4
	L							~ Unprepared Miscellaneous Fill ~	
		3	4.0	6.0	SS/12	6-5-5-8		Red BRICK, some cmf SAND, little fine GRAVEL (moist)	10
5	L								
	O	4	6.0	8.0	SS/12	7-6-7-7		Brown SILT, some cmf SAND, little cmf GRAVEL, trace BRICK (moist)	13
	W						8.0		
		5	8.0	10.0	SS/16	4-2-3-2		Brown mf SAND, little SILT (moist, loose)	5
10		6	10.0	12.0	SS/18	3-2-3-4		Brown fine SAND and SILT (moist, loose)	5
	S								
							12.0		
	T	7	12.0	14.0	SS/12	12-18-14-14		Brown SILT, some fine SAND (moist, hard)	32
	E								
		8	14.0	16.0	SS/18	8-11-11-13		Similar Soil (moist, very stiff)	22
15	M								
							16.0		
		9	16.0	18.0	SS/22	8-7-10-10		Brown fine SAND, trace SILT (moist, medium compact)	17
		10	18.0	20.0	SS/20	9-7-7-7		Brown mf SAND, trace SILT (moist, medium compact)	14
	A								
20	U	11	20.0	22.0	SS/22	7-6-6-7		Similar Soil (moist, medium compact)	12
	G						22.0		
		12	22.0	24.0	SS/20	8-10-13-10		Brown cmf SAND, some mf GRAVEL, trace SILT (moist, medium compact)	23
	E						24.0		
		13	24.0	26.0	SS/18	6-4-3-3		Brown SILT and CLAY, trace fine SAND (moist, stiff)	7
	R								
25								Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
		14	26.0	28.0	SS/20	4-4-6-7		Grey CLAY and SILT (wet, stiff)	10
	O								
	L								
		15	28.0	30.0	SS/24	2-3-4-4		Grey SILT and CLAY, trace fine SAND (moist, medium stiff)	7
	L								
30									
	O								
	W								
		16	33.0	35.0	SS/22	2-3-3-4		Grey CLAY and SILT (moist, medium stiff)	6
35									
	S								
	T								
	E	17	38.0	40.0	SS/24	3-4-5-6		Similar Soil (moist, stiff)	9
	M								
40									
	A	18	43.0	45.0	SS/22	4-3-9-9		Grey SILT and CLAY (moist, stiff)	12
	U								
45									
	G								
	E								
	R	19	48.0	50.0	SS/20	3-5-6-9		Grey CLAY and SILT (moist, stiff)	11
50								Continued on page 3	

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
50	H							Continued from page 2	
	O						52.1		
	L	20	52.1	54.1	SS/20	6-10-15-13		Grey SILT, some cmf SAND, some cmf GRAVEL, trace CLAY (moist, very stiff)	25
	L								
	O								
	W								
								~ Glacial Till ~	
55									
		21	57.5	59.0	SS/18	17-36-27		Grey SILT, some cmf SAND, some cmf GRAVEL, trace ROCK fragments (moist, hard)	63
	S								
	T								
	E								
60	M								
							63.0		
		22	63.0	63.3	SS/2	100@4"		Grey ROCK fragments	100+
	A								
65	U								
	G								
	E								
	R	23	67.8	67.8	SS/0	100@0"		No Recovery	100+
	XXX						67.8	*Auger & Sampler Refusal @ 67.8'*	
		R1	67.8	72.8	C/60	NQ-Core		Grey, soft to medium hard, very weathered, bedded SHALE BEDROCK	25%
	C							Recovery: 60"/60" = 100%	
70								RQD: 15"/60" = 25%	
	O							24 Pieces, 6" Chips & Fragments	
	R	R2	72.8	77.8	C/60	NQ-Core		Grey, medium hard, weathered, bedded SHALE BEDROCK	62%
	E							Recovery: 60"/60" = 100%	
								RQD: 37"/60" = 62%	
								18 Pieces, 2" Chips & Fragments	
75	XXX							Bottom of Boring @ 77.8'	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: CAPG at Cornell University, Ithaca, NY
Report No.: 26054B-01-0807
Client: Desman Associates
Date Started: 08/06/07 **Finished:** 08/06/07
Location of Boring: See Boring Location Sketch
Elevation of Surface of Boring: 807.9'

METHODS OF INVESTIGATION

Casing: 4-1/4" ID H. Stem Auger
Driller: Al Linstruth
Casing Hammer:
Driller: Tom McCarthy
Other:
Inspector:
Soil Sampler: 2" OD Split Barrel
Rod Size: AWJ
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: Diedrich D120 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
08/06/07	While drilling	None Noted	10.0'
08/06/07	Before casing removed	36.3'	38.7'
08/06/07	After casing removed	See Remark 1	
08/06/07	After casing removed		

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
0	XXX						0.5	3" Asphalt Pavement, 3" Tar and Stone	
	H	1	0.5	2.0	SS/14	11-9-15		Brown cmf SAND, little mf GRAVEL, little SILT (moist, medium compact)	24
	O							~ Possible Fill ~	
		2	2.0	4.0	SS/12	13-14-8-7		Similar Soil (moist, medium compact)	22
	L								
		3	4.0	6.0	SS/3	7-6-4-4		Brown cmf SAND, some mf GRAVEL, little SILT (moist to wet, loose)	10
5	L								
	O	4a	6.0	7.2	SS/14	4-4-4-2	7.2	Similar Soil (wet, loose)	
		4b	7.2	8.0				Brown SILT, trace fine SAND (wet, stiff)	8
	W								
		5	8.0	10.0	SS/2	4-2-2-1		Similar Soil (wet, medium compact)	4
							10.0		
10		6	10.0	12.0	SS/16	2-2-2-2		Brown mf SAND, some SILT (wet, loose)	4
	S								
	T	7	12.0	14.0	SS/16	5-5-5-5		Brown fine SAND, little SILT (moist, loose)	10
	E								
		8	14.0	16.0	SS/18	3-1-2-2		Brown fine SAND, little SILT (moist, very loose)	3
15	M								
		9	16.0	18.0	SS/16	2-1-2-2		Similar Soil (saturated, very loose)	3
		10a	18.0	19.6	SS/20	1-1-1-1	19.6	Similar Soil (saturated, very loose)	2
	A	10b	19.6	20.0				Brown CLAY, trace SILT (saturated, soft)	
20	U	11	20.0	22.0	SS/18	2-5-6-7		Brown SILT, trace CLAY (saturated, stiff)	11
	G								
		12	22.0	24.0	SS/0	3-2-3-5		Grey CLAY, trace SILT (saturated, medium stiff)	5
	E								
		13	24.0	26.0	SS/18	1-2-2-4		Grey CLAY, little SILT (wet, medium stiff)	4
	R								
25								Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

CME Associates, Inc. Report No.: 26054B-01-0807 BORING NO.: B-6 (2007) Page 2 of 2

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
	O	14	26.0	28.0	SS/20	3-5-8-11		Grey SILT, some CLAY (wet, stiff)	13
	L								
	L								
	O						28.0		
	W	15	28.0	30.0	SS/20	6-9-15-15		Grey SILT, little CLAY, trace fine GRAVEL (wet, very stiff)	24
30									
	S							~ Glacial Till ~	
	T								
	E								
	M	16	33.5	35.0	SS/10	12-11-13		Grey SILT, trace CLAY, trace fine GRAVEL (wet, very stiff)	24
35									
	A						36.3		
	U	17	36.3	36.5	SS/2	100@2"		Grey ROCK chips and fragments, little SILT (moist, hard)	100+
	G								
	E								
	R	18	38.7	38.7	SS/0	100@0"		No Recovery	100+
	XXX						38.7	*Auger & Sampler Refusal @ 38.7'*	
40	C	R1	38.7	43.7	C/60	NQ-Core		Grey, medium hard, weathered, bedded SHALE BEDROCK Recovery: 60"/60" = 100% RQD: 44"/60" = 73% 10 Pieces, 0" Chips & Fragments	73%
	O								
		R2	43.7	48.7	C/60	NQ-Core		Grey, medium hard, weathered, bedded SHALE BEDROCK Recovery: 60"/60" = 100% RQD: 53"/60" = 88% 10 Pieces, ½" Chips & Fragments	88%
45	R								
	E								
	XXX							Bottom of Boring @ 48.7'	
50									

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: CAPG at Cornell University, Ithaca, NY **Report No.:** 26054B-01-0807
Client: Desman Associates **Date Started:** 08/01/07 **Finished:** 08/02/07
Location of Boring: See Boring Location Sketch **Elevation of Surface of Boring:** 807.7'

METHODS OF INVESTIGATION

Casing: 4-1/4" ID H. Stem Auger **Driller:** Al Linstruth
Casing Hammer: **Driller:** Tom McCarthy
Other: **Inspector:**
Soil Sampler: 2" OD Split Barrel **Rod Size:** AWJ
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: Diedrich D120 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
08/02/07	While drilling	None Noted	21.5'
08/02/07	Before casing removed	None Noted	30.5'
08/02/07	After casing removed	See Remark 1	
08/02/07	After casing removed		

LOG OF BORING SAMPLES

CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
0	XXX	1a	0.0	0.5	SS/18	2-3-25-100@2"	0.5	Topsoil	
	H	1b	0.5	1.1				Brown SILT, some cmf SAND, little CLAY, trace cmf GRAVEL, trace ORGANICS (moist)	28
	O	1c	1.1	1.6				Brown cmf GRAVEL, some SILT (moist) ~ Possible Fill ~	
	L	2	2.0	2.2	SS/3	100@3"	4.0	Grey cmf SAND and cmf GRAVEL (moist, compact)	100+
5	L	3	4.0	6.0	SS/24	42-60-50-42		Brown cmf SAND and cmf GRAVEL, little SILT (moist, very compact)	110
	O								
		4	6.0	6.3	SS/4	100@4"		Similar Soil (moist, very compact)	100+
	W								
		5	8.0	8.2	SS/3	100@3"		Similar Soil (moist, very compact)	100+
10		6	10.0	12.0	SS/2	100@2"		Similar Soil (moist, very compact)	100+
	S								
							11.5	*Augering easier @ 11.5'*	
	T	7	11.5	13.5	SS/20	13-8-8-9		Brown SILT, trace fine SAND (moist, very stiff)	16
	E	8	13.5	15.5	SS/18	18-26-22-24		Similar Soil (moist, hard)	48
15	M								
							15.5		
		9	15.5	17.5	SS/24	23-19-19-20		Brown fine SAND and SILT (moist, compact)	38
		10	17.5	19.5	SS/24	13-15-15-16		Similar Soil (moist, compact)	30
	A								
		11	19.5	21.5	SS/20	11-11-7-8		Brown fine SAND, some SILT (wet, medium compact)	18
20	U								
	G	12	21.5	23.5	SS/24	6-4-3-2		Similar Soil (saturated, loose)	7
							23.5		
	E	13	23.5	25.5	SS/10	3-3-5-5		Grey SILT and CLAY, little mf SAND (moist, stiff)	8
	R								
25								Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
		14	25.5	27.5	SS/14	8-10-8-6		Grey SILT and CLAY (moist, very stiff)	18
	S	15	27.5	29.0	SS/16	3-3-5		Grey SILT, some CLAY (moist, stiff)	8
		16	29.0	30.5	SS/16	6-8-7		Grey SILT, little CLAY (moist, very stiff)	15
30	A								
	XXX							Bottom of Boring @ 30.5'	
35									
40									
45									
50									

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: CAPG at Cornell University, Ithaca, NY **Report No.:** 26054B-01-0807
Client: Desman Associates **Date Started:** 07/31/07 **Finished:** 07/31/07
Location of Boring: See Boring Location Sketch **Elevation of Surface of Boring:** 808.0'

METHODS OF INVESTIGATION

Casing: 4-1/4" ID H. Stem Auger **Driller:** Al Linstruth
Casing Hammer: **Driller:** Tom McCarthy
Other: **Inspector:**
Soil Sampler: 2" OD Split Barrel **Rod Size:** AWJ
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: Diedrich D120 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
07/31/07	While drilling	None Noted	28.0'
07/31/07	Before casing removed	None Noted	30.0
07/31/07	After casing removed	See Remark 1	
07/31/07	After casing removed		

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

c – coarse, m – medium, f – fine; **and** – 35 to 50 %, **some** – 20 to 35 %, **little** – 10 to 20 %, **trace** – 0 to 10 %

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	Classification of Material	SPT "N" or RQD
0	XXX	1a	0.0	0.3	SS/12	2-2-6-4	0.3	Topsoil (moist)	
	H	1b	0.3	2.0				Brown CINDERS, ASH, little SILT, little mf SAND (moist)	8
	O	2	2.0	4.0	SS/20	6-7-7-7		Brown SILT, some cmf SAND, some cmf GRAVEL (moist)	14
	L							~ Unprepared Miscellaneous Fill ~	
		3	4.0	6.0	SS/14	9-7-7-9		Brown SILT, some fine SAND, trace ROOT HAIRS (moist)	14
5	L								
	O	4	6.0	8.0	SS/14	10-6-5-4		Brown SILT, some cmf SAND, some cmf GRAVEL, trace ROOT HAIRS (moist)	11
	W						8.0		
		5	8.0	10.0	SS/10	5-3-3-4		Brown cmf SAND and SILT, some cmf GRAVEL (moist, loose)	6
10		6	10.0	12.0	SS/14	5-3-4-5		Brown cmf SAND, some SILT, some mf GRAVEL (moist, loose)	7
	S								
	T	7	12.0	14.0	SS/14	20-12-14-12		Similar Soil (moist, medium compact)	26
	E								
		8a	14.0	15.8	SS/24	13-10-8-4	15.8	Similar Soil (moist, medium compact)	18
15	M	8b	15.8	16.0				Brown SILT, trace fine SAND (moist, stiff)	
		9a	16.0	17.0	SS/12	6-5-6-7	17.0	Similar Soil (moist, stiff)	11
		9b	17.0	18.0				Brown fine SAND, little SILT (moist, medium compact)	
		10	18.0	20.0	SS/8	6-9-16-18		Brown fine SAND and SILT (moist, medium compact)	25
	A								
20	U	11	20.0	22.0	SS/24	19-19-21-22		Brown fine SAND and SILT (moist, compact)	40
	G								
		12	22.0	24.0	SS/24	13-15-17-14		Similar Soil (moist, compact)	32
	E								
	R	13	24.0	26.0	SS/24	6-8-8-8		Similar Soil (moist, medium compact)	16
25								Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

CME Associates, Inc. **Report No.: 26054B-01-0807 BORING NO.: B-8 (2007)** Page 2 of 2

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
		14a	26.0	27.8	SS/24	7-6-6-6	27.8	Brown mf SAND, little SILT (saturated, medium compact)	12
		14b	27.8	28.0				Brown SILT, trace mf SAND (moist, stiff)	
	S	15a	28.0	29.4	SS/24	3-4-4-6	29.4	Brown SILT and CLAY, trace fine GRAVEL (moist, stiff)	8
		15b	29.4	30.0				Grey CLAY and SILT, trace fine GRAVEL (moist, stiff)	
30	A								
	XXX							Bottom of Boring @ 30.5'	
35									
40									
45									
50									

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

CME Associates, Inc. **BORING NO.: B-9 (2007)** Page 1 of 2

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: CAPG at Cornell University, Ithaca, NY **Report No.:** 26054B-01-0807
Client: Desman Associates **Date Started:** 08/01/07 **Finished:** 08/01/07
Location of Boring: See Boring Location Sketch **Elevation of Surface of Boring:** 808.8'

METHODS OF INVESTIGATION

Casing: 4-1/4" ID H. Stem Auger **Driller:** Al Linstruth
Casing Hammer: **Driller:** Tom McCarthy
Other: **Inspector:**
Soil Sampler: 2" OD Split Barrel **Rod Size:** AWJ
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: Diedrich D120 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
08/01/07	While drilling	None Noted	28.0'
08/01/07	Before casing removed	None Noted	30.0
08/01/07	After casing removed	See Remark 1	
08/01/07	After casing removed		

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
0	XXX						0.5	3" Asphalt, 3" Crushed Stone	
	H	1	0.5	2.0	SS/8	5-4-3		Brown SILT, some cmf SAND, little cmf GRAVEL, trace ASPHALT (wet) ~ Unprepared Miscellaneous Fill ~	7
	O								
		2	2.0	4.0	SS/6	10-10-6-6		Similar Soil (moist)	16
	L								
		3	4.0	6.0	SS/8	5-5-3-2		Brown SILT, some cmf SAND, little cmf GRAVEL, trace ASPHALT, trace BRICK (moist)	8
5	L						6.0		
	O	4	6.0	8.0	SS/14	5-3-3-3		Brown cmf GRAVEL and cmf SAND, little SILT (wet, loose)	6
	W								
		5	8.0	10.0	SS/12	5-5-6-7		Brown cmf SAND, some cmf GRAVEL, little SILT (moist, medium compact)	11
10		6	10.0	12.0	SS/6	6-3-3-4		Similar Soil (moist, loose)	6
	S								
	T	7	12.0	14.0	SS/6	6-4-6-7		Similar Soil (moist, medium compact)	10
	E								
		8	14.0	16.0	SS/0	10-11-16-18		No Recovery	27
15	M						16.0		
		9	16.0	18.0	SS/18	10-11-9-9		Brown cmf SAND, little SILT, trace mf GRAVEL (moist, medium compact)	20
		10	18.0	20.0	SS/20	10-6-5-5		Similar Soil (moist, medium compact)	11
	A								
20	U	11	20.0	22.0	SS/20	6-4-4-4		Similar Soil (moist, loose)	8
	G								
		12	22.0	24.0	SS/20	4-4-5-3		Similar Soil (moist, loose)	9
	E								
		13	24.0	26.0	SS/18	4-5-6-7		Brown fine SAND, little SILT (moist, medium compact)	11
25	R							Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

CME Associates, Inc. **Report No.: 26054B-01-0807 BORING NO.: B-9 (2007)** Page 2 of 2

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
		14	26.0	28.0	SS/18	4-4-6-6		Similar Soil (moist, medium compact)	10
	S								
		15a	28.0	28.7	SS/18	3-4-5-6	28.7	Similar Soil (moist, medium compact)	
		15b	28.7	30.0				Brown SILT, trace fine SAND (moist, stiff)	9
	A								
30	XXX							Bottom of Boring @ 30.0'	
35									
40									
45									
50									

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

CME Associates, Inc. **BORING NO.: B-10 (2007)**

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: CAPG at Cornell University, Ithaca, NY **Report No.:** 26054B-01-0807
Client: Desman Associates **Date Started:** 07/31/07 **Finished:** 07/31/07
Location of Boring: See Boring Location Sketch & Remarks Below **Elevation of Surface of Boring:** 806.1’

METHODS OF INVESTIGATION

Casing: 4-1/4” ID H. Stem Auger **Driller:** Al Linstruth
Casing Hammer: **Driller:** Tom McCarthy
Other: **Inspector:**
Soil Sampler: 2” OD Split Barrel **Rod Size:** AWJ
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: Diedrich D120 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
07/31/07	While drilling	None Noted	28.0’
07/31/07	Before casing removed	None Noted	30.0’
07/31/07	After casing removed	See Remark 1	
07/31/07	After casing removed		

LOG OF BORING SAMPLES

CLASSIFICATION OF MATERIAL

c – coarse, m – medium, f – fine
and – 35 to 50 %, **some** – 20 to 35 %, **little** – 10 to 20 %, **trace** – 0 to 10 %

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	Classification of Material	SPT “N” or RQD
0	XXX						0.5	2” Asphalt, 4” Run-of-Crush	
	H	1a	0.5	1.6	SS/14	8-8-8		Grey Run-of-Crush LIMESTONE, trace BRICK (moist)	16
	O	1b	1.6	2.0				Red BRICK, trace Run-of-Crush LIMESTONE (moist)	
	L	2	2.0	4.0	SS/10	5-5-4-4		Reddish-yellow BRICK (moist)	9
								~ Unprepared Miscellaneous Fill ~	
5	L	3	4.0	6.0	SS/6	6-4-6-6		Red BRICK, little mf SAND (moist)	10
	O	4a	6.0	6.1	SS/12	5-5-3-3	6.1	Yellow BRICK, little mf SAND (moist, loose)	8
		4b	6.1	8.0				Brown cmf SAND and mf GRAVEL, some SILT (wet, loose)	
	W								
		5	8.0	10.0	SS/12	4-3-4-4		Similar Soil (wet, loose)	7
10		6	10.0	12.0	SS/10	6-5-4-4		Similar Soil (wet, loose)	9
	S								
	T	7	12.0	14.0	SS/10	6-4-3-4		Similar Soil (wet, loose)	7
	E								
		8	14.0	16.0	SS/10	5-4-2-2		Brown cmf SAND and SILT, little mf GRAVEL (wet, loose)	6
15	M								
		9a	16.0	17.0	SS/12	4-2-1-1	17.0	Similar Soil (wet, very loose)	3
		9b	17.0	18.0				Brown mf SAND, little SILT, trace mf GRAVEL (wet, very loose)	
		10	18.0	20.0	SS/12	2-1-2-3		Brown fine SAND, some SILT (wet, very loose)	3
	A								
		11	20.0	22.0	SS/20	5-5-5-5		Brown mf SAND, trace SILT (wet, very loose)	10
20	U								
		12a	22.0	23.5	SS/20	13-7-6-12		Similar Soil (wet, medium compact)	
	G	12b	23.5	24.0				Brown fine SAND (wet, medium compact)	13
		13a	24.0	24.2	SS/24	22-16-15-22		Grey cmf GRAVEL, some cmf SAND (moist, compact)	31
	E								
		13b	24.2	26.0				Brown fine SAND and SILT (moist, compact)	
	R								
25								Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade. **2.** Moved boring 4 feet South.

CME Associates, Inc. Report No.: 26054B-01-0807 BORING NO.: B-10 (2007) Page 2 of 2

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H						26.0	Continued from page 1	
		14	26.0	28.0	SS/18	16-19-19-21		Brown SILT and fine SAND (moist, hard)	38
	S								
		15	28.0	30.0	SS/24	10-12-12-15		Brown SILT and mf SAND (wet, very stiff)	24
	A								
30	XXX							Bottom of Boring @ 30.0'	
35									
40									
45									
50									

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

CME Associates, Inc. **BORING NO.: B-11 (2007)**

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: CAPG at Cornell University, Ithaca, NY **Report No.:** 26054B-01-0807
Client: Desman Associates **Date Started:** 08/07/07 **Finished:** 08/07/07
Location of Boring: See Boring Location Sketch **Elevation of Surface of Boring:** 805.6'

METHODS OF INVESTIGATION

Casing: 4-1/4" ID H. Stem Auger **Driller:** Al Linstruth
Casing Hammer: **Driller:** Tom McCarthy
Other: **Inspector:**
Soil Sampler: 2" OD Split Barrel **Rod Size:** AWJ
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: Diedrich D120 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
08/07/07	While drilling	None Noted	26.0'
08/07/07	Before casing removed	28.2'	28.0'
08/07/07	After casing removed	See Remark 1	
08/07/07	After casing removed		

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

c – coarse, m – medium, f – fine; **and** – 35 to 50 %, **some** – 20 to 35 %, **little** – 10 to 20 %, **trace** – 0 to 10 %

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	Classification of Material	SPT "N" or RQD
0	XXX						0.5	4" Asphalt, 2" Crushed Stone	
	H	1a	0.5	1.6	SS/12	7-9-6		Grey cmf SAND and cmf GRAVEL, some SILT, little ASPHALT (moist)	15
	O	1b	1.6	20.0				Brown SILT, some cmf SAND, some cmf GRAVEL (moist)	
	L							~ Unprepared Miscellaneous Fill ~	
		2	2.0	4.0	SS/12	6-6-6-5	4.0	Similar Soil (moist, stiff)	12
5	L	3	4.0	6.0	SS/6	5-5-4-4		Brown cmf SAND and cmf GRAVEL, some SILT (moist, loose)	9
	O	4	6.0	8.0	SS/3	3-3-3-4		Brown cmf SAND, trace SILT, trace fine GRAVEL (wet, loose)	6
	W						8.0		
		5	8.0	10.0	SS/20	3-2-3-3		Brown fine SAND and SILT (moist, loose)	5
10		6	10.0	12.0	SS/18	2-2-2-4		Brown fine SAND, some SILT (moist, loose)	4
	S								
	T	7	12.0	14.0	SS/22	4-6-8-11		Brown cmf SAND, little SILT (moist, medium compact)	14
	E								
		8	14.0	16.0	SS/0	11-11-9-9		Brown fine SAND and SILT (moist, medium compact)	20
15	M								
							16.0		
		9	16.0	18.0	SS/14	6-16-16-15		Brown SILT, some fine SAND (moist, hard)	32
		10	18.0	20.0	SS/22	7-9-8-10		Similar Soil (moist, very stiff)	17
	A								
20	U	11	20.0	22.0	SS/20	6-7-7-8		Brown SILT, little fine SAND (moist, stiff)	14
	G	12	22.0	24.0	SS/22	4-7-7-6		Similar Soil (moist, stiff)	14
	E	13a	24.0	25.0	SS/18	4-5-4-5		Brown SILT, trace fine SAND (moist, stiff)	
		13b	25.0	26.0				Similar Soil (saturated, stiff)	9
	R								
25								Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

CME Associates, Inc. **Report No.: 26054B-01-0807 BORING NO.: B-11 (2007)** Page 2 of 2

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H						26.0	Continued from page 1	
		14	26.0	28.0	SS/18	4-5-3-3		Brown fine SAND, trace SILT (saturated, loose)	8
	S								
		15	28.0	30.0	SS/20	2-3-2-3		Brown mf SAND, trace SILT (saturated, loose)	5
	A								
30	XXX							Bottom of Boring @ 30.0'	
35									
40									
45									
50									

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

CME Associates, Inc. **BORING NO.: B-1 (2003)** Page 1 of 3

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Milstein Hall at Cornell University, Ithaca, New York		**Report No.:** 25357B-01-0603	
Client: Barkow Leibinger Architekten		**Date Started:** 05/21/03	**Finished:** 05/21/03
Location of Boring: See Boring Location Sketch		**Elevation of Surface of Boring:** 807.01'	

METHODS OF INVESTIGATION

Casing:	3-1/4" ID H. Stem Auger	**Driller:**	Dave Lyons
Casing Hammer:		**Driller:**	Beau Fletcher
Other:		**Inspector:**	Candace Cean
Soil Sampler:	2" OD Split Barrel	**Rod Size:**	AWJ
Sampler Hammer: Wt.	140 lbs./Auto	**Fall:**	30 in.
Make & Model of Drill Rig:	CME 55 Truck Mounted		

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
05/21/03	While drilling	None Noted	28.5'
05/21/03	Before casing removed	None Noted	75.0'
05/21/03	After casing removed	None Noted	out
05/21/03	After casing removed	caved @ 45.4'	out

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

c – coarse, m – medium, f – fine; **and** – 35 to 50 %, **some** – 20 to 35 %, **little** – 10 to 20 %, **trace** – 0 to 10 %

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	Classification of Material	SPT "N" or RQD
0	XXX						0.2	2" Asphalt Pavement	
	H	1	0.5	2.0	SS/8	12-20-23		Grey Run-of-Crush GRAVEL (moist) ~ FILL ~	43
	O	2	2.0	4.0	SS/8	22-30-27-12	4.0	Grey cmf GRAVEL and cmf SAND (moist)	57
	L	3	4.0	6.0	SS/12	6-7-5-4		Grey SILT, little CLAY, trace cmf SAND, trace mf GRAVEL, trace ASPHALT/SLAG (moist)	12
5	L						6.0	~ MISCELLANEOUS FILL ~	
	O	4	6.0	8.0	SS/4	2-2-2-2		Brown cmf SAND and cmf GRAVEL, trace SILT (moist, loose)	4
	W								
		5	8.0	10.0	SS/8	2-2-1-2		Similar Soil (moist, very loose)	3
10		6	10.0	12.0	SS/4	2-3-4-7		Similar Soil (moist, loose)	7
	S								
		7	12.0	14.0	SS/6	8-10-12-17		Similar Soil (moist, medium compact)	22
	T						14.0		
	E	8	14.0	16.0	SS/16	11-11-10-11		Brown fine SAND, trace SILT (moist, medium compact)	21
15	M								
		9	16.0	18.0	SS/16	9-8-8-8		Brown mf SAND, little SILT (moist, medium compact)	16
		10	18.0	20.0	SS/18	6-8-9-11		Brown fine SAND, little SILT (moist, medium compact)	17
	A								
20									
	U								
	G								
		11	23.5	25.0	SS/18	4-6-5		Similar Soil (moist, medium compact)	11
	E								
25	R							Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
25	H							Continued from page 1	
	O						28.0		
	L	12	28.5	30.0	SS/18	5-6-5		Brown SILT, little fine SAND (wet, stiff)	11
	L								
30									
	O								
	W						33.0		
		13	33.5	35.0	SS/18	6-8-10		Grey SILT, some CLAY, trace cmf SAND (moist, very stiff)	18
35									
	S						38.0		
	T								
		14	38.5	40.0	SS/18	3-7-10		Grey SILT, trace CLAY, trace fine SAND (moist, very stiff)	17
	E								
40	M								
		15	43.5	45.0	SS/16	7-13-44		Similar Soil with trace mf GRAVEL (moist, hard)	57
	A								
45									
	U								
	G								
	E	16	48.5	50.0	SS/18	15-16-20		Grey SILT, little fine SAND (moist, hard)	36
	R								
50								Continued on page 3	

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
50	H							Continued from page 2	
	O								
	L	17	53.5	55.0	SS/18	9-7-10		Grey SILT, some CLAY, little cmf SAND, trace mf GRAVEL (moist, very stiff)	17
	L								
55									
	O								
	W								
		18	58.5	60.0	SS/10	10-18-20		Grey SILT, some cmf SAND, little CLAY, trace mf GRAVEL (moist, hard)	38
60									
	S								
	T								
		19	63.5	65.0	SS/12	14-14-24		Similar Soil (moist, hard)	38
	E								
65	M								
							68.0		
		20	68.5	70.0	SS/18	26-30-43		Grey fine SAND, trace SILT (moist, very compact)	73
	A								
70									
	U								
	G								
	E	21	73.5	75.0	SS/18	14-18-24		Similar Soil (moist, compact)	42
	R								
75	XXX							Bottom of Boring @ 75.0'	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

CME Associates, Inc. **BORING NO.: B-1 (2003)** Page 1 of 3

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Milstein Hall at Cornell University, Ithaca, New York **Report No.:** 25357B-01-0603
Client: Barkow Leibinger Architekten **Date Started:** 05/21/03 **Finished:** 05/21/03
Location of Boring: See Boring Location Sketch **Elevation of Surface of Boring:** 807.01'

METHODS OF INVESTIGATION

Casing: 3-1/4" ID H. Stem Auger **Driller:** Dave Lyons
Casing Hammer: **Driller:** Beau Fletcher
Other: **Inspector:** Candace Cean
Soil Sampler: 2" OD Split Barrel **Rod Size:** AWJ
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: CME 55 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
05/21/03	While drilling	None Noted	28.5'
05/21/03	Before casing removed	None Noted	75.0'
05/21/03	After casing removed	None Noted	out
05/21/03	After casing removed	caved @ 45.4'	out

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
0	XXX						0.2	2" Asphalt Pavement	
	H	1	0.5	2.0	SS/8	12-20-23		Grey Run-of-Crush GRAVEL (moist)	43
								~ FILL ~	
	O	2	2.0	4.0	SS/8	22-30-27-12		Grey cmf GRAVEL and cmf SAND (moist)	57
							4.0		
	L	3	4.0	6.0	SS/12	6-7-5-4		Grey SILT, little CLAY, trace cmf SAND, trace mf GRAVEL, trace ASPHALT/SLAG (moist)	12
5	L								
							6.0	~ MISCELLANEOUS FILL ~	
	O	4	6.0	8.0	SS/4	2-2-2-2		Brown cmf SAND and cmf GRAVEL, trace SILT (moist, loose)	4
	W								
		5	8.0	10.0	SS/8	2-2-1-2		Similar Soil (moist, very loose)	3
10		6	10.0	12.0	SS/4	2-3-4-7		Similar Soil (moist, loose)	7
	S								
		7	12.0	14.0	SS/6	8-10-12-17		Similar Soil (moist, medium compact)	22
	T								
							14.0		
	E	8	14.0	16.0	SS/16	11-11-10-11		Brown fine SAND, trace SILT (moist, medium compact)	21
15	M								
		9	16.0	18.0	SS/16	9-8-8-8		Brown mf SAND, little SILT (moist, medium compact)	16
		10	18.0	20.0	SS/18	6-8-9-11		Brown fine SAND, little SILT (moist, medium compact)	17
	A								
20									
	U								
	G								
		11	23.5	25.0	SS/18	4-6-5		Similar Soil (moist, medium compact)	11
	E								
25	R							Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
	O						28.0		
	L	12	28.5	30.0	SS/18	5-6-5		Brown SILT, little fine SAND (wet, stiff)	11
	L								
30									
	O								
	W						33.0		
		13	33.5	35.0	SS/18	6-8-10		Grey SILT, some CLAY, trace cmf SAND (moist, very stiff)	18
35									
	S						38.0		
	T								
		14	38.5	40.0	SS/18	3-7-10		Grey SILT, trace CLAY, trace fine SAND (moist, very stiff)	17
	E								
40	M								
		15	43.5	45.0	SS/16	7-13-44		Similar Soil with trace mf GRAVEL (moist, hard)	57
	A								
45									
	U								
	G								
	E	16	48.5	50.0	SS/18	15-16-20		Grey SILT, little fine SAND (moist, hard)	36
	R								
50								Continued on page 3	

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
50	H							Continued from page 2	
	O								
	L	17	53.5	55.0	SS/18	9-7-10		Grey SILT, some CLAY, little cmf SAND, trace mf GRAVEL (moist, very stiff)	17
	L								
55									
	O								
	W								
		18	58.5	60.0	SS/10	10-18-20		Grey SILT, some cmf SAND, little CLAY, trace mf GRAVEL (moist, hard)	38
60									
	S								
	T								
		19	63.5	65.0	SS/12	14-14-24		Similar Soil (moist, hard)	38
	E								
65	M								
							68.0		
		20	68.5	70.0	SS/18	26-30-43		Grey fine SAND, trace SILT (moist, very compact)	73
	A								
70									
	U								
	G								
	E	21	73.5	75.0	SS/18	14-18-24		Similar Soil (moist, compact)	42
	R								
75	XXX							Bottom of Boring @ 75.0'	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

SUBSURFACE EXPLORATION – TEST BORING LOG

Project:	Milstein Hall at Cornell University, Ithaca, New York	**Report No.:**	25357B-01-0603
Client:	Barkow Leibinger Architekten	**Date Started:**	05/21/03 **Finished:** 05/21/03
Location of Boring:	See Boring Location Sketch	**Elevation of Surface of Boring:**	809.7'

METHODS OF INVESTIGATION

Casing:	3-1/4" ID H. Stem Auger	**Driller:**	Dave Lyons
Casing Hammer:		**Driller:**	Beau Fletcher
Other:		**Inspector:**	Candace Cean
Soil Sampler:	2" OD Split Barrel	**Rod Size:**	AWJ
Sampler Hammer: Wt.	140 lbs./Auto	**Fall:**	30 in.
Make & Model of Drill Rig:	CME 55 Truck Mounted		

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
05/21/03	While drilling	None Noted	23.5'
05/21/03	Before casing removed	None Noted	47.0'
05/21/03	After casing removed	None Noted	out
05/21/03	After casing removed	caved @ 20.6'	out

LOG OF BORING SAMPLES | **CLASSIFICATION OF MATERIAL**

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine and – 35 to 50 % some – 20 to 35 % little – 10 to 20 % trace – 0 to 10 %	SPT "N" or RQD
			From	To					
0	XXX	1a	0.0	0.5	SS/10	2-3-6-13	0.5	Topsoil (moist)	
	H	1b	0.5	2.0				Brown SILT, little cmf SAND (moist)	9
	O	2	2.0	4.0	SS/14	7-5-10-10		Brown cmf SAND, some SILT, little mf GRAVEL, trace BRICK (moist)	15
	L						4.0	~ MISCELLANEOUS FILL ~	
		3	4.0	6.0	SS/12	11-9-13-8		Brown cmf GRAVEL and cmf SAND, trace SILT (moist, medium compact)	22
5	L								
	O	4	6.0	8.0	SS/8	7-7-14-21		Similar Soil (moist, medium compact)	21
	W								
		5	8.0	10.0	SS/10	12-14-18-28		Similar Soil (moist, compact)	32
10		6	10.0	12.0	SS/14	12-20-21-18		Similar Soil (moist, compact)	41
	S								
		7	12.0	14.0	SS/8	15-13-17-21		Similar Soil (moist, compact)	30
	T								
	E	8	14.0	16.0	SS/10	10-9-9-10		Similar Soil (moist, medium compact)	18
15	M								
		9	16.0	18.0	SS/6	10-8-6-7		Similar Soil (moist, medium compact)	14
							18.0		
		10	18.0	20.0	SS/18	4-3-3-4		Brown fine SAND, trace SILT (moist, loose)	6
	A								
20									
	U								
	G								
		11	23.5	25.0	SS/16	8-10-6		Similar Soil (wet, medium compact)	16
	E								
25	R							Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
	O						28.0		
	L	12	28.5	30.0	SS/18	3-3-6		Grey SILT and CLAY, trace cmf SAND (moist, stiff)	9
	L								
30									
	O								
	W								
		13	33.5	35.0	SS/18	6-12-23		Grey SILT, trace CLAY, trace fine SAND (moist, hard)	35
35	S								
	T								
	E								
		14	38.5	40.0	SS/18	20-21-17		Grey SILT, little fine SAND (moist, hard)	38
	M								
40									
	A	15a	43.5	44.5	SS/12	5-6-100@3"	44.5	Grey SILT, some CLAY, little mf GRAVEL, little cmf SAND (moist, stiff)	
	U	15b	44.5	45.0				Grey SHALE fragments (dry)	100+
45									
	G								
	E							*Auger Refusal @ 47.0'*	
		16	47.0	47.1	SS/0	100@1"		No Recovery	100+
	R							~ Probable Bedrock ~	
	XXX							Bottom of Boring @ 47.1'	
50									

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

CME Associates, Inc. **BORING NO.: B-7 (2003)** Page 1 of 2

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Milstein Hall at Cornell University, Ithaca, New York
Client: Barkow Leibinger Architekten
Location of Boring: See Boring Location Sketch
Report No.: 25357B-01-0603
Date Started: 05/19/03 **Finished:** 05/19/03
Elevation of Surface of Boring: 807.5'

METHODS OF INVESTIGATION

Casing: 3-1/4" ID H. Stem Auger **Driller:** Dave Lyons
Casing Hammer: **Driller:** Beau Fletcher
Other: NQ-Core Barrel **Inspector:** Candace Cean
Soil Sampler: 2" OD Split Barrel **Rod Size:** AWJ
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: CME 55 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
05/19/03	While drilling	24.3'	28.5'
05/19/03	Before casing removed	29.5'	42.6'
05/19/03	Before casing removed	Water added for coring	

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
0	XXX						0.3	4" Asphalt Pavement	
	H	1	0.5	2.0	SS/5	2-7-8		Brown cmf SAND and cmf GRAVEL, trace SILT, trace ASPHALT (moist)	15
	O	2	2.0	4.0	SS/7	7-8-5-9		Similar Material with trace BRICK (moist)	13
	L	3	4.0	6.0	SS/3	7-5-4-4		Similar Material (moist)	9
5	L							~ MISCELLANEOUS FILL ~	
	O	4	6.0	8.0	SS/2	5-6-8-10		Similar Material (wet)	14
	W	5a	8.0	8.5	SS/18	8-7-7-11		Similar Material (moist)	
							8.5		
		5b	8.5	10.0				Brown fine SAND, trace SILT (moist, medium compact)	14
10		6	10.0	12.0	SS/16	6-8-9-9		Brown fine SAND, little SILT (moist, medium compact)	17
	S								
		7	12.0	14.0	SS/18	9-10-12-10		Similar Soil (moist, medium compact)	22
	T								
	E	8	14.0	16.0	SS/16	4-4-5-5		Brown fine SAND, trace SILT (moist, loose)	9
15	M								
		9	16.0	18.0	SS/14	5-5-4-4		Similar Soil (moist, loose)	9
							18.0		
		10	18.0	20.0	SS/14	5-3-4-5		Brown SILT, some fine SAND (wet, medium stiff)	7
	A								
20									
	U								
	G								
		11	23.5	25.0	SS/14	2-2-2		Similar Soil (saturated, medium stiff)	4
	E								
25	R							Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

CME Associates, Inc. **Report No.: 25357B-01-0503 BORING NO.: B-7 (2003)** Page 2 of 2

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
	O								
	L						28.0		
	L								
	O	12	28.5	30.0	SS/12	2-2-3		Grey SILT, some CLAY, trace cmf SAND (saturated, medium stiff)	5
	W								
30									
		13a	33.5	34.0	SS/16	9-12-19	34.0	Similar Soil (saturated, hard)	
		13b	34.0	35.0				Grey SILT, trace fine SAND, trace CLAY (moist, hard)	31
35									
	S								
	T								
	E								
	M								
		14a	38.5	39.5	SS/10	5-10-100@2"	39.5	Similar Soil (moist, hard)	
		14b	39.5	39.7				Grey SHALE fragments (dry)	100+
40									
		15	42.6	42.6	SS/0	100@0"		No Recovery	100+
							42.6	*Auger Refusal @ 42.6'*	
		R1	42.6	47.6	C/60	NQ-Core		Grey, medium hard, weathered, thinly bedded SHALE BEDROCK Recovery: 60"/60" = 100% RQD: 38.5"/60" = 64% 12 Pieces, 1-1/2" Chips & Fragments	64%
	A								
	U								
45	G								
	E								
	R								
	XXX							Bottom of Boring @ 47.6'	
50									

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

CME Associates, Inc. **BORING NO.: B-8 (2003)** Page 1 of 3

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Milstein Hall at Cornell University, Ithaca, New York
Client: Barkow Leibinger Architekten
Location of Boring: See Boring Location Sketch

Report No.: 25357B-01-0603
Date Started: 05/19/03 **Finished:** 05/19/03
Elevation of Surface of Boring: 807.0'

METHODS OF INVESTIGATION

Casing: 3-1/4" ID H. Stem Auger **Driller:** Dave Lyons
Casing Hammer: **Driller:** Beau Fletcher
Other: **Inspector:** Candace Cean
Soil Sampler: 2" OD Split Barrel **Rod Size:** AWJ
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: CME 55 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
05/19/03	While drilling	27.7'	28.5'
05/19/03	Before casing removed	45.7'	57.4'
05/19/03	After casing removed	None Noted	out
05/19/03	After casing removed	caved @ 24.6'	out

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
0	XXX	1a	0.0	0.3	SS/8	2-5-9-7	0.3	Topsoil (moist)	
	H	1b	0.3	2.0				Brown cmf SAND and cmf GRAVEL, little SILT, trace BRICK, trace SLAG/CINDERS (moist)	14
	O								
		2	2.0	4.0	SS/10	4-4-3-3		Similar Material (moist)	7
	L								
		3	4.0	6.0	SS/10	5-4-4-3		Similar Material (moist) ~ MISCELLANEOUS FILL ~	8
5	L								
	O	4	6.0	8.0	SS/10	3-2-2-3		Similar Material (moist)	4
	W						8.0		
		5	8.0	10.0	SS/6	7-8-15-12		Brown cmf GRAVEL and cmf SAND, trace SILT (moist, medium compact)	23
10		6	10.0	12.0	SS/16	10-11-8-9		Brown cmf SAND, little cmf GRAVEL, trace SILT (moist, medium compact)	19
	S								
		7	12.0	14.0	SS/6	7-5-5-5		Similar Soil (moist, medium compact)	10
	T								
							14.0		
	E	8	14.0	16.0	SS/18	3-5-5-8		Brown fine SAND, some SILT (moist, medium compact)	10
15	M								
		9	16.0	18.0	SS/18	9-16-16-16		Brown fine SAND, little SILT (moist, compact)	32
		10	18.0	20.0	SS/20	7-10-11-12		Similar Soil (moist, medium compact)	21
	A								
20									
	U								
	G								
		11a	23.5	24.2	SS/18	5-5-5		Similar Soil (moist, medium compact)	10
	E	11b	24.2	25.0				Brown/Grey mf SAND (moist to wet, medium compact)	
25	R							Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core
Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
	O								
							28.0		
	L	12a	28.5	29.5	SS/18	5-5-3		Brown SILT, some fine SAND (saturated, stiff)	8
		12b	29.5	30.0				Brown SILT, little CLAY, trace cmf SAND (saturated, stiff)	
	L								
30									
	O								
	W								
		13	33.5	35.0	SS/16	2-3-3		Grey Similar Soil (wet to moist, medium stiff)	6
35									
	S								
	T						39.0		
		14	38.5	40.0	SS/14	5-10-10		Grey SILT, trace fine SAND, trace CLAY (moist, very stiff)	20
	E								
40	M								
		15	43.5	45.0	SS/16	15-20-25		Similar Soil (moist, hard)	45
	A								
45									
	U								
	G								
	E	16	48.5	50.0	SS/18	8-5-5		Grey SILT, some CLAY, trace cmf SAND (moist, stiff)	10
	R								
50								Continued on page 3	

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – **coarse** **m** – **medium** **f** – **fine** **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
50	H							Continued from page 2	
		17a	53.5	53.8	SS/5	100@5"	53.8	Similar Soil (moist, hard)	
		17b	53.8	53.9				Grey SHALE fragments (saturated)	100+
	S								
55									
								Auger Refusal @ 57.4'	
		18	57.4	57.5	SS/0.5	100@1"		Grey SHALE fragments (wet)	100+
	A							~ Probable Bedrock ~	
	XXX							Bottom of Boring @ 57.5	
60									
65									
70									
75									

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Milstein Hall at Cornell University, Ithaca, New York
Report No.: 25357B-01-0603
Client: Barkow Leibinger Architekten
Date Started: 05/19/03 **Finished:** 05/20/03
Location of Boring: See Boring Location Sketch
Elevation of Surface of Boring: 807.8'

METHODS OF INVESTIGATION

Casing: 3-1/4" ID H. Stem Auger **Driller:** Dave Lyons
Casing Hammer: **Driller:** Beau Fletcher
Other: **Inspector:** Candace Cean
Soil Sampler: 2" OD Split Barrel **Rod Size:** AWJ
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: CME 55 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
05/20/03	While drilling	18.5'	18.0'
05/20/03	Before casing removed	None Noted	37.6'
05/20/03	After casing removed	None Noted	out
05/20/03	After casing removed	caved @ 16.4'	out

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine and – 35 to 50 % some – 20 to 35 % little – 10 to 20 % trace – 0 to 10 %	SPT "N" or RQD
			From	To					
0	XXX						0.3	3" Asphalt Pavement	
	H	1	0.5	2.0	SS/12	5-7-4		Brown cmf SAND, some cmf GRAVEL, trace SILT, trace BRICK, trace ASPHALT (moist)	11
	O								
		2	2.0	4.0	SS/4	6-9-8-6		Similar Material (moist)	17
	L							~ MISCELLANEOUS FILL ~	
		3	4.0	6.0	SS/8	7-7-5-4		Similar Material (moist)	12
5	L								
							6.0		
	O	4	6.0	8.0	SS/10	4-4-1-2		Brown fine SAND, some SILT (wet, loose)	5
	W								
		5	8.0	10.0	SS/16	2-2-2-2		Brown fine SAND, trace SILT (moist, loose)	4
10		6	10.0	12.0	SS/18	2-2-2-2		Similar Soil (moist, loose)	4
	S						12.0		
		7	12.0	14.0	SS/22	2-2-3-2		Brown SILT, little fine SAND (moist, medium stiff)	5
	T						14.0		
	E	8	14.0	16.0	SS/22	3-3-2-3		Brown fine SAND, trace SILT (moist, loose)	5
15	M								
		9	16.0	18.0	SS/22	2-1-1-2		Brown fine SAND, some SILT (saturated, very loose)	2
		10a	18.0	19.5	SS/22	3-5-3-3	19.5	Similar Soil (saturated, loose)	
		10b	19.5	20.0				Brown CLAY, little SILT, trace fine SAND (moist, stiff)	8
	A								
20									
	U								
	G								
		11	23.5	25.0	SS/16	4-7-10		Grey SILT, little CLAY, little mf GRAVEL, trace cmf SAND (moist, very stiff)	17
	E								
25	R							Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

CME Associates, Inc. Report No.: 25357B-01-0503 BORING NO.: B-9 (2003) Page 2 of 2

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
25	H O L L O W							Continued from page 1	
		12	28.5	30.0	SS/18	5-10-9		Grey SILT, trace CLAY (moist, very stiff)	19
30									
	S T E M	13a	33.5	34.5	SS/16	7-7-100@4"	34.5	Brown SILT, little CLAY, trace cmf SAND (moist, very stiff)	
		13b	34.5	34.8				Grey weathered SHALE fragments (moist)	100+
35	A U G E R XXX								
		14	37.6	37.7	SS/0.5"	100@1"		*Auger Refusal @ 37.6'* Grey SHALE fragments (dry) ~ Probable Bedrock ~	100+
								Bottom of Boring @ 37.7'	
40									
45									
50									

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

B96-1 Ground Surface Elev.=810

DEPTH	SAMPLE	N	% MOISTURE	COLOR	DESCRIPTION
2	1	56	damp	brn	3 ft. of TOPSOIL (f-m) SAND w/silt & gravel
4	2	19	14.7	brn	SILT w/sand, gravel, brick, ash [Fill to 4']
6	3	15	6	brn	(4.0) well-graded GRAVEL w/silt & sand
8	4	12	No Recovery		
10	5	21	8.7	brn	well-graded GRAVEL w/ well-graded sand & silt, (piece of metal found)
12	6	90	4.9	brn	well-graded GRAVEL w/(f-m) sand, trace silt [Frequent Cobbles @ 12']
14	7	42	3.5	brn	
16	8	17	3.7	brn	(16.0)
18	9	10	5.2	brn	well-graded SAND, trace silt
20	10	14	11.1	brn	(f-m) SAND, trace silt
22	11	10	21.7	brn	well-graded to (f) sandy SILT w/clay varves
24	12	6	8.4	brn	well-graded SAND w/silt
26	13	3	28.1	brn	well-graded SAND w/silt & clay varves [Saturated @ 25']
28	14	6	27.3	brn	
30	15	8	24.0	gry	(29.0) lean to fat CLAY w/sand lenses
32	16	7	25.8	gry	lean to fat CLAY
34	17	7	21.8	gry	lean to fat CLAY w/ (f) embedded gravel
36	18	42	15.6	gry	varved lean CLAY & (f) sandy silt (35.0)
38	19	50	15.0	gry	
40	20	36	17.4	gry	
42	21	38	14.8	gry	
44	22	38	15.4	gry	
46	23	45	17.1	gry	lean CLAY w/(f) embedded gravel (traces)
48	24	60	14.1	gry	lean CLAY w/(f-c) embedded gravel
	25	50/3	dry	gry	
50	26	50/2	7.6	gry	Rock flour (50.5)
52 54	R1	Rec=95% RQD=18%			grey SHALE • thick bedded • soft • close jointing • highly weathered

Boring terminated at 55.5 ft.

Boring Log obtained from report by Gary L. Wood, P.E, dated November 22, 1996, entitled University Avenue Rehabilitation.

GENERAL INFORMATION & KEY TO TEST BORING LOGS

The **Subsurface Exploration - Test Boring Logs produced by CME Associates, Inc.** present the observations and mechanical data collected by the driller while at the site, supplemented, at times, by classification of the materials removed from the borings as determined through visual identification by technicians in the laboratory. It is cautioned that the materials removed from the borings represent only a fraction of the total volume of the deposits at the site and may not necessarily be representative of the subsurface conditions between adjacent borings or between the sampled intervals. The data presented on the Exploration Logs together with the recovered samples will provide a basis for evaluating the character of the subsurface conditions relative to the proposed construction. The evaluation must consider all the recorded details and their significance relative to each other. Often, analyses of standard boring data indicate the need for additional testing and sampling procedures to more accurately evaluate the subsurface conditions. Any evaluations of the contents of CME's report and the recovered samples must be performed by Licensed Professionals having experience in Soil Mechanics and Foundation Engineering. The information presented in this Key defines some of the procedures and terms used on the CME Exploration Logs to describe the conditions encountered. Refer to the Log on page 3 for key number.

Key No.	Description
1.	The figures in the **DEPTH SCALE** column define the vertical scale of the Boring Log.
2.	**CASING BLOWS/FOOT** - shows the number of blows required to advance the casing a distance of 12 inches. The casing size, the hammer weight and the length of drop are noted under the **Methods of Investigation**. If the casing is advanced by means other than driving, the method of advancement will be indicated under **Methods of Investigation** at the top of the Log. If Hollow Stem Augers or Coring is used, it will be so noted in this column.
3.	The **SAMPLE I.D.** is used for identification on the sample containers and in the Laboratory Test Report or Summary.
4.	The **DEPTH OF SAMPLE** column gives the exact depth range from which a sample was recovered.
5.	The **SAMPLE TYPE/RECOVERY** column is used to signify the various type of sample attempt. "SS" is Split Spoon, "P" is piston tube, "U" is Undisturbed tube. For soil samples, the recovered length of the sample is also indicated, in inches. If a rock core sample is taken, the core bit size designation is given here.
6.	**BLOWS ON SAMPLER** - shows the results of the "Standard Penetration Test (SPT) ASTM D1586", recording the number of blows required to drive a split spoon sampler into the soil beneath the casing. The number of blows required for each six inches of penetration is recorded. The total number of blows required for the 6 inch to 18 inch interval is summarized in the **SPT "N"** column and represents the "Standard Penetration Number". The outside diameter of the sampler, the hammer weight and the length of drop are noted in the **Methods of Investigation** portion of the log. A "WH" or "WR" in this column indicates that the sample spoon advanced the 6 inch interval under Weight of Hammer or Weight of Rods, respectively.
7.	The **DEPTH OF CHANGE** column designates the depth (in feet) that the driller noted a compactness or stratum change. In soft materials or soil strata exhibiting a consistent relative density, it is difficult for the driller to determine the exact change from one stratum to the next. In addition, a grading or gradual change may exist. In such cases the depth noted is approximate or estimated only and may be represented by a dashed line.
8.	**CLASSIFICATION OF MATERIAL** - **Soil materials** encountered and sampled are described by the driller on the original log. Notes of driller observations are also placed in this column. Recovered samples may also be visually classified by a Soil Technician upon receipt in the Laboratory. Visual sample classification is by Burmister System and strata may be classified additionally by the Unified System. The Burmister System is a type of visual-manual textural classification estimated by the Driller or Technician on the basis of weight-fraction of the recovered soil. See Table 1 **"Classification of Materials"**. The description of the relative soil compactness or consistency is based upon the standard penetration number as defined in Table 2. The description of the soil moisture condition is described as dry, moist, wet, or saturated. Water used to advance the boring may have affected the in-situ moisture content of the sample. Special terms are used as required to describe materials in greater detail, such terms are listed in ASTM D653. When sampling gravelly soils with a standard two-inch O.D. Split Spoon, the true percentage of gravel is often not recovered due to the relatively small sampler diameter. The presence of boulders, cobbles, and large gravel is sometimes, but not necessarily, detected by an evaluation of the casing and sampler blows or through the "action" of the drill rig as reported by the driller.

8. **CLASSIFICATION OF MATERIAL** (continued)
The Description of **Rock** is based upon the recovered rock core. Terms frequently used in the description are included in Table 3. The length of core run is defined as length of penetration between retreivals of the corebarrel from the bore hole, expressed in inches. The core recovery expresses the length of core recovered from the core barrel per core run, in percent. The size core barrel used is noted in **Column 5**. The more commonly used sizes of core barrels are denoted "AX" and "NX". An "NX" core, being larger in diameter than "AX" core, often produces better recovery, and is frequently utilized where accurate information regarding the geologic conditions and engineering properties is needed. A better estimate of in-situ rock quality is provided by a *modified core recovery ratio* known as the **"Rock Quality Designation" (RQD)**. This ratio is determined by considering only pieces of core that are at least 4 inches long and are hard and sound. Breaks obviously caused by drilling are ignored. The diameter of the core should preferably be not less than 2 inches (NX). The percentage ratio between the total length of such core recovered and the length of core drilled on a given run is the RQD. Table 4 gives the rock quality description as related to the **RQD**.

9. The **SPT "N"** or **RQD** is given in this column as applicable to the specific sample taken. In Very Compact coarse grained soils the N-value may be indicated as 50+, and in Hard fine-grained soils the N-value may be indicated as 30+. This typically means that the blow count was achieved prior to driving the sampler the entire 6 inch interval or the sampler refused further penetration. For "NX" rock cores, the RQD is reported here, expressed in percent.

10. **GROUND WATER OBSERVATIONS** and timing noted by the driller are shown in this section. It is important to realize that the reliability of the water level observations depend upon the soil type (water does not readily stabilize in a hole through fine grained soils), and that drill water used to advance the borings may have influenced the observations. Ground water levels typically fluctuate seasonally so those noted on the log are only representative of that exhibited during the period of time noted on the log. One or more perched or trapped water levels may exist in the ground seasonally. All the available readings should be evaluated. If definite conclusions cannot be made, it is often prudent to examine the conditions more thoroughly through test pit excavations or ground water observation well installations.

TABLE 1 - VISUAL CLASSIFICATION OF MATERIALS (BURMISTER)

GROUP	**TEXTURAL CLASSIFICATION SIZES**
BOULDERS	larger than 12" diameter
COBBLES	12" diameter to 3" sieve
GRAVEL	3" - coarse - 1" - medium - 1/2" - fine - #4 sieve
SAND	#4 - coarse - #10 - medium - #40 - fine - #200 sieve
SILT	#200 sieve (0.074mm) to 0.005mm size (see below *)
CLAY	0.005mm size to 0.001mm size (see below *)

ABBREVIATIONS	**PERCENT OF TOTAL SAMPLE BY WEIGHT**	
f - fine	and	35 to 50%
m - medium	some	20 to 35%
c - coarse	little	10 to 20%
	trace	0 to 10%

***PLASTICITY DESCRIPTIONS**

TERM	**PLASTICITY INDEX**	**DRY STRENGTH**	**FIELD TEST**
Non-plastic	0 - 3	Very low	falls apart easily
Slightly plastic	4 - 15	Slight	easily crushed by fingers
Plastic	15 - 30	Medium	difficult to crush
Highly plastic	31 or more	High	impossible to crush with fingers

TABLE 2 - DESCRIPTION OF SOIL COMPACTNESS OR CONSISTENCY based on SPT "N"*

Primary Soil Type	**Descriptive Term of Compactness**	**Range of Standard Penetration Resistance (N)**
COARSE GRAINED SOILS	Very loose	less than 4 blows per foot
(More than half of Material is larger than No. 200 sieve size.)	Loose	4 to 10
	Medium compact	10 to 30
	Compact	30 to 50
	Very compact	Greater than 50
FINE GRAINED SOILS	**Descriptive Term of Consistency**	**Range of Standard Penetration Resistance (N)**
(More than half of material is smaller than No. 200 sieve size.)	Very soft	less than 2 blows per foot
	Soft	2 to 4
	Medium stiff	4 to 8
	Stiff	8 to 15
	Very stiff	15 to 30
	Hard	Greater than 30

*The number of blows of 140 pound weight falling 30 inches to drive 2 inch O.D., 1-3/8 inch I.D. sampler 12 inches is defined as the Standard Penetration Resistance designated "N".

TABLE 3 - ROCK CLASSIFICATION TERMS

Rock Classification Terms		**Field Test or Meaning of Term**
Hardness	Soft	Scratched by fingernail
	Medium Hard	Scratched easily by penknife
	Hard	Scratched with difficulty by penknife
	Very Hard	Cannot be scratched by penknife
Weathering	Very Weathered Weathered Sound	Judged from the relative amounts of disintegration, iron staining, core recovery, clay seams, etc.
Bedding (Natural Breaks in Rock Layers)	Laminated Thinly bedded Bedded Thickly bedded Massive	less than 1 inch 1 inch to 4 inches 4 inches to 12 inches 12 inches to 36 inches greater than 36 inches

TABLE 4 **Relation of Rock Quality Designation (RQD) and in-situ Rock Quality**	
RQD (%)	**Rock Quality Term Used**
90 to 100	Excellent
75 to 90	Good
50 to 75	Fair
25 to 50	Poor
0 to 25	Very Poor

BORING NO.: B-1 **Page 1 of 1**

SUBSURFACE EXPLORATION - TEST BORING LOG

Project: **Report No.:**
Client: **Date Started:** **Finished:**
Location of Boring: **Elevation of Surface of Boring:**

METHODS OF INVESTIGATION

Casing: 3-1/4" I.D. Hollow Stem Auger **Hammer:**
Other:
Soil Sampler: 2" O.D. Split Barrel **Rod Size:**
Sampler Hammer: Wt. 140 lbs. **Fall:** 30 in.
Make & Model of Drill Rig:

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
	While drilling		
	Before casing removed		
	After casing removed		

LOG OF BORING SAMPLES **CLASSIFICATION OF MATERIAL**

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	To	Sample Type/ Recovery (inches)	Blows on Sampler Per 6 inches	Depth of Change (feet)	f - fine m - medium c - coarse **and** - 35 to 50% **some** - 20 to 35% **little** - 10 to 20% **trace** - 0 to 10%	STP "N" or RQD
1	2	3	4	4	5	6	7	8	9

Denotes Key Number (see page 1) ——

Subsurface Exploration Report
Central Avenue Parking Garage at Cornell University
Ithaca, New York
CME Report No.: 26054B-01-0807

APPENDIX - C

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CME Associates, Inc.

P.O. Box 1824
8560 Brewerton Road
Cicero, New York 13039
(315) 698-9315
(315) 698-9319 (Fax)

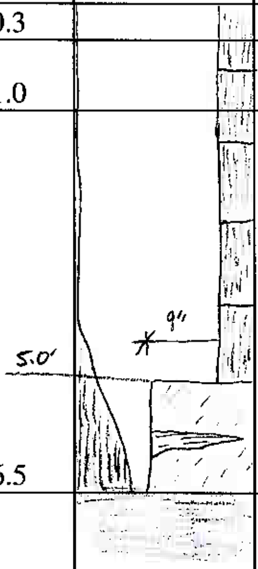
www.cmeassociates.com

TEST PIT LOG

Project:	CAPG at Cornell University, Ithaca, NY	**Report No.:**	26054B-01-0807
		Location of Test Pit:	See Boring Location Sketch
Client:	Desman Associates	**Ground Elevation:**	807.1'
		Date	**Start:** 08/28/07 **Finish:** 08/28/07
Test Pit No. TP-J	Sheet 1 of 1	**Representative:**	A. Navaratnam, I.E.

Ground Water Observations

Date	Time	Depth
08/28/07	11:55 am	None Noted

DEPTH (Feet)	SAMPLE NUMBER	DEPTH OF SAMPLE		DEPTH OF CHANGE (FEET)	NOTES OR PIT PROFILE	CLASSIFICATION OF MATERIAL
		FROM (FEET)	TO (FEET)			f - FINE and 35-50% m - MEDIUM some 20-35% c - COARSE little 10-20% trace 0-10%
0				0.3		Black Mulch and Topsoil (wet)
				1.0		Grey SILT, little mf SAND (moist) ~ Fill ~
5				6.5		Brown cmf SAND, some cmf GRAVEL, little SILT, trace BRICK, trace CONCRETE, trace ROCK (moist) ~ Miscellaneous Fill ~
	1	6.5	7.0			Brown cmf GRAVEL and cmf SAND, little SILT (wet) *See Remark 2*
10						Bottom of Test Pit @ 7.3'

REMARKS:

1. Test Pit excavated and backfilled by others using a JCB Model 215S rubber tire mounted backhoe, equipped with a 24" general purpose bucket.
2. Probe penetration at bottom of Test Pit ranged from 4 to 8 inches, when probed using a ⅜" diameter steel probe with approximately 75 pounds down force applied.

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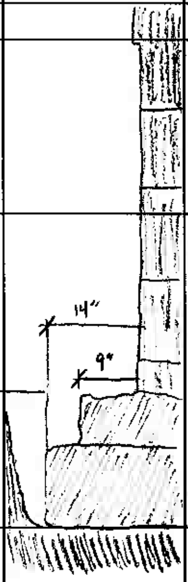
TEST PIT LOG

Project: CAPG at Cornell University, Ithaca, NY		**Report No.:**	26054B-01-0807
		Location of Test Pit:	See Boring Location Sketch
Client: Desman Associates		**Ground Elevation:**	807.5'
		Date	**Start:** 08/28/07 **Finish:** 08/28/07
Test Pit No. TP-K	Sheet 1 of 1	**Representative:**	A. Navaratnam, I.E.

Ground Water Observations

Date	**Time**	**Depth**
08/28/07	2:55 pm	None Noted

DEPTH (Feet)	SAMPLE NUMBER	DEPTH OF SAMPLE FROM (FEET)	DEPTH OF SAMPLE TO (FEET)	DEPTH OF CHANGE (FEET)	NOTES OR PIT PROFILE	CLASSIFICATION OF MATERIAL f - FINE and 35-50% m - MEDIUM some 20-35% c - COARSE little 10-20% trace 0-10%
0				0.3		Topsoil and Mulch (wet)
				2.5		Grey SILT, some GRAVEL, little cmf SAND (moist) ~ Fill ~
5				7.4		Brown cmf GRAVEL and cmf SAND, little SILT, trace COBBLE, trace ROCK ~ Fill ~ *See Remark 2*
						Light Brown cmf GRAVEL and cmf SAND, trace SILT (moist)
10						Bottom of Boring @ 7.6'

REMARKS:

1. Test Pit excavated and backfilled by others using a JCB Model 215S rubber tire mounted backhoe, equipped with a 24" general purpose bucket.
2. Electric conduit noted at 33" below existing grade and broke during excavation. This was immediately informed to Mr. Chuck Porter of Cornell University. Mr. Porter requested CME to leave the hole open to facilitate necessary repair. The hole was left open with bottom at 3.5 feet and was fenced with caution tape.

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Associates, Inc.

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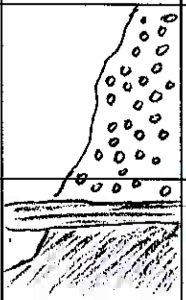
TEST PIT LOG

Project:	CAPG at Cornell University, Ithaca, NY	**Report No.:**	26054B-01-0807
		Location of Test Pit:	See Boring Location Sketch
Client:	Desman Associates	**Ground Elevation:**	807.8'
		Date	**Start:** 08/28/07 **Finish:** 08/28/07
Test Pit No. TP-L	Sheet 1 of 1	**Representative:**	A. Navaratnam, I.E.

Ground Water Observations

Date	**Time**	**Depth**
08/28/07	3:23 pm	None Noted

DEPTH (Feet)	SAMPLE NUMBER	DEPTH OF SAMPLE FROM (FEET)	DEPTH OF SAMPLE TO (FEET)	DEPTH OF CHANGE (FEET)	NOTES OR PIT PROFILE	CLASSIFICATION OF MATERIAL f - FINE and 35-50% m - MEDIUM some 20-35% c - COARSE little 10-20% trace 0-10%
0						Clean Gravel
				2.0		Brown SILT, little cmf SAND, little cmf GRAVEL (moist) ~ Fill ~ *See Remark 2*
						Bottom of Test Pit @ 3.0'
5						
10						

REMARKS:

1. Test Pit excavated and backfilled by others using a JCB Model 215S rubber tire mounted backhoe, equipped with a 24" general purpose bucket.
2. Test Pit terminated at 3 feet below grade, because a storm drain pipe was noted at about 2.5 feet below existing grade and runs parallel to the Sibley Hall North wall.

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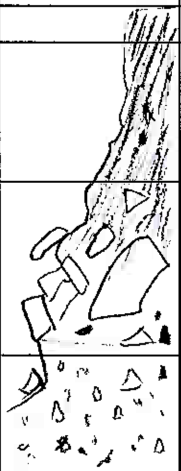
TEST PIT LOG

Project:	CAPG at Cornell University, Ithaca, NY	**Report No.:**	26054B-01-0807
		Location of Test Pit:	See Boring Location Sketch
Client:	Desman Associates	**Ground Elevation:**	805.7'
		Date	**Start:** 08/28/07 **Finish:** 08/28/07
Test Pit No.	TP-M Sheet 1 of 1	**Representative:**	A. Navaratnam, I.E.

Ground Water Observations

Date	Time	Depth
08/28/07	1:50 pm	None Noted

DEPTH (Feet)	SAMPLE NUMBER	DEPTH OF SAMPLE FROM (FEET)	DEPTH OF SAMPLE TO (FEET)	DEPTH OF CHANGE (FEET)	NOTES OR PIT PROFILE	CLASSIFICATION OF MATERIAL f - FINE and 35-50% m - MEDIUM some 20-35% c - COARSE little 10-20% trace 0-10%
0				0.4		Topsoil (moist)
				2.0		Brown SILT, some cmf SAND, little cmf GRAVEL, Trace COBBLES, trace BRICK, trace ROCK (moist) ~ Miscellaneous Fill ~
				4.0		BRICKS, some CONCRETE, little ROCK SLABS, little SILT, trace COBBLE, trace cmf GRAVEL, trace SAND (dry)
5	1	5.0	6.0			Brown cmf GRAVEL and cmf SAND, little SILT (moist)
						Bottom of Test Pit @ 6.0'
10						

REMARKS:

1. Test Pit excavated and backfilled by others using a JCB Model 215S rubber tire mounted backhoe, equipped with a 24" general purpose bucket.

Photo 1: Test Pit TP-J

Photo 2: Test Pit TP-J

Photo 3: Test Pit TP-J

Photo 4: Test Pit TP-J

Photo 5: Test Pit TP-J

Photo 6: Test Pit TP-J

Photo 7: Test Pit TP-K

Photo 8: Test Pit TP-K

Photo 9: Test Pit TP-K

Photo 10: Test Pit TP-L

Photo 11: Test Pit TP-M

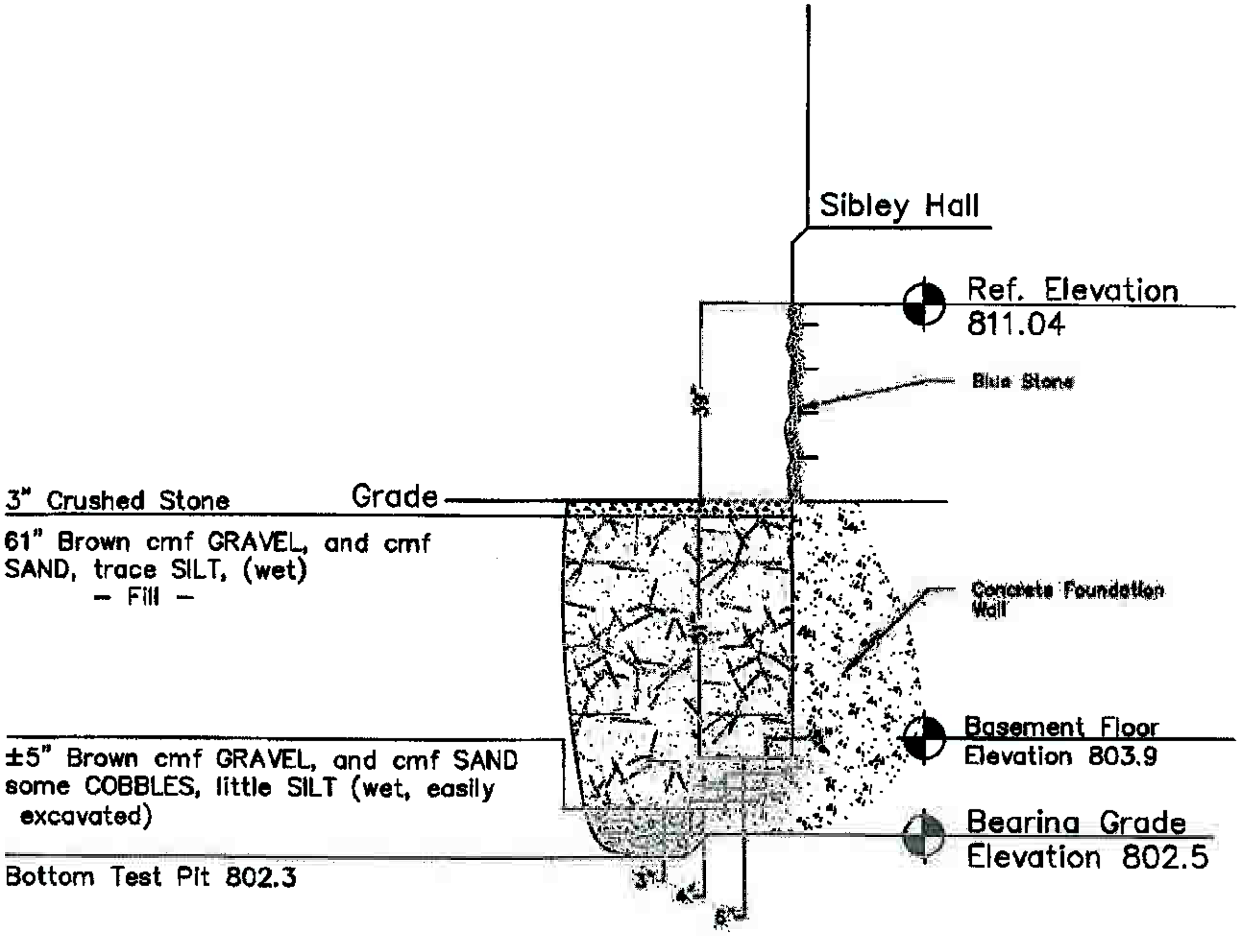
Photo 12: Test Pit TP-M

Photo 13: Test Pit TP-M

Photo 14: Test Pit TP-M

Notes:

1) Existing Surface Condition: Crushed Stone.
2) Excavated with Yanmar V035 mini-excavator with 24" GP bucket.
3) No groundwater observed.
4) Soil conditions encountered and shown below represent the area of backfill from previous construction. Soil conditions further away from the structure may vary.
5) Test Pits excavated by crew from Cornell University Physical Plant.



Test Pit "A" Profile

CME Report No.: 26000B-01-0307

Exploration observed by CME Associates, Inc.: during the period from 03-13-07 to 03-14-07.

SHEET NO.
TP-A

03-15-07
26000
jpw

Test Pit Profile Sketch
Milstein Hall Cornell University
University Avenue
Ithaca, Tompkins Co., New York

CME Associates, Inc.
Construction Materials Evaluation
P.O.Box 1824
Cicero, New York 13039-1824
[315] 699-0315 FAX: [315] 699-0319

Test Pit – A

Test Pit – A

Test Pit –B

Test Pit – B

Test Pit – C

Test Pit – C

Test Pit – D

Test Pit – D

Test Pit – E

Test Pit – F

CME Associates, Inc.

Subsurface Exploration Report
Central Avenue Parking Garage at Cornell University
Ithaca, New York
CME Report No.: 26054B-01-0807

APPENDIX - D

CME Associates, Inc.

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LABORATORY TEST SUMMARY
Central Avenue Parking Garage at Cornell University, Ithaca, NY
CME Report No.: 26054B-01-0807
August 21, 2007

CME Representatives obtained soil samples from Test Borings advanced as part of the Subsurface Exploration Program conducted for the subject project. Selected samples were delivered to CME's Cicero facility, an AASTHO AMRL[1] accredited laboratory for various laboratory testing. The results are presented below:

Sample ID Notations: B - Test Boring, S - Sample

I. Natural Moisture Content (ASTM D2216)

Sample ID	Natural Moisture Content (%)	Sample ID	Natural Moisture Content (%)	Sample ID	Natural Moisture Content (%)
B-2, S-1a	11.5	B-2, S-12	4.7	B-3, S-15	25.8
B-2, S-1b	4.3	B-2, S-13	2.5	B-4, S-6	3.2
B-2, S-2	5.8	B-2, S-14	4.3	B-4, S-8	10.2
B-2, S-3	9.4	B-2, S-15	5.1	B-4, S-11b	15.3
B-2, S-4	9.8	B-2, S-16a	18.2	B-4, S-14	24.1
B-2, S-5	5.3	B-2, S-16b	23.4	B-4, S-17	19.3
B-2, S-6	2.4	B-2, S-17	17.4	B-5, S-13	22.2
B-2, S-7	4.1	B-2, S-18	16.7	B-5, S-15	21.7
B-2, S-8	4.6	B-2, S-19	19.2	B-5, S-17	21.0
B-2, S-9	3.7	B-2, S-20a	18.6	B-8, S-15b	21.7
B-2, S-10	4.4	B-2, S-20b	21.2	B-9, S-4	7.5
B-2, S-11	5.3	B-2, S-21	21.3		

II. Atterberg Limits & USCS[2] Group Symbol (ASTM D4318 & D2487)

Sample ID	Liquid Limit	Plastic Limit	Plasticity Index	Natural Moisture Content (%)	USCS Group
B-5, S-13	32	17	15	22.2	CL-Lean clay
B-5, S-15	28	16	12	21.7	CL-Lean clay
B-5, S-17	30	16	14	21.0	CL-Lean clay
B-8, S-15b	30	18	12	21.7	CL-Lean clay

---

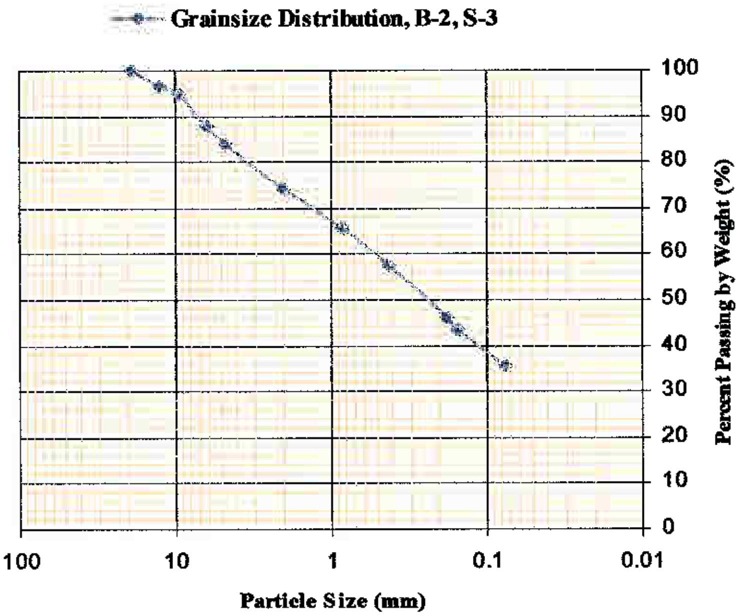
[1] **AMRL** – American Association of State Highway & Transportation Officials (AASHTO) Materials Reference Laboratory. AMRL is a Federal Agency having jurisdiction to assess laboratory competence according to the standards of the United States. **CME** Cicero accreditation includes tests of Portland Cement Concrete, Aggregate and Soil Materials. www.amrl.net

[2] USCS - Unified Soil Classification System

III. Mechanical Analysis (ASTM C136 & C117, D422)

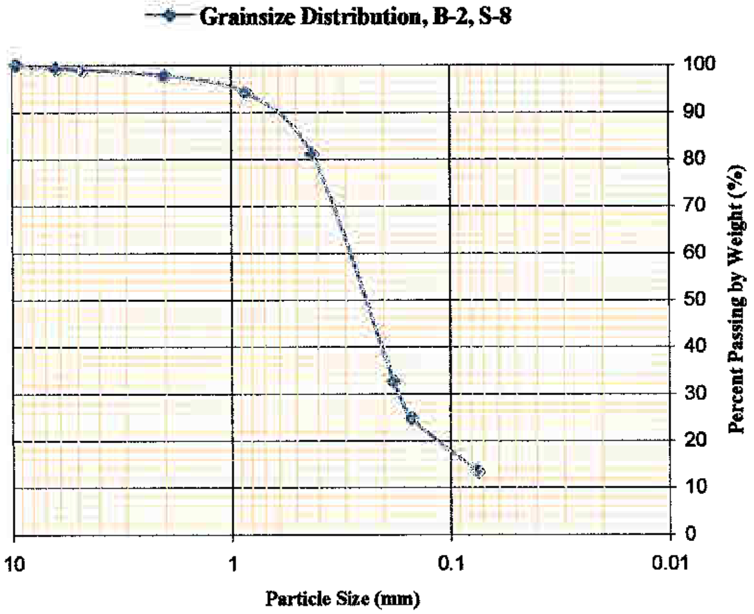
Sample ID: B-2, S-3

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
3/4"	19.0	100
1/2"	12.5	97
3/8"	9.50	95
1/4"	6.25	88
No.4	4.75	84
No.10	2.00	74
No.20	0.850	66
No.40	0.425	58
No.80	0.180	46
No.100	0.150	43
No.200	0.075	36



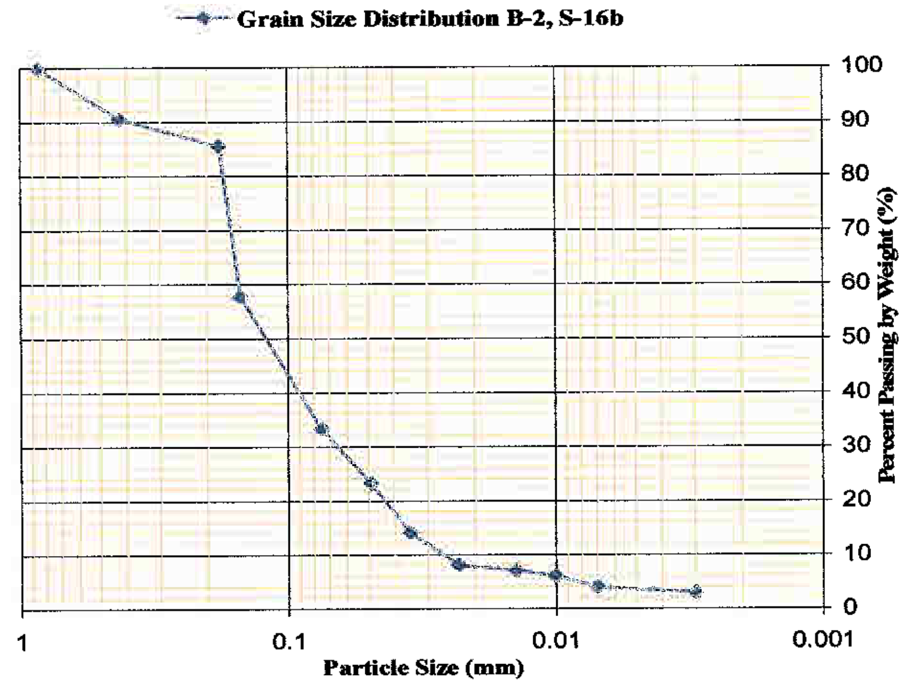
Sample ID: B-2, S-8

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
3/8"	9.50	100
1/4"	6.25	99
No.4	4.75	99
No.10	2.00	98
No.20	0.850	94
No.40	0.425	81
No.80	0.180	32
No.100	0.150	25
No.200	0.075	13



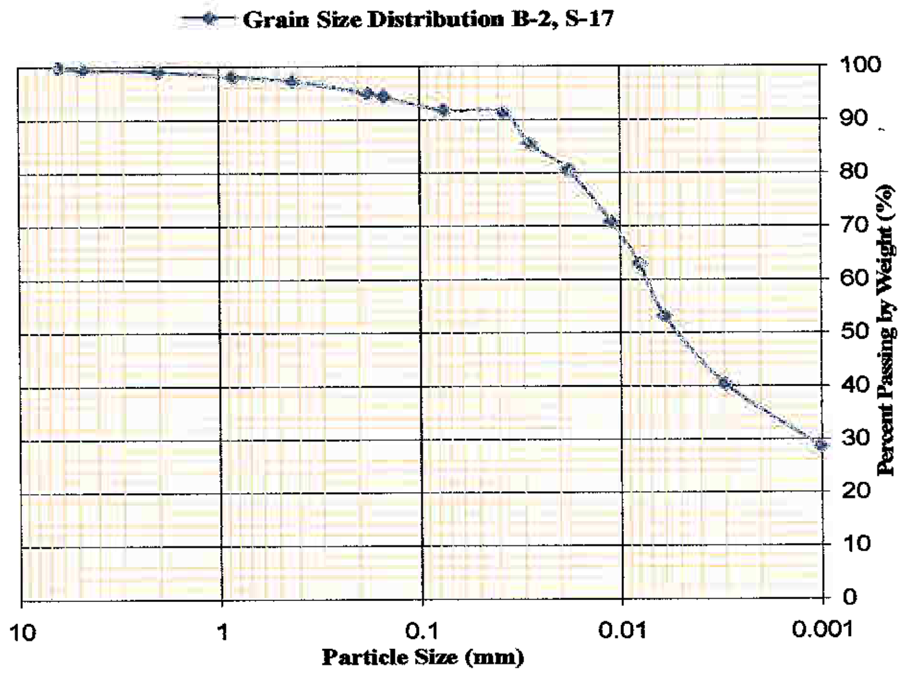
Sample ID: B-2, S-16b

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
No.20	0.850	-
No.40	0.425	100
No.80	0.180	90
No.100	0.150	86
No.200	0.075	58
Hydrometer	0.049	33
	0.035	23
	0.023	14
	0.014	8
	0.010	7
	0.007	6
	0.003	4
	0.001	3



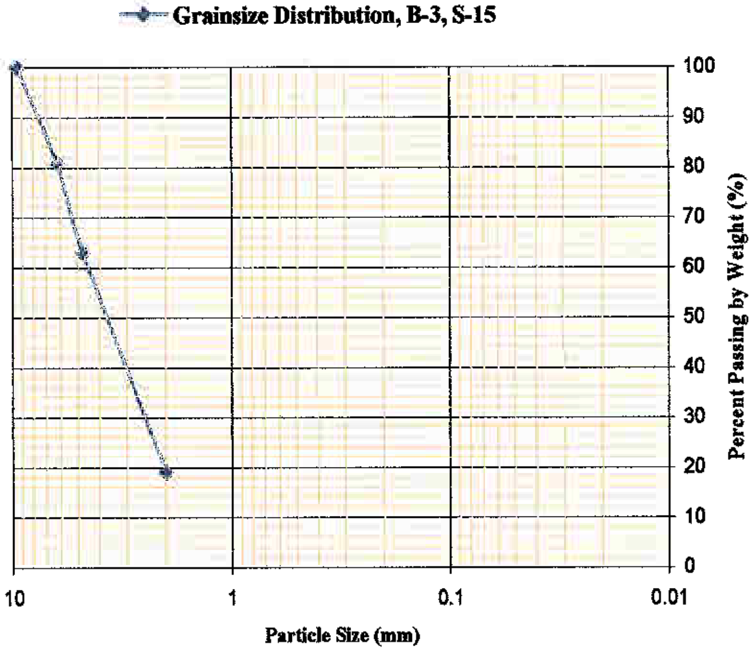
Sample ID: B-2, S-17

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
1/4"	6.25	100
No.4	4.75	99
No.10	2.00	99
No.20	0.850	98
No.40	0.425	97
No.80	0.180	95
No.100	0.150	94
No.200	0.075	92
Hydrometer	0.038	91
	0.028	85
	0.018	81
	0.011	71
	0.008	63
	0.006	53
	0.003	40
	0.001	28



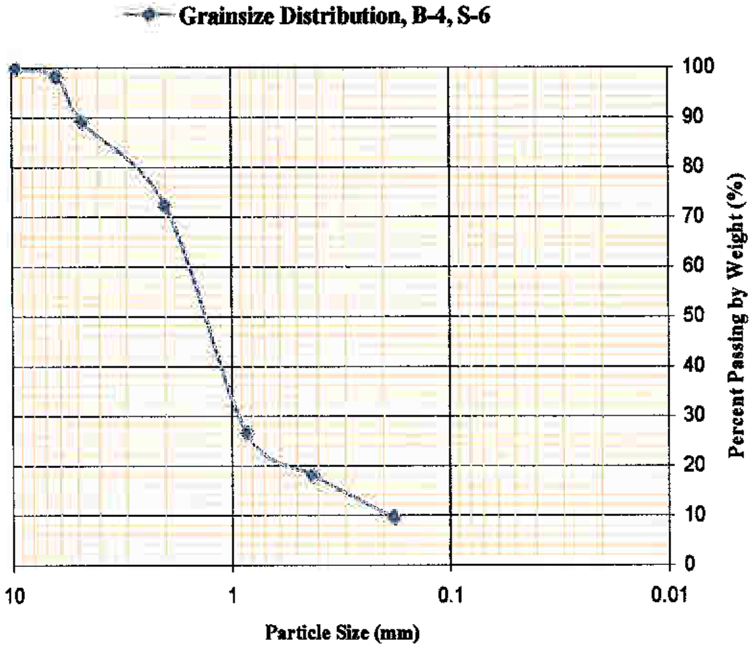
Sample ID: **B-3, S-15**

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
3/8"	9.50	-
1/4"	6.25	-
No.4	4.75	-
No.10	2.00	-
No.20	0.850	-
No.40	0.425	100
No.80	0.180	81
No.100	0.150	63
No.200	0.075	19



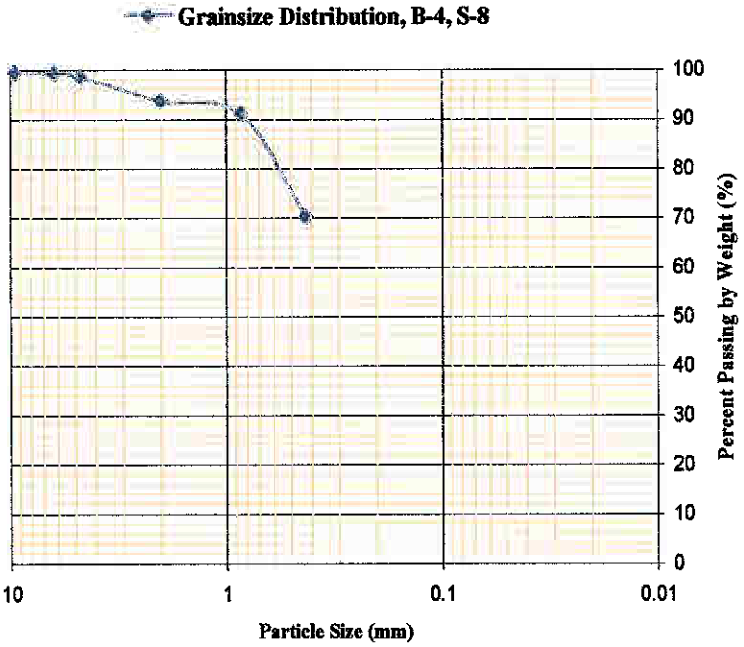
Sample ID: **B-4, S-6**

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
3/8"	9.50	-
1/4"	6.25	-
No.4	4.75	100
No.10	2.00	98
No.20	0.850	89
No.40	0.425	72
No.80	0.180	27
No.100	0.150	18
No.200	0.075	10



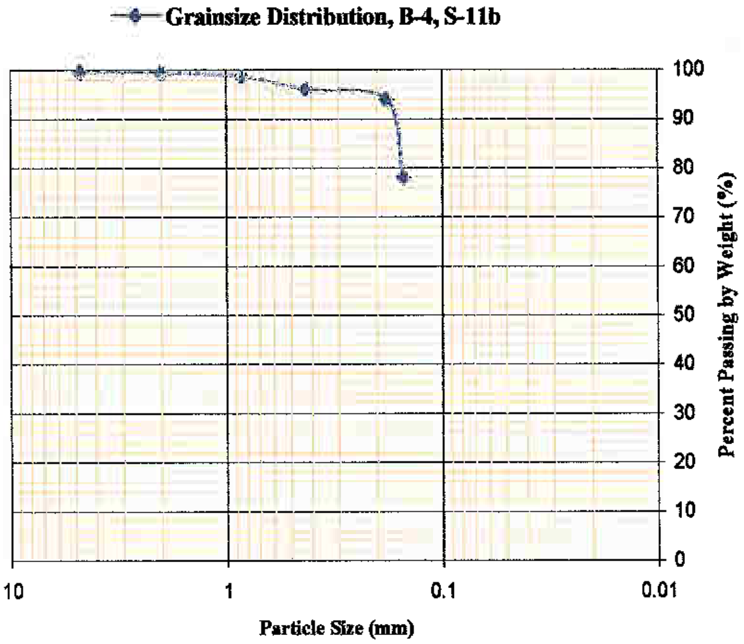
Sample ID: **B-4, S-8**

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
3/8"	9.50	-
1/4"	6.25	-
No.4	4.75	-
No.10	2.00	100
No.20	0.850	99
No.40	0.425	99
No.80	0.180	94
No.100	0.150	91
No.200	0.075	70



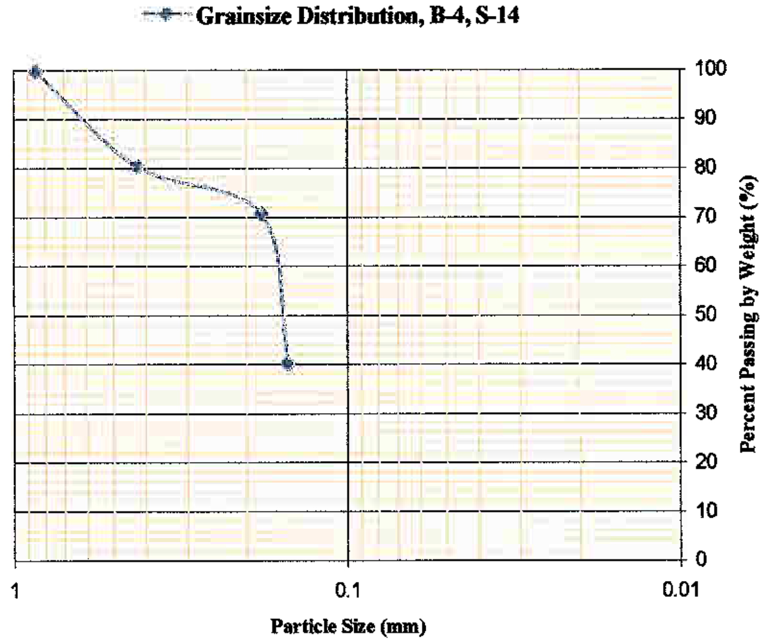
Sample ID: **B-4, S-11b**

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
No.4	4.75	-
No.10	2.00	100
No.20	0.850	99
No.40	0.425	99
No.80	0.180	96
No.100	0.150	94
No.200	0.075	78



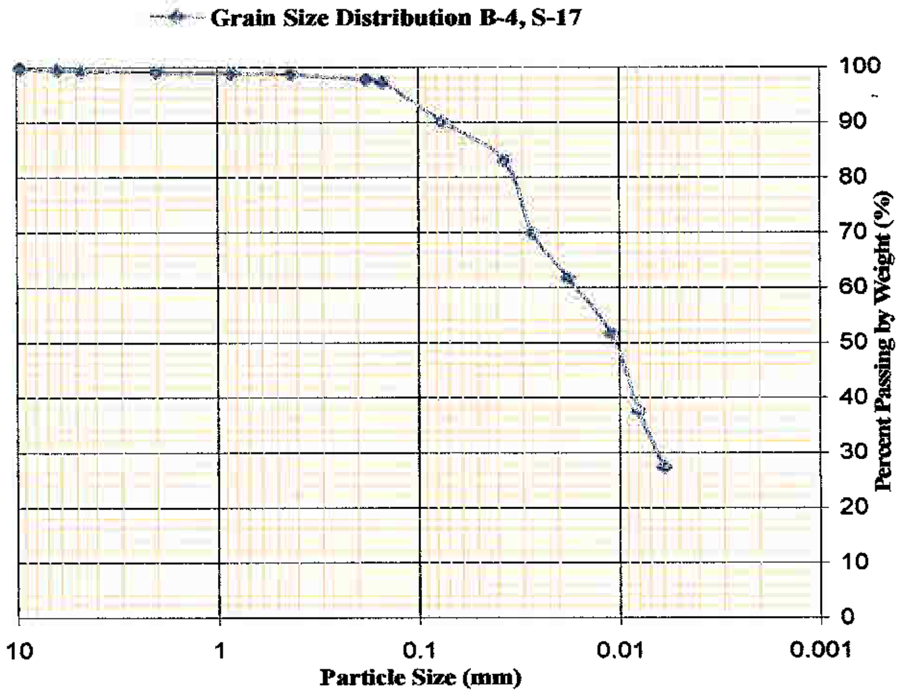
Sample ID: B-4, S-14

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
No.20	0.850	-
No.40	0.425	100
No.80	0.180	80
No.100	0.150	71
No.200	0.075	40



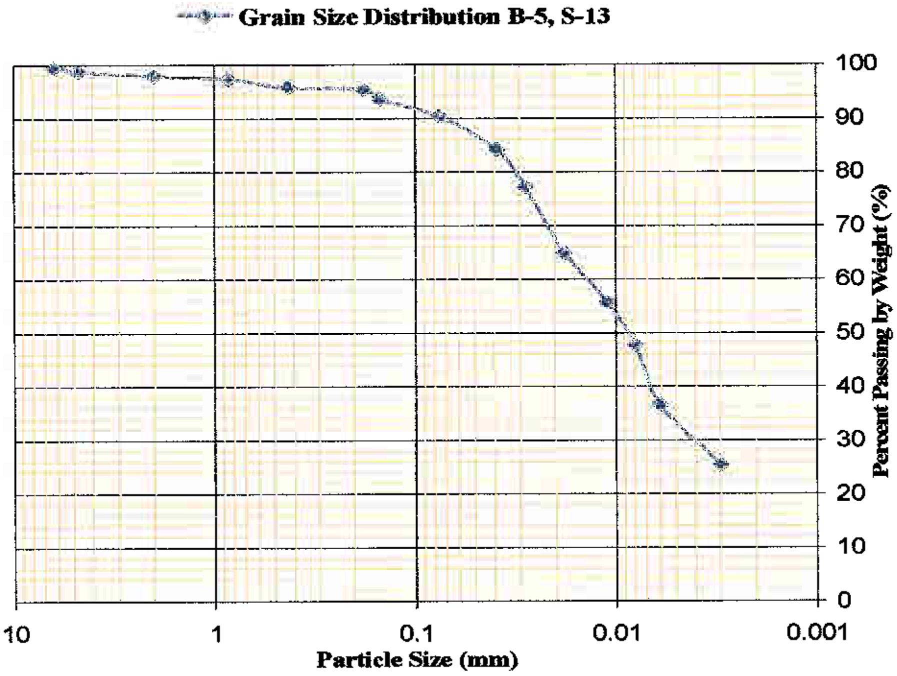
Sample ID: B-4, S-17

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
3/8"	9.5	-
1/4'	6.25	-
N0.4	4.75	100
No. 10	2.00	99
No.20	0.850	99
No.40	0.425	99
No.80	0.180	99
No.100	0.150	99
No.200	0.075	98
Hydrometer	0.037	97
	0.027	90
	0.018	83
	0.011	70
	0.008	62
	0.006	52
	0.003	37
	0.001	27



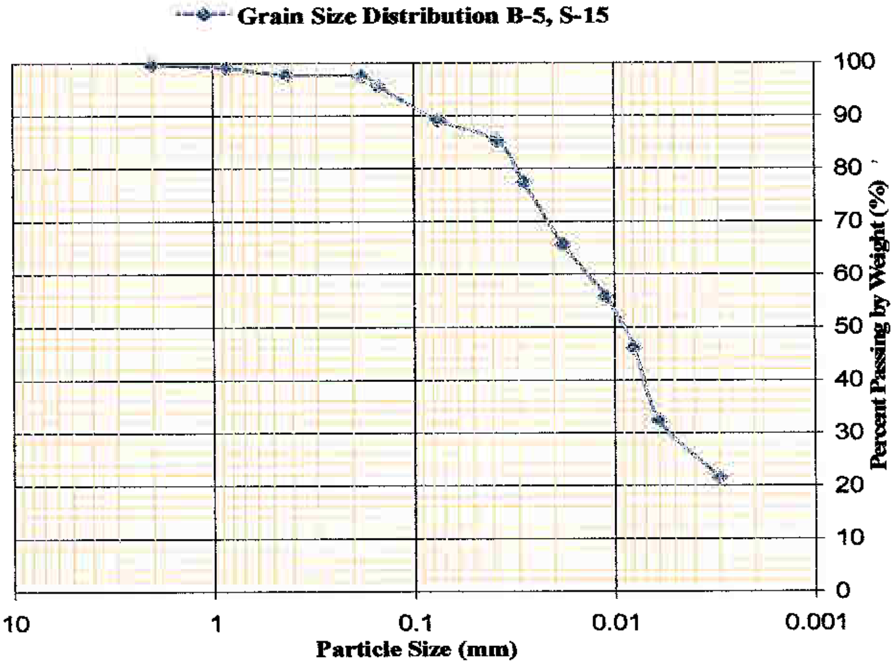
Sample ID: B-5, S-13

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
1/4"	6.25	-
No.4	4.75	100
No.10	2.00	99
No.20	0.850	98
No.40	0.425	97
No.80	0.180	96
No.100	0.150	95
No.200	0.075	94
Hydrometer	0.039	90
	0.028	84
	0.018	77
	0.011	65
	0.008	56
	0.006	48
	0.003	37
	0.001	25



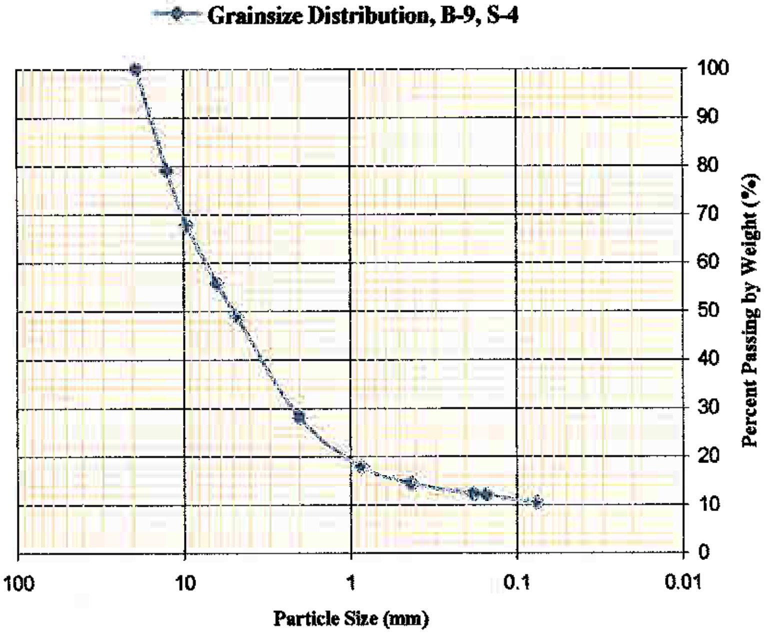
Sample ID: B-5, S-15

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
No. 10	2.00	-
No.20	0.850	100
No.40	0.425	99
No.80	0.180	98
No.100	0.150	97
No.200	0.075	96
Hydrometer	0.038	89
	0.028	85
	0.018	77
	0.011	66
	0.008	56
	0.006	46
	0.003	32
	0.001	22



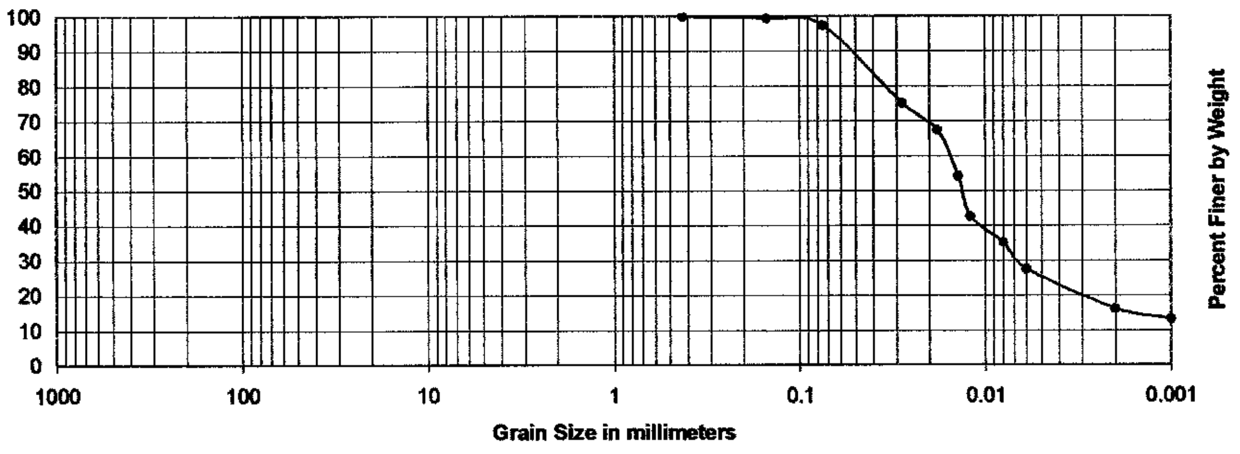
Sample ID: B-9, S-4

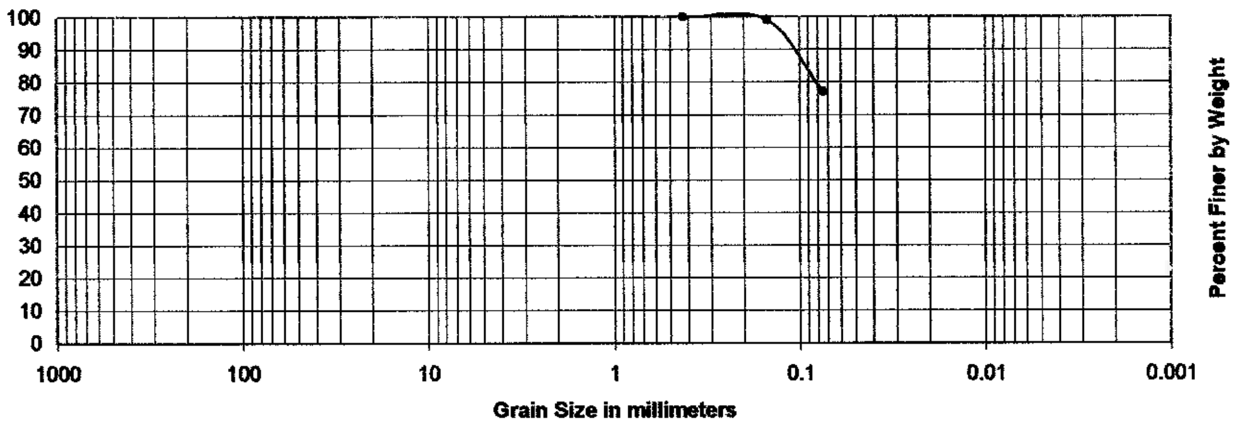
Sieve Designation	Size (mm)	Percent Passing by Weight (%)
3/4"	19.0	100
1/2"	12.5	79
3/8"	9.50	68
1/4"	6.25	56
No.4	4.75	49
No.10	2.00	28
No.20	0.850	18
No.40	0.425	14
No.80	0.180	12
No.100	0.150	12
No.200	0.075	10

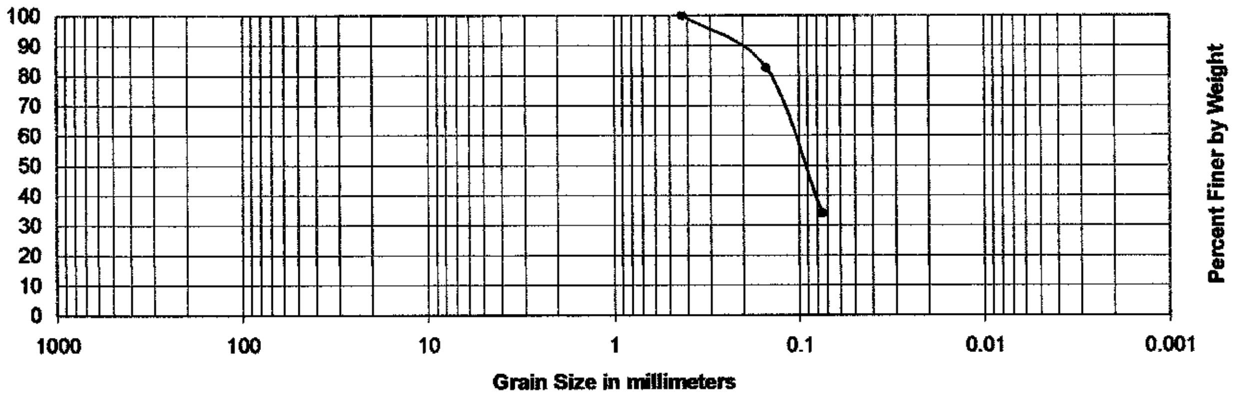


If you have any questions regarding this report please contact our office.

Jay Mikus
Laboratory Supervisor


Grain Size Distribution Curve B-4, S-11


Grain Size Distribution Curve B-7, S-11


Grain Size Distribution Curve B-9, S-9

Atterberg Limits, Natural Moisture and Unified Classification Group Symbol (ASTM D4318, D2216 & D2487):

B = Boring Number, S = Sample Number

Boring No., Sample No.	Liquid Limit	Plastic Limit	Plasticity Index	Natural Moisture Content (%)	USCS (Unified) Group*
B-1, S-13	27	16	11	19.7	CL
B-1, S-15	18	15	3	14.7	CL
B-4, S-10	24	16	8	17.6	CL

* Portion of sample passing #10 mesh sieve.

Natural Moisture Content (ASTM D2216):

Boring No., Sample No.	Depth Below Grade (ft)	Natural Moisture Content (%)
B-1, S-9	16.0 – 18.0	3.8
B-1, S-13	33.5 – 35.0	19.7
B-1, S-15	43.0 – 43.5	14.7
B-4, S-10	18.0 – 20.0	17.6
B-4, S-11	23.5 – 25.0	17.4
B-7, S-11	23.5 – 25.0	29.6
B-9, S-1	0.5 – 2.0	9.2
B-9, S-2	2.0 – 4.0	11.3
B-9, S-3	4.0 – 6.0	7.8
B-9, S-4	6.0 – 8.0	27.8
B-9, S-5	8.0 – 10.0	14.5
B-9, S-6	10.0 – 12.0	15.3
B-9, S-7	12.0 – 14.0	23.6
B-9, S-8	14.0 – 16.0	17.5
B-9, S-9	16.0 – 18.0	29.9
B-9, S-10a	18.0 – 19.5	26.3
B-9, S-10b	19.5 – 20.0	27.7
B-9, S-11	23.5 – 25.0	18.9
B-9, S-12	28.5 – 30.0	16.2
B-9, S-13a	33.5 – 34.5	15.3
B-9, S-13b	34.5 – 34.8	1.8
B-9, S-14	37.6 – 37.7	0.7

Specific Gravity Determination (ASTM C128):

Boring No., Sample No.	Depth Below Grade (ft)	Specific Gravity
B-4, S-11	23.5 – 25.0	2.78

CME
Associates, Inc.

Subsurface Exploration Report
Central Avenue Parking Garage at Cornell University
Ithaca, New York
CME Report No.: 26054B-01-0807

APPENDIX - E

Seismic Shear Wave Velocity Testing

Central Avenue Parking Garage at Cornell University
Ithaca, New York

Prepared For: (Client)

Cornell University
c/o Desman Associates
Attn: Mr. David Palmer
49 West 37th Street
New York, New York 10018
Phone: 212.686.5360
Fax: 212.779.1654

Prepared By:

CME Associates, Inc.
Attn: Mr. Anasthas Navaratnam, I.E.
P.O. Box 1824
Cicero, NY 13039
Phone: 315.698.9315
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CME Report No.: 26054B-01-0807
August 31, 2007

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Report No. 26054B-01-0807

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Seismic Shear Wave Velocity Testing
Central Avenue Parking Garage at Cornell University
Ithaca, New York
CME Report No.: 26054B-01-0807
Page 1 of 5

1.0 INTRODUCTION

CME Associates, Inc. (CME) conducted a Geophysical Investigation consisting of a Downhole Seismic Test to determine the Vertical Seismic Shear Wave Velocity Profile at a selected location. This report presents the shear wave velocity measurements obtained from the Downhole Seismic Testing. The Scope of Services and this report are provided pursuant to the written acceptance of CME's Proposal/Agreement Number: 05.2505 by Desman Associates (Desman-Project Architect) acting as agent for Cornell University (Client).

1.1 Earthquakes in New York State?[1]

Earthquakes occur on geologic faults. New York State is far from any known major geologic faults and one would not expect much earthquake activity in New York State. However, between 1730 and 1986, more than 400 earthquakes with a magnitude of 2.0 and greater on the Richter Scale, occurred in New York State. Three earthquakes above magnitude 3 occurred in New York State in the first eight months of 2007.

The largest known earthquake in New York State happened in the Cornwall-Massena area along the U.S./Canadian border on September 5, 1944 and had a magnitude of about 6.0. It was strong enough to damage many well-constructed buildings. It knocked down chimneys and walls, and overturned heavy furniture. Is this the last and the largest earthquake that could ever happen in New York State? Should buildings in New York State be designed in anticipation of possible greater earthquakes in the future?

Though a definite answer cannot be given to these questions, precautions may be taken. The 2002 version of the New York State Building Code requires that the structural design of buildings take into account earthquake loading resulting from ground motions specific to the site, which is related to the Seismic Site Class.

---

[1] Adapted from: Earthquake! What, Where, When, Why (Chapter 17) Geology of New York: A Simplified Account, Albany: New York State Museum/Geological Survey, 1991, pages 231-238.

1.2 Seismic Site Class and Site Coefficients Fa and Fv

Seismic Site Class is site specific. After investigation of the subsurface conditions, each site is designated a specific Site Class which is defined as Site Class A through Site Class F. Various studies conducted by different researchers over the last few decades indicate that the amplitude and duration of earthquake ground motion will be greatly influenced by Seismic Shear Wave (S-Wave) Velocity of subsurface soils or rock in the upper 100 to 200 feet. Seismic Site Class definitions should be based on subsurface S-Wave velocity, whenever this data is available. Where site specific subsurface S-Wave velocities are not known, the New York State Building Code also permits alternative definitions of Seismic Site Class based on Standard Penetration Testing (SPT) N-Values and/or undrained shear strength of subsurface soils, which can be obtained via Test Boring or other Subsurface Exploration. However, S-Wave velocity profile of subsurface soils is required to support a Site Class A or Site Class B. Seismic Site Class definitions are presented in Table 1615.1.1 of the New York State Building Code. The alternative definitions based on SPT N-Values and/or undrained shear strength are generally conservative, since the correlations between site amplification and these geotechnical parameters are more uncertain than with shear wave velocity.

The site coefficients Fa and Fv, for Site Classes A through E, are provided in Tables 1615.1.2 (1) and 1615.1.2 (2) of the NYSBC, and the values increase when Site Class goes from A to E. A Site-Specific Geotechnical Investigation and Dynamic Site Response Analysis shall be conducted to determine Fa and Fv values for Site Class F. The above analysis may also be conducted to determine Fa and Fv values for other site classes. If these values are determined based on Site-Specific Geotechnical Investigation and Dynamic Site Response Analysis, there will be instances when the Fa and Fv values will be smaller than what is published in the NYSBC tables.

2.0 GEOPHYSICAL INVESTIGATION

2.1 Downhole Seismic Testing

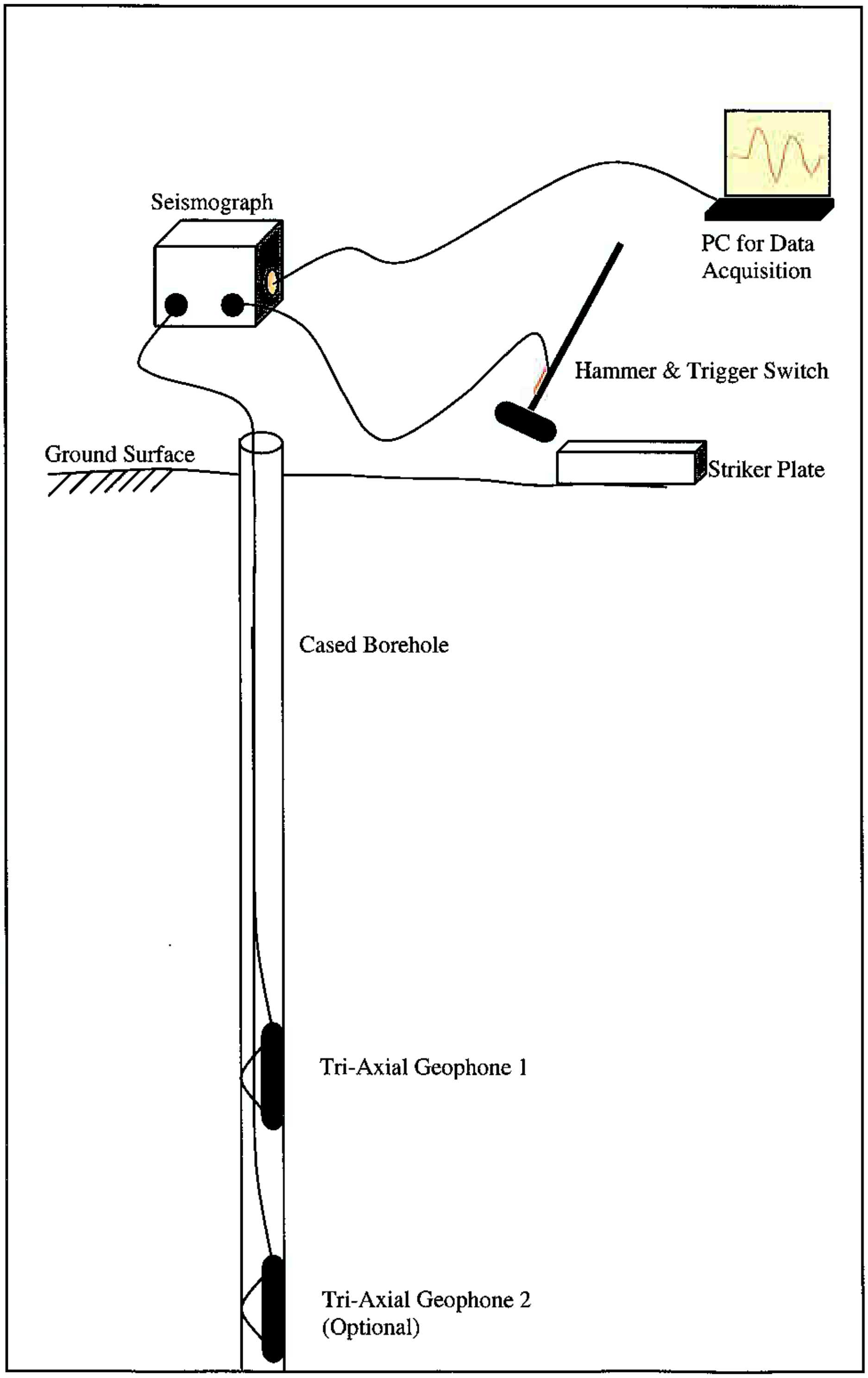
Because subsurface shear wave velocities can not be reliably measured by surficial seismic surveys, the normal procedure is to conduct the survey in prepared boreholes. There are two principal methods: Crosshole and Downhole Seismic Testing. The Crosshole Seismic Testing procedure is described in the ASTM Standard D4428/D4428M-00 *"Standard Test Methods for Crosshole Seismic Testing"*. Downhole Seismic Testing is a simple extension of the Crosshole Method and is a technique used for measuring in-situ P-Wave and S-Wave velocities, by recording travel times of waves traveling from a source at the ground surface to receivers in the borehole.

2.2 Borehole Preparation

CME advanced a cased borehole, labeled B-3a (2007), 8 feet East of CME Boring location B-3 (2007). Please refer to the Boring Location Sketch, labeled BL-1, for test location. The borehole was advanced using a Rotary Drill Rig using a 5-7/8 inch tri-cone roller bit. The borehole was cased using a 4 inch I.D. flush coupled PVC pipe with an end cap. The annular space outside the pipe was filled with cement-bentonite grout via tremie method. Please refer to the *"Specification for Installation of Casing in a Vertical Borehole"* in Appendix C, for details. The casing was dewatered using a submersible pump immediately prior to testing.

2.3 Test Procedure

The test setup consists of a cased borehole, receivers (two tri-axial geophones), energy source (8"x8"x48" steel I-Beam with spikes, 6" diameter by 6" height steel cylinder and a 12 lb sledge hammer with trigger switch attached), a seismograph and a laptop P.C. Please refer to Figure 1 for the typical Downhole Seismic Testing configuration.



The two geophones are spaced 2.5 feet apart and lowered to the bottom of the borehole. The steel I-Beam and the steel cylinder are positioned on the ground surface, 5.0 feet from the borehole. Data is acquired by collecting wave signals from receivers for each impact made on the I-Beam using the hammer. S-Waves are created by hitting the I-Beam ends horizontally in the tangential direction to the borehole. Both ends are hit to create positive and negative polarity S-Waves. P-Waves are created by hitting the steel cylinder vertically. The geophone assembly is raised in 5.0 feet intervals and the whole striking and recording sequence is repeated. The data is acquired using an E-3000 Geometrics Seismograph and a Laptop P.C. All geophysical data is digitally recorded and continuously monitored during collection by the CME Geotechnical Engineer and is available in electronic format in CME's Cicero office.

Figure 1 Downhole Seismic Testing Configuration

2.4 Data Interpretation and Shear Wave Velocity Profile

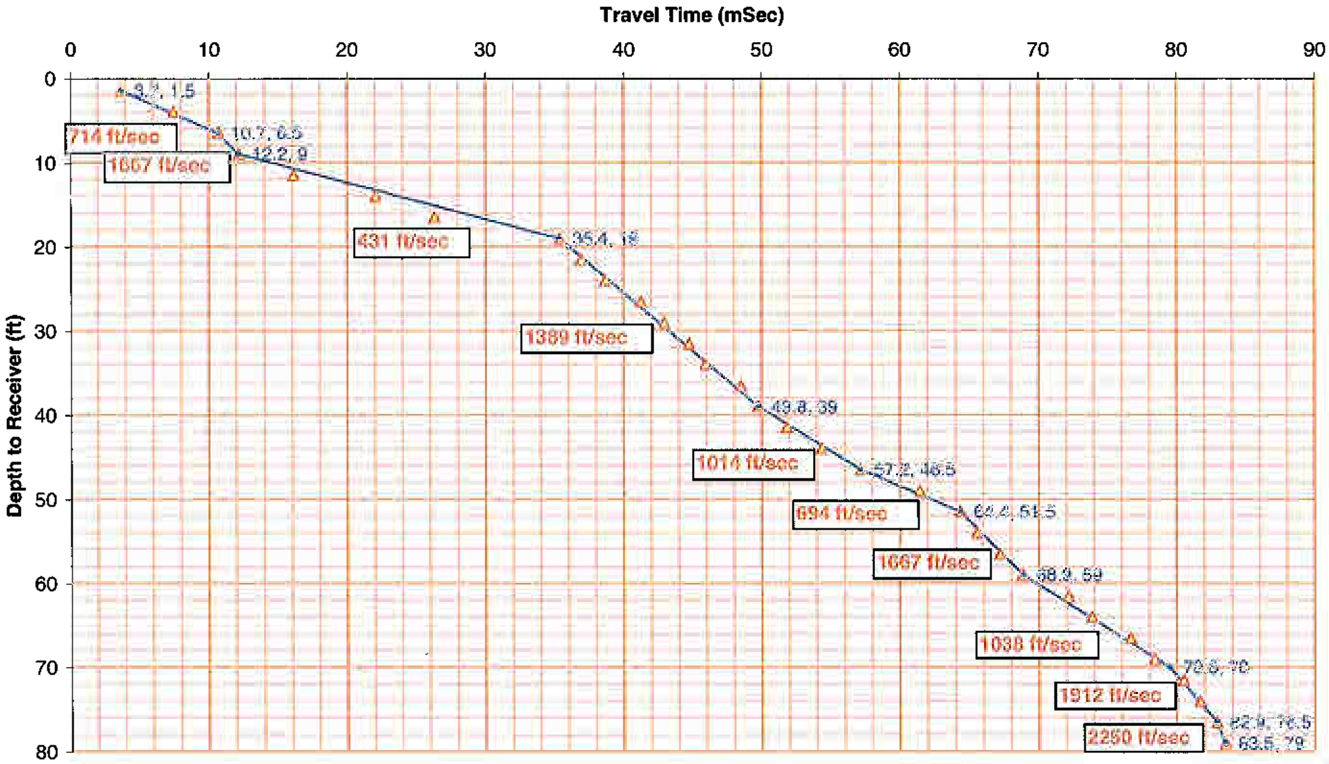
The raw data collected in the field was processed in the office, and the first wave arrival points on each of the wave signals (wave amplitude vs. travel time curves) were recorded. Please refer to columns 2 and 3 of the attached Table 1 for measured S-Wave travel times from source to receivers.

The direct distance from source to receivers at each test depth are calculated as shown in Appendix A, and are tabulated in columns 4 and 5 of Table 1.

Corrected wave travel time is the time it would have taken a wave to reach the receiver, had the receiver been positioned vertically below the source, allowing the waves to travel vertically. The corrected travel times are calculated as shown in Appendix A and are tabulated in columns 6 and 7 in Table 1.

Based on the analysis and interpretation of the S-Wave travel times, the following results are presented graphically and in tabular form.

Depth to Receiver vs. Corrected Wave Travel Time



Depth Below Grade (ft)	Soil Classification*	Measured Average S-Wave Velocity (ft/sec)
1.5 – 6.5	Miscellaneous Fill	714
6.5 – 9.0	Silty Sand and Gravel	1667
9.0 – 19.0	Silty Sand	431
19.0 – 39.0	Silty Sand	1389
39.0 – 46.5	Silty Clay	1014
46.5 – 51.5	Clayey Silt	694
51.5 – 59.0	Glacial Till	1667
59.0 – 71.5	Glacial Till/Rock Fragments	1038
71.5 – 76.5	Weathered Shale Bedrock	1912
76.5 – 79.0	Weathered Shale Bedrock	2250

*Please refer to Boring Log, labeled B-3a(2007), attached to this report for further details.

3.0 CLOSING COMMENTS

The interpretation presented in this report is based on observed geophysical responses obtained during the test procedure, visual observations by the CME Geotechnical Engineer, knowledge of the subsurface soil conditions in the surrounding area and the subsurface exploration performed for this project.

We have endeavored to conduct these services in a manner consistent with the level of care and skill ordinarily exercised by members of the geotechnical engineering profession, practicing contemporaneously under similar conditions in the locality of the project. No other representation, express or implied is made. Under no circumstances is any warranty, express or implied, made in connection with the providing of geotechnical engineering services.

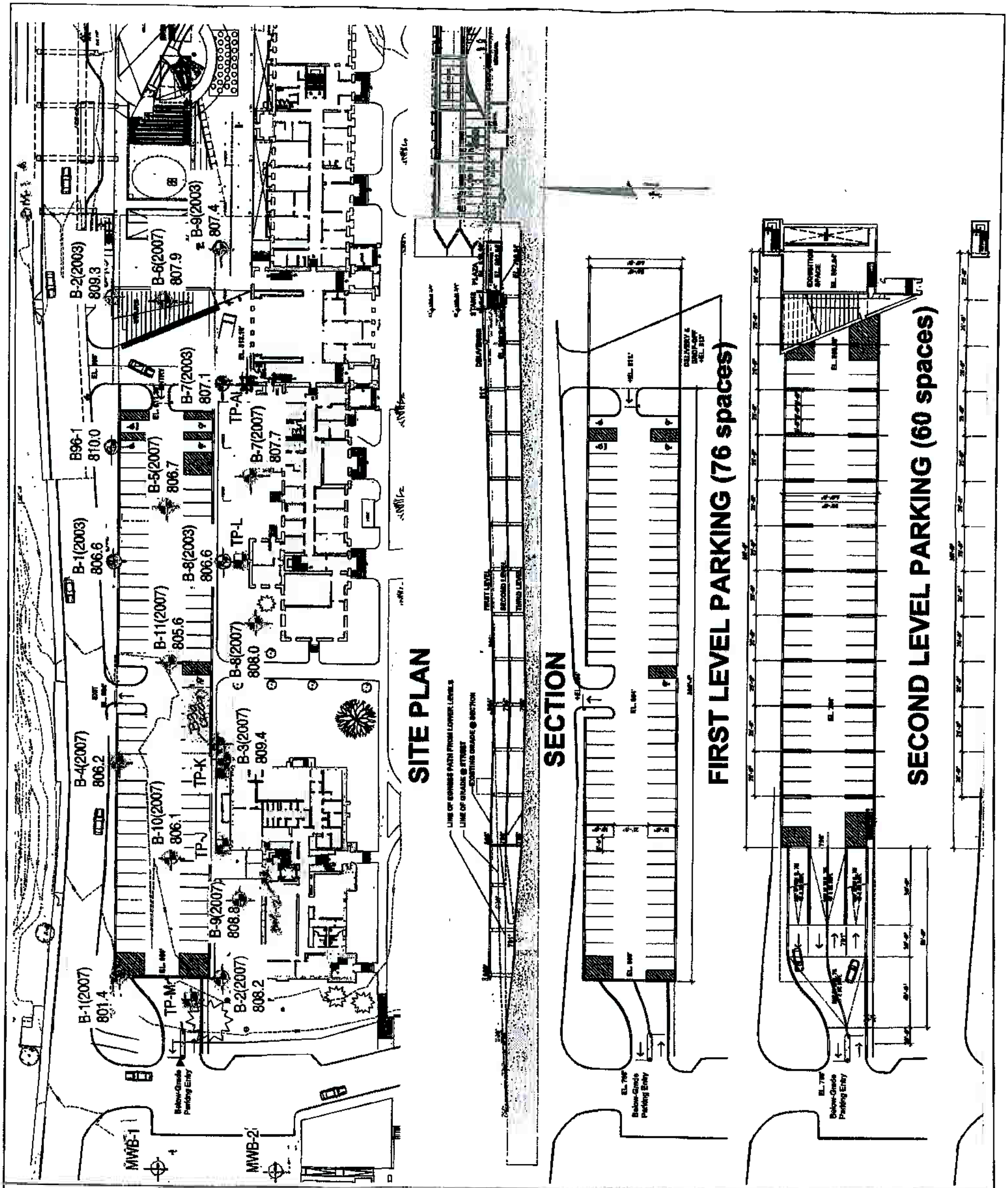
If you have any questions regarding the information presented in this report, please contact the undersigned.

Nicole L. Croft for
Anasthas Navaratnam, I.E.

Marcus Rotundo
Reviewed by: Marcus A. Rotundo, P.E.

Attachment Listing:

Boring Location Sketch, labeled BL-1 (1 of 1)
CME Subsurface Exploration-Test Boring Log, labeled B-3a (2007) (3 of 3)
Tabulated Data and Interpretations, labeled Table 1(1 of 1)
Appendix A: Calculations
Appendix B: Seismic Wave Signals Recorded During Downhole Seismic Testing
Appendix C: Specifications for Installing Casing in a Vertical Borehole



Sheet No.

BL-1

Scale: 1"=80'
08/29/07
26064
na

Boring Location Sketch
Central Avenue Parking Garage
at Cornell University
Ithaca, New York

CME Associates, Inc.
Construction Materials Evaluation
P.O.Box 1824 Cicero
New York 13039-1824
[315] 698-9315 FAX: [315] 698-9319

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: CAPG at Cornell University, Ithaca, NY
Report No.: 26054B-01-0807
Client: Desman Associates
Date Started: 07/24/07 **Finished:** 07/25/07
Location of Boring: See Boring Location Sketch
Elevation of Surface of Boring: 809.4'

METHODS OF INVESTIGATION

Casing:	3-1/4" ID H. Stem Auger	**Driller:**	Wayne Earl
Casing Hammer:		**Driller:**	Karl Allen
Other:		**Inspector:**	
Soil Sampler:	2" OD Split Barrel	**Rod Size:**	AWJ
Sampler Hammer: Wt.	140 lbs./Auto	**Fall:**	30 in.
Make & Model of Drill Rig:	CME 55 Truck Mounted		

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
07/24/07	While drilling	37.4'	40.0'
07/24/07	Before casing removed	43.2'	69.2'
07/25/07	After casing removed	See Remark 1	
07/25/07	After casing removed		

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

c – coarse, m – medium, f – fine; **and** – 35 to 50 %, **some** – 20 to 35 %, **little** – 10 to 20 %, **trace** – 0 to 10 %

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	Classification of Material	SPT "N" or RQD
0	XXX	1a	0.0	0.5	SS/16	2-2-5-8	0.5	Topsoil (moist)	
	H	1b	0.5	2.0				Brown SILT, some cmf SAND, trace ORGANICS (moist)	7
	O	2	2.0	4.0	SS/8	8-12-10-8		Brown cmf SAND and SILT, little fine GRAVEL, little BRICK (moist)	22
	L							~ Unprepared Miscellaneous Fill ~	
		3	4.0	6.0	SS/10	4-5-5-4		Brown cmf SAND and SILT, little mf GRAVEL, trace BRICK (moist)	10
5	L						6.0		
	O	4	6.0	8.0	SS/12	4-6-6-6		Brown cmf SAND, some cmf GRAVEL, some SILT (moist, medium compact)	12
	W	5a	8.0	9.4	SS/16	4-5-5-5	9.4	Brown cmf SAND, some SILT, little cmf GRAVEL (moist, medium compact)	
		5b	9.4	10.0				Brown mf SAND, some SILT (moist, medium compact)	10
10		6	10.0	12.0	SS/14	3-2-3-2		Brown SILT, trace fine SAND (moist, medium stiff)	5
	S								
	T	7	12.0	14.0	SS/14	3-4-4-4		Brown fine SAND, some SILT (moist, loose)	8
	E								
		8	14.0	16.0	SS/12	3-2-3-2		Brown mf SAND, little SILT (moist, loose)	5
15	M								
		9	16.0	18.0	SS/18	2-2-2-2		Brown fine SAND and SILT (moist, loose)	4
		10	18.0	20.0	SS/16	2-2-2-3		Brown mf SAND, some SILT (moist, loose)	4
	A								
20	U	11	20.0	22.0	SS/16	2-3-5-21		Brown fine SAND and SILT, trace fine GRAVEL (moist, loose)	8
	G								
		12	22.0	24.0	SS/20	3-4-4-4		Brown fine SAND, some SILT (moist, loose)	8
	E								
		13	24.0	26.0	SS/18	2-3-5-5		Similar Soil (moist, loose)	8
	R								
25								Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

LOG OF BORING SAMPLES							**CLASSIFICATION OF MATERIAL**		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – **coarse** **m** – **medium** **f** – **fine** **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	HOLLOW STEM AUGER							Continued from page 1	
		14	28.5	30.0	SS/16	8-11-12		Brown mf SAND, some SILT (moist, medium compact)	23
30									
		15	33.5	35.0	SS/18	4-7-9		Brown mf SAND, little SILT (saturated, medium compact)	16
35									
		16a	38.5	39.0	SS/14	2-3-2	39.0	Similar Soil (saturated, loose)	
		16b	39.0	4.0				Grey CLAY, little SILT (moist, medium stiff)	5
40									
		17	43.5	45.0	SS/14	7-9-12		Grey SILT, little CLAY (moist, very stiff)	21
45									
		18	48.5	50.0	SS/14	4-12-22		Grey SILT, trace CLAY (moist, hard)	34
50								Continued on page 3	

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

LOG OF BORING SAMPLES							**CLASSIFICATION OF MATERIAL**		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
50	H							Continued from page 2	
	O								
	L	19a	53.5	54.7	SS/16	15-28-28	54.7	Grey SILT, trace CLAY (moist, hard)	
		19b	54.7	55.0				Grey fine SAND and SILT (saturated, very compact)	56
	L								
55									
	O								
	W								
		20	58.5	58.8	SS/3	100@3"		Grey SILT, some cmf GRAVEL, little cmf SAND, trace CLAY (moist, hard)	100+
	S								
60	T								
	E							~ Glacial Till ~	
	M								
		21	63.5	64.1	SS/4	30-100@5"		Grey SILT and cmf SAND, little cmf GRAVEL, trace ROCK fragments (moist, hard)	100+
	A								
65									
	U								
							68.5		
	G	22	68.5	68.5	SS/0	100@0"		Grey ROCK fragments	100+
	E								
		23	69.2	69.2	SS/0	100@0"		No Recovery *Auger & Sampler Refusal @ 69.2'*	100+
	R								
70	XXX							Bottom of Boring @ 69.2'	
75									

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

TABLE 1

Project Central Avenue Parking Garage at Cornell University, Ithaca, NY
Borehole 8 feet East of CME Boring B-3a(2007)
Distance to Source from Borehole (ft) 5
Spacing Between Geophones (ft) 2.5 (Geophone 2 below Geophone 1)

1	2	3	4	5	6	7	8
Depth, Z (ft)	S-Wave Travel Time from Source to Receiver (mSec)		Distance from Source to Geophone 2 (ft)	Distance from Source to Geophone 1 (ft)	Corrected S-Wave Travel Time from Source to Depth Z (mSec)		
	Geophone 2	Geophone 1			Geophone 2	Geophone 1	Combined
1.5		12.8		5.2		3.7	3.7
4.0	12.0		6.4		7.5		7.5
6.5		13.6		8.2		10.7	10.7
9.0	14.0		10.3		12.2		12.2
11.5		17.6		12.5		16.1	16.1
14.0	23.4		14.9		22.1		22.1
16.5		27.5		17.2		26.3	26.3
19.0	36.6		19.6		35.4		35.4
21.5		37.9		22.1		36.9	36.9
24.0	39.5		24.5		38.7		38.7
26.5		42.0		27.0		41.3	41.3
29.0	43.6		29.4		43.0		43.0
31.5		45.3		31.9		44.7	44.7
34.0	46.4		34.4		45.9		45.9
36.5		49.0		36.8		48.5	48.5
39.0	50.2		39.3		49.8		49.8
41.5		52.2		41.8		51.8	51.8
44.0	54.7		44.3		54.4		54.4
46.5		57.5		46.8		57.2	57.2
49.0	61.8		49.3		61.4		61.4
51.5		64.7		51.7		64.4	64.4
54.0	65.8		54.2		65.6		65.6
56.5		67.5		56.7		67.2	67.2
59.0	69.1		59.2		68.9		68.9
61.5		72.4		61.7		72.2	72.2
64.0	74.1		64.2		73.9		73.9
66.5		76.9		66.7		76.7	76.7
69.0	78.6		69.2		78.4		78.4
71.5		80.7		71.7		80.5	80.5
74.0	81.9		74.2		81.7		81.7
76.5		83.1		76.7		82.9	82.9
79.0	83.7		79.2		83.5		83.5

APPENDIX A

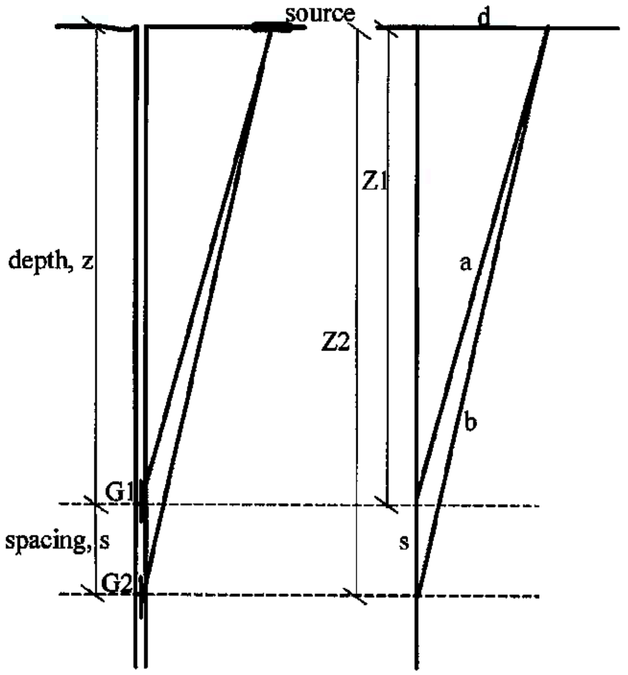
Calculations

CME Associates, Inc.
Construction Material Evaluation
P.O. Box 1824
Cicero, New York 13039
315-698-9315

Corrected Wave Travel Time Calculations
Central Avenue Parking Garage at Cornell
University, Ithaca, New York

CME Job No.:26054
Sheet No.:1 of 2
Calculated by: Anas Date: 8/30/2007
Checked by: ______ Date: ________

1. DIRECT DISTANCE FROM SOURCE TO RECEIVER



Direct distance from source to receiver G1

$$a = \sqrt{d^2 + Z1^2}$$

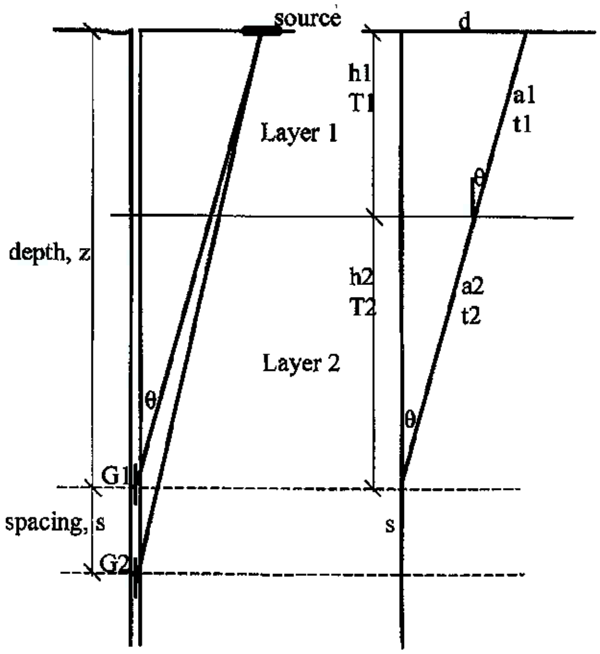
Direct distance from source to receiver G2

$$b = \sqrt{d^2 + Z2^2}$$

2. CORRECTED TRAVEL TIME FROM SOURCE TO DEPTH Z

Corrected travel time from source to depth z (vertically downward) =
Travel time along actual ray path x Cosine of angle between that ray path makes with vertical

Froof:



a1 = actual ray length in Layer 1
a2 = actual ray length in Layer 2

t1 = measured travel time in Layer 1
t2 = measured travel time in Layer 2

h1 = vertical ray length in Layer 1
h2 = vertical ray length in Layer 2

T1 = corrected travel time in Layer 1
T2 = corrected travel time in Layer 2

Travel time for distance a1 $= t1$

Therefore, travel time for distance h1 in the same layer, $T1 = \frac{t1}{a1} \cdot h1$

Also $\frac{h1}{a1} = \mathrm{Cos} \cdot \theta$

Therefore, $T1 = t1 \cdot \mathrm{Cos} \cdot \theta$

Similarly, $T2 = t2 \cdot \mathrm{Cos} \cdot \theta$

$$T1 + T2 = (t1 + t2) \cdot \mathrm{Cos} \cdot \theta$$

Therefore, total corrected travel time = Total travel time measured along actual ray path X Cosine of angle between ray path and vertical

Angle θ varies with Z, and Cos θ can be expressed as a function of Z, S and actual ray path length, as follows:

For Geophone 2

Actual ray length = b

$$\mathrm{Cos} \cdot \theta = \frac{Z2}{b}$$

Corrected travel time = measured travel time X Z2/b

For Geophone 1

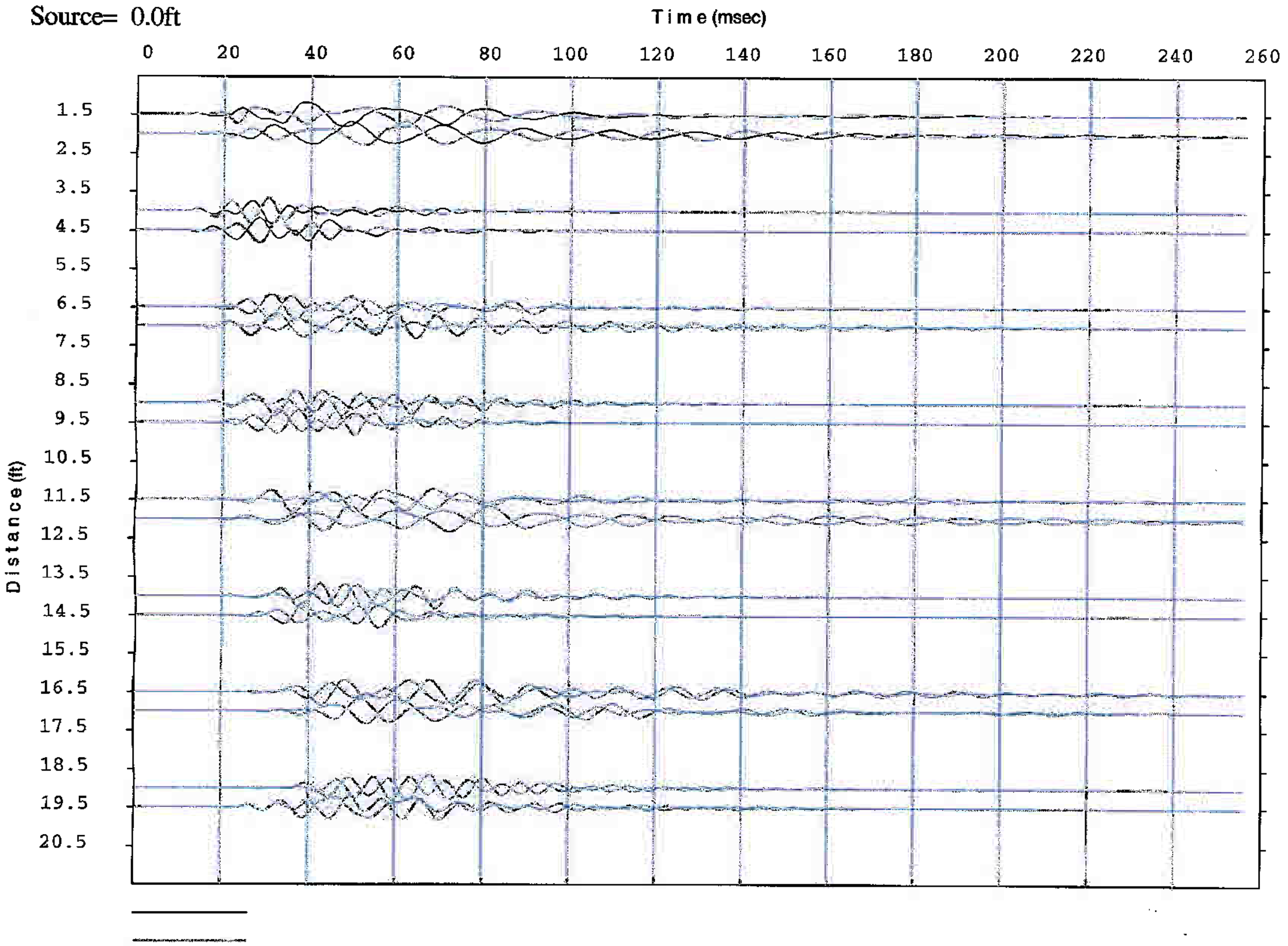
Actual ray length = a

$$\mathrm{Cos} \cdot \theta = \frac{Z1}{a}$$

Corrected travel time = measured travel time X Z1/a

APPENDIX B

Shear Wave Signals Recorded during Downhole Seismic Testing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60
80
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180
200
220
240
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Distance (ft)
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2.5
3.5
4.5
5.5
6.5
7.5
8.5
9.5
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16.5
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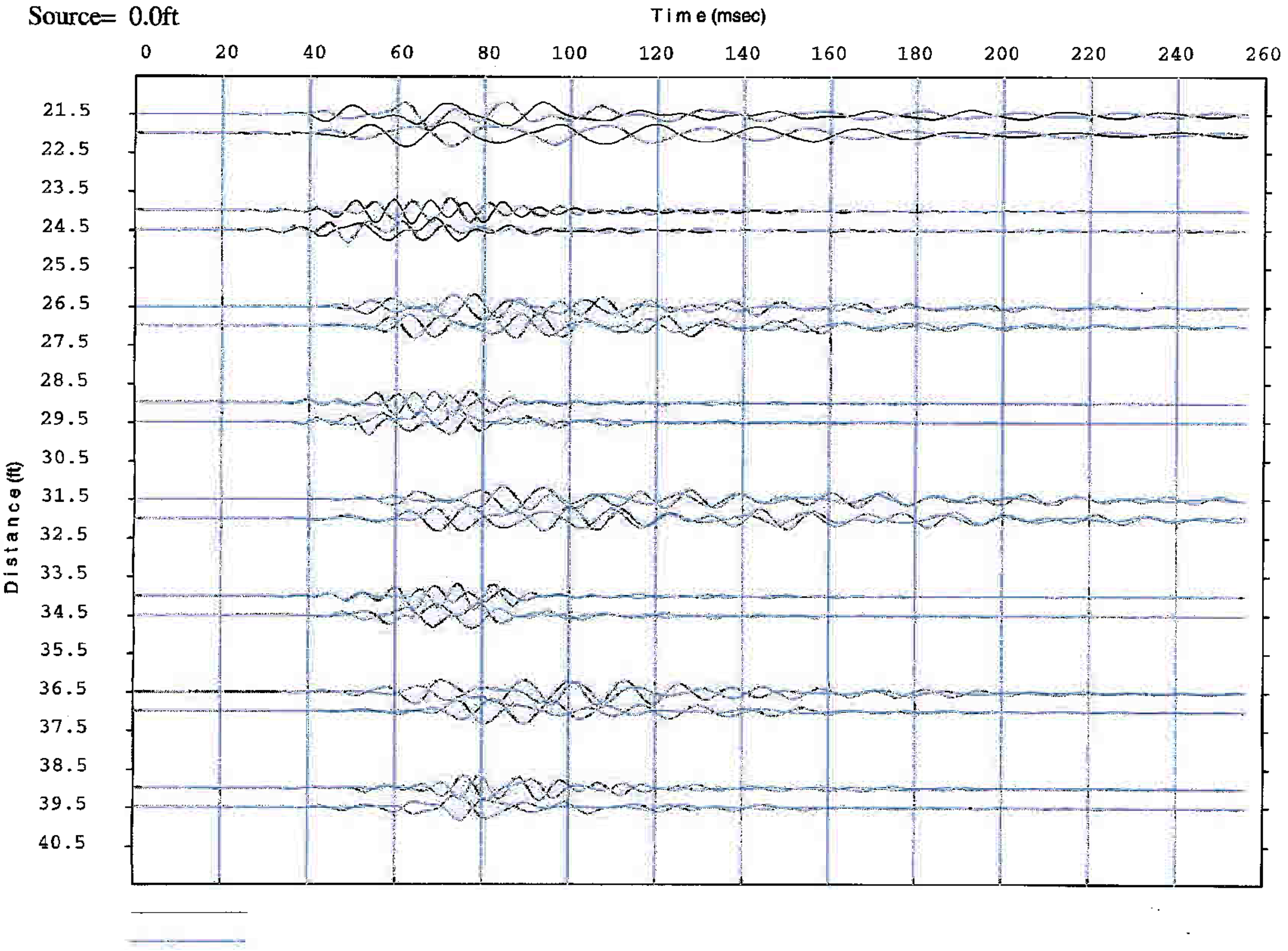
20.5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39.5
40.5

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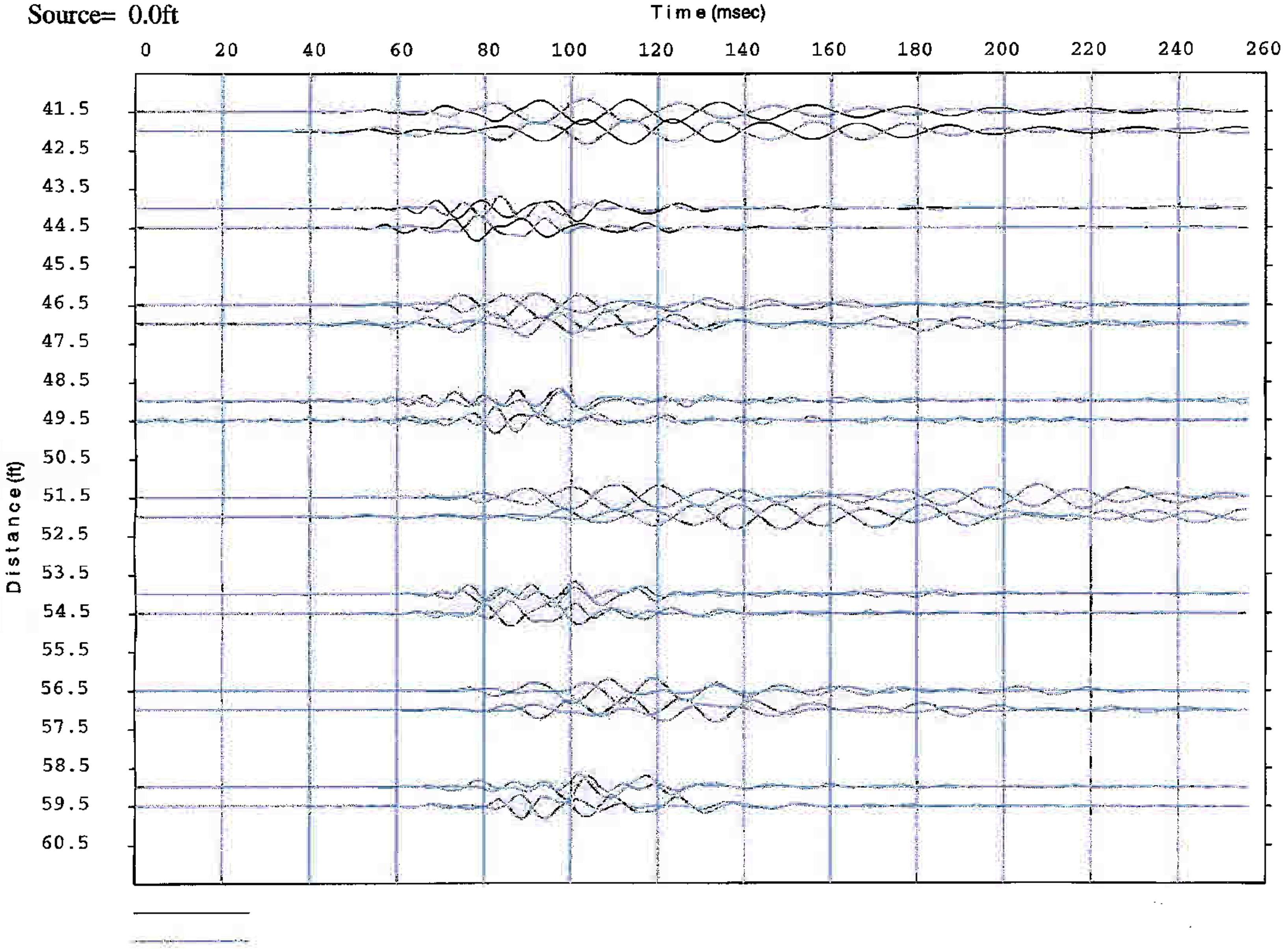
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160
180
200
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240
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Distance (ft)
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45.5
46.5
47.5
48.5
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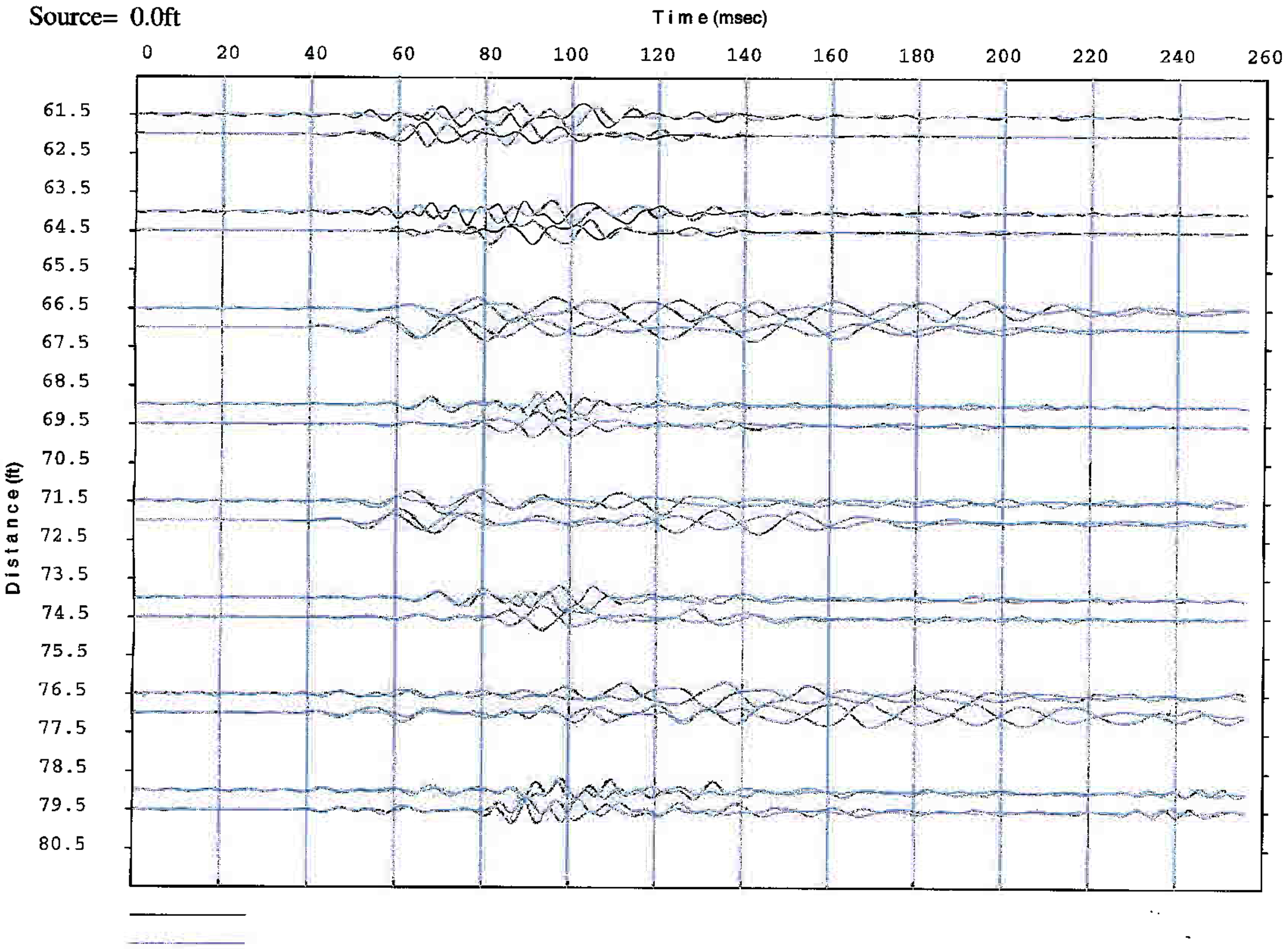
59.5
60.5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Time (msec)
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60
80
100
120
140
160
180
200
220
240
260
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63.5
64.5
65.5
66.5
67.5
68.5
69.5
70.5
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72.5
73.5
74.5
75.5
76.5
77.5
78.5
79.5
80.5

APPENDIX C

Specifications for Installation of Casing in a Vertical Borehole

Specification for Installation of Casing in a Vertical Borehole

1.0 SCOPE

This specification is intended to present the minimum requirements for installing a watertight PVC casing in a vertical boring. The casing is to be grouted in-place, and protected at grade to facilitate later downhole testing. The borehole is to be drilled by a method that will minimize sidewall disturbance and allow for installation of the casing and grouting.

2.0 MATERIALS

All materials to be incorporated in the work shall be new and fresh as evidenced by unopened containers and sealed bags when materials arrive on the job at the time of intended use.

2.1 Portland Cement shall conform to ASTM C150 for Type I or II.
2.2 Bentonite shall be graded Wyoming Bentonite as Manufactured by American Colloid Corp. model C/S Granular, N.L. Baroid Co. model Benseal, or equivalent.
2.3 Thermoplastic well casing pipe for use as permanent casing shall be 4-inch inside diameter, Schedule 40 Flush Threaded Joint Type, Poly Vinyl Chloride (PVC) equipped with rubber o-ring seals and conform to ASTM F480.
2.4 Water for use in grout preparation shall be clean and potable.
2.5 PVC pipe fittings shall be threaded and manufactured by the same manufacturer as the pipe.
2.6 Grout shall be machine mixed on-site using approved materials. Grout proportions shall be 94 pounds of cement to 3 pounds Bentonite to 85 pounds of water.
2.7 Centralizers as manufactured by Sinco or equivalent shall be used to center the PVC pipe casing in the borehole.

3.0 EXECUTION

3.1 Drill the borehole, with a minimum of sidewall disturbance, to a diameter not exceeding 6 inches. The use of hollow stem or solid augers shall not be allowed.
3.2 Use tools and equipment to drill the bore such that the borehole is vertical and truly plumb from top to bottom. An allowable maximum deviation from plumb is three (3) percent. Contractor shall check plumb while drilling by using a 5-foot carpenters level or a Bazooka Plumb-Bob applied to the drill stem at 10-foot intervals. Re-level the drilling apparatus after each check as required.
3.3 Use a drilling fluid to keep the borehole open until completion of casing installation and grouting.
3.4 After the drilling is completed, case the boring with the specified well pipe casing. Install a cap fitting on the bottom of the casing and centralizers at 10-foot on-center as it is installed. No adhesives, solvents, or sealants should be used. Each joint shall be torqued to the maximum value specified for the joint pattern. Clean water may be used to flood the casing to facilitate insertion into the boring.
3.4.1 The bottom cap fitting may be a plain end-cap or may be a special end-cap equipped with a one-way ball check valve and nipple capable of accommodating a 1.5-inch o.d. grout pipe. The cap used depends on the Contractor's planned method of grouting the casing.
3.5 After the casing has been inserted to the bottom of the borehole, it shall be grouted by one of three methods, at the Contractor's option, as given in 3.5.1 to 3.5.3.

3.5.1 Grout the casing in-place by inserting a 1.5-inch o.d. PVC pipe through the center of the casing to contact and engage the one-way valve and nipple affixed to the end-cap.
3.5.2 Grout the casing by using a grout tremmie pipe or flexible line attached to the outside of the casing near the bottom of the casing.
3.5.3 Grout the casing by filling the borehole with grout then displacing the grout by inserting the end-capped fluid filled well casing.
3.5.4 When using method 3.5.1 or 3.5.2, anchor the casing and pump the grout using a conventional circulating pump capable of moving the grout through the grout pipe to the bottom of the casing upward from the bottom of the borehole. Using this procedure, the annular space between the sidewall of the borehole and the casing will be filled from bottom to top in a uniform fashion displacing mud and debris with minimum sidewall disturbance.
3.5.5 When using the displacement method, 3.5.3, a tremmie pipe is inserted to the bottom of the borehole. Pump the grout using a conventional, circulating pump capable of moving the grout through the tremmie pipe to the bottom of the hole upward to displace the drilling fluid. Once the drilling fluid has been completely displaced from the borehole, the casing can be inserted.
3.6 Install the casing such that one-half (1/2) to one (1) foot of stickup above grade surface is provided. Install a cap with padlock and place a traffic cone over the top of the casing.
3.7 Examine the borehole mouth periodically for grout settlement and top off as necessary. Additional grout shall be inserted until the annular space is filled flush with the ground surface.
3.9 After 24-hours, remove anchoring from the casing, then remove all water from inside the casing. The Contractors shall then verify the verticality of the casing in the presence of the Engineer.
3.9.1 For the upper 50-feet of casing, insert a lighted plumb-bob observing its attitude at 10-foot intervals. If the plumb-bob strikes the sidewall, the depth and direction of deviation shall be recorded. The percent out-of-plumb shall be calculated as the distance from edge of plumb-bob at center to sidewall divided by depth of strike. This result shall be multiplied by 100. Casing installed less than or equal to 3% deviation from plumb shall be considered satisfactory.
3.9.2 For casings installed more than 3% out of plumb, Contractor shall have the option of surveying the casing using a slope indicator casing installed with centering devices inside the test casing, and a slope indicator device or abandoning the installation and installing a satisfactory casing at an alternate location and depth as determined by the Engineer. All costs associated with plumb survey and abandoned work shall be born by the Contractor.

4.0 PAYMENT ITEM

4.1 The basis for payment shall be the length of watertight, plumb casing installed to the satisfaction of the Engineer, measured from the ground surface to the bottom of casing and computed to the nearest one (1) foot.
4.2 The pay item for satisfactorily installed watertight casing conforming to these specification requirements shall be:

4-inch i.d. casing, grouted in-place ...... per lineal foot

5.0 INSPECTION

The Contractor shall notify the Engineer one business day prior to commencement of boring for casing installation. All work shall be observed by the Engineer or designated representative.

CME
Associates, Inc.

Subsurface Exploration Report
Milstein Hall Parking Garage at Cornell University
Ithaca, New York
CME Report No.: 26054B-01-0807

APPENDIX – F

Cornell University Milstein Hall Parking Garage Project

Looking south from north terminus of tunnel under University Avenue

Geotechnical Engineering Report

Central Avenue Parking Garage at Cornell University
Ithaca, New York

Prepared For: (Client)

Cornell University
c/o Desman Associates
Attn: Mr. David Palmer, Project Manager
49 West 37th Street
New York, New York 10018
Phone: 212.686.5360
Fax: 212.779.1654

Prepared By: (Geotechnical Engineer)

CME Associates, Inc.
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CME Report No.: 26054B-02-0907
September 6, 2007

Table of Contents
Report No. 26054B-02-0907

Attachment Listing:

CME Report No.: 26054B-01-0807 (120 pages)

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Geotechnical Engineering Report
Central Avenue Parking Garage at Cornell University
Ithaca, New York
CME Report No.: 26054B-02-0907
Page 1 of 12

1.0 INTRODUCTION

CME Associates, Inc. (CME) has completed a Subsurface Exploration Program, for the subject project and issued a Subsurface Exploration Report, labeled CME Report Number: 26054B-01-0807, (Report B-01) attached to this report. A detailed description of the project site surficial and subsurface soil, bedrock, and groundwater conditions, results of Seismic Shear Wave Velocity Testing, Summary of Laboratory Testing, bearing conditions of the existing Sibley Hall and Tjaden Hall foundations closest to new construction, available information about the abandoned underground tunnel, subsurface information relevant to this project obtained from previous subsurface explorations conducted by CME and others as part of other projects are documented in said report. The scope of work for this project was provided pursuant to the written acceptance of CME Proposal/Agreement Number: 05.2505 by Desman Associates (Desman-Project Architect) acting as agent for Cornell University (CU-Client). This report presents geotechnical information relative to the proposed Central Avenue Parking Garage, West of Milstein Hall West Wall (Line 12), as required by the Agreement, and more specifically as given below:

- Recommended type of foundation system best suited for the parking garage, including bearing capacities and elevations, and anticipated foundation settlement.
- Recommendations for handling groundwater during construction, and for the completed project.
- Seismic Site class (based on Downhole Shear Wave Velocity Testing) pursuant to the 2002 Building Code of New York State, and discussion of the potential for soil liquefaction and ground collapse during a seismic event.
- Filling and compaction requirements.
- Modulus of subgrade reaction for slab-on-grade design.
- Quality Control testing during earthwork operations and foundation construction.
- Requirements and suggested techniques for excavation, including rock excavation and blasting, if required.

CME is in contact with a local Specialty Contractor regarding retaining systems to facilitate the proposed project excavation. Also CME has requested additional information from CU, pertaining to the Sibley Hall foundations, to enable the selection of a suitable retaining system. Recommended retaining system and recommendations to protect existing building foundations will be presented under separate cover once CME has been provided with the requested information. Please note that recommendations presented in Report Section 3.5 and 3.7 may change depending on the type of retaining system used in this project.

2.0 PROPOSED DEVELOPMENT

The proposed development will include a 3-level (one grade-level and two underground levels) Parking Garage situate over the existing asphalt pavement parking lot, between University Avenue and existing Tjaden and Sibley Halls. The proposed Parking Garage will extend from the West end of the proposed Milstein Hall to Central Avenue. A portion of the Parking Garage is situate below Milstein Hall and will be designed and constructed as part of the Milstein Hall project. The main entrance to the lower levels of the garage will be accessed by ramps off of Central Avenue.

The structural design loads include a provision for future expansion. Please refer to the Boring Location Sketch, labeled BL-1, of Report B-01 for details of the proposed project scheme, at the time of this report preparation. Loading information on a preliminary structural grid was provided to CME by Desman. Based on the loading information, maximum unfactored column loadings will be 805 kips for columns on Line B and C, and 125 kips for columns on Line A and D. Maximum unfactored wall loadings along Line A and D will be 7.25 kips/foot.

3.0 GEOTECHNICAL ENGINEERING RECOMMENDATIONS

3.1 Site Characterization and Engineering Significance

1. The project involves excavation of a large deep hole. Excavations of about 18 to 25 feet will be required to achieve planned third-level underground parking (elevation 784 to 790). An underground tunnel exists at the site (please refer to Section 5.3 of Report B-01), which will be encountered within project excavation depth. Perched groundwater conditions exist above planned bottom of excavation. Sandy and Silty soils will tend to flow into open excavations continued below groundwater. The excavation also intercepts the zone of influence of existing foundations for Tjaden and Sibley Halls, thus, shoring, bracing and underpinning to prevent soil relaxation and damage to these existing buildings and the Public Street, University Avenue.

2. Fill and Miscellaneous Fill is present to depths of about 2 to 9 feet below existing grade, and consists primarily of earth, mixed with lesser amounts of Miscellaneous Debris such as Brick, Concrete, Asphalt, etc. Because of the high variability of Miscellaneous Fill, CME recommends that it be wasted off-site and not considered for re-use.

3. On-site native soils, below Fill and Miscellaneous Fill, consist of Silty Sand and Gravel, Silty Sand and Sandy Silt. The native soils to be excavated for this project are predominantly USCS[1] Classes SP, SM, GP, GM and ML. These soils may be sorted, stockpiled and re-used, outside the building excavation, if practical.

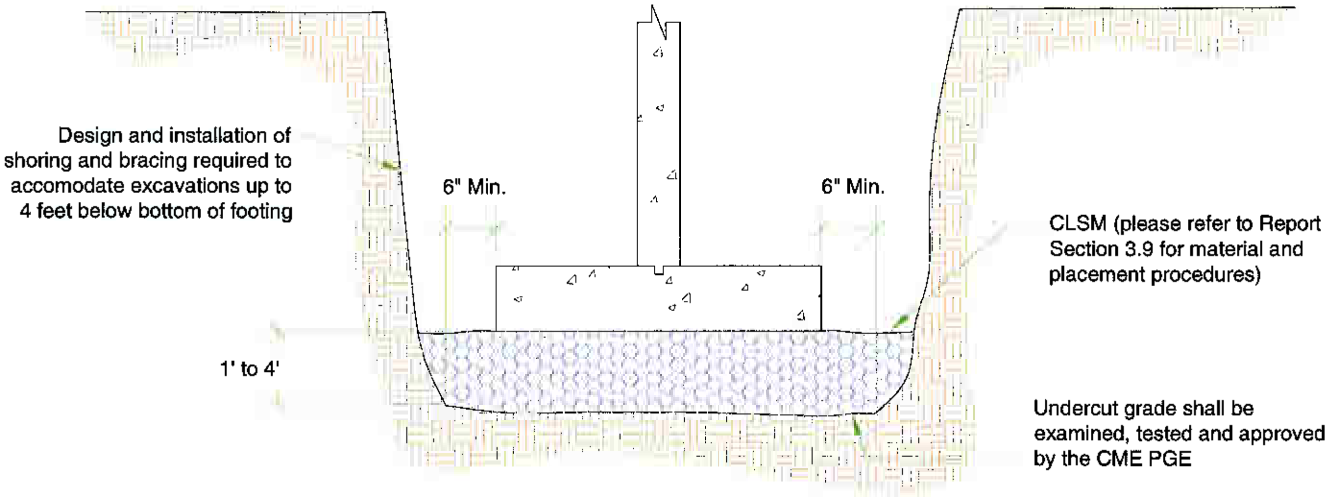
4. The soils to be exposed at bottom of excavation will consist of non to slightly plastic Silty Sand and Sandy Silt, which are sensitive to vibration and water. These soils will become muddy and loose strength in the presence of water and construction traffic, especially near the East end of the parking garage, where saturated soils and shallow perched groundwater are expected to be present. Excavation staging, strategic dewatering, and bearing grade protection will be required.

---

[1] USCS = Unified Soil Classification System

3.2 Foundation Support

A conventional spread and continuous footing foundation system may be utilized to support the proposed Parking Garage, West of Line 12. However, the satisfactory bearing soil depths are predicted to vary from 0 to 4 feet below a constant footing basal elevation. Two alternatives are available; 1) lower the foundations (i.e. step down) or 2) undercut and replace based on field examination and testing during construction. We recommend undercut/replacement methods be used. The Construction Documents should show a detail for a typical undercut (as shown below), and require design of shoring and bracing to accommodate excavation up to 4 feet deeper than bottom of footing in select areas.



3.2.1 Footing Grade Remediation

A typical footing grade remediation procedure (undercut), as would be determined during construction phase based on field examination and testing by a CME Professional Geotechnical Engineer (CME PGE), is given below:

1. Unsatisfactory bearing grades as determined by the CME PGE shall be undercut to firm satisfactory grade, and backfilled with Controlled Low Strength Material (CLSM, aka Flowable Fill).
2. Undercut shall be at least six inches (6") wider than the footing on all sides (ie., undercut width = footing width + twelve inches).
3. Undercut grades shall be examined and approved by the CME PGE, prior to placement of CLSM.
4. CLSM material specifications and placement procedures should conform to recommendations outlined in Report Section 3.9.

3.2.2 Design Soil Bearing Pressure

An Ultimate Bearing Capacity analysis based on Trezaghi's bearing capacity equation, and a series of settlement analyses based on Schmertmann's Method were conducted. The summary of the results were presented to Desman via an email on 09/04/07. CME contacted Mr. Debnath Bhattacharya, P.E. of Desman and discussed these results. Mr. Bhattacharya stated that a total settlement of about 1-¼ inches and a differential settlement of about 1 inch are tolerable for the proposed Parking Garage, and requested that CME present a Design Soil Bearing Pressure that corresponds to these magnitudes of settlement.

Because of the size and heavy weight of reinforcing cages expected for the footings, and the expected bearing grade soils, CME recommends that all footing grades should be protected by a nominal 4 inch thick Lean Concrete Mud Mat, placed immediately after bearing grade approval. The exception to the Lean Concrete Mud Mat is where undercut in excess of one foot is required. Table 1 may be used to proportion the project foundations.

TABLE 1-Soil Classification & Design Load-Bearing Capacity Required Pursuant to "BC-NYS 1802.6 Reports."[2]

Structure Name	Presumptive Soil Bearing Pressure	Applicable CME Test Borings	Minimum Footing Width
Central Avenue Parking Garage at Cornell University, Ithaca, New York	4000^{D}psf	B-1 through B-11 of 2007 and B-1, B-2, B-7, B-8, B-9 of 2003	2'-3"(exterior strip) 3'-3"(exterior spread) 4'-3"(interior spread)

General Notes To Table 1:

A. All footings shall bear on at least four inches (4") of lean concrete, placed over satisfactory bearing grade consisting of Silty Sand, Sandy Silt or Silt and Clay Soils, as approved in the field by the CME PGE.

B. All footings for unheated space bearing above third-level parking shall be constructed to bear at least five feet (5'-0") below final adjacent grade, for frost protection.

C. In accordance with the *BC-NYS*, the following materials shall not have footings constructed upon them; topsoil, mud, organic silt, organic clay, peat, unprepared fill, and unprepared miscellaneous fill.

D. Presumptive Soil Bearing Pressure must be confirmed in the field by a Licensed Professional Geotechnical Engineer.

Footings sized and positioned in accordance with the recommendations given in this report, are predicted to settle less than about one and one quarter inch (1-¼"), with differential settlement between adjacent footings predicted to be less than about one inch (1").

3.3 Seismic Site Class

Based on a computational analysis using the Seismic Shear Wave Velocity data obtained via Downhole Shear Wave Velocity Testing conducted at the site, and CME's interpretation of the Building Code of New York State, Section 1615, the proposed Central Avenue Parking Garage site at Cornell University in Ithaca, New York is defined as a "Stiff Soil Profile", representative of a Seismic Site Class "D". The CME Test Borings did not identify soils susceptible to liquefaction or sudden collapse during seismic loading conditions.

3.4 Slab-on-Grade

Slabs-on-grade are expected to be designed and constructed to rest on prepared, uniformly compacted granular aggregate base course placed over a subgrade that has been proofrolled and approved by a Licensed Professional Geotechnical Engineer.

Design of concrete slab-on-grade should be consistent with recognized standards such as ACI 360R *"Design of Slabs-on-Grade"*. Construction should be consistent with good industry practice using ACI Qualified Flatwork Finishers and recognized standards such as ACI 302.1R *"Guide for Concrete Floor and Slab Construction"*.

---

[2] BC-NYS is the 2002 edition of the Building Code of New York State.

3.4.1 Building Pad/Working Mat

In order to provide a trafficable working surface, CME recommends that a Building Pad consisting of not less than a 2 feet thick mat of Granular Fill be considered. The mat should be constructed over a layer of woven structural geotextile (such as Mirafi Model 500X). The bottom 8 inches should consist of Crushed Stone Aggregate (blend of NYSDOT, Table 703.1 Size No. 1 and No.2), exhibiting 100% fractured faces and conforming to the gradation given below:

Crushed Stone Aggregate Blend

Sieve Size	Percent Finer by Weight
1-½"	100
1"	90-95
½"	45-60
¼"	0-15

The top 16 inches should consist of Run-of-Crush Limestone or Run-of-Crush Gravel exhibiting at least 65% fractured faces (on the plus ¼" fraction) and conforming to the gradation given in Section 3.8.1, Fill and Backfill, Table 2, for Type 2 Material. The top should be placed in two lifts of equal thickness, with the lower lift compacted to not less than 92% Maximum Dry Density (MDD) and the upper lift compacted to not less than 95% MDD.

3.4.2 Subgrade Preparation

The above mat of Granular Fill should be placed over subgrade proofrolled using a two-ton steel drum roller, making at least two passes on static mode, in each of two perpendicular directions, on a dry day, free of rain. Proofrolling should occur in the presence of the CME PGE. The CME PGE will monitor the operation, delineate satisfactory and unsatisfactory areas, and recommend remediation procedures and materials for unsatisfactory areas.

3.4.3 Modulus of Subgrade Reaction

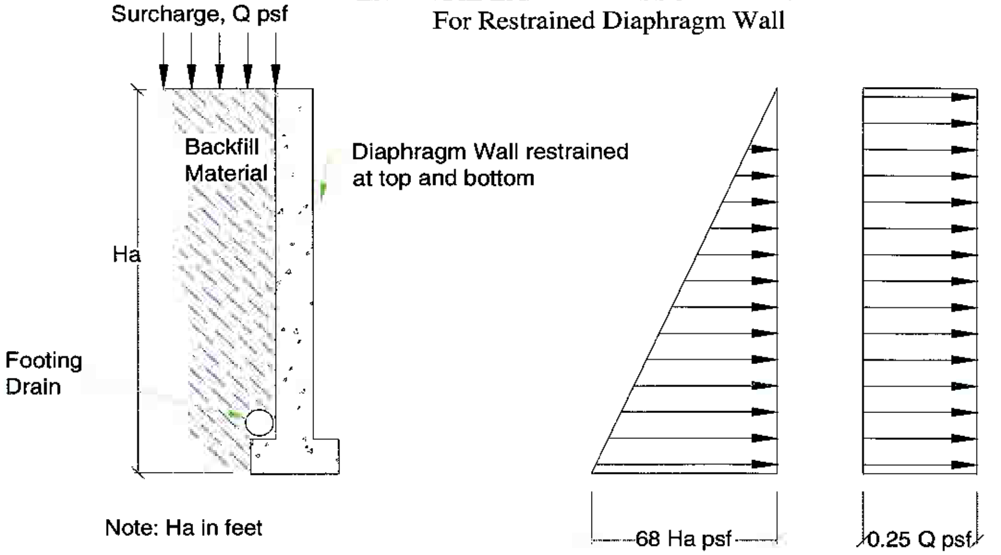
Slab-on-grade installed on the mat of Granular Fill and subgrade prepared as outlined in this Section 3.4 may be designed using a Modulus of Subgrade Reaction of 200 pci.

3.5 Lateral Earth Pressure

Please refer to the Lateral Earth Pressure Diagram given below for recommended lateral earth pressure distribution for the design of the below-grade walls for the proposed Parking Garage. The lateral earth pressure distribution diagram is prepared presuming the following:

- All below-grade walls are installed above the water table or will include a footing drain or other positive measures to prevent hydrostatic pressure buildup
- Finish exterior grade will slope away from the wall
- All existing foundations in close proximity to the proposed below-grade walls will be supported such that no lateral pressure will be imposed on these walls
- Backfill will be placed in compacted, quality controlled lifts consistent with good, workmanlike practice, as outlined in Report Section 3.8.

LATERAL EARTH PRESSURE DIAGRAM
For Restrained Diaphragm Wall



Typical Cross Section

Lateral Earth Pressure Distribution

3.6 Temporary Groundwater Management

Transient, seasonal and perched groundwater is predicted to be encountered within project excavation depths, especially near the East end of the site. Please refer to Section 4.3 of Report B-01 for more details. Where groundwater enters the excavation from sidewalls, it is likely to carry fine Sands and non-plastic Silts with it. This condition of ouzing soil and/or piping can create cavities in the soil mass outside the project excavation, thus leading to subsidence of earth, structures or grade surface outside the excavation perimeter. Careful monitoring of excavation dewatering discharge, the use of graded-aggregate filters, the installation of strategically placed groundwater control wells (outside of the excavation), and the use of cut-off walls to prevent water flow into the project excavation are expected to be necessary aspects of the Contractor's Excavation and Groundwater Control Plan. Water control and excavation staging is very important on this project, since the entire footprint of the project is inside the excavation and the soils at bottom of excavation will soften, become muddy, and yield when wet.

CME recommends that the Contract Documents require the Contractor to submit an Excavation and Groundwater Control Plan, which details and illustrates the Contractor's intended means, methods, sequences, and quality control measures for making the excavation and controlling groundwater. This plan should include narrative and sketches and be developed in concert with the shoring, bracing and underpinning support of nearby structures and roads.

3.7 Permanent Groundwater Management

The exploration indicate that precipitation is generally absorbed in green areas of the site, percolates vertically downward through more pervious soils, then perches above less pervious soils. The perched groundwater then flows Northerly and Westerly. The underground parking garage proposed at this site may intercept groundwater, and warrants careful consideration of permanent project improvements to prevent dampness and water intrusion into the structure. Below-grade perimeter walls should be waterproofed and drained to prevent hydrostatic pressure buildup.

CME recommends consideration of a complete sheet membrane waterproofing system such as the self-adhered sheet membrane system by Mirafi Model "Miradri" (or similar performance product) faced with a prefabricated drainage composite such as Mirafi Model "Miradrain 6000" (or similar performance product), for all subsurface walls to be backfilled on exterior side. A four inch diameter perforated pipe should be placed on top of the footing and wrapped with the Miradrain fabric wrap according to manufacturer instructions.

3.8 Filling and Backfilling

3.8.1 Fill and Backfill Material

Imported **Granular Fill** is required for filling and backfilling in all other structural areas. Imported **Granular Fill** quality and gradation should conform to that given in Table 2 of this Section for **Type 4 Granular Fill.**

Common Fill outside structural areas may consist of **satisfactory on-site borrow**.

Satisfactory on-site borrow is defined as inorganic soil material, with maximum particle size less than 4 inches, which exhibits a well-defined Moisture Density Relationship Curve and which conforms to Unified Soil Classification System (USCS) Classes GW, GM, GC, GP, SW, SM, SP and SC.

Unsatisfactory Materials include USCS Classes ML, CL, ML-CL, CH, MH, OH, OL, PT and Miscellaneous Fill, Organic Matter, Cobbles and Boulders.

Table 2: Gradation Specs For Granular Fill Materials

Sieve Size Designation	**Percent Passing by Dry Weight**			
	TYPE 1	***TYPE 2**	**TYPE 3**	**TYPE 4**
4 inch	-	-	100	-
3 inch	100	-	-	-
2 inch	90-100	100	-	100
¼ inch	30-65	25-60	30-75	30-65
No. 40	5-40	5-40	5-40	5-40
No. 200	0-10	0-10	0-10	0-10

*Material furnished for Type 2 shall consist solely of Crushed Stone, which is a product of crushing ledgerock and shall exhibit 65% fractured faces. Adapted from NYSDOT Standard Specifications, Section 304-2.02 Subbase Course Items.

3.8.2 Filling & Backfilling Methodology

All filling and backfilling to occur within structural areas must be accomplished in a workmanlike manner according to good industry practice. All filling and backfilling must be installed in a quality-controlled manner with pre-qualified materials and with quality assurance structural tests and special inspections conducted at regular intervals according to the Building Code Chapters 17 and 18, and the following methodology.

3.8.2.1 The areas to receive structural fill or backfill should be properly prepared then inspected prior to placement of fill.
3.8.2.2 Fill material shall be placed on a satisfactory and approved subgrade in a manner to minimize segregation. The fill should be placed in nearly horizontal lifts commencing at the lowest fill area elevation and proceeding with each lift upward and outward from the lower lift.
3.8.2.3 The moisture content of the material shall be adjusted prior to application of compaction such that it is within 2% of the Optimum Moisture Content.
3.8.2.4 The compacted lift thickness and minimum in-place field density shall conform to the requirements of Table 3. Soil in-place field density shall be determined using a nuclear density gauge in conformance with ASTM D2922 and D3017.
3.8.2.5 When the test results indicate that insufficient compaction has been obtained in any layer, the Contractor shall take action to modify or alter the moisture content of the soil, to provide additional compaction or otherwise to increase the in-place soil density. If the Contractor cannot obtain satisfactory compaction due to material properties, the Contractor shall remove the unsatisfactory material and replace with new material.
3.8.2.6 Materials contaminated by mud, debris, organics and/or any other deleterious materials shall be removed and replaced with uncontaminated specified material.
3.8.2.7 No Fill shall be placed over an area or lift of fill that has not been tested and achieved satisfactory results.

Table 3: Compaction & Lift Thickness Requirements

Minimum In-Place Density*	Range of Compacted Lift Thickness (inches)	Fill Area Description
95%	8 to 10	Confined areas
95%	10 to 12	Unconfined areas, mass fill areas

*As determined using ASTM D1557, Modified Proctor.

3.9 Controlled Low-Strength Material (CLSM)

3.9.1 Description

Controlled Low-Strength Material (CLSM) aka “Flowable Fill” is a slurry backfill composed of fly ash, cement and water which shall exhibit a 28 day compressive strength of not less than 200 psi, when placed at a slump of 10 to 11 inches.

3.9.2 Materials

The fly ash shall be tested for toxicity pursuant to a testing protocol approved by New York State Department of Environmental Conservation (NYSDEC) and certified to be non-toxic. The Engineer shall be provided with a copy of documentation issued by NYSDEC attesting to its conformance with applicable NYSDEC rules and regulations. The materials used for slurry backfill material shall meet the requirements of the following subsections:

- ✓ **Portland Cement**, Type 1 meeting ASTM C150
- ✓ **Water** – shall be Clean and Potable
- ✓ **Fly Ash** shall conform to the chemical and physical requirements for mineral admixture, Class F listed in ASTM C618 including Table 2 (except for Footnote A). The loss on ignition shall be waived.

3.9.3 Construction Details

Prior to use of any CLSM backfill material the Contractor shall submit to the A/E, results of independent laboratory tests, or results of tests made previously on slurry backfill used for other work. Test results shall show source and type or class of materials, batch proportions and conformance to the strength requirement. The method of placing of CLSM backfill material shall be as approved by the A/E in the pre-installation conference and shall be verified in the field by the Inspecting Geotechnical Engineer.

3.9.4 Method of Measurement

Payment for CLSM backfill material will be made for the number of satisfactorily placed cubic yards computed between the payment lines shown on the plans or from payment lines established in writing in the field by the CME PGE.

3.9.5 Basis of Payment

The unit price bid per cubic yard includes the cost of furnishing all labor, materials and equipment necessary to complete the work. The work includes excavation to depth and width directed by the Inspecting Geotechnical Engineer in the field, removal/disposal of soil spoils, the furnishing and placement of fill to proper grade, and the CLSM achieving required strength.

3.9.6 Satisfactory Alternative Material

Portland Cement Concrete with Slump of 6 to 8 inches and a 28 day Compressive Strength of 1500 psi.

3.9.7 Quality Assurance

Six cylinders shall be cast for every pour or each truckload of CLSM backfill, whichever is more. Test 3 cylinders at 7 days and 3 at 28 days.

3.10 Soil and Foundation Special Inspections

The ***2002 Building Code of New York State (BC-NYS)*** requires special inspections and structural tests to test and verify site preparation, fill placement and foundation load-bearing requirements (ref: *BC-NYS 1704.7 Soils*).

We have prepared Table 4 to satisfy the Foundation Special Inspection and Structural Testing provisions of the *BC-NYS* and this report.

Table 4 – Schedule of Foundation Special Inspection & Structural Testing
Central Avenue Parking Garage at Cornell University, Ithaca, New York

Item Number, Verification, Test and Inspection Description	Required Frequency and Inspector Qualification	References and Standards
1. Verify and monitor Structural Backfill/Fill placement, check lift thickness, conduct In-Place Field Density Tests or fabricate cylinders on CLSM Fill (See 3.9.7), and report to CME PGE on a daily basis.	Continuously by NICET Certified Technician. One in-place test per lift per 1,500 square feet of area and one in-place test per lift per 25 linear feet of trench or wall (per-side) area.	Geotechnical Report, ASTM D1557, D2922, and D3017. NYBC 1803.5, 1704.7.2 and 1704.7.3.
2. Witness proofroll following removals and prior to placement of any fill.	Continuously by CME PGE	Geotechnical Report
3. Examine, test, classify, and verify satisfactory bearing grade, or undercut depth, prior to placement of lean concrete or CLSM Fill for footings.	Continuously as footing excavation progresses by CME PGE	Geotechnical Report, ASTM D2487, NYBC 1704.7.1, 1803.5 and 1804.2.

Geotechnical Report = Geotechnical Engineering Report by CME Associates, Inc., CME Report No. 26054B-02-0907
PGE = Professional Geotechnical Engineer, a New York licensed P.E.
NICET = National Institute for Certification in Engineering Technologies. A Level II Certified Engineering Technician in Soil Construction Materials or Geotechnical Constructions.
*The Testing Agency providing these Special Inspections and Structural tests shall be Accredited to demonstrate compliance with ASTM E329-03 to conduct soil and aggregate materials testing. The agency shall possess written approval by the Code Enforcement Official (CEO) and file written proof of current accreditation by a recognized national accreditation authority with the CEO and the Registered Design Professional.

Approved Agency:
Items 1 to 3: CME Associates, Inc.
Mr. Tom Hamilton
Elmira, New York
Phone: 607.739.4033
Fax: 607.739.4085

By: Marcus A. Rotundo, P.E., Registered NY #059582
Registered Design Professional-Geotechnical

4.0 IMPORTANT OTHER CONSIDERATIONS

We present the information in this section to our Clients, so they may acquire a better understanding of CME's geotechnical engineering professional practice and the limitations associated with its application to the Project.

4.1 These Analyses and Recommendations Are Preliminary

The analysis and recommendations contained in this report are preliminary and are based on the specific data obtained from the referenced subsurface explorations. The explorations indicate subsurface conditions only at the specific locations and times, and only to the depths penetrated. They do not necessarily reflect strata variations that may exist between such locations. The validity of the recommendations is based in part on CME's assumptions about the stratigraphy and information about the planned construction as provided to CME by others. **Such assumptions may be confirmed only during the construction phase earthwork.**

For these reasons, we believe that it is in Client's best interest to hire CME to provide the geotechnical inspections relative to the Project's site preparation, foundation construction, and earthwork, wherein this Report will likely be used as the Reference Document for ascertaining compliance (reference: *2002 Building Code of NYS,* 1702, *Definitions, Special Inspection, and 1704.7, Soils*) and, most importantly, to confirm and verify these preliminary analyses and recommendations.

The Client should be aware that CME is relieved and released from the liability and responsibility for the adequacy of these preliminary recommendations when CME is not hired during the construction phase.

4.2 Project Changes

CME has generally described our understanding of the planned Project improvements at the time this report is published. We all know that projects change during design phase and even during the bidding/negotiating/value engineering phases. Substantial changes consist of many items such as, but not limited to, bearing elevation, floor elevation, planned depth of cuts or fills, decreased or increased design loads, building footprint growth or shrinkage, building location movement, time period of construction (compression or relaxation), and addition or deletion of sublevel (basement or crawlspace) area, among others. Please advise CME of substantial changes so we can revisit our analyses and recommendations. It could save you time and money, and result in a higher quality construction project. Obviously, CME cannot be held responsible for the applicability of recommendations made by us before substantial project changes occur, when CME is not aware of the changes.

4.3 Standard of Care and Warranty

We have endeavored to conduct these services in a manner consistent with the level of care and skill ordinarily exercised by members of the geotechnical engineering profession practicing contemporaneously under similar conditions in the locality of the project. No other representation, express or implied is made. Under no circumstances is any warranty, express or implied, made in connection with the providing of geotechnical engineering services.

4.4 Closing Comments

It is a violation of the law for any person unless he is acting under the direction of a licensed professional engineer to alter this document in any way. Alterations must have the seal affixed along with a description of the alterations, the signature and date.

Please contact our office if you have any questions regarding this report, its conclusions, its recommendations, or its application to actual field conditions revealed during construction.

Anasthas Navaratnam, I.E.

Marcus A. Rotundo, P.E.

Attachment Listing:

CME Report Number:26054B-01-0807 (120 Pages)

CME
Associates, Inc.

P.O. Box 1824
8560 Brewerton Road
Cicero, New York 13039
(315) 698-9315
(315) 698-9319 (Fax)

www.cmeassociates.com

November 16, 2007

Cornell University
c/o Desman Associates
Architects, Engineers, Planners
49 West 37th Street ~ 5th Floor
New York, New York 10018

Attn: Mr. David Palmer, Project Manager

Re: Central Avenue Parking Garage at Cornell University
Ithaca, New York
CME Report No.: 26054B-03-1107
Page 1 of 2

Gentlepeople:

CME Associates, Inc. (CME) conducted a subsurface exploration program for the subject project and issued CME Reports labeled 26054B-01-0807 (B-01 Report) and 26054B-02-0907 (B-02 Report). Recommendations for a spread and continuous footing foundation and slab-on-grade system was presented in B-02 Report. An Allowable Soil Bearing Pressure of 4000 psf was presented for foundation design, and a Subgrade Reaction Modulus of 200 pci was provided for slab-on-grade bearing on a two foot thick working mat, which will be required to facilitate this construction.

Mr. Debnath Bhattacharya, P.E. of Desman Associates recently contacted CME and stated that the foundation scheme has changed now, and that a mat foundation is planned as shown on the attached sketch, provided by Mr. Bhattacharya.

Mr. Bhattacharya requested that CME provide subgrade preparation and subgrade reaction modulus for soils to be anticipated at bearing elevation. Since the structure will be constructed in four to six segments, subgrade reaction modulus at various locations may be used in the design, according to Mr. Bhattacharya.

CME revisited B-01 and B-02 reports and the available subsurface information to provide the following recommendations:

Subgrade Preparation and Subgrade Reaction Modulus

1. Excavate to planned subgrade elevation minus 4", using a backhoe bucket equipped with a smooth cutting blade. Excavate only an area which can be covered by concrete mud mat on the same work shift as excavation.

2. Obtain subgrade approval from a Licensed Professional Geotechnical Engineer (PGE). A proofroll may be required at the discretion of the PGE.

3. Following grade approval by the PGE, place a 4" thick concrete mud mat.

Subgrade soils examined and approved by the PGE is expected to exhibit a subgrade reaction modulus of 100 pci for areas East of Column Line 4.5, and 200 pci for areas West of Column Line 4.5.

All other recommendations, closing and limitations statements of referenced reports still apply.

Respectfully Submitted,
CME Associates, Inc.

Anasthas Navaratnam, I.E.
Geotechnical Engineer

Reviewed By,
CME Associates, Inc.

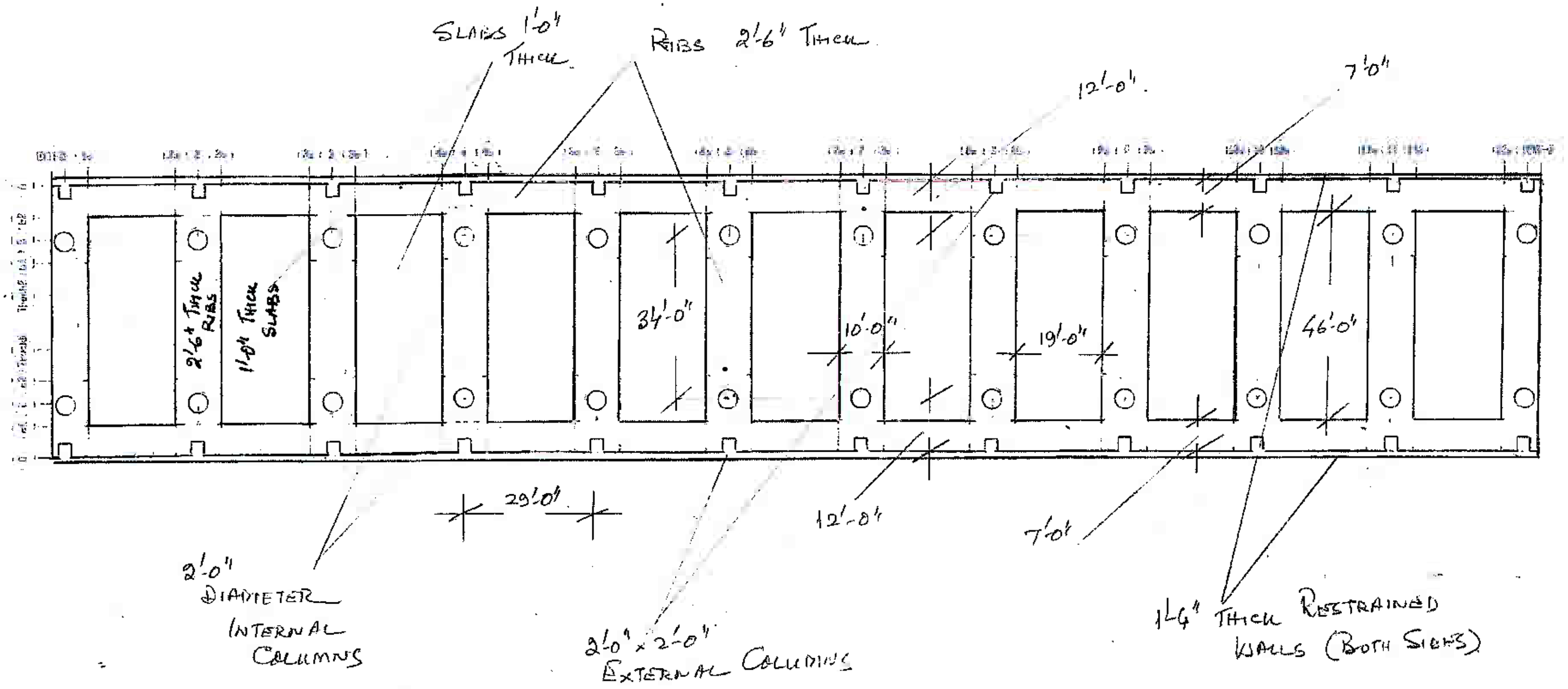
for.

Marcus A. Rotundo, P.E.
Senior Geotechnical Engineer

AN.nlc

Attachment: Sketch-1 (1 page)

MAT FOUNDATION - SCHEMATICS



SAFE v8.1.0 - File: Basement+Superstructure-1C-Safe-100107 - November 2,2007 12:03 - Scale: Fit to Page
Structural Layer Plan View - Kip-in Units

Attachment to core report No. 260548-03-1107.

Study and Report for Stability of Earth Slopes North of University Avenue Between Foundry and Johnson Art Museum at Cornell University

Prepared For: (Client)	**Cornell University** **c/o Desman Associates** Attn: Mr. David Palmer, R.A. 49 West 37th Street New York, New York 10018 Phone: 212.686.5360 Fax: 212.779.1654
Prepared By: (Geotechnical Engineer)	**CME Associates, Inc.** Marcus A. Rotundo, P.E. Anasthas Navaratnam, I.E. P.O. Box 1824 Cicero, New York 13039 Phone: 315.698.9315 Fax: 315.698.9319

CME Report No.: 26055B-01-0108
January 18, 2008

Re-issued 6/23/2008

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Appendices:

Study and Report for
Stability of Earth Slopes North of University Avenue Between Foundry and Johnson Art Museum at Cornell University
CME Report No.: 26055B-01-0108

1.0 INTRODUCTION

This Report details the results of a study conducted by CME Associates, Inc. (CME) for Desman Associates and Cornell University. The subject of the study is the South Earthen Slope of Fall Creek Gorge located on the Cornell University Campus in Ithaca, New York, and bounded by the Foundry on the East and Johnson Art Museum on the West.

1.1 Study & Report

This Study and Report is intended to evaluate the likelihood of earth slope failure due to planned new construction. Three building projects are currently planned that are considered in this Study. They are, the Milstein Hall Building, the Central Avenue Parking Garage, and the Johnson Art Museum Addition. After commencement of this Study, Desman requested that CME's slope analyses include an evaluation of the existing condition (loadings) of University Avenue. Since University Avenue is located between the slope and the proposed building projects, CME agreed to this request and the results are included herein. This Study and Report are provided pursuant to acceptance by Desman of CME Proposal/Agreement No.: 05.2505. This Study does not include evaluation of the bedrock and rock faces or surfaces within Fall Creek Gorge, nor does it include discussion or recommendations relative to mitigation or resolution of identified conditions. The field work and analyses given in this Study and Report were performed by CME over the period of August to September of 2007.

1.2 Background

The Milstein Hall Building, being designed by the Office of Metropolitan Architecture, was at 100% DD Phase, but recent concept changes indicate that the footprint of the foundation level of this structure will be located just South of the University Avenue curb line. A portion of the Building Superstructure will cantilever over University Avenue. CME is currently engaged by agreement with Cornell University to provide geotechnical engineering services for the Milstein Hall Project. This Study presumes that all Milstein Hall foundation loads will be situated South of the University Avenue south curb line.

The Central Avenue Parking Garage, being designed by Desman Associates, is planned to be two levels below grade, accommodating a future Superstructure Addition. CME is engaged by Desman to provide design phase geotechnical engineering services on the Central Avenue Parking Garage Project. This Study presumes a building footprint as given on Site Plan, labeled Drawing B-100, dated July 2007, by Desman Associates.

The Johnson Art Museum Addition Architectural Drawings (A1.00, A1.01, A1.02, A1.04, A1.05, A1.06, A1.07 and A1.08), dated April 13, 2007, were emailed to CME by Cornell University on 09/24/07. The Addition will be single story with a two-level basement (two below-grade floor levels and a grade-level floor). Design loading and structural grid information for this Addition was estimated by CME for this Study (ref: Appendix G – Model A).

A Feasibility Study for Improvements to University Avenue was just getting underway in September 2007. CME understands that a potential widening of the road and appurtenant (i.e. curb, sidewalks, retaining walls, etc.) improvements may be considered. Specifics and details were unknown at Report time. This Study evaluates the Existing (9/07) Loading Conditions for University Avenue.

1.3 Resource Information

In addition to the project specific exploration, testing and site reconnaissance conducted by CME, the following listing contains other information, some of which is relevant to this Study. We have extracted several specific exhibits and reproduced and appended them to this Report for ease of reference. For complete information and content, please refer to the resource documents.

- CME Reports 26000B-01-0307 and 26000B-02-0707 for Milstein Hall.
- CME Reports 26054B-01-0807 and 26054B-02-0907 for Central Avenue Parking Garage.
- Topographic Survey Maps, no date, entitled Horizontal Alignment of University Avenue, Proposed Plan, provided by Desman on 09/04/07.
- Slope Cross Sections, based on TG Miller 2007 Topographic Survey, LWM 1988 Topographic Survey and Baker 1996 Topographic Survey provided by TG Miller. (see Appendix E)
- Geotechnical Engineering Report, entitled Rehabilitation of Foundry Building by Gifford Engineering (2006 Gifford Report).
- University Avenue Rehabilitation Report, prepared by Gary L. Wood, P.E. (1996 Wood Report).
- Geotechnical Engineering Feasibility Study of Foundry Site, by Empire Soils Investigations, Inc (1988 ESI Report).
- Site Investigation Report, Art Museum-Cornell University, by ESI (1969 ESI Report).

2.0 EXECUTIVE SUMMARY

CME's computational analyses of deep seated (global) slope stability caused by building loads and planned foundations for the proposed Milstein Hall, the Central Avenue Parking Garage and the Johnson Art Museum Addition, yielded satisfactory safety factors against deep seated slope failure under static and dynamic loading conditions.

Likewise, CME's computational analyses of deep seated (global) slope stability caused by the existing loads of University Avenue resulted in satisfactory safety factors against deep seated failure under static and dynamic loading conditions.

CME's computational analyses of shallow (local) slope stability of the existing earth slopes resulted in unsatisfactory safety factors against local slope failure under static and dynamic loading conditions.

The results of CME's computational analyses were compared with existing physical evidence of failure, by examination of the slopes at or near the model cross-sections. Physical evidence confirms that local slope failure is historic and on-going. CME observed existing stormwater management practices and man-made detriments on or influencing the slope, which may tend to promote or serve as catalyst to observed local slope failure.

CME also observed that some portions of the North Sidewalk and westbound lane of University Avenue exhibited distress associated with local slope failure or creep, such as surface cracking of pavements parallel to contours, subsidence of surface features, and apparent translation of surfaces in the direction of the Gorge.

CME is recommending affirmative contemporaneous action by Cornell University to develop and implement a comprehensive resource management plan for the Fall Creek Gorge within its campus. Such a plan would, by necessity, include provisions for abating or reversing any past practices which may have contributed to local slope failure, thus reducing the incidence and frequency of man-induced local slope failure. Naturally occurring slope failures will continue, the incidence and initiation, or progression of, will be influenced by variation in extremes of prevailing climate changes, weather and other factors over which humans have little or no control.

3.0 SUBSURFACE EXPLORATION

3.1 Overview

CME's 2007 subsurface exploration for this Study and Report consisted of advancing three Test Borings, labeled GB-1 through GB-3, and conducting laboratory testing of selected samples in CME's AMRL[1] Accredited Syracuse Facility.

Subsurface information obtained from CME's 2003 and 2007 exploration programs, conducted for the proposed Milstein Hall Project, were reviewed, and relevant information is included here. Test Boring Logs, labeled B-1 (2003) through B-9 (2003) of the 2003 exploration and Test Boring Logs, labeled B07-10 and B07-11A of the 2007 exploration are also included in Appendix B.

CME Subsurface Exploration Report 26054B-01-0807 prepared for the proposed Central Avenue Parking Garage was reviewed, and Test Boring Logs, labeled B-1 (2007) through B-11 (2007) of the 2007 exploration program are included in Appendix B.

A review of the 1996 Wood Report was made, and subsurface information given on Test Boring Logs B96-1, B96-2, B96-3, B96-5 and B96-8 and laboratory test results were used. These boring logs are reproduced in Appendix C.

The 2006 Gifford Report and the 1969 and 1988 ESI Reports were reviewed and relevant subsurface information from these reports is included in Appendix C. Approximate locations of these Test Borings are shown on the Boring Location Sketch provided in Appendix A.

CME also measured groundwater levels in the existing groundwater monitoring wells installed by others. These monitoring wells are labeled as MWB-1 and MWB-2 and approximate locations are shown on the Boring Location Sketch.

3.2 Exploration Means and Methods

This section focuses on CME's 2007 exploration program conducted between 08/20/07 and 08/28/07, for this Study and Report, only.

3.2.1 Test Boring Exploration

The Test Boring locations were selected by the CME Geotechnical Engineer. The boring locations were staked in the field by CME, based on a Topographic Map, labeled Sheet 2 of 3, dated 07/13/07, provided to CME by Desman. Elevation at grade at each exploration location was determined by CME using standard survey equipment and referencing an on-site Benchmark being the rim of a catch basin, elevation 810.40. Please refer to the Boring Location Sketch for the as-drilled boring locations.

---

[1] **AMRL** – American Association of State Highway & Transportation Officials (AASHTO) Materials Reference Laboratory. AMRL is a Federal Agency having jurisdiction to assess laboratory competence according to the Standards of the United States. **CME** Cicero accreditation includes tests of Portland Cement Concrete, Aggregate and Soil Materials. www.amrl.net

The borings were advanced using a Central Mine Equipment Model 55 rotary exploration drill rig, equipped with 3-¼" I.D. hollow stem augers. Soil Sampling and Standard Penetration Testing (SPT) were conducted utilizing a 140-pound automatic (mechanical) hammer dropping through a distance of 30 inches to drive a 2-inch O.D. split barrel sampler. This test method is described in ASTM Standard Practice D-1586.

The boring samples were logged and visually classified in the field by the CME Driller, and a portion of each soil sample was placed and sealed in a glass jar. The visual soil classifications were made using the modified Burmister Classification System as described in the Appendix B document entitled *"General Information & Key to Test Boring Logs"* (referenced herein as *Key*). The soil classifications were later reviewed by a CME Geotechnical Engineer.

Bedrock cores were extracted at four boring locations, once borings had penetrated into the bedrock, and upon auger and sampler refusal. An NQ wireline core barrel was used to extract the cores in general conformance with ASTM D-2113 *"Standard Practice for Diamond Core Drilling for Site Investigation"*. A CME Geologist and the CME Geotechnical Engineer examined each rock core, evaluated rock quality, and provided a classification using the terminology outlined in Tables 3 and 4 of the *Key*. Bedrock cores were placed in segmented wooden core boxes. Photographs of each core are given in Appendix A.

3.2.2 Laboratory Testing Program

CME selected soil samples which were subjected to laboratory testing. The laboratory test results are used to index and characterize each soil stratum. Laboratory Test Summaries are included in Appendix D.

4.0 SUMMARY OF SUBSURFACE SOIL, BEDROCK AND GROUNDWATER

4.1 Geologic Deposition

The slope being investigated is generally located North of the Foundry, Sibley Hall, Tjaden Hall and Johnson Art Museum, between University Avenue and the Fall Creek Gorge. Several foot trails and a stair, leading to the Pedestrian Bridge over the Fall Creek Gorge, are present on the slope. A brick-arch tunnel which runs underneath University Avenue in the North/South direction daylights at the slope surface at about elevation (tunnel bottom elevation) 795.

The slope is covered by mature forest exhibiting a single high canopy and little to no undergrowth. The top of slope near University Avenue varies from about elevation 810 to 785, and slopes down at about 1H:1V to 2H:1V to about elevation 740 to 720, where Bedrock outcrops, and drops down at slopes as steep as 0H:1V (vertical face). Bedrock gorge faces East and South of the Pedestrian Bridge exhibit concave (undercut) profile.

The natural stratigraphy at this site consists of sedimentary Bedrock overlain by Glaciolacustrine overburden soils, consisting of Glacial Till, overlain by pre-consolidated (i.e. has seen past pressure greater than present overburden pressure) Lacustrine Clays and Silts (Clayey Silt and Silty Clay), overlain by normally-consolidated (i.e. has not seen past pressure greater than present overburden pressure) Lacustrine Sands, Gravels and Silts (Silty Sand and Gravel, Silty Sand and Sandy Silt).

4.2 Subsurface Profile at Cross-Sections

CME used the field observations, the previously identified subsurface explorations, and engineering judgment to develop a cross-section for analysis at each of three locations. These cross-section locations, designated A, B and C, are shown on the Boring Location Sketch.

The Subsurface Profile for each cross-section is illustrated in Figures 1 through 3. Each cross-section is a composite estimate of the topography and subsurface characterization developed by CME, illustrated in two dimensions along a vertical plane described by the line shown on the Boring Location Sketch at the designated location.

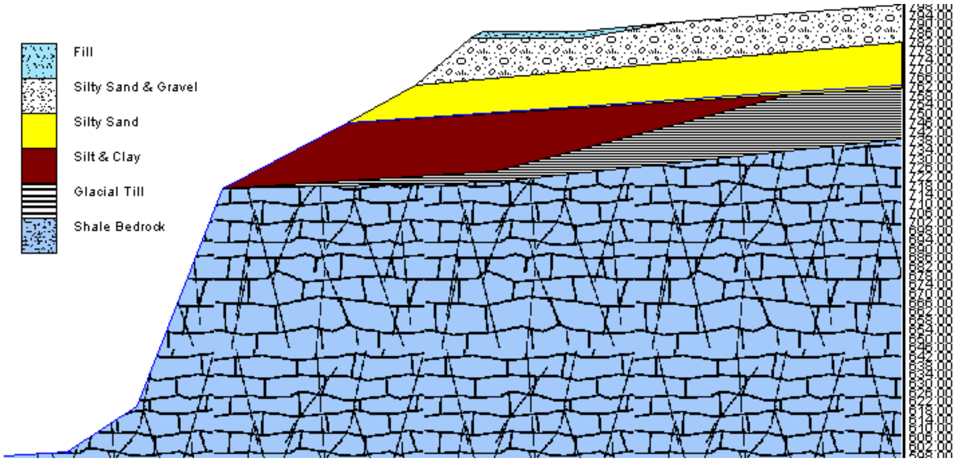

Figure 1: Subsurface Profile along Cross Section A

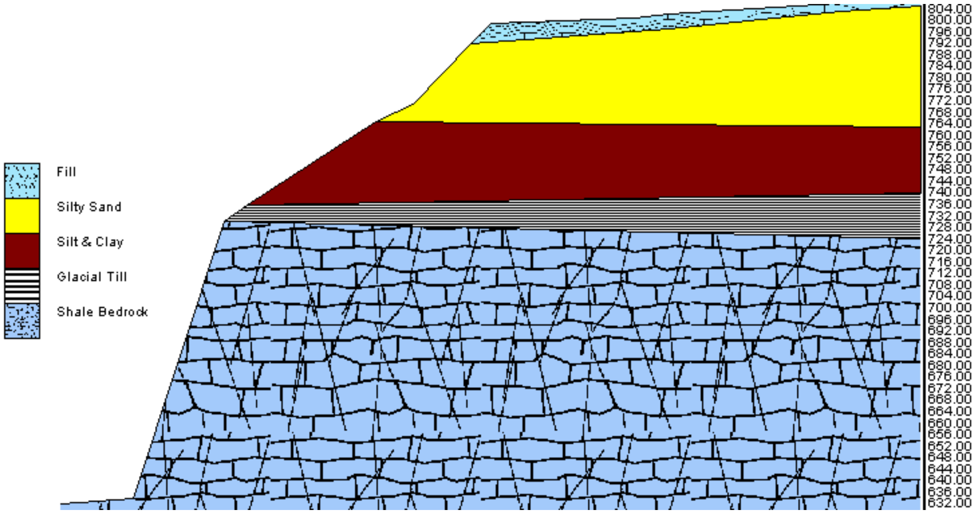

Figure 2: Subsurface Profile along Cross Section B

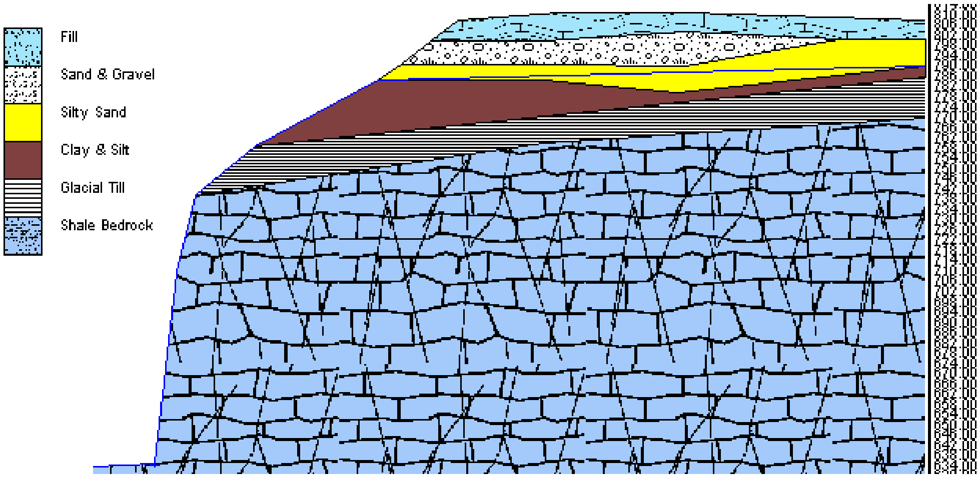

Figure 3: Subsurface Profile along Cross Section C

4.3 Strata Descriptions

In this Section, we present a narrative description of each stratum, in approximate order of encounter from existing grade surface.

Stratum 1 – Fill/Miscellaneous Fill

Fill and Miscellaneous Fill is an unprepared, random, heterogeneous mixture of soil or soil and debris such as Brick, Cinders, Asphalt, etc. Fill varies greatly in composition, density, and character.

Stratum 2 – Lacustrine Sands, Silts and Gravels

This stratum consists of Silty Sand and Gravel, Sandy Silt and Silty Sand layers, which resulted from a lake sedimentation process in a glacial lake environment. These deposits are normally-consolidated and non-plastic and have USCS[2] Classes SP, SM, SW, GP, and GM. The Silty Sand and Sandy Silt are poorly graded and consist primarily of particles with a grain size close to that of fine Sands. Based on Standard Penetration Testing (SPT), the Sandy and Gravelly intervals of this stratum have a relative density of very loose to very compact, and the Silty intervals are medium stiff to hard in consistency.

These soils were examined by naked eye and under a microscope at low power to ascertain angularity of coarse-grained particles (reference ASTM D2488, Table 1 and Figure 3). This exam revealed that the Lacustrine Sands are chiefly sub-rounded to sub-angular and the Lacustrine Gravels are chiefly sub-angular to angular. The observed angles of repose of these deposits in the Study Area are supported by these observations of particle angularity.

Stratum 3 – Lacustrine Clays and Silts

Below Stratum-2, Silty Clay and Clayey Silt layers were identified, which are a lacustrine sediment formed by deep glacial, or post-glacial lake deposition. The consistency of this stratum varies from medium stiff to hard, based on SPT, with the medium stiff intervals, generally found in the upper portion of this Stratum. Atterberg Limits testing conducted on several soil samples retrieved from this Stratum indicate that this Stratum is slightly-plastic to plastic and has a USCS Class of CL (Lean Clay). Natural Moisture Content testing performed on the Atterberg Limits samples revealed that the moisture content is generally well below the liquid limit of the soil. This may indicate that the Clay is pre-consolidated. According to Cornell University resources, the Over Consolidation Ratio (OCR) of similar strata around the Cornell Campus is 1.2 to 1.5. Pocket penetrometer test results approximate unconfined compressive strength and are useful in estimating shear strength of cohesive soils. Pocket penetrometer test results ranged from 1 to 3.5 tons per square foot (tsf), with a median result of less than 1.5 tsf.

Stratum 4 – Glacial Till

Glacial Till is a dense, unsorted, heterogeneous mixture of Silt, Clay, Sand, Gravel, Cobbles and Boulders, formed from glacial deposition and subsequent consolidation by the glacier. The Till has a consistency of very stiff to hard, based on SPT.

Stratum 5 – Shale Bedrock

Weathered to highly weathered or decomposed Bedrock was penetrated in several CME Test Borings, using standard earth drilling tools, to about one to five feet, where auger and sampler practical refusal was met. Material retrieved from the drive sampler consisted of Rock Fragments and/or Rock Flour. SPT N values in this layer were over 100.

Bedrock cores were obtained from all three Borings advanced for this Study and Report and from several CME Test Borings advanced for the Milstein Hall and the Central Avenue Parking Garage Projects.

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[2] USCS = Unified Soil Classification System

The Shale Bedrock, has many ruler-straight joints, and contains many vertical to near vertical cracks or joints, some of which were sampled by CME's exploration.

The Bedrock is generally thinly bedded to bedded (i.e. near horizontal natural breaks in rock layers spaced at 1 to 12 inches apart), and is medium hard (i.e. scratched easily by pen knife). The Bedrock surface dips Westerly at Cross-Section C, Southwesterly at Cross-Section B, and Northerly at Cross Section A. A Bedrock Contour Map is included in Appendix A, Drawing BC-1. This map illustrates that the Bedrock Surface is irregular and does not exhibit a well-defined dip or slope direction.

4.4 Groundwater Observations

Groundwater observations in CME Boreholes, and as recorded by others on Test Boring Logs or wells generally indicate transient or perched water conditions within the earth mantle overlying Bedrock at the subject site. CME has not encountered a static groundwater table in any of the 2003 or 2007 series explorations considered applicable to this Study.

A perched water condition occurs where groundwater flows and collects in a more pervious soil overlying a relatively impervious material. At the subject site, water is generally present in Sandy soil immediately above Clayey soil.

Since the subject site is situated on a Bedrock bench at the edge of the Fall Creek Gorge, it is likely that groundwater is flowing generally northerly and westerly towards the Gorge and Valley. Observations of groundwater in Test Borings indicate the presence of perched water conditions where more pervious strata exist over less pervious strata. The levels at which these conditions exist vary significantly and the presence of flow of groundwater depend upon many conditions, such as, but not limited to, seasonal changes, prevailing climate, precipitation, and nearby construction operations.

4.5 Erosion/Formation of Fall Creek Gorge

Although the scope of this Study does not include an evaluation of the stability of the Bedrock faces of the gorge, the reader needs to understand the formation of the Gorge, as the erosion and shaping of the Gorge is a continuing and constantly changing natural process.

Obviously, if the Bedrock foundation underlying the subject earthen slope gives way, the earthen slope will be compromised also. CME's exploration sampled Bedrock and retrieved specimens containing vertical to near vertical fractures or joints. Visual examination of Fall Creek Gorge shows these ruler-straight cracks and joints. Please refer to Appendix F for illustrative photographs of the Gorge.

The *New York State Geology* website gives an excellent description of this "Llenroc" and the formation of Fall Creek Gorge. It is excerpted below:

Some of the gorges were likely cut during earlier interglacial times, filled with glacial sediment during ice advances, and then re-cut since the last glacial retreat. Erosion of the gorges appears today to be slow and gradual. There are rounded pebbles worn smooth by the water and occasionally rounded holes in the stream beds (plunge pools and potholes) that have been scoured out by the water. But things are not always as they seem. The flow of the streams in upstate New York is highly seasonal, with high volume in the spring from snowmelt and low volume in the summer and fall. More erosion is likely to happen when there is more water flowing in the stream. Look carefully at the rocks themselves and you will see other signs that erosion is not always constant and gradual. The rocks around Ithaca are cut by thousands of ruler-straight cracks, which look like they have been cut with a saw. These are natural fractures called joints. They are caused by stress of rocks on an enormous geographic scale, due to the collision of the continents more than 250 million years ago. These joints form weaknesses in the rock of the gorge walls. Water flows into the cracks, freezes and expands. Eventually, catastrophic failure occurs and a rockslide happens. The broken rocks are then moved downstream by spring floods and eventually out into the main valley or lake. Look at the fracture patterns in the walls of the gorges. Look at the piles of rocks at the bases of the walls. The gorges have formed by this system of small catastrophes and variation of flow in the streams."

Such vertical joints are not of concern when located well-within the massive Bedrock formation, however, vertical joints do pose problems when present near a gorge, as they are a plane of weakness which, through natural means, cause rock falls and slides.

An undercut bedrock profile is present in the south face of the gorge near the plunge pool, immediately below the upper falls and where Fall Creek's direction changes abruptly from southerly to due west. See the Site Recon Key Map in Appendix F for location. The undercut (and overhang) profile is due to several factors including, erosion and weathering at or near creekbed level which is occurring at a faster rate than the caprock. The caprock is protected by a dense, relatively impervious mantle of earth, which exhibits severe surface slope causing rapid stormwater runoff and allowing for little seepage of water downward to contact the caprock. In addition, the profile is north-facing, thereby experiencing little solar-induced aging action.

Mr. Lawrence A. Hoetzlein, PM, PDC Architecture, Cornell University, asked CME about the potential effect that a failure of the bedrock shelf (overhang) would have on slope stability. Although it is impossible to predict the future, CME can rationalize an answer based on our current knowledge and experience. For purposes of analysis, it was assumed that a near-vertical shearing off of the overhang would take a wedge of earth, located at toe of slope, with it. The resulting earth toe (slope) is likely to be too steep to remain stable. Thus, a series of shallow slope failures, progressing up gradient is logical. These failures would probably continue up gradient until an intermediate stable condition was achieved or until the entire slope had failed and readjusted. A roughly rectangular area would likely be affected. Further study is recommended for this item. Refer to Study Report Section 7.3 for more information.

5.0 SITE RECONNAISSANCE SURVEY

A Site Recon Key Map is included in Appendix F. Please refer to the Map for locations of the noted features in this section.

A mature forest with a high canopy and little to no underbrush covers the subject site. The forest is generally diverse by horticultural standards, and many of the tree species have adapted well by expanding their root system long, shallow distances through the upper thin mantel of earth, to obtain water. Further, tree species, such as Norway Maple, which are very invasive, coexist with trees such as Hemlocks, which are sensitive to light exposure. From a horticultural standpoint, this type of mixture of forest is good for the continued growth of the forest.

There is little to no buffer between man-made surface features or University Avenue sidewalk and the top of slope. The surface of the slope is covered with tree litter and is generally soft and springy in the upper few inches. Numerous areas exhibit erosional surficial soil loss. Surficial erosion is more prevalent near University Avenue, top of slope, and immediately North of the Foundry.

Existing local slope failures exhibit variable width (measured parallel to contours) of 10 to 50 feet. One, located just East of the Suspension Bridge, has had an erosion control blanket recently installed over it, but no vegetation or trees are noted to be present within the blanketed area.

Another existing local slope failure area exhibits drain tile or pipe, either broken or daylighting into the failed zone. The largest local slope failure is present Northwesterly of the Foundry. This area is referenced in the 1988 ESI Report, wherein it is noted that "… *portions of the slope are sufficiently unstable and slope and soil loss may continue to a point that would endanger the existing structure and surrounding property*". The top of slope has encroached on pavements and aprons located Northwest and West of the Foundry. Evidence of apparent attempts to halt slope failure progression, includes covering the slope with plain concrete, but the concrete cracked, broke loose and traveled downslope, exposing a barren earth surface, again subject to erosion. An excerpt from the 2007 CME Milstein Hall Report also discusses this area, and is given below:

"*The wooded earth slope between University Avenue and Fall Creek Gorge in the vicinity of the Milstein Hall project was examined by this engineer in 2003, 2006, and July 2007. The slope exhibits erosion channels, several near-surface slides, and tree roots are exposed in areas. The most significant slide and an area of concern is located North of the concrete pavement slab situated West of the Foundry. The slope below this area is eroded and near-vertical for about 15 feet in height. The trees nearest the slab are undercut exposing two or more feet of root-mat. This slope could fail at any time. A drain-tile is located here, which is a leading cause of the condition. A large mass of concrete is present under the slab, adding to the weight (mass) of the upgradient area…*"

There is existing evidence of translation and subsidence in the (asphalt paved) sidewalk area across from the vehicle entrance into the Sibley Hall Parking lot. This is a drop-curb area for sheet flow of stormwater runoff to flow over the North curb and sidewalk to the Gorge. This is an example of poor stormwater management practice and may have been the leading cause of a local slope failure in this area which was the subject of the 1996 Wood Report.

The site reconnaissance conducted by CME helped us to compare our computational models and results to actual field conditions. The topography provided to CME indicates slopes which appear less variable, in general, than observed local conditions.

It is noted that no re-forestation or re-vegetation of existing local slope failure areas is evident in the Study Area and areas which failed years ago, exhibit little or no evidence of corrective or mitigative effort. These pre-existing areas tend to become barren drainageways that do not appear to reforest or revegitate naturally.

Site reconnaissance photographs and key maps are given in Appendix F. The photos and maps are intended to be illustrative of the general locations and noted surface conditions. The actual location of specific feature was not surveyed-in, so actual field location may vary from that depicted on the Location Sketch.

6.0 SLOPE STABILITY ANALYSIS

6.1 Analysis Method and Procedure

6.1.1 Applicable Analysis Method

Conventional limit equilibrium analysis procedures are applicable for this project, to determine Factor Of Safety (FOS) against global and local slope failure. The conventional limit equilibrium methods of Slope Stability Analysis investigate the equilibrium of a soil mass tending to move down slope under the influence of gravity and other external loading conditions on the soil mass. The analysis involves comparison between forces, moments, or stresses tending to cause instability of the soil mass, and those that resist instability. For an overview of Slope Stability Analysis, please refer to Appendix H.

6.1.2 Limit Equilibrium Analysis

The limit equilibrium analysis methods assume plane strain conditions on two-dimensional (2-D) sections. A free body of the soil mass bounded at the bottom by an assumed potential slip surface (surface of sliding), and at the top by the surface of the slope, is considered in these analyses. A free body diagram of the soil mass is analyzed for static equilibrium, and a FOS is computed. The FOS is defined as the ratio of the available shear resistance (the resisting force) to that required for equilibrium (the driving force). A value of FOS greater than 1.0 indicates that the resisting force exceeds the driving force and that the slope will be stable with respect to sliding along the assumed particular slip surface analyzed. A value of FOS less than 1.0 indicates that the resisting force is less than the driving force, thus the slope will be unstable. The analysis for all potential slip surfaces must be conducted and the minimum FOS must be obtained for each slope analyzed.

CME analyzed three conditions of slope stability referred to as Global (or deep seated), Local (or shallow) and Sliding Wedge. Please refer to Appendix H for a General Overview of Slope Stability.

6.1.3 Software Program for Slope Analysis

Several recognized limit equilibrium analysis methods are available for computation of slope stability. CME utilized a computer program “Slope 2005” to conduct slope stability analyses for this project. Several computational analyses were conducted for each slope model using each of the several recognized slope stability analysis methods such as Fellenius’ Method (FL), Bishop Method (BS), Jambu’s Simplified Method (JB), Bell’s Method (BL), Sarma’s Method (SM), Spencer Method (SP), and Morgenstern and Price Method (MP), and the average of the nominal FOS was calculated, giving equal weighting for all methods. On occasion, an analysis method may produce a slope failure surface and/or a factor of safety which is unreasonable when compared to the results of the other methods. When this event occurs, the FOS result is thrown out, not used and not reported.

6.2 Slope Modeling and Analysis

6.2.1 Slope Models

The CME Geotechnical Engineer selected three slope cross sections along Section A, Section B and Section C, identified previously. These three sections were selected based on the subsurface soil and bedrock conditions, field observation of the slopes and location/loading conditions of the proposed new building construction. Analysis models were generated for each section with the proposed building present. Please refer to the Analysis Models, labeled Model A through Model C, given in Appendix G.

Building layout and foundation loading information for the Milstein Hall and the Central Avenue Parking Garage obtained from referenced CME Reports are incorporated into Models C and B, respectively. Building layout/elevation information obtained from Cornell University for Johnson Museum Addition and estimated shallow foundation loading information are incorporated into Model A.

6.2.2 Soil Properties

Soil properties used for each subsurface stratum in the analysis models are presented in Table 1. These soil properties were determined by the CME Geotechnical Engineer, based on the subsurface information, laboratory test results, CME’s past experience, and to be compatible with the type of analysis performed. Slope analysis with drained conditions is considered appropriate for this project, as well as, drained strength parameters (effective friction angle and effective cohesion) based on effective stress envelopes.

TABLE 1: Soil Properties Used in Slope Analysis Models

Subsurface Stratum	Moist Unit Weight, g_{dry} (pcf)	Saturated Unit Weight, g_{sat} (pcf)	Effective Friction Angle, φ' (deg.)	Effective Cohesion, c' (psf)
Fill	120	132	30	0
Silty Sand &Gravel	125	137	36[a]	0
Silty Sand	115	127	34[b]	0
Clay and Silt	122	134	23	800
Glacial Till	125	137	40	2500
Shale Bedrock	145	150	45	0

a. Friction angle of 43 deg. used for local analysis reported in Section 6.3.2 due to observed Field Condition.
b. Friction angle of 43 deg, used for local analysis reported in Section 6.3.2 due to observed Field Condition.

Field observations of slopes during CME's Site Reconnaissance Survey indicated existing slopes at 45 to 60 degrees or more in several areas. In some areas these very steep slopes appear to be anchored or founded on bedrock outcrops and/or the root mat of large trees. The maximum slope inclination at which the soil is barely stable is termed the *angle of repose*. For cohesionless soils, the friction angle of the soil is equal to the angle of repose. Based on CME's field and laboratory observations (ref: Report § 4.3, Stratum 2), the friction angles for the Silty Sand & Gravel and Silty Sand strata reported in the following table were increased when used in the local slope stability analysis reported in Report Section 6.3.2.

6.2.3 Seismic Loading Considerations

The Study Area is classified as Seismic Site Class D, representative of a "Stiff Soil Profile". The site coordinates, based on North American Datum, are N42.45 and W76.48. According to USGS, the Peak Ground Acceleration (PGA) for this site is 0.0695g for a reported Probability of Exceedence in 50 years of 2%. This information was used in the analysis models to analyze stability of slopes under seismic (dynamic) loading conditions.

6.3 Slope Stability Analysis and Results

6.3.1 Global Slope Stability

Several potential slip surfaces with respect to global slope failure were analyzed for each of the models. Potential failure surfaces through the existing University Avenue and the proposed Building Foundations (Johnson Art Museum Addition, Central Avenue Parking Garage and Milstein Hall incorporated into Model A, Model B and Model C, respectively), were analyzed for each Cross Section. Each analysis model (given in Figures 4 through 12) with a typical failure surface (slip plane) and the summary of nominal FOS are presented in Tables 2 to 11. Where, in CME's opinion, the resultant FOS and/or failure surface for a particular method is not reasonable, the FOS is not reported and a dash (-) is presented in the table.

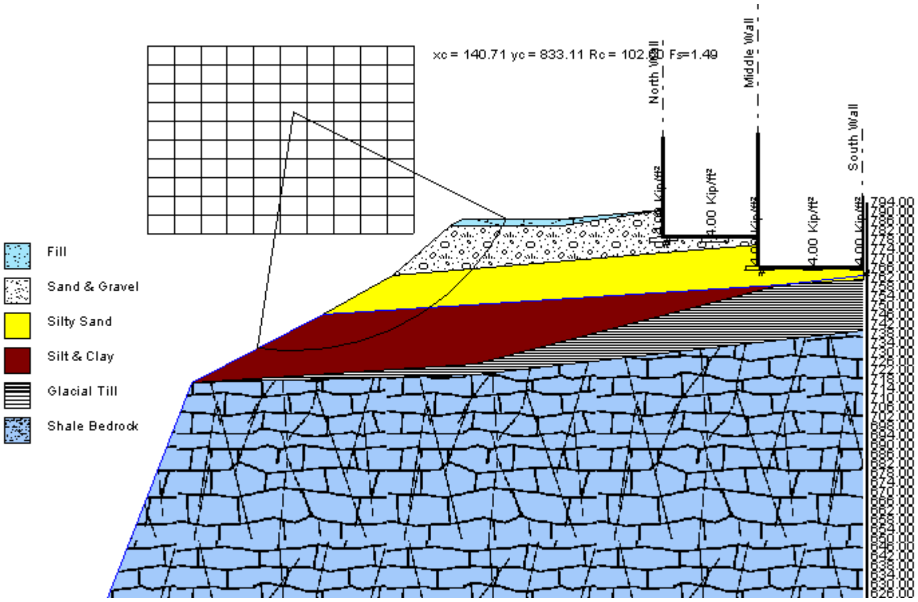

Figure 4: Model A- Global Slope Stability Analysis (failure surface through University Avenue)

Table 2: FOS Against Global Slope Failure for Model A (failure through University Avenue)								
Analysis Method	FL	BS	JB	BL	SM	SP	MP	Average
FOS (Static)	1.55	1.73	1.98	1.88	1.68	1.59	1.61	1.72
FOS (Dynamic)	1.30	1.45	1.67	1.53	1.49	1.41	1.41	1.47

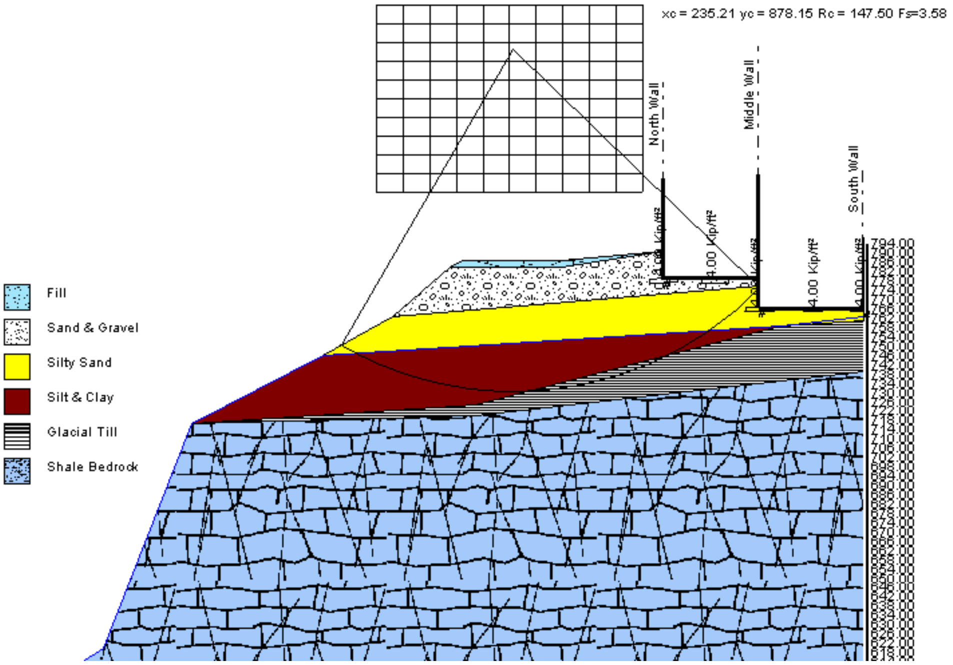

Figure 5: Model A- Global Slope Stability Analysis (failure through proposed building)

Table 3: FOS Against Global Slope Failure for Model A (failure through proposed building)								
Analysis Method	FL	BS	JB	BL	SM	SP	MP	Average
FOS (Static)	3.55	3.76	4.43	5.33	4.47	3.51	4.47	4.42
FOS (Dynamic)	2.25	2.19	2.91	2.81	2.79	2.57	2.32	2.54

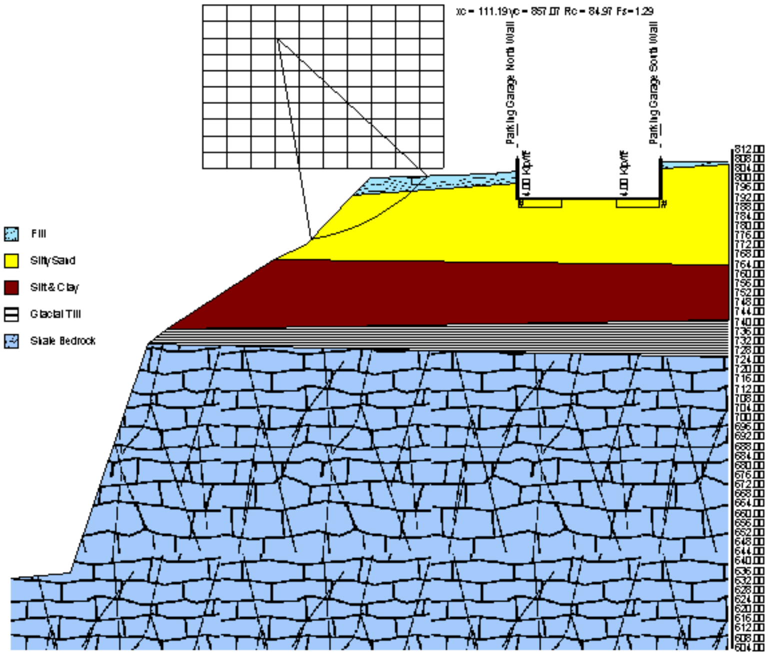

Figure 6: Model B- Global Slope Stability Analysis (failure through University Avenue)

Table 4: FOS Against Global Slope Failure for Model B (failure through University Avenue)								
Analysis Method	FL	BS	JB	BL	SM	SP	MP	Average
FOS (Static)	1.23	1.45	1.28	1.48	-	1.45	1.47	1.39
FOS (Dynamic)	1.10	1.25	1.07	1.21	1.19	1.19	1.19	1.17

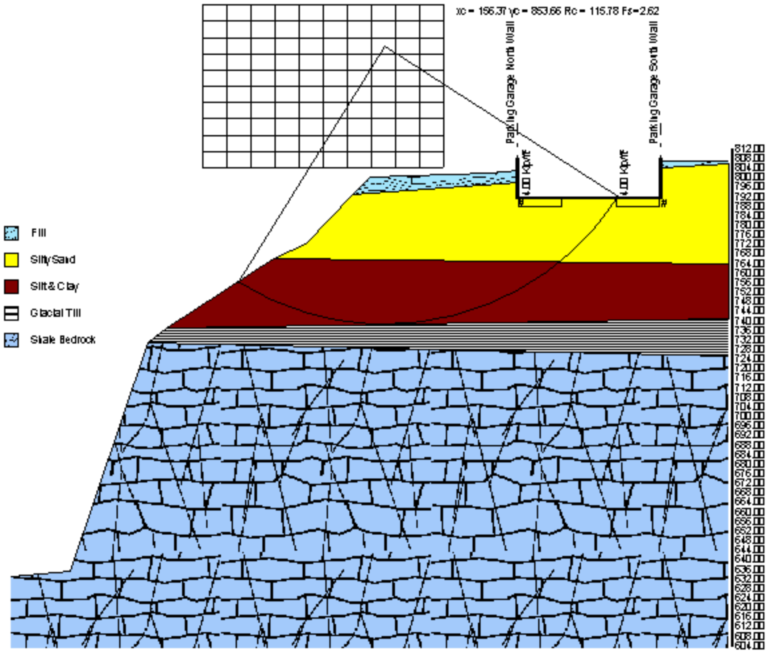

Figure 7: Model B- Global Slope Stability Analysis (failure through proposed building)

Table 5: FOS Against Global Slope Failure for Model B (failure through proposed building)								
Analysis Method	FL	BS	JB	BL	SM	SP	MP	Average
FOS (Static)	1.94	2.32	2.32	2.50	2.93	2.27	2.21	2.36
FOS (Dynamic)	1.70	1.81	1.82	1.89	2.35	1.76	1.76	1.87

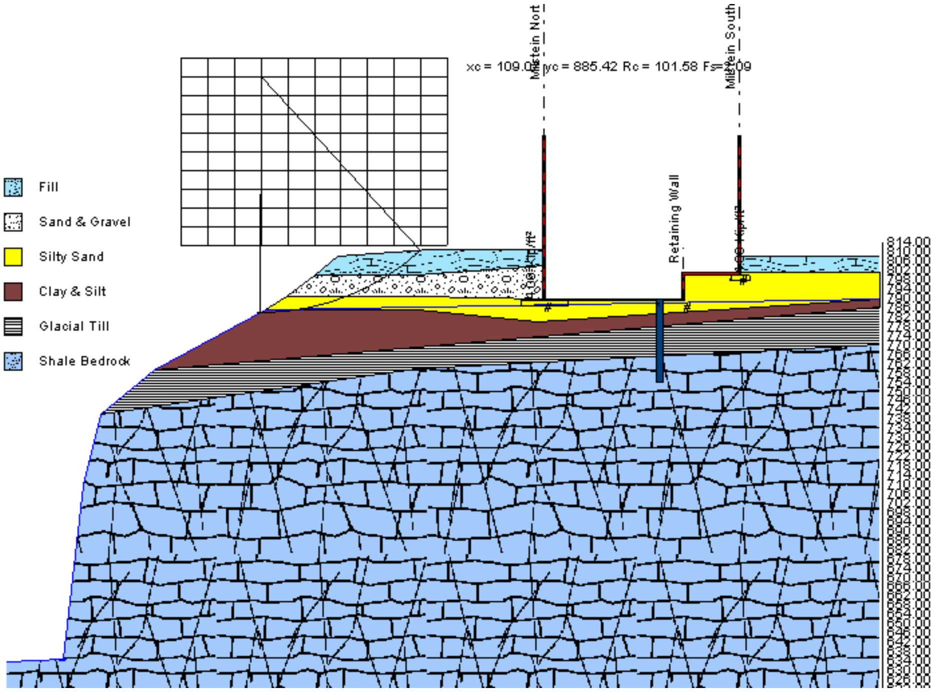

Figure 8: Model C- Global Slope Stability Analysis (failure through University Avenue)

Table 6: FOS Against Local Slope Failure for Model C (failure through University Avenue)								
Analysis Method	FL	BS	JB	BL	SM	SP	MP	Average
FOS (Static)	2.19	2.57	2.61	2.58	2.41	2.33	2.22	2.42
FOS (Dynamic)	1.71	1.65	1.91	1.81	1.71	1.74	1.59	1.73

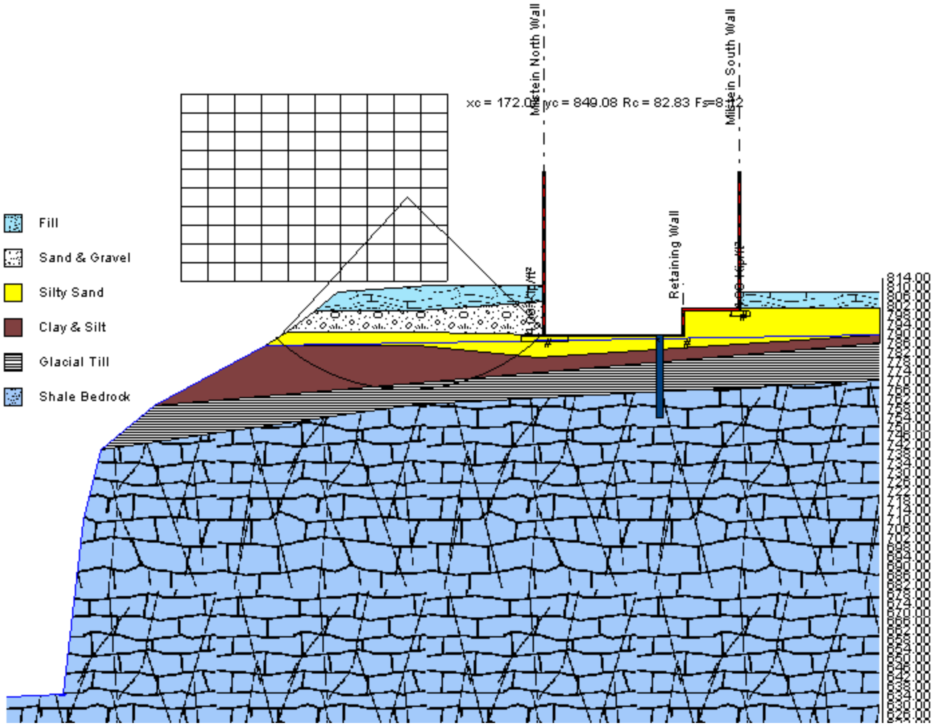

Figure 9: Model C- Global Slope Stability Analysis (failure through proposed building)

Table 7: FOS Against Local Slope Failure for Model C (failure through proposed building)								
Analysis Method	FL	BS	JB	BL	SM	SP	MP	Average
FOS (Static)	3.99	3.95	4.36	3.88	-	4.24	4.24	4.11
FOS (Dynamic)	2.81	2.48	2.94	2.88	3.35	2.91	2.68	2.86

6.3.2 Local Slope Stability

Several potential slip surfaces with respect to local slope failure were analyzed for each of the models. Each model with a typical failure surface (slip plane) and the summary of FOS are presented below.

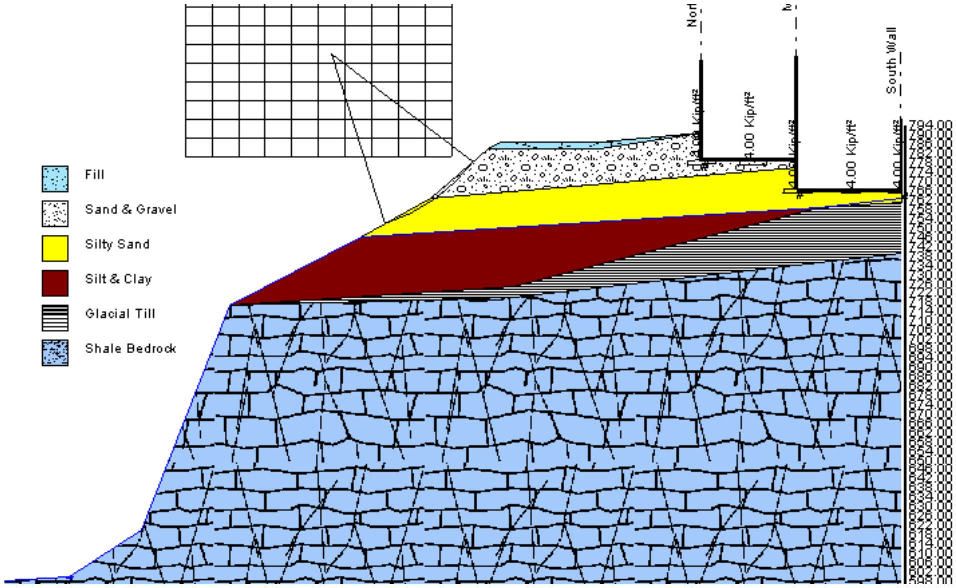

Figure 10: Model A- Local Slope Stability Analysis

Table 8: FOS Against Local Slope Failure for Model A								
Analysis Method	FL	BS	JB	BL	SM	SP	MP	Average
FOS (Static)	1.16	1.20	1.40	1.19	-	1.19	1.19	1.22
FOS (Dynamic)	1.01	0.94	1.08	-	1.03	1.03	1.03	1.02

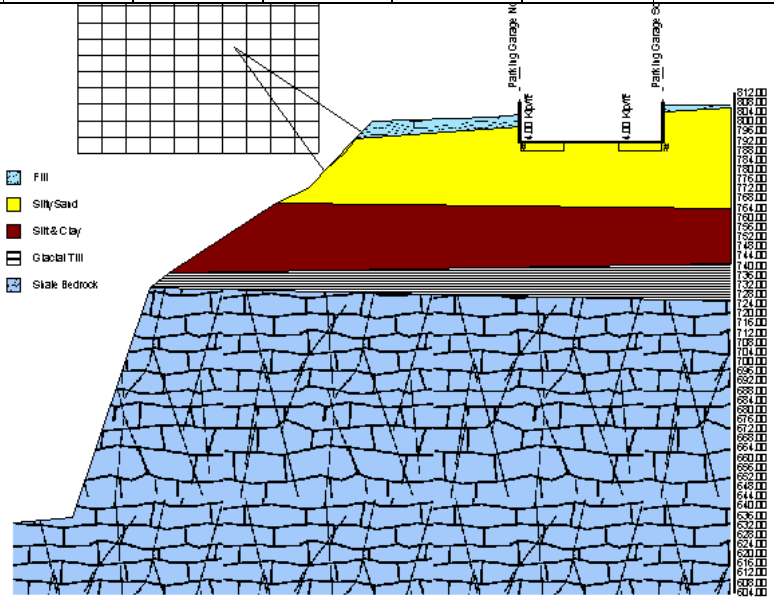

Figure 11: Model B- Local Slope Stability Analysis

Table 9: FOS Against Local Slope Failure for Model B								
Analysis Method	FL	BS	JB	BL	SM	SP	MP	Average
FOS (Static)	0.89	0.94	1.06	1.12	-	1.05	1.12	1.03
FOS (Dynamic)	0.75	0.87	0.89	-	1.00	0.96	0.97	0.91

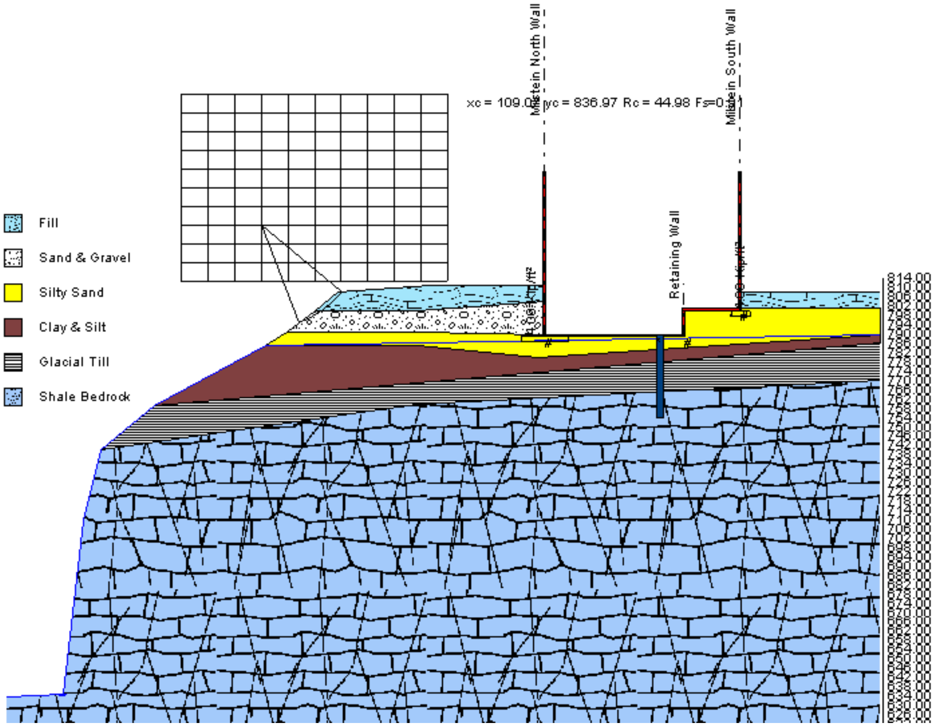

Figure 12: Model C- Local Slope Stability Analysis

Table 10: FOS Against Local Slope Failure for Model C

Analysis Method	FL	BS	JB	BL	SM	SP	MP	Average
FOS (Static)	1.17	1.18	1.35	1.20	-	1.22	1.16	1.21
FOS (Dynamic)	0.79	0.81	1.12	1.07	1.11	1.12	1.01	1.00

6.4 Sliding Wedge Analysis

Subsurface profiles in Model A and Model C indicate interfaces between strata inclined towards the face of the slope. A sliding wedge analysis was conducted to obtain FOS against earth mass sliding along these interfaces. The analysis was conducted using the *Wedge Method* outlined in the Foundation and Engineering Handbook: Design and Construction with the 2006 International Building Code, by Robert W. Day.

The analysis conducted for the interface between Silt and Clay stratum and the Glacial Till stratum in Model C resulted in a FOS of 11.9. The analysis conducted for the interface between the Silty Sand stratum and the Silt and Clay stratum resulted in a FOS of 10.

7.0 SUMMARY, CONCLUSIONS & RECOMMENDATIONS

7.1 Summary

CME's field observations correlate well with the results of the computational analyses. Table 11 presents a summary of CME's Computational Slope Stability Analysis.

TABLE 11: Summary of Earth Slope Stability Average Factor of Safety

Section	Analysis	Failure Through	Static Factor of Safety	Dynamic Factor of Safety
A	Global	University Avenue	1.7	1.5
	Global	JAM Addition	4.4	2.5
	Local	Slope Surface	1.2	1.0
B	Global	University Avenue	1.4	1.2
	Global	CAP Garage	2.4	1.9
	Local	Slope Surface	1.0	0.9
C	Global	University Avenue	2.4	1.7
	Global	Milstein Hall	4.1	2.9
	Local	Slope Surface	1.2	1.0

JAM = Johnson Art Museum, CAP = Central Avenue Parking

As given in Study Report Section 6.1.2, a Factor of Safety (FOS) of 1.0 is the numerical definition (divider) between a Stable and an Unstable slope. A FOS of “less than 1.0” is numerically defined as “Unstable”. A FOS of “1.0” is numerically defined as “Marginal” (equilibrium), and a FOS of “greater than 1.0” is numerically defined as “Stable”.

In the real world, it is considered prudent to account for the risks, variables, and uncertainties always involved in geotechniques and subsurface conditions, by utilizing a Safety Factor. For guidance, we offer the Minimum Factors of Safety given in Table 12 as extracted from two Federal Guides; *Naval Facilities Engineering Command (NAVFAC) Design Manual 7.1, Soil Mechanics, 1982* and *American Association of State Highway & Transportation Officials (AASHTO), Standard Specifications for Highway Bridges, 1997.*

TABLE 12: Minimum Safety Factors for Earth Slope Stability

Simple Earth Slope or Retaining Wall Structure under loading condition given as…	Analysis Condition	NAVFAC min. FOS	AASHTO min. FOS
…permanent or sustained loading.	static	1.25 to 1.5	1.3
…supporting bridge, building or critical utilities.	static	1.3 to 2.0	1.5
…temporary or transient loading.	dynamic	1.15 to 1.2	1.1

7.1.1 Summary of Computational Analyses

If one selected the AASHTO Minimum FOS value from Table 12 for each loading condition (i.e. 1.3, 1.5 and 1.1) to judge the results given in Table 11, the following summary of computational analyses would result:

- ✓ The JAM Addition Building Results exceed the minimums of 1.5 and 1.1.
- ✓ The CAP Garage Building Results exceed the minimums of 1.5 and 1.1.
- ✓ The Milstein Hall Building Results exceed the minimums of 1.5 and 1.1.
- ✓ The Existing Condition at University Avenue Global Results exceed the minimums of 1.3 and 1.1.
- ✓ The Existing slope surface Local Results are less than the minimums of 1.3 and 1.1.
- ✓ The Sliding Wedge Analyses indicate this mode of slope failure is very unlikely with FOS exceeding 10.

7.1.2 Summary of Field Observations

Based on CME's September 2007 site reconnaissance, the following statements summarize CME's field observations: Refer to the Site Recon Key Map in Appendix F for locations.

- ✓ Two pre-existing local slope failures were identified in the Study Area: one located northeast of the Foundry, and the second located just west of the Pedestrian Bridge Stairway. There is evidence that man-placed stormwater drainage features may have contributed to both failures.
- ✓ No tell-tale evidence of global slope instability was observed by CME.
- ✓ Near surface creep of the slope is apparent from visual examination of trees and structures (steps and walls).
- ✓ Portions of University Avenue's north curb and westbound lane exhibited longitudinal pavement cracking and indications of subsidence. These signs indicate movement of surface features (near top of slope) downward and northerly towards the Fall Creek Gorge. Note that University Avenue was paved with an asphalt overlay subsequent to CME's site reconnaissance.
- ✓ No evidence of re-vegetation or re-forestation was observed in the slope study area.
- ✓ Observed subsidence and translation (or rotation) of the asphalt sidewalk and retaining structure (located northwest of Sibley Parking lot gate at University Avenue) indicates that this retaining structure and pavement repair did not arrest local slope movement.

7.2 Conclusions

Based on the summary presentation, we conclude that no foundation (geotechnical) program changes are warranted to the three Building Projects due to earth slope stability issues. The summary shows that global (deep seated) slope stability factors of safety exceed applicable AASHTO Standards under predicted future Building Loads for both, the static and dynamic (seismic), analysis models.

The summary shows that global (deep seated) slope stability factors of safety exceed applicable AASHTO Standards under then-existing (September 2007) loads imposed by the University Avenue roadway for both, the static and dynamic (seismic), analysis models.

The summary shows that local (shallow) slope stability factors of safety are less than applicable AASHTO Standards for the existing slope surfaces for both, the static and dynamic (seismic), analysis models. These numerical results indicate that physical field evidence of local slope failure should exist, and indeed, it does exist.

Field evidence of translation and subsidence was confirmed to be present in a local failure area which intercepts University Avenue, just Northwest of the exit gate out of Sibley Hall parking lot. The asphalt-paved sidewalk encroaches on the top of earth slope, here, and previous efforts to repair the pavement have not been completely effective.

It can be concluded that modifications to University Avenue anywhere in the Study Area which increase the weight of University Avenue and/or encroach on the slope (i.e. widening to North) will warrant specific analysis and likely require artificial means to strengthen the slope or support the modifications independent of the down-gradient soil mass. Continued maintenance will be necessary for those portions of University Avenue where signs of subsidence and translation exist

7.3 Action Items & Issues

In CME's professional opinion, further action in the form of study, analysis, and planning development/implementation is warranted to address the items and issues given in this section.

7.3.1 Existing Conditions of Concern

A detailed survey of existing physical conditions is beyond the Scope of this Study, however, CME did identify several specific areas of concern, vis-à-vis past resource maintenance/management practices and existing conditions. The Photo presentation included in Appendix F is intended to help the reader to visualize and better understand the slope conditions CME observed.

It is important to note that one hundred fifty years of development (urbanization) of the Cornell University campus and use of the Fall Creek for power and water resources has pressured and encroached on the Fall Creek Gorge. It is also important to understand that the natural evolution of the gorge is ongoing and changing with or without the influence of man.

Please refer to the Site Recon Key Map (Drawing GL-3, Appendix F) for identification and approximate location of some of the existing observed conditions of concern to CME. An overview of the observed condition and a suggested course of action are given in Table 13.

Table 13: Observed Condition in Study Area	**Suggested Action or Next Step**
Overall absence of re-vegetation or re-forestation in Study Area.	Expert to appraise existing conditions, recommend genus & species, stake field location, and plant and maintain.
Subsiding and translating retaining structure and sidewalk at University Avenue pinch point.	Evaluate specific selected University Avenue improvements at this area and design & implement corrective action.
Pre-existing local slope failures.	Carefully survey each area and determine if stormwater piping is active. If so, reroute, then reinforce ,revegitate and maintain.
Undercut or Overhanging Bedrock Profile in Study Area.	Perform interactive computational analyses based on plausible overhang failure to help define potential up-gradient affects.
The presence or absence of stormwater management facilities which affect the slope.	Evaluate all future projects adjacent to Study Area for best management practices and to implement same to the benefit of the natural resource.

7.4 Recommendations

CME recommends affirmative contemporaneous action by Cornell University to study, develop and implement a comprehensive resource management plan for the entire Fall Creek Gorge within its campus. Such a plan would, by necessity, include provisions for design and implementation of best management practices to preserve and protect the natural resource, and thus reducing the incidence and frequency of man-induced local slope failure. Naturally occurring slope failures will continue; the incidence and initiation or progression of, will be influenced by variation in extremes of prevailing climate changes, weather and other factors.

8.0 CLOSING AND LIMITATIONS STATEMENTS

8.1 Standard of Care and Warranty

We have endeavored to conduct these services in a manner consistent with the level of care and skill ordinarily exercised by members of the geotechnical engineering profession practicing contemporaneously under similar conditions in the locality of the project. No other representation, express or implied is made. Under no circumstances is any warranty, express or implied, made in connection with the providing of geotechnical engineering services.

8.2 Closing Comments

Please contact our office if you have any questions regarding this report, its conclusions, or recommendations.

Marcus Rotundo

June 23, 2008

Anasthas Navaratnam, I.E.

Marcus A. Rotundo, P.E.

CME Associates, Inc.

Study and Report for Stability of Earth Slopes North of University Avenue between Foundry and Johnson Art Museum
Cornell University
Ithaca, New York
CME Report No.: 26055B-01-0108

APPENDICES

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	Generalized Subsurface Profiles, SP-A, SP-B and SP-C	3
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B	2007 CME Test Boring Logs, GB-1 to GB-3	9
	2007 CME Test Boring Logs, B-1 (2007) to B-11 (2007)	30
	2007 CME Test Boring Logs, B07-10, B07-11A	6
	2003 CME Test Boring Logs, B-1 (2003) to B-9 (2003)	20
	General Information & Key to Test Borings Logs	4
C	2006 Gifford Report Boring Log, B-2	1
	1996 Wood Report Boring Logs, B96-1 to B96-3, B96-5 and B96-8	5
	1988 ESI Report Boring Log, B-1	2
	1969 ESI Report Boring Logs, MC-3 and MC-6	4
D	Laboratory Test Summary, CME Report No.: 25357B-01-0603	4
	Laboratory Test Summary, CME Report No.: 26000B-02-0607	2
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	Laboratory Test Summary, CME Report No.: 26055B-01-0907	5
E	Contour Map and Cross Sections, provided by TG Miller	5
F	Photo Index Map, GL-3 (11" x17" Sheet)	1
	Site Reconnaissance Key Map, GL-3-R1 (11" x17" Sheet)	1
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G	Slope Analysis Models, Model A to Model C	3
H	General Overview of Slope Stability Analysis and Factor of Safety	2

CME
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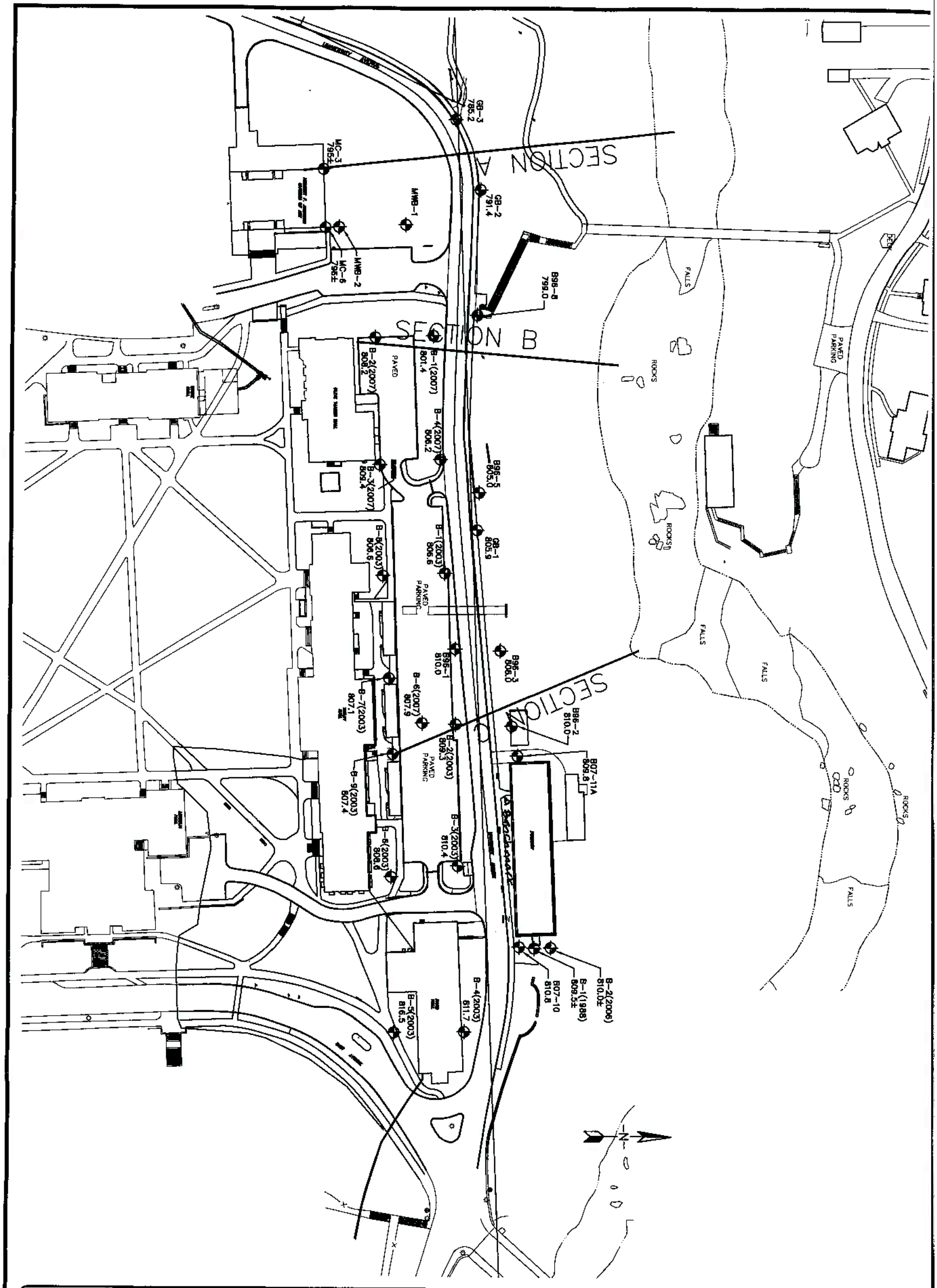
Study and Report for Stability of Earth Slopes North of University Avenue between Foundry and Johnson Art Museum
Cornell University
Ithaca, New York
CME Report No.: 26055B-01-0108

APPENDIX - A



SHEET NO.

BL–1

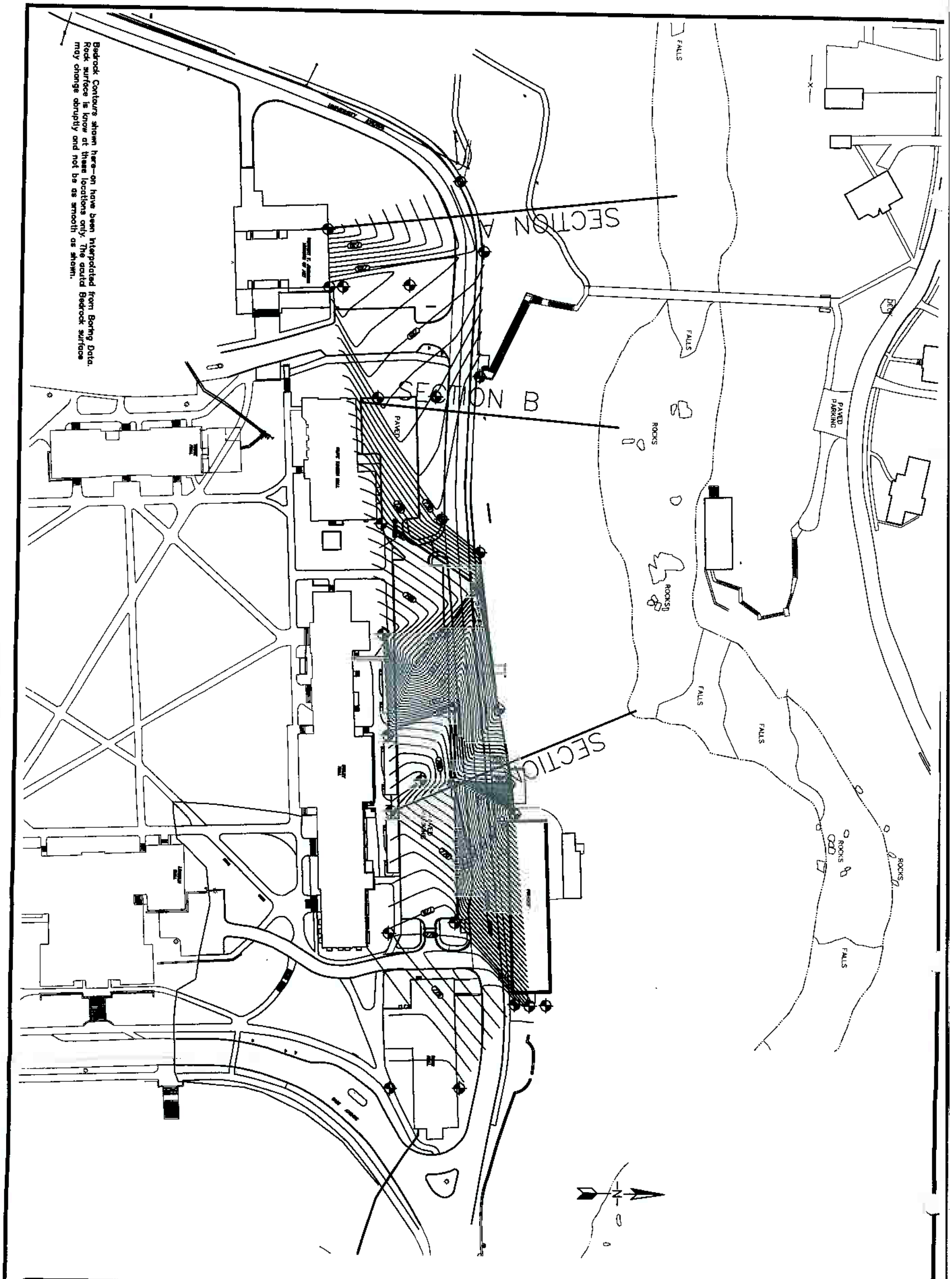
1"=100'
09–23–07
26055
jpw

Cornell University

Stability of Slopes North of University Avenue
Between Foundary and Johnson Art Museum
Boring Location Sketch

Ithaca, Tompkins Co., New York

CME Associates, Inc.
Construction Materials Evaluation
P.O.Box 1824
Cicero, New York 13039–1824
[315] 698–9315 FAX: [315] 698–9319



Bedrock Contours shown here-on have been interpolated from Boring Data. Rock surface is know at these locations only. The acutal Bedrock surface may change abruptly and not be as smooth as shown.

SHEET NO.
BC–1

1"=100'
09–23–07
26055
jpw

Cornell University
Stability of Slopes North of University Avenue
Between Foundary and Johnson Art Museum
Bedrock Contour Map
Ithaca, Tompkins Co., New York

CME Associates, Inc.
Construction Materials Evaluation
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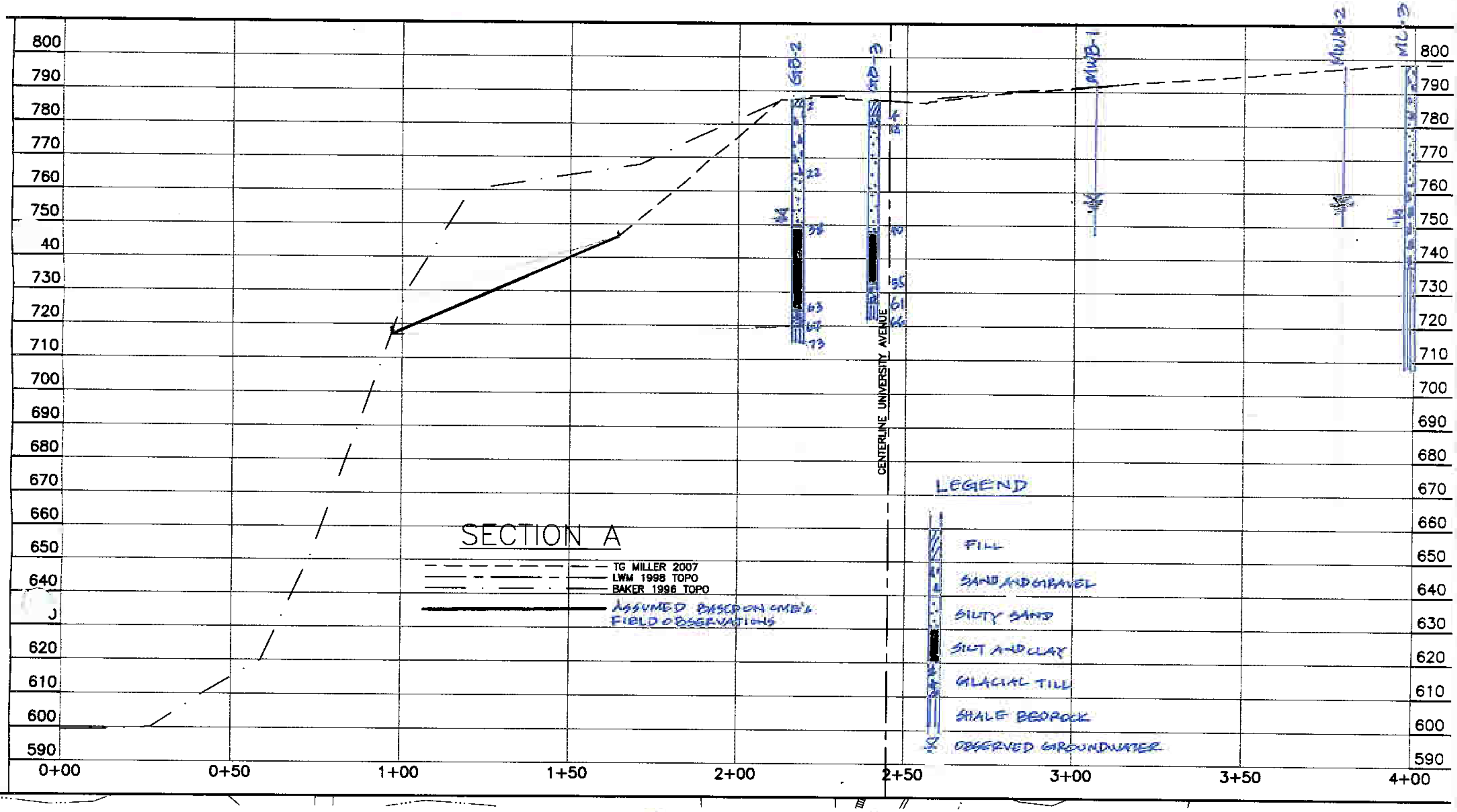
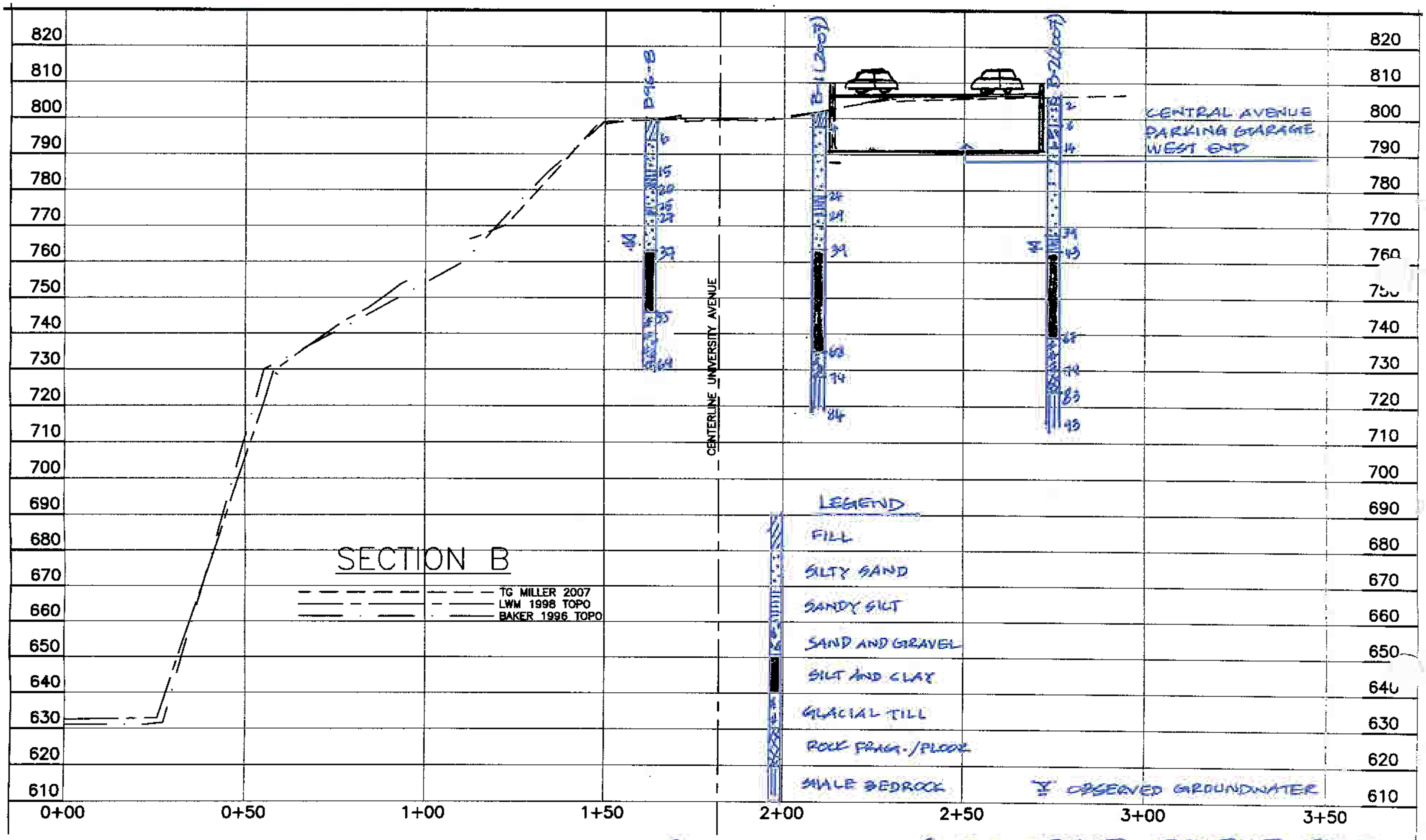
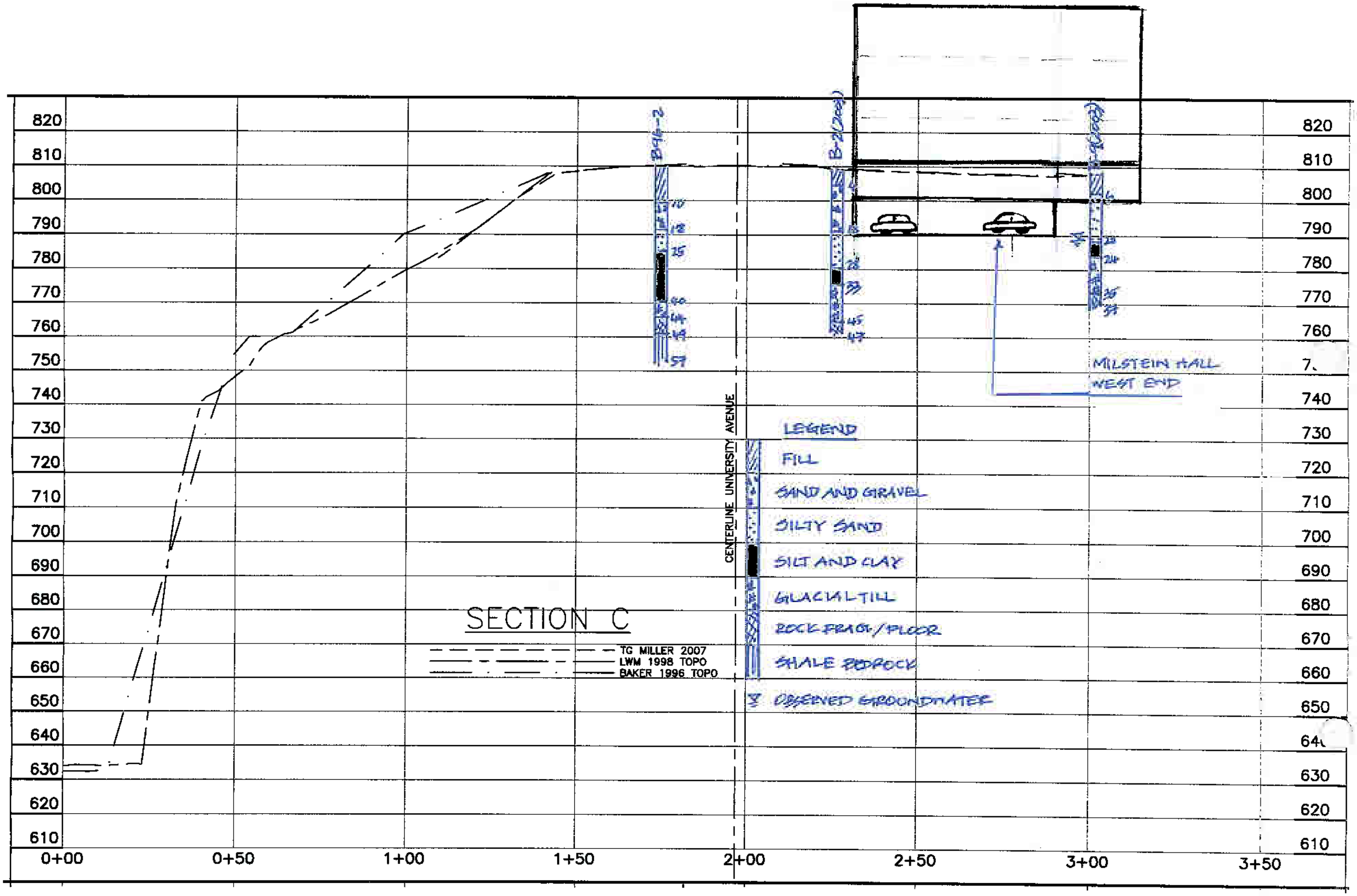


GENERALIZED SUBSURFACE PROFILE, SP-A
CME Report No. 26055B-01-0907

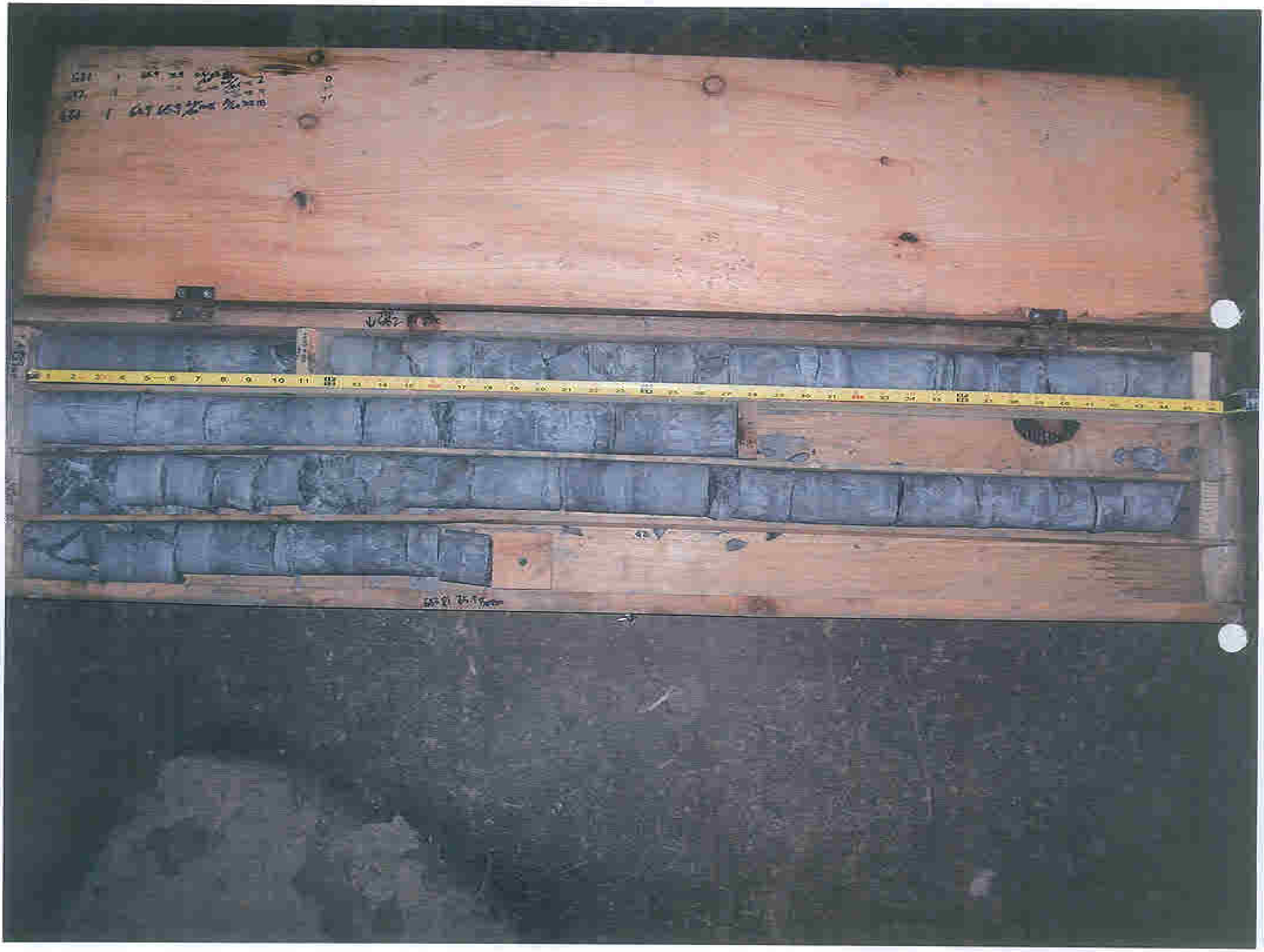


GENERALIZED SUBSURFACE PROFILE SP-B

CHE Report No 26055801-0907



GENERALIZED SUBSURFACE PROFILE, SPC
CME Report No. 26055B-01-0907



CME
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Study and Report for Stability of Earth Slopes North of University Avenue between Foundry and Johnson Art Museum
Cornell University
Ithaca, New York
CME Report No.: 26055B-01-0108

APPENDIX - B

CME Associates, Inc. **BORING NO.: GB-1** Page 1 of 3

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Stability of Slope North of University Avenue at Cornell University, Ithaca, New York **Report No.:** 26055B-01-0108
Client: Desman Associates **Date Started:** 08/20/07 **Finished:** 08/22/07
Location of Boring: See Boring Location Sketch **Elevation of Surface of Boring:** 805.9'

METHODS OF INVESTIGATION

Casing: 3-1/4" ID H. Stem Auger **Driller:** Dan Gates
Casing Hammer: **Driller:** Wayne Earl
Other: **Inspector:**
Soil Sampler: 2" OD Split Barrel **Rod Size:** AWJ
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: CME 55 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
08/20/07	While drilling	None Noted	38.0'
08/20/07	Before casing removed	None Noted	65.9
08/20/07	After casing removed	See Remark 1	
08/20/07	After casing removed		

LOG OF BORING SAMPLES

CLASSIFICATION OF MATERIAL

c – coarse **and** – 35 to 50 %
m – medium **some** – 20 to 35 %
f – fine **little** – 10 to 20 %
trace – 0 to 10 %

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	Classification of Material	SPT "N" or RQD
0	XXX	1a	0.0	0.8	SS/24	3-5-7-8	0.8	Topsoil (moist)	12
	HOLLOW STEM AUGER	1b	0.8	1.6				Brown cmf GRAVEL, some cmf SAND, little SILT (moist)	
		1c	1.6	2.0				Black CINDERS, little cmf SAND (moist) *~ Unprepared Miscellaneous Fill ~*	
		2	2.0	4.0	SS/18	9-10-8-5		Similar Fill (moist)	18
5		3	4.0	6.0	SS/10	4-4-6-7	6.0	Similar Fill (moist)	10
		4	6.0	8.0	SS/12	4-4-5-5		Brown fine SAND, little SILT (moist, loose)	9
10		5	8.0	10.0	SS/12	7-7-9-9		Brown fine SAND, some SILT, trace mf GRAVEL (moist, medium compact)	16
		6	10.0	12.0	SS/12	9-8-9-9		Brown mf SAND, trace SILT (moist, medium compact)	17
		7	12.0	14.0	SS/20	6-4-6-7		Brown fine SAND, some SILT (moist, medium compact)	10
15		8	14.0	16.0	SS/20	5-5-7-8		Similar Soil (moist, medium compact)	12
		9a	16.0	17.6	SS/20	5-5-6-6	17.6	Brown mf SAND, trace SILT (moist, medium compact)	11
		9b	17.6	18.0			18.0	Brown SILT, little fine SAND, (saturated, stiff)	
20		10	18.0	20.0	SS/24	6-8-8-10		Brown mf SAND, trace SILT (moist, medium compact)	16
		11	20.0	22.0	SS/24	5-5-7-7		Similar Soil (moist, medium compact)	12
		12	22.0	24.0	SS/20	2-6-6-7		Similar Soil (moist, medium compact)	12
25		13	24.0	26.0	SS/24	9-10-13-16		Brown fine SAND, some SILT (moist, medium compact) Continued on page 2	23

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

1. At completion, hole was cement grouted to nearly match existing grade.

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
	H O L L O W S T E M A U G E R	14	26.0	28.0	SS/24	5-6-6-5	28.0	Continued from page 1 Brown mf SAND, little SILT (wet, medium compact)	12
30		15a	28.0	29.2	SS/24	4-4-4-4	29.2	Brown SILT, some fine SAND (saturated, stiff)	8
		15b	29.2	29.6			29.6	Brown mf SAND, little SILT (wet to saturated, loose)	
		15c	29.6	30.0				Brown CLAY, some SILT, little fine SAND (moist, stiff)	
		16	33.5	35.0	SS/18	3-6-7		Grey SILT, some CLAY, trace fine SAND (moist, stiff)	13
35									
40		17	38.5	40.0	SS/18	4-7-7		Similar Soil (moist, stiff)	14
		18	43.5	45.0	SS/18	7-9-8		Grey SILT, little CLAY (moist, very stiff)	17
45									
50		19	48.5	50.0	SS/16	7-7-7		Grey CLAY and SILT, trace cmf SAND, trace fine GRAVEL (moist, stiff) Continued on page 3	14

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
								Continued from page 2	
	H								
	O								
	L	20	53.5	55.0	SS/12	4-7-7		Grey CLAY and SILT (moist, stiff)	14
	L								
	O								
	W								
55		21	55.0	57.0	U/9	Shelby Tube		Grey CLAY, some SILT, trace fine SAND (moist)	
	S								
	T								
	E								
	M								
		22	58.5	60.0	SS/18	WH-WH-WH		Similar Soil (moist, very soft)	WH
60									
	A						63.0		
	U	23a	63.5	64.8	SS/12	7-12-100@5"		Grey SILT, some cmf GRAVEL, trace cmf SAND (moist, hard) *~ Glacial Till ~*	100+
	G						64.8		
	E								
	R	23b	64.8	64.9				Grey ROCK fragments (moist)	
65	XXX	24	65.9	65.9	SS/0	100@0"		No Recovery	100+
	C						65.9	*~ Sampler Refusal @ 65.9' ~*	
	O	R1	65.9	70.9	C/10.5	NQ-Core		Grey, medium hard, weathered, bedded SHALE BEDROCK Recovery: 10.5"/60" = 8.4% RQD: 10.5"/60" = 8.4% 2 Pieces, 0" Chips & Fragments *(See Remark 2)*	8%
	R								
	E								
70									
	XXX							Bottom of Boring @ 70.9'	
75									

*SS – Split Spoon, U – Undisturbed Tube, C – Core

Remarks: 2. Core barrel smoked due to loss of water stuck in bedrock. Forceful retrieved of core barrel resulted in loss of material from the core barrel.

CME Associates, Inc. **BORING NO.: GB-2** Page 1 of 3

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Stability of Slopes North of University Avenue at Cornell University, Ithaca, NY **Report No.:** 26055B-01-0108
Client: Desman Associates **Date Started:** 08/23/07 **Finished:** 08/27/07
Location of Boring: See Boring Location Sketch **Elevation of Surface of Boring:** 791.4’

METHODS OF INVESTIGATION

Casing: 3-1/4” ID H. Stem Auger **Driller:** Dan Gates
Casing Hammer: **Driller:** Tom McCarthy
Other: **Inspector:**
Soil Sampler: 2” OD Split Barrel **Rod Size:** AWJ
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: CME 55 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
08/23/07	While drilling	None Noted	38.0’
08/27/07	Before casing removed	35.5’	72.0’
08/27/07	After casing removed	See Remark 1	
08/27/07	After casing removed		

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse, m – medium, f – fine; and – 35 to 50 %, some – 20 to 35 %, little – 10 to 20 %, trace – 0 to 10 %	SPT “N” or RQD
0	XXX	1a	0.0	0.4	SS/18	4-8-11-46	0.4	Topsoil (moist)	19
	H	1b	0.4	1.4				Brown SILT, some cmf SAND, little cmf GRAVEL, trace ROOT HAIRS (moist)	
	O	1c	1.4	1.6				ASPHALT (moist)	
								~ Unprepared Miscellaneous Fill ~	
	L	1d	1.6	2.0			2.0	Grey cmf GRAVEL, little SILT, little cmf SAND (moist)	
5	L	2	2.0	4.0	SS/18	6-8-6-4		Brown cmf SAND, little cmf GRAVEL, trace SILT (moist, medium compact)	14
		3	4.0	6.0	SS/20	5-5-8-12		Similar Soil (moist, medium compact)	13
	O	4	6.0	8.0	SS/18	11-10-8-9		Brown cmf SAND, some cmf GRAVEL, little SILT (moist, medium compact)	18
	W	5	8.0	10.0	SS/20	14-13-14-10		Similar Soil (moist, medium compact)	27
10	S	6	10.0	12.0	SS/8	12-20-22-20		Similar Soil (moist, medium compact)	42
	T E	7	12.0	14.0	SS/24	9-10-12-14		Brown mf SAND, trace SILT (moist, medium compact)	22
15	M	8	14.0	16.0	SS/18	4-6-7-9		Brown cmf SAND, little mf GRAVEL, trace SILT (moist, medium compact)	13
	A U	9	16.0	18.0	SS/18	11-14-19-18		Grey cmf GRAVEL, little cmf SAND, trace SILT (moist, medium compact)	33
20	G	10	18.0	20.0	SS/20	16-8-9-7		Brown cmf SAND, little cmf GRAVEL, trace SILT (moist, medium compact)	17
	E	11	20.0	22.0	SS/24	20-10-8-10	22.0	Similar Soil (moist, medium compact)	18
	R	12	22.0	24.0	SS/24	6-6-7-7		Brown mf SAND, little SILT (moist, medium compact)	13
25		13	24.0	26.0	SS/22	5-5-5-6		Similar Soil (moist, medium compact) Continued on page 2	10

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

CME Associates, Inc. **Report No.: 26055B-01-0108** **BORING NO.: GB-2** Page 2 of 3

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
	H							Continued from page 1	
		14	26.0	28.0	SS/22	6-8-8-8		Brown mf SAND, little SILT (moist, medium compact)	16
	O								
	L								
	L	15	28.0	30.0	SS/24	10-10-11-13		Similar Soil (moist, medium compact)	21
30									
	O								
	W								
		16	33.5	35.0	SS/18	6-8-9		Similar Soil (wet, medium compact)	17
35									
	S								
	T								
	E						38.0		
	M	17	38.5	40.0	SS/18	6-5-7		Grey SILT, little CLAY (moist, stiff)	12
40									
		18	43.5	45.0	SS/18	8-18-19		Grey SILT, trace fine SAND (moist, hard)	37
	A								
45									
	U								
	G								
	E								
	R	19	48.5	50.0	SS/18	8-13-20		Similar Soil (moist, hard)	33
50								Continued on page 3	

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
	HOLLOW STEM AUGER							Continued from page 2	
55		20	53.5	55.0	SS/18	3-5-8		Grey SILT, little CLAY, trace cmf SAND (moist, stiff)	13
60		21	58.5	60.0	SS/18	3-6-8		Grey CLAY, some SILT, trace cmf SAND, trace fine GRAVEL (moist, stiff)	14
							63.0		
65		23	63.5	64.8	SS/14	69-12-100@3"		Grey SILT, some cmf GRAVEL, little cmf SAND (moist, hard) ~ Glacial Till ~ ~ Auger Refusal @ 67.0' ~	100+
							67.0		
	XXX CORE XXX	R1	67.0	72.0	C/10.60	NQ-CORE		Grey, medium hard, weathered, thinly bedded bedded SHALE BEDROCK Recovery: 60"/60" = 100% RQD: 26.5"/60" = 44% 17 Pieces, 6" Chips & Fragments	44%
70									
								Bottom of Boring @ 72.0'	
75									

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

CME Associates, Inc. **BORING NO.: GB-3** Page 1 of 3

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Stability of Slopes North of University Avenue at Cornell University, Ithaca, NY **Report No.:** 26055B-01-0108

Client: Desman Associates **Date Started:** 08/28/07 **Finished:** 08/29/07

Location of Boring: See Boring Location Sketch **Elevation of Surface of Boring:** 785.2’

METHODS OF INVESTIGATION

Casing:	3-1/4” ID H. Stem Auger	**Driller:**	Dan Gates
Casing Hammer:		**Driller:**	Tom McCarthy
Other:		**Inspector:**	
Soil Sampler:	2” OD Split Barrel	**Rod Size:**	AWJ
Sampler Hammer: Wt.	140 lbs./Auto	**Fall:**	30 in.
Make & Model of Drill Rig:	CME 55 Truck Mounted		

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
08/28/07	While drilling	36.8’	38.5’
08/28/07	Before casing removed	52.0’	60.9’
08/29/07	After casing removed	60.2’	out
08/29/07	After casing removed	See Remark 1	

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine and – 35 to 50 % some – 20 to 35 % little – 10 to 20 % trace – 0 to 10 %	SPT “N” or RQD
			From	To					
0	XXX H	1a	0.0	2.0	SS/0	See Remark 2		Grey Crushed Stone, some cmf SAND with CONCRETE (moist)	
	O L	2	2.0	4.0	SS/6	4-3-3-3	4.0	Brown cmf SAND and cmf GRAVEL, little SILT (moist, loose) ~ Fill ~	6
5	L	3	4.0	6.0	SS/16	4-4-2-3		Brown cmf SAND, some cmf GRAVEL, little SILT (moist, loose)	6
	O W	4	6.0	8.0	SS/8	3-3-3-2	8.0	Similar Soil (moist, loose)	6
10		5	8.0	10.0	SS/20	6-7-6-7		Brown mf SAND, little SILT (moist, medium compact)	13
	S	6	10.0	12.0	SS/22	5-5-5-8		Similar Soil (moist, medium compact)	10
	T E	7	12.0	14.0	SS/22	5-6-6-6		Brown cmf SAND, trace SILT, trace fine GRAVEL (moist, medium compact)	12
15	M	8	14.0	16.0	SS/24	8-8-10-12		Brown mf SAND, little SILT (moist, medium compact)	18
		9	16.0	18.0	SS/24	5-7-7-9		Brown cmf SAND, little SILT, trace fine GRAVEL (moist, medium compact)	14
20	A	10	18.0	20.0	SS/24	13-14-13-20		Similar Soil (moist, medium compact)	27
	U	11	20.0	22.0	SS/24	9-8-12-14		Similar Soil (moist, medium compact)	20
	G E	12	22.0	24.0	SS/20	13-10-11-12		Similar Soil (moist, medium compact)	21
25	R	13	24.0	26.0	SS/24	8-9-11-12		Similar Soil (moist, medium compact) Continued on page 2	20

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

2. Sample recovered from auger cutting.

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
	H O L	14	26.0	28.0	SS/24	26-12-14-20		Continued from page 1 Brown cmf SAND, little SILT , trace fine GRAVEL (moist, medium compact)	26
30	L O W	15	28.0	30.0	SS/22	3-5-7-7		Brown mf SAND, little SILT (moist, medium compact)	12
35		16	33.5	35.0	SS/16	6-9-15	33.0	Brown SILT, little fine SAND (saturated, very stiff)	24
40	S T E M	17a	38.5	39.5	SS/18	4-4-8	38.0	Brown mf SAND, trace SILT (saturated, medium compact)	12
		17b	39.5	40.0			39.5	Brown SILT and fine SAND (saturated, stiff)	
45	A	18	43.5	45.0	SS/18	7-13-21		Grey SILT, little CLAY, trace fine SAND (moist, hard)	34
50	U G E R	19	48.5	50.0	SS/18	13-12-15		Grey SILT, some CLAY (moist, very stiff) Continued on page 3	27

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

LOG OF BORING SAMPLES							**CLASSIFICATION OF MATERIAL**		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
	H							Continued from page 2	
		20	53.5	55.0	SS/18	6-8-13		Grey SILT, some CLAY, trace cmf SAND (moist, very stiff)	21
55	S						55.0		
								~ Glacial Till ~	
		21	58.5	60.0	SS/18	11-29-33		Grey SILT, some cmf GRAVEL, little cmf SAND, little CLAY (moist, hard)	62
60	A	22	60.9	60.9	SS/0	100@0'		No Recovery	100+
	XXX						60.9	*~ Auger and Sampler Refusal @ 60.9' ~*	
	C	Run 1	60.9	65.9	C/60	NQ-Core		Grey, medium hard, weathered, thinly bedded to bedded SHALE BEDROCK Recovery: 60"/60" = 100% RQD: 18"/60" = 30% 18 Pieces, 7" Chips & Fragments	30%
	O								
	R								
65	E								
	XXX							Bottom of Boring @ 65.9'	
70									
75									

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Milstein Hall Parking Garage at Cornell University, Ithaca, NY **Report No.:** 26054B-01-0807
Client: Desman Associates **Date Started:** 08/08/07 **Finished:** 08/08/07
Location of Boring: See Boring Location Sketch **Elevation of Surface of Boring:** 801.4'

METHODS OF INVESTIGATION

Casing: 3-1/4" ID H. Stem Auger **Driller:** Al Linstruth
Casing Hammer: **Driller:** Tom McCarthy
Other: **Inspector:**
Soil Sampler: 2" OD Split Barrel **Rod Size:** AWJ
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: Diedrich D120 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
08/08/07	While drilling	62.3'	74.3'
08/08/07	Before casing removed	Cored	74.3'
08/08/07	After casing removed	See Remark 1	
08/08/07	After casing removed		

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
0	XXX	1a	0.0	0.5	SS/14	4-5-9-6	0.5	Topsoil (moist)	
	H	1b	0.5	2.0				Brown SILT, some cmf SAND, little cmf GRAVEL, trace BRICK, trace ROOT HAIRS (moist, stiff)	14
	O								
		2	2.0	4.0	SS/16	8-5-7-6		Similar Soil (moist, stiff)	12
	L						4.0	~ Unprepared Miscellaneous Fill ~	
		3	4.0	6.0	SS/16	7-6-6-10		Brown mf SAND, trace SILT (moist, medium compact)	12
5	L								
	O	4	6.0	8.0	SS/24	7-10-10-10		Similar Soil (moist, medium compact)	20
	W								
		5	8.0	10.0	SS/24	6-8-9-9		Brown cmf SAND, trace SILT (moist, medium compact)	17
10		6	10.0	12.0	SS/20	8-9-7-6		Similar Soil (moist, medium compact)	16
	S								
	T	7	12.0	14.0	SS/20	5-6-6-7		Brown cmf SAND, little SILT (moist, medium compact)	12
	E								
		8	14.0	16.0	SS/18	4-6-5-6		Brown cmf SAND, some SILT (moist, medium compact)	11
15	M								
		9	16.0	18.0	SS/20	8-7-6-6		Similar Soil (moist, medium compact)	13
		10	18.0	20.0	SS/20	5-6-6-7		Brown cmf SAND, trace SILT (moist, medium compact)	12
	A								
20	U	11a	20.0	20.8	SS/18	6-7-6-6		Similar Soil (moist, medium compact)	
		11b	20.8	22.0				Brown fine SAND and some SILT (moist, stiff)	13
	G								
		12	22.0	24.0	SS/20	5-8-8-10		Similar Soil (moist, very stiff)	16
	E						24.0		
		13	24.0	26.0	SS/24	5-8-10-16		Brown SILT, some fine SAND (moist, very stiff)	18
	R								
25								Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
		14a	26.0	27.5	SS/24	16-18-18-15	27.5	Brown SILT, some fine SAND (moist, very stiff)	
	O	14b	27.5	28.0				Brown mf SAND, trace SILT (moist, compact)	36
	L						28.0		
		15a	28.0	29.2	SS/18	7-8-8-9		Brown SILT, trace fine SAND (moist, very stiff)	16
	L	15b	29.2	30.0				Brown mf SAND, trace SILT (moist, medium compact)	
30									
	O								
	W								
		16	33.0	35.0	SS/20	8-8-8-9		Similar Soil (wet, medium compact)	16
35									
	S								
	T								
		17a	38.0	39.3	SS/-	7-8-7-15		Brown fine SAND, some SILT (saturated, medium compact)	15
	E						39.3		
		17b	39.3	40.0				Brown SILT, trace CLAY (saturated, stiff)	
	M								
40									
							43.0		
	A	18	43.0	45.0	SS/20	1-3-4-6		Grey CLAY, little cmf SAND, trace SILT (wet, medium stiff)	7
	U								
45									
	G								
	E								
	R	19	48.0	49.5	SS/16	7-11-16		Grey SILT, trace CLAY (moist, very stiff)	27
50								Continued on page 3	

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
50	HOLLOW STEM AUGER							Continued from page 2	
		20	53.0	54.5	SS/10	5-6-8		Grey CLAY, trace SILT (moist, stiff)	14
55									
		21	58.0	60.0	SS/0	6-7-7-8		Grey SILT and CLAY (wet, stiff)	14
60									
		22	63.5	65.0	SS/22	5-5-6		Grey CLAY, trace cmf SAND, trace SILT (wet, stiff)	11
65									
							68.0		
		23	68.0	69.5	SS/18	5-15-25		Grey CLAY, some cmf SAND, little SILT, trace cmf GRAVEL (wet, hard)	40
70									
							73.0	~ Glacial Till ~	
		24	73.0	73.4	SS/4	100@5"		Grey ROCK fragments and SILT (moist)	100+
	XXX	25	74.3	74.3	SS/0	100@0"		*Auger Refusal @ 74.3'*	
75								Continued on page 4	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
75								Continued from page 3	
	C O	R1	74.3	79.3	C/60	NQ-Core		Grey, medium hard, weathered, bedded SHALE BEDROCK Recovery: 60"/60" = 100% RQD: 17"/60" = 28% 20 Pieces, 2½" Chips & Fragments	28%
80	R E	R2	79.3	84.3	C/60	NQ-Core		Grey, medium hard, very weathered to weathered, bedded SHALE BEDROCK with mud seams (*See Remark 1*) Recovery: 60"/60" = 100% RQD: 34"/60" = 57% 17 Pieces, 0" Chips & Fragments	57%
	XXX							Bottom of Boring @ 84.3'	
85									
90									
95									
100									

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. Two mud seams of about 2 inches in total thickness was noted.

CME Associates, Inc. **BORING NO.: B-2 (2007)** Page 1 of 4

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Milstein Hall Parking Garage at Cornell University, Ithaca, NY **Report No.:** 26054B-01-0807
Client: Desman Associates **Date Started:** 07/16/07 **Finished:** 07/18/07
Location of Boring: See Boring Location Sketch **Elevation of Surface of Boring:** 808.2'

METHODS OF INVESTIGATION

Casing: 3-1/4" ID H. Stem Auger **Driller:** Wayne Earl
Casing Hammer: **Driller:** Karl Allen
Other: **Inspector:**
Soil Sampler: 2" OD Split Barrel **Rod Size:** AWJ
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: CME 55 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
07/16/07	While drilling	43.1'	43.5'
07/18/07	Before casing removed	82.5'	42.3'
07/18/07	After casing removed	See Remark 1	
07/18/07	After casing removed		

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine and – 35 to 50 % some – 20 to 35 % little – 10 to 20 % trace – 0 to 10 %	SPT "N" or RQD
			From	To					
0	XXX	1a	0.0	0.3	SS/14	2-9-9-9	0.3	Topsoil (moist)	
	H	1b	0.3	2.0				Brown cmf SAND and SILT, trace ORGANICS, trace BRICK (moist)	18
	O						2.0	~ Unprepared Miscellaneous Fill ~	
		2	2.0	4.0	SS/12	3-4-2-2		Brown cmf SAND and SILT, trace mf GRAVEL (moist, loose)	6
	L								
		3	4.0	6.0	SS/13	3-5-4-4		Brown cmf SAND and SILT, little cmf GRAVEL (moist, loose)	9
5	L								
	O	4	6.0	8.0	SS/11	3-5-2-6		Brown cmf SAND and SILT (moist, loose)	7
	W								
		5	8.0	10.0	SS/12	6-5-4-4		Brown cmf SAND, little mf GRAVEL, little SILT (moist to wet, loose)	9
10		6	10.0	12.0	SS/12	6-5-8-11		Brown cmf SAND, some cmf GRAVEL, little SILT (moist, medium compact)	13
	S								
	T	7	12.0	14.0	SS/8	6-5-3-12		Similar Soil (moist, loose)	8
	E						14.0		
		8	14.0	16.0	SS/16	2-7-7-8		Brown cmf SAND, little SILT, trace fine GRAVEL (moist, medium compact)	14
15	M								
		9	16.0	18.0	SS/15	6-6-5-5		Brown mf SAND, little SILT (moist, medium compact)	11
		10	18.0	20.0	SS/14	3-5-6-6		Similar Soil (moist, medium compact)	11
	A								
20	U	11	20.0	22.0	SS/22	7-6-5-6		Similar Soil (moist, medium compact)	11
	G								
		12	22.0	24.0	SS/18	7-6-6-6		Brown cmf SAND, little SILT, trace mf GRAVEL (moist, medium compact)	12
	E								
		13	24.0	26.0	SS/20	6-7-8-9		Brown mf SAND, little SILT (moist, medium compact)	15
	R								
25								Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H O L L O W S T E M A U G E R							Continued from page 1	
		14	28.5	30.0	SS/16	5-6-5-6		Brown mf SAND, little SILT (moist, medium compact)	11
30									
		15	33.5	35.0	SS/17	6-7-8		Similar Soil (moist, medium compact)	15
35									
		16a	38.5	39.2	SS/14	7-8-7	39.2	Brown mf SAND and SILT (moist, medium compact)	
		16b	39.2	40.0				Brown SILT and fine SAND, trace CLAY (saturated, very stiff)	15
40									
							43.0		
		17	43.5	45.0	SS/16	6-8-8		Brown CLAY and SILT, trace mf SAND (wet, very stiff)	16
45									
		18	48.5	50.0	SS/15	6-12-13		Grey SILT, little CLAY (moist, very stiff)	25
50								Continued on page 3	

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
50	HOLLOW STEM AUGER							Continued from page 2	
		19	53.5	55.0	SS/18	12-12-8		Grey SILT, little CLAY (moist, very stiff)	20
55									
		20a	58.5	59.5	SS/14	12-11-6	59.5	Grey SILT, trace CLAY (moist, very stiff)	
		20b	59.5	60.0				Grey CLAY and SILT (moist, very stiff)	17
60									
		21	63.5	65.0	SS/17	4-7-6		Similar Soil (wet, stiff)	13
65									
							67.0		
		22	67.1	68.6	SS/17	6-9-11		Grey SILT and CLAY, trace mf SAND, trace fine GRAVEL (moist, very stiff)	20
		23	69.0	70.5	SS/16	7-8-8		Similar Soil (moist, very stiff)	16
70								~ Glacial Till ~	
		24	73.5	75.0	SS/15	6-12-13		Grey SILT and cmf SAND, little mf GRAVEL, trace CLAY (moist, very stiff)	25
75								Continued on page 4	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

CME Associates, Inc. **Report No.: 26054B-01-0807 BORING NO.: B-2 (2007)** Page 4 of 4

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
75	H							Continued from page 3	
	S	25a	78.0	78.5	SS/8	39-100@5”	78.5	Brown SILT and cmf SAND, some cmf GRAVEL (moist, hard)	
80		25b	78.5	78.9				Grey/Brown cmf GRAVEL and ROCK fragments, little SILT (moist)	100+
	A XXX	26	82.5	82.5	SS/0	100@0”	82.5	Grey ROCK fragments and flour (dry) *Auger Refusal @ 82.5’*	100+
		R1	82.5	87.5	C/60	NQ-Core		Grey, medium hard, weathered, bedded SHALE BEDROCK Recovery: 60”/60” = 100% RQD: 52”/60” = 87% 9 Pieces, 0” Chips & Fragments	87%
85	C								
	O								
	R	R2	87.5	92.5	C/60	NQ-Core		Grey, medium hard, weathered, bedded SHALE BEDROCK Recovery: 60”/60” = 100% RQD: 58”/60” = 97% 6 Pieces, 0” Chips & Fragments	97%
	E								
90									
	XXX							Bottom of Boring @ 92.5’	
95									
100									

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

CME Associates, Inc. **BORING NO.: B-3 (20[illegible])** Page 1 of 3

SUBSURFACE EXPLORATION – TEST BORING LOG

Project:	Milstein Hall Parking Garage at Cornell University, Ithaca, NY	**Report No.:**	26054B-01-0807
Client:	Desman Associates	**Date Started:**	07/24/07
		Finished:	07/25/07
Location of Boring:	See Boring Location Sketch	**Elevation of Surface of Boring:**	809.4’

METHODS OF INVESTIGATION

Casing:	3-1/4” ID H. Stem Auger	**Driller:**	Wayne Earl
Casing Hammer:		**Driller:**	Karl Allen
Other:		**Inspector:**	
Soil Sampler:	2” OD Split Barrel	**Rod Size:**	AWJ
Sampler Hammer: Wt.	140 lbs./Auto	**Fall:**	30 in.
Make & Model of Drill Rig:	CME 55 Truck Mounted		

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
07/24/07	While drilling	37.4’	40.0’
07/24/07	Before casing removed	43.2’	69.2’
07/25/07	After casing removed	See Remark 1	
07/25/07	After casing removed		

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse, m – medium, f – fine; **and** – 35 to 50 %, **some** – 20 to 35 %, **little** – 10 to 20 %, **trace** – 0 to 10 %	SPT “N” or RQD
0	XXX	1a	0.0	0.5	SS/16	2-2-5-8	0.5	Topsoil (moist)	
	H	1b	0.5	2.0				Brown SILT, some cmf SAND, trace ORGANICS (moist)	7
	O	2	2.0	4.0	SS/8	8-12-10-8		Brown cmf SAND and SILT, little fine GRAVEL, little BRICK (moist)	22
	L							~ Unprepared Miscellaneous Fill ~	
		3	4.0	6.0	SS/10	4-5-5-4		Brown cmf SAND and SILT, little mf GRAVEL, trace BRICK (moist)	10
5	L								
							6.0		
	O	4	6.0	8.0	SS/12	4-6-6-6		Brown cmf SAND, some cmf GRAVEL, some SILT (moist, medium compact)	12
	W	5a	8.0	9.4	SS/16	4-5-5-5	9.4	Brown cmf SAND, some SILT, little cmf GRAVEL (moist, medium compact)	
		5b	9.4	10.0				Brown mf SAND, some SILT (moist, medium compact)	10
10		6	10.0	12.0	SS/14	3-2-3-2		Brown SILT, trace fine SAND (moist, medium stiff)	5
	S								
	T	7	12.0	14.0	SS/14	3-4-4-4		Brown fine SAND, some SILT (moist, loose)	8
	E								
		8	14.0	16.0	SS/12	3-2-3-2		Brown mf SAND, little SILT (moist, loose)	5
15	M								
		9	16.0	18.0	SS/18	2-2-2-2		Brown fine SAND and SILT (moist, loose)	4
		10	18.0	20.0	SS/16	2-2-2-3		Brown mf SAND, some SILT (moist, loose)	4
	A								
20	U	11	20.0	22.0	SS/16	2-3-5-21		Brown fine SAND and SILT, trace fine GRAVEL (moist, loose)	8
	G								
		12	22.0	24.0	SS/20	3-4-4-4		Brown fine SAND, some SILT (moist, loose)	8
	E								
		13	24.0	26.0	SS/18	2-3-5-5		Similar Soil (moist, loose)	8
	R								
25								Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	HOLLOW STEM AUGER							Continued from page 1	
		14	28.5	30.0	SS/16	8-11-12		Brown mf SAND, some SILT (moist, medium compact)	23
30									
		15	33.5	35.0	SS/18	4-7-9		Brown mf SAND, little SILT (saturated, medium compact)	16
35									
		16a	38.5	39.0	SS/14	2-3-2	39.0	Similar Soil (saturated, loose)	
		16b	39.0	4.0				Grey CLAY, little SILT (moist, medium stiff)	5
40									
		17	43.5	45.0	SS/14	7-9-12		Grey SILT, little CLAY (moist, very stiff)	21
45									
		18	48.5	50.0	SS/14	4-12-22		Grey SILT, trace CLAY (moist, hard)	34
50								Continued on page 3	

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

CME Associates, Inc. **Report No.: 26054B-01-0807** **BORING NO.: B-3 (2007)** Page 3 of 3

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
50	H							Continued from page 2	
	O								
	L	19a	53.5	54.7	SS/16	15-28-28	54.7	Grey SILT, trace CLAY (moist, hard)	
		19b	54.7	55.0				Grey fine SAND and SILT (saturated, very compact)	56
55	L								
	O								
	W								
		20	58.5	58.8	SS/3	100@3"		Grey SILT, some cmf GRAVEL, little cmf SAND, trace CLAY (moist, hard)	100+
	S								
60	T								
	E							~ Glacial Till ~	
	M								
		21	63.5	64.1	SS/4	30-100@5"		Grey SILT and cmf SAND, little cmf GRAVEL, trace ROCK fragments (moist, hard)	100+
	A								
65	U								
							68.5		
	G	22	68.5	68.5	SS/0	100@0"		Grey ROCK fragments	100+
	E								
		23	69.2	69.2	SS/0	100@0"		No Recovery *Auger & Sampler Refusal @ 69.2'*	100+
	R								
70	XXX							Bottom of Boring @ 69.2'	
75									

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

CME Associates, Inc. **BORING NO.: B-4 (2007)** Page 1 of 4

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Milstein Hall Parking Garage at Cornell University, Ithaca, NY **Report No.:** 26054B-01-0807
Client: Desman Associates **Date Started:** 07/23/07 **Finished:** 07/23/07
Location of Boring: See Boring Location Sketch **Elevation of Surface of Boring:** 806.2'

METHODS OF INVESTIGATION

Casing: 3-1/4" ID H. Stem Auger **Driller:** Wayne Earl
Casing Hammer: **Driller:** Karl Allen
Other: **Inspector:**
Soil Sampler: 2" OD Split Barrel **Rod Size:** AWJ
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: CME 55 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
07/23/07	While drilling	43.2'	43.5'
07/23/07	Before casing removed	48.1'	76.9'
07/23/07	After casing removed	See Remark 1	
07/23/07	After casing removed		

LOG OF BORING SAMPLES

CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
0	XXX	1a	0.0	0.5	SS/16	2-4-9-8	0.5	Topsoil (moist)	
	H	1b	0.5	2.0			2.0	Brown cmf SAND, some cmf GRAVEL, some SILT, trace ORGANICS (moist) ~ Fill ~	13
	O	2	2.0	4.0	SS/12	7-6-5-6		Brown cmf SAND, some SILT, little mf GRAVEL (moist, medium compact)	11
	L								
		3	4.0	6.0	SS/10	4-5-5-4		Similar Soil (moist, medium compact)	10
5	L								
	O	4	6.0	8.0	SS/10	4-5-3-3		Similar Soil (moist, loose)	8
	W						8.0		
		5	8.0	10.0	SS/14	4-5-4-5		Brown fine SAND, some SILT (moist, loose)	9
10		6	10.0	12.0	SS/16	3-4-3-3		Brown mf SAND, trace SILT (moist, loose)	7
	S								
	T	7	12.0	14.0	SS/14	3-4-5-4		Similar Soil (moist, loose)	9
	E						14.0		
		8	14.0	16.0	SS/20	7-9-11-12		Brown SILT, some fine SAND (moist, very stiff)	20
15	M								
		9	16.0	18.0	SS/22	11-13-14-16		Similar Soil (moist, very stiff	27
		10a	18.0	19.7	SS/22	7-8-9-11	19.7	Similar Soil (moist, very stiff)	
	A	10b	19.7	20.0				Brown fine SAND, trace SILT (moist, medium compact)	17
20	U	11a	20.0	20.5	SS/20	9-9-11-11	20.5	Similar Soil (moist, medium compact)	
		11b	20.5	22.0				Brown SILT, little mf SAND (moist, very stiff)	20
	G								
		12	22.0	24.0	SS/18	11-12-14-14		Similar Soil (moist, very stiff)	26
	E	13a	24.0	24.4	SS/16	8-8-10-8	24.4	Similar Soil (moist, very stiff)	
		13b	24.4	26.0				Brown fine SAND, trace SILT (moist, medium compact)	18
	R								
25								Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

CME Associates, Inc. Report No.: 26054B-01-0807 BORING NO.. B-4 (2007) Page 2 of 4

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
	O								
	L								
		14	28.5	30.0	SS/18	11-12-14-14		Brown fine SAND and SILT (moist, very stiff)	26
	L								
30									
	O								
	W								
		15a	33.5	34.4	SS/16	8-8-9	34.4	Similar Soil (wet, medium compact)	
		15b	34.4	35.0				Brown SILT, trace CLAY (moist, very stiff)	17
35									
	S								
	T								
	E	16	38.5	40.0	SS/18	5-7-8		Grey CLAY and SILT (moist, very stiff)	15
	M								
40									
	A	17	43.5	45.0	SS/16	5-8-7		Similar Soil (moist, very stiff)	15
	U								
45									
	G								
	E								
	R	18	48.5	50.0	SS/16	7-8-8		Grey SILT and CLAY (moist, very stiff)	16
50								Continued on page 3	

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
50	H							Continued from page 2	
	O						53.0		
	L	19	53.5	55.0	SS/14	8-11-19		Grey SILT, little CLAY, little cmf SAND, trace fine GRAVEL (moist, hard)	30
	L								
55									
	O							~ Glacial Till ~	
	W								
		20	58.5	60.0	SS/16	11-12-14		Grey SILT, little CLAY, little mf SAND, trace cmf GRAVEL (moist, very stiff)	26
	S								
60	T								
	E								
		21a	62.7	62.8	SS/16	11-16-14		Grey SILT and cmf SAND, trace fine GRAVEL (moist, hard)	30
	M								
		21b	62.8	63.6				Grey SILT, some cmf SAND, some mf GRAVEL, trace CLAY (moist, hard)	
	A	22	64.0	65.5	SS/14	11-24-34		Grey SILT, some cmf SAND, some mf GRAVEL (moist, hard)	58
65									
	U								
	G	23a	68.5	69.6	SS/12	24-24-52		Grey SILT and mf SAND, trace mf GRAVEL (moist, hard)	76
	E	23b	69.6	70.0				Grey SILT and cmf GRAVEL, little ROCK fragments (moist, hard)	
	R								
70	XXX								
							73.0		
		24	73.5	74.4	SS/8	87-100@4"		Grey cmf SAND, some ROCK fragments, little SILT (moist)	100+
75								Continued on page 4	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

CME Associates, Inc. **Report No.: 26054B-01-0807 BORING NO.: B-4 (2007)** Page 4 of 4

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
75	H							Continued from page 3	
	S	25	76.9	76.9	SS/0	100@0"		No Recovery *Auger & Sampler Refusal @ 76.9'*	100+
	A								
	XXX							Bottom of Boring @ 76.9'	
80									
85									
90									
95									
100									

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Milstein Hall Parking Garage at Cornell University, Ithaca, NY
Report No.: 26054B-01-0807
Client: Desman Associates
Date Started: 08/02/07 **Finished:** 08/03/07
Location of Boring: See Boring Location Sketch
Elevation of Surface of Boring: 806.7'

METHODS OF INVESTIGATION

Casing:	4-1/4" ID H. Stem Auger	**Driller:**	Al Linstruth
Casing Hammer:		**Driller:**	Tom McCarthy
Other:		**Inspector:**	
Soil Sampler:	2" OD Split Barrel	**Rod Size:**	AWJ
Sampler Hammer: Wt.	140 lbs./Auto	**Fall:**	30 in.
Make & Model of Drill Rig:	Diedrich D120 Truck Mounted		

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
08/02/07	While drilling	None Noted	57.5'
08/03/07	Before casing removed	15.0'	67.8'
08/03/07	After casing removed	See Remark 1	
08/03/07	After casing removed		

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
0	XXX						0.5	2" Asphalt Pavement, 3" Tar and Stone	
	H	1	0.5	2.0	SS/10	12-8-1		Brown SILT, some cmf SAND, some cmf GRAVEL, trace BRICK (moist)	9
	O	2	2.0	4.0	SS/6	2-2-2-2		Brown cmf SAND, some cmf GRAVEL, little BRICK, trace SILT (moist)	4
	L							~ Unprepared Miscellaneous Fill ~	
5	L	3	4.0	6.0	SS/12	6-5-5-8		Red BRICK, some cmf SAND, little fine GRAVEL (moist)	10
	O	4	6.0	8.0	SS/12	7-6-7-7		Brown SILT, some cmf SAND, little cmf GRAVEL, trace BRICK (moist)	13
	W						8.0		
		5	8.0	10.0	SS/16	4-2-3-2		Brown mf SAND, little SILT (moist, loose)	5
10		6	10.0	12.0	SS/18	3-2-3-4		Brown fine SAND and SILT (moist, loose)	5
	S						12.0		
	T	7	12.0	14.0	SS/12	12-18-14-14		Brown SILT, some fine SAND (moist, hard)	32
	E	8	14.0	16.0	SS/18	8-11-11-13		Similar Soil (moist, very stiff)	22
15	M						16.0		
		9	16.0	18.0	SS/22	8-7-10-10		Brown fine SAND, trace SILT (moist, medium compact)	17
		10	18.0	20.0	SS/20	9-7-7-7		Brown mf SAND, trace SILT (moist, medium compact)	14
	A								
20	U	11	20.0	22.0	SS/22	7-6-6-7		Similar Soil (moist, medium compact)	12
	G						22.0		
		12	22.0	24.0	SS/20	8-10-13-10		Brown cmf SAND, some mf GRAVEL, trace SILT (moist, medium compact)	23
	E						24.0		
		13	24.0	26.0	SS/18	6-4-3-3		Brown SILT and CLAY, trace fine SAND (moist, stiff)	7
25	R							Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	HOLLOW STEM AUGER							Continued from page 1	
		14	26.0	28.0	SS/20	4-4-6-7		Grey CLAY and SILT (wet, stiff)	10
		15	28.0	30.0	SS/24	2-3-4-4		Grey SILT and CLAY, trace fine SAND (moist, medium stiff)	7
30									
		16	33.0	35.0	SS/22	2-3-3-4		Grey CLAY and SILT (moist, medium stiff)	6
35									
		17	38.0	40.0	SS/24	3-4-5-6		Similar Soil (moist, stiff)	9
40									
		18	43.0	45.0	SS/22	4-3-9-9		Grey SILT and CLAY (moist, stiff)	12
45									
		19	48.0	50.0	SS/20	3-5-6-9		Grey CLAY and SILT (moist, stiff)	11
50								Continued on page 3	

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

CME Associates, Inc. **Report No.: 26054B-01-0807 BORING NO.: B-5 (2007)** Page 3 of 3

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
50	H O						52.1	Continued from page 2	
	L L O W	20	52.1	54.1	SS/20	6-10-15-13		Grey SILT, some cmf SAND, some cmf GRAVEL, trace CLAY (moist, very stiff) ~ Glacial Till ~	25
55									
		21	57.5	59.0	SS/18	17-36-27		Grey SILT, some cmf SAND, some cmf GRAVEL, trace ROCK fragments (moist, hard)	63
60	S T E M						63.0		
		22	63.0	63.3	SS/2	100@4”		Grey ROCK fragments	100+
65	A U G E								
	R XXX	23	67.8	67.8	SS/0	100@0”	67.8	No Recovery *Auger & Sampler Refusal @ 67.8’*	100+
		R1	67.8	72.8	C/60	NQ-Core		Grey, soft to medium hard, very weathered, bedded SHALE BEDROCK Recovery: 60”/60” = 100% RQD: 15”/60” = 25% 24 Pieces, 6” Chips & Fragments	25%
70	C O								
	R E	R2	72.8	77.8	C/60	NQ-Core		Grey, medium hard, weathered, bedded SHALE BEDROCK Recovery: 60”/60” = 100% RQD: 37”/60” = 62% 18 Pieces, 2” Chips & Fragments	62%
75	XXX							Bottom of Boring @ 77.8’	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

CME Associates, Inc. **BORING NO.: B-6 (2007)** Page 1 of 2

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Milstein Hall Parking Garage at Cornell University, Ithaca, NY **Report No.:** 26054B-01-0807
Client: Desman Associates **Date Started:** 08/06/07 **Finished:** 08/06/07
Location of Boring: See Boring Location Sketch **Elevation of Surface of Boring:** 807.9'

METHODS OF INVESTIGATION

Casing: 4-1/4" ID H. Stem Auger **Driller:** Al Linstruth
Casing Hammer: **Driller:** Tom McCarthy
Other: **Inspector:**
Soil Sampler: 2" OD Split Barrel **Rod Size:** AWJ
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: Diedrich D120 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
08/06/07	While drilling	None Noted	10.0'
08/06/07	Before casing removed	36.3'	38.7'
08/06/07	After casing removed	See Remark 1	
08/06/07	After casing removed		

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

c – coarse, m – medium, f – fine; **and** – 35 to 50 %, **some** – 20 to 35 %, **little** – 10 to 20 %, **trace** – 0 to 10 %

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	Classification of Material	SPT "N" or RQD
0	XXX						0.5	3" Asphalt Pavement, 3" Tar and Stone	
	H	1	0.5	2.0	SS/14	11-9-15		Brown cmf SAND, little mf GRAVEL, little SILT (moist, medium compact)	24
	O							~ Possible Fill ~	
		2	2.0	4.0	SS/12	13-14-8-7		Similar Soil (moist, medium compact)	22
	L								
		3	4.0	6.0	SS/3	7-6-4-4		Brown cmf SAND, some mf GRAVEL, little SILT (moist to wet, loose)	10
5	L								
	O	4a	6.0	7.2	SS/14	4-4-4-2	7.2	Similar Soil (wet, loose)	
		4b	7.2	8.0				Brown SILT, trace fine SAND (wet, stiff)	8
	W								
		5	8.0	10.0	SS/2	4-2-2-1		Similar Soil (wet, medium compact)	4
							10.0		
10		6	10.0	12.0	SS/16	2-2-2-2		Brown mf SAND, some SILT (wet, loose)	4
	S								
	T	7	12.0	14.0	SS/16	5-5-5-5		Brown fine SAND, little SILT (moist, loose)	10
	E								
		8	14.0	16.0	SS/18	3-1-2-2		Brown fine SAND, little SILT (moist, very loose)	3
15	M								
		9	16.0	18.0	SS/16	2-1-2-2		Similar Soil (saturated, very loose)	3
		10a	18.0	19.6	SS/20	1-1-1-1	19.6	Similar Soil (saturated, very loose)	2
	A	10b	19.6	20.0				Brown CLAY, trace SILT (saturated, soft)	
20	U	11	20.0	22.0	SS/18	2-5-6-7		Brown SILT, trace CLAY (saturated, stiff)	11
	G								
		12	22.0	24.0	SS/0	3-2-3-5		Grey CLAY, trace SILT (saturated, medium stiff)	5
	E								
		13	24.0	26.0	SS/18	1-2-2-4		Grey CLAY, little SILT (wet, medium stiff)	4
	R								
25								Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

CME Associates, Inc. Rep. No.: 26054B-01-0807 BORING NO. B-6 (2007) Page 2 of 2

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT “N” or RQD
			From	To					
25	H							Continued from page 1	
	O	14	26.0	28.0	SS/20	3-5-8-11		Grey SILT, some CLAY (wet, stiff)	13
	L								
	L								
	O						28.0		
	W	15	28.0	30.0	SS/20	6-9-15-15		Grey SILT, little CLAY, trace fine GRAVEL (wet, very stiff)	24
30									
	S							~ Glacial Till ~	
	T								
	E								
	M	16	33.5	35.0	SS/10	12-11-13		Grey SILT, trace CLAY, trace fine GRAVEL (wet, very stiff)	24
35									
	A						36.3		
	U	17	36.3	36.5	SS/2	100@2”		Grey ROCK chips and fragments, little SILT (moist, hard)	100+
	G								
	E								
	R	18	38.7	38.7	SS/0	100@0”		No Recovery	100+
	XXX						38.7	*Auger & Sampler Refusal @ 38.7’*	
40	C	R1	38.7	43.7	C/60	NQ-Core		Grey, medium hard, weathered, bedded SHALE BEDROCK Recovery: 60”/60” = 100% RQD: 44”/60” = 73% 10 Pieces, 0” Chips & Fragments	73%
	O								
		R2	43.7	48.7	C/60	NQ-Core		Grey, medium hard, weathered, bedded SHALE BEDROCK Recovery: 60”/60” = 100% RQD: 53”/60” = 88% 10 Pieces, ½” Chips & Fragments	88%
45	R								
	E								
	XXX							Bottom of Boring @ 48.7’	
50									

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

CME Associates, Inc. **BORING NO.: B-7 (2007)** Page 1 of 2

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Milstein Hall Parking Garage at Cornell University, Ithaca, NY **Report No.:** 26054B-01-0807
Client: Desman Associates **Date Started:** 08/01/07 **Finished:** 08/02/07
Location of Boring: See Boring Location Sketch **Elevation of Surface of Boring:** 807.7'

METHODS OF INVESTIGATION

Casing:	4-1/4" ID H. Stem Auger	**Driller:**	Al Linstruth
Casing Hammer:		**Driller:**	Tom McCarthy
Other:		**Inspector:**	
Soil Sampler:	2" OD Split Barrel	**Rod Size:**	AWJ
Sampler Hammer: Wt.	140 lbs./Auto	**Fall:**	30 in.
Make & Model of Drill Rig:	Diedrich D120 Truck Mounted		

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
08/02/07	While drilling	None Noted	21.5'
08/02/07	Before casing removed	None Noted	30.5'
08/02/07	After casing removed	See Remark 1	
08/02/07	After casing removed		

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
0	XXX	1a	0.0	0.5	SS/18	2-3-25-100@2"	0.5	Topsoil	
	H	1b	0.5	1.1				Brown SILT, some cmf SAND, little CLAY, trace cmf GRAVEL, trace ORGANICS (moist)	28
	O	1c	1.1	1.6				Brown cmf GRAVEL, some SILT (moist)	
								~ Possible Fill ~	
	L	2	2.0	2.2	SS/3	100@3"	4.0	Grey cmf SAND and cmf GRAVEL (moist, compact)	100+
5	L	3	4.0	6.0	SS/24	42-60-50-42		Brown cmf SAND and cmf GRAVEL, little SILT (moist, very compact)	110
	O								
		4	6.0	6.3	SS/4	100@4"		Similar Soil (moist, very compact)	100+
	W								
		5	8.0	8.2	SS/3	100@3"		Similar Soil (moist, very compact)	100+
10		6	10.0	12.0	SS/2	100@2"		Similar Soil (moist, very compact)	100+
	S								
							11.5	*Augering easier @ 11.5'*	
	T	7	11.5	13.5	SS/20	13-8-8-9		Brown SILT, trace fine SAND (moist, very stiff)	16
	E	8	13.5	15.5	SS/18	18-26-22-24		Similar Soil (moist, hard)	48
15	M								
							15.5		
		9	15.5	17.5	SS/24	23-19-19-20		Brown fine SAND and SILT (moist, compact)	38
		10	17.5	19.5	SS/24	13-15-15-16		Similar Soil (moist, compact)	30
	A								
		11	19.5	21.5	SS/20	11-11-7-8		Brown fine SAND, some SILT (wet, medium compact)	18
20	U								
	G	12	21.5	23.5	SS/24	6-4-3-2		Similar Soil (saturated, loose)	7
							23.5		
	E	13	23.5	25.5	SS/10	3-3-5-5		Grey SILT and CLAY, little mf SAND (moist, stiff)	8
	R								
25								Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

LOG OF BORING SAMPLES							**CLASSIFICATION OF MATERIAL**		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
		14	25.5	27.5	SS/14	8-10-8-6		Grey SILT and CLAY (moist, very stiff)	18
	S	15	27.5	29.0	SS/16	3-3-5		Grey SILT, some CLAY (moist, stiff)	8
		16	29.0	30.5	SS/16	6-8-7		Grey SILT, little CLAY (moist, very stiff)	15
30	A								
	XXX							Bottom of Boring @ 30.5'	
35									
40									
45									
50									

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

CME Associates, Inc. **BORING NO.: B-8 (20[illegible])** age 1 of 2

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Milstein Hall Parking Garage at Cornell University, Ithaca, NY		**Report No.:**	26054B-01-0807
Client: Desman Associates	**Date Started:** 07/31/07	**Finished:**	07/31/07
Location of Boring: See Boring Location Sketch	**Elevation of Surface of Boring:** 808.0'		

METHODS OF INVESTIGATION

Casing:	4-1/4" ID H. Stem Auger	**Driller:**	Al Linstruth
Casing Hammer:		**Driller:**	Tom McCarthy
Other:		**Inspector:**	
Soil Sampler:	2" OD Split Barrel	**Rod Size:**	AWJ
Sampler Hammer: Wt.	140 lbs./Auto	**Fall:**	30 in.
Make & Model of Drill Rig:	Diedrich D120 Truck Mounted		

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
07/31/07	While drilling	None Noted	28.0'
07/31/07	Before casing removed	None Noted	30.0
07/31/07	After casing removed	See Remark 1	
07/31/07	After casing removed		

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
0	XXX	1a	0.0	0.3	SS/12	2-2-6-4	0.3	Topsoil (moist)	
	H	1b	0.3	2.0				Brown CINDERS, ASH, little SILT, little mf SAND (moist)	8
	O	2	2.0	4.0	SS/20	6-7-7-7		Brown SILT, some cmf SAND, some cmf GRAVEL (moist)	14
	L							~ Unprepared Miscellaneous Fill ~	
		3	4.0	6.0	SS/14	9-7-7-9		Brown SILT, some fine SAND, trace ROOT HAIRS (moist)	14
5	L								
	O	4	6.0	8.0	SS/14	10-6-5-4		Brown SILT, some cmf SAND, some cmf GRAVEL, trace ROOT HAIRS (moist)	11
	W						8.0		
		5	8.0	10.0	SS/10	5-3-3-4		Brown cmf SAND and SILT, some cmf GRAVEL (moist, loose)	6
10		6	10.0	12.0	SS/14	5-3-4-5		Brown cmf SAND, some SILT, some mf GRAVEL (moist, loose)	7
	S								
	T	7	12.0	14.0	SS/14	20-12-14-12		Similar Soil (moist, medium compact)	26
	E								
		8a	14.0	15.8	SS/24	13-10-8-4	15.8	Similar Soil (moist, medium compact)	18
15	M	8b	15.8	16.0				Brown SILT, trace fine SAND (moist, stiff)	
		9a	16.0	17.0	SS/12	6-5-6-7	17.0	Similar Soil (moist, stiff)	11
		9b	17.0	18.0				Brown fine SAND, little SILT (moist, medium compact)	
		10	18.0	20.0	SS/8	6-9-16-18		Brown fine SAND and SILT (moist, medium compact)	25
	A								
20	U	11	20.0	22.0	SS/24	19-19-21-22		Brown fine SAND and SILT (moist, compact)	40
	G								
		12	22.0	24.0	SS/24	13-15-17-14		Similar Soil (moist, compact)	32
	E								
	R	13	24.0	26.0	SS/24	6-8-8-8		Similar Soil (moist, medium compact)	16
25								Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
		14a	26.0	27.8	SS/24	7-6-6-6	27.8	Brown mf SAND, little SILT (saturated, medium compact)	12
		14b	27.8	28.0				Brown SILT, trace mf SAND (moist, stiff)	
	S	15a	28.0	29.4	SS/24	3-4-4-6	29.4	Brown SILT and CLAY, trace fine GRAVEL (moist, stiff)	8
		15b	29.4	30.0				Grey CLAY and SILT, trace fine GRAVEL (moist, stiff)	
30	A								
	XXX							Bottom of Boring @ 30.5'	
35									
40									
45									
50									

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

CME Associates, Inc. **BORING NO.: B-9 (2007)** Page 1 of 2

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Milstein Hall Parking Garage at Cornell University, Ithaca, NY **Report No.:** 26054B-01-0807
Client: Desman Associates **Date Started:** 08/01/07 **Finished:** 08/01/07
Location of Boring: See Boring Location Sketch **Elevation of Surface of Boring:** 808.8'

METHODS OF INVESTIGATION

Casing: 4-1/4" ID H. Stem Auger **Driller:** Al Linstruth
Casing Hammer: **Driller:** Tom McCarthy
Other: **Inspector:**
Soil Sampler: 2" OD Split Barrel **Rod Size:** AWJ
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: Diedrich D120 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
08/01/07	While drilling	None Noted	28.0'
08/01/07	Before casing removed	None Noted	30.0
08/01/07	After casing removed	See Remark 1	
08/01/07	After casing removed		

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
0	XXX						0.5	3" Asphalt, 3" Crushed Stone	
	H	1	0.5	2.0	SS/8	5-4-3		Brown SILT, some cmf SAND, little cmf GRAVEL, trace ASPHALT (wet)	7
	O							~ Unprepared Miscellaneous Fill ~	
		2	2.0	4.0	SS/6	10-10-6-6		Similar Soil (moist)	16
	L								
		3	4.0	6.0	SS/8	5-5-3-2		Brown SILT, some cmf SAND, little cmf GRAVEL, trace ASPHALT, trace BRICK	8
5	L						6.0	(moist)	
	O	4	6.0	8.0	SS/14	5-3-3-3		Brown cmf GRAVEL and cmf SAND, little SILT (wet, loose)	6
	W								
		5	8.0	10.0	SS/12	5-5-6-7		Brown cmf SAND, some cmf GRAVEL, little SILT (moist, medium compact)	11
10		6	10.0	12.0	SS/6	6-3-3-4		Similar Soil (moist, loose)	6
	S								
	T	7	12.0	14.0	SS/6	6-4-6-7		Similar Soil (moist, medium compact)	10
	E								
		8	14.0	16.0	SS/0	10-11-16-18		No Recovery	27
15	M						16.0		
		9	16.0	18.0	SS/18	10-11-9-9		Brown cmf SAND, little SILT, trace mf GRAVEL (moist, medium compact)	20
		10	18.0	20.0	SS/20	10-6-5-5		Similar Soil (moist, medium compact)	11
	A								
20	U	11	20.0	22.0	SS/20	6-4-4-4		Similar Soil (moist, loose)	8
	G								
		12	22.0	24.0	SS/20	4-4-5-3		Similar Soil (moist, loose)	9
	E								
		13	24.0	26.0	SS/18	4-5-6-7		Brown fine SAND, little SILT (moist, medium compact)	11
25	R							Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

CME Associates, Inc. Report No.: 26054B-01-0807 BORING NO.: B-9 (2007) Page 2 of 2

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
		14	26.0	28.0	SS/18	4-4-6-6		Similar Soil (moist, medium compact)	10
	S								
		15a	28.0	28.7	SS/18	3-4-5-6	28.7	Similar Soil (moist, medium compact)	
		15b	28.7	30.0				Brown SILT, trace fine SAND (moist, stiff)	9
	A								
30	XXX							Bottom of Boring @ 30.0'	
35									
40									
45									
50									

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

CME Associates, Inc. **BORING NO.: B-10 (2007)** Page 1 of 2

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Milstein Hall Parking Garage at Cornell University, Ithaca, NY **Report No.:** 26054B-01-0807
Client: Desman Associates **Date Started:** 07/31/07 **Finished:** 07/31/07
Location of Boring: See Boring Location Sketch & Remarks Below **Elevation of Surface of Boring:** 806.1'

METHODS OF INVESTIGATION

Casing: 4-1/4" ID H. Stem Auger **Driller:** Al Linstruth
Casing Hammer: **Driller:** Tom McCarthy
Other: **Inspector:**
Soil Sampler: 2" OD Split Barrel **Rod Size:** AWJ
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: Diedrich D120 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
07/31/07	While drilling	None Noted	28.0'
07/31/07	Before casing removed	None Noted	30.0'
07/31/07	After casing removed	See Remark 1	
07/31/07	After casing removed		

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
0	XXX						0.5	2" Asphalt, 4" Run-of-Crush	
	H	1a	0.5	1.6	SS/14	8-8-8		Grey Run-of-Crush LIMESTONE, trace BRICK (moist)	16
	O	1b	1.6	2.0				Red BRICK, trace Run-of-Crush LIMESTONE (moist)	
	L	2	2.0	4.0	SS/10	5-5-4-4		Reddish-yellow BRICK (moist) ~ Unprepared Miscellaneous Fill ~	9
5	L	3	4.0	6.0	SS/6	6-4-6-6		Red BRICK, little mf SAND (moist)	10
	O	4a	6.0	6.1	SS/12	5-5-3-3	6.1	Yellow BRICK, little mf SAND (moist, loose)	8
	W	4b	6.1	8.0				Brown cmf SAND and mf GRAVEL, some SILT (wet, loose)	
		5	8.0	10.0	SS/12	4-3-4-4		Similar Soil (wet, loose)	7
10		6	10.0	12.0	SS/10	6-5-4-4		Similar Soil (wet, loose)	9
	S								
	T	7	12.0	14.0	SS/10	6-4-3-4		Similar Soil (wet, loose)	7
	E								
		8	14.0	16.0	SS/10	5-4-2-2		Brown cmf SAND and SILT, little mf GRAVEL (wet, loose)	6
15	M								
		9a	16.0	17.0	SS/12	4-2-1-1	17.0	Similar Soil (wet, very loose)	3
		9b	17.0	18.0				Brown mf SAND, little SILT, trace mf GRAVEL (wet, very loose)	
		10	18.0	20.0	SS/12	2-1-2-3		Brown fine SAND, some SILT (wet, very loose)	3
	A								
		11	20.0	22.0	SS/20	5-5-5-5		Brown mf SAND, trace SILT (wet, very loose)	10
20	U								
		12a	22.0	23.5	SS/20	13-7-6-12		Similar Soil (wet, medium compact)	
	G	12b	23.5	24.0				Brown fine SAND (wet, medium compact)	13
		13a	24.0	24.2	SS/24	22-16-15-22		Grey cmf GRAVEL, some cmf SAND (moist, compact)	31
	E								
		13b	24.2	26.0				Brown fine SAND and SILT (moist, compact)	
	R								
25								Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade. **2.** Moved boring 4 feet South.

LOG OF BORING SAMPLES							**CLASSIFICATION OF MATERIAL**		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H						26.0	Continued from page 1	
		14	26.0	28.0	SS/18	16-19-19-21		Brown SILT and fine SAND (moist, hard)	38
	S								
		15	28.0	30.0	SS/24	10-12-12-15		Brown SILT and mf SAND (wet, very stiff)	24
	A								
30	XXX							Bottom of Boring @ 30.0'	
35									
40									
45									
50									

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

SUBSURFACE EXPLORATION – TEST BORING LOG

Project:	Milstein Hall Parking Garage at Cornell University, Ithaca, NY	**Report No.:**	26054B-01-0807
Client:	Desman Associates	**Date Started:** 08/07/07	**Finished:** 08/07/07
Location of Boring:	See Boring Location Sketch	**Elevation of Surface of Boring:**	805.6'

METHODS OF INVESTIGATION

Casing:	4-1/4" ID H. Stem Auger	**Driller:**	Al Linstruth
Casing Hammer:		**Driller:**	Tom McCarthy
Other:		**Inspector:**	
Soil Sampler:	2" OD Split Barrel	**Rod Size:**	AWJ
Sampler Hammer: Wt.	140 lbs./Auto	**Fall:**	30 in.
Make & Model of Drill Rig:	Diedrich D120 Truck Mounted		

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
08/07/07	While drilling	None Noted	26.0'
08/07/07	Before casing removed	28.2'	28.0'
08/07/07	After casing removed	See Remark 1	
08/07/07	After casing removed		

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

c – coarse, m – medium, f – fine; **and** – 35 to 50 %, **some** – 20 to 35 %, **little** – 10 to 20 %, **trace** – 0 to 10 %

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	Classification of Material	SPT "N" or RQD
0	XXX						0.5	4" Asphalt, 2" Crushed Stone	
	H	1a	0.5	1.6	SS/12	7-9-6		Grey cmf SAND and cmf GRAVEL, some SILT, little ASPHALT (moist)	15
	O	1b	1.6	20.0				Brown SILT, some cmf SAND, some cmf GRAVEL (moist)	
	L							~ Unprepared Miscellaneous Fill ~	
		2	2.0	4.0	SS/12	6-6-6-5	4.0	Similar Soil (moist, stiff)	12
5	L	3	4.0	6.0	SS/6	5-5-4-4		Brown cmf SAND and cmf GRAVEL, some SILT (moist, loose)	9
	O	4	6.0	8.0	SS/3	3-3-3-4		Brown cmf SAND, trace SILT, trace fine GRAVEL (wet, loose)	6
	W						8.0		
		5	8.0	10.0	SS/20	3-2-3-3		Brown fine SAND and SILT (moist, loose)	5
10		6	10.0	12.0	SS/18	2-2-2-4		Brown fine SAND, some SILT (moist, loose)	4
	S								
	T	7	12.0	14.0	SS/22	4-6-8-11		Brown cmf SAND, little SILT (moist, medium compact)	14
	E								
		8	14.0	16.0	SS/0	11-11-9-9		Brown fine SAND and SILT (moist, medium compact)	20
15	M								
							16.0		
		9	16.0	18.0	SS/14	6-16-16-15		Brown SILT, some fine SAND (moist, hard)	32
		10	18.0	20.0	SS/22	7-9-8-10		Similar Soil (moist, very stiff)	17
	A								
20	U	11	20.0	22.0	SS/20	6-7-7-8		Brown SILT, little fine SAND (moist, stiff)	14
	G	12	22.0	24.0	SS/22	4-7-7-6		Similar Soil (moist, stiff)	14
	E	13a	24.0	25.0	SS/18	4-5-4-5		Brown SILT, trace fine SAND (moist, stiff)	
		13b	25.0	26.0				Similar Soil (saturated, stiff)	9
	R								
25								Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

CME Associates, Inc. **Rep.. No.: 26054B-01-0807 BORING NO.. B-11 (2007)** Page 2 of 2

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m – medium** **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little –** 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H						26.0	Continued from page 1	
		14	26.0	28.0	SS/18	4-5-3-3		Brown fine SAND, trace SILT (saturated, loose)	8
	S								
		15	28.0	30.0	SS/20	2-3-2-3		Brown mf SAND, trace SILT (saturated, loose)	5
	A								
30	XXX							Bottom of Boring @ 30.0'	
35									
40									
45									
50									

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

CME Associates, Inc. **BORING NO.: B07-10** Page 1 of 2

SUBSURFACE EXPLORATION – TEST BORING LOG

Project:	Milstein Hall, Cornell University, Ithaca, New York	**Report No.:**	26000B-02-0707
Client:	Cornell University	**Date Started:**	06/01/07 **Finished:** 06/01/07
Location of Boring:	Offset Boring 2' N and 7' E, due to utilities	**Elevation of Surface of Boring:**	810.8' (-2.3')

METHODS OF INVESTIGATION

Casing:	4-1/4" ID H. Stem Auger	**Driller:**	Dan Gates
Casing Hammer:		**Driller:**	Karl Allen
Other:		**Inspector:**	Natalie Meneilly
Soil Sampler:	2" OD Split Barrel	**Rod Size:**	AWJ
Sampler Hammer: Wt.	140 lbs./Auto	**Fall:**	30 in.
Make & Model of Drill Rig:	Diedrich D120 Truck Mounted		

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
06/01/07	While drilling	None Noted	18.0'
06/01/07	Before casing removed	None Noted	40.4'
06/01/07	After casing removed	See Remark 1	
06/01/07	After casing removed		

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
0	XXX	1a	0.0	1.3	SS/10	8-7-6		Brown SILT, some cmf GRAVEL, little cmf SAND with CINDERS (moist)	13
	H								
		1b	1.3	1.5				CINDERS and BRICK, little cmf SAND (moist)	
	O								
								~ Miscellaneous Fill ~	
	L								
5		2a	5.0	6.0	SS/10	2-4-9		Black CINDERS, little SILT, trace BRICK, trace cmf GRAVEL (moist)	13
	L						6.0		
		2b	6.0	6.5				Brown SILT, some cmf SAND, little cmf GRAVEL (moist, stiff)	
	O								
	W								
10		3	10.0	12.0	SS/9	13-14-14-12		Dark Grey Mottled SILT, some cmf SAND, trace cmf GRAVEL (moist, very stiff)	28
	S								
							12.0	*~ Augering gravelly @ 10.0' ~*	
	T	4	12.0	14.0	SS/13	18-22-26-11		Brown cmf GRAVEL, some cmf SAND, trace SILT (moist, compact)	48
	E	5	14.0	14.3	SS/½	100@4"		Grey cmf GRAVEL, little cmf SAND (moist, very compact)	
15	M							*~ Augered through probable Cobble @ 14.2' ~*	
		6a	16.0	16.8	SS/*	43-46-10-6	16.8	Brown cmf GRAVEL, little cmf SAND (moist, very compact)	56
		6b	16.8	18.0				Brown CLAY, some SILT, trace cmf SAND with interlayered fine SAND seams (moist, hard)	
	A								
		7	18.0	20.0	SS/8	20-29-30-8		Similar Soil (wet, very stiff)	
	U	8a	20.6	22.0	SS/14	23-13-13-14		Brown Mottled CLAY, some SILT, trace cmf SAND (moist, very stiff)	59
20									26
	G	8b	20.6	22.0				Grey Similar Soil (moist, very stiff)	
		9a	22.0	22.2	SS/*	30-17-24-36		1" recovery w/2" spoon – 1st Attempt Grey SILT (moist)	41
	E								
		9b	22.2	24.0				Brown/Grey Mottled CLAY, some SILT, little cmf GRAVEL, little cmf SAND (moist, hard)	
	R								
25								Continued on Page 2	

*SS – Split Spoon, U – Undisturbed Tube, C – Core

* 3" Spoon Used for Second Attempt

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
								Continued from Page 1	
		10a	24.0	24.5	SS/24	26-22-24-27		Brown/Grey Mottled CLAY, some SILT, trace cmf SAND, trace cmf GRAVEL (moist to wet, hard)	46
	H								
		10b	24.5	26.0				Grey SILT, trace fine SAND (moist, hard)	
							28.0		
30		11	28.5	30.0	SS/8	27-19-82		Grey/Brown cmf GRAVEL, some SILT, little CLAY, trace cmf SAND (moist, very compact) *~ Augering harder @ 32.2' ~*	101
		12	32.2	32.7	SS/3	100@5"		Brown cmf GRAVEL (moist, very compact) ~ Augering easier @ 32.4', then gravelly again @ 32.7' ~	100+
	S							~ Glacial Till ~	
35									
							37.0	Grey SHALE fragments noted in auger cuttings	
		13	37.5	37.8	SS/2	100@4"		Grey SHALE fragments (moist)	100+
	A							~ Weathered Rock ~	
							40.4	*~ Auger Refusal @ 39.9' ~*	
40		14	39.9	40.4	SS/2	100@5"		Grey SHALE fragments (moist)	100+
	XXX								
		R1	40.4	45.4		NQ-Core		Rec: 60/60 = 100% RQD: 53/60 = 88% 9 Pieces, ½" Chips & Fragments Grey, medium hard to hard, weathered bedded SHALE BEDROCK with ¼" thick mud seam at 42.0' and vertical fracture noted at 41.2' No loss of return water, Cores at about 1 foot per minute at 300 psi.	88%
	C O R E								
45									
	XXX							Bottom of Boring @ 45.4'	
50									

*SS – Split Spoon, U – Undisturbed Tube

CME Associates, Inc. **BORING NO.: B07-11A** Page 1 of 4

SUBSURFACE EXPLORATION – TEST BORING LOG

Project:	Milstein Hall, Cornell University, Ithaca, New York	**Report No.:**	26000B-02-0707
Client:	Cornell University	**Date Started:**	05/29/07 **Finished:** 05/31/07
Location of Boring:	See Boring Location Sketch	**Elevation of Surface of Boring:**	809.8' (-3.3')

METHODS OF INVESTIGATION

Casing:	4-1/4" ID H. Stem Auger	**Driller:**	Dan Gates
Casing Hammer:		**Driller:**	Karl Allen
Other:		**Inspector:**	Natalie Meneilly
Soil Sampler:	2" OD Split Barrel	**Rod Size:**	AWJ
Sampler Hammer: Wt.	140 lbs./Auto	**Fall:**	30 in.
Make & Model of Drill Rig:	Diedrich D120 Truck Mounted		

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
05/29/07	While drilling	24.8'	24.0'
05/31/07	Before casing removed	23.7'	70.2'
05/31/07	After casing removed	See Remark 1	

Additional Groundwater Observations on Page 4

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse, m – medium, f – fine; **and** – 35 to 50 %, **some** – 20 to 35 %, **little** – 10 to 20 %, **trace** – 0 to 10 %	SPT "N" or RQD
0	XXX						0.05	Asphalt Pavement (<1")	
		1a	0.0	1.0	SS/16	11-8-8		Crushed Stone and CINDERS	16
		1b	1.0	1.5				Brown SILT, little cmf SAND, trace mf GRAVEL (moist ~ Miscellaneous Fill ~	
	H								
	O						5.0		
5	L	2	5.0	6.5	SS/*	4-6-7		Brown mf GRAVEL, some cmf SAND, little SILT (moist, medium compact)	13
	L								
	O								
	W								
10		3	10.0	12.0	SS/16	34-34-15-16		Brown cmf GRAVEL, some SILT, little cmf SAND (moist, compact)	49
	S								
	T	4	12.0	14.0	SS/16	20-17-15-21		Brown cmf GRAVEL, some cmf SAND, little SILT (moist, compact)	32
	E								
15	M	5	14.0	16.0	SS/15	47-16-12-9		Similar Soil (moist, medium compact)	28
		6a	16.0	16.7	SS/13	14-12-8-7		Similar Soil (moist, medium compact)	20
		6b	16.7	18.0				Brown fine SAND, trace SILT (moist, medium compact)	
	A								
	U	7	18.0	20.0	SS/16	4-4-6-7		Brown fine SAND, little SILT (moist, medium compact)	10
20	G								
	E	8	20.0	22.0	SS/16	8-11-12-16		Similar Soil (moist to wet, medium compact)	23
	R	9	22.0	24.0	SS/18	7-12-14-19		Brown mf SAND, some SILT, trace CLAY (wet to saturated, medium compact)	26
25								Continued on Page 2	

*SS – Split Spoon, U – Undisturbed Tube, C – Core

* 3" Spoon Used for Second Attempt

Remarks: 1. At completion, hole was cement grouted to nearly match existing grade.

CME Associates, Inc. **Report No.: 26000B-02-0607 BORING NO.: B07-11A** Page 2 of 4

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
								Continued from Page 1	
		10	24.0	26.0	SS/20	8-13-12-12		Brown fine SAND, some SILT (wet to medium compact)	25
	H								
		11	26.0	28.0	SS/18	6-10-12-15		Similar Soil (saturated, medium compact)	22
	O						28.0		
		12a	28.0	28.5	SS/18	4-12-12-16	28.5	Brown CLAY, little SILT, trace mf SAND, (moist, very stiff)	24
	L								
30		12b	28.5	29.1				Brown fine SAND, little SILT (wet, medium compact)	
	L						29.1		
		12c	29.1	29.4				Brown CLAY, little SILT, trace mf SAND (moist, very stiff)	
	O						29.4		
		12d	29.4	29.6				Brown fine SAND, little SILT (moist, medium compact)	
	W						29.6		
		12e	29.6	30.0			30.0	Mottled Brown CLAY, little SILT (moist, very stiff)	
35		13a	30.0	30.3	SS/12	4-8-12-16	30.3	Brown fine SAND, little SILT (moist, medium compact)	20
	S	13b	30.3	31.0				Brown Mottled CLAY, little SILT (moist, very stiff)	
	T	13c	31.0	32.0				Grey Similar Soil (moist, very stiff)	
		14a	32.0	32.8	SS/12	9-11-17-23		Brown Mottled Similar Soil (moist, very stiff)	28
	E	14b	32.8	34.0				Grey CLAY with interlayered SILT, trace fine SAND (moist, very stiff)	
40	M	15	37.5	39.0	SS/14	8-9-12		Grey CLAY, little SILT, little cmf SAND (moist, very stiff)	21
		16	42.5	44.0	SS/16	11-11-13		Grey SILT, little CLAY (wet, very stiff)	24
	A								
	U	17	44.5	45.0	SS/18	2-3-6		Reddish Grey CLAY, little SILT, trace cmf GRAVEL (moist, stiff)	9
45	G								
	E	18a	48.5	49.0	SS/19	5-48-45		Grey SILT, trace CLAY (wet, stiff)	
	R	18b	49.0	50.0				Grey SILT, some cmf GRAVEL, little CLAY, trace cmf SAND (moist, hard)	93
50								Continued on Page 3	

*SS – Split Spoon, U – Undisturbed Tube

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
								Continued from Page 2	
	H O L L O W S T E M A U G E R	19a	53.5	54.2	SS/16	14-12-31	54.2	Grey SILT, some CLAY, trace cmf SAND, trace fine GRAVEL (moist, very stiff)	
55		19b	54.2	55.0				Grey weathered SHALE fragments (moist)	43
		20a	58.5	59.0	SS/6	33-100@3"		Grey weathered SHALE fragments, some SILT (moist)	100+
		20b	59.0	59.3				Grey weathered SHALE (moist)	
60								~ Weathered Bedrock ~	
		21	63.5	65.0	SS/10	14-25-67		Grey weathered SHALE, little SILT (moist)	92
65									
		22	68.5	70.0	SS/10	23-73-100@5"	70.2	Similar SHALE (moist) *~ Augered to 70.2'~*	100+
70	XXX C O R E	R1	70.2	75.2		NQ-Core		Rec: 28/60 = 47% RQD: 0/60 = 0% 6 Pieces, 21" Chips & Fragments Grey, medium hard, weathered thinly bedded SHALE BEDROCK No loss of return water noted. Cores at about 0.3 to 1 foot per minute at 300 psi. Continued on Page 4	0%
75									

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

CME Associates, Inc. **Report No.: 26000B-02-0607** **BORING NO.: B07-11A** Page 4 of 4

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
	C O	R2	75.2	80.2		NQ-Core		Continued from Page 3 Rec: 60/60 = 100% RQD: 21.5/60 = 36% 15 Pieces, 6" Chips & Fragments Grey, medium hard, weathered, thinly bedded SHALE BEDROCK with mud seam noted at 77.8'. No loss of return water.	36%
80	R E	R3	80.2	85.2		NQ-Core		Rec: 57/60 = 95% RQD: 31/60 = 52% 14 Pieces, 0" Chips & Fragments Grey, medium hard, weathered, thinly bedded to bedded SHALE BEDROCK No loss of return water. Cored at 0.3 to 1 foot per minute at 300 psi.	52%
85	XXX							Bottom of Boring 85.2'	
90									
95									
100									

*SS – Split Spoon, U – Undisturbed Tube, C – Core

Groundwater Observations: First wet to saturated sample noted on 05/29/07 at 22.0. No water noted in borehole after 10 minutes. Water first noted in borehole at 24.8' with augers at 24.0'. After 10 minutes water was noted at 23.6', augers at 24.0'. Drilled and sampled to 70.2' and left borehole open. Water was noted on 05/30/07 at 23.7'. Upon arrival on 05/31/07, water was noted at 23.6 feet. NQ Core to 85.2', water noted (after coring) at 18.9' on 05/31/07.

CME Associates, Inc. **BORING NO.: B-1**

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Milstein Hall at Cornell University, Ithaca, New York
Client: Barkow Leibinger Architekten
Location of Boring: See Boring Location Sketch
Report No.: 25357B-01-0603
Date Started: 05/21/03 **Finished:** 05/21/03
Elevation of Surface of Boring: 807.01'

METHODS OF INVESTIGATION

Casing: 3-1/4" ID H. Stem Auger
Casing Hammer:
Other:
Soil Sampler: 2" OD Split Barrel
Sampler Hammer: Wt. 140 lbs./Auto
Make & Model of Drill Rig: CME 55 Truck Mounted
Driller: Dave Lyons
Driller: Beau Fletcher
Inspector: Candace Cean
Rod Size: AWJ
Fall: 30 in.

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
05/21/03	While drilling	None Noted	28.5'
05/21/03	Before casing removed	None Noted	75.0'
05/21/03	After casing removed	None Noted	out
05/21/03	After casing removed	caved @ 45.4'	out

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
0	XXX						0.2	2" Asphalt Pavement	
	H	1	0.5	2.0	SS/8	12-20-23		Grey Run-of-Crush GRAVEL (moist)	43
								~ FILL ~	
	O	2	2.0	4.0	SS/8	22-30-27-12		Grey cmf GRAVEL and cmf SAND (moist)	57
							4.0		
	L	3	4.0	6.0	SS/12	6-7-5-4		Grey SILT, little CLAY, trace cmf SAND, trace mf GRAVEL, trace ASPHALT/SLAG (moist)	12
5	L								
							6.0	~ MISCELLANEOUS FILL ~	
	O	4	6.0	8.0	SS/4	2-2-2-2		Brown cmf SAND and cmf GRAVEL, trace SILT (moist, loose)	4
	W								
		5	8.0	10.0	SS/8	2-2-1-2		Similar Soil (moist, very loose)	3
10		6	10.0	12.0	SS/4	2-3-4-7		Similar Soil (moist, loose)	7
	S								
		7	12.0	14.0	SS/6	8-10-12-17		Similar Soil (moist, medium compact)	22
	T								
							14.0		
	E	8	14.0	16.0	SS/16	11-11-10-11		Brown fine SAND, trace SILT (moist, medium compact)	21
15	M								
		9	16.0	18.0	SS/16	9-8-8-8		Brown mf SAND, little SILT (moist, medium compact)	16
		10	18.0	20.0	SS/18	6-8-9-11		Brown fine SAND, little SILT (moist, medium compact)	17
	A								
20									
	U								
	G								
		11	23.5	25.0	SS/18	4-6-5		Similar Soil (moist, medium compact)	11
	E								
25	R							Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
	O						28.0		
	L	12	28.5	30.0	SS/18	5-6-5		Brown SILT, little fine SAND (wet, stiff)	11
	L								
30	O								
	W						33.0		
		13	33.5	35.0	SS/18	6-8-10		Grey SILT, some CLAY, trace cmf SAND (moist, very stiff)	18
35									
	S						38.0		
	T	14	38.5	40.0	SS/18	3-7-10		Grey SILT, trace CLAY, trace fine SAND (moist, very stiff)	17
	E								
40	M								
		15	43.5	45.0	SS/16	7-13-44		Similar Soil with trace mf GRAVEL (moist, hard)	57
	A								
45	U								
	G								
	E	16	48.5	50.0	SS/18	15-16-20		Grey SILT, little fine SAND (moist, hard)	36
50	R							Continued on page 3	

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
50	H							Continued from page 2	
	O								
	L	17	53.5	55.0	SS/18	9-7-10		Grey SILT, some CLAY, little cmf SAND, trace mf GRAVEL (moist, very stiff)	17
	L								
55									
	O								
	W								
		18	58.5	60.0	SS/10	10-18-20		Grey SILT, some cmf SAND, little CLAY, trace mf GRAVEL (moist, hard)	38
60									
	S								
	T								
		19	63.5	65.0	SS/12	14-14-24		Similar Soil (moist, hard)	38
	E								
65	M								
							68.0		
		20	68.5	70.0	SS/18	26-30-43		Grey fine SAND, trace SILT (moist, very compact)	73
	A								
70									
	U								
	G								
	E	21	73.5	75.0	SS/18	14-18-24		Similar Soil (moist, compact)	42
	R								
75	XXX							Bottom of Boring @ 75.0'	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

CME Associates, Inc. **BORING NO.: B-2** Page 1 of 2

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Milstein Hall at Cornell University, Ithaca, New York
Report No.: 25357B-01-0603
Client: Barkow Leibinger Architekten
Date Started: 05/21/03 **Finished:** 05/21/03
Location of Boring: See Boring Location Sketch
Elevation of Surface of Boring: 809.7'

METHODS OF INVESTIGATION

Casing: 3-1/4" ID H. Stem Auger
Driller: Dave Lyons
Casing Hammer:
Driller: Beau Fletcher
Other:
Inspector: Candace Cean
Soil Sampler: 2" OD Split Barrel
Rod Size: AWJ
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: CME 55 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
05/21/03	While drilling	None Noted	23.5'
05/21/03	Before casing removed	None Noted	47.0'
05/21/03	After casing removed	None Noted	out
05/21/03	After casing removed	caved @ 20.6'	out

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
0	XXX	1a	0.0	0.5	SS/10	2-3-6-13	0.5	Topsoil (moist)	
	H	1b	0.5	2.0				Brown SILT, little cmf SAND (moist)	9
	O	2	2.0	4.0	SS/14	7-5-10-10		Brown cmf SAND, some SILT, little mf GRAVEL, trace BRICK (moist)	15
	L						4.0	~ MISCELLANEOUS FILL ~	
		3	4.0	6.0	SS/12	11-9-13-8		Brown cmf GRAVEL and cmf SAND, trace SILT (moist, medium compact)	22
5	L								
	O	4	6.0	8.0	SS/8	7-7-14-21		Similar Soil (moist, medium compact)	21
	W								
		5	8.0	10.0	SS/10	12-14-18-28		Similar Soil (moist, compact)	32
10		6	10.0	12.0	SS/14	12-20-21-18		Similar Soil (moist, compact)	41
	S								
		7	12.0	14.0	SS/8	15-13-17-21		Similar Soil (moist, compact)	30
	T								
	E	8	14.0	16.0	SS/10	10-9-9-10		Similar Soil (moist, medium compact)	18
15	M								
		9	16.0	18.0	SS/6	10-8-6-7		Similar Soil (moist, medium compact)	14
							18.0		
		10	18.0	20.0	SS/18	4-3-3-4		Brown fine SAND, trace SILT (moist, loose)	6
	A								
20									
	U								
	G								
		11	23.5	25.0	SS/16	8-10-6		Similar Soil (wet, medium compact)	16
	E								
25	R							Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

CME Associates, Inc. **Report No.: 25357B-01-0503 BORING NO.: B-2** Page 2 of 2

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
	O						28.0		
	L	12	28.5	30.0	SS/18	3-3-6		Grey SILT and CLAY, trace cmf SAND (moist, stiff)	9
30	L								
	O								
	W								
		13	33.5	35.0	SS/18	6-12-23		Grey SILT, trace CLAY, trace fine SAND (moist, hard)	35
35	S								
	T								
	E								
		14	38.5	40.0	SS/18	20-21-17		Grey SILT, little fine SAND (moist, hard)	38
	M								
40									
	A	15a	43.5	44.5	SS/12	5-6-100@3"	44.5	Grey SILT, some CLAY, little mf GRAVEL, little cmf SAND (moist, stiff)	
	U	15b	44.5	45.0				Grey SHALE fragments (dry)	100+
45									
	G								
	E							*Auger Refusal @ 47.0'*	
		16	47.0	47.1	SS/0	100@1"		No Recovery	100+
	R							~ Probable Bedrock ~	
	XXX							Bottom of Boring @ 47.1'	
50									

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

CME Associates, Inc. **BORING NO.: B-3** Page 1 of 2

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Milstein Hall at Cornell University, Ithaca, New York
Report No.: 25357B-01-0603
Client: Barkow Leibinger Architekten
Date Started: 05/20/03 **Finished:** 05/21/03
Location of Boring: See Boring Location Sketch
Elevation of Surface of Boring: 810.4'

METHODS OF INVESTIGATION

Casing: 3-1/4" ID H. Stem Auger
Driller: Dave Lyons
Casing Hammer:
Driller: Beau Fletcher
Other:
Inspector: Candace Cean
Soil Sampler: 2" OD Split Barrel
Rod Size: AWJ
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: CME 55 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
05/20/03	While drilling	None Noted	34.5'
05/21/03	Before casing removed	None Noted	33.4'
05/21/03	After casing removed	None Noted	out
05/21/03	After casing removed	caved @ 25.6'	out

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

c – coarse, **m** – medium, **f** – fine; **and** – 35 to 50 %, **some** – 20 to 35 %, **little** – 10 to 20 %, **trace** – 0 to 10 %

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	Classification of Material	SPT "N" or RQD
0	XXX	1a	0.0	0.3	SS/12	3-4-4-7	0.3	Topsoil (moist)	
	H	1b	0.3	2.0				Brown cmf SAND, some cmf GRAVEL, little SILT (moist)	8
	O	2	2.0	4.0	SS/14	8-12-6-3		Brown cmf SAND and SILT, little mf GRAVEL (moist)	18
	L								
		3	4.0	6.0	SS/12	3-4-6-11		Brown cmf SAND and mf GRAVEL, trace SILT, trace ROOTS (moist)	10
5	L								
							6.0	~ FILL ~	
	O	4	6.0	8.0	SS/2	9-10-6-3		Grey cmf GRAVEL, trace cmf SAND (moist, medium compact)	16
	W								
		5	8.0	10.0	SS/6	3-4-5-4		Brown cmf SAND, some SILT, little mf GRAVEL (wet, loose)	9
10		6	10.0	12.0	SS/6	3-4-2-3		Similar Soil (moist, loose)	6
	S						12.0		
		7	12.0	14.0	SS/18	3-4-3-3		Brown fine SAND, little SILT (saturated, loose)	7
	T								
	E	8	14.0	16.0	SS/18	4-3-4-9		Similar Soil (saturated, loose)	7
15	M								
							16.0		
		9	16.0	18.0	SS/18	7-6-5-7		Grey SILT, some CLAY, trace cmf SAND (moist, stiff)	11
		10	18.0	20.0	SS/16	3-5-8-12		Grey SILT, little CLAY, trace cmf SAND (moist, stiff)	13
	A								
20									
	U								
	G								
		11	23.5	25.0	SS/16	5-7-8		Similar Soil with trace cmf GRAVEL (moist, very stiff)	15
	E								
25	R							Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

CME Associates, Inc. **eport No.: 25357B-01-0503 BORIN NO.: B-3** Page 2 of 2

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
		12	28.5	30.0	SS/14	7-7-7		Grey SILT, little cmf GRAVEL, trace CLAY, trace cmf SAND (moist, stiff)	14
30	S								
							32.0		
	A	13	34.4	34.5	SS/1	100@1"		*Auger Refusal @ 34.4'* Grey SHALE fragments (dry) ~ Probable Bedrock ~	100+
35	XXX							Bottom of Boring @ 34.5'	
40									
45									
50									

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

SUBSURFACE EXPLORATION – TEST BORING LOG

Project:	Milstein Hall at Cornell University, Ithaca, New York	**Report No.:**	25357B-01-0603
Client:	Barkow Leibinger Architekten	**Date Started:**	05/21/03 **Finished:** 05/21/03
Location of Boring:	See Boring Location Sketch	**Elevation of Surface of Boring:**	811.7'

METHODS OF INVESTIGATION

Casing:	3-1/4" ID H. Stem Auger	**Driller:**	Dave Lyons
Casing Hammer:		**Driller:**	Beau Fletcher
Other:		**Inspector:**	Candace Cean
Soil Sampler:	2" OD Split Barrel	**Rod Size:**	AWJ
Sampler Hammer: Wt.	140 lbs./Auto	**Fall:**	30 in.
Make & Model of Drill Rig:	CME 55 Truck Mounted		

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
05/21/03	While drilling	None Noted	10.0'
05/21/03	Before casing removed	None Noted	33.1'
05/21/03	After casing removed	None Noted	out
05/21/03	After casing removed	caved @ 29.3'	out

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

c – coarse, m – medium, f – fine; **and** – 35 to 50 %, **some** – 20 to 35 %, **little** – 10 to 20 %, **trace** – 0 to 10 %

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	Classification of Material	SPT "N" or RQD
0	XXX	1a	0.0	0.5	SS/12	3-2-1-2	0.5	Topsoil (moist)	
	H	1b	0.5	2.0				Brown SILT, some cmf SAND, trace mf GRAVEL (moist)	3
	O	2	2.0	4.0	SS/14	1-1-2-2		Brown cmf SAND and SILT, trace mf GRAVEL, trace SLAG (moist)	3
	L								
		3	4.0	6.0	SS/20	2-2-2-5		Brown cmf SAND, some SILT, trace mf GRAVEL (moist)	4
5	L								
							6.0	~ Miscellaneous FILL ~	
	O	4	6.0	8.0	SS/16	4-4-4-6		Brown cmf GRAVEL and cmf SAND, trace SILT (moist, loose)	8
	W								
		5	8.0	10.0	SS/16	5-6-10-9		Brown cmf SAND and SILT, some cmf GRAVEL, trace CLAY (moist, medium compact)	16
10		6	10.0	12.0	SS/16	8-12-7-7		Brown cmf GRAVEL and cmf SAND, little SILT (wet, medium compact)	19
	S						12.0		
		7	12.0	14.0	SS/18	10-10-15-20		Grey SILT, little CLAY, trace cmf SAND, trace mf GRAVEL (moist, very stiff)	25
	T								
	E	8	14.0	16.0	SS/18	7-12-16-19		Grey SILT, little CLAY, little cmf SAND, trace mf GRAVEL (moist, very stiff)	28
15	M								
		9	16.0	18.0	SS/4	16-14-16-16		Similar Soil (moist, hard)	30
		10	18.0	20.0	SS/18	5-6-8-11		Similar Soil (moist, stiff)	14
	A								
20									
	U								
							23.0		
	G								
		11	23.5	25.0	SS/18	10-11-18		Grey SILT, some CLAY, trace fine SAND (wet, very stiff)	29
	E								
25	R							Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
							28.0		
		12	28.5	30.0	SS/18	4-12-21		Grey SILT and cmf SAND, little cmf GRAVEL, trace SHALE fragments (moist, hard)	33
	S								
30									
							31.0		
								Auger Refusal @ 33.1'	
		13	33.1	33.2	SS/1	100@1"		Grey SHALE fragments (dry) ~ Probable Bedrock ~	100+
	A XXX							Bottom of Boring @ 34.5'	
35									
40									
45									
50									

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

SUBSURFACE EXPLORATION – TEST BORING LOG

Project:	Milstein Hall at Cornell University, Ithaca, New York	**Report No.:**	25357B-01-0603
Client:	Barkow Leibinger Architekten	**Date Started:**	05/20/03 **Finished:** 05/20/03
Location of Boring:	See Boring Location Sketch	**Elevation of Surface of Boring:**	816.5'

METHODS OF INVESTIGATION

Casing:	3-1/4" ID H. Stem Auger	**Driller:**	Dave Lyons
Casing Hammer:		**Driller:**	Beau Fletcher
Other:		**Inspector:**	Candace Cean
Soil Sampler:	2" OD Split Barrel	**Rod Size:**	AWJ
Sampler Hammer: Wt.	140 lbs./Auto	**Fall:**	30 in.
Make & Model of Drill Rig:	CME 55 Truck Mounted		

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
05/20/03	While drilling	None Noted	10.0'
05/20/03	Before casing removed	34.7'	37.9'
05/20/03	After casing removed	None Noted	out
05/20/03	After casing removed	caved @ 27.7'	out

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
0	XXX						0.5	6" Asphalt Pavement	
	H	1	0.5	2.0	SS/6	7-7-4	2.0	Grey Run-of-Crush GRAVEL (moist) ~ FILL ~	11
	O	2	2.0	4.0	SS/10	4-3-3-2	4.0	Brown cmf SAND, some SILT (moist) ~ FILL ~	6
	L	3	4.0	6.0	SS/10	1-2-1-4		Brown cmf SAND and SILT, trace cmf GRAVEL (moist, very loose)	3
5	L								
	O	4	6.0	8.0	SS/12	7-7-6-5		Similar Soil (moist, medium compact)	13
	W								
		5	8.0	10.0	SS/18	3-3-4-4	10.0	Brown mf SAND, little SILT, trace fine GRAVEL (moist, loose)	7
10		6	10.0	12.0	SS/16	3-4-3-5	12.0	Brown SILT, little CLAY, trace cmf SAND (wet, medium stiff)	7
	S								
		7	12.0	14.0	SS/18	4-5-7-8		Grey CLAY, little SILT, trace mf GRAVEL, trace cmf SAND (moist, stiff)	12
	T								
	E	8	14.0	16.0	SS/22	2-4-5-7		Similar Soil (moist, stiff)	9
15	M								
		9	16.0	18.0	SS/23	7-8-10-11		Similar Soil (moist, very stiff)	18
		10	18.0	20.0	SS/20	3-5-7-10		Similar Soil (moist, stiff)	12
	A								
20									
	U						23.0		
	G								
		11	23.5	25.0	SS/16	11-14-9		Grey fine SAND, some SILT (moist, medium compact)	23
	E								
25	R							Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	HOLLOW							Continued from page 1	
							28.0		
		12	28.5	30.0	SS/16	5-6-8		Grey CLAY, some SILT, trace mf GRAVEL, trace cmf SAND (moist, stiff)	14
30	STEM								
		13	33.5	35.0	SS/12	6-8-57		Similar Soil with trace SHALE fragments (moist, hard)	65
35	AUGER						34.5		
		14	37.9	38.0	SS/0.5	100@1"		*Auger Refusal @ 37.9* Grey SHALE fragments (wet) ~ Probable Bedrock ~	100+
	XXX							Bottom of Boring @ 38.0'	
40									
45									
50									

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

SUBSURFACE EXPLORATION – TEST BORING LOG

Project:	Milstein Hall at Cornell University, Ithaca, New York	**Report No.:**	25357B-01-0603
Client:	Barkow Leibinger Architekten	**Date Started:**	05/20/03 **Finished:** 05/20/03
Location of Boring:	See Boring Location Sketch	**Elevation of Surface of Boring:**	808.6'

METHODS OF INVESTIGATION

Casing:	3-1/4" ID H. Stem Auger	**Driller:**	Dave Lyons
Casing Hammer:		**Driller:**	Beau Fletcher
Other:		**Inspector:**	Candace Cean
Soil Sampler:	2" OD Split Barrel	**Rod Size:**	AWJ
Sampler Hammer: Wt.	140 lbs./Auto	**Fall:**	30 in.
Make & Model of Drill Rig:	CME 55 Truck Mounted		

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
05/20/03	While drilling	None Noted	10.0'
05/20/03	Before casing removed	29.9'	33.4'
05/20/03	After casing removed	28.7'	out
05/20/03	After casing removed	caved @ 28.7'	out

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
0	XXX	1a	0.0	0.5	SS/10	2-5-5-6	0.5	Topsoil (moist)	
	H	1b	0.5	2.0				Brown cmf SAND and cmf GRAVEL, trace SILT (moist)	10
	O	2	2.0	4.0	SS/3	4-5-4-3		Similar Material (moist)	9
	L	3	4.0	6.0	SS/8	4-5-5-5		Similar Material (moist)	10
5	L							~ FILL ~	
	O	4	6.0	8.0	SS/6	5-6-8-5		Similar Material (moist)	14
	W						8.0		
		5	8.0	10.0	SS/18	12-5-5-5		Brown mf SAND, trace SILT (moist, medium compact)	10
10		6	10.0	12.0	SS/18	5-4-4-4		Brown fine SAND, trace SILT (saturated, loose)	8
	S						12.0		
		7	12.0	14.0	SS/16	3-4-8-10		Brown SILT, trace CLAY, trace fine SAND (moist, stiff)	12
	T						14.0		
	E	8	14.0	16.0	SS/20	5-4-6-8		Grey CLAY, trace SILT (moist, stiff)	10
15	M								
							16.0		
		9	16.0	18.0	SS/22	7-10-13-16		Grey SILT, trace CLAY (moist, very stiff)	23
		10	18.0	20.0	SS/14	11-13-21-27		Similar Soil (moist, hard)	34
	A								
20									
	U								
	G						23.0		
		11	23.5	25.0	SS/18	4-7-9		Grey CLAY, little SILT, trace cmf SAND, trace mf GRAVEL (moist, very stiff)	16
	E								
25	R							Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

CME Associates, Inc. **Report No.: 25357B-01-0503 BORING NO.: B-6** Page 2 of 2

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
							28.0		
		12	28.5	30.0	SS/14	9-14-13		Grey SILT, some cmf GRAVEL, some cmf SAND, trace CLAY (moist, very stiff)	27
30	S								
							31.0		
								Auger Refusal @ 33.4'	
	A	13	33.4	33.5	SS/0.5	100@1"		Grey SHALE fragments (wet) ~ Probable Bedrock ~	100+
	XXX							Bottom of Boring @ 33.5'	
35									
40									
45									
50									

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

CME Associates, Inc. **BORING NO.: B-7** Page 1 of 2

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Milstein Hall at Cornell University, Ithaca, New York
Client: Barkow Leibinger Architekten
Location of Boring: See Boring Location Sketch
Report No.: 25357B-01-0603
Date Started: 05/19/03 **Finished:** 05/19/03
Elevation of Surface of Boring: 807.5'

METHODS OF INVESTIGATION

Casing: 3-1/4" ID H. Stem Auger
Casing Hammer:
Other: NQ-Core Barrel
Soil Sampler: 2" OD Split Barrel
Sampler Hammer: Wt. 140 lbs./Auto **Fall:** 30 in.
Make & Model of Drill Rig: CME 55 Truck Mounted
Driller: Dave Lyons
Driller: Beau Fletcher
Inspector: Candace Cean
Rod Size: AWJ

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
05/19/03	While drilling	24.3'	28.5'
05/19/03	Before casing removed	29.5'	42.6'
05/19/03	Before casing removed	Water added for coring	

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
0	XXX						0.3	4" Asphalt Pavement	
	H	1	0.5	2.0	SS/5	2-7-8		Brown cmf SAND and cmf GRAVEL, trace SILT, trace ASPHALT (moist)	15
	O	2	2.0	4.0	SS/7	7-8-5-9		Similar Material with trace BRICK (moist)	13
	L	3	4.0	6.0	SS/3	7-5-4-4		Similar Material (moist)	9
5	L							~ MISCELLANEOUS FILL ~	
	O	4	6.0	8.0	SS/2	5-6-8-10		Similar Material (wet)	14
	W	5a	8.0	8.5	SS/18	8-7-7-11		Similar Material (moist)	
							8.5		
		5b	8.5	10.0				Brown fine SAND, trace SILT (moist, medium compact)	14
10		6	10.0	12.0	SS/16	6-8-9-9		Brown fine SAND, little SILT (moist, medium compact)	17
	S								
		7	12.0	14.0	SS/18	9-10-12-10		Similar Soil (moist, medium compact)	22
	T								
	E	8	14.0	16.0	SS/16	4-4-5-5		Brown fine SAND, trace SILT (moist, loose)	9
15	M								
		9	16.0	18.0	SS/14	5-5-4-4		Similar Soil (moist, loose)	9
							18.0		
		10	18.0	20.0	SS/14	5-3-4-5		Brown SILT, some fine SAND (wet, medium stiff)	7
	A								
20									
	U								
	G								
		11	23.5	25.0	SS/14	2-2-2		Similar Soil (saturated, medium stiff)	4
	E								
25	R							Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core
Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	HOLLOW							Continued from page 1	
							28.0		
		12	28.5	30.0	SS/12	2-2-3		Grey SILT, some CLAY, trace cmf SAND (saturated, medium stiff)	5
30									
		13a	33.5	34.0	SS/16	9-12-19	34.0	Similar Soil (saturated, hard)	
		13b	34.0	35.0				Grey SILT, trace fine SAND, trace CLAY (moist, hard)	31
35	STEM								
		14a	38.5	39.5	SS/10	5-10-100@2"	39.5	Similar Soil (moist, hard)	
		14b	39.5	39.7				Grey SHALE fragments (dry)	100+
40									
		15	42.6	42.6	SS/0	100@0"		No Recovery	100+
							42.6	*Auger Refusal @ 42.6'*	
		R1	42.6	47.6	C/60	NQ-Core		Grey, medium hard, weathered, thinly bedded SHALE BEDROCK Recovery: 60"/60" = 100% RQD: 38.5"/60" = 64% 12 Pieces, 1-1/2" Chips & Fragments	64%
45	AUGER XXX								
								Bottom of Boring @ 47.6'	
50									

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

SUBSURFACE EXPLORATION – TEST BORING LOG

Project: Milstein Hall at Cornell University, Ithaca, New York
Client: Barkow Leibinger Architekten
Location of Boring: See Boring Location Sketch
Report No.: 25357B-01-0603
Date Started: 05/19/03 **Finished:** 05/19/03
Elevation of Surface of Boring: 807.0'

METHODS OF INVESTIGATION

Casing: 3-1/4" ID H. Stem Auger
Casing Hammer:
Other:
Soil Sampler: 2" OD Split Barrel
Sampler Hammer: Wt. 140 lbs./Auto
Driller: Dave Lyons
Driller: Beau Fletcher
Inspector: Candace Cean
Rod Size: AWJ
Fall: 30 in.
Make & Model of Drill Rig: CME 55 Truck Mounted

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
05/19/03	While drilling	27.7'	28.5'
05/19/03	Before casing removed	45.7'	57.4'
05/19/03	After casing removed	None Noted	out
05/19/03	After casing removed	caved @ 24.6'	out

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
0	XXX	1a	0.0	0.3	SS/8	2-5-9-7	0.3	Topsoil (moist)	
	H	1b	0.3	2.0				Brown cmf SAND and cmf GRAVEL, little SILT, trace BRICK, trace SLAG/CINDERS (moist)	14
	O								
		2	2.0	4.0	SS/10	4-4-3-3		Similar Material (moist)	7
	L								
		3	4.0	6.0	SS/10	5-4-4-3		Similar Material (moist)	8
5	L							~ MISCELLANEOUS FILL ~	
	O	4	6.0	8.0	SS/10	3-2-2-3		Similar Material (moist)	4
	W						8.0		
		5	8.0	10.0	SS/6	7-8-15-12		Brown cmf GRAVEL and cmf SAND, trace SILT (moist, medium compact)	23
10		6	10.0	12.0	SS/16	10-11-8-9		Brown cmf SAND, little cmf GRAVEL, trace SILT (moist, medium compact)	19
	S								
		7	12.0	14.0	SS/6	7-5-5-5		Similar Soil (moist, medium compact)	10
	T						14.0		
	E	8	14.0	16.0	SS/18	3-5-5-8		Brown fine SAND, some SILT (moist, medium compact)	10
15	M								
		9	16.0	18.0	SS/18	9-16-16-16		Brown fine SAND, little SILT (moist, compact)	32
		10	18.0	20.0	SS/20	7-10-11-12		Similar Soil (moist, medium compact)	21
	A								
20									
	U								
	G								
		11a	23.5	24.2	SS/18	5-5-5		Similar Soil (moist, medium compact)	10
	E	11b	24.2	25.0				Brown/Grey mf SAND (moist to wet, medium compact)	
25	R							Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	H							Continued from page 1	
	O								
							28.0		
	L	12a	28.5	29.5	SS/18	5-5-3		Brown SILT, some fine SAND (saturated, stiff)	8
		12b	29.5	30.0				Brown SILT, little CLAY, trace cmf SAND (saturated, stiff)	
	L								
30									
	O								
	W								
		13	33.5	35.0	SS/16	2-3-3		Grey Similar Soil (wet to moist, medium stiff)	6
35									
	S								
	T						39.0		
		14	38.5	40.0	SS/14	5-10-10		Grey SILT, trace fine SAND, trace CLAY (moist, very stiff)	20
	E								
40	M								
		15	43.5	45.0	SS/16	15-20-25		Similar Soil (moist, hard)	45
	A								
45									
	U								
	G								
	E	16	48.5	50.0	SS/18	8-5-5		Grey SILT, some CLAY, trace cmf SAND (moist, stiff)	10
	R								
50								Continued on page 3	

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	Depth of Sample (Feet) To	Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
50	H							Continued from page 2	
		17a	53.5	53.8	SS/5	100@5"	53.8	Similar Soil (moist, hard)	
		17b	53.8	53.9				Grey SHALE fragments (saturated)	100+
	S								
55									
								Auger Refusal @ 57.4'	
		18	57.4	57.5	SS/0.5	100@1"		Grey SHALE fragments (wet)	100+
	A							~ Probable Bedrock ~	
	XXX							Bottom of Boring @ 57.5	
60									
65									
70									
75									

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

CME Associates, Inc. **BORING NO.: B-9** Page 1 of 2

SUBSURFACE EXPLORATION – TEST BORING LOG

Project:	Milstein Hall at Cornell University, Ithaca, New York	**Report No.:**	25357B-01-0603
Client:	Barkow Leibinger Architekten	**Date Started:**	05/19/03 **Finished:** 05/20/03
Location of Boring:	See Boring Location Sketch	**Elevation of Surface of Boring:**	807.8'

METHODS OF INVESTIGATION

Casing:	3-1/4" ID H. Stem Auger	**Driller:**	Dave Lyons
Casing Hammer:		**Driller:**	Beau Fletcher
Other:		**Inspector:**	Candace Cean
Soil Sampler:	2" OD Split Barrel	**Rod Size:**	AWJ
Sampler Hammer: Wt.	140 lbs./Auto	**Fall:**	30 in.
Make & Model of Drill Rig:	CME 55 Truck Mounted		

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
05/20/03	While drilling	18.5'	18.0'
05/20/03	Before casing removed	None Noted	37.6'
05/20/03	After casing removed	None Noted	out
05/20/03	After casing removed	caved @ 16.4'	out

LOG OF BORING SAMPLES / CLASSIFICATION OF MATERIAL

Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	c – coarse m – medium f – fine and – 35 to 50 % some – 20 to 35 % little – 10 to 20 % trace – 0 to 10 %	SPT "N" or RQD
			From	To					
0	XXX						0.3	3" Asphalt Pavement	
	H	1	0.5	2.0	SS/12	5-7-4		Brown cmf SAND, some cmf GRAVEL, trace SILT, trace BRICK, trace ASPHALT (moist)	11
	O								
		2	2.0	4.0	SS/4	6-9-8-6		Similar Material (moist)	17
	L							~ MISCELLANEOUS FILL ~	
		3	4.0	6.0	SS/8	7-7-5-4		Similar Material (moist)	12
5	L								
							6.0		
	O	4	6.0	8.0	SS/10	4-4-1-2		Brown fine SAND, some SILT (wet, loose)	5
	W								
		5	8.0	10.0	SS/16	2-2-2-2		Brown fine SAND, trace SILT (moist, loose)	4
10		6	10.0	12.0	SS/18	2-2-2-2		Similar Soil (moist, loose)	4
	S						12.0		
		7	12.0	14.0	SS/22	2-2-3-2		Brown SILT, little fine SAND (moist, medium stiff)	5
	T						14.0		
	E	8	14.0	16.0	SS/22	3-3-2-3		Brown fine SAND, trace SILT (moist, loose)	5
15	M								
		9	16.0	18.0	SS/22	2-1-1-2		Brown fine SAND, some SILT (saturated, very loose)	2
		10a	18.0	19.5	SS/22	3-5-3-3	19.5	Similar Soil (saturated, loose)	
		10b	19.5	20.0				Brown CLAY, little SILT, trace fine SAND (moist, stiff)	8
	A								
20									
	U								
	G								
		11	23.5	25.0	SS/16	4-7-10		Grey SILT, little CLAY, little mf GRAVEL, trace cmf SAND (moist, very stiff)	17
	E								
25	R							Continued on page 2	

*SS – Split Spoon, U – Undisturbed Tube, C - Core

Remarks:

CME Associates, Inc. **Report No.: 25357B-01-0503 BORING NO.: B-9** Page 2 of 2

LOG OF BORING SAMPLES							CLASSIFICATION OF MATERIAL		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet)		Sample Type/ Recovery (Inches)	Blows On Sampler Per 6 inches	Depth Of Change (feet)	**c** – coarse **m** – medium **f** – fine **and** – 35 to 50 % **some** – 20 to 35 % **little** – 10 to 20 % **trace** – 0 to 10 %	SPT "N" or RQD
			From	To					
25	HOLLOW							Continued from page 1	
		12	28.5	30.0	SS/18	5-10-9		Grey SILT, trace CLAY (moist, very stiff)	19
30									
	STEM	13a	33.5	34.5	SS/16	7-7-100@4"	34.5	Brown SILT, little CLAY, trace cmf SAND (moist, very stiff)	
		13b	34.5	34.8				Grey weathered SHALE fragments (moist)	100+
35	AUGER							*Auger Refusal @ 37.6'*	
		14	37.6	37.7	SS/0.5"	100@1"		Grey SHALE fragments (dry) ~ Probable Bedrock ~	100+
	XXX							Bottom of Boring @ 37.7'	
40									
45									
50									

*SS – Split Spoon, U – Undisturbed Tube

Remarks:

GENERAL INFORMATION & KEY TO TEST BORING LOGS

The **Subsurface Exploration - Test Boring Logs produced by CME Associates, Inc**. present the observations and mechanical data collected by the driller while at the site, supplemented, at times, by classification of the materials removed from the borings as determined through visual identification by technicians in the laboratory. It is cautioned that the materials removed from the borings represent only a fraction of the total volume of the deposits at the site and may not necessarily be representative of the subsurface conditions between adjacent borings or between the sampled intervals. The data presented on the Exploration Logs together with the recovered samples will provide a basis for evaluating the character of the subsurface conditions relative to the proposed construction. The evaluation must consider all the recorded details and their significance relative to each other. Often, analyses of standard boring data indicate the need for additional testing and sampling procedures to more accurately evaluate the subsurface conditions. Any evaluations of the contents of CME's report and the recovered samples must be performed by Licensed Professionals having experience in Soil Mechanics and Foundation Engineering. The information presented in this Key defines some of the procedures and terms used on the CME Exploration Logs to describe the conditions encountered. Refer to the Log on page 3 for key number.

Key No.	Description
1.	The figures in the **DEPTH SCALE** column define the vertical scale of the Boring Log.
2.	**CASING BLOWS/FOOT** - shows the number of blows required to advance the casing a distance of 12 inches. The casing size, the hammer weight and the length of drop are noted under the **Methods of Investigation.** If the casing is advanced by means other than driving, the method of advancement will be indicated under **Methods of Investigation** at the top of the Log. If Hollow Stem Augers or Coring is used, it will be so noted in this column.
3.	The **SAMPLE I.D.** is used for identification on the sample containers and in the Laboratory Test Report or Summary.
4.	The **DEPTH OF SAMPLE** column gives the exact depth range from which a sample was recovered.
5.	The **SAMPLE TYPE/RECOVERY** column is used to signify the various type of sample attempt. "SS" is Split Spoon, "P" is piston tube, "U" is Undisturbed tube. For soil samples, the recovered length of the sample is also indicated, in inches. If a rock core sample is taken, the core bit size designation is given here.
6.	**BLOWS ON SAMPLER** - shows the results of the "Standard Penetration Test (SPT) ASTM D1586", recording the number of blows required to drive a split spoon sampler into the soil beneath the casing. The number of blows required for each six inches of penetration is recorded. The total number of blows required for the 6 inch to 18 inch interval is summarized in the **SPT "N"** column and represents the "Standard Penetration Number". The outside diameter of the sampler, the hammer weight and the length of drop are noted in the **Methods of Investigation** portion of the log. A "WH" or "WR" in this column indicates that the sample spoon advanced the 6 inch interval under **W**eight of **H**ammer or **W**eight of **R**ods, respectively.
7.	The **DEPTH OF CHANGE** column designates the depth (in feet) that the driller noted a compactness or stratum change. In soft materials or soil strata exhibiting a consistent relative density, it is difficult for the driller to determine the exact change from one stratum to the next. In addition, a grading or gradual change may exist. In such cases the depth noted is approximate or estimated only and may be represented by a dashed line.
8.	**CLASSIFICATION OF MATERIAL - Soil materials** encountered and sampled are described by the driller on the original log. Notes of driller observations are also placed in this column. Recovered samples may also be visually classified by a Soil Technician upon receipt in the Laboratory. Visual sample classification is by Burmister System and strata may be classified additionally by the Unified System. The Burmister System is a type of visual-manual textural classification estimated by the Driller or Technician on the basis of weight-fraction of the recovered soil. See Table 1 **"Classification of Materials"**. The description of the relative soil compactness or consistency is based upon the standard penetration number as defined in Table 2. The description of the soil moisture condition is described as dry, moist, wet, or saturated. Water used to advance the boring may have affected the in-situ moisture content of the sample. Special terms are used as required to describe materials in greater detail, such terms are listed in ASTM D653. When sampling gravelly soils with a standard two-inch O.D. Split Spoon, the true percentage of gravel is often not recovered due to the relatively small sampler diameter. The presence of boulders, cobbles, and large gravel is sometimes, but not necessarily, detected by an evaluation of the casing and sampler blows or through the "action" of the drill rig as reported by the driller.

8. **CLASSIFICATION OF MATERIAL** (continued)
The Description of **Rock** is based upon the recovered rock core. Terms frequently used in the description are included in Table 3. The length of core run is defined as length of penetration between retreivals of the corebarrel from the bore hole, expressed in inches. The core recovery expresses the length of core recovered from the core barrel per core run, in percent. The size core barrel used is noted in **Column 5**. The more commonly used sizes of core barrels are denoted "AX" and "NX". An "NX" core, being larger in diameter than "AX" core, often produces better recovery, and is frequently utilized where accurate information regarding the geologic conditions and engineering properties is needed. A better estimate of in-situ rock quality is provided by a *modified core recovery ratio* known as the **"Rock Quality Designation" (RQD)**. This ratio is determined by considering only pieces of core that are at least 4 inches long and are hard and sound. Breaks obviously caused by drilling are ignored. The diameter of the core should preferably be not less than 2 inches (NX). The percentage ratio between the total length of such core recovered and the length of core drilled on a given run is the RQD. Table 4 gives the rock quality description as related to the **RQD**.

9. The **SPT "N"** or **RQD** is given in this column as applicable to the specific sample taken. In Very Compact coarse grained soils the N-value may be indicated as 50+, and in Hard fine-grained soils the N-value may be indicated as 30+. This typically means that the blow count was achieved prior to driving the sampler the entire 6 inch interval or the sampler refused further penetration. For "NX" rock cores, the RQD is reported here, expressed in percent.

10. **GROUND WATER OBSERVATIONS** and timing noted by the driller are shown in this section. It is important to realize that the reliability of the water level observations depend upon the soil type (water does not readily stabilize in a hole through fine grained soils), and that drill water used to advance the borings may have influenced the observations. Ground water levels typically fluctuate seasonally so those noted on the log are only representative of that exhibited during the period of time noted on the log. One or more perched or trapped water levels may exist in the ground seasonally. All the available readings should be evaluated. If definite conclusions cannot be made, it is often prudent to examine the conditions more thoroughly through test pit excavations or ground water observation well installations.

TABLE 1 - VISUAL CLASSIFICATION OF MATERIALS (BURMISTER)

GROUP	TEXTURAL CLASSIFICATION SIZES
BOULDERS	larger than 12" diameter
COBBLES	12" diameter to 3" sieve
GRAVEL	3" - coarse - 1" - medium - 1/2" - fine - #4 sieve
SAND	#4 - coarse - #10 - medium - #40 - fine - #200 sieve
SILT	#200 sieve (0.074mm) to 0.005mm size (see below *)
CLAY	0.005mm size to 0.001mm size (see below *)

ABBREVIATIONS	PERCENT OF TOTAL SAMPLE BY WEIGHT	
f - fine	and	35 to 50%
m - medium	some	20 to 35%
c - coarse	little	10 to 20%
	trace	0 to 10%

***PLASTICITY DESCRIPTIONS**

TERM	PLASTICITY INDEX	DRY STRENGTH	FIELD TEST
Non-plastic	0 - 3	Very low	falls apart easily
Slightly plastic	4 - 15	Slight	easily crushed by fingers
Plastic	15 - 30	Medium	difficult to crush
Highly plastic	31 or more	High	impossible to crush with fingers

TABLE 2 - DESCRIPTION OF SOIL COMPACTNESS OR CONSISTENCY based on SPT "N"*

Primary Soil Type	**Descriptive Term of Compactness**	**Range of Standard Penetration Resistance (N)**
COARSE GRAINED SOILS	Very loose	less than 4 blows per foot
(More than half of Material is larger than No. 200 sieve size.)	Loose	4 to 10
	Medium compact	10 to 30
	Compact	30 to 50
	Very compact	Greater than 50
FINE GRAINED SOILS	**Descriptive Term of Consistency**	**Range of Standard Penetration Resistance (N)**
(More than half of material is smaller than No. 200 sieve size.)	Very soft	less than 2 blows per foot
	Soft	2 to 4
	Medium stiff	4 to 8
	Stiff	8 to 15
	Very stiff	15 to 30
	Hard	Greater than 30

*The number of blows of 140 pound weight falling 30 inches to drive 2 inch O.D., 1-3/8 inch I.D. sampler 12 inches is defined as the Standard Penetration Resistance designated "N".

TABLE 3 - ROCK CLASSIFICATION TERMS

Rock Classification Terms		**Field Test or Meaning of Term**
Hardness	Soft	Scratched by fingernail
	Medium Hard	Scratched easily by penknife
	Hard	Scratched with difficulty by penknife
	Very Hard	Cannot be scratched by penknife
Weathering	Very Weathered Weathered Sound	Judged from the relative amounts of disintegration, iron staining, core recovery, clay seams, etc.
Bedding (Natural Breaks in Rock Layers)	Laminated Thinly bedded Bedded Thickly bedded Massive	less than 1inch 1inch to 4 inches 4 inches to 12 inches 12 inches to 36 inches greater than 36 inches

TABLE 4 **Relation of Rock Quality Designation (RQD) and in-situ Rock Quality**	
RQD (%)	**Rock Quality Term Used**
90 to 100	Excellent
75 to 90	Good
50 to 75	Fair
25 to 50	Poor
0 to 25	Very Poor

BORING NO.: B-1 **Page** 1 **of** 1

SUBSURFACE EXPLORATION - TEST BORING LOG

Project:

Report No.:

Client:

Date Started: **Finished:**

Location of Boring:

Elevation of Surface of Boring:

METHODS OF INVESTIGATION

Casing: 3-1/4" I.D. Hollow Stem Auger **Hammer:**

Other:

Soil Sampler: 2" O.D. Split Barrel **Rod Size:**

Sampler Hammer: Wt. 140 lbs. **Fall:** 30 in.

Make & Model of Drill Rig:

GROUND WATER OBSERVATIONS

Date	Time	Depth	Casing At
	While drilling		
	Before casing removed		
	After casing removed		

LOG OF BORING SAMPLES							**CLASSIFICATION OF MATERIAL**		
Depth Scale (Feet)	Casing Blows/ Foot	Sample I.D.	Depth of Sample (Feet) From	To	Sample Type/ Recovery (inches)	Blows on Sampler Per 6 inches	Depth of Change (feet)	**f** - fine **m** - medium **c** - coarse **and** - 35 to 50% **some** - 20 to 35% **little** - 10 to 20% **trace** - 0 to 10%	STP "N" or RQD
1	**2**	**3**	**4**	**4**	**5**	**6**	**7**	**8**	**9**

Denotes Key Number (see page 1) ⟶

CME
Associates, Inc.

Study and Report for Stability of Earth Slopes North of University Avenue between Foundry and Johnson Art Museum
Cornell University
Ithaca, New York
CME Report No.: 26055B-01-0108

APPENDIX - C

PROJECT NAME:	Rehabilitation of Foundry Building	**FILE NO.:** 0634			
BORING NO.:	B-2		**CASING**	**SAMPLER**	**CORE BARREL**
CLIENT:	Robert Silman Associates	**TYPE:**	HSA	SS	NWD4
SITE LOCATION:	Cornell University, Ithaca, NY	**SIZE I.D.:**	3.25"	1.375"	1.995"
BORING LOCATION:	See Location Diagram	**HAMMER WT:**	140#		
SURFACE ELEVATION:	Unknown	**HAMMER FALL:**	30"		

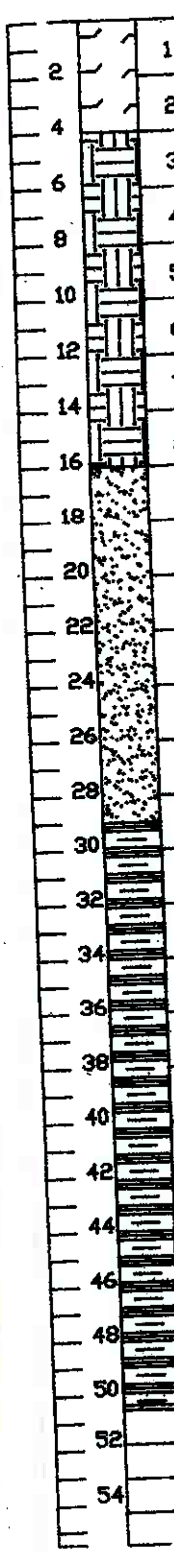
DEPTH	**SAMPLE**						**REC.**	**COL. A**	**STRATA CHANGE**	**FIELD CLASSIFICATION AND REMARKS**
	NO.	**DEPTH RANGE**	**BLOWS PER 6" ON SAMPLER**							
			0-6	**6-12**	**12-18**	**18-24**				
	S-1	0.0' - 2.0'	1	2			1.0'			Dark brown, moist, loose Sand, some Silt, little Gravel, SM, fill with rock fragments, brick and coal.*
					2	3				
	S-2	2.0' - 4.0'	2	2			0.5'			Similar.
					2	2				
	S-3	4.0' - 6.0'	1	3			0.2'			Similar except moist to wet. Poor recovery.
5					1	3				
	S-4	6.0' - 8.0'	3	1			0.7'			Similar.
					3	2				
									9'	
10	S-5	10.0' - 12.0'	4	6			1.1'			Brown, moist, medium dense Sand, some Gravel, little Silt, SM, native with rock fragments, cobbles and boulders.
					7	10				
15	S-6	15.0' - 17.0'	7	8			1.2'			Similar.
					8	10				
20	S-7	20.0' - 22.0'	12	13			1.1'			Similar except dry and finer.
					10	7				
25	S-8	25.0' - 27.0'	7	5			0.7'			Similar.
					6	4				
									30'	
30	S-9	30.0' - 32.0'	16	19			1.5'			Grey, moist to wet, dense Silt and Sand, little Gravel, ML, glacial till.
					19					
						15				
35	S-10	34.5' - 34.7'	50/0.2'				0.2'			Similar except wet with weathered shale. Set auger at 35' and begin coring operations with NWD4 core barrel. Run # Depth Recovery RQD 1 35' - 40' 80% 32% Driller notes grey, thin bedded soft shale with iron staining between joints with soil seams and vertical fracture at 37.2' - 37.9'.
40									40'	
										End of Boring at 40'. * Driller notes water added during drilling.

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN-SITU TRANSITION MAY BE GRADUAL.

WATER LEVEL:	Water at 29' after drilling. Water at 9' May 31st (could be influenced by surface runoff).		
DRILLER:	Lyon Drilling Co. - HL	**DATE:**	17-May-06
APPROVED BY:	BDR	**DATE:**	06-Jun-06

GIFFORD ENGINEERING
GEOTECHNICAL & GEOENVIRONMENTAL SERVICES
875 Pearse Road
Niskayuna, NY 12309-2909
Phone: (518) 382-2545

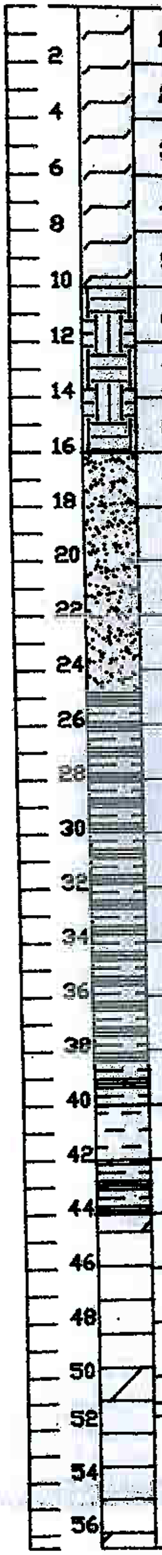
B96-1 Ground Surface Elev.=810



SAMPLE	"N"	% MOISTURE	COLOR	DESCRIPTION
1	56	damp	brn	3 ft. of TOPSOIL (f-m) SAND w/silt & gravel
2	19	14.7	brn	SILT w/sand, gravel, brick, ash [Fill to 4'] (4.0)
3	15	6	brn	well-graded GRAVEL w/silt & sand
4	12	No Recovery		
5	21	8.7	brn	well-graded GRAVEL w/ well-graded sand & silt, (piece of metal found)
6	90	4.9	brn	well-graded GRAVEL w/(f-m) sand, trace silt [Frequent Cobbles @ 12']
7	42	3.5	brn	
8	17	3.7	brn	(16.0)
9	10	5.2	brn	well-graded SAND, trace silt
10	14	11.1	brn	(f-m) SAND, trace silt
11	10	21.7	brn	well-graded to (f) sandy SILT w/clay varves
12	6	8.4	brn	well-graded SAND w/silt
13	3	28.1	brn	well-graded SAND w/silt & clay varves [Saturated @ 25']
14	6	27.3	brn	(29.
15	8	24.0	gry	lean to fat CLAY w/sand lenses
16	7	25.0	gry	lean to fat CLAY lean to fat CLAY w/ (f) embedded gravel
17	7	21.0	gry	varved lean CLAY & (f) sandy silt
18	42	15.6	gry	(35.0
19	50	15.0	gry	
20	36	17.4	gry	
21	52	14.5	gry	
22	52	15.4	gry	lean CLAY w/(f) embedded gravel (traces)
23	45	17.1	gry	lean CLAY w/(f-c) embedded gravel
24	60	14.1	gry	
25	50/.3	dry	gry	Rock flour
26	50/.3	7.6	gry	(50.5
R1	Rec=96% RQD=18%			grey SHALE • thick bedded • soft • close jointing • highly weathered

Boring terminated at 55.5 ft.

B96-2 Ground Surface Elev.=810



SAMPLE	N	% MOISTURE	COLOR	DESCRIPTION
1	13	12.1	multi	3 ft. of TOPSOIL well-graded SAND w/silt, gravel, ash
2	15	6.7	tan	sandy SILT w/gravel
3	29	5.7	tan	
4	18	6.4	tan	well-graded GRAVEL w/sand some silt
5	29	6.0	brn	fragmented GRAVEL w/sand some silt [Fill to 10'] (10.0)
6	32	6.0	brn	
7	47	3.1	brn	
8	21	3.7	brn	well-graded GRAVEL w/(f-m) san some silt
9	35	4.4	brn	well-graded SAND w/poorly-grade gravel, some silt (18.
10	3	8.5	brn	(f-m) SAND, trace silt (f-m) SAND, w/silt
11	1	12.4	brn	
12	9	21.8	brn	[Wet] (25.
13	11	20.3	gry	CLAY w/lenses of (f) sand
14	16	20.4	gry	(trace of embedded (f) gravel found In Sample 14)
15	14	18.2	gry	
16	28	16.0	gry	lean CLAY w/sandy (f) silt varv
17	40	15.1	gry	
18	30	17.3	gry	
19	31	16.5	gry	
20	36	14.8	gry	
21	58	19.4	gry	SILT w/(f) sand lenses grades to lean CLAY w/sand
22	53	15.1	gry	lean CLAY w/trace (f) sand lenses
23	23	24.8	gry	lean CLAY w/(f-c) embedded gravel (44.0)
24	38	15.1	gry	highly weathered to extremely weathered SHALE
25	52	7.9	gry	(49.0)
26	50/5	7.4	gry	
R1	Rec=80% RQD=0%			extremely weathered SHALE • close jointing & fracturing

Boring terminated at 56.5 ft.

B96-3

Ground Surface Elev.=808

DEPTH	SAMPLE	N	% MOISTURE	COLOR	DESCRIPTION
2	1	17	damp	brn	3 ft. of TOPSOIL well-graded SAND w/gravel, trace silt
4	2	35	No Recovery		
6	3	36	3.8	tan	(f-m) SAND w/silt & gravel, roots
8	4	44	dry	tan	
10	5	37	dry	tan	
12	6	43	dry	tan	[Fill to 13']
14	7	19	dry	tan	13.0
16	8	15	3.3	brn	(f-m) GRAVEL w/sand, some silt
18	9	31	7.3	brn	
20	10	21	4.4	brn	fragmented GRAVEL w/sand, some silt (19.8)
22	11	22	4.3	brn	(f-m) SAND, trace silt
24	12	18	damp	brn	
26	13	12	23.4	brn	(f-m) SAND w/silt [wet]
28	14	11	30.2	brn	(f) sandy SILT [Saturated]
30	15	13	26.2	brn	
32	16	8	22.7	gry	(31.0) lean to fat CLAY w/(f) embedded gravel
34	17	19	21.5	gry	lean CLAY w/(f-m) embedded gravel
36	18	30	18.3	gry	
38	19	46	20.5	gry	
40	20	27	15.2	gry	varved lean CLAY w/silt or (f) sand partings
42	21	53	14.6	gry	
44	22	60	12.3	gry	SILT w/(f) sand layers & clay lenses
46	23	68	16.2	gry	lean CLAY w/pocket of (f) sandy silt
48	24	50	moist	gry	varved lean CLAY
50	25	20	16.1	gry	lean CLAY w/(f-m) embedded gravel
52	26	46	18.0	gry	fat CLAY w/occasional (f-m) embedded gravel
54	27	57	11.3	gry	lean CLAY w/sand & gravel fragments
56	28	59	damp	gry	
58	29	57		gry	sandy well-graded lean CLAY w/silt & gravel
60	30	60		gry	(f) sandy lean CLAY w/silt & gravel
62	31	88	10.0	gry	(f) sandy SILT occasional (f-m) embedded gravel
64					
66	32	54	16.2	gry	(65.5) f. sandy SILT, occasional (f-m) embedded gravel
68	33	50/.4	6.5	gry	(66.8) extremely weathered SHALE
70 72	R1	Rec=20% RQD=0			

Boring terminated at 73.5 ft.

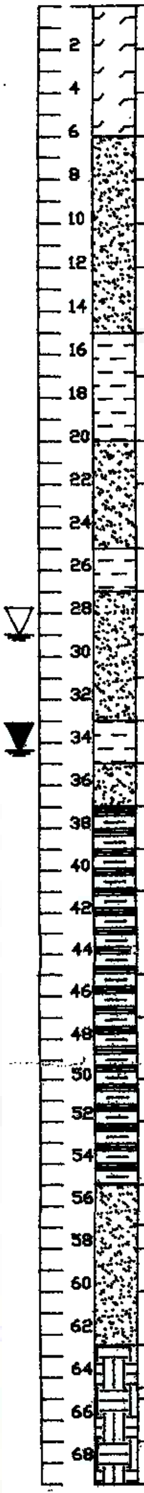
B96-5 Gournd Surface Elev.=805

DEPTH	SAMPLE	'N'	% MOISTURE	COLOR	DESCRIPTION
2	1	6	7.3	brn/blk	0.3 ft. of TOPSOIL (f-m) SAND w/silt & occasional gravel, cinders (ashes found in Sample2)
4	2	4	12.6	brn/blk	
6	3	2	23.7	brn/blk	CINDERS & ASHES w/(f-m) sand & silt, occasional gravel
8	4	3	35.6	brn/blk	
10	5	18	5.6	brn	[FILL] (9.0) (f-m) SAND w/fragmented (c) gravel, trace silt
12	6	4	10.6	brn	well-graded SAND w/silt & (c) gravel [possible FILL] (12.0)
14	7	6	9.0	brn	well-graded SAND grading to (f) sandy silt
16	8	15	15.1	brn	(f) SAND w/silt
18	9	20	7.4	brn	(f-m) SAND w/silt
20	10	14	3.4	brn	well-graded SAND, trace silt
22	11	14	damp	brn	
24	12	21	12.2	brn	(f-m) SAND w/silt
26	13	21	20.5	brn	(f) sandy SILT
28	14	31	20.8	brn	(f) sandy SILT w/(f) sand lenses
30	15	16	24.5	brn	
32	16	18	22.2	brn	(f) sandy SILT w/lense of clay (32.0)
34	17	25	18.4	gry	lean CLAY w/occasional embedded (f) gravel
36	18	24	20.1	gry	
38	19	24	22.1	gry	lean to fat CLAY
40					
42	20	18	18.7	gry	lean CLAY to elastic SILT
44					
46	21	15	17.0	gry	(f) sandy elastic SILT
48 50					
52	22	21	20.0	gry	lean to fat CLAY w/occasional embedded (f) gravel
54					
56	23	15	20.0	gry	
58 60					
62	24	9	damp	gry	
64					[Wet]
	25	100/.4	6.3	gry	(64.5 (f-c) SAND w/fragmented gravel & silt
66					
68	26	72	7.1	gry	(f-c) SAND w/fragmented gravel & silt, trace shale
70	27	39	11.0	gry	(f-m) SAND w/fragmented gravel & silt
72	28	92/.9	14.4	gry	(f-c) SAND w/silt (71.5)
74	29	50/.4	9.2	gry	moderately weathered SHALE
76	30	50/.3	8.7	gry	(75.0)
78 80	R1	Rec=93% RQD=16%			grey SHALE • thick bedded • soft • close jointing • highly weathered

Boring terminated at 81.5 ft.

B96-8

Ground Surface Elev.=799



SAMPLE	'N'	% MOISTURE	COLOR	DESCRIPTION
1	8	7.5	brn	4 ft. of TOPSOIL (f-m) SAND w/occasional (f-m) gravel, trace silt, roots
2	19	No Recovery		[FILL] (6.0)
3	13	damp	brn	(f0) SAND w/silt
4	4	14.0	brn	well-graded SAND; trace silt
5	4	8.5	brn	well-graded SAND w/silt
				(f-m) sandy SILT, roots
6	9	15.2	brn	
7	16	6.7	brn	well-graded SAND w/silt
				[seam of (m) Sand]
8	22	13.0	brn	(f) sandy SILT
9	64	11.8	brn	well-graded SAND w/(f) sandy silt lenses
10	37	11.5	brn	
11	28	19.8	brn	
12	28	19.7	brn	(f) sandy SILT
13	44	19.1	brn	(f-m) layered SAND w/clay lenses (37.0)
14	15	22.3	gry	lean CLAY w/(f-m) embedded gravel
15	15	23.0	gry	
16	15	18.7	gry	lean CLAY w/(f-m) embedded gravel & silt lenses
17	19	18.2	gry	
18	15	17.2	gry	(f-m) layered SAND w/clay lenses [occasional Cobbles]
				(no silt found in Sample 19)
19	21	21.7	gry	
				(62.5)
20	43	7.3	gry	(f-c) fragmented GRAVEL w/(f-m) sandy lean clay & silt
21	21	6.4	gry	
22	51	10.6	gry	

Boring terminated at 69.0 ft.

▽ denotes water level reading on 01 Nov 1996

▼ denotes water level reading on 16 Nov 1996

DATE
STARTED 4-29-88
FINISHED 5-02-88
SHEET 1 OF 2

EMPIRE SOILS INVESTIGATIONS INC.

SUBSURFACE LOG

HOLE NO. B-1
SURF. ELEV. 809.5±
C. W. DEPTH See Notes

PROJECT Feasibility Study of Cornell Foundry Site
LOCATION Cornell University Ithaca, New York

DEPTH-FT	SAMPLE NO	BLOWS ON SAMPLER 0/6	6/12	12/18	N	BLOW ON CASING C	SOIL OR ROCK CLASSIFICATION	NOTES
0	1	2	2	5	7		FILL:Brown & Black Cinders, coarse-fine Sand, Silt & Ash (Damp)	
		5						
	2	5	4	3	7			
		5						
	3	15	15	15	30		No Recovery - pushed coarse gravel	
5		15						
	4	8	8	7	15		No Recovery - pushed coarse gravel	
		8						
	5	10	9	12	21		Brown coarse-fine GRAVEL & SAND, little silt (Damp-Firm to Very Compact)	
		19						
10	6	25	27	28	55			
		28						
	7	18	16	14	30			
		16						
15	8	12	20	19	39			
		17						
	9	22	25	29	44			
		14						
	10	22	36	25	61			
20		15						
	11	11	11	8	19		Brown medium-fine SAND, little gravel trace silt (Moist-Firm)	
		5						
	12	9	8	7	15		No Recovery - pushed coarse gravel	
		8						
25	13	1	1	2	3		becomes Loose	
		1						
	14	1	2	4	6		becomes Wet	Water first encountered at sample #15.
		4						
	15	2	2	9	11		29.5'	
30		10					Brown to Grey SILT (Wet to Saturated-Firm)	On 4-29-88 p.m., water at 32.1', augers at 34.0'.
							34.0'	Top of Rock at 34.0'±
	16	100/.4'					Grey Shaley SILTSTONE with Limestone clasts, medium hard, slightly weathered to Sound, thin-bedded to bedded from 34'-39', bedded to thick-bedded below 39', fractured zone at 35'± , highly fractured to shattered zone 38.6'-39.3', continued	34.4' 4-29-88 5-02-88 On 5-02-88, a.m., water at 29.1', augers at 34.0'.
35								
40								

N = No blows to drive 2 " spoon 12 " with 140 lb. pin wt. falling 30 "per blow.
C = No blows to drive ______ " casing ______ " with ______ lb. weight falling ______ "per blow.
CLASSIFICATION Visual by Driller & Geotechnical Engineer
METHOD OF INVESTIGATION 3¼"I.D. Hollow Stem Augers/N size Core Barrel using Water [illegible]

R T Form H

DATE
STARTED 4-29-88
FINISHED 5-02-88
SHEET 2 OF 2

EMPIRE SOILS INVESTIGATIONS INC.

SUBSURFACE LOG

HOLE NO. B-1
SURF. ELEV. 809.5±
G. W. DEPTH See Notes

PROJECT Feasibility Study of Cornell Foundry Site
LOCATION Cornell University Ithaca, New York

DEPTH	SAMPLES	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	BLOW ON CASING C	SOIL OR ROCK CLASSIFICATION	NOTES
40								driller notes lost recirculation of water at 35'±.	Run #1, 34.0'-39.0' 88% Recovery - 4.4' 68% RQD (left 0.4' rock in hole)
								Boring Terminated @ 43.6'	Run #2, 38.6'-43.6' 100% Recovery - 5.0' 86% RQD
45									
50									

N = No. blows to drive 2 " spoon 12 " with 140 lb. pin wt. falling 30 "per blow
C = No. blows to drive " casing " with lb. weight falling "per blow
CLASSIFICATION Visual by Driller & Geotechnical Engineer
METHOD OF INVESTIGATION 3¼"I.D. Hollow Stem Augers/N size Core Barrel using Water [illegible]

R. T. Form H

DATE
STARTED 7/13/69
FINISHED 7/13/69
SHEET 1 OF 2

EMPIRE SOILS INVESTIGATIONS, INC.

SUBSURFACE LOG

HOLE NO. MC-3
SURF. ELEV.
G. W. DEPTH See Note #1

PROJECT Art Museum - Cornell University
LOCATION Ithaca, New York

DEPTH-FT.	SAMPLES	SAMPLE NO.	BLOWS ON SAMPLER 0-6	6-12	12-18	N	BLOW ON CASING C	CROSS SECTION	SOIL OR ROCK CLASSIFICATION	NOTES
0		1	5	10	9	19			TOPSOIL (4") Brown SAND, some Silt & Gravel, trace fibers	NOTE #1: Water level observations: Encountered water @ 44.7' 7/13 - 5:35 Hole completed Water @ 8.2' 7/13 - 6:00 Casing pulled to 35.0'-Water @9.4' 7/13 - 6:10 Casing out Water @ 10.1'
5		2	8	11	12	23			Grades little gravel & silt @ 5.7'	
10		3	36	18	12	30			(Moist - Firm)	
15		4	9	9	13	22			Brown fine SAND, some Silt	NOTE #2: Boulders noted @ 10.0'& 37.6'-37.9'
20		5	31	40	40	80				
25		6	10	11	12	23			Grades little silt @ 25.0' (Moist - Firm & Very Compact)	
30		7	22	25	33	58			Brown SILT, some fine Sand (Moist - Very Compact)	
35		8	26	23	31	54			Grey SILT, some Clay, trace embedded rock fragments & sand (Moist - Very Compact)	
40										

N = No. blows to drive 2 "spoon 12 "with 140 lb. pin wt. falling 30 "per blow.
C = No. blows to drive ____ "casing ____ "with ____ lb. weight falling ____ "per blow.
METHOD OF INVESTIGATION: Cased Boring; Casing drilled in place

CLASSIFICATION Visual by Laboratory Technician

DATE STARTED 7/13/69 FINISHED 7/13/69 SHEET 2 OF 2	EMPIRE SOILS INVESTIGATIONS, INC. SUBSURFACE LOG	HOLE NO. MC-3 Cont'd. SURF. ELEV. G.W. DEPTH See Note #1

PROJECT Art Museum - Cornell University LOCATION Ithaca, New York

DEPTH-FT.	SAMPLES	SAMPLE NO.	BLOWS ON SAMPLER 0-6	6-12	12-18	N	BLOW ON CASING C	CROSS SECTION	SOIL OR ROCK CLASSIFICATION	NOTES
40		9	14	25	32	57			Grey SILT, little fine sand (Moist - Very Compact)	
45		10	12	11	13	24			Grey fine SAND, some Silt (Moist - Firm)	
50		11	20	21	31	52			Grey SILT, little fine sand	
55		12	16	17	20	37			Some embedded Gravel @55.0'	
60		13	150/.0						(Moist - Very Compact - Compact)	Encountered rock @ 59.9' Used fishtail to 61.0'
									Grey, medium hard, fractured SHALE	Run#1: 61.0'-66.0' 86% Recovery "AX" Size
65										Run#2: -66.0'-71.0' 95% Recovery "AX" Size
70										Run#3: -71.0'-76.0' 96% Recovery "AX" Size
75									Bottom of Hole @ 76.0'	
80										

N = No. blows to drive 2 "spoon 12 "with 140 lb. pin wt. falling 30 "per blow.

C = No. blows to drive ____ "casing ____ "with ____ lb. weight falling ____ "per blow.

CLASSIFICATION Visual by Laboratory Technician

METHOD OF INVESTIGATION: Cased Boring; Casing drilled in place

DATE STARTED 7/7/69 FINISHED 7/9/69 SHEET 1 OF 2	EMPIRE SOILS INVESTIGATIONS, INC. SUBSURFACE LOG	HOLE NO. MC-6 SURF. ELEV. G. W. DEPTH See Note #1

PROJECT Art Museum - Cornell University LOCATION Ithaca, New York

DEPTH-FT.	SAMPLES	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18-	N	BLOW ON CASING C	CROSS SECTION	SOIL OR ROCK CLASSIFICATION	NOTES
0		1	4	6	12	18			TOPSOIL (2") FILL: Brown SILT, SAND with some Brick Fragments, trace gravel (Damp - Firm)	NOTE #1: Water level observations: Water encountered @ 56.8' 7/9 - 7:45 A.M. Casing @ 65.0' Water @ 56.8' 7/9 4:30 P.M. Casing @ 74.0' Water @ 10.0' 7/10 - 7:30 A.M. Casing out Water @ 32.4' 7/10 - 8:45 A.M. Water @ 40.8' 7/10 - 9:15 A.M. Water @ 38.1'
5		2	10	46	55	101			Brown SAND & GRAVEL (Damp - Very Compact)	
10		3	8	11	12	23			Brown fine SAND, some Silt Becomes brown & grey @15.0'	
15		4	7	8	12	20			(Moist - Firm)	
20		5	14	15	18	33			Brown SAND & GRAVEL with boulder fragments (Damp - Compact)	
25		6	7	10	13	23			Brown & grey SAND, little silt	
30		7	10	13	13	26			(some Gravel in sample #7)	
35		8	18	10	11	21			(Moist - Firm)	
40										

N = No. blows to drive 2 "spoon 12 "with 140 lb. pin wt. falling 30 "per blow.

C = No. blows to drive ____ "casing ____ "with ____ lb. weight falling ____ "per blow.

CLASSIFICATION Visual by Laboratory Technician

Cased Boring: Casing drilled in place

DATE
STARTED 7/7/69
FINISHED 7/9/69
SHEET 2 OF 2

EMPIRE SOILS INVESTIGATIONS, INC.

SUBSURFACE LOG

HOLE NO. MC-6 Cont'd.
SURF. ELEV.
G. W. DEPTH See Note #1

PROJECT Art Museum - Cornell University
LOCATION Ithaca, New York

DEPTH-FT.	SAMPLES	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	BLOW ON CASING C	CROSS SECTION	SOIL OR ROCK CLASSIFICATION	NOTES
40										
		9	13	17	18	30				
		10	13	15	19	31			Brown SILT, little clay & sand, trace embedded gravel	
						34				
									(Moist - Firm)	
45		11	19	60	54	114			Grey SILT, trace fine sand & clay	
									Embedded gravel & rock fragments beginning @50.0'	
50		12	20	27	34	47				NOTE #2: Boulders noted 50.0'-53.0' 69.5' to bedrock
		13	17	25	33	51				
						58				
55		14	14	19	25	44				
60		15	25	35	39	60				
		16	21	37	44	60				
						81				
65		17	9	15	19	24				
		18	12	27	34	31				
						61				
70		19	14	17	25	42				
		20	17	21	25	46				
									(Moist - Very Compact to Firm)	
75									Grey, medium hard, fractured SHALE	Run#1:-74.0'-79.0' 96% Recovery "AX" Size
80									Bottom of Hole @ 79.0'	

N = No. blows to drive 2 "spoon 12 "with 140 lb. pin wt. falling 30 "per blow.
C = No. blows to drive ____ "casing ____ "with ____ lb. weight falling ____ "per blow.
METHOD OF INVESTIGATION: Cased Boring; Casing drilled in place
CLASSIFICATION Visual by Laboratory Technician

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CME
Associates, Inc.

Study and Report for Stability of Earth Slopes North of University
Avenue between Foundry and Johnson Art Museum
Cornell University
Ithaca, New York
CME Report No.: 26055B-01-0108

APPENDIX - D

CME Associates, Inc.

P.O. Box 554
Central Square, New York
13036
(315) 668-3868
(315) 676-3150 (Fax)

www.cmeassociates.com

LABORATORY TEST SUMMARY

Barkow Leibinger Architects
Milstein Hall at Cornell University, Ithaca, NY
CME Report No.: 25357B-01-0603
June 4, 2003
Page 1 of 4

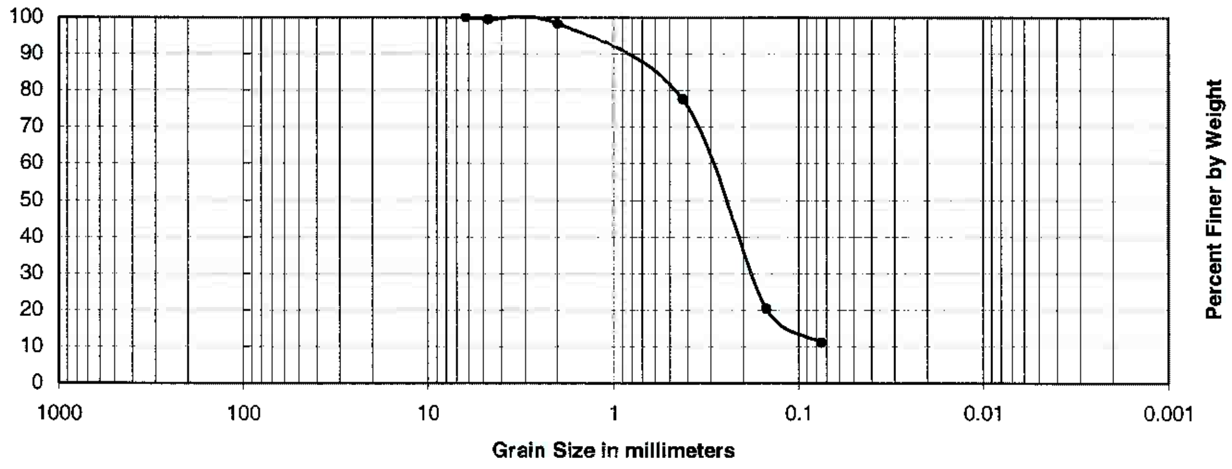
CME Representatives obtained samples from soil borings advanced as part of a Subsurface Exploration Program conducted for the subject project. Selected samples were subjected to laboratory testing at CME's Central Square Facility, an AASHTO AMRL accredited laboratory. The results are presented below:

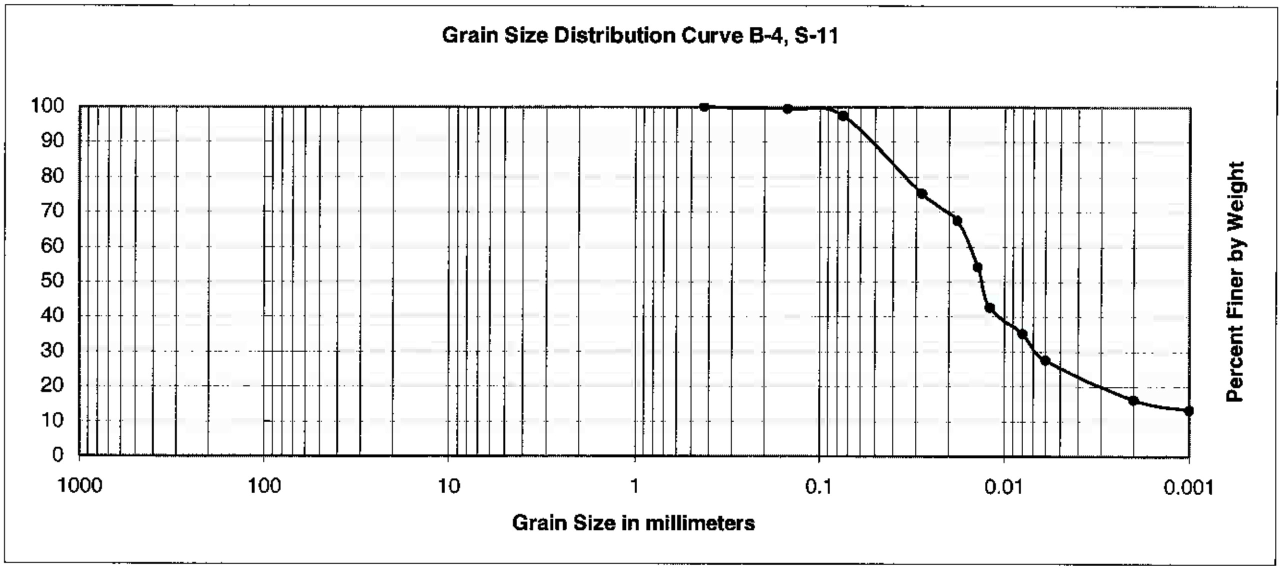
Mechanical Analysis with Hydrometer (ASTM D1140 and D422):

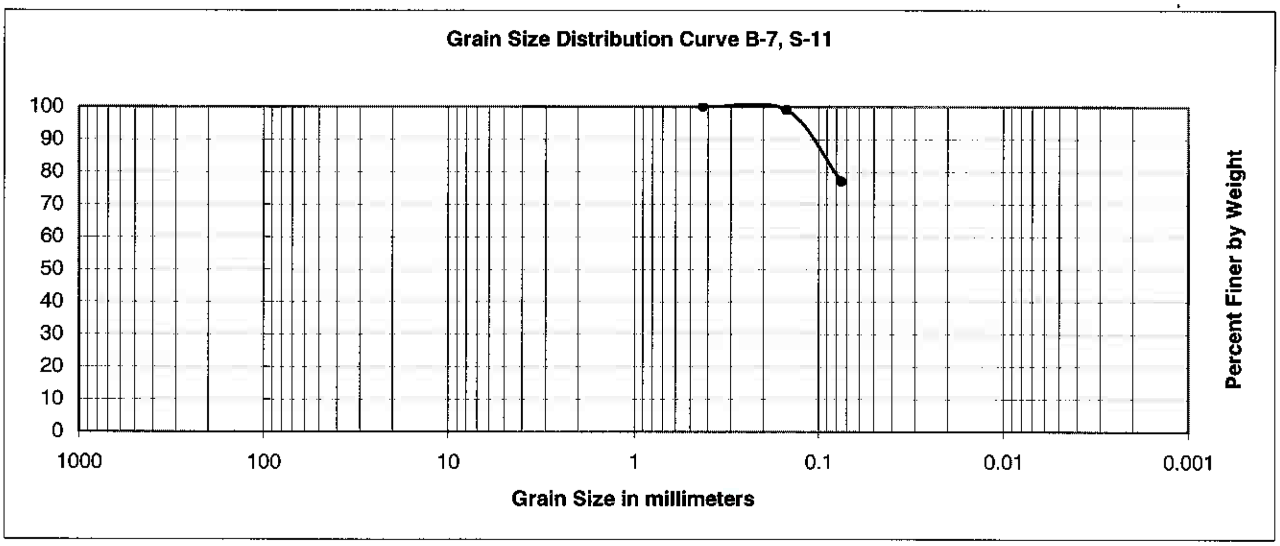
B = Boring Number, S = Sample Number

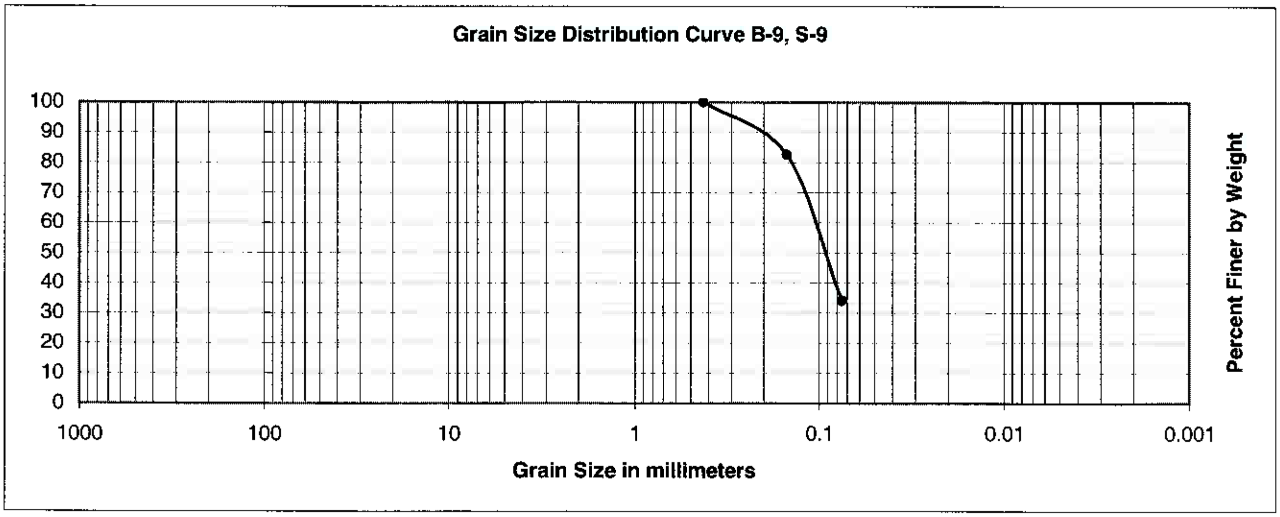
		Percent Passing by Weight			
Sieve	Size (mm)	B-1, S-9	B-4, S-11	B-7, S-11	B-9, S-9
1"	25.0				
3/4"	19.0				
1/2"	12.5				
¼"	9.4	100			
No. 4	4.75	99			
No. 10	2.0	98			
No. 40	0.850	78	100	100	100
No. 200	0.075	11.0	97.5	77.0	34.0
Hydrometer	Analysis				
	0.074	-	97	-	-
	0.005	-	25	-	-
	0.001	-	13	-	-

Grain Size Distribution Curve B-1, S-9




Grain Size Distribution Curve B-4, S-11


Grain Size Distribution Curve B-7, S-11


Grain Size Distribution Curve B-9, S-9

Atterberg Limits, Natural Moisture and Unified Classification Group Symbol (ASTM D4318, D2216 & D2487):

B = Boring Number, S = Sample Number

Boring No., Sample No.	Liquid Limit	Plastic Limit	Plasticity Index	Natural Moisture Content (%)	USCS (Unified) Group*
B-1, S-13	27	16	11	19.7	CL
B-1, S-15	18	15	3	14.7	CL
B-4, S-10	24	16	8	17.6	CL

* Portion of sample passing #10 mesh sieve.

Natural Moisture Content (ASTM D2216):

Boring No., Sample No.	Depth Below Grade (ft)	Natural Moisture Content (%)
B-1, S-9	16.0 – 18.0	3.8
B-1, S-13	33.5 – 35.0	19.7
B-1, S-15	43.0 – 43.5	14.7
B-4, S-10	18.0 – 20.0	17.6
B-4, S-11	23.5 – 25.0	17.4
B-7, S-11	23.5 – 25.0	29.6
B-9, S-1	0.5 – 2.0	9.2
B-9, S-2	2.0 – 4.0	11.3
B-9, S-3	4.0 – 6.0	7.8
B-9, S-4	6.0 – 8.0	27.8
B-9, S-5	8.0 – 10.0	14.5
B-9, S-6	10.0 – 12.0	15.3
B-9, S-7	12.0 – 14.0	23.6
B-9, S-8	14.0 – 16.0	17.5
B-9, S-9	16.0 – 18.0	29.9
B-9, S-10a	18.0 – 19.5	26.3
B-9, S-10b	19.5 – 20.0	27.7
B-9, S-11	23.5 – 25.0	18.9
B-9, S-12	28.5 – 30.0	16.2
B-9, S-13a	33.5 – 34.5	15.3
B-9, S-13b	34.5 – 34.8	1.8
B-9, S-14	37.6 – 37.7	0.7

Specific Gravity Determination (ASTM C128):

Boring No., Sample No.	Depth Below Grade (ft)	Specific Gravity
B-4, S-11	23.5 – 25.0	2.78

Bedrock Core Compression Testing (ASTM D4543 & D2936):

Core Identification & Measurements:

Boring No., Run No.	Depth Below Grade (ft)	Date Tested	Trimmed Length (in)	Diameter of Core (in)	Length to Diameter (note 5)
B-7, R-1	42.6 – 47.6	05/30/03	4.040	1.990	2.0

Compression Test Results:

Boring No., Run No.	Maximum Compressive Load (lbs)	Cross Sectional Area (in^2)	Compressive Strength (tsf)
B-7, R-1	27,500	3.11	965

Notes for Bedrock Core Compression Testing:

1. The specimens were soaked in water for at least 24 hours before compression testing.
2. Specimens were tested in the moisture condition immediately following removal from water bath.
3. The direction of application of the load on the specimen was applied perpendicular with respect to the horizontal plane of the surface drilled.
4. Specimens were loaded at a rate of approximately 50 lbs per second.
5. Length to diameter refers to the specimen trimmed length divided by its diameter.

By: Valerie M. Goettel, Laboratory Supervisor

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LABORATORY TEST SUMMARY
Cornell University, Ithaca, New York
Milstein Hall College of Architecture, Art, & Planning
CME Report No.: 26000B-02-0607
June 18, 2007
Page 1 of 2

A CME Representative obtained samples for use at the above referenced project. The samples were delivered to CME's Cicero facility, an AASHTO AMRL[1] accredited laboratory, for a Soil Mechanical Analysis and Rock Core Compression Testing. The results are as follows:

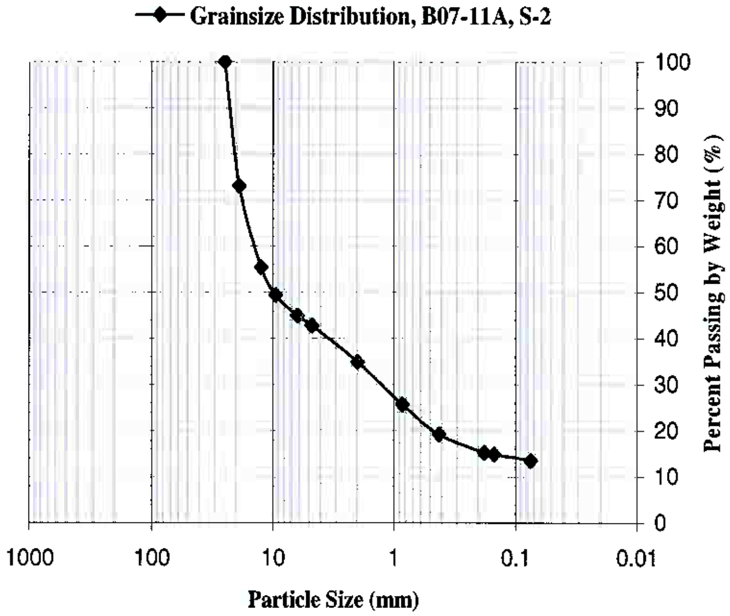
I. Material Identification

Boring #	Sample #	Depth Below Grade (ft.)	Classification
B07-11A	S-2	5.0-6.5	Brown mf GRAVEL, some cmf SAND, trace SILT, trace CLAY ~ USCS Group Symbol GM (Silty gravel with sand)
B07-11A	S-9	22.0-24.0	Brown mf SAND, some SILT ~ USCS Group Symbol SM (Silty sand)

II. Mechanical Analysis (ASTM C136 & C117)

Sample ID: B07-11A, S-2

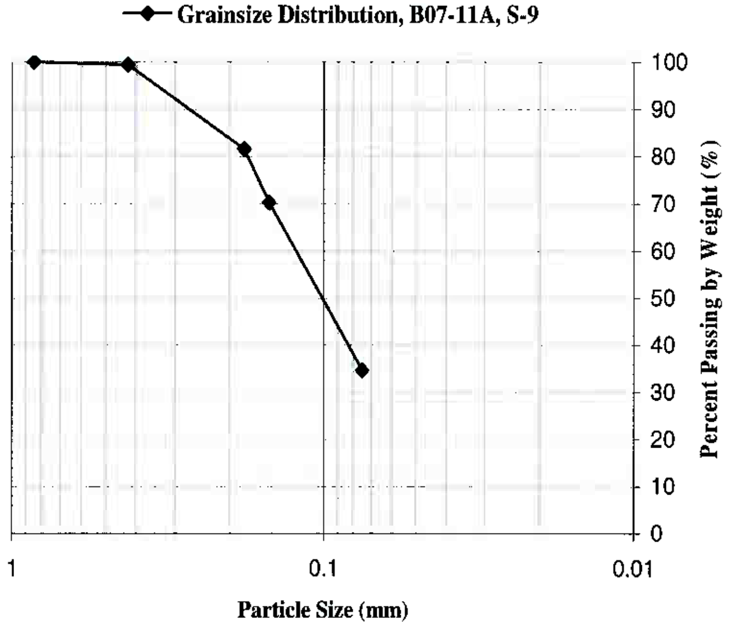
Sieve Designation	Size (mm)	Percent Passing by Weight (%)
1"	25.0	100
3/4"	19.0	73
1/2"	12.5	55
3/8"	9.50	49
1/4"	6.25	45
No.4	4.75	43
No.10	2.00	35
No.20	0.85	26
No.40	0.425	19
No.80	0.18	15
No.100	0.15	15
No.200	0.075	13



1AMRL - American Association of State Highway & Transportation Officials (AASHTO) Materials Reference Laboratory. AMRL is a Federal Agency having jurisdiction to assess laboratory competence according to the standards of the United States. CME Cicero accreditation includes tests of Portland Cement Concrete, Aggregate and Soil Materials. www.amrl.net

Sample ID: **B07-11A, S-9**

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
No.20	0.85	100
No.40	0.425	99
No.80	0.18	82
No.100	0.15	70
No.200	0.075	35



III. Bedrock Core Compression Testing:

Boring Number/ Sample Number	Depth Below Grade (ft.)	Trimmed Length (in.)	Diameter of Core (in.)	Length to Diameter Ratio	Maximum Compressive Load (lbs)	Cross Sectional Area (in^2)	Unconfined Compressive Strength (tsf)
B-07-10 (C-1)	41.5	4.010	1.98	2.03	39000	3.08	910
B-07-11A (C-2)	77.2	4.010	1.98	2.03	57000	3.08	1330
B-07-11A (C-3)	79.7	3.975	1.98	2.01	41000	3.08	960

Please feel free to contact our office if you have any questions.

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LABORATORY TEST SUMMARY
Milstein Hall Parking Garage at Cornell University, Ithaca, NY
CME Report No.: 26054B-01-0807
August 21, 2007
Page 1 of 8

CME Representatives obtained soil samples from Test Borings advanced as part of the Subsurface Exploration Program conducted for the subject project. Selected samples were delivered to CME's Cicero facility, an AASTHO AMRL[1] accredited laboratory for various laboratory testing. The results are presented below:

Sample ID Notations: B - Test Boring, S - Sample

I. Natural Moisture Content (ASTM D2216)

Sample ID	Natural Moisture Content (%)	Sample ID	Natural Moisture Content (%)	Sample ID	Natural Moisture Content (%)
B-2, S-1a	11.5	B-2, S-12	4.7	B-3, S-15	25.8
B-2, S-1b	4.3	B-2, S-13	2.5	B-4, S-6	3.2
B-2, S-2	5.8	B-2, S-14	4.3	B-4, S-8	10.2
B-2, S-3	9.4	B-2, S-15	5.1	B-4, S-11b	15.3
B-2, S-4	9.8	B-2, S-16a	18.2	B-4, S-14	24.1
B-2, S-5	5.3	B-2, S-16b	23.4	B-4, S-17	19.3
B-2, S-6	2.4	B-2, S-17	17.4	B-5, S-13	22.2
B-2, S-7	4.1	B-2, S-18	16.7	B-5, S-15	21.7
B-2, S-8	4.6	B-2, S-19	19.2	B-5, S-17	21.0
B-2, S-9	3.7	B-2, S-20a	18.6	B-8, S-15b	21.7
B-2, S-10	4.4	B-2, S-20b	21.2	B-9, S-4	7.5
B-2, S-11	5.3	B-2, S-21	21.3		

II. Atterberg Limits & USCS[2] Group Symbol (ASTM D4318 & D2487)

Sample ID	Liquid Limit	Plastic Limit	Plasticity Index	Natural Moisture Content (%)	USCS Group
B-5, S-13	32	17	15	22.2	CL-Lean clay
B-5, S-15	28	16	12	21.7	CL-Lean clay
B-5, S-17	30	16	14	21.0	CL-Lean clay
B-8, S-15b	30	18	12	21.7	CL-Lean clay

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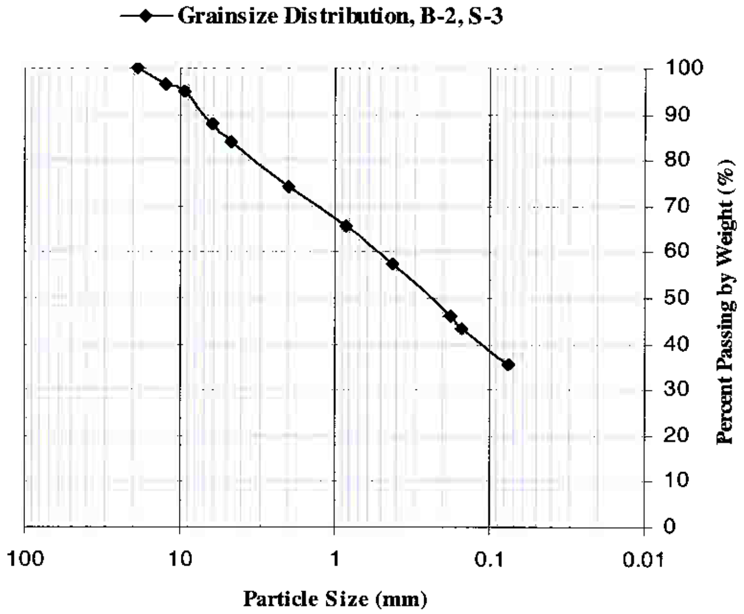
[1] **AMRL** – American Association of State Highway & Transportation Officials (AASHTO) Materials Reference Laboratory. AMRL is a Federal Agency having jurisdiction to assess laboratory competence according to the standards of the United States. **CME** Cicero accreditation includes tests of Portland Cement Concrete, Aggregate and Soil Materials. www.amrl.net

[2] USCS - Unified Soil Classification System

III. Mechanical Analysis (ASTM C136 & C117, D422)

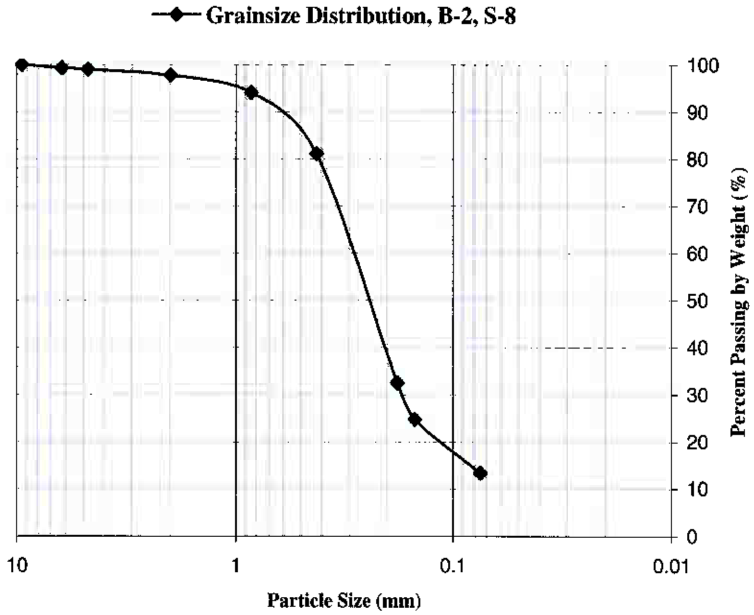
Sample ID: B-2, S-3

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
3/4"	19.0	100
1/2"	12.5	97
3/8"	9.50	95
1/4"	6.25	88
No.4	4.75	84
No.10	2.00	74
No.20	0.850	66
No.40	0.425	58
No.80	0.180	46
No.100	0.150	43
No.200	0.075	36



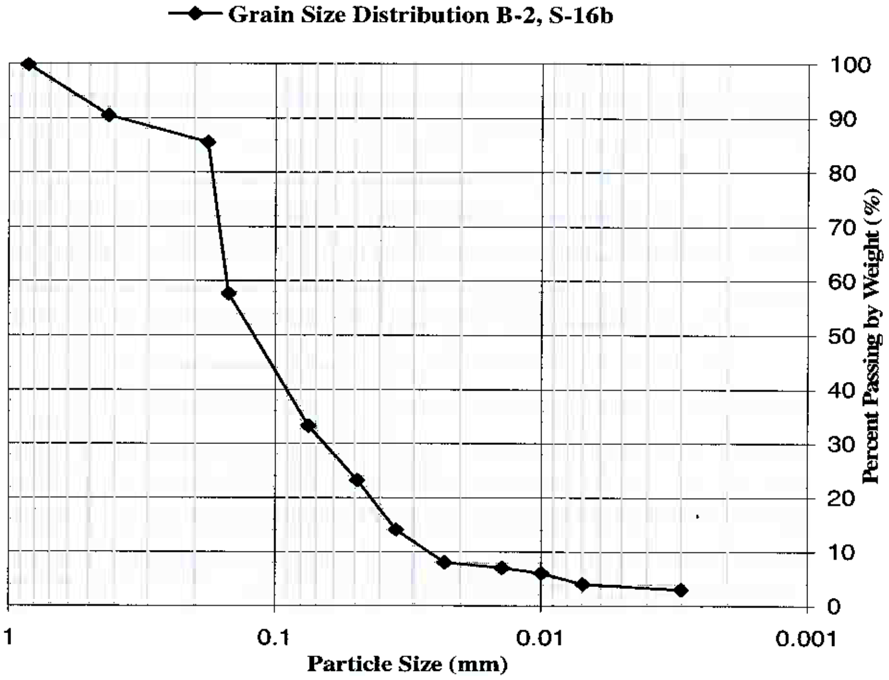
Sample ID: B-2, S-8

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
3/8"	9.50	100
1/4"	6.25	99
No.4	4.75	99
No.10	2.00	98
No.20	0.850	94
No.40	0.425	81
No.80	0.180	32
No.100	0.150	25
No.200	0.075	13



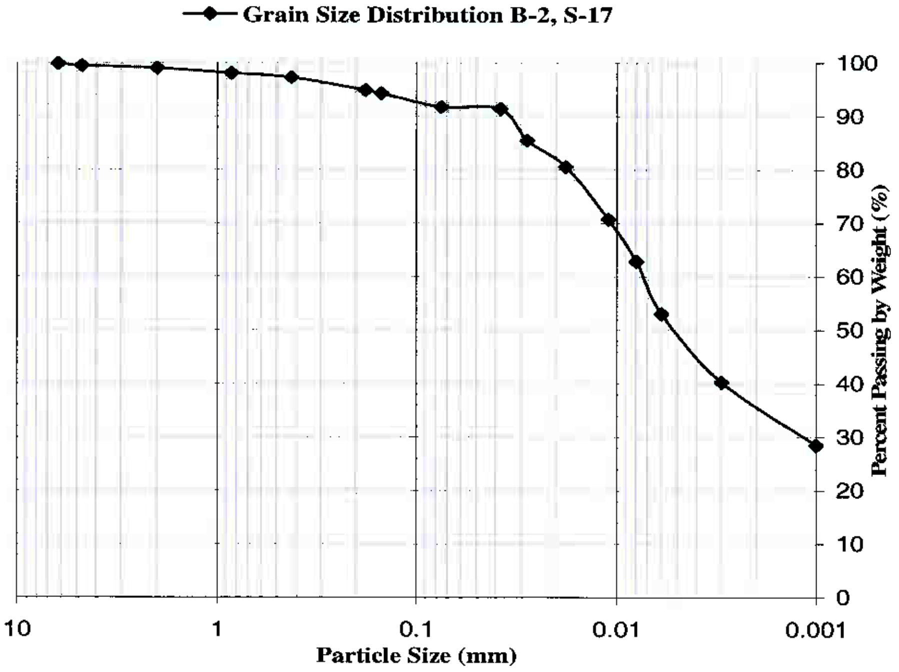
Sample ID: **B-2, S-16b**

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
No.20	0.850	-
No.40	0.425	100
No.80	0.180	90
No.100	0.150	86
No.200	0.075	58
Hydrometer	0.049	33
	0.035	23
	0.023	14
	0.014	8
	0.010	7
	0.007	6
	0.003	4
	0.001	3



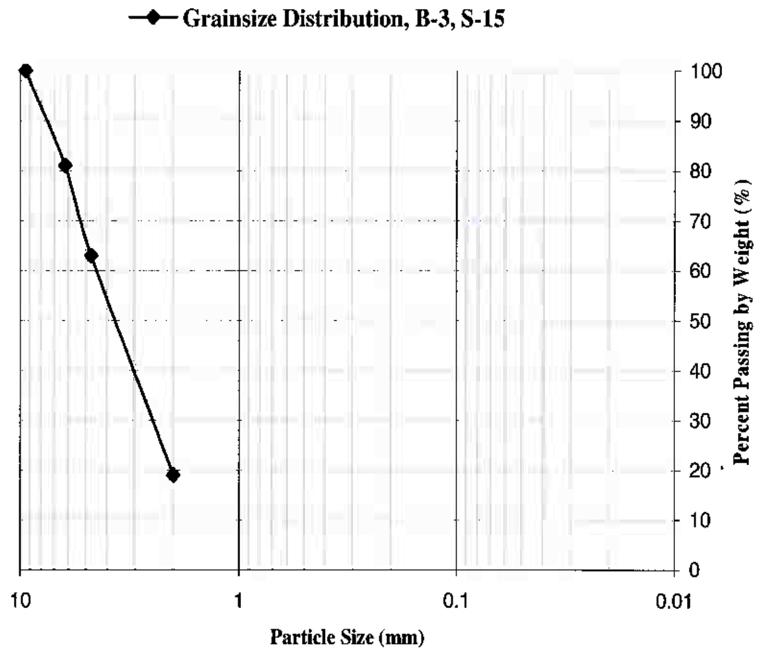
Sample ID: **B-2, S-17**

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
1/4"	6.25	100
No.4	4.75	99
No.10	2.00	99
No.20	0.850	98
No.40	0.425	97
No.80	0.180	95
No.100	0.150	94
No.200	0.075	92
Hydrometer	0.038	91
	0.028	85
	0.018	81
	0.011	71
	0.008	63
	0.006	53
	0.003	40
	0.001	28



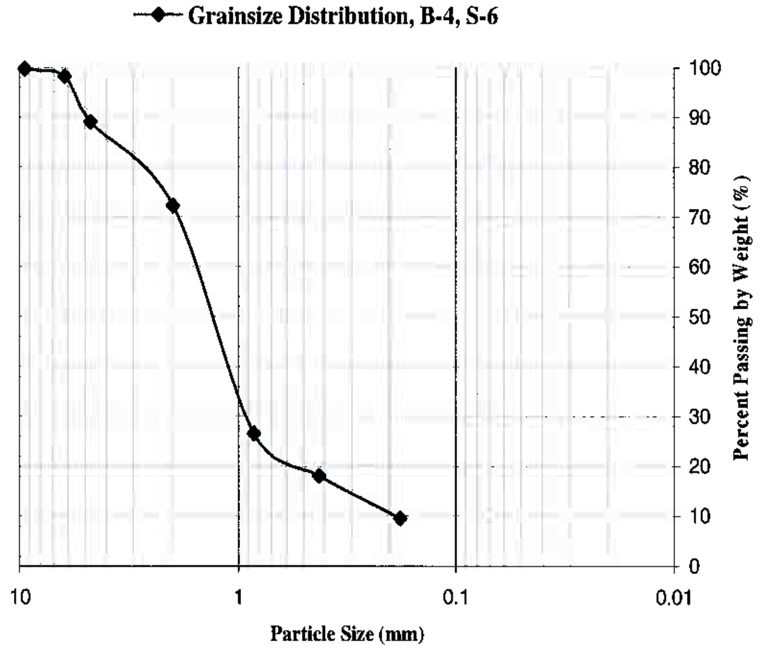
Sample ID: B-3, S-15

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
3/8"	9.50	-
1/4"	6.25	-
No.4	4.75	-
No.10	2.00	-
No.20	0.850	-
No.40	0.425	100
No.80	0.180	81
No.100	0.150	63
No.200	0.075	19



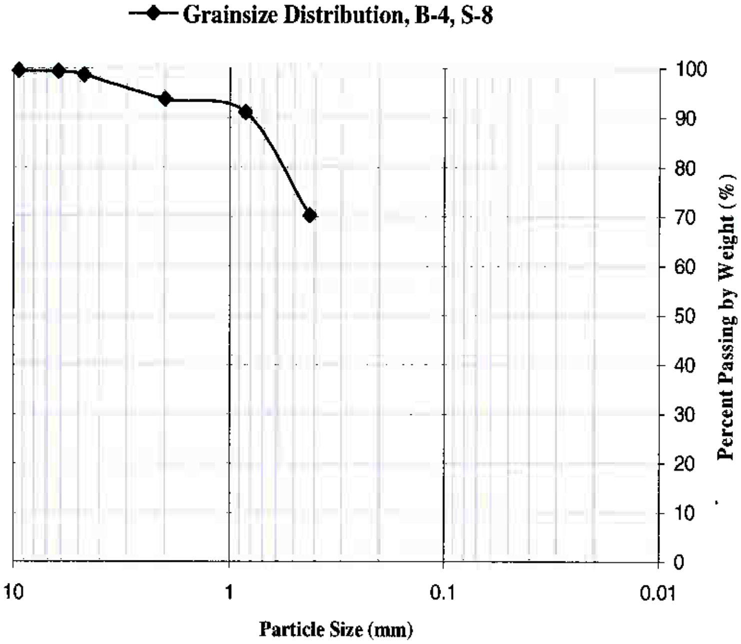
Sample ID: B-4, S-6

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
3/8"	9.50	-
1/4"	6.25	-
No.4	4.75	100
No.10	2.00	98
No.20	0.850	89
No.40	0.425	72
No.80	0.180	27
No.100	0.150	18
No.200	0.075	10



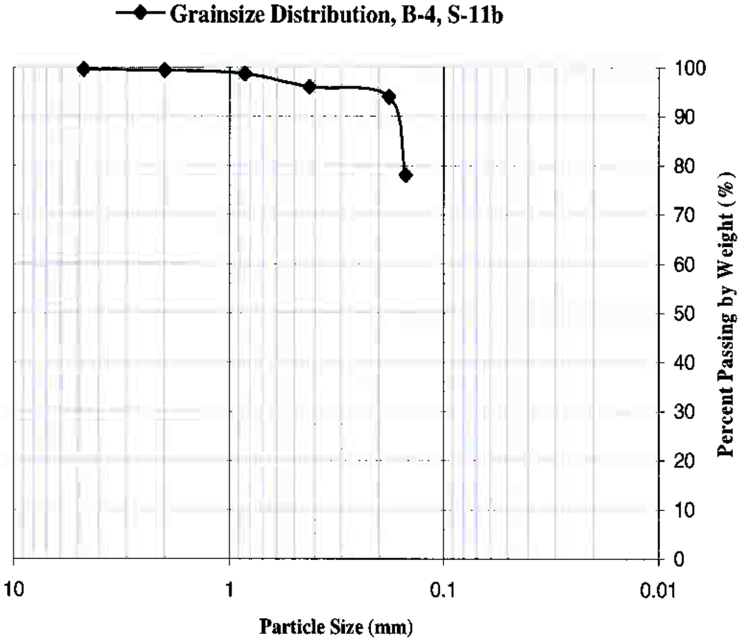
Sample ID: B-4, S-8

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
3/8"	9.50	-
1/4"	6.25	-
No.4	4.75	-
No.10	2.00	100
No.20	0.850	99
No.40	0.425	99
No.80	0.180	94
No.100	0.150	91
No.200	0.075	70



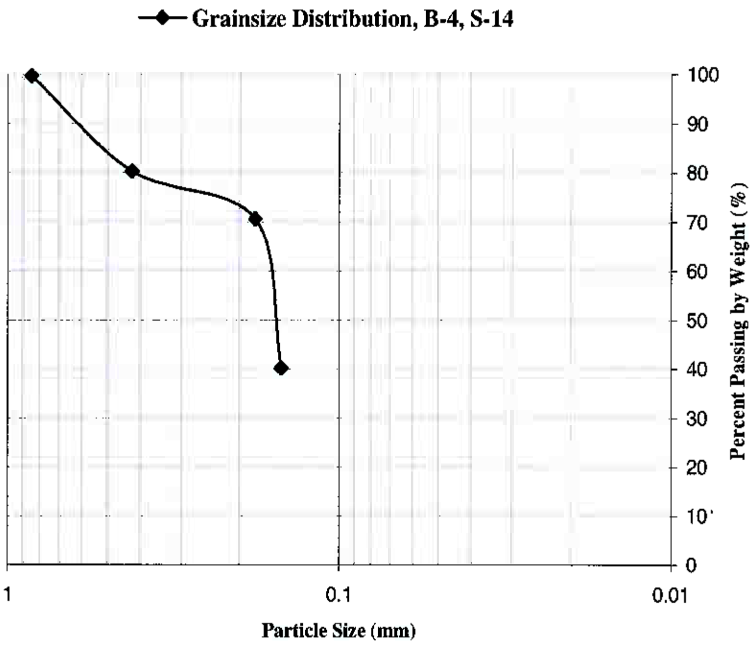
Sample ID: B-4, S-11b

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
No.4	4.75	-
No.10	2.00	100
No.20	0.850	99
No.40	0.425	99
No.80	0.180	96
No.100	0.150	94
No.200	0.075	78



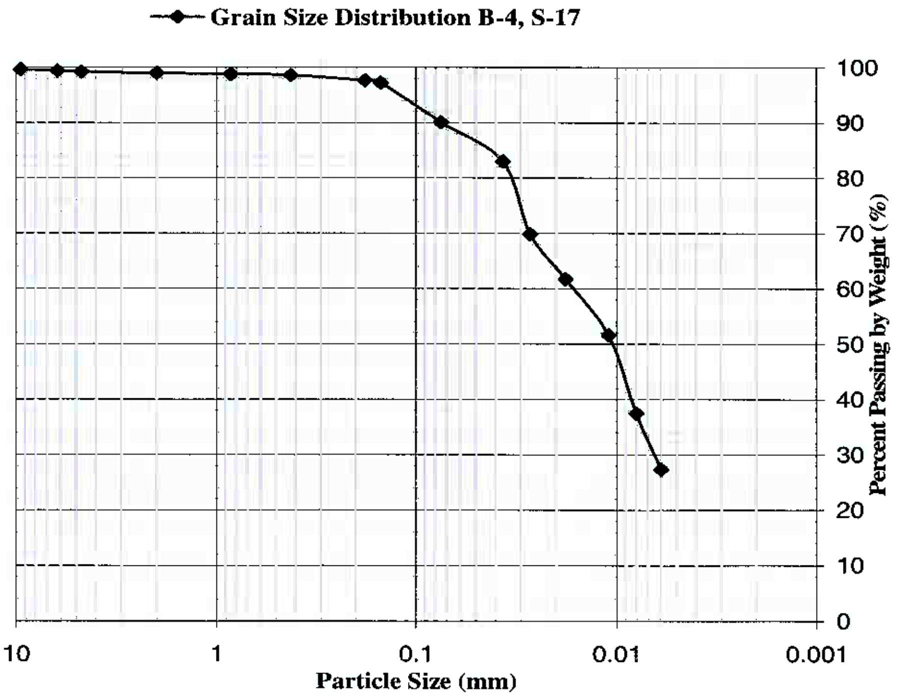
Sample ID: **B-4, S-14**

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
No.20	0.850	-
No.40	0.425	100
No.80	0.180	80
No.100	0.150	71
No.200	0.075	40



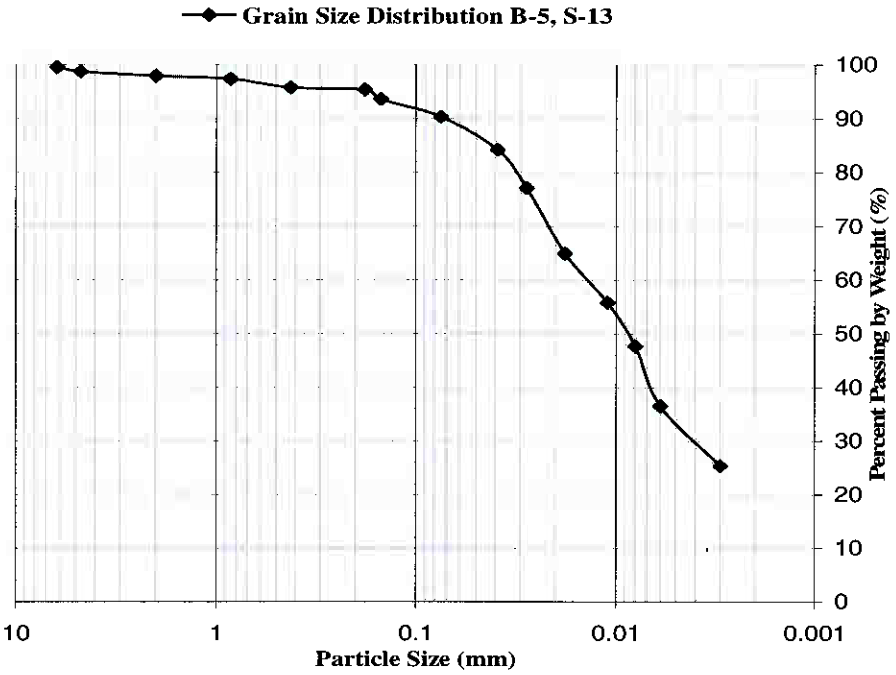
Sample ID: **B-4, S-17**

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
3/8"	9.5	-
1/4'	6.25	-
N0.4	4.75	100
No. 10	2.00	99
No.20	0.850	99
No.40	0.425	99
No.80	0.180	99
No.100	0.150	99
No.200	0.075	98
Hydrometer	0.037	97
	0.027	90
	0.018	83
	0.011	70
	0.008	62
	0.006	52
	0.003	37
	0.001	27



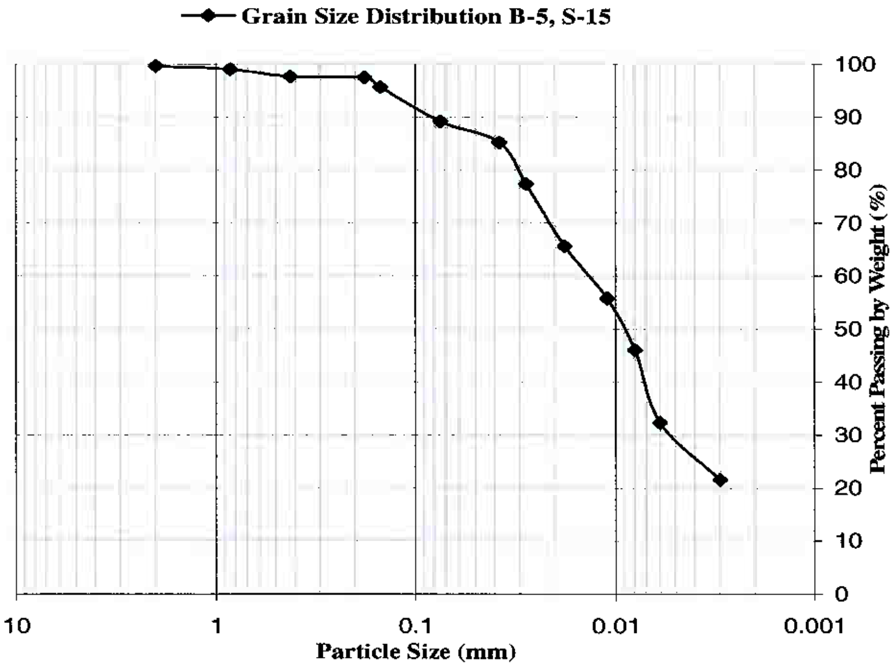
Sample ID: B-5, S-13

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
1/4"	6.25	-
No.4	4.75	100
No.10	2.00	99
No.20	0.850	98
No.40	0.425	97
No.80	0.180	96
No.100	0.150	95
No.200	0.075	94
Hydrometer	0.039	90
	0.028	84
	0.018	77
	0.011	65
	0.008	56
	0.006	48
	0.003	37
	0.001	25



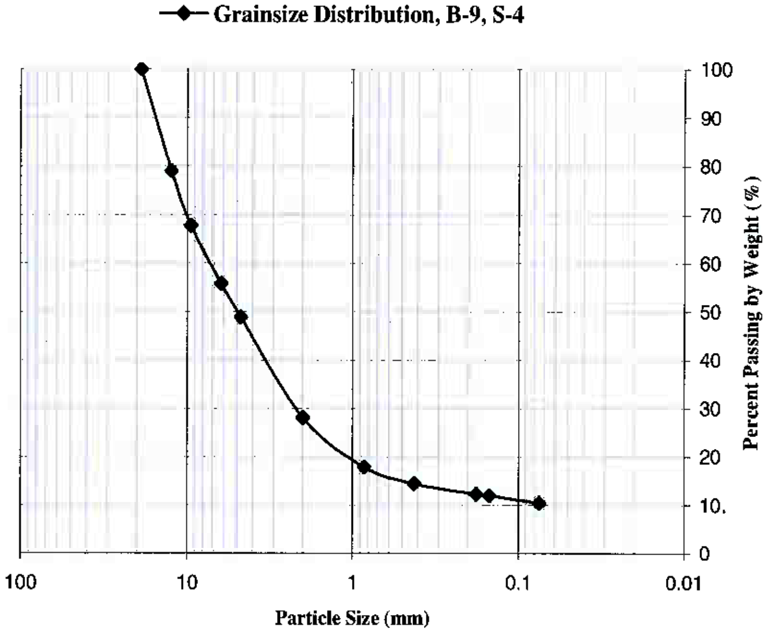
Sample ID: B-5, S-15

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
No. 10	2.00	-
No.20	0.850	100
No.40	0.425	99
No.80	0.180	98
No.100	0.150	97
No.200	0.075	96
Hydrometer	0.038	89
	0.028	85
	0.018	77
	0.011	66
	0.008	56
	0.006	46
	0.003	32
	0.001	22



Sample ID: B-9, S-4

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
3/4"	19.0	100
1/2"	12.5	79
3/8"	9.50	68
1/4"	6.25	56
No.4	4.75	49
No.10	2.00	28
No.20	0.850	18
No.40	0.425	14
No.80	0.180	12
No.100	0.150	12
No.200	0.075	10



If you have any questions regarding this report please contact our office.

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LABORATORY TEST SUMMARY
Analysis of Slopes North of University Avenue Between Foundry and Johnson Art Museum
Cornell University, Ithaca, New York
CME Report No.: 26055B-01-0907
September 17, 2007
Page 1 of 5

CME Representatives obtained soil samples from Test Borings advanced as part of the Subsurface Exploration Program conducted for the subject project. Selected samples were delivered to CME's Cicero facility, an AASTHO AMRL[1] accredited laboratory for various laboratory testing. The results are presented below:

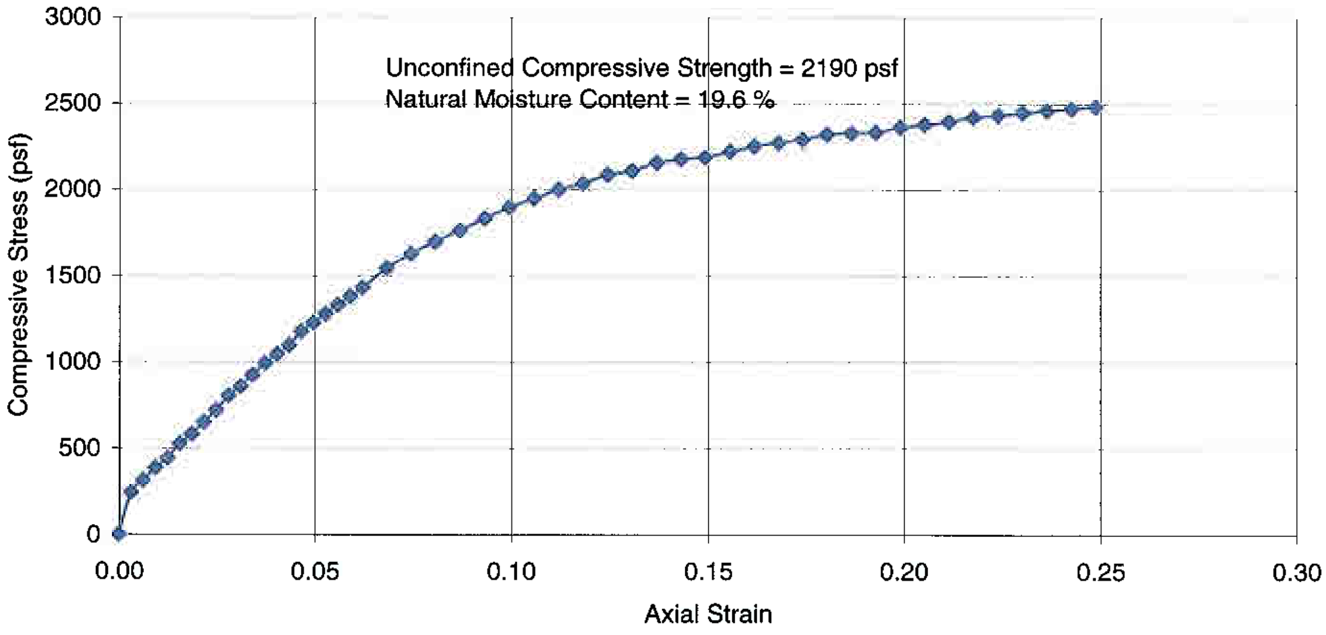
Sample ID Notations: GB - Test Boring, S - Sample

I. Atterberg Limits Testing and Natural Moisture Content (ASTM D4318 & D2216)

Sample ID	Liquid Limit	Plastic Limit	Plasticity Index	USCS Symbol	Natural Moisture Content
GB-1 S-21	31	16	15	CL	19.6

II. Unconfined Compression Test (ASTM D 2166)

Boring: GB-1 Sample: S-21 (depth = 55.0'-57.0' below grade)



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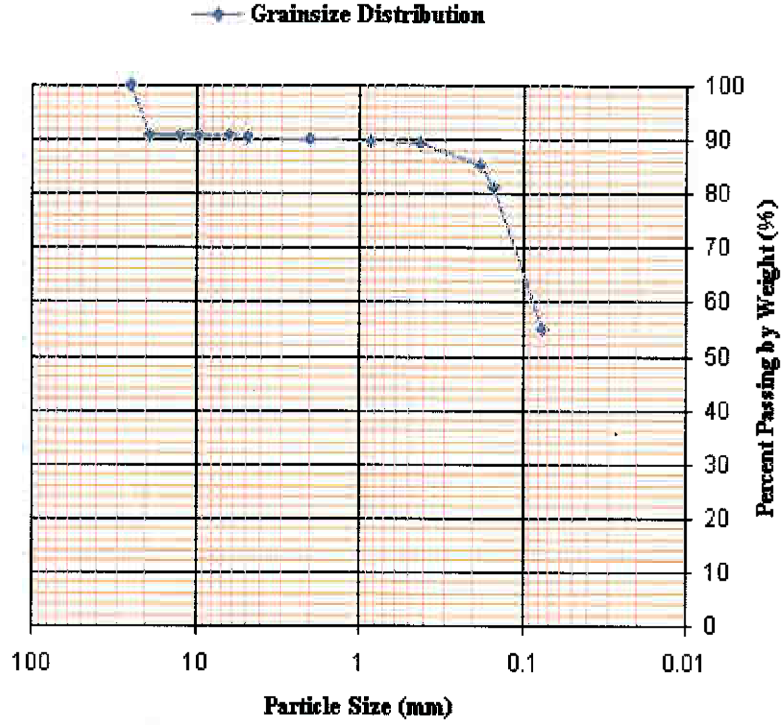
[1] **AMRL** – American Association of State Highway & Transportation Officials (AASHTO) Materials Reference Laboratory. AMRL is a Federal Agency having jurisdiction to assess laboratory competence according to the standards of the United States. **CME** Cicero accreditation includes tests of Portland Cement Concrete, Aggregate and Soil Materials. www.amrl.net

III. Mechanical Analysis (ASTM C136 & C117, D422)

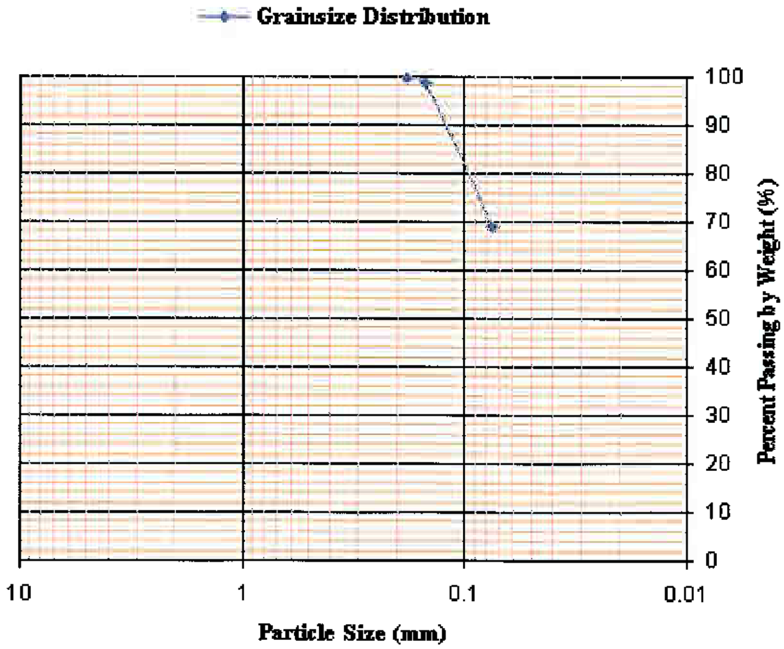
Sample ID: GB-1, S-5

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
1"	25.0	100
3/4"	19.0	91
1/2"	12.5	91
3/8"	9.50	91
1/4"	6.25	91
No.4	4.75	90
No.10	2.00	90
No.20	0.850	90
No.40	0.425	89
No.80	0.180	85
No.100	0.150	81
No.200	0.075	55



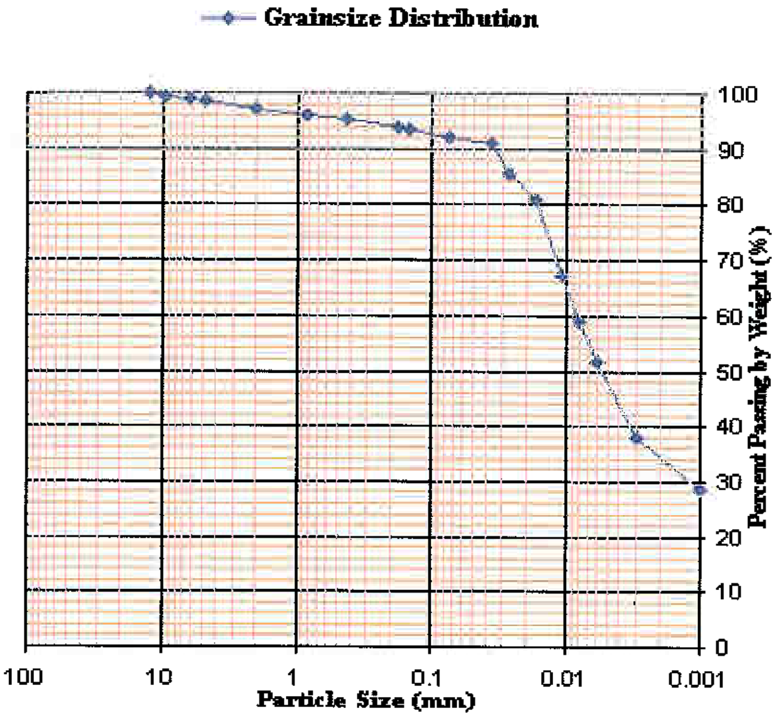
Sample ID: GB-1, S-15a

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
No.80	0.180	100
No.100	0.150	99
No.200	0.075	69



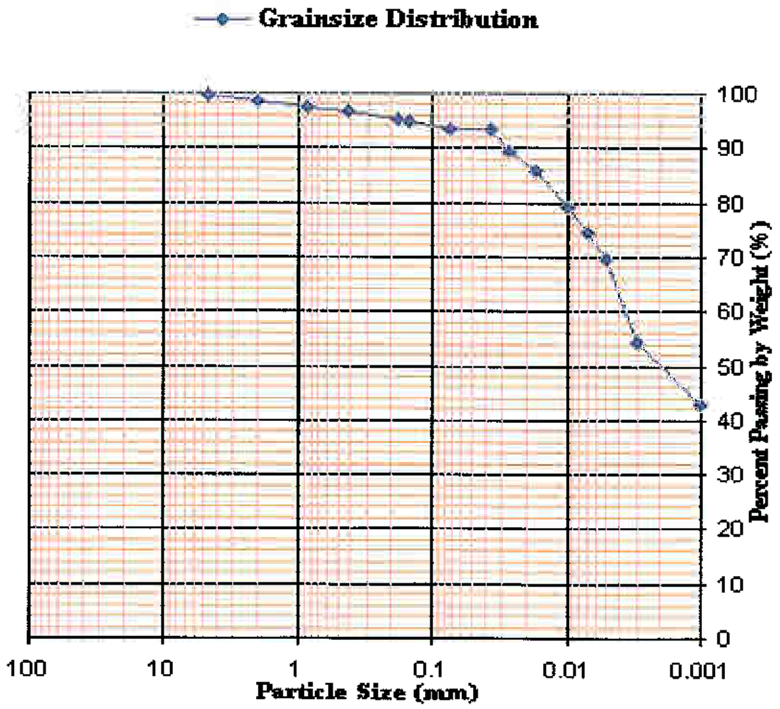
Sample ID: GB-1, S-19

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
1/2"	12.5	100
3/8"	9.50	99
1/4"	6.25	99
No.4	4.75	98
No.10	2.00	97
No.20	0.850	96
No.40	0.425	95
No.80	0.180	94
No.100	0.150	94
No.200	0.075	92
Hydrometer	0.037	91
	0.027	86
	0.017	81
	0.011	67
	0.008	59
	0.006	52
	0.003	38
	0.001	29



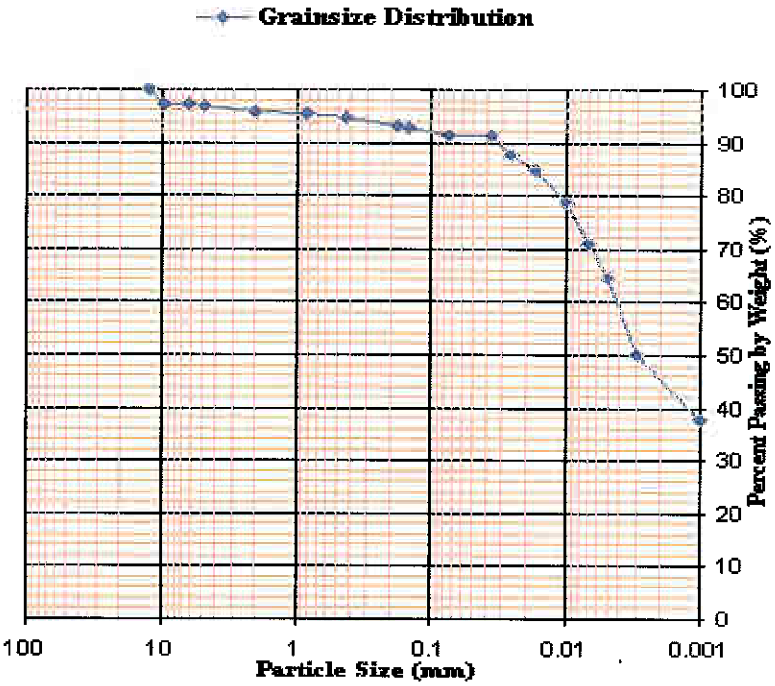
Sample ID: GB-1, S-22

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
No.4	4.75	100
No.10	2.00	99
No.20	0.850	97
No.40	0.425	97
No.80	0.180	95
No.100	0.150	95
No.200	0.075	93
Hydrometer	0.037	93
	0.027	90
	0.017	86
	0.010	79
	0.007	74
	0.005	70
	0.003	54
	0.001	43



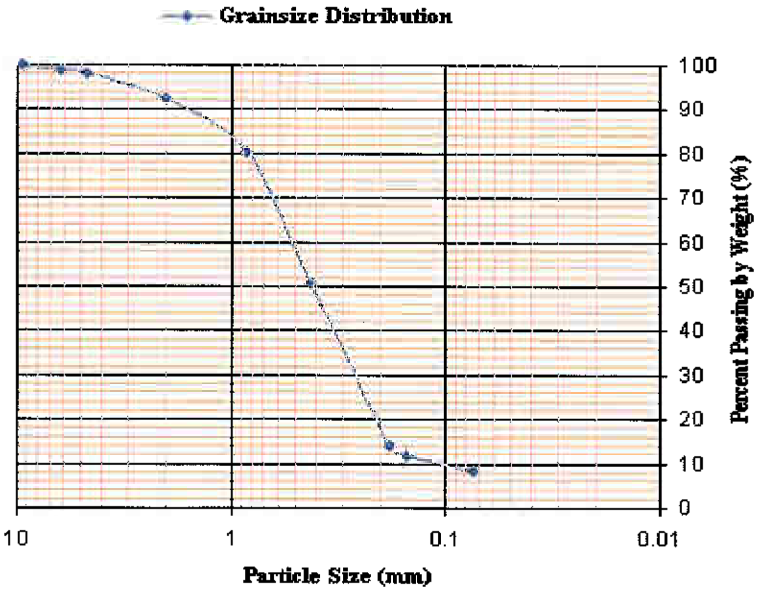
Sample ID: GB-2, S-21

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
1/2"	12.5	100
3/8"	9.50	97
1/4"	6.25	97
No.4	4.75	97
No.10	2.00	96
No.20	0.850	95
No.40	0.425	94
No.80	0.180	93
No.100	0.150	93
No.200	0.075	91
Hydrometer	0.037	91
	0.026	88
	0.017	85
	0.010	78
	0.007	71
	0.005	65
	0.003	50
	0.001	38



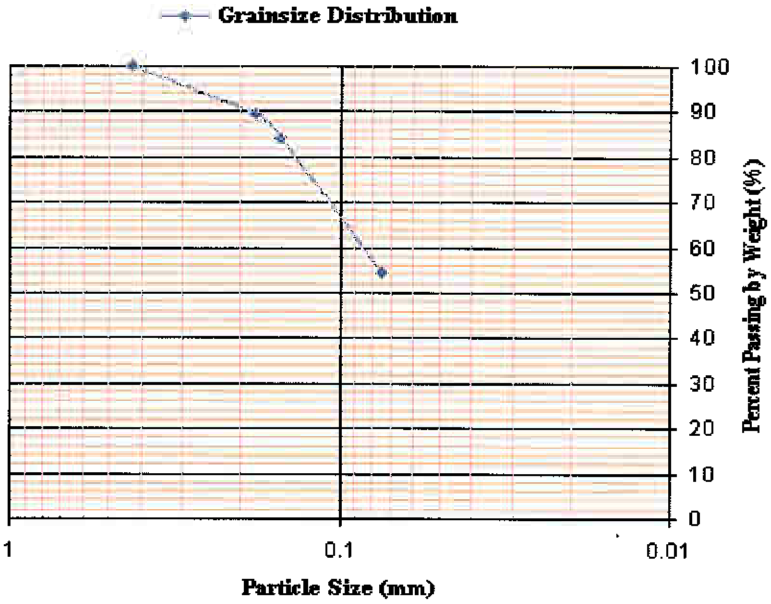
Sample ID: GB-3, S-7

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
3/8"	9.50	100
1/4"	6.25	99
No.4	4.75	98
No.10	2.00	93
No.20	0.850	80
No.40	0.425	51
No.80	0.180	14
No.100	0.150	12
No.200	0.075	8



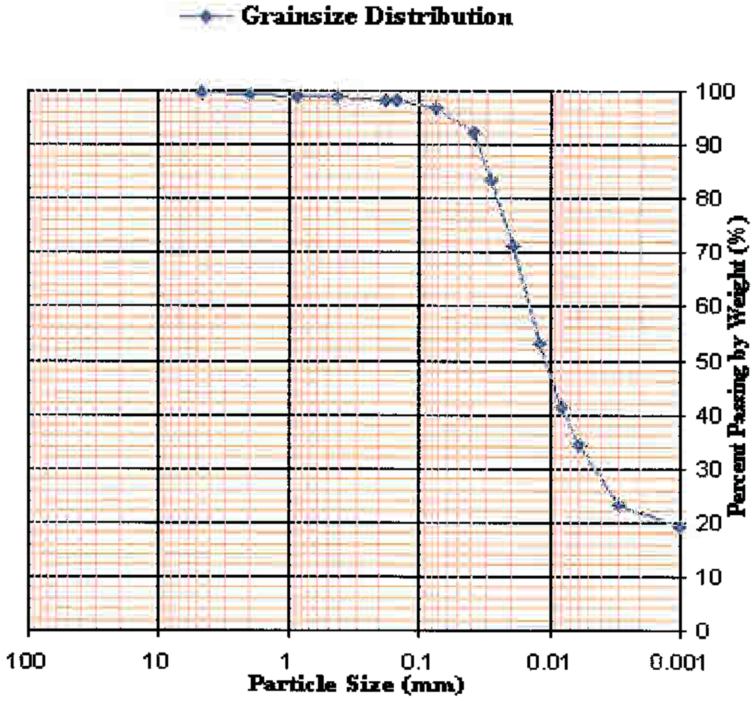
Sample ID: **GB-3, S-17b**

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
No.40	0.425	100
No.80	0.180	89
No.100	0.150	84
No.200	0.075	54



Sample ID: **GB-3, S-20**

Sieve Designation	Size (mm)	Percent Passing by Weight (%)
No.4	4.75	100
No.10	2.00	99
No.20	0.850	99
No.40	0.425	99
No.80	0.180	98
No.100	0.150	98
No.200	0.075	97
Hydrometer	0.038	92
	0.028	83
	0.019	71
	0.012	53
	0.008	41
	0.006	34
	0.003	23
	0.001	19



If you have any questions regarding this report please contact our office.

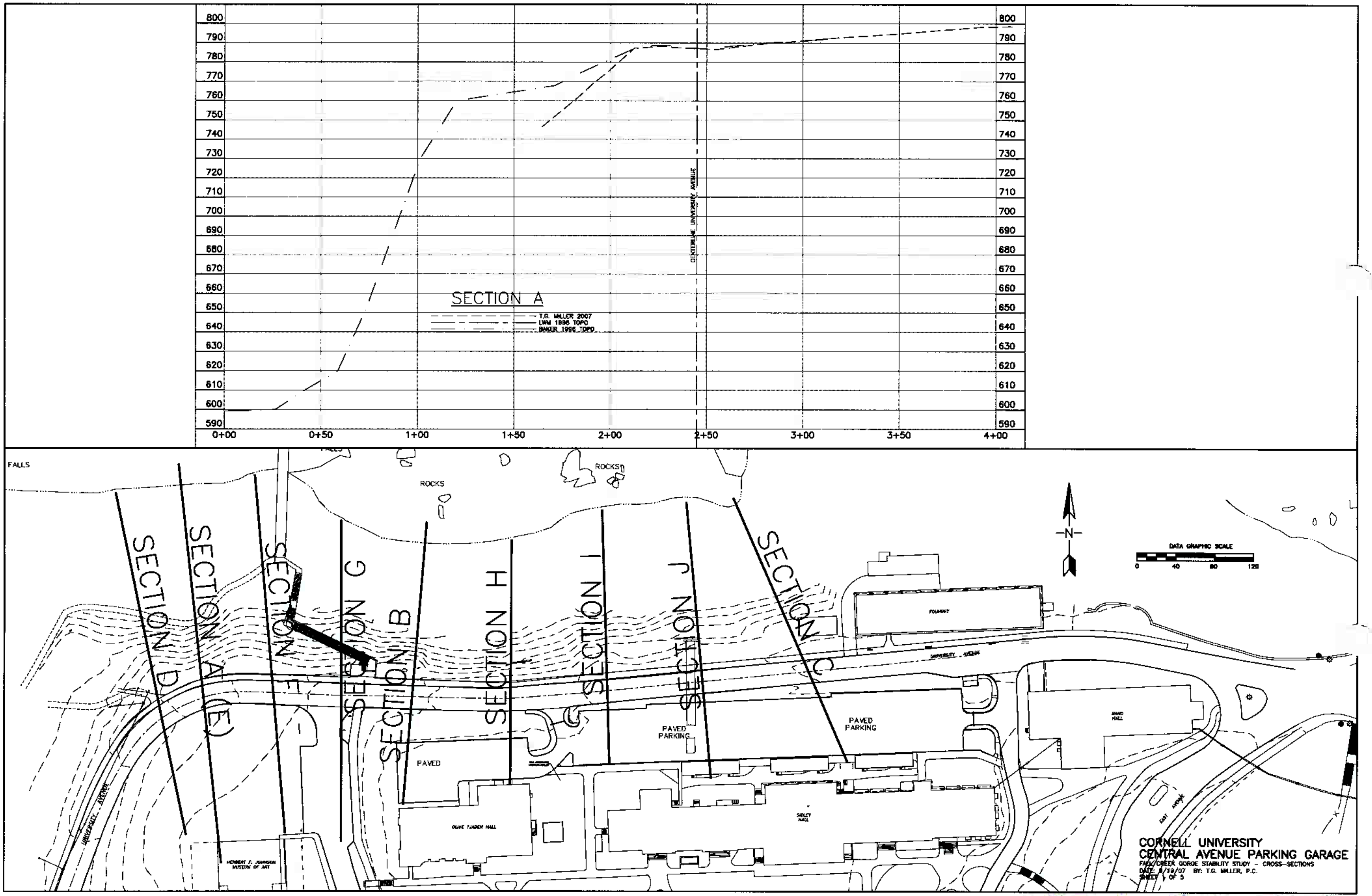
Jay Mikus

Jay Mikus
Laboratory Supervisor

CME
Associates, Inc.

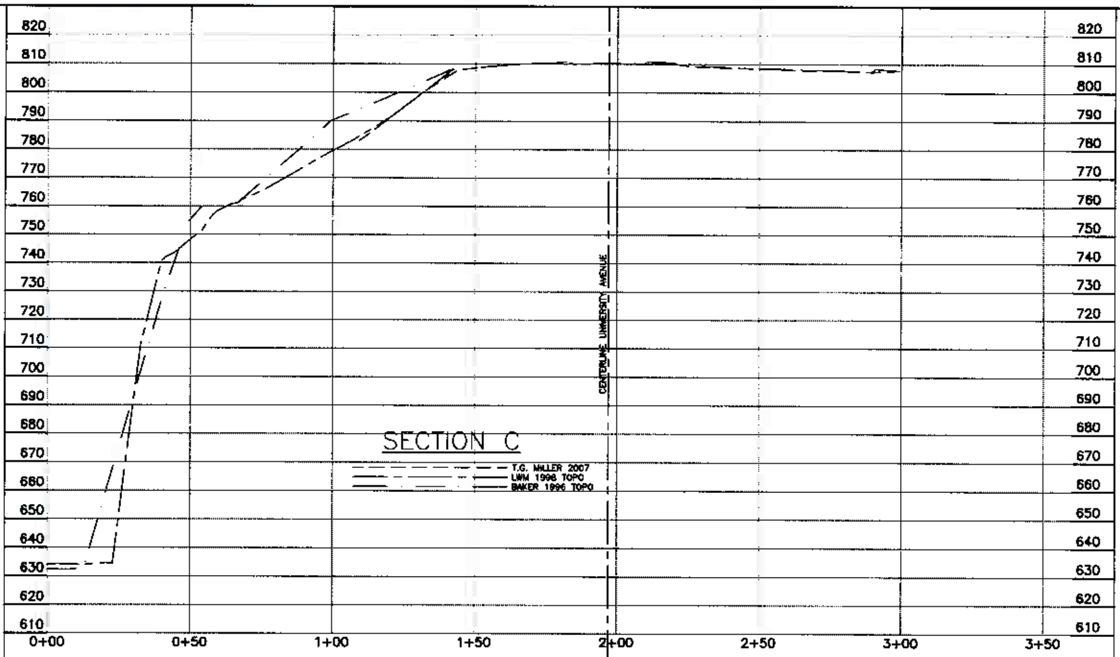
Study and Report for Stability of Earth Slopes North of University Avenue between Foundry and Johnson Art Museum
Cornell University
Ithaca, New York
CME Report No.: 26055B-01-0108

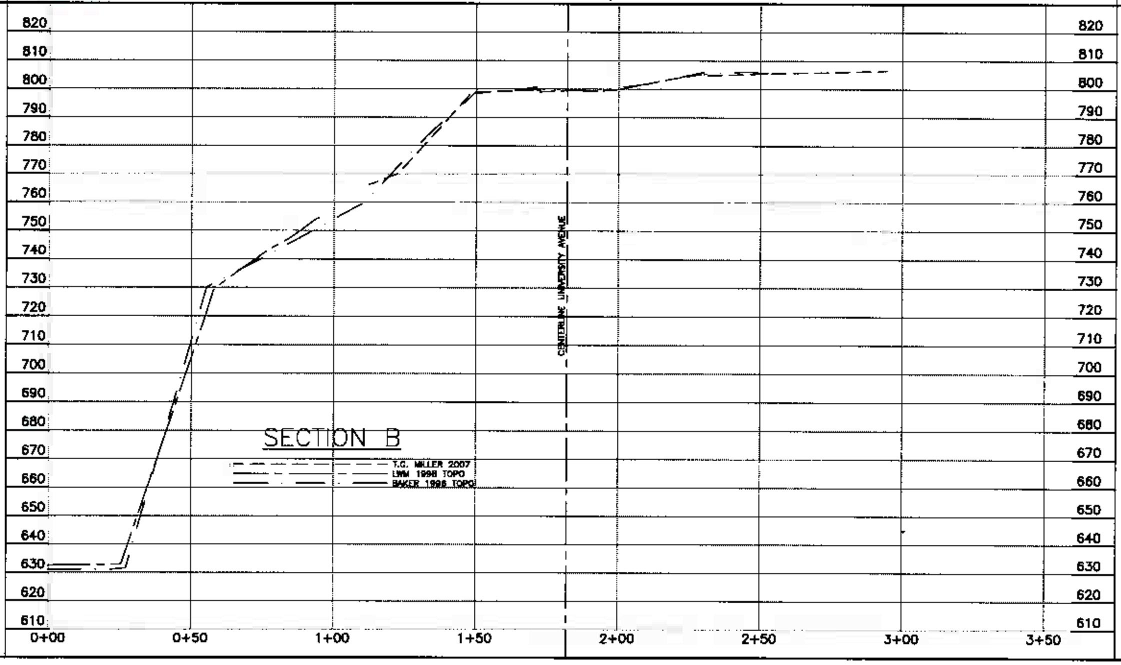
APPENDIX - E



CORNELL UNIVERSITY
CENTRAL AVENUE PARKING GARAGE
FALL CREEK GORGE STABILITY STUDY – CROSS-SECTIONS
DATE: 8/19/07 BY: T.G. MILLER, P.C.
SHEET 1 OF 5

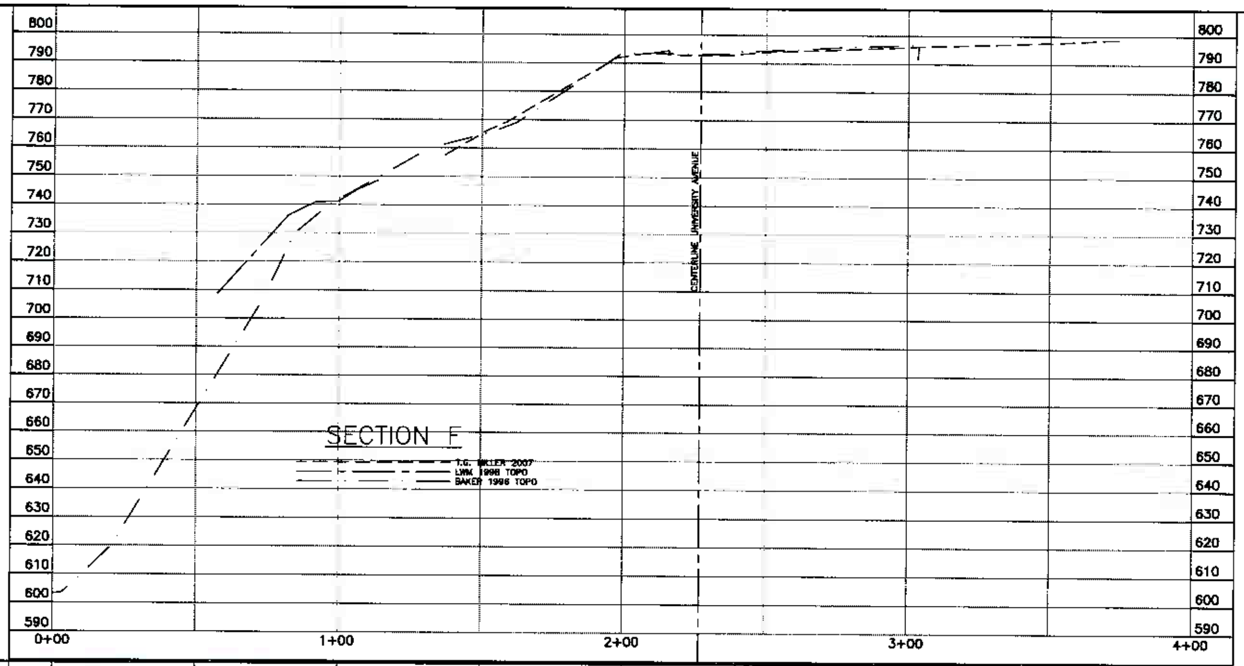
1 of 5 Provided by TG Miller

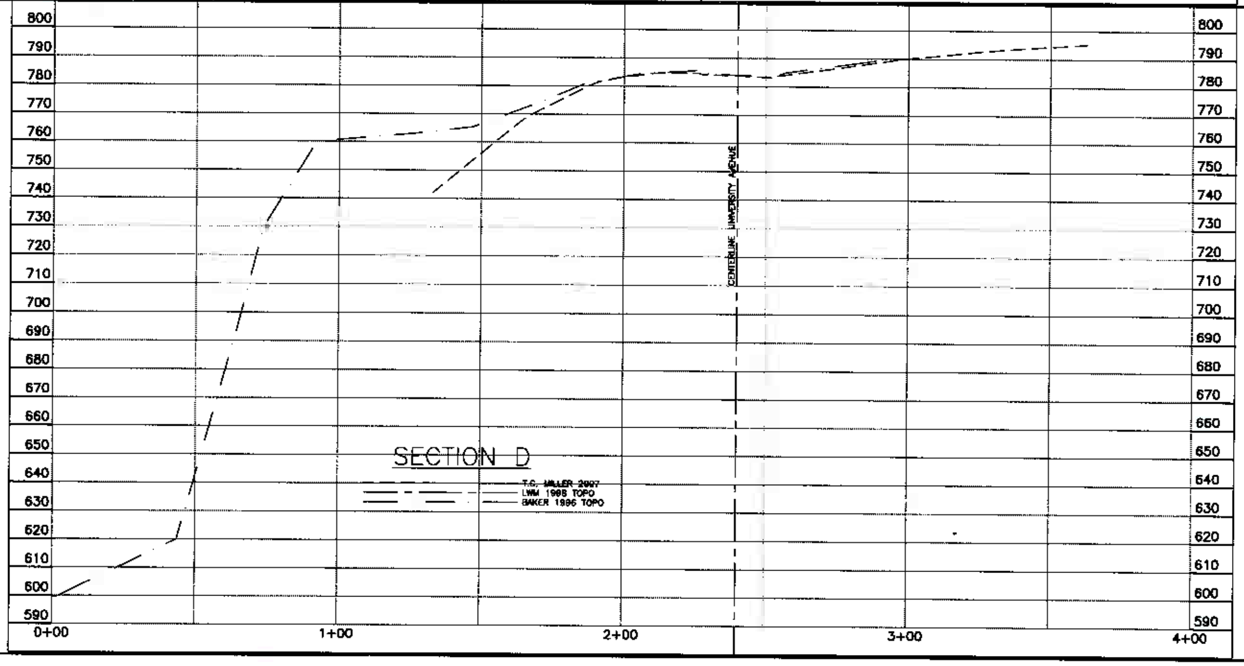

SECTION C


SECTION B

CORNELL UNIVERSITY
CENTRAL AVENUE PARKING GARAGE
FALL CREEK GORGE STABILITY STUDY – CROSS-SECTIONS
DATE: 9/19/07 BY: T.G. MILLER, P.C.
SHEET 2 OF 5

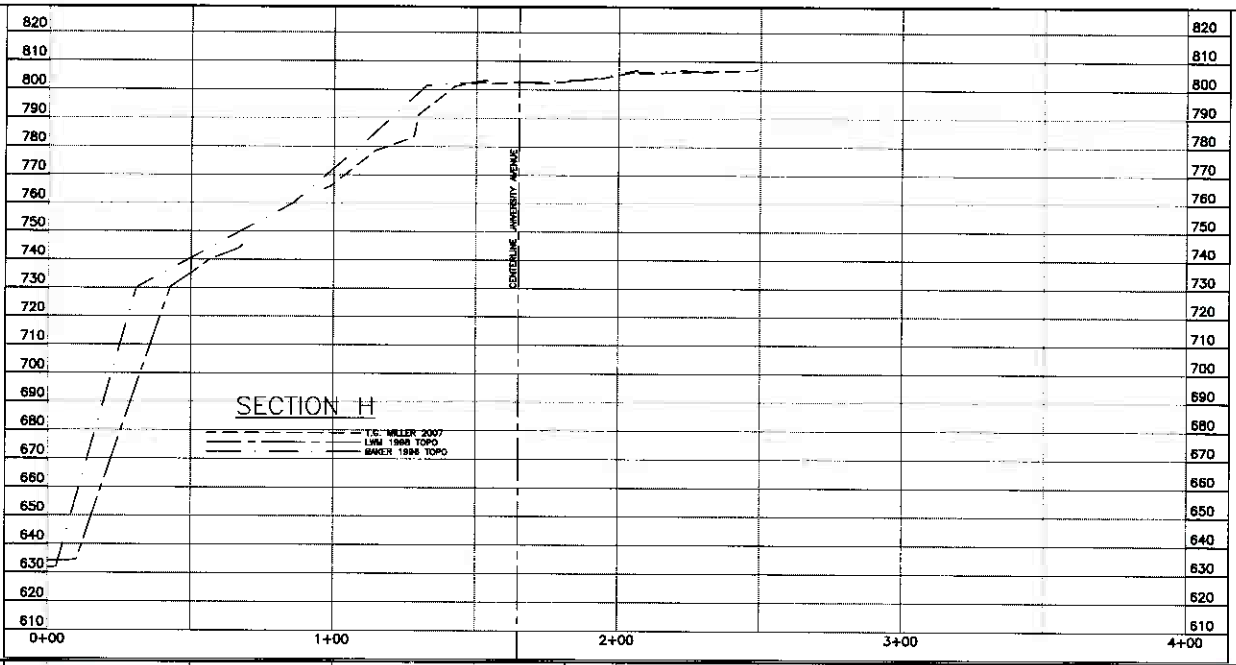
2 of 5 Provided by TG Miller

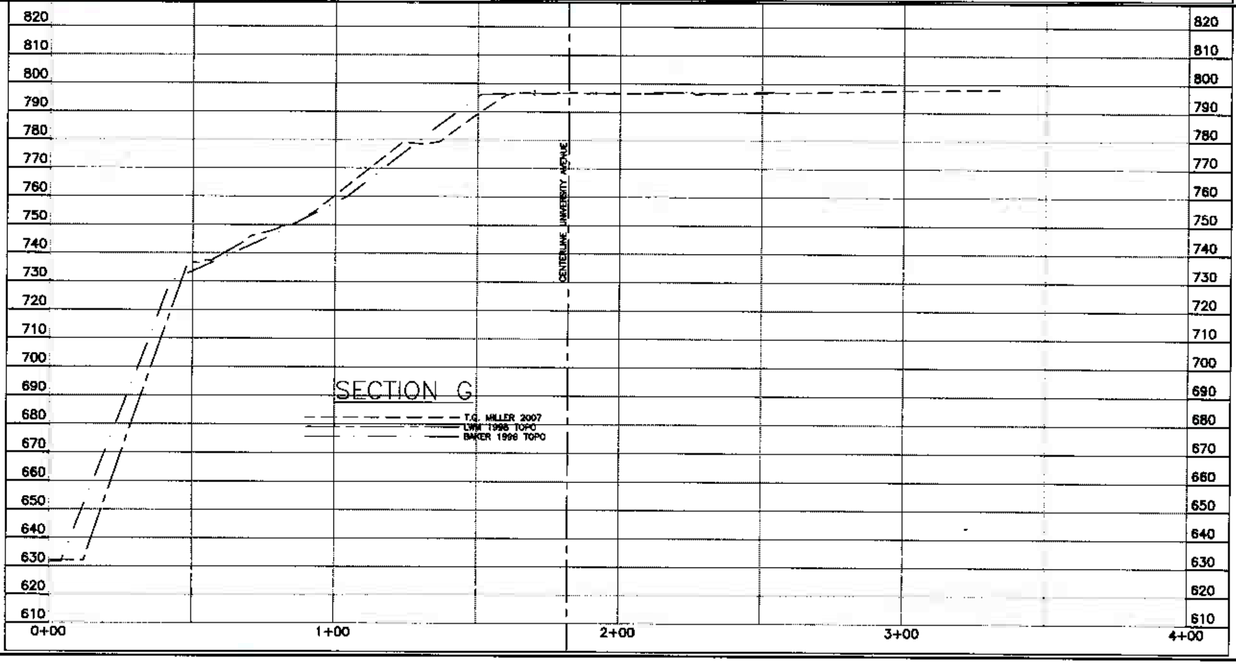




CORNELL UNIVERSITY
CENTRAL AVENUE PARKING GARAGE
FALL CREEK GORGE STABILITY STUDY – CROSS-SECTIONS
DATE: 9/19/07 BY: T.G. MILLER, P.C.
SHEET 3 OF 5

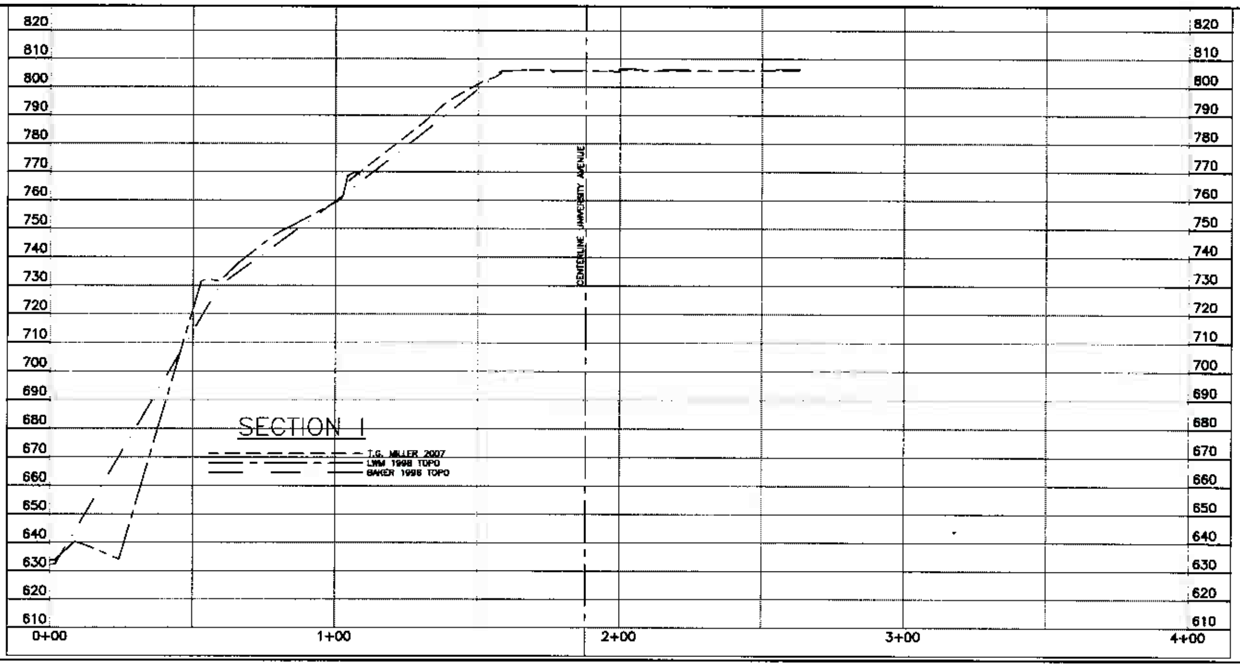
345 Provided by TG Miller





CORNELL UNIVERSITY
CENTRAL AVENUE PARKING GARAGE
FALL CREEK GORGE STABILITY STUDY – CROSS-SECTIONS
DATE: 9/19/07 BY: T.G. MILLER, P.C.
SHEET 4 OF 5

4 of 5 Provided by TG Miller



SECTION I

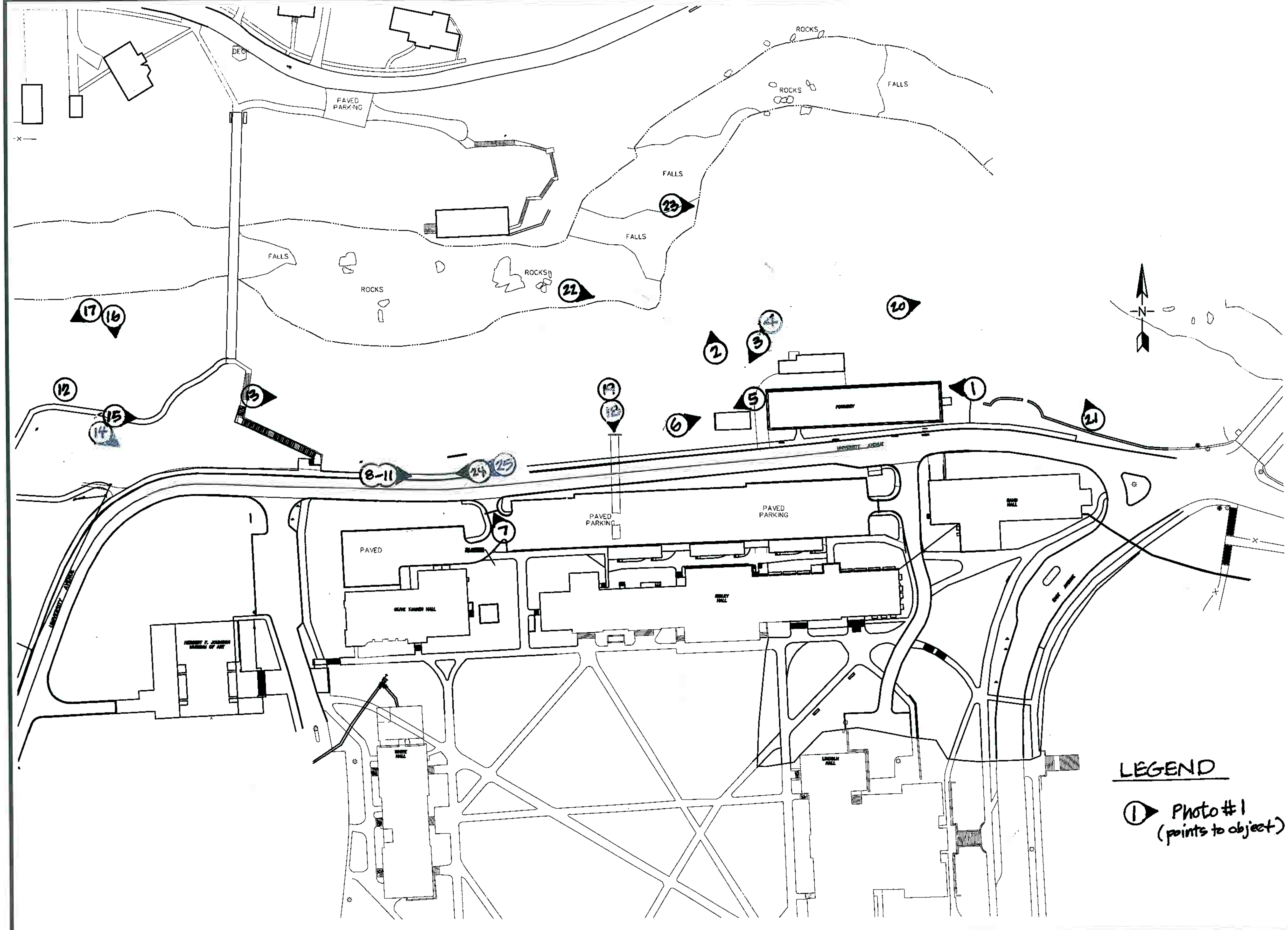
CORNELL UNIVERSITY
CENTRAL AVENUE PARKING GARAGE
FALL CREEK GORGE STABILITY STUDY – CROSS-SECTIONS
DATE: 9/19/07 BY: T.G. MILLER, P.C.
SHEET 5 OF 5

5 of 5 Provided by TG Miller

CME Associates, Inc.

Study and Report for Stability of Earth Slopes North of University Avenue between Foundry and Johnson Art Museum
Cornell University
Ithaca, New York
CME Report No.: 26055B-01-0108

APPENDIX - F



LEGEND

① Photo #1 (points to object)

CME Associates, Inc.
Construction Materials Evaluation
P.O.Box 1824
Cicero, New York 13039-1824
[315] 698-9315 FAX: [315] 698-9319

Cornell University
Stability of Slopes North of University Avenue
Between Foundary and Johnson Art Museum
Photo Index Map
Ithaca, Tompkins Co., New York

SHEET NO.
GL-1

1"=100'
12-11-07
26055
jpw/MAR

MAR 6-22-2008

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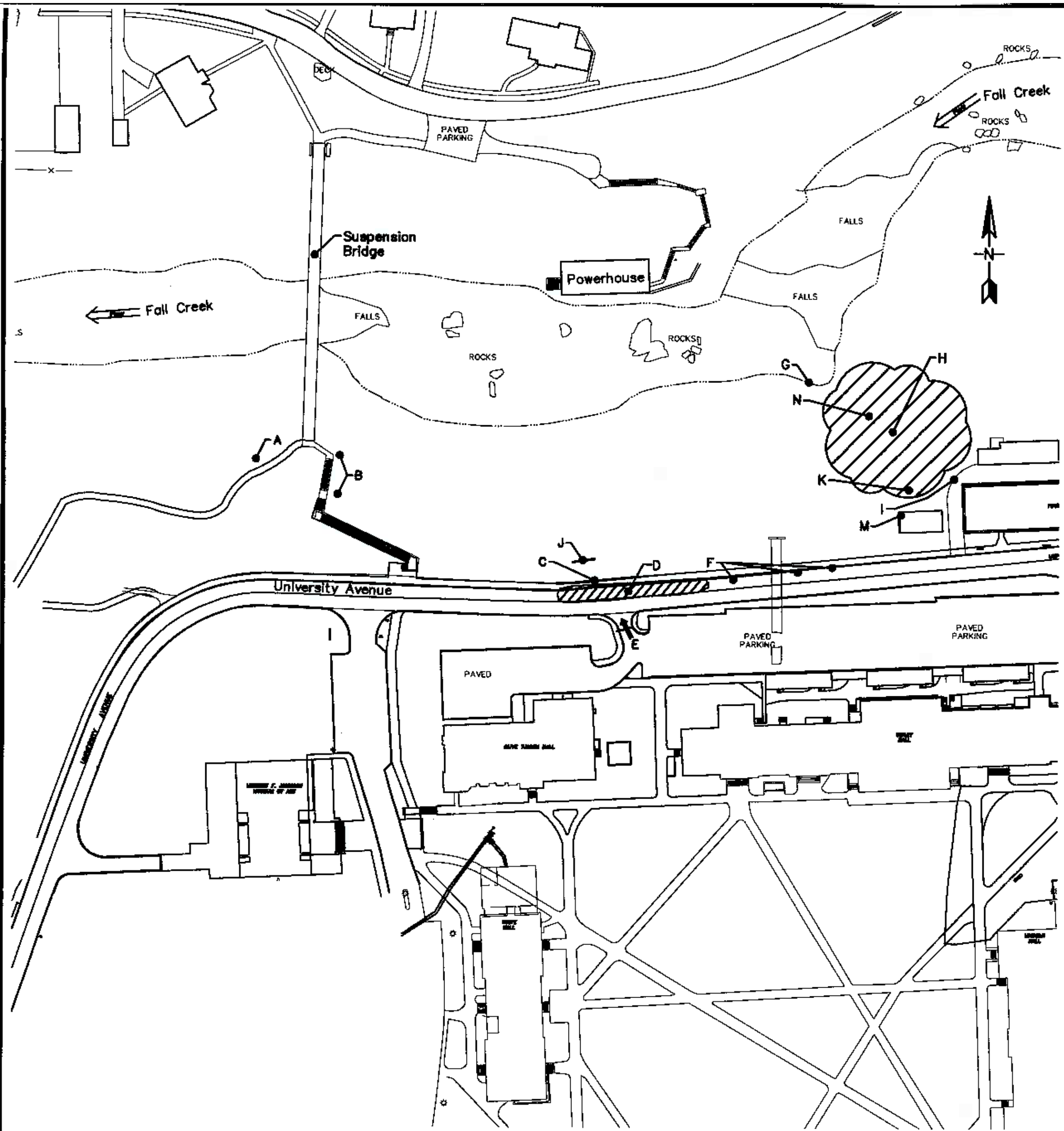


Key

- A – See Photograph 12, pipe outfall, Unknown Source
- B – Local Slope failure area.
- C – Retaining Structure rotating northerly at edge of sidewalk.
- D – Pavement subsidence and translation evidence.
- E – Sheet flow of Stormwater across University Ave over drop–curb onto slope
- F – Longitudinal cracks near north curb indicate translation.
- G – Undercut rock face profile at Gorge.
- H – Local slope failure area. (Hatched)
- I – Timber poles rotated northerly.
- J – Existing RR–tie retaining wall in poor condition.
- K – VCT Drain Pipe exposed at groin of local failure.
- L – VCT Drain Pipe exposed at edge of local failure.
- M – Exposed mass of concrete under slab.
- N – Several sections of VCT Pipe lying on grade in local failure.

SHEET NO.
GL–3
1"=100'
01–18–08
26055

Cornell University
Stability of Slopes North of University Avenue
Between Foundary and Johnson Art Museum
Site Reconnaissance Key Map
Ithaca, *Tompkins Co.,* *New York*

CME Associates, Inc.
Construction Materials Evaluation
P.O.Box 1824
Cicero, New York 13039–1824
[315] 698–9315 FAX: [315] 698–9319

Photo 1 - Area where fresh concrete has been poured on grade surface in attempt to stabilize surface at NE corner Foundry.

Photo 2 - Area of continuing and historic (1988 ESI Report) large slope failure.

Photo 3 - Drain tile exposed at failed slope area.

Photo 4 - Near vertical (and undercut barren earth face in danger of failure at any time. Foundry above left. Drain in Center.

Photo 5 - Large mass of concrete fill exposed at NW corner of concrete pad. Note concrete poured on grade below (lower right).

Photo 6 - Timber (poles) piles driven to retain slope, exhibit rotation northerly.

Photo 7 - Precipitation sheet flows from the Parking Lot thru the Exit, across University Avenue, over the drop curb, over the asphalt sidewalk, over the retaining structure, into the gorge.

Photo 8 - This asphalt sidewalk has settled and the pavement appears to be translating northerly into the gorge

Photo 9 - A poor stormwater management practice and local slope failure area.

Photo 10 - New asphalt patch (overlay) designated over existing failed area.

Photo 11 - Notice all of the pavement cracking along the North Curb line of University Avenue.

Photo 12 - Approximate location of drain outlet.

Photo 13 - Area of recently repaired local failure covered with erosion control fabric, but no planting of any kind are apparent.

Photo 14 - Looking up to University Avenue from the foot trail, over a barren, eroded area.

Photo 15 - Looking back east toward Pedestrian Bridge.

Photo 16 - Relatively undisturbed area of slope with good ground cover and leaf litter.

Photo 17 - Wet laid stone stair case on trail. Note rotation of wall to right and mortar in fill in gap between stairs and wall.

Photo 18 - Tunnel under University Avenue.

Photo 19 - Tunnel under University Avenue.

Photo 20 - Very steep, well vegetated natural slope.

Photo 21 - On grade pipe.

Photo 22 - Undercut rockface in knee of Fall Creek.

Photo 23 - Large rockface failure near edge of Falls.

Photo 24 - Retaining structure at local slope failure area at University Avenue.

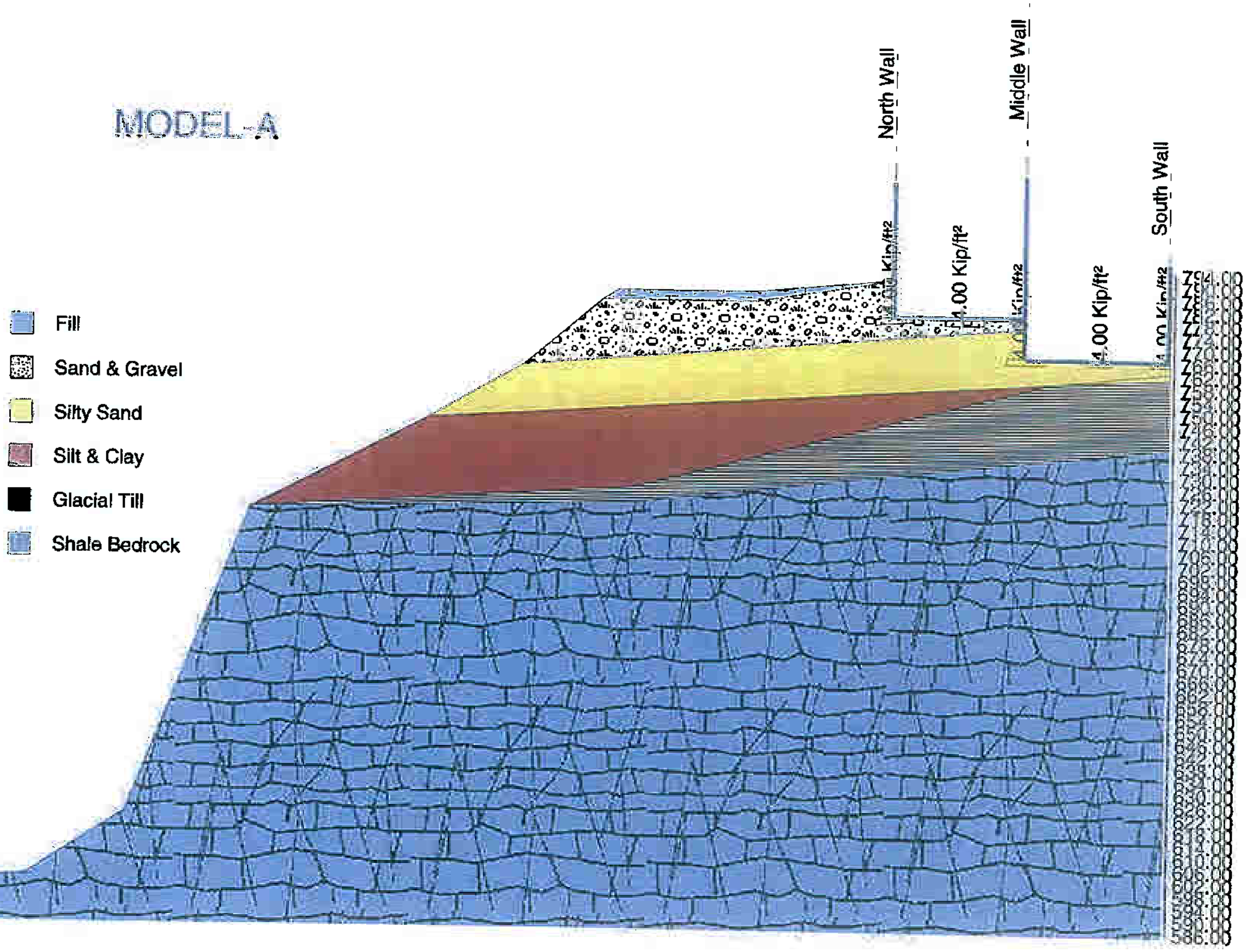
Photo 25 - Retaining structure at local slope failure area at University Avenue.
]

CME
Associates, Inc.

Study and Report for Stability of Earth Slopes North of University Avenue between Foundry and Johnson Art Museum
Cornell University
Ithaca, New York
CME Report No.: 26055B-01-0108

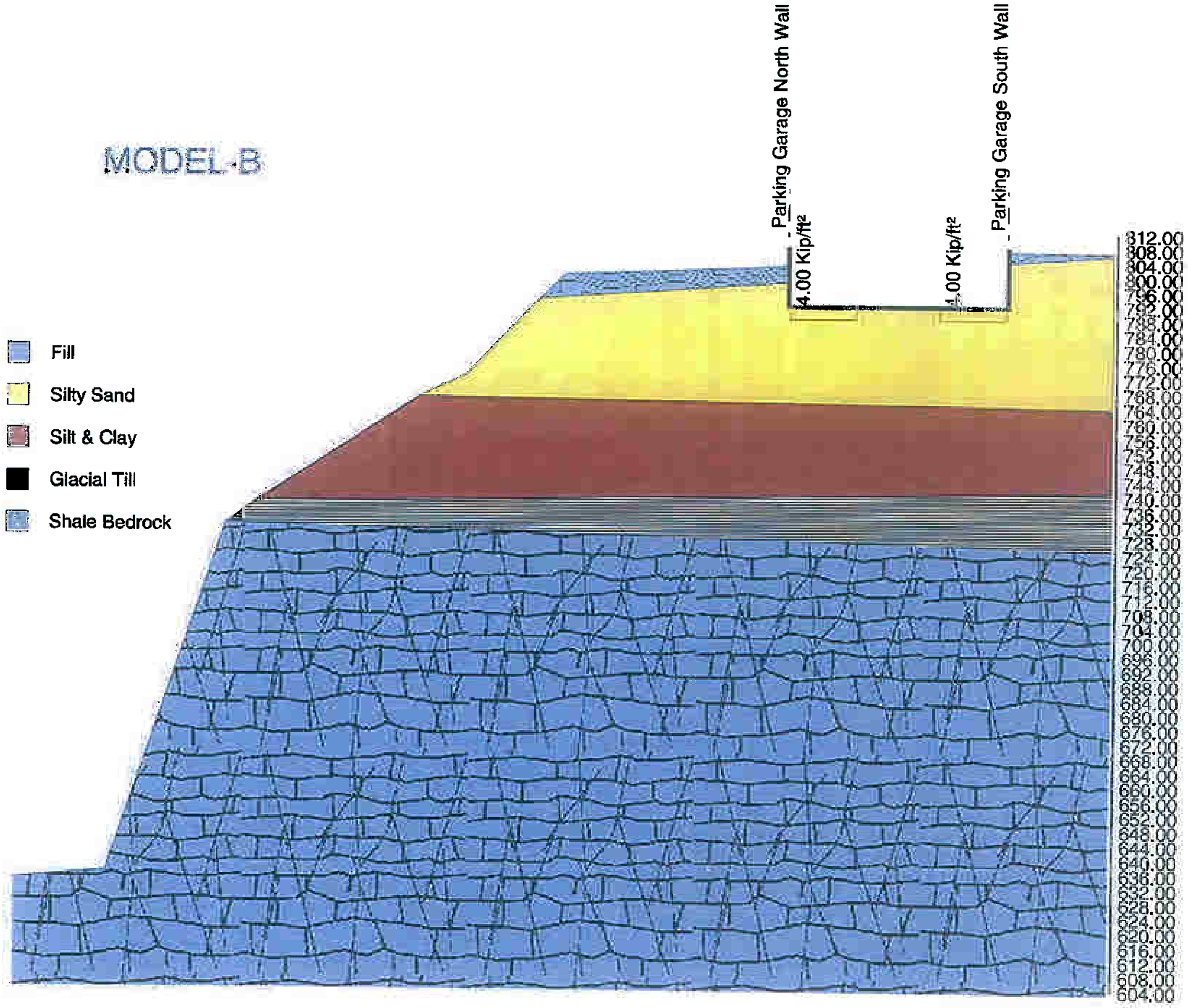
APPENDIX - G

MODEL A

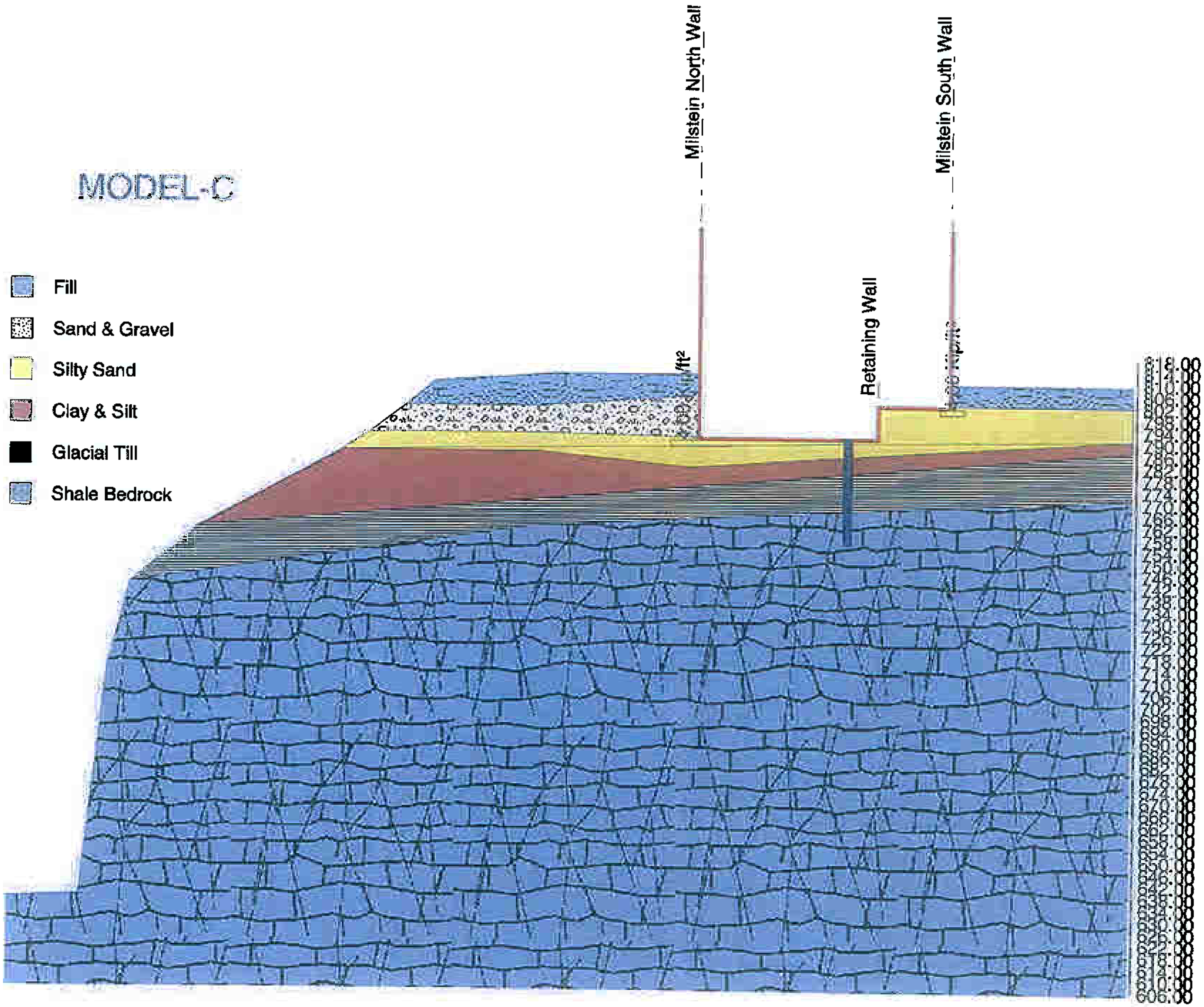


Fill
Sand & Gravel
Silty Sand
Silt & Clay
Glacial Till
Shale Bedrock
North Wall
Middle Wall
South Wall
Kip/ft²
4.00 Kip/ft²
Kip/ft²
4.00 Kip/ft²
4.00 Kip/ft²
794.00
586.00

MODEL-B


Fill
Silty Sand
Silt & Clay
Glacial Till
Shale Bedrock
Parking Garage North Wall
Parking Garage South Wall
4.00 Kip/ft²
4.00 Kip/ft²
812.00
808.00
804.00
800.00
796.00
792.00
788.00
784.00
780.00
776.00
772.00
768.00
764.00
760.00
756.00
752.00
748.00
744.00
740.00
736.00
732.00
728.00
724.00
720.00
716.00
712.00
708.00
704.00
700.00
696.00
692.00
688.00
684.00
680.00
676.00
672.00
668.00
664.00
660.00
656.00
652.00
648.00
644.00
640.00
636.00
632.00
628.00
624.00
620.00
616.00
612.00
608.00
604.00

MODEL-C


Fill
Sand & Gravel
Silty Sand
Clay & Silt
Glacial Till
Shale Bedrock
Milstein North Wall
Milstein South Wall
Retaining Wall
4.68 Kip/ft²
Kip/ft²
818.00
814.00
810.00
806.00
802.00
798.00
794.00
790.00
786.00
782.00
778.00
774.00
770.00
766.00
762.00
758.00
754.00
750.00
746.00
742.00
738.00
734.00
730.00
726.00
722.00
718.00
714.00
710.00
706.00
702.00
698.00
694.00
690.00
686.00
682.00
678.00
674.00
670.00
666.00
662.00
658.00
654.00
650.00
646.00
642.00
638.00
634.00
630.00
626.00
622.00
618.00
614.00
610.00
606.00

CME
Associates, Inc.

Study and Report for Stability of Earth Slopes North of University Avenue between Foundry and Johnson Art Museum
Cornell University
Ithaca, New York
CME Report No.: 26055B-01-0108

APPENDIX - H

Factor of Safety (FOS) against Slope Failure

Slope failures occur when a body of soil mass on a slope moves downward under the influence of gravity. Slope stability analysis involve comparison between forces, moments, or stresses tending to cause instability of a soil mass (bound by slope surface and an assumed slip plane), and those that resist instability. FOS against slope failure is defined as the ratio of resisting moment to driving moment. Resisting moment calculation takes into account of the available shear resistance along the slip plane and frictional resistance along slip plane resulting from the weight of the resisting soil mass, if present. Driving moment calculation takes into account of the frictional force resulting from the weight of the driving soil mass plus the structures near top of slope, within the slip plane footprint, if present. Please refer to Figure A for details.

FOS calculations are repeated for various assumed realistic slip planes until the critical slip plane, which has the lowest FOS, is located. FOS corresponding to the critical slip plane is the minimum FOS for the analyzed slope.

Global Slope Failure

Global Slope Failure is a term designated for a slope failure mode where the soil mass slides along a deep-seated failure plane, as shown in Figure A.

The resisting moment for factor of safety calculation for a Global Slope Failure will take into account of the available shear resistance along the slip plane plus the frictional resistance along slope plane resulting from the resisting soil mass, and the driving moment calculation will take into account of the driving force along the slip plane resulting from the driving soil mass plus the weight of the structures near top of slope, within the failure plane.

Local Slope Failure (Surface Sloughing)

Local Slope Failure is a term designated for a failure mode where a surficial (shallow) portion of the slope moves downward, as shown in Figure A. Local Slope Failure is considered a maintenance problem, since it usually does not affect the overall stability of the slope. However, if Local Slope Failures are not satisfactorily repaired, they can become progressively larger and will become a threat to the stability of the slope.

The resisting moment for factor of safety calculation for a Local Slope Failure will take into account of the available shear resistance along the slip plane only, and the driving moment calculation will take into account of the driving force along the slip plane resulting from the driving soil mass only.

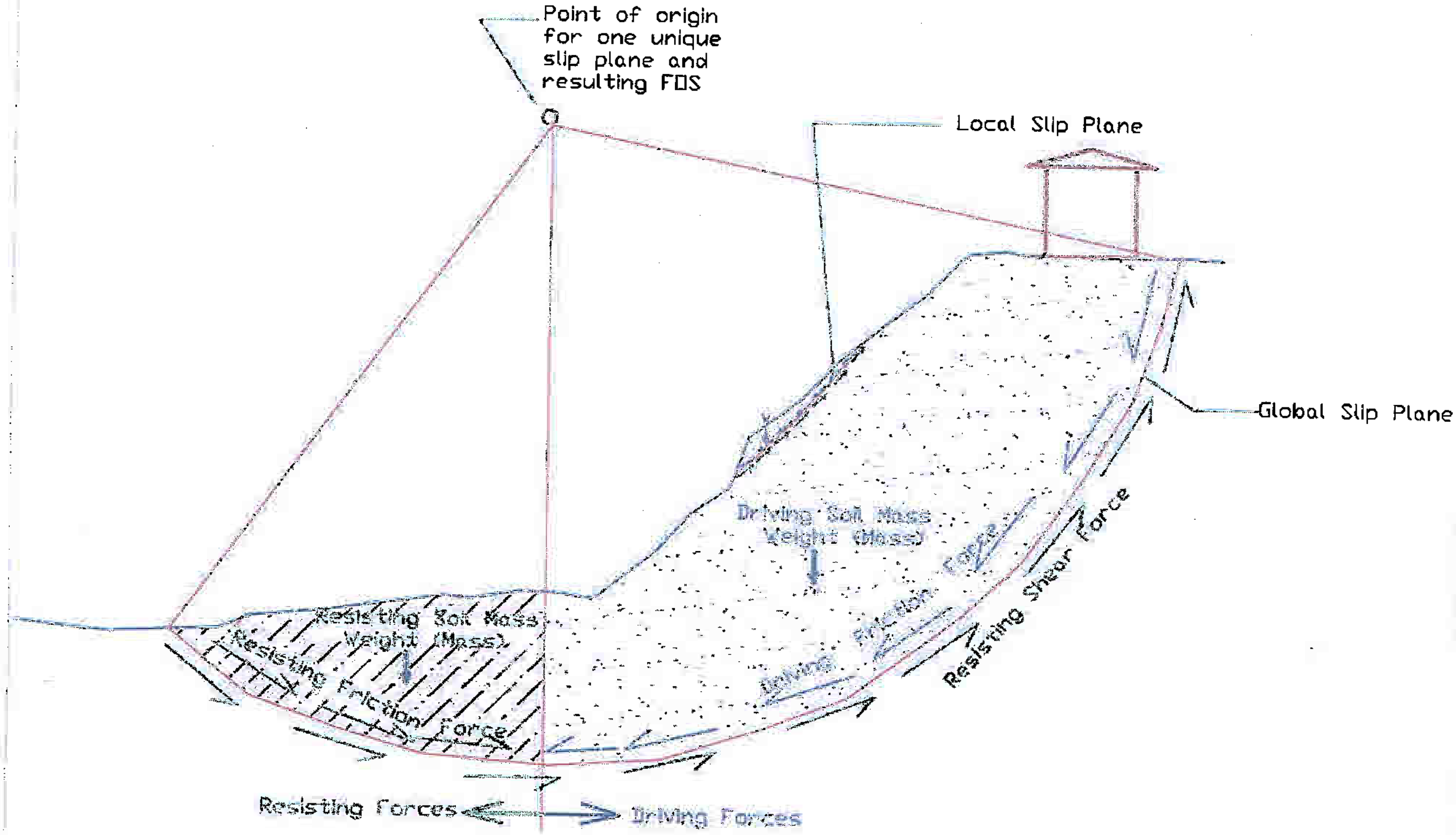


Figure A

No Scale

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CME
Associates, Inc.

P.O. Box 696
Central Square, New York 13036
(315) 668-0242
(315) 668-0256 (Fax)

www.cmeassociates.com

January 28, 2008

Desman Associates
49 West 37th Street
New York, New York 10018

Attn: Mr. David Palmer

Re: **Slope Stability Study & Report**
CAPG – University Avenue Reconstruction
CME Report No. 26055B-03-0108

Dear Gentlemen:

CME Associates, Inc. (CME) has approximately located the undercut (outcropping) bedrock face within the Fall Creek Gorge Study Limits, and graphically projected upgradient these limits of undercut. This service (task) is provided pursuant to Desman's oral acceptance of CME Proposal/Agreement No. 05.2721R(3) on January 21, 2008, given as Task Item 4.

Using the topography given on Slope Stabilization Options 5 and 6, Dwg. No. L103 (for 7023.TW.Schematic Design), CME plotted the approximate Limits of the undercut as observed during site reconnaissance in September 2007. CME estimates the outcrop to extend into the creek about 5 feet to 15 feet. CME projected these limits upgradient, roughly perpendicular to the topographic contours.

A sketch is attached which shows the following information:

- ✓ Approximate Undercut Rock Face
- ✓ Westerly Upgradient Extension
- ✓ Easterly Upgradient Extension
- ✓ Approximate Top of Slope
- ✓ 5 Foot Line (measured from Top of Slope)
- ✓ 15 Foot Line (measured from Top of Slope)

Feel free to contact us if there are any questions regarding this report.

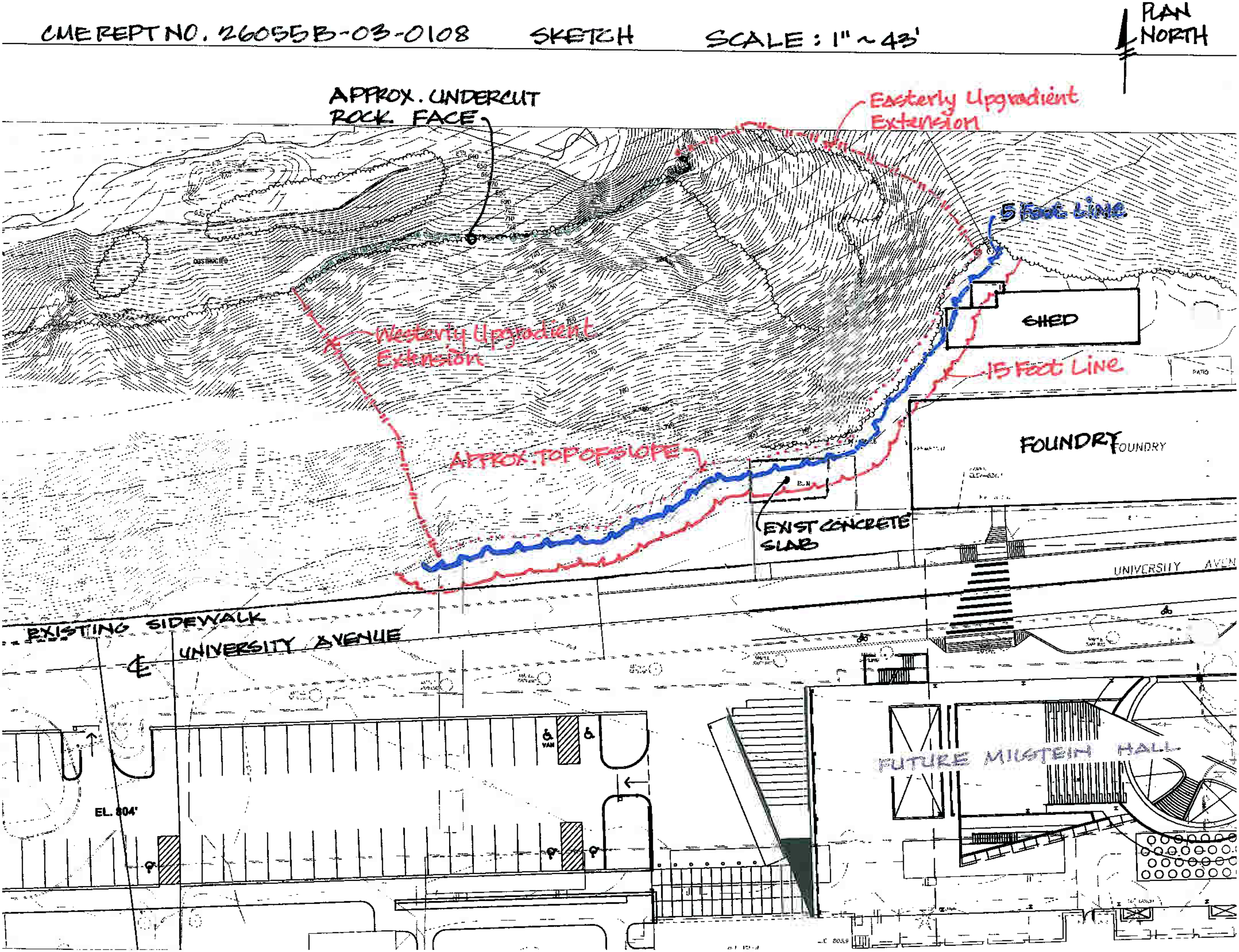
Respectfully Submitted,
CME Associates, Inc.

Marcus Rotundo

Marcus A. Rotundo, P.E.

MAR/jll
Attachment: Sketch (1 of 1 page)

CME REPT NO. 26055B-03-0108 SKETCH SCALE: 1" ~ 43'



APPENDIX B: Stormwater SWPPP

T.G. Miller, P.C.

DRAFT
STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

for

CONSTRUCTION ACTIVITIES

at

CORNELL UNIVERSITY
MILSTEIN HALL AND CENTRAL AVENUE PARKING GARAGE
Central Avenue, University Avenue and East Avenue
City of Ithaca, Tompkins County, New York

Prepared for:
Cornell University
Ithaca, NY 14853

Prepared by:
T.G. Miller, P.C.
203 North Aurora Street
Ithaca, New York 14850
Telephone: (607)-272-6477
Fax: (607)-273-6322

June 2008

Table of Contents

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

MS4 Stormwater Pollution Prevention Plan (SWPPP) Acceptance Form

for

Construction Activities Seeking Authorization Under SPDES General Permit GP-0-08-001

(NOTE: Attach Completed Form to Notice Of Intent and Submit to Address Above)

Name of MS4: City of Ithaca

MS4 Permit Identification Number: NYR 20A ___ ___ ___

I. Project Owner/Operator Information

1. Owner/Operator Name: Cornell University

2. Street Address: Humphreys Service Building

3. City/State/Zip: Ithaca, NY 14853

II. Project Site Information

4. Project/Site Name: Milstein Hall / Central Avenue Parking Garage

5. Street Address: University Avenue

6. City/State/Zip: Ithaca, NY 14853

III. Stormwater Pollution Prevention Plan (SWPPP) Review and Acceptance Information

7. SWPPP Reviewed by:

7a. Title/Position: Stormwater Management Officer

8. Date Final SWPPP Reviewed and Accepted:

IV. Certification Statement - MS4 Official (principal executive officer or ranking elected official) or Duly Authorized Representative

I hereby certify that the final Stormwater Pollution Prevention Plan (SWPPP) for the construction project identified in question 4 has been reviewed and determined to be in conformance with the requirements in the SPDES General Permit For Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4s). Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the MS4 general permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:

Title/Position:

Signature: Date:

3358554733

NOTICE OF INTENT

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

NYR ☐☐☐☐☐☐
(for DEC use only)

Stormwater Discharges Associated with Construction Activity Under State Pollutant Discharge Elimination System (SPDES) General Permit # GP-0-08-001

All sections must be completed unless otherwise noted. Failure to complete all items may result in this form being returned to you, thereby delaying your coverage under this General Permit. Applicants must read and understand the conditions of the permit and prepare a Stormwater Pollution Prevention Plan prior to submitting this NOI. Applicants are responsible for identifying and obtaining other DEC permits that may be required.

-IMPORTANT-

RETURN THIS FORM TO THE ADDRESS ABOVE

OWNER/OPERATOR MUST SIGN FORM

Owner/Operator Information

Owner/Operator (Company Name/Private Owner Name/Municipality Name)
Cornell University

Owner/Operator Contact Person Last Name (NOT CONSULTANT)
Kiefer

Owner/Operator Contact Person First Name
John

Owner/Operator Mailing Address
Humphreys Service Building

City
Ithaca

State
NY

Zip
14853 -

Phone (Owner/Operator)
607 - 255 - 6633

Fax (Owner/Operator)
 - -

Email (Owner/Operator)
jak14@cornell.edu

FED TAX ID
 - (not required for individuals)

Project Site Information

Project/Site Name
Milstein Hall/Central Avenue Parking

Street Address (NOT P.O. BOX)
University Avenue

Side of Street
○ **North** ● **South** ○ **East** ○ **West**

City/Town/Village (THAT ISSUES BUILDING PERMIT)
City of Ithaca

State
NY

Zip
14850-

County
Tompkins

DEC Region
7

Name of Nearest Cross Street
East Avenue

Distance to Nearest Cross Street (Feet)
0

Project In Relation to Cross Street
○ **North** ○ **South** ○ **East** ● **West**

Tax Map Numbers
Section-Block-Parcel
30-1-1.2

Tax Map Numbers

1. Provide the Geographic Coordinates for the project site in NYTM Units. To do this you **must** go to the NYSDEC Stormwater Interactive Map on the DEC website at:

www.dec.ny.gov/imsmaps/stormwater/viewer.htm

Zoom into your Project Location such that you can accurately click on the centroid of your site. Once you have located your project site go to the dropdown menu on the left and choose "Get Coordinates". Click on the center of your site and a small window containing the X, Y coordinates in UTM will pop up. Transcribe these coordinates into the boxes below. For problems with the interactive map use the help function.

X Coordinates (Easting)	**Y Coordinates (Northing)**
377960	4700950

2. What is the nature of this construction project?

○ **New Construction**

○ **Redevelopment with increase in imperviousness**

● **Redevelopment with no increase in imperviousness**

3. Select the predominant land use for both pre and post development conditions.
SELECT ONLY ONE CHOICE FOR EACH

Pre-Development Existing Land Use

○ FOREST
○ PASTURE/OPEN LAND
○ CULTIVATED LAND
○ SINGLE FAMILY HOME
○ SINGLE FAMILY SUBDIVISION
○ TOWN HOME RESIDENTIAL
○ MULTIFAMILY RESIDENTIAL
● INSTITUTIONAL/SCHOOL
○ INDUSTRIAL
○ COMMERCIAL
○ ROAD/HIGHWAY
○ RECREATIONAL/SPORTS FIELD
○ BIKE PATH/TRAIL
○ LINEAR UTILITY
○ PARKING LOT
○ OTHER

Post-Development Future Land Use

○ SINGLE FAMILY HOME
○ SINGLE FAMILY SUBDIVISION — Number of Lots
○ TOWN HOME RESIDENTIAL
○ MULTIFAMILY RESIDENTIAL
● INSTITUTIONAL/SCHOOL
○ INDUSTRIAL
○ COMMERCIAL
○ MUNICIPAL
○ ROAD/HIGHWAY
○ RECREATIONAL/SPORTS FIELD
○ BIKE PATH/TRAIL
○ LINEAR UTILITY (water, sewer, gas, etc.)
○ PARKING LOT
○ CLEARING/GRADING ONLY
○ DEMOLITION, NO REDEVELOPMENT
○ OTHER

4. Will future use of this site be an agricultural property as defined by the NYS Agriculture and Markets Law ? ○ **Yes** ● **No**

5. Is this a project which does not require coverage under the General Permit (e.g. Project done under an Individual SPDES Permit, or department approved remediation)? ○ **Yes** ● **No**

6. Is this property owned by a state authority, state agency or local government? ○ **Yes** ● **No**

7. In accordance with the larger common plan of development or sale, enter the total project site acreage, the acreage to be disturbed and the future impervious area (acreage) within the disturbed area. Round to the nearest tenth of an acre.

Total Site Acreage	**Acreage To Be Disturbed**	**Existing Impervious Area Within Disturbed**	**Future Impervious Area Within Disturbed**
.	3.5	2.1	2.1

8. Do you plan to disturb more than 5 acres of soil at any one time? ○ **Yes** ● **No**

9. Indicate the percentage of each Hydrologic Soil Group(HSG) at the site.

A	**B**	**C**	**D**
%	%	100 %	%

10. Is this a phased project? ● **Yes** ○ **No**

11. Enter the planned start and end dates of the disturbance activities.

Start Date 12/01/2008 - **End Date** 09/01/2011

12. Identify the nearest, natural, surface waterbody(ies) to which construction site runoff will discharge.

Name
Fall Creek

12a. Type of waterbody identified in Question 12?

○ Wetland / State Jurisdiction On Site (Answer 12b)
○ Wetland / State Jurisdiction Off Site
○ Wetland / Federal Jurisdiction On Site (Answer 12b)
○ Wetland / Federal Jurisdiction Off Site
● Stream / Creek On Site
○ Stream / Creek Off Site
○ River On Site
○ River Off Site
○ Lake On Site
○ Lake Off Site
○ Other Type On Site
○ Other Type Off Site

12b. How was the wetland identified?

○ Regulatory Map
○ Delineated by Consultant
○ Delineated by Army Corps of Engineers
○ Other (identify)

13. Has the surface waterbody(ies) in question 12 been identified as a 303(d) segment in Appendix E of GP-0-08-001? ○ **Yes** ● **No**

14. Is this project located in one of the Watersheds identified in Appendix C of GP-0-08-001? ○ **Yes** ● **No**

15. Is the project located in one of the watershed areas associated with AA and AA-S classified waters? **If no, skip question 16.** ● **Yes** ○ **No**

16. Does this construction activity disturb land with no existing impervious cover and where the Soil Slope Phase is identified as an E or F on the USDA Soil Survey? ○ **Yes** ● **No**
If Yes, what is the acreage to be disturbed?
☐☐☐☐.☐

17. Will the project disturb soils within a State regulated wetland or the protected 100 foot adjacent area? ○ **Yes** ● **No**

18. Does the site runoff enter a separate storm sewer system (including roadside drains, swales, ditches, culverts, etc)? ● **Yes** ○ **No** ○ **Unknown**
(If No, skip question 19)

19. What is the name of the municipality/entity that owns the separate storm sewer system?
City of Ithaca

20. Does any runoff from the site enter a sewer classified as a Combined Sewer? ○ **Yes** ● **No** ○ **Unknown**

21. Has the required Erosion and Sediment Control component of the SWPPP been developed in conformance with the current NYS Standards and Specifications for Erosion and Sediment Control (aka Blue Book) ? ● **Yes** ○ **No**

22. Does this construction activity require the development of a SWPPP that includes Water Quality and Quantity Control components (Post-Construction Stormwater Management Practices) ● **Yes** ○ **No**
(If No, skip questions 23 and 27-35)

23. Have the Water Quality and Quantity Control components of the SWPPP been developed in comformance with the current NYS Stormwater Management Design Manual ? ● **Yes** ○ **No**

24. The Stormwater Pollution Prevention Plan (SWPPP) was prepared by:

● **Professional Engineer (P.E.)**
○ **Soil and Water Conservation District (SWCD)**
○ **Registered Landscape Architect (R.L.A)**
○ **Certified Professional in Erosion and Sediment Control (CPESC)**
○ **Owner/Operator**
○ **Other**

SWPPP Preparer
T.G. Miller, P.C.

Contact Name (Last, Space, First)
Santelli, Frank

Mailing Address
203 N. Aurora Street

City
Ithaca

State
NY

Zip
14850 -

Phone
607 - 272 - 6477

Fax
607 - 273 - 6322

Email
fls@tgmillerpc.com

SWPPP Preparer Certification

I hereby certify that the Stormwater Pollution Prevention Plan (SWPPP) for this project has been prepared in accordance with the terms and conditions of the GP-0-08-001. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of this permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

First Name
Frank

MI
L

Last Name
Santelli

Signature

Date
06 / 04 / 2008

25. Has a construction sequence schedule for the planned management practices been prepared? ● **Yes** ○ **No**

26. Select **all** of the erosion and sediment control practices that will be employed on the project site:

Temporary Structural

- ○ **Check Dams**
- ○ **Construction Road Stabilization**
- ○ **Dust Control**
- ○ **Earth Dike**
- ○ **Level Spreader**
- ○ **Perimeter Dike/Swale**
- ○ **Pipe Slope Drain**
- ○ **Portable Sediment Tank**
- ○ **Rock Dam**
- ● **Sediment Basin**
- ● **Sediment Traps**
- ● **Silt Fence**
- ● **Stabilized Construction Entrance**
- ● **Storm Drain Inlet Protection**
- ○ **Straw/Hay Bale Dike**
- ○ **Temporary Access Waterway Crossing**
- ○ **Temporary Stormdrain Diversion**
- ○ **Temporary Swale**
- ○ **Turbidity Curtain**
- ○ **Water bars**

Biotechnical

- ○ **Brush Matting**
- ○ **Wattling**

Vegetative Measures

- ○ **Brush Matting**
- ○ **Dune Stabilization**
- ○ **Grassed Waterway**
- ● **Mulching**
- ○ **Protecting Vegetation**
- ○ **Recreation Area Improvement**
- ● **Seeding**
- ○ **Sodding**
- ○ **Straw/Hay Bale Dike**
- ○ **Streambank Protection**
- ○ **Temporary Swale**
- ● **Topsoiling**
- ○ **Vegetating Waterways**

Permanent Structural

- ○ **Debris Basin**
- ○ **Diversion**
- ○ **Grade Stabilization Structure**
- ● **Land Grading**
- ○ **Lined Waterway (Rock)**
- ○ **Paved Channel (Concrete)**
- ○ **Paved Flume**
- ● **Retaining Wall**
- ○ **Riprap Slope Protection**
- ○ **Rock Outlet Protection**
- ○ **Streambank Protection**

Other

Erosion control blanket

Water Quality and Quantity Control

Important: **Completion of Questions 27-35 is not required if response to Question 22 is No.**

Post-Construction Stormwater Management Practices

27. Indicate **all** Stormwater Management Practice(s) that will be installed/constructed on this site:

Ponds
- ○ **Micropool Extended Detention (P-1)**
- ○ **Wet Pond (P-2)**
- ○ **Wet Extended Detention (P-3)**
- ○ **Multiple Pond System (P-4)**
- ○ **Pocket Pond (P-5)**

Filtering
- ○ **Surface Sand Filter (F-1)**
- ● **Underground Sand Filter (F-2)**
- ○ **Perimeter Sand Filter (F-3)**
- ○ **Organic Filter (F-4)**
- ○ **Bioretention (F-5)**
- ○ **Other** ______________

Alternative Practice
- ○ **Rain Garden**
- ○ **Cistern**
- ● **Green Roof**
- ○ **Stormwater Planters**
- ○ **Permeable Paving (Modular Block)**

Wetlands
- ○ **Shallow Wetland (W-1)**
- ○ **Extended Detention Wetland (W-2)**
- ○ **Pond/Wetland System (W-3)**
- ○ **Pocket Wetland (W-4)**

Infiltration
- ○ **Infiltration Trench (I-1)**
- ○ **Infiltration Basin (I-2)**
- ○ **Dry Well (I-3)**
- ○ **Underground Infiltration System**

Open Channels
- ○ **Dry Swale (O-1)**
- ○ **Wet Swale (O-2)**

Verified Proprietary Practice
- ○ **Hydrodynamic**
- ○ **Wet Vault**
- ○ **Media Filter**

28. Describe other stormwater management practices not listed above or explain any deviations from the technical standards.

29. Has a long term Operation and Maintenance Plan for the post-construction stormwater management practice(s) been developed? ● **Yes** ○ **No**

If Yes, Identify the entity responsible for the long term Operation and Maintenance

Cornell University

30. Provide the total water quality volume required and the total provided for the site.

WQv Required	**WQv Provided**
0.033 **acre-feet**	0.043 **acre-feet**

31. Provide the following Unified Stormwater Sizing Criteria for the site.

Total Channel Protection Storage Volume (CPv) - Extended detention of post-developed 1 year, 24 hour storm event

CPv Required	**CPv Provided**
0.0 **acre-feet**	0.0 **acre-feet**

31a. The need to provide for channel protection has been waived because:

● **Site discharges directly to fourth order stream or larger**

Total Overbank Flood Control Criteria (Qp) - Peak discharge rate for the 10 year storm

Pre-Development	**Post-development**
16.6 **CFS**	16.2 **CFS**

Total Extreme Flood Control Criteria (Qf) - Peak discharge rate for the 100 year storm

Pre-Development	**Post-development**
24.7 **CFS**	24.2 **CFS**

31b. The need to provide for flood control has been waived because:

● **Site discharges directly to fourth order stream or larger**

○ **Downstream analysis reveals that flood control is not required**

IMPORTANT: For questions 31 and 32, impervious area should be calculated considering the project site and all offsite areas that drain to the post-construction stormwater management practice(s). (Total Drainage Area = Project Site + Offsite areas)

32. Pre-Construction Impervious Area - As a percent of the Total Drainage Area enter the percentage of the existing impervious areas before construction begins. 61 %

33. Post-Construction Impervious Area - As a percent of the Total Drainage Area, enter the percentage of the future impervious areas that will be created/remain on the site after completion of construction. 59 %

34. Indicate the total number of post-construction stormwater management practices to be installed/constructed. 02

35. Provide the total number of stormwater discharge points from the site. (include discharges to either surface waters or to separate storm sewer systems) 03

1912554737

36. Identify other DEC permits that are required for this project.

DEC Permits

○ Air Pollution Control
○ Coastal Erosion
○ Hazardous Waste
○ Long Island Wells
○ Mined Land Reclamation
○ Other SPDES
○ Solid Waste
○ None
○ Other

○ Navigable Waters Protection / Article 15
○ Water Quality Certificate
○ Dam Safety
○ Water Supply
○ Freshwater Wetlands/Article 24
○ Tidal Wetlands
○ Wild, Scenic and Recreational Rivers
○ Stream Bed or Bank Protection / Article 15

37. Does this project require a US Army Corps of Engineers Wetland Permit?
If Yes, Indicate Size of Impact. .
○ **Yes** ● **No**

38. Is this project subject to the requirements of a regulated, traditional land use control MS4?
(If No, skip question 39)
● **Yes** ○ **No**

39. Has the "MS4 SWPPP Acceptance" form been signed by the principal executive officer or ranking elected official and submitted along with this NOI?
● **Yes** ○ **No**

40. If this NOI is being submitted for the purpose of continuing coverage under a general permit for stormwater runoff from construction activities, please indicate the former SPDES number assigned. NYR

Owner/Operator Certification

I have read or been advised of the permit conditions and believe that I understand them. I also understand that, under the terms of the permit, there may be reporting requirements. I hereby certify that this document and the corresponding documents were prepared under my direction or supervision. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further understand that coverage under the general permit will be identified in the acknowledgment that I will receive as a result of submitting this NOI and can be as long as sixty (60) business days as provided for in the general permit. I also understand that, by submitting this NOI, I am acknowledging that the SWPPP has been developed and will be implemented as the first element of construction, and agreeing to comply with all the terms and conditions of the general permit for which this NOI is being submitted.

Print First Name John

MI A

Print Last Name Kiefer

Owner/Operator Signature

Date / /

I. SCOPE

A. **SPDES GENERAL PERMITS FOR STORMWATER DISCHARGE FROM CONSTRUCTION SITES:** Regulations promulgated by the NYSDEC are applicable to the discharge of storm water from construction activities on sites where more than 1 acre of soil is disturbed. One of the ways to comply with these regulations for affected sites is to request coverage under the General Permit for Construction Activities (GP-0-08-001) from the state of New York. In order to use the General Permit, a Notice of Intent (NOI) form must be completed and received by NYSDEC 5 business days prior to any earth-disturbing activities and a Stormwater Pollution Prevention Plan (SWPPP) for the site must be prepared and followed during the construction activities. In certain areas of the State, where the local municipality has been designated as a *regulated, traditional land use control MS4* (municipal separate storm sewer system), the SWPPP must first be approved by local MS4. Upon approval, the MS4 will complete an MS4 SWPPP Acceptance Form, which is submitted along with the NOI to the NYSDEC.

B. **REGARDING THE GENERAL PERMIT:** The Contractor shall manage the discharge of stormwater from the site in accordance with the conditions of the NYSDEC General Permit for Construction Activities and the following provisions of this Program. The Contractor shall be responsible for conducting the stormwater management practices in accordance with the permit. The Owner shall be responsible for providing a Qualified Professional (a person knowledgeable in the principles and practices of erosion and sediment controls, such as a licensed professional engineer, Certified Professional in Erosion and Sediment Control (CPESC) or soil scientist) to conduct the inspections required by the SWPPP. The Contractor shall be responsible for any enforcement action taken or imposed by federal, state, or local agencies, including the cost of fines, construction delays, and remedial actions resulting from the Contractor’s failure to comply with the permit provisions. It shall be the responsibility of the Contractor to make any changes to the SWPPP necessary when the Contractor or any of his subcontractors elects to use borrow or fill or material storage sites, either contiguous to or remote from the construction site, when such sites are used solely for this construction site. Such sites are considered to be part of the construction site covered by the permit and this SWPPP. Off-site borrow, fill, or material storage sites which are used for multiple construction projects are not subject to this requirement, unless specifically required by state or local jurisdictional entity regulations. The Contractor should consider this requirement in negotiating with earthwork subcontractors, since the choice of an off-site borrow, fill, or material storage site may impact their duty to implement, make changes to, and perform inspections required by the SWPPP for the site.

C. **MS4 SWPPP ACCEPTANCE FORM:** The SWPPP and NOI have been reviewed and approved by the *regulated, traditional land use control MS4,* which in this case is the City of Ithaca (MS4 No. NYR20A-_ _ _). A copy of the MS4 SWPPP Acceptance Form, executed by the City has been submitted by the Operator to the NYSDEC along with the NOI.

D. **NOTICE OF INTENT:** The Operator has petitioned the NYSDEC for the stormwater discharges during construction at this site to be covered by the SPDES General Permit for Construction Activity for the State of New York. A Notice of Intent (NOI) for the project to be covered under the general permit has been filed by the Operator. The permit identification number for this project is NYR_ _ _ _ _ _ (to be entered once received). The Operator will require the Contractor to be a co-permittee.

E. **CONTRACTOR NOTIFICATION**: The **Operator’s Qualified Professional** will notify the Contractor’s Project Manager/Superintendent of his responsibility for implementation of the Erosion Sediment and Control Plan and SWPPP. The Operator’s Qualified Professional will be available to answer questions and provide any additional information needed by the Contractor as may be required for implementation of the SWPPP. The Contractor shall maintain the project SWPPP Ledger.

F. **REQUIREMENTS FOR THE CONTRACTOR AND SUBCONTRACTOR:** The *SWPPP Ledger* shall provide a “Contractor’s Certification Log” **(Form 1)**, identifying the Company Name, Business Address and Telephone Number along with the Responsible Person for the Contractor and all subcontractors’ who will implement the measures identified in the SWPPP. The entities identified on **Form 1** shall sign a “Contractor’s Certification” **(Form 2)**, verifying they have been instructed and fully understand the requirements of the NYSDEC and SWPPP. **This certification must be signed, by a fully qualified individual on behalf of each entity, prior to the Beginning of any Construction Activities and shall be filed in the projects *SWPPP Ledger.***

G. **STORMWATER POLLUTION PREVENTION PROGRAM LOCATION REQUIREMENTS:** The *SWPPP Ledger* is meant to be a working document that shall be maintained at the Project site at all times throughout the project, shall be readily available upon request by the Operator’s personnel or NYSDEC or any other agency with regulatory authority over stormwater issues, and shall be kept on-site until the site complies with the Final Stabilization section of this document.

H. **SWPPP LEDGER:** The SWPPP Ledger shall be a 3-ring Binder, tabbed and indexed for the following sections:

- **Table of Contents**
- **MS4 SWPPP Acceptance Form**
- **Notice of Intent**
- **SWPPP Narrative**
- **Contractor’s Certifications (Forms 1 and 2)**
- **Inspections (Form 3)**
- **Modification Reports (Form 4)**
- **Project Rainfall Log (Form 5)**
- **Record of Stabilization and Construction Activities (Form 6)**

The Operator’s Qualified Professional must review and evaluate for compliance the *SWPPP Ledger* at each Project Review. All Inspection and Maintenance Forms must be initialed by the Operator’s Qualified Professional at this review and be submitted with the Contractor’s Monthly Application for Payment. The approval of the Contractor’s Application for Payment will be withheld until the *SWPPP Ledger* is deemed in compliance and all SWPPP Inspection and Maintenance Forms and have been submitted to the satisfaction of the Operator.

I. **INSPECTIONS AND RECORD KEEPING:** Inspections will be completed by the Operator’s Qualified Professional at least weekly and within 24 hours following a rainfall event exceeding 0.5-inch in precipitation and shall continue until the site complies with the Final Stabilization section of this document. Each inspection must be followed up by a report documenting the inspector’s findings and request the required maintenance and/or repair for the erosion and sedimentation control measures. It is imperative that the Contractor documents the Inspection and Maintenance of all erosion and sedimentation control measures as soon as possible after the inspection and/or maintenance is completed. These records are used to prove that the required inspection and maintenance were performed and shall be placed in the *SWPPP Ledger*. In addition to inspection and maintenance reports, records should be kept of the Construction Activities that occur on the site. The Operator shall retain copies of the SWPPP, all reports and data for a minimum of **five (5) years** after the project is complete in paper and electronic format. The following list identifies the **required** Inspection and Maintenance documentation that must be maintained by the Operator under this SWPPP.

- **Form 3 Inspection Report for SWPPP**
- **Form 4 Modification Report**
- **Form 5 Project Rainfall Log**

J. **SWPPP MODIFICATIONS:** The inspection report should also identify if any revisions to the SWPPP are warranted due to unexpected conditions. The SWPPP is meant to be a dynamic working guide that is to be kept current and amended whenever the design, construction, operation, or maintenance of the site changes in a way which significantly affects the potential for the discharge of pollutants or when the plan proves to be ineffective in eliminating or significantly minimizing pollutant discharges. Any such changes to the SWPPP must be made in writing on the "Requested Changes to the SWPPP" **(Form 4)** within 7 days of the date such modification or amendment is made. The Contractor's failure to monitor or report deficiencies to the Operator will result in the Contractor being liable for fines and construction delays resulting from any federal, state, or local agency enforcement action.

K. **PRECONSTRUCTION MEETING:** The Operator's Qualified Professional shall, during a pre-construction meeting, review the requirements of the Erosion and Sediment Control Plan and the written SWPPP with the Contractor, and any subcontractors who will be involved in the construction and/or maintenance of SWPPP measures. The Contractor shall be responsible to ensure that a qualified representative of all involved subcontractors attends the pre-construction meeting. The meeting should inform attendees on the topics of:

- The Location and type of Control Measures
- The Construction Requirements for the Control Measures
- Maintenance Procedures for each of the Control Measures
- Spill Prevention and Cleanup Measures
- Inspection and Maintenance Record Keeping Requirements

L. **FINAL STABILIZATION AND TERMINATION OF PERMIT COVERAGE:** A site can be considered finally stabilized when all soil disturbing activities have been completed and a uniform perennial vegetative cover with a density of 85% for the unpaved areas and areas not covered by permanent structures has been established or equivalent permanent stabilization measures have been established and the facility no longer discharges stormwater associated with construction activities and a final inspection is conducted by the Operator's Qualified Professional prior to filing the Notice of Termination (NOT) to certify that the site has undergone final stabilization. The NOT form can then be filed by the Operator with the NYSDEC. This filing terminates coverage under the General Permit and terminates the Contractor's responsibility to implement the SWPPP, but the requirements of the SWPPP, including periodic inspections, must be continued until the NOT is filed. Upon achieving this milestone, the Contractor shall also submit "Final Stabilization Certification/Termination Checklist" (Form 7). Final payment and/or the release of retainage will be withheld until all provisions of the SWPPP have been submitted, completed and accepted by the Operator.

II. SITE DESCRIPTION

A. PROJECT NAME AND LOCATION

Cornell University, Milstein Hall/Central Avenue Parking Garage
City of Ithaca, Tompkins County, New York 14850
X Coordinate: 377960
Y Coordinate: 4700950
Estimated area of site: >100 acres
Estimated area to be disturbed by construction activities: 3.48 acres

B. OPERATOR'S NAME AND ADDRESS

Cornell University
c/o Andrew L. Magre
Project Manager
Humphreys Service Building
Ithaca, NY 14853

C. DESCRIPTION

This SWPPP combines two contiguous projects on the Cornell University campus in the City of Ithaca, New York. The project site is located along University Avenue between Central Avenue and East Avenue, north of the Arts Quad and south of the Fall Creek gorge. The combined project is expected to disturb approximately 3.48 acres of land that drains directly to the Fall Creek gorge north of the site.

The Milstein Hall project proposes to construct a 59,000-square foot building as an addition to the existing buildings of the College of Architecture, Art and Planning. Located generally to the south of University Avenue, the upper plate of the building will be built over a plaza with a portion cantilevered over University Avenue. Site improvements will include relocation of the drive serving Lincoln Hall, reconstruction of this section of University Avenue with new bike lane and reconfiguration of pedestrian pathways. The building will displace a surface parking facility currently located on the site.

The Central Avenue Parking Garage (CAPG) project is located generally to the west of Milstein Hall and includes an at-grade parking lot to be accessed from University Avenue, and two floors of below-grade parking, which will be accessed from Central Avenue at the far west edge of site. Construction of the CAPG is expected to follow completion of Milstein Hall, except for the areas of the garage structure located adjacent and/or directly below Milstein Hall, which will be constructed by the Milstein Hall project. The garage facility will in general replace existing at-grade parking lots on the site. Associated site improvements will include pedestrian walks and other landscape improvements. No reconstruction work or other improvements are proposed for the section of University Avenue north of the CAPG.

D. EXISTING LAND COVER CONDITIONS AND HYDROLOGY

The project site is located within the Fall Creek watershed which extends as far as Cortland County to the west and which covers an area estimated to be greater than 22,000 acres. The site has been previously developed and is comprised of academic buildings, walkways, roadways, parking lots and landscaped areas. The site is on Made Soils, which are assumed to be Hydrologic Soil Group C. Within the limits of the proposed project the existing land cover conditions are summarized below:

LAND COVER	CURVE NUMBER	PRE-DEVELOPMENT (ACRE)
Impervious pavements and roofs	98	2.13
Lawn or landscaped	74	1.35
Composite/Total	**88.7 (89)**	**3.48**

E. FUTURE LAND COVER CONDITIONS AND HYDROLOGY

The objective of the stormwater management design is to reduce the site imperviousness below the existing hydrologic conditions on the site. This goal is accomplished primarily by using alternative (green) roofing surfaces on Milstein Hall. By reducing imperviousness, the volumes and rates of runoff can be reduced which is reflected in a lowering of the composite curve number for the site following development. Reducing site imperviousness is also proposed as part of the strategy for compliance with the required water quality control objectives. A summary of the post-development site conditions are as follows:

LAND COVER	CURVE NUMBER	POST-DEVELOPMENT (ACRE)
Impervious pavements	98	2.06
Lawn or landscaped	74	0.87
Green Roof	71	0.55
Composite/Total	**87.7 (88)**	**3.48**

F. RAINFALL INFORMATION

The site is in Tompkins County, which receives an average of 35 inches of rainfall annually with the highest amounts of rainfall received in the months of May-September.

G. RECEIVING WATERS

Runoff from the site is collected by the existing storm sewer system which has 3 separate outfalls to Fall Creek Gorge north of University Avenue. Fall Creek at this location is a 6th order stream per Tompkins County GIS data.

The easterly outfall, located east of the Foundry, generally serves the Milstein Hall site as well as a significant area of campus above. The middle of the three outfalls, located immediately west of the CAPG entrance on University Avenue, serves the existing parking lot north of the west wing and dome of Sibley Hall as well as portions of the Sibley Hall roof. The piping for this outfall has partially failed and is likely the cause of a recent slope failure north of University Avenue. Continued use of the middle outfall has the potential to further destabilize the slope at this location. The third outfall is located adjacent to the south approach to the pedestrian bridge over Fall Creek and serves the westerly area of the garage project site and a significant portion of University Avenue. The piping for this third outfall was recently reconstructed in conjunction with improvements to the bridge approach.

The easterly outfall will see reductions in the volumes and rates of runoff due to the proposed green roof and associated reduction in impervious cover on the site. Reconstruction of the middle outfall, which has failed, would be very difficult and could exasperate the potential for erosion or further slope failure. Use of the middle outfall will therefore be discontinued and the storm sewer pipe will be capped off at University Avenue as part of the CAPG project improvements. The catchment currently draining to the middle outfall will be combined with the adjacent catchment, which drains to the westerly outfall. The capacity of the westerly outfall is sufficient to drain the combined catchment.

III. CONTROLS

A. EROSION AND SEDIMENT CONTROLS

The Contractor will be responsible for implementing the following erosion control measures. The Contractor may designate these tasks to certain subcontractors as he sees fit, but the ultimate responsibility for implementing these controls and ensuring their proper functioning remains with the Contractor. The order of activities will be as follows:

1. Stabilization Practices
   Stabilization practices for this site include but are not limited to:
    a. Tarping or covering of material and spoil piles.
    b. Use of stabilization fabric for all slopes having a slope of 1V:3H or greater.
    c. Temporary seeding and mulching of exposed soils with conservation mixes.
    d. Permanent seeding using the hydromulching grass seeding technique.

2. Structural Practices
   Structural practices for this site include but are not limited to:
    a. Perimeter Protection using Silt Fences
    b. Stabilized Construction Entrances
    c. Inlet Protection
    d. Temporary Sediment Traps
    e. Storm Filter Bags

3. Sequence of Major Activities:

a. Demolish existing pavements, strip top soil and grade sedimentation basin where shown. Install temporary silt trap riser. Install either temporary outfall pipe to existing storm sewer system or permanent downstream storm pipe per utility plans downstream of trap. Establish temporary vegetation within sediment basin using conservation seed mix. Maintain sediment trap. Remove silt from the basins when 50% capacity is reached.
b. Install silt fencing in locations shown.
c. Install inlet protection on existing drainage inlet downstream of areas to be disturbed.
d. Begin surface demolition and install stabilized construction entrances where shown.
e. Complete surface demolition.
f. Install proposed storm sewer system and install inlet protection on new drainage inlets.
g. Begin building and pavement earthwork operations. Runoff from any exposed soils to be directed to silt fence or sedimentation basin. Provide temporary diversion swales as necessary. Discharge from dewatering operations associated with building excavation or utility work shall be to the sedimentation basin or sediment filter bag.
h. Complete grading, pavements and building work.
i. Install topsoil, seed, mulch and erosion control blanket where shown. Install plantings per landscape plans.
j. Flush silt and debris from all storm sewers. Remove silt from sediment basin. Remove temporary silt trap and piping. Fine grade and establish final vegetation and paving per plans.

B. WATER QUALITY CONTROLS

The water quality treatment strategy at this site includes a vegetated (green) roof on Milstein Hall and an underground sand filter practice to treat the surface parking level of the CAPG. These two measures provide sufficient treatment capacity with a combined reduction in site imperviousness to comply with the current NYSDEC standards for redevelopment as described in Chapter 9 of the New York State Design Manual.

The existing impervious roofs and pavements on the site cover approximately 92,770 s.f. The proposed 24,000-s.f. green roof on Milstein Hall will result in a net decrease in site imperviousness of approximately 2,900 s.f. or 3.1% of the existing impervious cover. The proposed sand filter for the CAPG will treat approximately 26,000 s.f. of paved parking and adjacent walkways or the equivalent of 28% of the existing impervious cover. In effect the combined measures provide “treatment” equivalent to 31% of the existing site impervious cover, which is greater than the 25% required by the standards.

1. Practice Sizing – Green Roof

The water quality volume is calculated with the following equation (DEC, 2003):

WQ_v = P*(0.05+0.009*I)*A / 12
Where:
P = 90% rainfall event (inches)
= 0.90 inches (Ithaca, NY)
I = Imperviousness (%)
A = Drainage Area (s.f.)

The 24,000 s.f. green roof is required to provide an equivalent water quality volume, where:
I = 100%
A = 24,000 s.f.
WQv = 0.90*(0.05+0.009*100)*24,000 / 12
= 1,620 c.f. (required)

The required water quality volume per square foot of roof area is therefore:
WQv = 1,620 c.f. / 24,000 s.f.
= 0.0675 c.f. (required per s.f. of roof)

According to the design manual, the water quality volume provided by the green roof can be estimated based on the volume of rainfall that can be instantaneously stored in the soil media, drainage layer and surface ponding, or:

WQv = Vsm + Vdl + Dp
Where:
Vsm = Volume in the soil media
= Depth of media * porosity
Vdl = Volume in the drainage layer
Dp = Depth of ponding

Based on the current green roof design, the proposed soil media has an average depth of 5 inches or 0.417 feet, and the porosity of the media is assumed to be 20%. The green roof drainage layer (Zinco Floradrain FD25-E) has a water retention capacity of 0.07 gallons/s.f. In addition, the system has a protective mat layer (Zinco Protection Mat SSM 45) that has a water retention capacity of 0.12 gallons /s.f. No appreciable ponding above the soil media is expected. The water quality volume provided is therefore:

WQv = (0.417 feet * 20%) + (0.07 + 0.12)gals/s.f. / 7.481 gals/c.f
= 0.109 c.f. per s.f. (provided)

Based on the calculations, the water quality provided by the green roof exceeds that required by more than 60%.

2. Practice Sizing – Underground Sand Filter
The underground sand filter will be sized to treat the runoff from the surface parking lot on the CAPG structure plus the walkway that runs along the south edge of the lot. The area to be treated is all impervious and covers approximately 26,000 s.f. based on the current schematic design (SD) documents. The required water quality volume to be treated is calculated as follows:

WQ_v = P*(0.05+0.009*I)*A / 12
Where:
P = 0.90 inches
I = 100%
A = 26,000 s.f.
Therefore:
WQv = 0.90*(0.05+0.009*100)*26,000 / 12
= 1,860 c.f. (required)

The treatment system will include a sedimentation tank to provide pretreatment of stormwater prior to the filter bed. The system will also be equipped with a flow splitter diversion structure to allow larger flows to bypass the pretreatment and filter bed. The required sedimentation basin area is based on the following equation from the design manual:

As = -(Qo / W) * Ln (1-E)
Where:
As = Basin area (s.f.)
E = Sediment trap efficiency
= 90%
W = Particle settling velocity (ft/sec)
= 0.0033 ft/sec (where Imperviousness > 75%)
Qo = Discharge rate from basin (cfs)
= WQv/24hrs/3600sec
= 1,860 / 24 / 3600
= 0.0215 cfs
Therefore:
As = -(0.0215 / 0.00330) * Ln (1 – 0.90)

= 15 s.f. (required)

The sand filter bed area will be sized based on the following equation:

Af = (WQv)*(df) / [(k)*(hf + df)*(tf)]
Where:
Af = Surface area of the filter bed (s.f.)
WQv = 1,860 c.f.
df = Filter bed depth (ft)
= 1.5 feet
k = Coefficient of permeability of filter media
= 3.5 ft/day (sand)
hf = Average height of water above filter bed (ft)
= 2.0 ft
tf = Design filter bed drain time (days)
= 1.67 days
Therefore:
Af = (1,860)*(2.0) / [(3.5)*(1.5+2.0)*(1.67)
= 182 s.f (required minimum)

In addition to the filter bed area requirement, the treatment system will be sized to temporarily hold at least 75% of the water quality volume prior to filtration.

Final design documents for the sand filter treatment system as well as the erosion and sediment control plan and details will be completed in conjunction with the CAPG project construction documents. The SWPPP will be amended with the addition of these design documents when completed and in advance of construction work on the CAPG portion of the site.

C. WATER QUANTITY CONTROLS

The proposed redevelopment of this area of the Cornell campus will reduce imperviousness and will result in a net decrease in the volume and rates of runoff from the site. No adverse impacts to flood conditions or channel erosion on the downstream receiving waters are expected. Inherent storage within the proposed sand filter treatment system, although not quantified, will also tend to reduce peak flows of runoff from the site. No other structural measures to control the rate or quantities of runoff are proposed. Since the receiving water, Fall Creek, is a 6th order stream, no additional controls for channel protection or flooding are required by the standards.

D. OTHER CONTROLS

1. Waste Disposal

All waste materials will be collected and stored in a securely lidded metal dumpster rented from a local waste management company which must be a solid waste management company licensed to do business in Tompkins County. The dumpster will comply with all local and state solid waste management regulations.

All trash and construction debris from the site will be deposited in the dumpster. The dumpster will be emptied a minimum of twice per week or more often if necessary, and the trash will be hauled to a landfill approved by New York State. No construction waste materials will be buried on site. All personnel will be instructed regarding the correct procedures for waste disposal. Notices stating these practices will be posted in the job site construction office trailer, and the job site superintendent will be responsible for seeing that these procedures are followed.

2. Sanitary Waste

All sanitary waste will be collected from the portable units a minimum of three times per week by a licensed portable facility provider in complete compliance with local and state regulations.

3. Off-Site Vehicle Tracking
   Stabilized construction exits will be provided to help reduce vehicle tracking of sediments. The paved streets adjacent to the site entrances will be inspected daily and cleaned with vacuum equipment as necessary to remove any excess mud, dirt, or rock tracked from the sites. Dump trucks hauling material from the construction sites will be covered with a tarpaulin. The job site superintendent will be responsible for seeing that these procedures are followed.

4. Hazardous Substances and Hazardous Waste

   a. All hazardous waste materials will be disposed of by the Contractor in the manner specified by local, state, and/or federal regulations and by the manufacturer of such products. Site personnel will be instructed in these practices by the job site superintendent, who will also be responsible for seeing that these practices are followed. Material Safety Data Sheets (MSDS's) for each substance with hazardous properties that is used on the job site will be obtained and used for the proper management of potential wastes that may result from these products. An MSDS will be posted in the immediate area where such product is stored and/or used and another copy of each MSDS will be maintained in the SWPPP file at the job site construction trailer office. Each employee who must handle a substance with hazardous properties will be instructed on the use of MSDS sheets and the specific information in the applicable MSDS for the product he/she is using, particularly regarding spill control techniques.

   b. Any spills of hazardous materials which are in quantities in excess of Reportable Quantities as defined by EPA regulations shall be immediately reported to the EPA National Response Center 1-800-424-8802.

   c. In order to minimize the potential for a spill of hazardous materials to come into contact with stormwater, the following steps will be implemented:

      i. All materials with hazardous properties (such as pesticides, petroleum products, fertilizers, detergents, construction chemicals, acids, paints, paint solvents, cleaning solvents, additives for soil stabilization, concrete curing compounds and additives, etc.) will be stored in a secure location, under cover, when not in use.

      ii. The minimum practical quantity of all such materials will be kept on the job site.

      iii. A spill control and containment kit (containing, for example, absorbent such as kitty litter or sawdust, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) will be provided at the storage site.

      iv. All of the product in a container will be used before the container is disposed of. All such containers will be triple-rinsed with water prior to disposal. The rinse water used in these containers will be disposed of in a manner in compliance with state and federal regulations and will not be allowed to mix with stormwater discharges.

      v. All products will be stored in and used from the original container with the original product label.

      vi. All products will be used in strict compliance with instructions on the product label.

      vii. The disposal of excess or used products will be in strict compliance with instructions on the product label.

5. Contaminated Soils

    a. Any contaminated soils (resulting from spills of materials with hazardous properties) which may result from construction activities will be contained and cleaned up immediately in accordance with the procedures given in the Spill Prevention Control and Countermeasures (SPCC) Plan and in accordance with applicable state and federal regulations.

    b. The job site superintendent will be responsible for seeing that these procedures are followed.

IV. COMPLIANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS

A. The Contractor will obtain copies of any and all local and state regulations which are applicable to stormwater management, erosion control, and pollution minimization at this job site and will comply fully with such regulations. The Contractor will submit written evidence of such compliance if requested by the Operator or any agent of a regulatory body. The Contractor will comply with all conditions of the NYSDEC General Permit for Construction Activities, including the conditions related to maintaining the SWPPP and evidence of compliance with the SWPPP at the job site and allowing regulatory personnel access to the job site and to records in order to determine compliance.

V. MAINTENANCE/INSPECTION PROCEDURES

A. Erosion and Sediment Control and Stabilization Measures Maintenance and Inspection Practices - The following inspection and maintenance practices will be used to maintain erosion and sediment controls and stabilization measures.

    1. All control measures will be inspected at least weekly and within 24 hours following a rainfall event exceeding 1/2-inch in precipitation.

    2. All measures will be maintained in good working order; if repairs are found to be necessary, they will be initiated within 24 hours of report.

    3. Built up sediment will be removed from silt fence when it has reached one-third the height of the silt fence.

    4. Silt fences will be inspected for proper toe-in depth, depth of sediment, tears, etc., to see if the fabric is securely attached to the fence posts, and to see that the fence posts are securely in the ground.

    5. Temporary and permanent seeding and all other stabilization measures will be inspected for bare spots, washouts, and healthy growth.

    6. The job site superintendent will be responsible for selecting and training the individuals who will be responsible for these maintenance and repair activities.

    7. Personnel selected for the maintenance responsibilities will receive training from the job site superintendent. They will be trained in all the maintenance practices necessary for keeping the erosion and sediment controls that are used onsite in good working order. They will also be trained in the completion of, initiation of actions required by, and the filing of the inspection forms. Documentation of this personnel training will be kept on site with the SWPPP.

    8. Disturbed areas and materials storage areas will be inspected for evidence of or potential for pollutants entering stormwater systems.

9. Report to NYSDEC within 24 hours any noncompliance with the SWPPP that will endanger public health or the environment. Follow up with a written report within 5 days of the noncompliance event.

B. Inspection and Maintenance Report Forms

Once installation of any required or optional erosion control device or measure has been implemented, weekly and within 24 hours following a rainfall event exceeding 1/2-inch in precipitation, inspections of each measure shall be performed by the Operator's Qualified Professional. The Inspection and Maintenance Reports found in this SWPPP shall be used by the inspector to inventory and report the condition of each measure to assist in maintaining the erosion and sediment control measures in good working order.

These report forms shall become an integral part of the SWPPP and shall be made readily accessible to governmental inspection officials, the Operator's Engineer, and the Operator for review upon request during visits to the project site. In addition, copies of the reports shall be provided to any of these persons, upon request, via mail or facsimile transmission. Inspection and maintenance report forms are to be maintained by the Operator for five years following the final stabilization of the site.

C. Other Record-Keeping Requirements

The Contractor shall keep the following records related to construction activities at the site:

- Dates when major grading activities occur and the areas which were graded
- Dates and details concerning the installation of structural controls
- Dates when construction activities cease in an area
- Dates when an area is stabilized, either temporarily or permanently
- Dates of rainfall and the amount of rainfall
- Dates and descriptions of the character and amount of any spills of hazardous materials
- Records of reports filed with regulatory agencies if reportable quantities of hazardous materials spilled

D. Post-Construction Maintenance

Cornell University will be responsible for maintaining all practices used on this site. Maintenance requirements will be as follows:

Green Roof

- Inspect the membrane and underdrain system at least quarterly
- Maintain rooftop vegetation as necessary, including fertilizing, weeding, replanting, and removing dead vegetation.
- Repair any damage to the membrane or to the edges of the green roof immediately.
- Ensure that the underdrain system is not clogged, and remove any leaves or other accumulated matter as necessary upon inspection.

Underground Sand Filter System

The system should be inspected every 6 months and after major storm events. The sedimentation basin should be pumped out and material disposed of when the depth of sediment exceeds 12 inches. Debris should be removed during each inspection. Oil or other floating contaminants should be removed and disposed of when observed. The water level in the sand filter bed should be monitored on a quarterly basin and after large storms for the first year of service. A log should be maintained for the observed water depths and rates of drawdown. Monitoring can be reduced to a semiannual basis following the first year of service.

The following is a revised version of a recommended inspection checklist adapted from Shaver and Bell, 1996, by the Center for Watershed Protection, Ellicott City, Maryland (www.stormwatercenter.com):

Inspection Item	Interval	Disposition
Debris Cleanout Inlets and outlets clear of debris? Filtration facility clear of debris?	Quarterly	Identify areas requiring cleanout and severity of buildup.
Filter Bed Chamber Evidence of filter bed surface clogging? Drainage area to facility clear of oil/grease sources? Sediment buildup less than 1 inches?	Semi-annual	Identify clogged filter bed, source area contributions, and actions required
Sedimentation Chamber Permanent pool wet? Evidence of leaking? Sediment buildup less than 12 inches?	Semi-annual	Identify leaking chamber and sediment level, specify actions required.
Structural Components Evidence of structure deterioration? Inlet grates, pipes, etc in good condition? Evidence of spalling or cracking of concrete?	Annual	Identify problems, specify actions required.
Outlets/Overflow Spillway Evidence of clogging of outlet pipe? Evidence of downstream erosion? Evidence of underdrain piping failure?	Annual	Identify problems, specify actions required.

SUMMARY OF EROSION AND SEDIMENT CONTROL AND STABILIZATION MEASURES MAINTENANCE/INSPECTION PROCEDURES

☐ All control measures will be inspected at least weekly and within 24 hours following a rainfall event exceeding 1/2-inch in precipitation.

☐ All measures will be maintained in good working order; if a repair is necessary, it will be initiated within 24 hours of report.

☐ Built-up sediment will be removed from silt fences when it has reached one-third the height of the fence.

☐ Silt fences will be inspected for depth of sediment, tears, to see if the fabric is securely attached to the fence posts, and to see that the fence posts are firmly in the ground.

☐ Temporary and permanent seeding and planting and other stabilization measures will be inspected for bare spots, washouts, and healthy growth.

☐ A maintenance inspection report will be made after each inspection. Copies of the report forms to be used are included in this SWPPP.

☐ The site job superintendent will select the individuals who will be responsible for inspections, maintenance and repair activities, and filling out the inspection and maintenance reports.

☐ Personnel selected for inspection and maintenance responsibilities will receive training from the site job superintendent. They will be trained in all the inspection and maintenance practices necessary for keeping the erosion and sediment controls used onsite in good working order.

☐ Disturbed areas and materials storage areas will be inspected for evidence of or potential for pollutants entering stormwater systems.

☐ Report to NYSDEC within 24 hours any noncompliance with the SWPPP that will endanger public health or the environment. Follow up with a written report within 5 days of the noncompliance event.

CONSTRUCTION/IMPLEMENTATION CHECKLIST

1. Maintain Records of Construction Activities, including:

    ☐ Dates when major grading activities occur

    ☐ Dates when construction activities temporarily cease on a portion of the site

    ☐ Dates when construction activities permanently cease on a portion of the site

    ☐ Dates when stabilization measures are initiated on the site

    ☐ Dates of rainfall and the amount of rainfall

    ☐ Dates and descriptions of the character and amount of any spills of hazardous materials

    ☐ Records of reports filed with regulatory agencies if reportable quantities of hazardous materials spilled

2. Prepare Inspection Reports summarizing:

    ☐ Name of inspector

    ☐ Qualifications of inspector

    ☐ Measures/areas inspected

    ☐ Observed conditions

    ☐ Changes necessary to the SWPPP

3. Report Releases of Reportable Quantities of Oil or Hazardous Materials (if they occur):

    ☐ Notify the Operator immediately

    ☐ Notify permitting authority in writing within 14 days

    ☐ Modify the pollution prevention plan to include:

    - the date of release
    - circumstances leading to the release
    - steps taken to prevent reoccurrence of the release

4. Modify Pollution Prevention Plan as necessary to:

    ☐ Comply with the minimum permit requirements when notified by the NYSDEC that the plan does not comply

    ☐ Address a change in design, construction operation, or maintenance which has an effect on the potential for discharge of pollutants

    ☐ Prevent reoccurrence of reportable quantity releases of a hazardous material or oil

VI. SPILL PREVENTION CONTROL AND COUNTERMEASURES (SPCC) PLAN

A. MATERIALS COVERED

The following materials or substances with known hazardous properties are expected to be present onsite during construction:

Concrete
Detergents
Paints
Paint solvents
Fertilizers
Soil stabilization additives
Cleaning solvents
Petroleum based products
Pesticides
Acids
Concrete additives

B. MATERIAL MANAGEMENT PRACTICES

The following are the material management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff.

1. Good Housekeeping

   The following good housekeeping practices will be followed onsite during the construction project.

   a. An effort will be made to store only enough product required to do the job.

   b. All materials stored onsite will be stored in a neat, orderly manner and, if possible, under a roof or other enclosure.

   c. Products will be kept in their original containers with the original manufacturer's label in legible condition.

   d. Substances will not be mixed with one another unless recommended by the manufacturer.

   e. Whenever possible, all of a product will be used up before disposing of the container.

   f. Manufacturer's recommendations for proper use and disposal will be followed.

   g. The job site superintendent will be responsible for daily inspections to ensure proper use and disposal of materials.

2. Hazardous Products

   These practices will be used to reduce the risks associated with hazardous materials.

   a. Products will be kept in original containers with the original labels in legible condition.

   b. Original labels and material safety data sheets (MSDS's) will be procured and used for each material.

   c. If surplus product must be disposed of, manufacturers or local/state/federal recommended methods for proper disposal will be followed.

   d. A spill control and containment kit (containing, for example, absorbent such as kitty litter or sawdust, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) will be provided at the storage site.

   e. All of the product in a container will be used before the container is disposed of. All such containers will be triple-rinsed with water prior to disposal. The rinse water used in these containers will be disposed of in a manner in compliance with state and federal regulations and will not be allowed to mix with stormwater discharges.

3. Product Specific Practices
   The following product specific practices will be followed on the job site.
   a. Petroleum Products

   All onsite vehicles will be monitored for leaks and receive regular preventative maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed containers which are clearly labeled. Any petroleum storage tanks used onsite will have a dike or berm containment structure constructed around it to contain any spills which may occur. Any asphalt substances used onsite will be applied according to the manufacturer's recommendations.

   b. Fertilizers
   Fertilizers will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked in the soil to limit exposure to stormwater. Storage will be in a covered shed. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.

   c. Paints, Paint Solvents, and Cleaning Solvents
   All containers will be tightly sealed and stored when not in use. Excess paint and solvents will not be discharged to the storm sewer system but will be properly disposed of according to manufacturer's instructions or state and federal regulations.

4. Spill Prevention Practices
   In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and cleanup.

   a. Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be trained regarding these procedures and the location of the information and cleanup supplies.

   b. Materials and equipment necessary for spill cleanup will be kept in the material storage area onsite in spill control and containment kit (containing, for example, absorbent such as kitty litter or sawdust, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.).

   c. All spills will be cleaned up immediately after discovery.

   d. The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with the hazardous substances.

   e. Spills of toxic or hazardous materials will be reported to the appropriate federal, state, and/or local government agency, regardless of the size of the spill. Spills of amounts that exceed Reportable Quantities of certain substances specifically mentioned in federal regulations (40 CFR 302 list and oil) will be immediately reported to the EPA National Response Center, telephone 1-800-424-8802. Reportable Quantities of some substances which may be used at the job site are as follows:
      oil - appearance of a film or sheen on water
      pesticides - usually 1 lb.
      acids - 5000 lb.
      solvents, flammable - 100 lb.

   f. The SPCC plan will be adjusted to include measures to prevent this type of spill from recurring and how to clean up the spill if there is another one. A description of the spill, what caused it, and the cleanup measures will also be included. If the spill exceeds a Reportable Quantity, all federal regulations regarding reports of the incident will be complied with.

g. The job site superintendent will be the spill prevention and cleanup coordinator. He will designate the individuals who will receive spill prevention and cleanup training. These individuals will each become responsible for a particular phase of prevention and cleanup. The names of these personnel will be posted in the material storage area and in the office trailer onsite.

VII. CONTROL OF ALLOWABLE NON-STORMWATER DISCHARGES

A. Certain types of discharges are allowable under the NYSDEC General Permit for Construction Activity, and it is the intent of this SWPPP to allow such discharges. These types of discharges will be allowed under the conditions that no pollutants will be allowed to come in contact with the water prior to or after its discharge. The control measures which have been outlined previously in this SWPPP will be strictly followed to ensure that no contamination of these non-stormwater discharges takes place. The following allowable non-stormwater discharges which may occur from the job site include:

1. Discharges from fire fighting activities
2. Fire hydrant flushing using de-chlorination practices or discharge into sanitary sewer
3. Waters used to wash vehicles or control dust in order to minimize offsite sediment tracking
4. Routine external building washdown which does not use detergents.
5. Pavement washwaters where spills or leaks of hazardous materials have not occurred or detergents have not been used.
6. Air conditioning condensate.
7. Springs and other uncontaminated groundwater, including dewatering ground water infiltration.
8. Foundation or footing drains where no contamination with process materials such as solvents is present.

VIII. CERTIFICATION AND NOTIFICATION

A. The NYSDEC requires that certifications of knowledge of the contents of this SWPPP and agreement to follow the SWPPP be made by the Operator and the Contractor. The terms of the General Permit also require that each Contractor sign the SWPPP plan, thereby making them co-permittees and acknowledging their responsibility for certain operational aspects of the plan. These certifications should be signed before the contractor begins activities and should be filed with the site's SWPPP at the job site. The Contractor certification is provided as Form 2 attached to this document.

B. **Operator's Certification:**
"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate and complete. I am aware that false statements made herein are punishable as a class A misdemeanor pursuant to Section 210.45of the Penal Law."

Name: Andrew L. Magre
Title: Project Manager

Signature: ______________________________

Date: ________________________________

C. **Engineer's Certification of Compliance with Federal, State and Local Regulations:**

This Stormwater Pollution Prevention Plan reflects the NYSDEC requirements for stormwater management and erosion and sediment control.

Name: Frank L. Santelli, P.E.
Title: Design Engineer
Acting as Professional Engineer for: T.G. Miller, P.C.

Signature: ______________________________

Date: ________________________________

CONTRACTOR’S CERTIFICATION LOG

FORM 1

Construction Site:
Milstein Hall/Central Avenue Parking Garage, City of Ithaca, Tompkins County, New York

Company Name	
Address	
Contact Name	
Telephone Number	
Cell Phone/Pager	
Scope of Services	
Certification Date	

Company Name	
Address	
Contact Name	
Telephone Number	
Cell Phone/Pager	
Scope of Services	
Certification Date	

Company Name	
Address	
Contact Name	
Telephone Number	
Cell Phone/Pager	
Scope of Services	
Certification Date	

Operator’s Representative_____________________

CONTRACTOR’S CERTIFICATION

FORM 2

Construction Site:
Milstein Hall/Central Avenue Parking Garage, City of Ithaca, Tompkins County, New York

CONTRACTOR'S CERTIFICATION:

> “I certify under penalty of law that I understand and agree to comply with the terms and conditions of the pollution prevention plan for the construction site identified in such plan as a condition of authorization to discharge storm water. I also understand that the operator must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System (“SPDES”) general permit for storm water discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards.”

Name: ________________________________
(Print)

Signature: ______________________________

Title: ________________________________

Company Name: ________________________

Operator’s Representative________________________

STORMWATER POLLUTION PREVENTION PLAN
INSPECTION REPORT (Page 1 of 2)

FORM 3

Construction Site:
Milstein Hall/Central Avenue Parking Garage, City of Ithaca, Tompkins County, New York

Inspections/reports must be completed as described in Section 1, Paragraph I. of the SWPPP

Inspection Type: ☐ **Routine (every 7 calendar days)** ☐ **Pre-Storm** ☐ **Storm** ☐ **Post-Storm**

Date: ________________________________ Week Ending: ____________________________

Weather/Storm Event Information:

Storm Start Time: _________________________ Storm Duration: ____________________________

Time Elapsed Since Last Storm: ______________ Approximate Amount of Rainfall (inches): ______

Based on the results of the inspection, necessary control modifications shall be implemented within seven (7) calendar days. These reports shall be kept on file as part of the Storm Water Pollution Prevention Plan for at least five (5) years from the date of completion and submission of the Final Stabilization Certification/Termination Checklist and Notice of Termination. A copy of the SWPPP shall be kept at the site at all times during construction.

Certification Statement:
"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Name of Inspector: _______________________________ Title of Inspector: ____________________________

Qualifications of Inspector: ____
____

Inspector's Signature: ____

.

Form 3 Continued [*The inspection areas must be modified to be site specific.*]

Inspection Areas (Structural)	**Satisfactory**	**Unsatisfactory (provide location or numeric identification per plan sheet)**	**N/A**	**Corrective Action Required**	**Implementation Date of Corrective Action**
Construction Entrance/Exit					
Perimeter Silt Fence					
Inlet Protection					
Outlet Protection					
Temporary Sediment Basin					
Material Laydown/ Staging Area					
Underground Storm Sewer					
Curb/Curb & Gutter System					
Storm Water Detention/Retention					
Vehicle Service Area Berm					
Discharge Locations (i.e., ditches)					
Material Storage Areas					
Waste Storage Areas					
Check Dams					
Swales					

Operator's Representative____________________

MODIFICATION REPORT

FORM 4

Construction Site:
Milstein Hall/Central Avenue Parking Garage, City of Ithaca, Tompkins County, New York

CHANGES REQUIRED FOR STORMWATER POLLUTION PREVENTION PLAN

To:	Operator's Representative	Date:	
Address:	*(to be named)*		
Telephone:			
Sent Via:	☐ Facsimile	☐ Courier	☐ US Mail

INSPECTOR: ______________________ DATE:________________
(Print)

____
(Signature)

QUALIFICATIONS OF INSPECTOR:____

CHANGES REQUIRED TO THE STORMWATER POLLUTION PREVENTION PLAN: ________________

____

____

REASONS FOR CHANGES: ____

____

____

TO BE PERFORMED BY: ___________________ ON OR BEFORE: _________________

YEAR 20___

PROJECT RAINFALL LOG

FORM 5

Construction Site: <u>Milstein Hall/Central Avenue Parking Garage, City of Ithaca, Tompkins County, New York</u>

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Day												
1												
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PM Initials												

RECORD OF STABILIZATION AND CONSTRUCTION ACTIVITIES

FORM 6

Construction Site:
Milstein Hall/Central Avenue Parking Garage, City of Ithaca, Tompkins County, New York

A record of dates when major grading activities occur, when construction activities temporarily or permanently cease on a portion of the site, and when stabilization measures are initiated shall be maintained until final site stabilization is achieved and the Notice of Termination is filed.

MAJOR GRADING, CONSTRUCTION, OR STABILIZATION ACTIVITIES

Description of Activity: ____________________

Begin Date:__________ Site Contractor: ____________________

Location: ____________________

End Date: ____________________

Description of Activity: ____________________

Begin Date:__________ Site Contractor: ____________________

Location: ____________________

End Date: ____________________

Description of Activity: ____________________

Begin Date:__________ Site Contractor: ____________________

Location: ____________________

End Date: ____________________

Description of Activity: ____________________

Begin Date:__________ Site Contractor: ____________________

Location: ____________________

End Date: ____________________

Description of Activity: ____________________

Begin Date:__________ Site Contractor: ____________________

Location: ____________________

End Date: ____________________

Operator's Representative__________________

FINAL STABILIZATION CERTIFICATION /NOTICE OF TERMINATION CHECKLIST

FORM 7

Construction Site:
Milstein Hall/Central Avenue Parking Garage, City of Ithaca, Tompkins County, New York

1. ☐ All soil disturbing activities are complete.
2. ☐ Temporary Erosion and Sediment Control Measures have been removed or will be removed at the appropriate time.
3. ☐ All areas of the Construction Site not otherwise covered by a permanent pavement or structure have been stabilized with a uniform perennial vegetative cover with a density of 85% or equivalent measures have been employed.

CONTRACTOR'S CERTIFICATION:

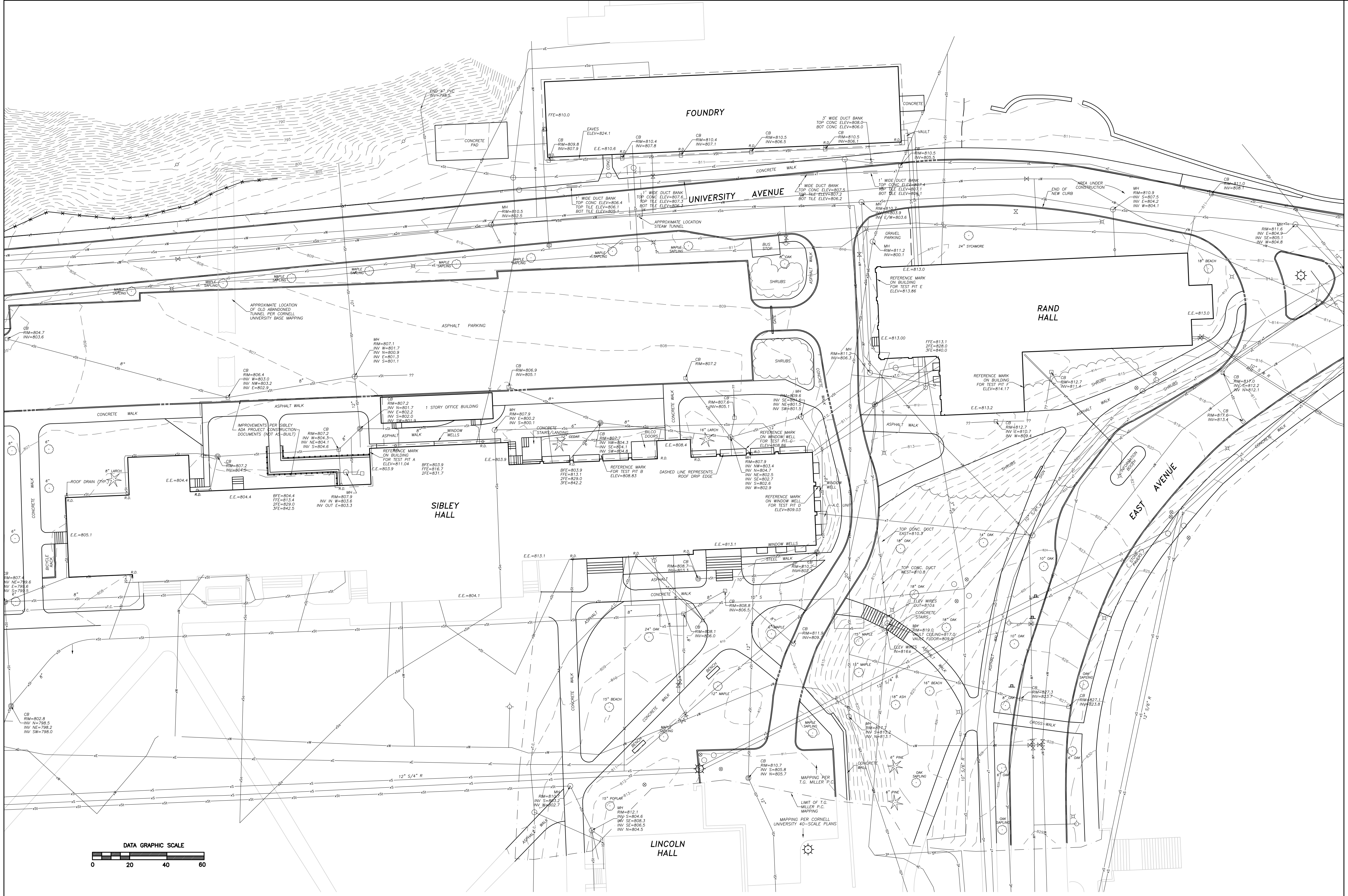
> *"I certify under penalty of law that all storm water discharges associated with industrial activity from the identified project that are authorized by SPDES general permit have been eliminated and that all disturbed areas and soils at the construction site have achieved Final Stabilization and all temporary erosion and sediment control measures have been removed or will be removed at the appropriate time."*

Company Name ____

Name (Print) ____

Signature ____

Date ____



LEGEND

xSa	SANITARY SEWER MAIN
xW	WATER MAIN
xG	GAS MAIN
xSt	STORM SEWER MAIN
xT	UNDERGROUND TELEPHONE
xE	UNDERGROUND ELECTRIC
xT	UNDERGROUND TELECOMMUNICATIONS
xCP	UNDERGROUND CATHODIC PROTECTION
xS	STEAM MAIN
xCH	CHILLED WATER MAIN
⊙	MANHOLE
⊚	ROUND CATCH BASIN
⊡	SQUARE CATCH BASIN
⋈	WATER VALVE
⦶	GAS VALVE
⌖	FIRE HYDRANT
☉	PRV
☉	UTILITY POLE
☉	LIGHT POLE
✿	DECIDUOUS TREE
✶	CONIFEROUS TREE
⊓	SIGN
⊗	STEAM VENT
E.E=100.0	ENTRANCE ELEVATION

NOTES

1.) HORIZONTAL AND VERTICAL DATUMS BASED ON CONTROL POINTS PROVIDED BY CORNELL UNIVERSITY. (DATUM=APPROXIMATE NAD83)

2.) LOCATION OF UNDERGROUND UTILITIES SHOWN HEREON ARE APPROXIMATE. UTILITY LOCATIONS WERE TAKEN FROM DRAWINGS ENTITLED "CORNELL UNIVERSITY CAMPUS UTILITY MAPS", PROVIDED BY CORNELL UNIVERSITY AND FIELD LOCATION OF ABOVE GROUND STRUCTURES BY T.G. MILLER P.C. VERIFY IN FIELD PRIOR TO CONSTRUCTION.

3.) INDIVIDUAL SPOT ELEVATIONS ARE AVAILABLE IN ELECTRONIC FORMAT.

4.) FLOOR ELEVATIONS SHOWN HEREON FOR RAND HALL AND SIBLEY HALL ARE AVERAGES OF MULTIPLE FIELD MEASUREMENTS BY T.G. MILLER P.C. ARCHITECT SHOULD VERIFY FLOOR ELEVATION AT SPECIFIC LOCATION OF ANY PROPOSED CONNECTION WITH NEW CONSTRUCTION.

5.) BUILDING OUTLINE OF THE WEST FACE OF RAND HALL AND NORTH FACE OF SIBLEY EAST WING WAS MEASURED AT A HEIGHT OF 6 FEET ABOVE EXISTING GRADE.

6.) UTILITY PIPE SIZES SHOWN HEREON WERE TAKEN FROM CORNELL UNIVERSITY 40 SCALE DRAWINGS.

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1	18 APRIL 2008	75% CD

FILE NAME
C100-SURVEY

PROJECT NO.
KHA 06015 / TGM E06-30

DRAWING TITLE
EXISTING SITE CONDITIONS

DRAWING NO.
C100

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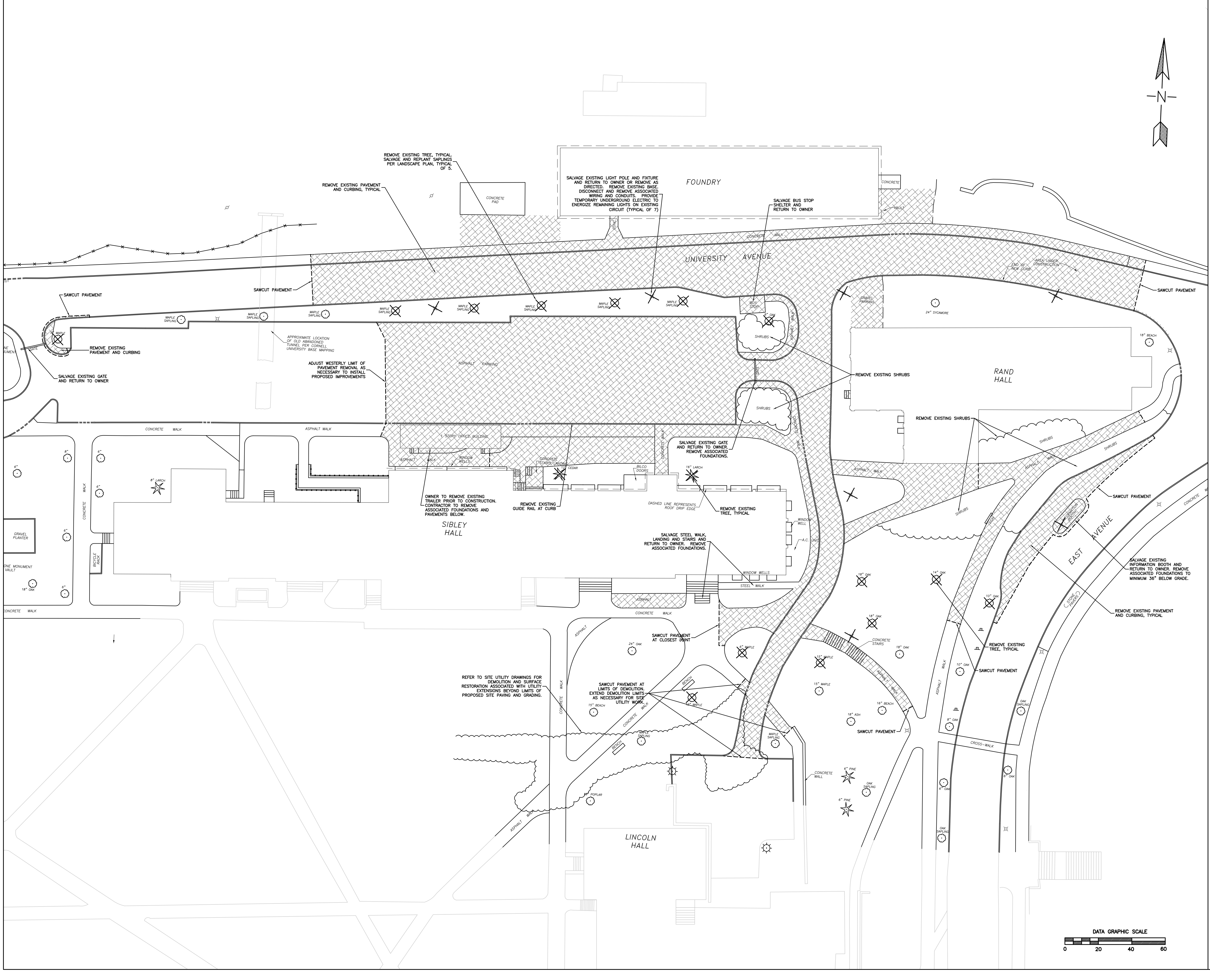

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FILE NAME
C101-STE-DEMOLITION

PROJECT NO.
KHA 06015 / TGM E06-30

DRAWING TITLE

SITE
DEMOLITION

DRAWING NO.
C101

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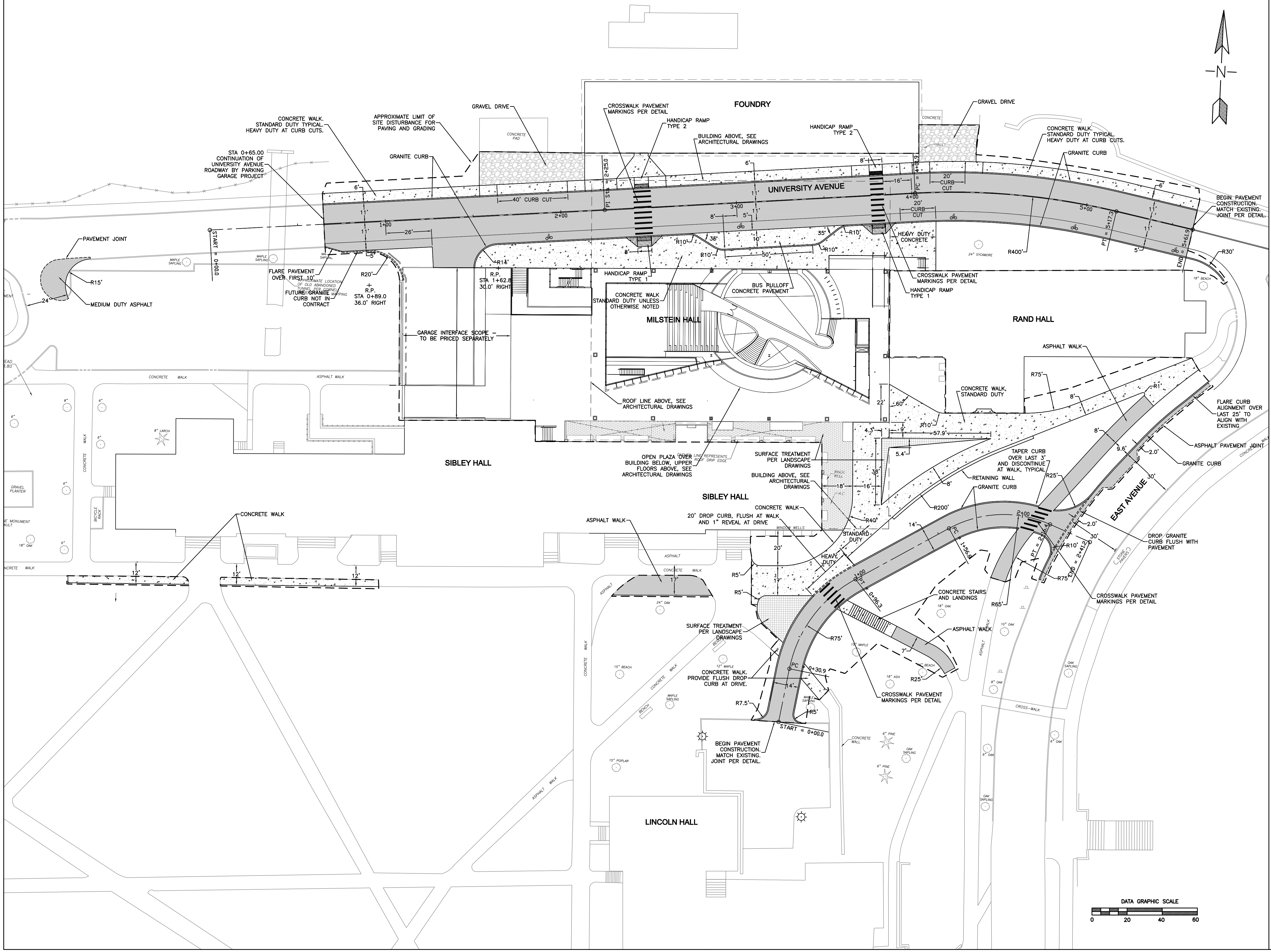

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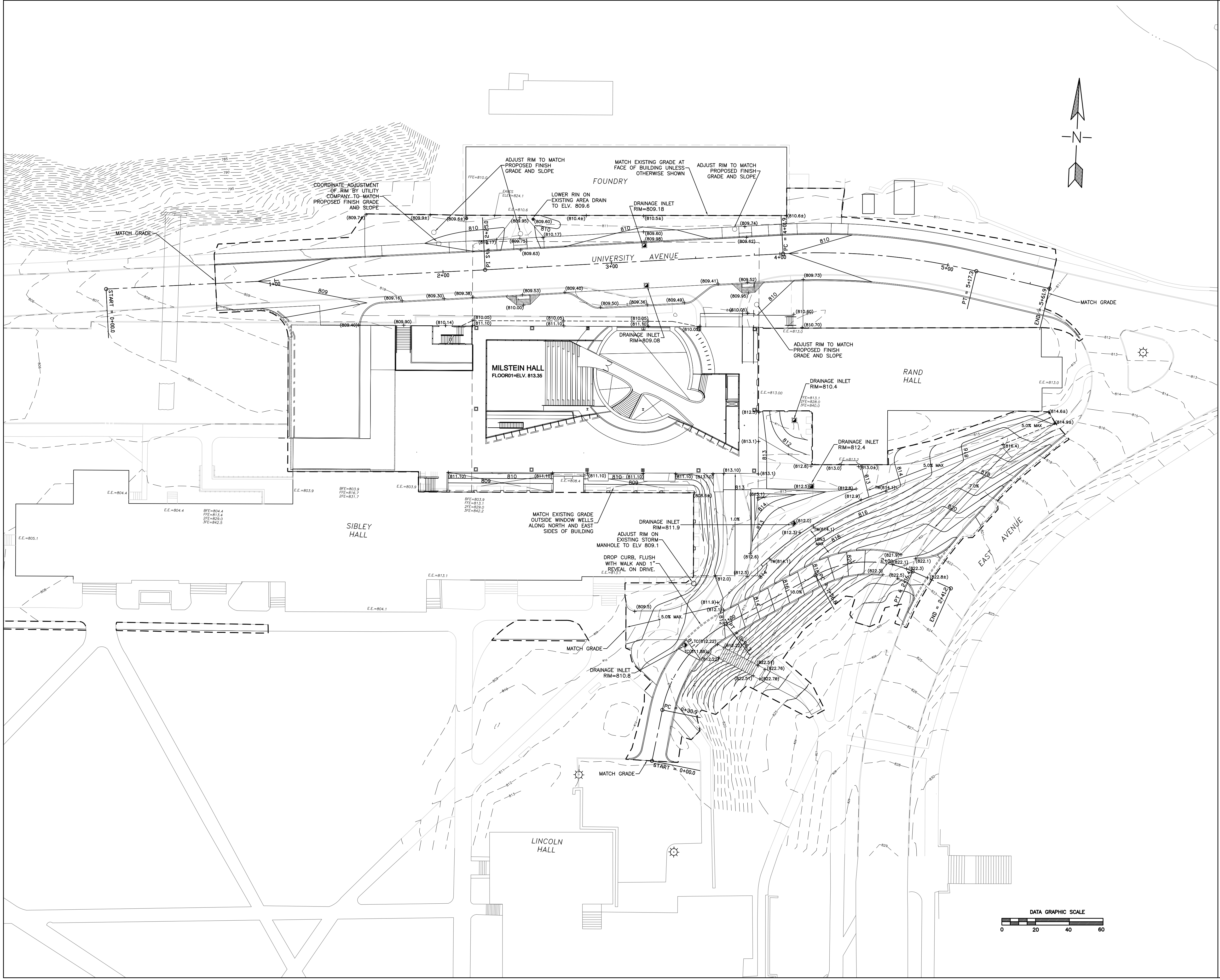
1	18 APRIL 2008	75% CD

FILE NAME
C103-STE-LAYOUT

PROJECT NO.
KHA 06015 / TGM E06-30

DRAWING TITLE
SITE
LAYOUT PLAN

DRAWING NO.
C103



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1	18 APRIL 2008	75% CD

FILE NAME
C104-GRADING-DRAINAGE

PROJECT NO.
KHA 06015 / TGM E06-30

DRAWING TITLE

GRADING &
DRAINAGE PLAN

DRAWING NO.
C104

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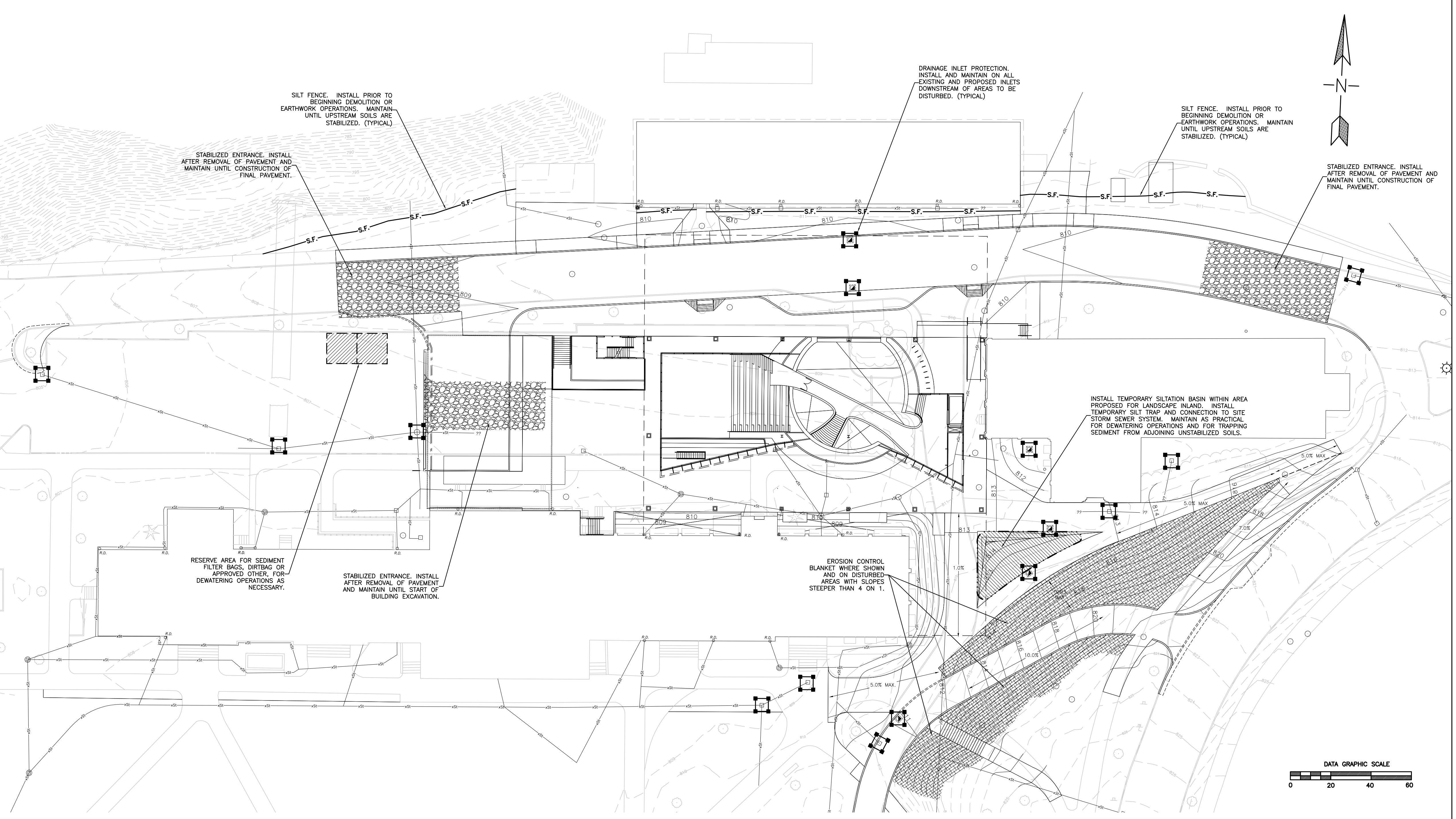

SILT FENCE. INSTALL PRIOR TO BEGINNING DEMOLITION OR EARTHWORK OPERATIONS. MAINTAIN UNTIL UPSTREAM SOILS ARE STABILIZED. (TYPICAL)

STABILIZED ENTRANCE. INSTALL AFTER REMOVAL OF PAVEMENT AND MAINTAIN UNTIL CONSTRUCTION OF FINAL PAVEMENT.

DRAINAGE INLET PROTECTION. INSTALL AND MAINTAIN ON ALL EXISTING AND PROPOSED INLETS DOWNSTREAM OF AREAS TO BE DISTURBED. (TYPICAL)

SILT FENCE. INSTALL PRIOR TO BEGINNING DEMOLITION OR EARTHWORK OPERATIONS. MAINTAIN UNTIL UPSTREAM SOILS ARE STABILIZED. (TYPICAL)

STABILIZED ENTRANCE. INSTALL AFTER REMOVAL OF PAVEMENT AND MAINTAIN UNTIL CONSTRUCTION OF FINAL PAVEMENT.

INSTALL TEMPORARY SILTATION BASIN WITHIN AREA PROPOSED FOR LANDSCAPE INLAND. INSTALL TEMPORARY SILT TRAP AND CONNECTION TO SITE STORM SEWER SYSTEM. MAINTAIN AS PRACTICAL FOR DEWATERING OPERATIONS AND FOR TRAPPING SEDIMENT FROM ADJOINING UNSTABILIZED SOILS.

RESERVE AREA FOR SEDIMENT FILTER BAGS, DIRTBAG OR APPROVED OTHER, FOR DEWATERING OPERATIONS AS NECESSARY.

STABILIZED ENTRANCE. INSTALL AFTER REMOVAL OF PAVEMENT AND MAINTAIN UNTIL START OF BUILDING EXCAVATION.

EROSION CONTROL BLANKET WHERE SHOWN AND ON DISTURBED AREAS WITH SLOPES STEEPER THAN 4 ON 1.

GENERAL NOTES

- SILT FENCING TO BE INSTALLED ALONG CONTOURS, NOT CROSSING CONTOURS.
- SURFACE RUNOFF FROM UPGRADE AREAS SHALL BE DIVERTED OR OTHERWISE PREVENTED FROM FLOWING THROUGH AREAS OF CONSTRUCTION ACTIVITY.
- RUNOFF FROM DISTURBED AREAS SHALL NOT BE DISCHARGED OFF-SITE WITHOUT FIRST PASSING THROUGH A PROPERLY INSTALLED AND MAINTAINED SEDIMENT CONTROL STRUCTURE.
- SOILS SHALL BE STABILIZED WITH TEMPORARY SEEDING AND MULCH OR SURFACED WITH GRANULAR MATERIALS WITHIN 14 DAYS OF DISTURBANCE.
- PERMANENT VEGETATION AND EROSION CONTROL BLANKET SHALL BE INSTALLED IMMEDIATELY FOLLOWING FINAL GRADING.
- ALL CONTROL STRUCTURES SHALL BE PERIODICALLY INSPECTED AND MAINTAINED DURING CONSTRUCTION. TEMPORARY SEDIMENT BASIN SHALL BE CLEANED OUT WHEN SEDIMENT REACHES 25% OF BASIN DEPTH.
- MAINTAIN STABILIZED ENTRANCES FOR DURATION OF PROJECT. TOP DRESS WITH ADDITIONAL AGGREGATE WHEN SURFACE BECOMES PACKED WITH SEDIMENT.

SEQUENCING

1. DEMOLISH EXISTING PAVEMENTS, STRIP TOP SOIL AND GRADE SEDIMENTATION BASIN WHERE SHOWN. INSTALL TEMPORARY SILT TRAP RISER. INSTALL EITHER TEMPORARY OUTFALL PIPE TO EXISTING STORM SEWER SYSTEM OR PERMANENT DOWNSTREAM STORM PIPE PER UTILITY PLANS DOWNSTRAEM OF TRAP. ESTABLISH TEMPORARY VEGETATION WITHIN SEDIMENT BASIN USING CONSERVATION SEED MIX.

2. INSTALL SILT FENCING IN LOCATIONS SHOWN.

3. INSTALL INLET PROTECTION ON EXISTING DRAINAGE INLET DOWNSTREAM OF AREAS TO BE DISTURBED.

4. BEGIN SURFACE DEMOLITION AND INSTALL STABILIZED ENTRANCES WHERE SHOWN.

5. COMPLETE SURFACE DEMOLITION.

6. INSTALL PROPOSED STORM SEWER SYSTEM AND INSTALL INLET PROTECTION ON NEW DRAINAGE INLETS.

7. BEGIN BUILDING AND PAVEMENT EARTHWORK OPERATIONS. RUNOFF FROM ANY EXPOSED SOILS TO BE DIRECTED TO SILT FENCE OR SEDIMENTATION BASIN. PROVIDE TEMPORARY DIVERSION SWALES AS NECESSARY. DISCHARGE FROM DEWATERING OPERATIONS ASSOCIATED WITH BUILDING EXCAVATION OR UTILITY WORK SHALL BE TO THE SEDIMENTATION BASIN OR SEDIMENT FILTER BAG.

8. COMPLETE GRADING, PAVEMENTS AND BUILDING WORK.

9. INSTALL TOPSOIL, SEED, MULCH AND EROSION CONTROL BLANKET WHERE SHOWN. INSTALL PLANTINGS PER LANDSCAPE PLANS.

10. FLUSH SILT AND DEBRIS FROM ALL STORM SEWERS. REMOVE SILT FROM SEDIMENT BASIN. REMOVE TEMPORARY SILT TRAP AND INSTALL PERMANENT DRAINAGE INLET STRUCTURE. FINE GRADE AND ESTABLISH FINAL VEGETATION PER LANDSCAPE PLANS.

MULCH

MATERIAL: CLEAN STRAW MULCH
APPLICATION RATE: 100 LBS (2-3 BALES)/1000 S.F.

INSTALLATION: MULCH SHALL BE APPLIED OVER TEMPORARY OR PERMANENT SEEDING AND SHALL BE ANCHORED USING ONE OF THE FOLLOWING OPTIONS:
- ON SLOPES <3%, DRIVE TRACKED EQUIPMENT OVER MULCH, WITH TREADS RUNNING PARALLEL TO THE CONTOUR.
- USE A MULCH ANCHORING TOOL OR SQUARE SHOVEL TO CUT MULCH IN SO THAT MULCH IS TUCKED INTO THE SOIL BY 3"
- APPLY A TACKIFIER OVER MULCH CONSISTENT WITH MANUFACTURER'S SPECIFICATIONS.
- APPLY WOOD FIBER MULCH OVER STRAW MULCH AT A RATE OF 400 LBS. PER ACRE.
- SECURE MULCH IN PLACE WITH BIODEGRADABLE NETTING, OR WITH PEG AND TWINE SECURED BY WOOD STAKES SPACED AT 3' INTERVALS, AND TWINE WOVEN IN A CRISS-CROSS PATTERN.

CONSERVATION SEED MIX

SPRING SEEDINGS

a) ANNUAL RYEGRASS:	0.70 LBS/1000 S.F.
b) SPRING OATS:	2.00 LBS/1000 S.F.
c) ANNUAL RYEGRASS:	0.35 LBS/1000 S.F
AND SPRING OATS:	1.50 LBS/1000 S.F
d) PERENNIAL RYEGRASS:	0.70 LBS/1000 S.F.

LATE SPRING & SUMMER SEEDINGS

a) SUDANGRASS:	0.90 LBS/1000 S.F.
b) ANNUAL RYEGRASS:	0.70 LBS/1000 S.F.
c) PERENNIAL RYEGRASS:	0.70 LBS/1000 S.F.

LATE SUMMER & FALL SEEDINGS

a) ANNUAL RYEGRASS (COMMON)	0.70 LBS/1000 S.F.
b) WINTER RYE (AROOSTOOK):	2.50 LBS/1000 S.F.
c) WINTER WHEAT:	2.75 LBS/1000 S.F.
d) PERENNIAL RYEGRASS (PENNFINE):	0.70 LBS/1000 S.F.

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FILE NAME
C105-ESCP

PROJECT NO.
KHA 06015 / TGM E06-30

DRAWING TITLE
EROSION & SEDIMENT CONTROL PLAN

DRAWING NO.
C105

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1 **DETAIL**
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2 **DETAIL**
NOT TO SCALE

3 **DETAIL**
NOT TO SCALE

4 **DETAIL**
NOT TO SCALE

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6 **DETAIL**
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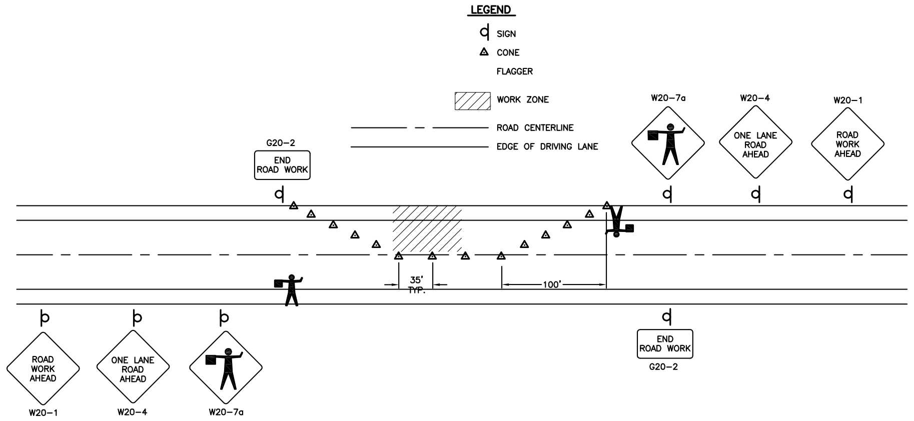
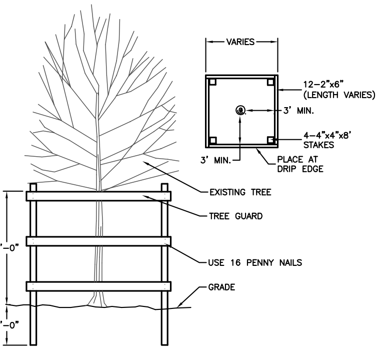
7 **DETAIL**
NOT TO SCALE

8 **CROSS-WALK MARKINGS**
NOT TO SCALE



9 **LANE CLOSURE**
NOT TO SCALE



10 **TREE PROTECTION**
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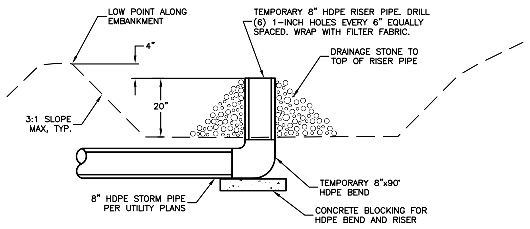
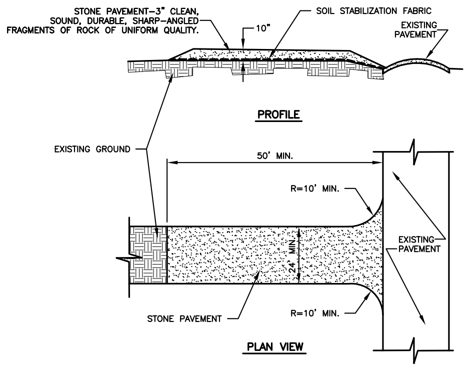
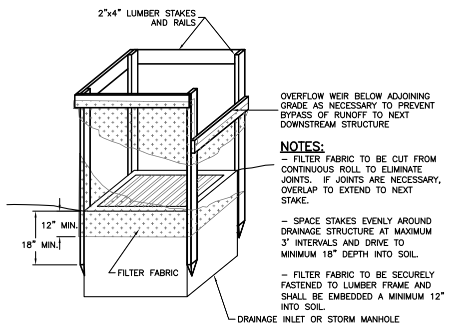


11 **SILT TRAP**
NOT TO SCALE

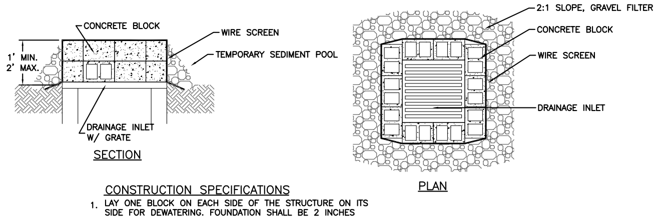


12 **STABILIZED ENTRANCE**
NOT TO SCALE



NOTES:
- FILTER FABRIC TO BE CUT FROM CONTINUOUS ROLL TO ELIMINATE JOINTS. IF JOINTS ARE NECESSARY, OVERLAP TO EXTEND TO NEXT STAKE.
- SPACE STAKES EVENLY AROUND DRAINAGE STRUCTURE AT MAXIMUM 3' INTERVALS AND DRIVE TO MINIMUM 18" DEPTH INTO SOIL.
- FILTER FABRIC TO BE SECURELY FASTENED TO LUMBER FRAME AND SHALL BE EMBEDDED A MINIMUM 12" INTO SOIL.

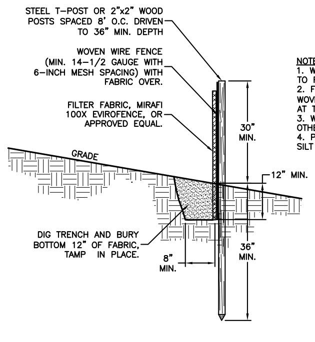
FABRIC FILTER INLET PROTECTOR



CONSTRUCTION SPECIFICATIONS
1. LAY ONE BLOCK ON EACH SIDE OF THE STRUCTURE ON ITS SIDE FOR DEWATERING. FOUNDATION SHALL BE 2 INCHES MINIMUM BELOW REST OF INLET AND BLOCKS SHALL BE PLACED AGAINST INLET FOR SUPPORT.
2. HARDWARE CLOTH OR 1/2" WIRE MESH SHALL BE PLACED OVER BLOCK OPENINGS TO SUPPORT STONE.
3. USE CLEAN STONE OR GRAVEL 1/2 - 3/4 INCH IN DIAMETER PLACED 2 INCHES BELOW THE TOP OF THE BLOCK ON A 2:1 SLOPE OR FLATTER.

STONE AND BLOCK INLET PROTECTOR

13 **INLET PROTECTION**
NOT TO SCALE



NOTES:
1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POST WITH WIRE TIES OR STAPLES.
2. FILTER FABRIC TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION.
3. WHEN TWO SECTIONS OF FABRIC ADJOIN EACH OTHER OVERLAP BY 6 INCHES AND FOLD.
4. PERFORM MAINTENANCE AS NEEDED AND REMOVE SILT WHEN BULGES DEVELOP IN THE SILT FENCE.

14 **SILT FENCE**
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FILE NAME
C301-DETAILS

PROJECT NO.
KHA 06015 / TGM E06-30

DRAWING TITLE
DETAILS

DRAWING NO.
C301

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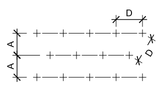
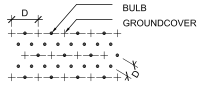
SPACING CHART

SPACING 'D'	ROW 'A'	# OF PLANTS	AREA UNIT
6" O.C.	5.20"	4	1 SQ. FT.
8" O.C.	7"	2.6	1 SQ. FT.
10" O.C.	8.66"	1.66	1 SQ. FT.
12" O.C.	10.40"	1.15	1 SQ. FT.
18" O.C.	15.60"	5.12	10 SQ. FT.
24" O.C.	20.80"	2.9	10 SQ. FT.
30" O.C.	26"	1.85	10 SQ. FT.

PLANT LAYOUT DIAGRAM



GROUNDCOVER/BULB LAYOUT DIAGRAM



PLANTING KEY

+	PLANTING TYPE 1 TOTAL AREA: 13,755 SF
▨	PLANTING TYPE 2 TOTAL AREA: 10,270 SF

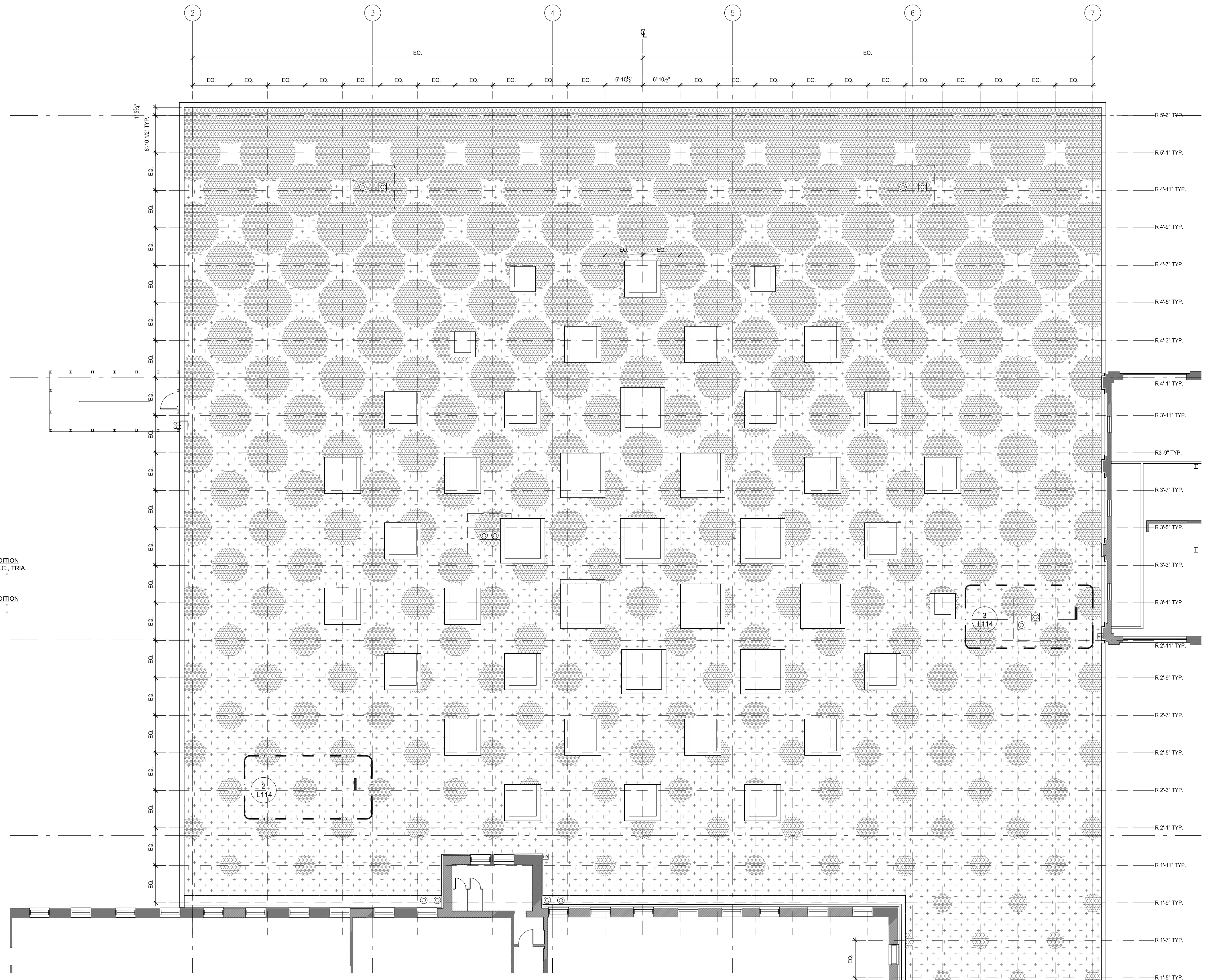
GREEN ROOF PLANTING

PLANTING TYPE 1

QUANT	SYM	BOTANICAL NAME	COMMON NAME	SIZE	CONDITION
27,510	ss	SEDUM SEXANGULARE	SEDUM SP	PLUG TYP.	12" O.C., TRIA.
27,510	ss	SEDUM ACRE	SEDUM SP	PLUG TYP.	"

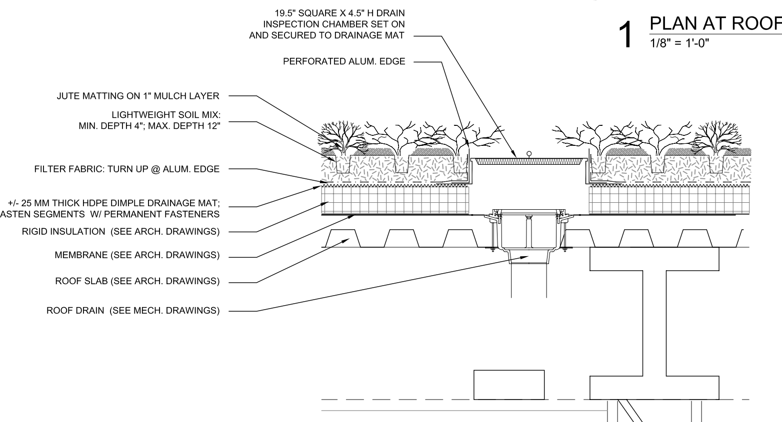
PLANTING TYPE 2

QUANT	SYM	BOTANICAL NAME	COMMON NAME	SIZE	CONDITION
20,540	sf	SEDUM SPURIUM 'FULDAGLUT'	SEDUM SP	PLUG TYP.	"
20,540	sf	SEDUM ALBUM 'MURALE'	SEDUM SP	PLUG TYP.	"



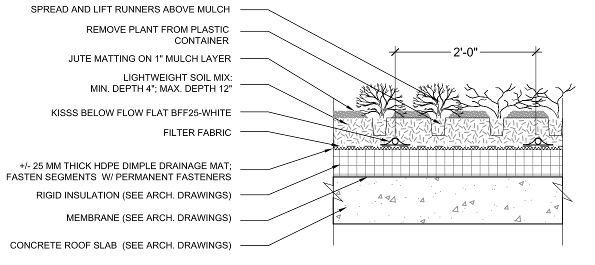
1 PLAN AT ROOF LEVEL

1/8" = 1'-0"



3 TYPICAL ROOF DRAIN INSPECTION CHAMBER

1" = 1'-0"



2 TYPICAL GREEN ROOF SECTION DETAIL

1" = 1'-0"

FILE NAME: XXX
LAYER FILE: XXX
TB30X42COR B_B 11-06-07 09:03
UNIT SIZE: XXX
PLOT RATIO: XXX
CONFIG. FILE: XXX
PLOT DATE: XXX
DISK #: XXX

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Structural Engineer

PLUS GROUP CONSULTING ENGINEERING PLLC
MEPFP Engineer

GIE NIAGARA ENGINEERING INC., PC
Utilities Engineer

T.G. MILLER ENGINEERS AND SURVEYORS
Civil Engineering

SCAPE landscape architecture pllc
Landscape Consultant

FRONT
Facade Design and Engineering

DHV V.B.
Acoustic Consultant

TILLOTSON DESIGN ASSOCIATES, INC.
Lighting Consultant

PERSOHN/HAHN ASSOCIATES, INC.
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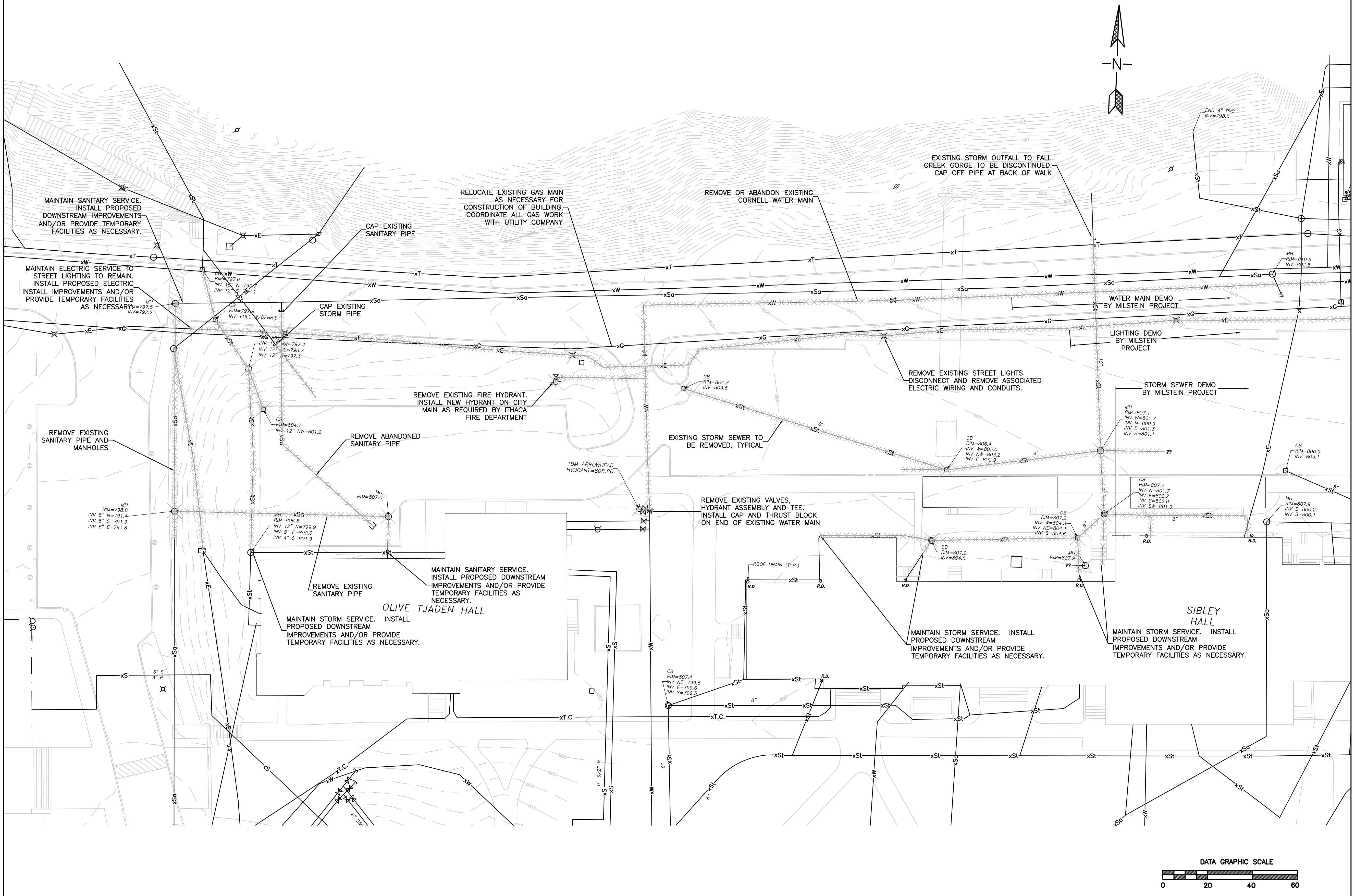

CENTRAL AVENUE PARKING GARAGE

CORNELL UNIVERSITY
Owner

DESMAN ASSOCIATES
Architect/Structural Engineer

TROWBRIDGE & WOLF LLP
Landscape Architect

T.G. MILLER ENGINEERS AND SURVEYORS
Civil Engineering

PLUS GROUP CONSULTING ENGINEERING PLLC
MEPFP Engineer

CME ASSOCIATES, INC.
Geotechnical Engineer

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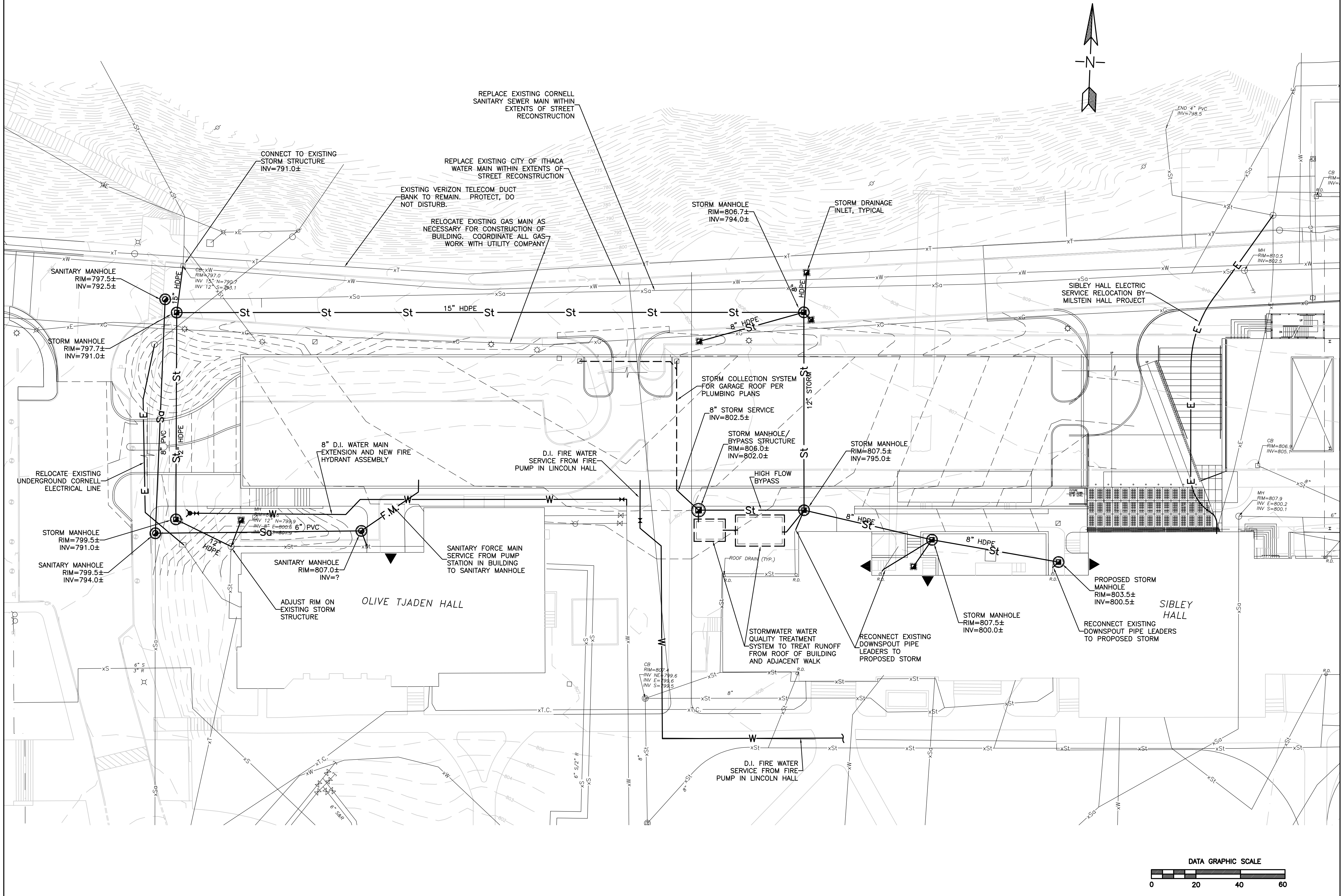

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APPENDIX C: Historic Resources Report

Bero Architecture, P.C.

Appendix C

Paul Milstein Hall
and
Central Avenue Parking Garage (CAPG)
Historic Resources Report

Bero Architecture P.C.
32 Winthrop Street
Rochester, NY 14607

TABLE OF CONTENTS

INTRODUCTION

PURPOSE

Paul Milstein Hall is to be constructed on Cornell University's Ithaca campus, north of Sibley Hall, linking two existing buildings—Sibley Hall and Rand Hall. The Central Avenue Parking Garage (CAPG) is to be constructed north of Sibley Hall and Tjaden Hall. The project includes minor interior modifications to facilitate the additions.

Figure 1. Milstein Hall and CAPG Location

A number of architecturally and/or historically significant resources are located in the vicinity of the project site. The goal of this Historic Resources Report is to identify, describe, and investigate the history of historic resources that may be affected by the construction. It includes a brief history of the Cornell campus, particularly the Arts Quad and its surrounding area, documents landscape and architectural elements, and assesses historic and architectural significance of individual resources.

METHODOLOGY

The City of Ithaca has declared the Arts Quad a local historic district:

> Historic District – An area which contains improvements which:
>
> A. Have special character or special historical or aesthetical interest or value;
> B. Represent one or more periods or styles of architecture typical of one or more eras in the history of the city; and
> C. Cause such area, by reason of such factors, to constitute a visibly perceptible section of the city.[1]

The Foundry has been declared a city landmark:

> Landmark – A structure, memorial or site or a group of structures or memorials, including the adjacent areas necessary for the proper appreciation of the landmark, deemed worthy of preservation, by reason of its value to the city as:
>
> A. An outstanding example of a structure or memorial representative of its era, either past or present.
> B. One of the few remaining examples of a past architectural style or combination of styles.
> C. A place where an historical event of significance to the city, region, state or nation or representative activity of a past era took place or any structure, memorial or site which has a special character, special historical and aesthetic interest and value as part of the development, heritage, and cultural characteristics of the City of Ithaca, including sites of natural or ecological interest.[2]

The Building Structure Inventory Form states: "The building is a rare example on the University campus and in the New York region of a small scale wood industrial building." This suggests criterion "B" is the principal reason for its landmark status.

To more definitively determine the significance of individual buildings and sites, Bero Architecture P.C. staff toured the Arts Quad and the Milstein Hall/CAPG site, surveyed the area's buildings and their context, identified extant architectural features, and researched the area's history. The area was evaluated by applying eligibility criteria for the National Register of Historic Places, a nationwide standard for assessing historic resources. Properties that are more than 50 years old, retain a sufficient level of integrity[3], and possess architectural or historical importance are eligible for listing on the National Register of Historic Places. The following Criteria for Evaluation[4] have been

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[1] Section 228-3, Chapter 228: Landmarks Preservation, Municipal Code, City of Ithaca
[2] Ibid

[3] Integrity is defined by the National Park Service in "National Register Bulletin 16A" as the "authenticity of a property's historic identity, evidenced by the survival of physical characteristics that existed during the property's historic period." A "high level of integrity" is a prerequisite for National Register Listing.

[4] *Code of Federal Regulations, Title 36, Part 60*

developed by the National Park Service to provide a standardized method for determining significance:

> The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:
>
> 1) That are associated with events that have made a significant contribution to the broad patterns of our history; or
> 2) That are associated with the lives of persons significant in our past; or
> 3) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of master, or that possess high artistic values, or that represent a significant and distinguishable entity whose individual components may lack distinction; or
> 4) That have yielded, or may be likely to yield, information important in prehistory or history.

Listing a property on the National Register requires an extensive documentation and approval process. If a property is not listed but appears to meet the eligibility criteria, it may be referred to as “potentially eligible.” The actual determination of a property’s eligibility is made by the regional National Register representative of the New York State Department of Parks, Recreation, and Historic Preservation, Field Services Bureau (FSB). If FSB staff determines a property eligible, the property is referred to as “deemed eligible.” Two individual buildings within the affected area are already recognized at the state and national levels – the A.D. White House, on East Avenue, listed on the National Register in 1972, and Morrill Hall, the University’s first building, on the west side of the Arts Quad, listed as a National Historic Landmark in 1965 (the university’s centennial year) and listed on the National Register the following year.

This historic resource inventory follows the National Park Service’s guidelines for historic resource documentation. Terminology, classification, and format standards have been established by the Park Service to ensure consistency in the evaluation of historic properties.

The inventory includes individual resources which, due to proximity or visual relationship, might be affected by Cornell’s Milstein Hall/CAPG project. Figure 2 identifies the areas of proposed construction and the historic resources inventory area. In addition to the Arts Quad, the A.D. White House, and the adjacent physical sciences buildings east of the Arts Quad, two resources north of Fall Creek are included—the Cornell Heights residential neighborhood and Risley Hall.

This Appendix is divided into two sections:

Historic Overview chronicles the historic development of the Arts Quad and its surrounding area; and the relationship between the area and historically important themes of Cornell University, the City of Ithaca, and the nation.

Historic Resource Inventory describes individual resources. Known changes or alterations are described. Each building inventory form includes a significance section describing its architectural and historical importance, and notes about important persons associated with the property. For the four historic structures bordering the construction, comments on integrity of the resource are included.

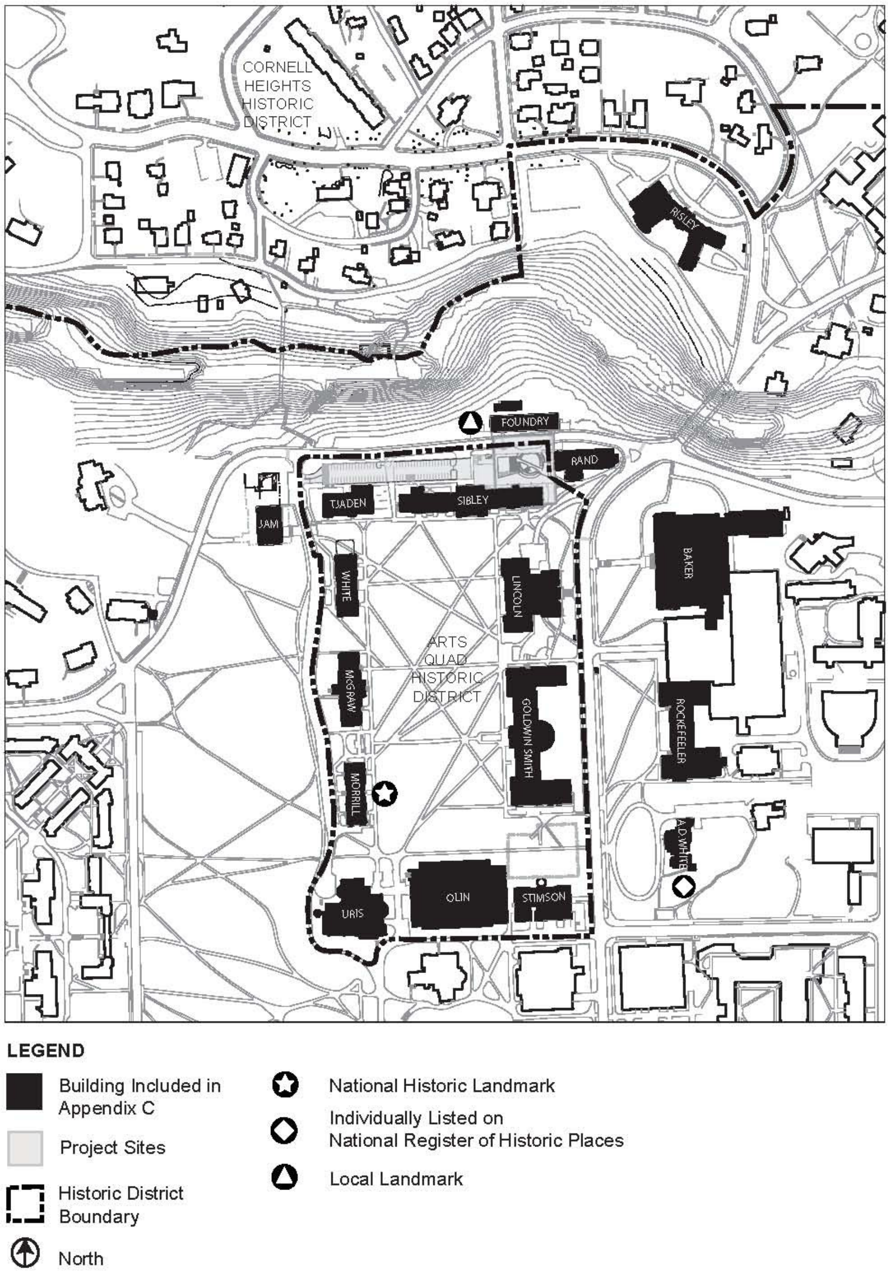

Figure 2. Historic Resources Inventory Diagram

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HISTORIC OVERVIEW

INTRODUCTION

The site of Milstein Hall/CAPG is just north of Cornell University's Arts Quad. Although Cornell's Ithaca campus has expanded dramatically during the 140 years since the first classes were held, the original quadrangle has remained the symbolic center of the 19th century campus. This overview traces the development of the Milstein Hall/CAPG project site and the immediate surrounding area within the context of the history of the university and its main campus.

1865-1880: FOUNDING OF THE UNIVERSITY AND PLANNING OF THE QUADRANGLE

Cornell University was founded in the mid-19th century during a period of higher education reform in the United States. At the time, the curricula of most American colleges and universities were focused on education of theologians, teachers, and lawyers. Much of the general population viewed traditional colleges as elitist, while some writers, educators, and politicians attacked them as "irrelevant to contemporary needs."[5]

The movement to "democratize" higher education culminated with Congress' passage of the Land Grant College Act, also known as the Morrill Act, in 1862. This act allotted each state a portion of western government lands to be sold to fund the establishment of agricultural and engineering colleges. Land-grant colleges that arose from the act promoted practical education, the right of all social classes to higher education, and freedom for students to choose their courses of study.[6]

In New York State, the availability of land-grant money spawned fierce competition among higher learning institutions. To help settle the issue, State Assemblyman Ezra Cornell offered to donate a personal endowment of $500,000 if the entire land grant was used to fund a new university in Ithaca. With the aid of his fellow legislator, Andrew Dickson White, Cornell drafted legislation creating Cornell University which was approved by the State Legislature on April 27, 1865.[7]

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[5] Paul Venable Turner. *Campus, an American Planning Tradition*. (Cambridge, Massachusetts: The MIT Press, 1984) 129

[6] Ibid. 140

[7] Carol U. Sisler. *Enterprising Families, Ithaca , New York, Their Houses and Businesses*. (Ithaca, NY: Enterprise Publishing, 1986) 57

From inception, Cornell was shaped and enriched by the contrasting philosophies espoused by its founder and benefactor, Ezra Cornell, and its first president, Andrew Dickson White. Cornell, a successful, self-made entrepreneur, with a Quaker background, embraced the ideals of the land-grant movement. Believing in universal practical education, Cornell favored economical utilitarian facilities, and championed the study of science and technology. White, a patrician academic, was interested in architecture, art, philosophy, political science, and had a different vision of the new university. White advocated a grand quadrangle lined with durable stone Gothic buildings fulfilling the ideals of the architectural theorist Charles Ruskin. White felt the base of East Hill would provide the most pragmatic and convenient location for the new campus, while Cornell, recognizing the value of the magnificent view from the crest of East Hill, insisted the university be located there. Cornell, who donated 200 acres of his East Hill farm for the site of the new school, eventually prevailed and the first buildings were erected along the west-facing crest of the hill.

In 1865, an appointed building committee began planning the first building program. The origin of today's Arts Quad can be traced to the adoption of a quadrangular campus plan in which academic buildings would surround a 15-acre square with each side measuring one thousand feet. As the first phase in the development of the campus, three buildings would be erected. The first two buildings would each contain a block of lecture rooms sandwiched between dormitory rooms. The plan was based on recent buildings at Yale and was conceived so dormitory rooms might eventually be converted to classrooms. The third building of the group was to contain a library and museum.

Four architecture firms were invited to submit designs. Following additional research, intensive review of the submitted designs, and a spirited debate over style, the building committee selected the Buffalo architecture firm of Porter and Wilcox. Porter and Wilcox's Italianate design offered "the obvious economies of using the mansard roof and raised basement to provide inexpensive extra floors."[8] The building's conservative, restrained exterior conformed to Ezra Cornell's pragmatic concerns while the arrangement of the buildings on the site and the rusticated and quoined stone exteriors appeased White's tastes and desire for permanence. "The balance of ruggedness and elegance in the walls of these buildings seems to symbolize the balance of practical and academic education the founders wanted at Cornell."[9] The stone for the first buildings was quarried from a pasture on the slope of East Hill, which today is part of Library Slope.[10] Ezra Cornell personally supervised the construction of "the Stone Row." Following the advice of Frederick Law Olmsted, Morrill and White Halls, the first two (nearly identical) buildings, were aligned in plan and elevation.

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[8] Kermit Carlyle Parsons. *The Cornell Campus, a History of Its Planning and Development.* (Ithaca, New York: Cornell University Press, 1968.) 45

[9] Ibid. 45

[10] Sisler. *Enterprising Families* 57

Only Morrill Hall was completed when the university opened in 1868. White Hall was finished the following year. The unexpectedly large number of students immediately created a need for additional classroom space. A two-and-one-half-story wood building, housing classrooms and laboratories, was constructed in the center of the proposed quadrangle in 1869. Despite A. D. White's protests regarding the location and appearance of the structure, the building represented the first of the many no-frills, utilitarian, accessory buildings on the campus over the years. Although intended to be temporary, the building remained in use for 24 years until its site was needed to provide space for a permanent stone building facing the quadrangle. McGraw Hall and Sibley Hall were completed during the next two years using funds donated by John McGraw of Dryden and Hiram Sibley of Rochester. Archimedes Russell of Syracuse was the architect for both buildings. McGraw Hall, housing a library, a museum of scientific collections, and classrooms, was envisioned as the centerpiece of the group of buildings defining the west side of the proposed large square quadrangle.

Hiram Sibley was a wealthy New York State industrialist and entrepreneur and a Charter Trustee of Cornell. At the age of 21 he opened a machine shop and progressed to banking and real estate in Rochester. In 1840, he entered the telegraph business with Ezra Cornell and Samuel B. Morse, eventually serving as president of the Western Union Company. In 1870 Cornell persuaded Sibley to donate funds for the establishment of the Sibley College of Mechanical Engineering and Mechanic Arts—a significant expansion of the practical education offered at the university—and for the construction of Sibley Hall to house it. Sibley, and later his son Hiram W., remained important benefactors to the College of Mechanic Arts for many years.[11]

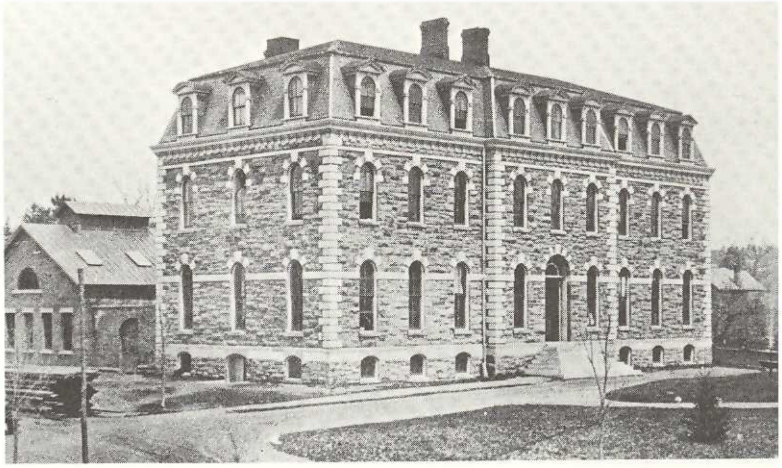

Figure 3. Sibley Hall shortly after construction. The original brick foundry building is visible at the left.

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[11] Morris Bishop. *A History of Cornell.* (Ithaca, New York: Cornell University Press, 1962.) 180-181.

The original Sibley Hall, constructed in 1870 to house the Sibley College of Mechanic Arts, constitutes the western nine bays of the western wing of the building existing today. Russell continued to employ the Second Empire style and primary design elements used in the three original buildings. Although a story less in height than nearby White Hall, Russell used the higher grade elevation at the site of the new building and increased the height of the first story to align the cornice and roof of Sibley with the buildings of the original stone row. Utilitarian one-story mechanical laboratory buildings were constructed behind Sibley on the north. Constructed of brick, the shops were painted gray to blend with Sibley Hall. The buildings contained machine shops powered both by steam and water power derived from a turbine wheel far below in Fall Creek gorge and conveyed to Sibley by a running wire cable. Just north of Sibley, adjacent to the rim of Fall Creek gorge, were an old farmhouse and an "ungainly wooden structure" housing 20 working students.[12]

White, in his position as president, was keenly interested in the aesthetic development of the new campus and oversaw the grading and landscaping of the quadrangle during the 1870s. Although his suggestion for a great terrace west of the Stone Row never materialized, the view of the lake and valley was recognized by the university administration as an important attribute from the beginning of the university's existence.

White interviewed Frederick Law Olmsted in the late 1860s regarding design of the new campus. Olmsted urged the university to abandon the quadrangle-based campus plan in favor of "… a freer disposition of the buildings more in keeping with the rugged topography of the site and the unforeseeable demands of later generations."[13] Although White remained committed to the development of the "stone" quadrangle, he supervised the development of the later "informal group" consisting of Sage Chapel (1873), Sage Hall (1875), and Barnes Hall (1888). These polychromatic brick High Victorian Gothic buildings were sited picturesquely between small ravines following the more naturalistic planning philosophy advocated by Olmsted.

The 1870s also saw the development of private homes for faculty members along the east side of East Avenue, an area known as "Faculty Row." The home of President White was the first and the most imposing of these, and is the only surviving element of this group.

1880-1900: INFORMAL PLANNING AND THE PICTURESQUE AESTHETIC

After a period of declining enrollment and financial difficulty in the 1870s, Cornell University entered a sustained period of growth in the 1880s. The university's

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[12] Bishop. *A History of Cornell.* 96-97

[13] Parsons. *The Cornell Campus, a History of Its Planning and Development.* 48

enrollment expanded from less than 400 in 1880, to over 1500 students in 1891,[14] while its physical plant doubled in size.

In 1881, architecture professor Charles Babcock was appointed architect for the new physics and chemistry building to be known as Franklin Hall (later renamed Olive Tjaden Hall). First proposed in brick, the building was executed in red Medina Sandstone, conforming to A. D. White's desire to maintain stone buildings around the quadrangle. At White's suggestion, medallions representing images of the world's great scientists were included in the design of the building's exterior. Although executed in the Romanesque style, Babcock used belt courses, quoins, denticulated cornices and a patterned slate mansard roof to relate the new building to its existing neighbors. The tower of the building provided a northern termination for the west-facing stone row while the ornamental south balcony terminated the axis of the drive (now a walk) along the west side of the quadrangle.

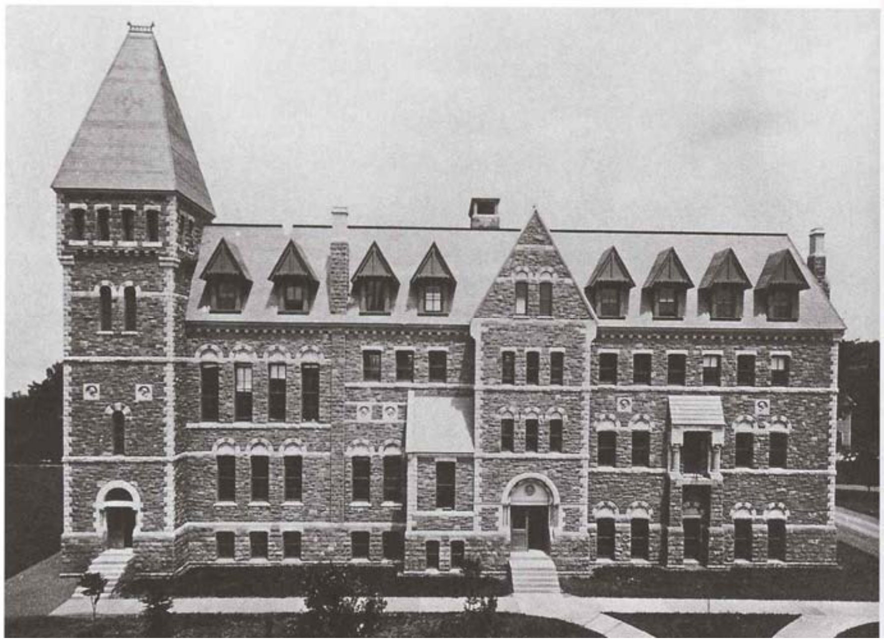

Figure 4. Franklin Hall (later renamed Olive Tjaden Hall)

Beginning in 1881, Sibley Hall underwent a series of additions, beginning with the small one-story wing added to the north side of the original building. The additions were funded by the original donor, Hiram Sibley and designed by the building's original architect, Archimedes Russell. Three years later, six additional bays were added to the east end of the building. The new center of the south façade, formerly the eastern end section, was embellished with a large gabled dormer. During the same period, the shops immediately north of Sibley were enlarged to form a u-shape configuration. The enlarged facilities accommodated a boiler with large stack, a brass and iron foundry, and

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[14] Parsons. *The Cornell Campus, a History of Its Planning and Development*. 177

a blacksmith shop to permit instruction in molding, casting and forging.[15] Other improvements included the addition of a machine shop, a wood-working shop, a pattern shop, and janitor's quarters. A separate building, located east of the other shops, housed mechanical laboratories.[16] In 1885, Dr. Robert Henry Thurston was appointed Director of Sibley College. During Thurston's tenure, Cornell's engineering college grew in reputation and enrollment. Thurston established mechanical engineering research laboratories at Cornell that became models for the field and brought international recognition to the Cornell program. Research conducted during Thurston's administration included strength of materials, hydraulics, friction and lubrication, transmission of power, dynamometers, steam and gas engines, air-compressing machinery, heating and ventilation machinery, elevators and mining equipment.[17] During his 18 year tenure, enrollment in the mechanical engineering program increased from 63 to 885.[18]

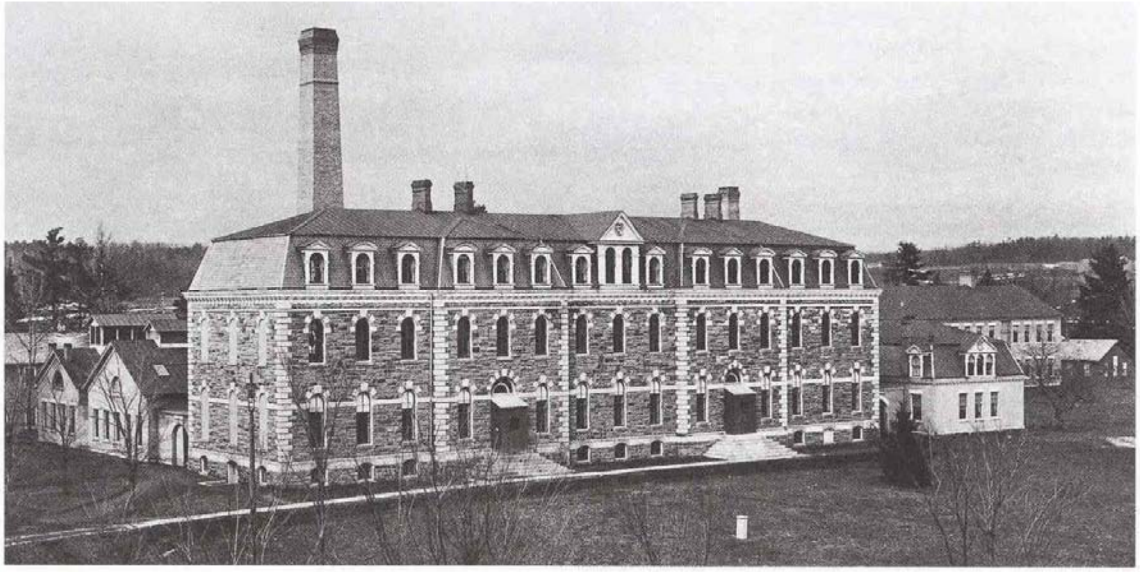

Figure 5. Ca. 1888 view of Sibley Hall after completion of a six-bay addition at the east (right) end of the original nine-bay building. The original forge and foundry are visible behind Sibley Hall (to the left). Just east of Sibley (to the right) are the janitor's quarters.

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[15] "Cornell University Register" 1881-1882. 38.

[16] "Cornell University Register" 1884-1885. 100

[17] Robert Henry Thurston,. "Sibley College, Cornell University, Mechanical Laboratories and Research." (Article reprinted as brochure from *Cassier's Magazine.* New York, New York: Cassier Magazine Co., 1896.)

[18] Parsons. *The Cornell Campus, a History of Its Planning and Development*. 280

Figure 6. Another view of East Sibley from the east showing some of the workshops

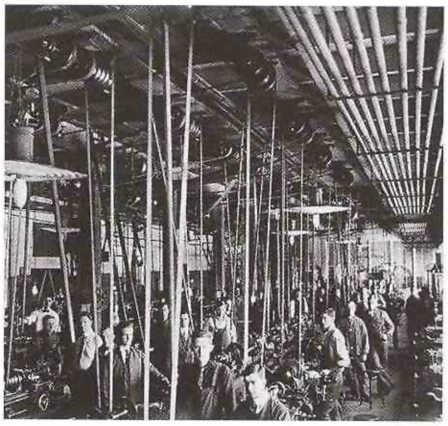

Figure 7. Late 19th century view of Sibley College machine shops.[19]

The next major academic building was added to the campus in 1888; Lincoln Hall, designed to house civil engineering and architecture, established the eastern edge of the modern quadrangle. Charles Babcock designed the building in a restrained variation of the Romanesque Revival style. Again a controversy erupted when the building was proposed in brick. After former president White protested, the exterior material was changed to Medina sandstone, although brick was used at the east (rear) wall to reduce the building's cost ($72,603). Although the red color was a concession to the architect and trustee Henry Sage, White succeeded in preventing a brick building from intruding on his vision of a stone quadrangle. Despite his success with Lincoln Hall, White was dismayed a year later, upon his return from Europe, to find a three-story brick building housing the chemistry department located on the promontory northwest of the Old Stone Row. Named Morse Hall, the building offended White because it blocked the view of Cayuga Lake to the north, violated the premise restricting the buildings around the quadrangle to stone, and was placed on a site that White believed should have remained

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[19] Thomas M. Clougherty, "Cornell's First Heating and Plumbing Systems, and the People Who Built Them: 1868-1900." (Paper prepared to fulfill the requirements of History 409: History of Work in Europe and America, Cornell University. December 16, 1998). 6-7.

open. The roof and third floor of Morse Hall were destroyed by a fire in 1916 and the building was completely demolished in 1954. Its site was later used for the construction of the Johnson Museum in the 1970s.

In 1888, the first centralized steam heating system for the campus was installed. Designed by the American District Heating Company of Lockport, New York, the system represented the latest mechanical system technology. New boilers were installed in the Sibley College boiler house and a new 10-inch steam line ran through the basement of Sibley Hall to connect with other buildings on the quadrangle.[20]

In 1891, a new university library (the current Uris Library) designed by William Henry Miller was dedicated. Miller's design for the building fused elements of Henry Hobson Richardson's[21] architectural vocabulary and elements from Van Brunt's preliminary scheme to produce a building of outstanding functional and aesthetic design. Viewed by many as Miller's best work and an outstanding example of the Romanesque style, the building and its elegant McGraw Tower with its clock and chimes have become one of the most widely recognized symbols of Cornell University. The success of the building established Miller as the most prominent architect in the Ithaca area.

A year after the library was completed, Miller gained the commission for another building housing the law school. Boardman Hall, named for the recently deceased dean of the school, stylistically complemented the library and defined the south side of the quadrangle. The building was demolished in 1958 to permit construction of Olin Library.

Continued growth of the university during the 1890s resulted in the planning of three new buildings facing the Quadrangle. To make space available, the old "temporary" wood-frame civil engineering building (c. 1868), located in the middle of the Arts Quad, was finally removed.

An agriculture building had been planned by Professor Babcock for the site south of Lincoln Hall. When the New York State Legislature appropriated only $50,000 for a new building, architecture professor Charles Francis Osborne was asked to develop a new design that could be phased. Only the first phase of the project was constructed. The resulting two-story, hip-roof, rock-face ashlar stone Dairy Building was intended to be the north wing of a large building facing the quad. A decade later when Liberty Hyde Bailey, dean of the College of Agriculture instituted a massive expansion program for the department, agricultural college functions were moved to a new larger area at the east edge of the campus and the Dairy Building was incorporated into the design of Goldwin Smith Hall.

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[21] Henry Hobson Richardson, was one of the best known and most creative American architects practicing during the fourth quarter of the 19th century. Richardson's work was largely responsible for the popularization of the Romanesque Revival style during the 1880s and 1890s.

In 1886, Hiram Sibley asked Archimedes Russell, architect of the original Sibley Hall, to develop a plan for the growth of the Sibley College of Mechanical Engineering and Mechanic Arts. In the early 1890s, Hiram's son, Hiram W. Sibley, donated funds for a new classroom building for mechanical and civil engineering. Charles Francis Osborne received the commission to design a new building east of the original Sibley Hall. Osborne's building was nearly a mirror image of Russell's earlier building. The end and rear walls of the building were constructed of buff brick in anticipation of future additions.

The roof of the north row of shops was raised one story to increase the size of the machine shop and wood shop.[22] Dynamos (electrical generators) were installed in the former blacksmith and foundry spaces. At about the same time, a new wood-frame building (today known as the Foundry) was designed by A. B. Conaga, an assistant professor of mechanical engineering, and constructed between University Avenue and the rim of the Fall Creek gorge to house a foundry and blacksmith shop. Some of the wood utilized in the construction of the Foundry was salvaged from the recently demolished civil engineering building on the quad.[23]

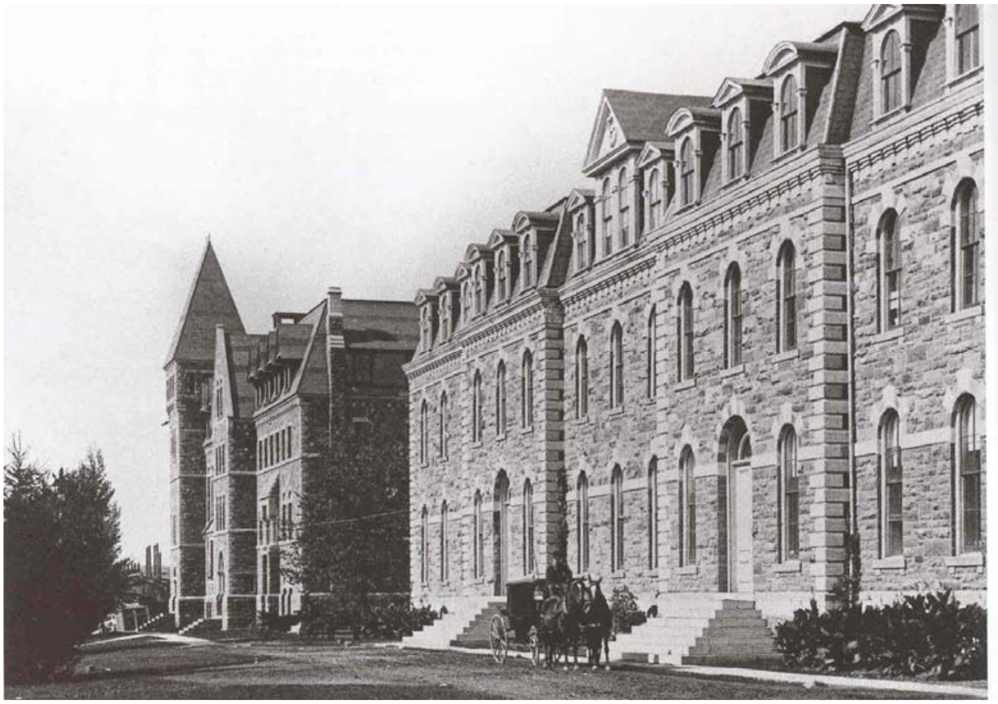

Figure 8. Early 1890s view of the north edge of quadrangle showing carriage drive, Franklin Hall (later renamed Olive Tjaden Hall), and West Sibley.

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[22] "Cornell Daily Sun" October 7, 1890. 1.

[23] "Cornell Daily Sun" May 23, 1890. 1.

Figure 9. 1885 view of the Foundry interior.

Figure 10. Looking west along University Avenue toward the Mechanical shops and the Foundry (ca. 1909 view)[24]

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[24] Merrill Hesch, Richard Pieper & Harry Little. *Ithaca Then and Now.* (Ithaca, New York: McBooks Press, 2000.) 102.

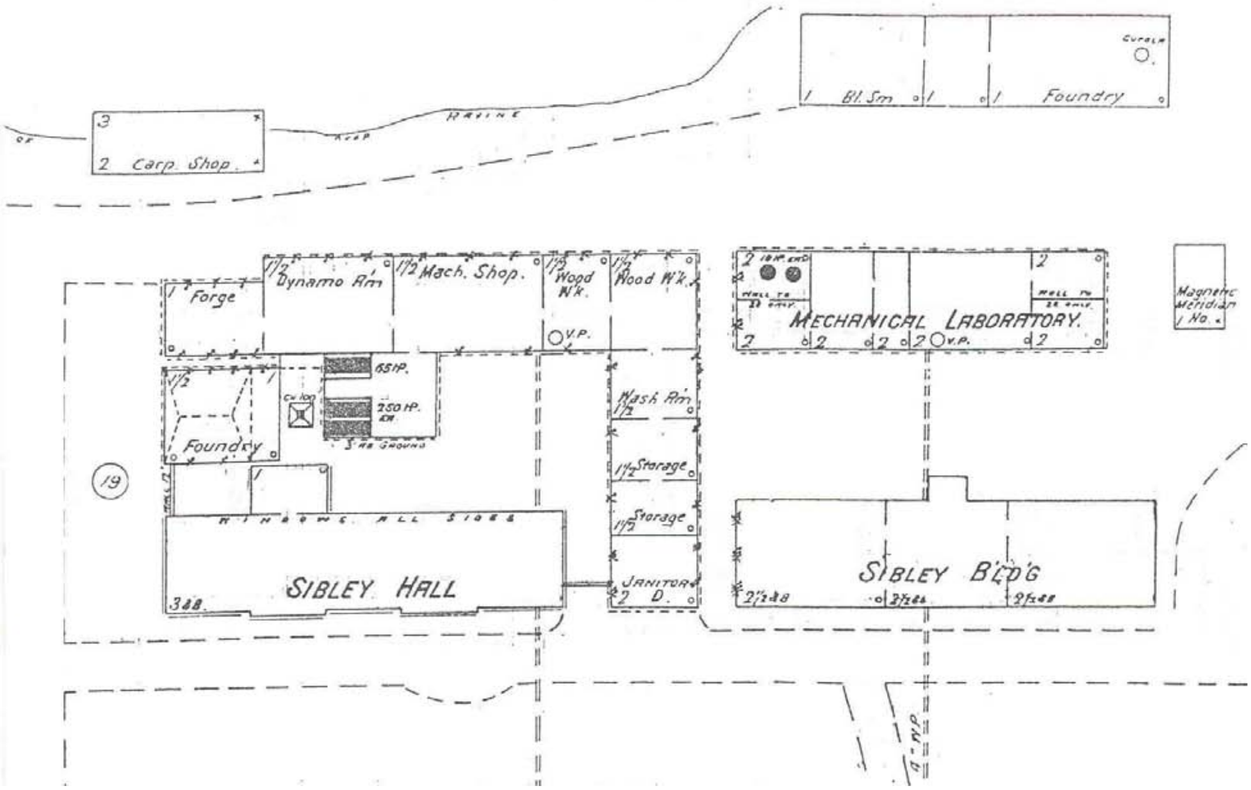

Figure 11. Detail of 1893 Sanborn Map of Ithaca showing Sibley College complex

In 1891, the Ithaca Street Railway established electric trolley service between downtown Ithaca and the south side of the Cornell quadrangle. In 1897, Edward G. Wyckoff led a group of land developers seeking to develop the area north of Fall Creek, to finance the construction of the Triphammer Bridge (now Thurston Avenue Bridge) over the Fall Creek gorge. The trolley line was extended in 1901 to form a loop which crossed the bridge to the north side of Fall Creek and returned downtown via Stewart Avenue.[25] Concern over the proximity of trolley electrical lines to the new physics building (professors feared power lines would interfere with electrical experiments) was among the reasons that led to the development of new academic buildings, beginning with Rockefeller Hall, east of East Avenue.

The completion of the trolley line also gave a major boost to the development of the Cornell Heights neighborhood north of the campus, across the Fall Creek gorge. Beginning with the subdivision of two large parcels of land in 1896 and 1901, Cornell Heights grew into an outstanding example of a planned residential subdivision over the next several decades. Following the "ideal romantic landscape" precepts of Frederick Law Olmsted, Cornell Heights featured dramatic topography, curvilinear streets, and

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[25] The trolley climbed East State Street to Eddy Street which it followed north to the head of Buffalo Street. Just north of Buffalo Street, it turned northeast, crossed Cascadilla Creek at what is now the Trolley Footbridge, and continued to East Avenue. It ran north on East Avenue, west on Thurston and south along Stewart Avenue back to East State Street.

extensive landscaping. Over 150 homes, many of them occupied by Cornell faculty and staff, were built in this area between 1898 and 1935.

1900-1940: BEAUX-ARTS PLANNING AND COLLEGIATE IDEALS

Popularized by the success of the 1893 Columbian Exposition in Chicago, the Beaux-Arts Movement facilitated orderly planning on a grand scale through the incorporation of disparate buildings within a hierarchical unified pattern.[26] After 1900, Beaux-Arts planning was widely adopted by American educational institutions. A parallel movement in architecture swept away the eclectic Picturesque styles of the late nineteenth century and replaced them with a new academic architecture, "…whose styling showed, by a new sense of restraint and discipline of ornament, the results of systematic training in professional academies of art and architecture."[27] Rather than achieving a consensus in style, the "academic" movement applied a similar approach to a diverse group of historically based styles ranging from Beaux Arts classicism to Collegiate Gothic.

During the first decade of the 20th century, Cornell University was strained by over-burdened facilities and expanding programs. To ease the situation, the university constructed a number of new academic buildings and significantly increased the size of the campus through the purchase of land to accommodate future growth.

The first early 20th century building project to adopt the new attitude in architectural design at Cornell was the domed center section which connected the two existing Sibley buildings defining the north edge of the quad. The architect was Arthur N. Gibb. A native of Quebec, Gibb was a leading architect in Ithaca and a graduate of the Cornell University College of Architecture who began his career as a draftsman in the office of William Henry Miller. Gibb's Cornell work included Baker Laboratory of Chemistry, Schoellkopf Hall, and several fraternities, as well as numerous other buildings throughout Ithaca executed in a wide range of styles. Rather than construct the tower proposed by Archimedes Russell, Gibb proposed connecting East and West Sibley with a domed structure he argued was better suited to accommodate the large interior space of the auditorium included in the program.[28] Although the use of half-round windows, a modillioned cornice and random-course rock-face ashlar deferred to the existing buildings, the dome, pilasters and overall form of Gibb's design were clearly inspired by Beaux Arts classical forms. Gibb's 1902 addition featured "fireproof" construction. Like the East Sibley Building, the north-facing (rear) wall was clad in brick rather than stone because it faced into a service court. On its interior, Gibb's building featured twin stair halls that connected to the existing east and west buildings. Between the stair halls on the

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[26] Turner. *Campus, an American Planning Tradition*. 167

[27] Alan Gowans. *Styles and Types of North American Architecture, Social Function and Cultural Expression.* (New York: Harper Collins Publishers. 1992.) 211.

[28] Parsons. *The Cornell Campus, a History of Its Planning and Development*. 186

first floor was a display area. On the second floor, a large auditorium was open to the underside of the dome.[29]

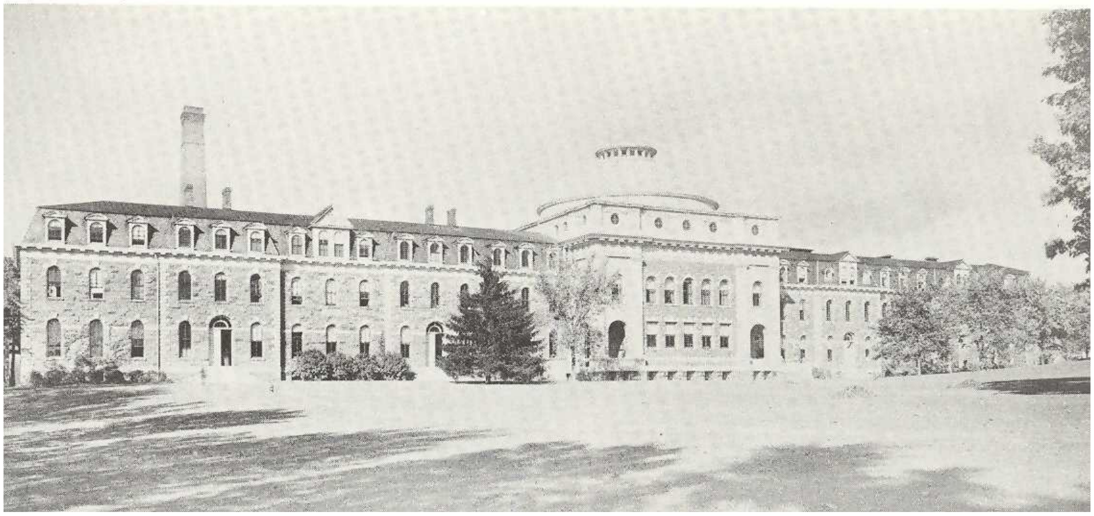

Figure 12. Early 20th-century view of Sibley Hall showing dome designed by Arthur Gibb.

The following year, Stimson Hall, William Henry Miller's fourth[30] building on the Cornell campus, was completed to house the new Ithaca division of the university's medical college.[31] The building was funded by Dean Sage in honor of Dr. Lewis A. Stimson who had been instrumental in organizing the medical college. The building was another example of Miller's skill as a designer. Although elevated 15 feet above adjacent Boardman Hall, Stimson Hall was related to the existing building through the alignment of a second floor stringcourse with the roof cornice of the older building. Below the stringcourse, use of the sandstone rock-face ashlar cladding and a window rhythm similar to Boardman established architectural harmony between the new building and old. Above the stringcourse, large north-facing areas of glass provided ample light. Miller's building is wrapped in a simple but carefully proportioned neoclassical skin.

The next building proposed for the quadrangle area was Rockefeller Hall, to house the Physics Department. In 1901, John D. Rockefeller provided $250,000 toward the erection of a new physics facility. The building was originally proposed to bisect the

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[29] The auditorium serves today as the circulation area and reading room for the Fine Arts Library. The former museum is now a gallery for the Department of Architecture.

[30] Miller's other academic buildings include Barnes Hall (1886), Boardman Hall (1890), and Uris Library/McGraw Tower (1891). In addition, Miller designed numerous fraternities and private homes in the neighborhoods surrounding the central campus.

[31] The medical college originated in 1896 when three independent New York City medical schools united to become a branch of New York University. Disputes between the college faculty and the university administration resulted in secession of the medical school in 1898. The newly separated faculty sought association with a major university and accepted an arrangement with the Cornell University Board of Trustees the same year, thus forming the Cornell University Medical College.

university's main quadrangle. Objections from Hiram Sibley, University Trustee and benefactor of the Sibley College of Engineering, initiated a 15 month debate on the location of the proposed building. In the end, it was agreed that the interior of the quadrangle should not be a site for future buildings, and a site for it was selected on the east side of East Avenue, thus initiating the 20th century expansion of the academic campus beyond the original quadrangle area and the relocation of the physical sciences departments to this part of campus.

Figure 13. View of Cornell quadrangle shortly after the completion of Goldwin Smith Hall (1906).

Construction of Rockefeller Hall began in 1904 and the building was completed in 1906. After its completion, the 125,000 square-foot new building was described as "the largest physical laboratory in America."

Figure 14. Early 20th century postcard view of Rockefeller Hall.

The architect for the project, Carrère and Hastings of New York, was also selected to design a new campus master plan and a new humanities building (Goldwin Smith Hall) that would complete enclosure of the quadrangle. Goldwin Smith Hall, was finished in 1906, was designed to provide more space for the liberal arts departments. The new building incorporated the existing Dairy Building as a wing. Although designed in the neoclassical style with a symmetrical façade and Doric pedimented portico, the building deferred to the Dairy Building and several of the other existing quad buildings through the use of rock-face random ashlar stone and prominent hipped roofs. With the completion of the quadrangle, expansion of the campus shifted to the east and south. Construction of Bailey Hall, Barton Hall, the Veterinary College, the College of

Agriculture and improved athletic facilities transformed the scale of the university campus.

The Beaux-Arts master plan for the expansion of the campus developed by Carrere and Hastings, while working on the design of Goldwin Smith Hall, was criticized by former president White and others because it proposed constructing a building across the center of the university's main quadrangle, and because it seemed to ignore the campus's hilly terrain. A new debate arose over how the campus might be expanded. Out of the debate emerged a consensual recognition that the existing quadrangle and Library Slope should be reserved as open space. These concepts were incorporated into a subsequent campus plan prepared by landscape architect Charles Lowrie of New York in 1903. Lowrie's plan recognized the campus's spectacular vistas and used existing landmarks such as McGraw Tower to define new axes. Lowrie's tempered version of Beaux Arts planning extended existing circulation routes in a block-like pattern and took advantage of Cornell's dramatic topography. His plan heavily influenced campus planning for the next fifty years.[32]

In 1896, the Department of Architecture was reorganized into a college including a fine arts program. By 1906, increasing enrollment resulted in relocation of the College of Architecture from Lincoln to the third and fourth floors of White Hall and the third floor of Franklin (Tjaden). In the following years the College expanded to occupy additional spaces in White, Franklin, and Morse Halls. The college's programs were also expanded to include the Department of Art (1923) and the Department of City and Regional Planning (1935).[33]

The engineering complex located at the north end of the quadrangle was expanded a final time with the construction of Rand Hall in 1912 to house machine shops, pattern shops, and electrical laboratories. The building was donated by Mrs. Henry Lang as a memorial to her father Jasper Raymond Rand, her uncle Addison Crittendon Rand, and her brother Jasper Raymond Rand (Cornell University Class of '97). All three men were associated with the management of the Rand Drill Company.[34]

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[32] Parsons. *The Cornell Campus, a History of Its Planning and Development*. 199.

[33] Kim. "The Department of Architecture and Its Buildings: A Brief History" *The Cornell Journal of Architecture* 71-72.

[34] The Rand Drill Company merged with the Ingersoll-Sergeant Drill Company in 1905 to form Ingersoll-Rand, headquartered in New York City. Today, the company is a large multi-national diversified manufacturing corporation.

Figure 15. Rand Hall

The Ithaca firm of Gibb and Waltz was selected as the Rand Hall project architect. In 1906, Arthur Gibb, architect of the nearby Sibley Dome, joined forces with Ornan H. Waltz, the former manager of the locally prominent office of William Henry Miller. Between 1910 and 1926, the firm of Gibb and Waltz was the dominant architectural practice in Ithaca and was responsible for many of the city's most prominent building projects including the Crescent Theater, the Citizen's Bank Building, the Masonic Temple, and many others. Gibb was recognized as a skilled designer and was responsible for the design of many of the firm's larger projects. The firm's work was executed in a variety of period styles.[35]

The design of Rand Hall utilized technological advancements in industrial construction. The building was constructed with a riveted steel frame and concrete slab floors. To maximize natural light and ventilation, the exterior of the building was articulated as a series of structural piers, permitting extensive areas of glass. Large multi-light cold rolled steel windows and brick spandrel panels supported by steel lintels spanned between structural piers. Rand Hall was clad with a rough-surfaced brick popular during the period.

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[35] Daniel R. Snodderly. *Ithaca and Its Past* (Ithaca, NY: DeWitt Historical Society of Tompkins County. 1982.) 17.

Figure 16 Rand Hall under construction

The long, narrow (11 bays long by three bays wide) main wing of the building housed large open shops on each floor. Machine shops were housed on the first and second floors while a carpentry shop was located on the third floor. A stair, toilets, and service spaces were located in the projecting south wing.

The site for Rand Hall was created just prior to the building's construction when the northern end of East Avenue and the trolley line were both relocated eastward to intersect University Avenue opposite the Triphammer Bridge (Thurston Avenue Bridge). A small wood-frame house occupying the present intersection was demolished. As a new women's residence hall and residential subdivisions transformed the area north of Fall Creek during the first decades of the 20th century, the Triphammer Bridge became an increasingly important gateway to the center of the Cornell University campus. Perhaps because it was situated in a highly visible location, Rand Hall was wrapped with a restrained Neoclassical exterior, more elaborate than the pure functional skin being developed for such skeleton-framed support buildings by industry. The structural piers were designed as giant-order two-story pilasters with abstracted capitals supporting a massive concrete cornice at the third-floor level.[36] The third floor was articulated as an attic story. The main entrance to the building was recessed within a masonry arch centered on the face of the projecting south wing.

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[36] Gibb and Waltz's construction documents for the building indicate the pilasters were originally intended to be concrete.

Figure 17 Aerial view ca. 1944. This view from the northwest shows the relationship of Rand (at the left) to the completed Sibley Hall and the full complement of workshops north of Sibley. Morse Hall, demolished in 1954, is at bottom right.

Figure 18. This aerial view from the west is dated 1950. Rand is the light-colored building beyond the Sibley dome. Workshops fill the space between Sibley and University Avenue. The Foundry is hidden beneath the trees.

After World War I, building activity on the Cornell campus resumed. The buildings constructed on campus between the wars were characterized by careful study, resulting in excellence of design, fitness to the site, and attention to detail. The most important buildings of the period were Neoclassical Baker Hall (1921), the Collegiate Gothic style Willard Straight Hall (1923) and Myron Taylor Hall (1930). Baker Hall, north of Rockefeller Hall, was the second in the group of physical sciences buildings built on the east side of East Avenue,.

By 1910, preliminary plans were being developed for a new chemistry building. Although the urgency of the project was increased due to the loss of Morse Hall to fire in 1916, the project was delayed by the onset of World War I. Funding was provided by George F. Baker who donated $1,500,000 in 1919. A site was chosen next to Rockefeller Hall on the east side of East Avenue. Rather than rebuild a new chemistry building on the site of Morse Hall, a new location was selected that was accessible to the center of campus and the College of Agriculture. The site also allowed easy communication with the physics department located in adjacent Rockefeller Hall. The project required demolition of the remaining faculty cottages near the north end of East Avenue. The University hired the local architectural firm of Gibb and Waltz and Philadelphia-based firm of Day and Klauder to design the building. Arthur Gibb, who had previously worked on other chemistry facilities at Cornell was responsible for the building's interior planning and construction supervision. Day and Klauder, who had recently designed the Baker group of men's dormitories at the base of Library Slope, gave form to the building's exterior. Although designed in the Beaux Arts style, the exterior walls are clad with the same gray-green locally quarried stone used on the men's dormitories and many other buildings on campus.

Baker Laboratory is a rectangular-plan courtyard building. Considered one of the nation's largest laboratories at the time of its construction, the building's footprint measures 192 feet by 266 and contains an interior area of 221,000 square feet. The building was designed anticipating future additions on its east side. Lauded as the "the finest chemistry laboratory in the country"[37] the building was admired for its appearance, functional design, and successful use of the latest mechanical system technology.

Figure 19. Baker Laboratory (1920s postcard view).

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[37] Parsons. *The Cornell Campus, a History of Its Planning and Development.* 229.

In 1919, under Cornell University President Schurman, the Sibley College of Mechanical Engineering was consolidated with the College of Civil Engineering to form the College of Engineering. At the same time, Schurman called for new engineering facilities that would replace Franklin (now Tjaden) and Lincoln Halls. In 1925, the architecture firm of York and Sawyer drew plans for a massive Collegiate Gothic engineering complex that would have wrapped around the north end of the quad and that would have replaced all of the existing engineering buildings, except the oldest two sections of Sibley Hall and Rand Hall. Like most of the ambitious building plans of the 1920s, the construction of new engineering facilities was stalled by the economic depression of the 1930s and by World War II.

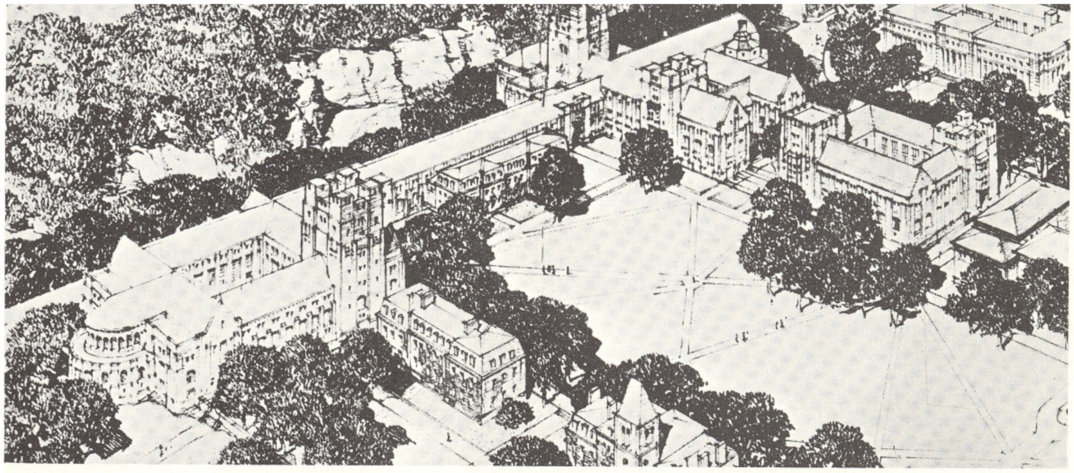

Figure 20. Sketch of ca. 1925 proposed College of Engineering complex.

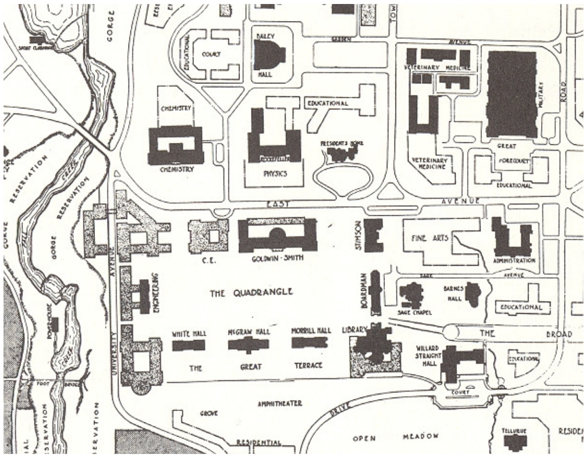

Figure 21. 1925 "General Plan for Cornell University" showing proposed engineering complex at the north end of the quadrangle.

During the first 40 years of the 20th century, the planning efforts of Cornell University recognized the value of the campus's natural assets and focused on enhancing the aesthetic quality of the campus through both building and landscaping improvements.

Over this same period the Cornell Heights residential neighborhood was built out, initially intended to serve as a "residence park" for prominent members of the university faculty and staff and wealthy area businessmen. Primarily a neighborhood of single-family homes, Cornell Heights also included multi-family residences and student housing in the form of Cornell-owned dormitories as well as fraternities and sororities. Risley Hall, designed by William Henry Miller, was constructed in 1913 beyond Fall Creek gorge. Balch Hall, located across Thurston Avenue, was constructed in 1927. Both of these facilities were designated as residences for women students.

1940-1980: POST-WAR EXPANSION, MODERNISM, AND THE POST-MODERN ERA

Campus planning underwent a drastic transformation after World War II. Ballooning enrollments, limited funds, changing patterns of education, the need to accommodate automobile movement and parking, and the emergence of research and development as an important component of the university mission, led to the rapid abandonment of the Beaux-Arts model of planning. Universities and colleges, facing increasingly complex and contradictory programmatic needs, gradually abandoned the comprehensive campus plans popular during the first half of the century. Formal master plans, with axial arrangements of classical buildings, might have been successful if the planners had been able to predict the future needs of institutions, but these plans proved impossible to complete because of rapid changes in the demands on colleges. They have been replaced with informal arrangements which allow growth and change by providing an infrastructure which accommodates unforeseen buildings, creation of entirely new disciplines, and the influx of automobiles.

Modern architecture theories, rejecting revivals of historic precedents and emphasizing functionalism, were introduced in America during the 1930s. Classical precedents did not exist for many of the needs of the day and proponents of new styles began to attack classical and Gothic revival buildings as intellectually bankrupt and functionally obsolete.[38] By the end of the 1950s, Modernism had become the predominant style for new buildings on most college campuses.

Beginning in the late 1930s under the administration of President Edmund Ezra Day, Cornell adopted a new approach toward planning and campus development. The increasing need for research and expanded engineering facilities led to the creation of a new engineering campus located between Cascadilla Creek and Campus Road. The introduction of the International style at Cornell resulted from the need for efficiency rather than a philosophical decision.

Following the war, building costs were high, labor was in short supply, and the volume of space needed was great. For the engineering school alone, 10 new buildings were constructed in the 25 years between 1940 and 1965. The space between Rockefeller and

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[38] Turner. *Campus, an American Planning Tradition*. 251

Baker Laboratory was enclosed on its east side with the construction of Clark Hall in 1965 to provide a library and more space for the physical sciences. In the area immediately east of Baker, Clark and Rockefeller a cluster of new buildings was constructed including the Space Sciences Building, Savage Hall, Kinzelberg Hall, the Newman Lab and Lab annex and the Olin Chemistry Research Lab. As the number of chemistry faculty and students increased steadily after World War II, and several new fields of chemistry research were opened, the facilities in Baker Lab were stretched to capacity.

The S. T. Olin Chemistry Research Wing, a seven-story Modern-style tower, was added to the east end of Baker Lab in 1967. It housed about half of the chemistry faculty and their research groups, as well as a spacious and well-equipped new stockroom and support services for both teaching and research.

Anabel Taylor Hall, constructed in 1952, was one of several post-World War II buildings at Cornell whose design followed the prewar style of planning and design. The building was donated by Myron Taylor as a complement to his earlier gift of the law school complex and as a memorial to his wife. Anabel Taylor Hall was designed by Eggers and Higgins in the Collegiate Gothic style and built to provide space for Cornell United Religious Works. The conservative design of the building reflected the donor’s wishes, was compatible with the adjacent existing law buildings, and seemed appropriate for the building’s religious program and the World War II memorial contained in the tower.

Between 1945 and the present, numerous academic buildings were added to the Cornell campus representing a broad spectrum of variations of modernism. As engineering and the sciences migrated to new facilities, the original quadrangle became available for the arts and humanities departments and assumed the name of the “Arts Quad.” In 1960, Civil Engineering vacated Lincoln Hall and the Department of Music moved in the following year. As part of the changes, Morse Hall and the shops north of Franklin (Tjaden) and Sibley Hall were demolished in the late 1950s and the College of Architecture relocated from White Hall to renovated space in Franklin and Sibley Halls in 1959. The unified College of Architecture, Art and Planning was created in 1967. The Department of Architecture began to occupy Rand Hall in 1974. The interior of Rand Hall was altered to accommodate the new use. Partitions were removed from the second and third floors to provide studio space while the ground level was reconfigured to house offices and a model shop. In subsequent years, the building was remodeled again to accommodate additional critique rooms and a computer lab.[39]

The physical changes wrought by the post-war growth of the campus occasionally brought into question building practices which satisfied modern programmatic needs without considering the architectural and historic significance of the existing campus. One example was the replacement of the functionally obsolete Boardman Hall with Olin Library in 1959—the only modern structure defining the original campus quadrangle.

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[39] Kim. “The Department of Architecture and Its Buildings: A Brief History” *The Cornell Journal of Architecture* 73.

Although the design of the new library building deferred to the form of its neighbors and respected the axial view from the A. D. White House, it resulted in the loss of the historic Law School building. To address concerns which arose, the Buildings and Properties Committee of the Board of Trustees adopted a policy to promote compatible new design that would respect the existing campus. The policy states, "older buildings, the spectacular gorges, the views across the town to the west, of the lake to the north, of the valley to the south, the symbolism of the Library Tower, must not only be recognized but embraced by the architect."[40]

On December 21, 1965, 100 years after the establishment of the university, Morrill Hall, the first building erected on the campus, was designated a National Historic Landmark.

Several years later, considerable debate ensued when a new art gallery was proposed on campus. The university's art gallery had been housed in the A. D. White House. To provide greater and more suitable space, located closer to the Department of Art's facilities, the internationally prominent architect I. M. Pei designed a 10-story, 61,000 square-foot building located just west of Franklin Hall (renamed Tjaden) overlooking Library Slope. I. M. Pei, whose well-known international work includes the famous pyramidal entry pavilion at the Louvre, is probably the best-known international practitioner of Modernist architecture. He won the highest award granted in the field of architecture, the Pritzker Prize, in 1983. Other well-known work in the Unites States includes the East Building at the National Gallery of Art in Washington, D.C., and the Rock and Roll Hall of Fame in Cleveland.

The Johnson Museum of Art building was constructed in 1973. It was both praised for the way its massing deferred to the spatial organization of its neighbors and criticized because of its large scale and modern form. Over time, the building has become one of the university's distinctive icons and most easily recognized landmarks. The Johnson Museum of Art, which received the National Honor Award of the American Institute of Architects in 1975, is viewed by many as one of the campus's most significant works of contemporary architecture.

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[40] Cornell University Board of Trustees, Buildings and Properties Committee. "A Policy for Architectural Design at Cornell." 11 June 1966

Figure 22. Johnson Museum from the east. Tjaden is on the right.

Paralleling a national trend, during the last decades of the 20th century, building construction received increasing scrutiny from environmental and historic preservation interest groups. In 1990, the City of Ithaca designated the Arts Quadrangle a local Historic District, including nine Cornell University buildings. The City also designated four other university buildings, the Foundry and the "informal group" of structures south of the Arts Quad, as individual local landmarks. (Please refer to Figure 2 for a diagram showing the location of most of these landmarks. All are shown except for those of the "informal group" which are immediately south of the local historic district.)

CONCLUSION

Cornell University’s campus, including the Arts Quad, has evolved over a period of 135 years. Today, the campus is a diverse collection of landscapes and buildings encompassing a broad range of size, style, and quality. New buildings, like the original buildings, have typically been representative of their eras. Historical movements in planning and architecture are legible throughout the Arts Quad and the entire campus. The Arts Quad and the buildings which surround it now constitute only a small section of Cornell University’s vast campus. The quad still represents the differing but complimentary philosophies of Ezra Cornell and A. D. White. Containing the university’s oldest buildings, most important landmarks and views, the quad remains the university’s most aesthetically distinguished precinct as well as its symbolic heart. Despite the campus’s continued growth, the Arts Quad has retained a scenic aesthetic quality. Increased recognition that the quad and some of the surrounding buildings represent a significant historic resource has resulted in the Arts Quad’s local designation as a historic district, with 13 buildings on the quad or nearby being designated as historic, including Sibley Hall, Lincoln Hall, Tjaden Hall, and the Foundry.

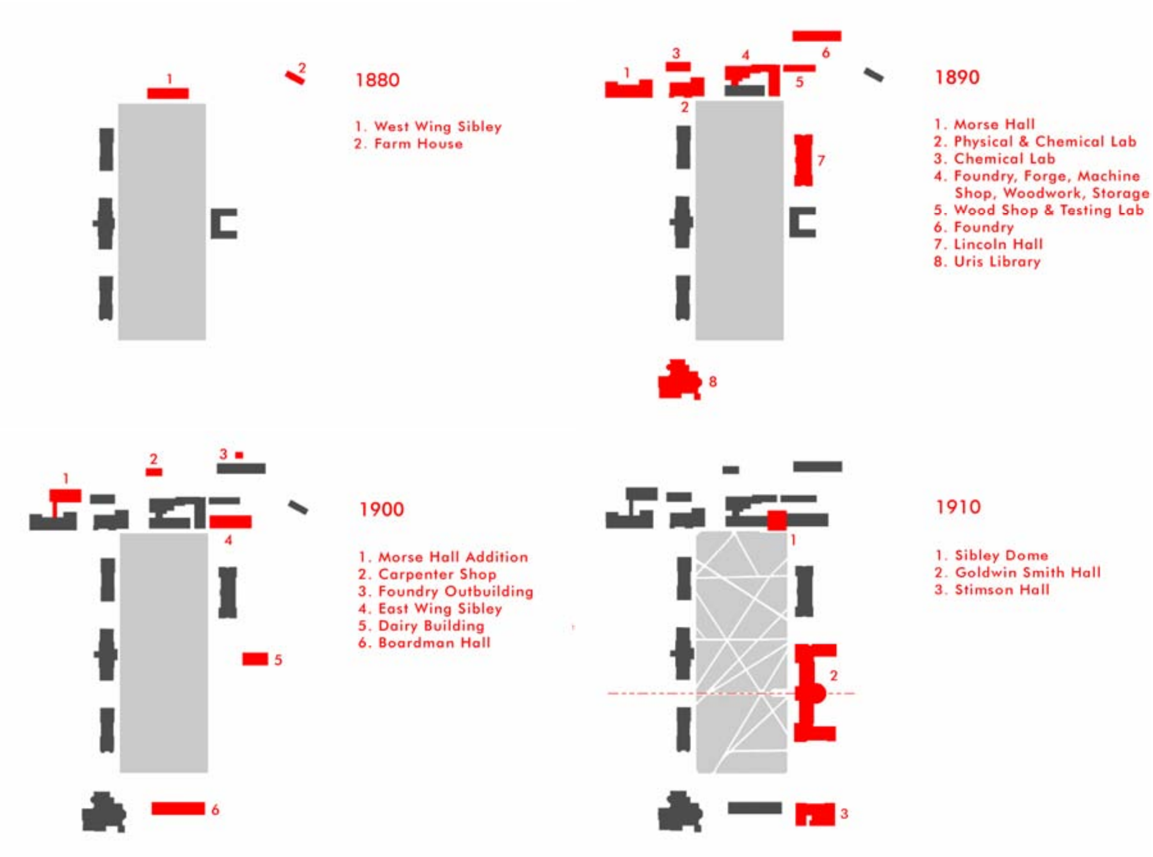

Figure 23. Diagrams of quad development stages from 1880 – 1910.

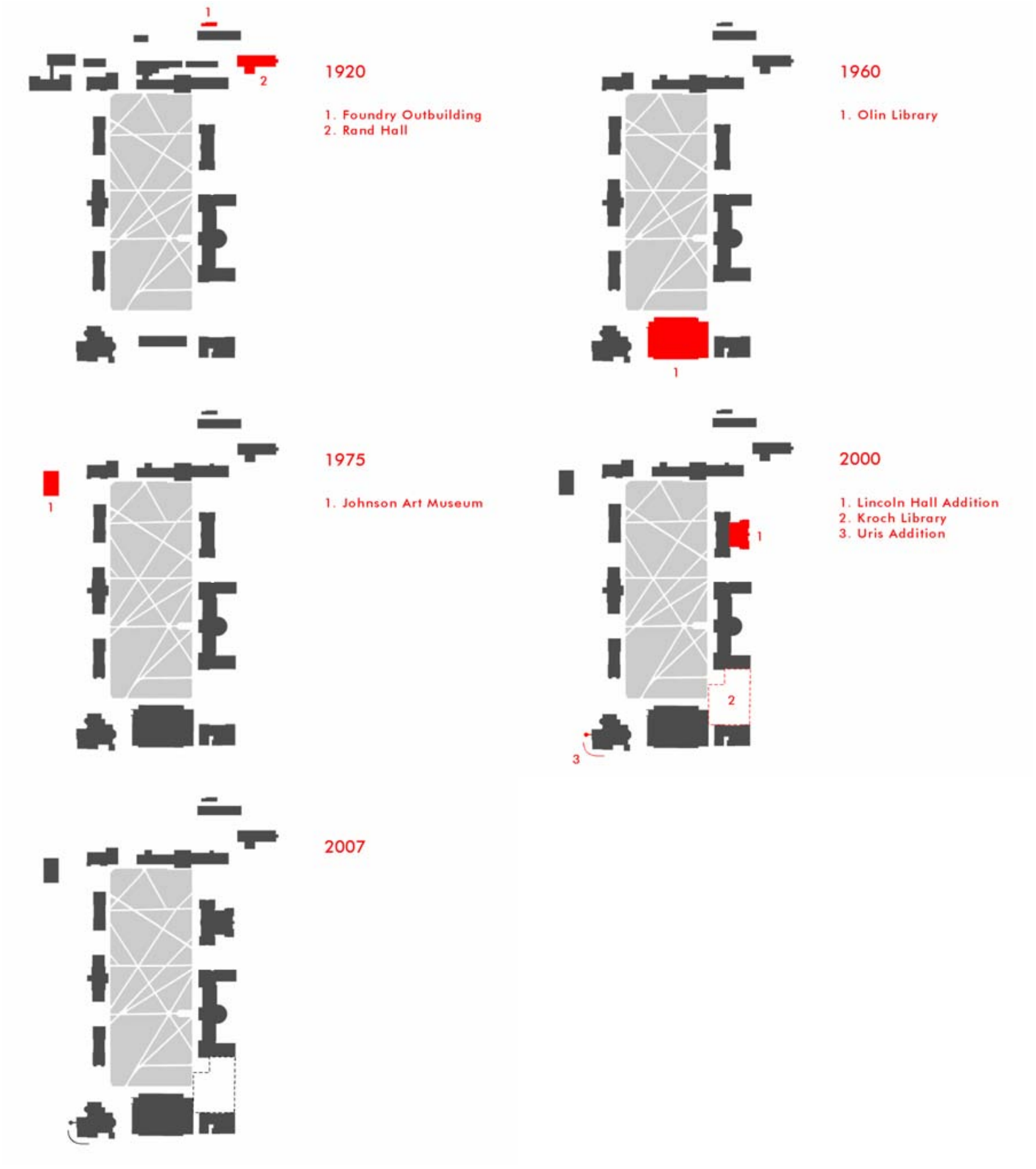

Figure 24. Diagrams of quad development stages from 1920 - 2007.

New building projects, on the Arts Quad and elsewhere on campus, have employed a variety of design approaches to reduce their impact on historic buildings, scenic views and other existing resources. These approaches include:

- Concealment
- Replication
- Contextual design
- Differentiation

For instance, the Uris Library addition, Campus Bookstore and Kroch Library are all examples of concealment underground. The replication of historic details to conceal the age of additions was used in the case of the Jane Foster Wing addition to the Law School at Myron Taylor Hall. Contextual design is the technique of blending new construction with its context but maintaining subtle differentiations in order to reveal the provenance of the new; the Sage Hall addition and the Lincoln Hall additions are examples of the use of contextual design. The Johnson Museum of Art, the Mann Library addition, and the Physical Sciences addition (under construction) are all examples that employ differentiation through the use of contemporary design.

Differing sites, building programs, and design philosophies all influence the selection of the design approach to reduce impact on historic resources. Many projects use a blend of different approaches.

Figure 25. The Kroch Library addition to Olin Library is buried between Olin and East Avenue

Figure 26. The underground addition to Uris Library is visible only from the southwest.

Figure 27. Anabel Taylor Hall, c. 1952, has details duplicated from the earlier Myron Taylor Hall.

Figure 28. The Jane Foster Wing (on the left in the photo) includes c. 1988 replication of details from the c. 1932 Myron Taylor Hall.

Figure 29. View of Lincoln Hall showing contextual design. The 2000 addition on the right has massing, forms, materials, and details similar to, but not matching, the original building.

Figure 30. The Johnson Museum, a modernist icon, is clearly differentiated from earlier buildings by its architectural style.

Academic uses occurring around the university's original quadrangle have changed: sciences, engineering, agriculture, and residence halls have migrated to other areas of the campus leaving libraries, humanities, planning, architecture, and the fine arts, which in turn, have been expanded and adapted in this location. Using various combinations of the design approaches discussed above, Cornell has successfully adapted the historic section of campus to accommodate contemporary uses while preserving the most important historic resources. The Milstein Hall/CAPG projects continue this historic trend. In addition to locating Milstein Hall and the CAPG behind and to the side of the Arts Quad, making them clearly secondary to the major buildings, the designers have relied on concealment and differentiation to respect the historic campus setting.

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HISTORIC RESOURCE INVENTORY

THE ARTS QUAD

Cornell University's main quadrangle is a large rectangular lawn planted with informally located deciduous trees and traversed by numerous walkways. The quad is enclosed by 10 buildings, including a number of the university's oldest structures. Morrill Hall, located at the southwest corner of the quad and completed in 1868, was the first building constructed by the University. Olin Library at the south end, completed in 1961, is the most recently constructed free-standing building defining the Arts Quad. For a summary of chronological development of the Quad please refer to Figure 23 and Figure 24.

Encompassing a variety of architectural styles including Italianate/Second Empire, Romanesque Revival, Beaux Arts, Neoclassical, and Modern, the buildings of the quad are architecturally distinguished and retain a high degree of integrity. Despite its variety of architectural styles, the quad is notable for the conscientious effort made to retain an overall harmony in architectural design. Consistent use of stone, cornice lines, building alignments, and proportions distinguishes the Arts Quad from other areas of the campus.

The Arts Quad is unique. Its present arrangement is the result of the continual growth and change experienced by Cornell from the first plan in 1866[41] to the construction of Olin Hall.

The concept for the quad was a grouping of buildings around a square, 1000 feet on a side. The present quad occupies the western half of that square. The arrangement of the original "Old Stone Row" (White, McGraw and Morrill Halls) echoes that of older campus plans such as the "Old Brick Row" developed at Yale around the beginning of the 19th century and shared with it characteristics identified uniquely with American colleges: separate buildings for separate functions, complete accommodation of the learning and living needs of an academic community, and an open orientation outward toward the non-academic community. The linear arrangement prominently displayed its size to the adjacent town and capitalized on the dramatic western views across the valley. McGraw Hall in the middle of the composition established a central east-west visual axis which was not developed or accented by later improvements to the quad.

The quadrangle is terminated at the north by an earthen terrace on which Tjaden and Sibley Halls were constructed. The terrace was built in order to ensure the cornice of East Sibley aligned with the cornices of the old Stone Row. The strategy was a great success and helps to visually unify the composition. The terrace, together with extension of the northern row east and west of the open lawn, creates a strong visual closure. Tjaden's tower punctuates the northwest corner. These buildings were always oriented toward the quad and the area behind them was always used for ancillary structures. Fall creek was the original source of campus power so the rim of the gorge was the site of workshops as well as steam and electrical generation. Sibley grew over time: West Sibley was started in 1870, East Sibley in 1894, and the center dome completed in 1902. East Sibley was located almost on the original center axis of the quad which probably

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[41] Ithaca Journal and Advertiser, 6 June, 1866.

coincides with Cornell's early vision. Sibley Hall and the dome together create a building longer than any other on the quad. Its size, height, location on the highest ground, nearly symmetrical arrangement, and formal dome make it visually dominant when viewed from the south. The dome's off-axis location is one of the charms of the space and expresses visually how the quad was subject to the forces of unanticipated growth and change.

Buildings forming the east side of the quad are larger in scale than those on the west and visually backed by the hill. This wall of the quad is more closed and focused on the quad than the west wall, with the exception of the opening at the south which provides a view of, and acknowledges the importance of, the A.D. White house.

The quad is closed at the south by the row consisting of Stimson Hall at the southeast corner, Olin library in the center, and Uris Library at the southwest corner. Stimson is the plainest of the three, with simple massing, a lower height, and a greater setback than the others. Olin is massive, modern, and white. A base terrace extends into the quad. The building calls attention to itself because its color and modern detailing contrast with other buildings on the quad. At the southwest corner Uris Library, with its handsome tower, protrudes into the walk and forms a gateway to the quad. This tower is Cornell's most prominent landmark, visible from much of the campus, from the City below, and from across the valley. It is the visual termination of Tower Road, the organizing spine of the newer portion of the campus.

Ground contours reflect naturalistic landscape ideals of the late 19th century; the surface is not a horizontal plane but rather sweeps diagonally up from Uris Library at the southwest corner of the quad to the Sibley dome at the northeast corner of the quad. Although there are many visual and circulatory axes established by the topography and location of the buildings, the yard is not fundamentally a formal, axial, composition. The irregular placement of most buildings, such as the off-center location of the Sibley dome, groups of large deciduous trees providing a park-like ambience, and walks following natural paths create an informal, irregular composition.

The major axis is purely visual, not defined by paving; it is the fall line which runs diagonally across the quad and connects the Sibley dome (and its adjacent gateway opening at East Sibley) with the tower at Uris Library.

The most formal and symbolic axis is the east-west line created by the alignment of the Andrew Dickson White and Ezra Cornell statues with the center of the Goldwin Smith entrance portico.

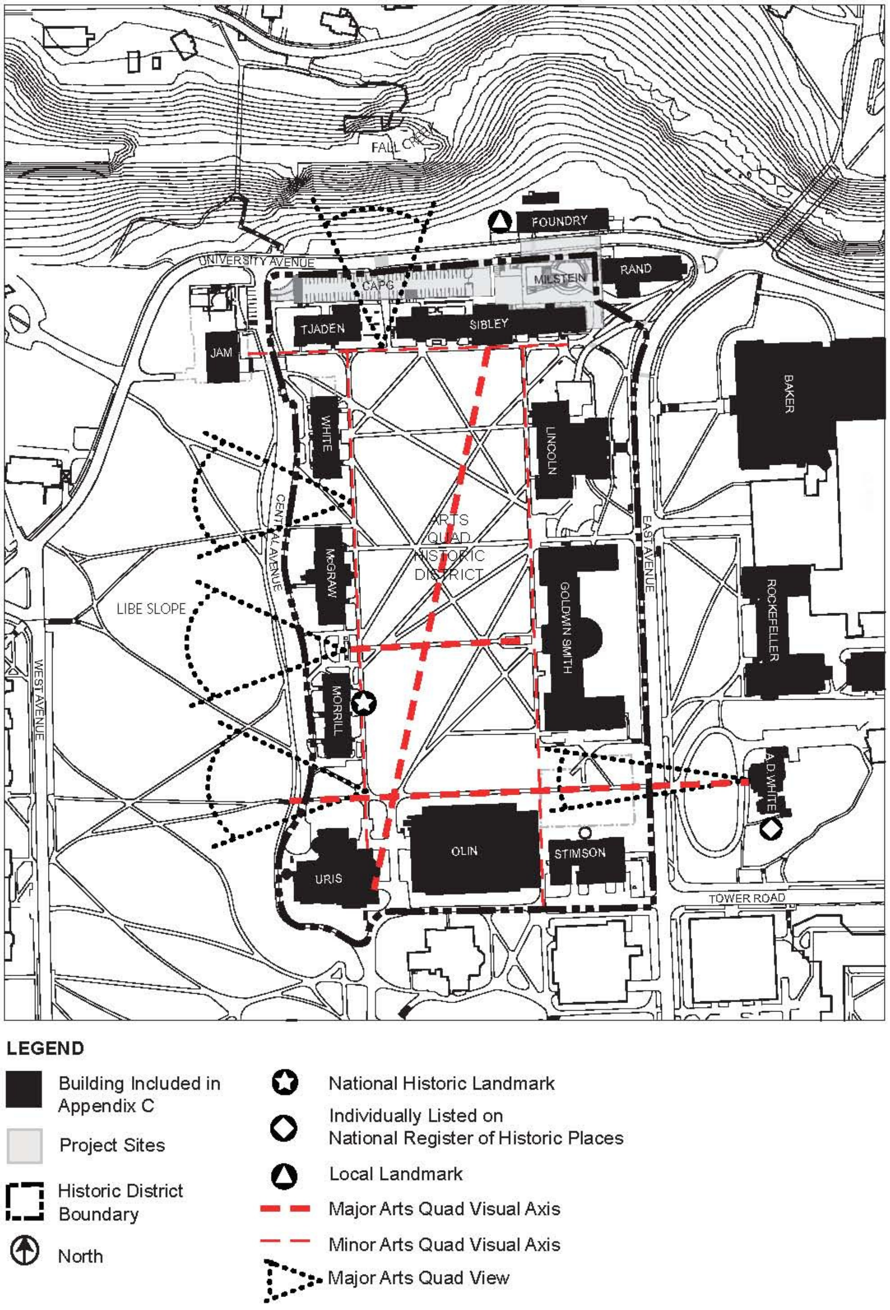

Figure 31. Diagram of the Arts Quad showing major visual axes and views.

A rectangular grid of pathways at the perimeter of the open space emphasizes axes defined by buildings. The north-south axes terminate at the east-west rows of buildings. The east-west axes are open to the west, incorporating the dramatic western view. The northern of these leads from the northeast gateway to the Johnson Museum and the southern extends from the A.D. White house. A secondary rectangular array of walkways crosses the sward from west to east. The most significant of these helps establish an axis pointing from the Goldwin Smith portico to the western view. Along this axis are the A. D. White and Ezra Cornell Statues.

Circulation paths follow the rectangular array of minor axes but even more important may be diagonal walkways, paved over foot-worn paths, which reveal a complex informal pattern of pedestrian circulation. The pattern has nodes at the Uris Library and the Cornell statue from which uphill traffic diffuses and at which downhill traffic consolidates.

The transformation of the original row of buildings into a quadrangle is typical of the expansion experienced by many colleges during the late 19th and early 20th centuries. Cornell's quadrangle's is visually dramatic because of its size and the contrast between the contained views of the manmade space inside the quad and the distant panorama to the west.

Figure 32. Arts Quad, view looking north.

Figure 33. Arts Quad, view looking South.

The Arts Quad is a City of Ithaca designated historic district. Other individual properties with local landmark designations include the Foundry north of the quad, and three buildings in the brick group south of the quad: Sage Chapel, Sage Hall and Barnes Hall. The Cornell Heights residential district north of the campus, across the Fall Creek gorge, is also a City of Ithaca designated historic district. Please refer to Figure 2 for locations of both local and national landmarks.

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ADDRESS/LOCATION	NAME	DATE OF CONSTRUCTION
North End – Arts Quad	**SIBLEY HALL** a.k.a. Sibley College	1870-71 – West Sibley Additions 1881, 1884, 1894, 1902

DESCRIPTION:

Sibley Hall is a three-story building of local stone which forms the north edge of the Arts Quadrangle. The west section, the fourth building built on the campus, employed many of the Second Empire stylistic features of the first three buildings including its cornice line, local stone, mansard roof, bracketed cornices, round-arched windows, and solid, utilitarian image. Originally nine bays by three bays, it was expanded in 1881 and 1884 to include a one-story rear addition and six more bays on the east end. The 15 bay by three bay east section, completed in 1894, largely duplicated West Sibley, and was originally a freestanding building. The 1902 Sibley Dome connected the two with a classically inspired link including medallion windows at the third floor and a large shallow dome over a central auditorium. The north facades of all three sections and the east façade of the east wing are more irregular and modest in their materials and levels of decoration, employing brick rather than stone at the central and east sections, and suggesting the intention of continued expansion. The land north of Sibley Hall was the site of a frequently changing collection of one-story brick buildings in a rough courtyard configuration until the 1950s – these housed workshops for the study of mechanical engineering and included water-powered machinery driven by the adjacent Fall Creek. The 1890 Foundry is the only surviving structure from this group.

SIGNIFICANCE

Sibley Hall is a contributing structure in Cornell’s Arts Quadrangle, a locally designated historic district.

Architecturally, Sibley Hall is significant as a contributing element and focal point in Cornell’s Arts Quadrangle, a locally designated historic district. Its earliest section, designed by Archimedes Russell, who also designed McGraw Hall, was the last of the native gray stone buildings to give the quad its original character. It reflects the architectural development of the quadrangle over its first few decades by combining design elements of the original “Old Stone Row” with Beaux Arts features in the prominent central section which joined the two end wings in 1902. Sibley Dome and Goldwin Smith Hall are the principal surviving examples of the Beaux Arts period of campus planning (1900-1940) as it affected the center of campus.

Historically, Sibley Hall is significant as the original site of Sibley College, Cornell’s first engineering program, and an early manifestation of Cornell’s focus on practical and technological disciplines. The college underwent a major expansion in the 1880s and became recognized as one of the nation’s finest engineering schools. Although the engineering school later expanded into the adjacent Rand Hall and eventually relocated during the 40s and 50s to the current engineering quadrangle south of Campus Road, Sibley Hall remains its historic home. It has been the headquarters of the College of Architecture, Art and Planning since 1967. See the Historic Overview section for additional information on the building’s architects and for historic images.

INTEGRITY (Aspects of integrity defined by the Department of the Interior are location, design, setting, materials, workmanship, feeling, and association)

Sibley Hall retains integrity of location, materials, workmanship, and association.

Design: The exterior has been temporarily altered by accessibility modifications at the eastern entrance. Interior spaces have been changed many times to accommodate changing programs.

Setting: The setting is intact on three sides but has been irreversibly altered north of the building by replacement of the powerhouse and workshops with auto parking.

Feeling: From the south the feeling has changed little since completion of the Dome in 1902. From the north loss of the workshops, increased traffic on University Avenue, and the parking lot make it difficult to sense its original period.

Figure 25 West Sibley Hall and Sibley Dome, from south

Figure 26 Sibley East – south and partial east facades

Figure 27 East Sibley Hall, 2007 – rear (north) façade

ADDRESS/LOCATION	NAME	DATE OF CONSTRUCTION
University Avenue at East Avenue	**RAND HALL**	1912

DESCRIPTION:

Rand Hall is a three-story brick-clad flat-roofed building northeast of Sibley Hall. It was built in 1912 as a support facility for Sibley College, housing the machine shop, pattern shop and electrical laboratories. It consists of a rectangular block of 11 bays by three bays extending east-west along University Avenue, with a three-bay by three-bay block and an arched entrance projecting from its south side. The building contrasts with the revival styles of the adjacent campus structures in its materials and industrial appearance. It has a steel frame with buff brick piers and large multi-paned cold rolled steel industrial windows on each level suitable for wide-open shops. The exterior elevations employ abstracted Neoclassical features such as pilasters, shallow arched windows at the third level, limestone trim, and the third story articulated as an attic.

SIGNIFICANCE

Architectural significance: Rand Hall was designed by the Ithaca firm of Gibb and Waltz, one of whose principals (Arthur Gibb) had designed the adjacent 1902 Sibley Dome. Occupying a central site flanked by the Arts Quad to the southwest and the physical sciences complex to the southeast across East Avenue, Rand Hall embodies the delicate balance between practical and academic instincts which was characteristic of campus development in the early decades of the 20th century.

Historic significance: Rand Hall is not included among the buildings with local landmark designations, either as an individual structure or as part of the Arts Quad. However, it has provided important support space for the programs occupying Sibley Hall – first Sibley College of Mechanical Engineering and later the College of Architecture, Art and Planning. Together with the Foundry, it is one of the group of ancillary structures that provided workshop and laboratory space for the practical education provided to engineering students. Funds for Rand Hall were donated in memory of a family of industrialists. See the Historic Overview for additional information on the development of Rand Hall and for historic images.

INTEGRITY (Aspects of integrity defined by the Department of the Interior are location, design, setting, materials, workmanship, feeling, and association)

Rand Hall retains integrity of location, materials, workmanship, and association.

Design: The exterior design is intact except for removal of the loading dock door at the west and modification of steel windows to accommodate window air conditioning units. Interior spaces have been renovated to accommodate the change of use from engineering workshops to design studios.

Setting: The setting is intact on three sides but has been irreversibly altered west of the building by the removal of the workshops. Today, the site is dedicated to auto parking.

Feeling: Rand Hall was the easternmost of a long row of masonry workshops supporting the engineering program in Sibley Hall. It remains after removal of the other workshops. Removal of the trolley from East Avenue and increased auto traffic on University Avenue have also changed the historic feeling of the building.

Figure 28 Rand Hall from the south

Figure 29 Rand Hall from the northeast

ADDRESS/LOCATION	NAME	DATE OF CONSTRUCTION
University Avenue	**THE FOUNDRY**	1890

DESCRIPTION:

The Foundry is a one story building with a footprint approximately 190 feet by 40 feet, with the long axis parallel to University Avenue, between University Avenue and Fall Creek gorge. It was built in 1890 as part of the complex of shops grouped north of Sibley Hall. It has a brick base and wood framed piers enclosing a repetitive series of tall multi-paned wood windows. The hipped roof is topped by a window monitor extending its full length. A modern ceiling blocks interior light and ventilation from the monitor. Originally open space to house workshops and a forge, the interior is now a series of high-ceilinged art studios. North of the Foundry is a small wooden shed of undistinguished design, c. 1933, used originally for materials storage and more recently as a sculpture studio.

SIGNIFICANCE

The Foundry is a locally-listed landmark.

Architecturally, the building can be considered a vernacular building, designed by A.B. Canaga, Assistant Professor of Mechanical Engineering, to serve a utilitarian function with little attention to appearance and no fine art pretensions. Almost all university buildings, including the adjacent workshops, were constructed of masonry; the Foundry is of wood, some of which was reportedly salvaged from the temporary building on the quad which housed civil engineering and architecture programs prior to 1889.

Historically, the building housed foundry casting and sand molding equipment and the blacksmith shop associated with Sibley College. As the College of Engineering gradually relocated to the new engineering quadrangle during the 1940s and 1950s, the remaining engineering shops behind Sibley Hall were demolished to allow for the construction of parking lots, but the Foundry continued as an ancillary engineering facility until 1960, when it was assigned to the School of Art, which also occupied space in Franklin Hall. It has provided space for sculpture studios and other studio art functions since 1963. In recognition of its status as one of the few remaining examples of a past building type (engineering shops north of Sibley), the Foundry is one of four Cornell buildings listed as an individual landmark by the City of Ithaca. See the Historic Overview section for historic images of the Foundry and the rest of the engineering shops

INTEGRITY (Aspects of integrity defined by the Department of the Interior are location, design, setting, materials, workmanship, feeling, and association)

The Foundry retains integrity of location, materials, workmanship, and association.

Design: The structure has been modified several times in an effort to reinforce the original lightly framed, inadequately braced, structure. About a quarter of the perimeter knee wall has been replaced. Interior spaces have been rearranged to accommodate changing programs.

Setting: The setting is intact on two sides. North of the Foundry sheds obscure the setting. South of the building the setting has been irrevocably altered by removal of the workshops. The grade of University Avenue has been slightly raised, subtly reducing its apparent height and directing damaging runoff toward the building.

Feeling: The feeling of the building is much changed from the time it was actively used for its original purpose. Its location among other workshops, the physical connection to, and the dependence on, the stream as a source of power, and the pace of travel along University Avenue have all changed, and resulted in the loss of the sense of its historic time.

Figure 30 The Foundry

Figure 31 The Foundry, rear façade and shed, looking east

ADDRESS/LOCATION	**NAME**	**DATE OF CONSTRUCTION**
Arts Quad, East side	**LINCOLN HALL**	1888

DESCRIPTION:

Lincoln Hall is a rough-hewn stone block with a steeply pitched slate roof, dormers, and prominent wood-shingled gables facing north, south and west. Its style is modified Richardsonian Romanesque. The red Medina sandstone facades are broken up by projecting elements at the north and south ends. The building is three stories (basement partially exposed) plus attic, and originally had small stone towers at each end, which were removed c. 1965 to alleviate maintenance problems. The stone walls feature belt courses at the first and second floors and trimmed arches at the main building entrances.

The building underwent extensive interior renovations during the late 1960s and in 1999-2000. A contextual modern addition of red brick with limestone trim was built on the east side as part of the 1999-2000 project.

SIGNIFICANCE

Lincoln Hall is a contributing structure in Cornell's Arts Quadrangle, a locally designated historic district.

Architectural Significance. Designed in the Romanesque Revival style, Lincoln Hall resembles the 1882 Franklin Hall (now Tjaden Hall), the first building to vary from the materials and design details of the "Old Stone Row." Architect Charles Babcock (who also designed Franklin Hall seven years earlier) conceived the building as a brick structure, but modified it to Medina sandstone at the insistence of A.D. White, whose vision of the main quadrangle included only stone buildings. As at Sibley Hall, brick was an acceptable façade material on building sides not facing the quad.

Historical significance. It was built in 1888 for the departments of architecture and civil engineering, and it was the first permanent building to establish the eastern edge of the quadrangle, thereby decreasing the east-west dimension from its originally conceived 1,000 foot length. Lincoln Hall housed the Departments of Architecture and Civil Engineering until the late 1950s, and has been the home of the Music Department since 1963. The 1999-2000 renovations and addition, designed by Shepley Bullfinch Richardson and Abbott, provided additional space for music library, classrooms, practice and performances, within a compatible modern building shell.

Figure 32 Lincoln Hall, from Arts Quad - south façade. 2000 addition at right

ADDRESS/LOCATION	NAME	DATE OF CONSTRUCTION
Arts Quad, East side	**GOLDWIN SMITH HALL**	1906 Dairy Building - 1893

DESCRIPTION:

Goldwin Smith Hall is a two-story hip-roofed stone block which forms the east side of the Arts Quadrangle. Completed in 1906, the symmetrical main block features six bays of windows on each side of a Doric pedimented portico and central entrance. Subsidiary lower blocks at the north and south ends wrap around to the east; the north of these was originally the Dairy Building, built in 1893 for Cornell's agriculture program and later incorporated as a wing of Goldwin Smith Hall. Features adopted from the Dairy Building and employed with a neoclassical flair throughout the main block are light tan rough ashlar masonry, hipped roofs, denticulated cornices, and smooth limestone base and belt courses and first floor window surrounds. The exterior is largely unaltered since the time of construction, and the interior, the most elaborate of the academic buildings at the time, has been well preserved.

SIGNIFICANCE

Goldwin Smith Hall is a contributing structure in Cornell's Arts Quadrangle, a locally designated historic district.

Architectural Significance. Goldwin Smith Hall was completed in 1906 to the design of Carrere and Hastings, one of the nation's outstanding Beaux-Arts architecture firms, particularly well known as the designers of the New York Public Library. Goldwin Smith Hall completed the construction of the stone quadrangle, fulfilling the vision of A.D. White, and lending a formal Beaux Arts component to the east side of the quad, in a similar vein to the 1902 formal Sibley Dome at the north side.

Historical significance. The 1893 Dairy Building, now the north wing of Goldwin Smith Hall, was designed by Charles Osborn in response to the appropriation of $50,000 by the New York State legislature – the first state-funded building at Cornell and the precursor to the early 20th century agriculture quadrangle. The commission for Goldwin Smith Hall included the design of Rockefeller Hall and a campus master plan; all three were completed between 1902 and 1906. Goldwin Smith Hall was built with university funds to house the College of Arts and Sciences, as it still does. It was the last building to be built on the quad until 1959-61, when Boardman Hall was demolished and replaced with the modernist Olin Library. The name of the building commemorates Professor Goldwyn Smith, Regius Professor of History at Oxford, who was brought from England by Ezra Cornell and named Nonresident Professor of English History in 1868.

Figure 33 Goldwin Smith Hall - center entrance and portico, from Arts Quad

Figure 34 Goldwin Smith Hall from east. North section (right) is former Dairy Building

ADDRESS/LOCATION	**NAME**	**DATE OF CONSTRUCTION**
Arts Quad, southeast corner	**STIMSON HALL**	1903

DESCRIPTION:

Stimson Hall is a three-story gray sandstone block located at the southeast corner of the Arts Quad. It was the fourth Cornell building designed by local architect William Henry Miller, and it joined two of his other structures – Uris Library and Boardman Hall (on the site of the current Olin Library) to complete the south end of the Arts Quadrangle. The symmetrical block faces north with a prominent central arched entrance. The first floor is of rusticated stone, while the second has 17 bays of large windows spanning between stone pilasters. The third floor is articulated as an attic with smaller windows. A hipped slate roof covers the block.

SIGNIFICANCE

Stimson Hall is a contributing structure in the Cornell Arts Quadrangle Local Historic District.

Architectural significance. The designer, William Henry Miller, considered Cornell's first architectural student, is locally important as the architect of many early 20th century Ithaca landmarks. Stimson Hall is similar in massing to many secondary school buildings of the time, reflecting educational theories codified in rules and regulations promulgated by the State Education Department.

Historical significance. Stimson Hall was built to house the Ithaca division of Cornell's College of Medicine, an institution created in the late 1890s as a partnership between Cornell and a group of existing medical colleges in New York City, where Cornell's medical school is today. While Stimson Hall was highly regarded as a medical instruction facility, the Ithaca program was overshadowed by the better-funded New York branch, which offered better opportunities for clinical work. Around 1940 the medical school was consolidated in New York and Stimson Hall became the home of the newly formed Department of Zoology, and is now home to part of the Department of Biological Sciences.

Figure 35 Stimson Hall, north facade

ADDRESS/LOCATION	NAME	DATE OF CONSTRUCTION
Arts Quad, south end	**OLIN LIBRARY**	1960-61

DESCRIPTION:

Olin Library is a seven-story limestone and glass block that dominates the south end of the Arts Quad. It replaced the Romanesque Revival Boardman Hall (1892). Olin was the first new building on the quad since Goldwin Smith Hall, and is its only freestanding modern building. The building consists of a wide central block with narrow vertical windows over a larger red sandstone base story which extends forward into the quadrangle, creating a plaza at the second floor level with paths and seating areas overlooking the quad, and some ballasted flat roofs. The top floor has a gray slate mansard roof above an expanse of glass. The principal entrance is on the west side, facing Uris Library. Several carved architectural elements from Boardman Hall (gargoyle heads and stone faces) are incorporated into the north and west facades of Olin Library.

A three story underground addition, the Carl A. Kroch Library, was completed in 1992, located between Olin, Stimson and Goldwin Smith Halls. Kroch Library houses rare books and special collections. Its only outward manifestation is a set of skylights visible in the area between Stimson and Goldwin Smith Halls. The addition was designed by Shepley, Bullfinch, Richardson & Abbott, of Boston.

SIGNIFICANCE

Olin Library is identified as a non-contributing element within Cornell's Arts Quadrangle in the local historic district nomination, "included because of its geographical location but … not considered to be historically or architecturally important."[42] When the nomination was written, it was less than 50 years old, and its architectural style may have been considered incompatible with the 19th and early 20th century structures enclosing the rest of the quadrangle. It is now approaching 50 years old and has become an accepted element in the functional and architectural make-up of the central campus, though some still regret the loss of the architecturally distinguished Boardman Hall, home to Cornell's Law School and subsequently its history and government programs.

Architectural significance. Olin Library was designed by the New York firm of Warner, Burns, Toan and Lunde and completed in 1961. While its architectural vocabulary and scale differ markedly from that of the other Arts Quad buildings, its design reflects several measures intended to respect the neighboring buildings including symmetrical massing, cornice alignment with Stimson Hall, stone façade, brick first story, regular fenestration, and mansard roof. Its massing also respects the western view from the A.D. White House. These design features place it squarely in the architectural tradition of the Arts Quad, where new buildings consistently employed the popular styles of their time while remaining compatible with their neighbors in scale, materials and siting. The 55-year span between the completion of Goldwin Smith Hall and Olin Library, and the dramatic changes in architectural vocabulary over that period, together with its very prominent south-end position on the quad, make Olin stand out as a 20th century element within an otherwise traditional building group.

Historic significance. Olin Hall does not contribute to the historic district.

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[42] Cover letter of March 7, 1990 from Historic Ithaca Executive Director Barbara Ebert to the Common Council of the City of Ithaca, proposing the nomination of the Arts Quad as a local landmark district.

Figure 36 Olin Library, view from north (Arts Quad façade)

ADDRESS/LOCATION	NAME	DATE OF CONSTRUCTION
Arts Quad, southwest corner	**URIS LIBRARY** (includes McGraw Tower)	1891

DESCRIPTION:

Uris Library is a three-story Romanesque Revival building located at the southwest corner of the Arts Quadrangle. Its ashlar stone mass and the attached McGraw Tower have become one of Cornell's most widely recognized symbols, prominent in campus views from the west (across the Libe Slope), the south (from the north end of College Avenue), and the Arts Quad. The building originally was called "University Library", and contained book stacks and seminar rooms, along with a highly decorated reading hall devoted to A.D. White's personal book collection, the most elaborate interior space on the campus at the time. The exterior detailing employs an irregular massing and an elegant mix of rough, smooth and polished sandstone, hipped and gable roofs, round arched and rectangular windows, and classical elements. The square McGraw Tower, originally called the Library Tower, features a round clock facing in each direction as well as triple-arched openings for the university chimes. It is topped by a pyramidal, patterned, slate roof, the tallest architectural element of the original quadrangle. There is a generous landscaped plaza outside the east-facing main entrance, joining Uris and Olin Libraries, which jointly serve as Cornell's main library complex.

The building was renovated for primarily undergraduate use in 1962 to accompany the opening of the larger Olin Library. At that time the building was renamed Uris Library, in honor of the donor who sponsored the renovations, and the tower was renamed McGraw Tower. In 1982 a largely underground reading room, designed by Gunnar Birkerts, was added to the west side of the building,.

SIGNIFICANCE

Uris Library is a contributing structure within Cornell's Arts Quadrangle, a locally designated historic district.

Architectural significance. Uris Library plays an important role architecturally as a mediating element between the original stone buildings which preceded it along the west and north sides of the Arts Quad (mostly 1868 – 1872) and the "informal group" of High Victorian brick buildings built south of the Quad in the 1870s, including Sage Chapel, Sage Hall and Barnes Hall. It was the second Cornell commission of William Henry Miller (the first was the A.D. White House), and is widely regarded as his masterpiece and among the best of Cornell's 19th century buildings. Miller's design reflects the influences of a proposed design for the Cornell library by Henry Van Brunt, architect of Harvard's 1870s Memorial Hall, and of H.H. Richardson's libraries of the 1870s and 1880s. It served along with Miller's similarly styled Boardman Hall to solidify the university's architectural strategy of lining the quadrangle with solid and elegant historical revival-style buildings of compatible materials and scale. This strategy prevailed through the early years of the 20th century until the construction of Olin Library in 1960.

Historic significance. The new library was planned over an extended period in the1880s as a result of a promised library bequest that never materialized and was ultimately replaced by a donation from Henry W. Sage. It was designed to house 400,000 volumes and, when dedicated (already housing over 100,000 volumes), was considered to be the finest college library in America.[43]

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[43] Parsons. P.271.

Figure 347 Uris Library and McGraw Tower

ADDRESS/LOCATION	NAME	DATE OF CONSTRUCTION
Arts Quad, west side	**MORRILL HALL**	1868

DESCRIPTION:

Morrill Hall is a three-story stone Second Empire block located on the west side of the Arts Quad, overlooking Cayuga Lake, the Village of Ithaca and the West Hill beyond. It has a high basement, tall arched windows, and a mansard roof, and consists of three seven-bay sections, with the central section slightly recessed and with central entrances into each section on both east and west sides. It was the first building to be completed on the Cornell campus, and is a National Historic Landmark. Originally the three sections had no interior connections, and each housed one of the institution's principal functions – classrooms, a library and an auditorium in the center, student residence rooms in the north, and faculty and administration offices in the south.

The building is of local gray bluestone, quarried from the adjacent Library Slope, with lighter gray stone quoins and voussoirs. The mansard roof features bull's eye arched dormers. The east and west facades are virtually identical, denoting the university's dual purpose of presenting a distinguished front to the town of Ithaca at the foot of East Hill and anchoring a university quadrangle on the plateau to the west. Morrill Hall, which was originally called South University, served as the design and detailing standard for the buildings which followed in the next four years – White Hall (then called North University), McGraw Hall, and Sibley Hall.

The exterior of Morrill Hall is largely unchanged from its original appearance, though its interior has undergone many changes of use and alterations and has little remaining of the original interior. It currently houses the Departments of Romance Studies, Russian Literature, and Linguistics.

SIGNIFICANCE

Morrill Hall is the only structure on the Cornell campus listed as a National Historic Landmark, and one of the few listed in the National Register of Historic Places. It is a contributing structure within Cornell's Arts Quadrangle, a locally designated historic district.

Architectural significance. Shortly after the institution was chartered in April 1885, a Board of Trustees was appointed and a Building Committee was established. Cornell visited Harvard, and reported to the Board with a suggested building program including the use of local stone, separate buildings and separate entrances within the buildings. Morrill Hall was designed by the Buffalo firm of Wilcox and Potter, built between 1866 and 1868, and opened in the fall of 1868. Founder Ezra Cornell directly oversaw the building design and construction, and it reflects the instincts toward economy and efficiency which he brought to the establishment of the university. The work proceeded slowly with the accommodations barely completed on Inauguration day, October 7, 1868.

Historical Significance. It is the initial structure of the university. At the inaugural ceremonies, Ezra Cornell nicely summarized the intentions of the founders:

> "I hope we have laid the foundation of an institution which shall combine practical with liberal education, which shall fit the youth of our country for the professions, the farms, the mines, the manufactories, for the investigations of science, and for mastering all the practical questions of life with success and honor. I believe we have made a beginning of an institution which will prove highly beneficial to the poor young men and the poor young women of our country."[44]

Cornell's inaugural words highlight several important themes in Cornell's history as a pioneering institution with emphasis on the practical along with the academic, and the inclusion of women and those of modest means among the student body. South University Building, or University Building No.1, was renamed for Senator Justin Morrill, author of the Land Grant Act, in the 1890s.

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[44] quoted in Bishop, Morris, A History of Cornell, Cornell University Press, Ithaca, NY 1962, p. 87-88.

Figure 38 Morrill Hall – south and east facades, view from south end of Arts Quad

ADDRESS/LOCATION	NAME	DATE OF CONSTRUCTION
Arts Quad, west side	**MCGRAW HALL**	1869

DESCRIPTION:

McGraw Hall, the university's third building, is the central building on the west side of the Arts Quad, and is flanked by the two matching original buildings (Morrill and White halls), each three stories, built one year earlier. Similar to its earlier neighbors in its Second Empire style, materials, and scale, it is more imposing and was the central focal point and unifying element for the growing institution. It has a symmetrical five-section c-b-a-b-c plan, with a and b sections having four stories, c sections having two. All have high basements and mansard roofs with dormers. A tower with an elongated pyramid roof, the original site of the campus chimes, is attached to the west side, giving the west façade prominence over the east (quadrangle) side, although otherwise the two sides are very similar. Slate roofs feature multi-colored horizontal bands. Masonry detailing, windows, dormers, and entry stairways are similar to the earlier buildings.

Between Morrill and McGraw Halls a statue of Ezra Cornell, sculpted in 1918 by Herman Atkins McNeil, an instructor at Cornell, faces the Arts Quad. It is located directly across the quad from a statue of A.D. White, sculpted in 1915 by Karl Bitter and placed in front of the main entrance to Goldwin Smith Hall. Both sculptures are mounted on substantial stone pedestals, and both are noted as contributing elements in the local landmark nomination for the Arts Quad.

SIGNIFICANCE

McGraw Hall is a contributing structure within Cornell's Arts Quadrangle, a locally designated historic district.

Architectural significance. The architect for McGraw Hall was Archimedes Russell of Syracuse, who went on to design the 1870 West Sibley Hall and its 1880s additions. Russell succeeded in the task of creating a new, compatible, and unifying variation on the original architectural theme of Morrill and White Halls, and set the precedent for further development of the quadrangle in this vein. The design of McGraw Hall was influenced by the advice of Frederick Law Olmsted, who visited the campus during the initial construction at the invitation of A.D. White. Olmsted's notions of an informal composition for the campus plan failed to derail the quadrangle scheme (though they did influence the development of the "informal group" of brick buildings to its south). However, his suggestion of a wide terrace on the west side of the three campus buildings, overlooking Ithaca and the lake, though never fully implemented, did likely influence the location of the chime tower on the west rather on than the east side of the building.

The sculptures of Ezra Cornell and A.D. White define an important visual and circulation axis and are architecturally significant as contributing decorative elements among the historic buildings of the quadrangle.

Historical significance. McGraw Hall was named for its donor, John McGraw, a local lumber merchant and Cornell Trustee. His daughter, Jennie McGraw Fiske, was the donor of the chimes and the namesake of McGraw Tower, the current home of the chimes (part of Uris Library). It originally housed part of the University Library as well as a natural history museum in the center section. Its exterior is largely unchanged from the original; its interior has undergone numerous renovations and housed a wide array of academic programs. It currently houses the Departments of History, Archaeology, Anthropology and a writing institute.

The sculptures of Ezra Cornell and A.D. White commemorate the university's two founders and their complementary (and sometimes opposing) ideas and influences.

Figure 39 McGraw Hall

Figure 40 Statue of Ezra Cornell, between Morrill Hall and McGraw Hall, looking west

ADDRESS/LOCATION	NAME	DATE OF CONSTRUCTION
Arts Quad, west side	**WHITE HALL**	1868

DESCRIPTION:

White Hall, on the west side of the Arts Quad, was completed on the heels of Morrill Hall and is nearly identical to Morrill in its massing and exterior detailing – three stories plus mansard roofed attic and high basement, three seven-bay sections, gray Ithaca stone with limestone quoins and voussoirs. Rehabilitation in 2003 included replacement of much of the interior structure but preserved most of the original exterior fabric.

SIGNIFICANCE

White Hall is a contributing structure within Cornell's Arts Quadrangle, a locally designated historic district.

Architectural significance. It was designed by the firm of Wilson and Potter as a match to Morrill Hall. Together with Morrill and McGraw Halls it makes up the "Old Stone Row" of buildings defining the west side of the Arts Quad and setting materials and scale standards for the remainder of the quadrangle. Its architectural style is Second Empire.

Historic significance. The second building built at Cornell, White Hall originally housed student residence rooms, classrooms and a large lecture hall in the center section. It has housed many different programs over the years, including the College of Architecture and the Math Department and is currently the home of the Departments of Government, Near East Studies and Visual Studies.

"North University" was renamed in honor of the university's first President, Andrew Dickson White, in 1883.

Figure 41 White Hall, east façade - view from north end of Arts Quad

ADDRESS/LOCATION	NAME	DATE OF CONSTRUCTION
Central Ave., northwest of Arts Quad	**HERBERT F. JOHNSON MUSEUM OF ART**	1973

DESCRIPTION:

The Johnson Museum is a starkly modernist sculptural composition of reinforced concrete, built in the early 1970s off the northwest corner of the Arts Quad, at the north end of the Library Slope. It has 10 floors (four underground) and includes permanent and temporary exhibition space, collection space for the university's art collections, arts classroom space and offices. The composition includes a tall (multi-floor) covered outdoor sculpture gallery in the center of the building, with an exhibit floor projecting above it. The north façade has a grid of large square windows; otherwise glass areas are typically in wide horizontal bands. The building offers spectacular views of the campus and the vistas to the north, south and west from several floor levels.

A major expansion of the Johnson Museum is currently in the planning stages, designed by Pei Cobb Freed, the successor firm to I.M. Pei, the architect of the original building. The concept for the wing was developed at the time of the original design. The addition will extend three floors northward, two of them below grade, and include classroom, exhibition, storage, office and lecture space. It is scheduled to open in 2010.

SIGNIFICANCE

The Johnson Museum is not included in the local landmark nomination as a contributing component in the Arts Quadrangle or as an individual historic landmark. (At the time the nomination was prepared the museum was less than 20 years old.)

Architectural significance. The Museum is one of Cornell's most widely recognized and admired buildings, both for its prominence on the Cornell skyline and for its bold modern design, which was recognized with the American Institute of Architects' National Honor Award in 1975.

Historic significance. The Johnson Museum occupies the site of Morse Hall, a three-story brick chemistry building built in 1888, damaged by fire in 1916, and demolished in the 1950s. Morse Hall was regarded as an inferior addition to the campus because of its mundane design, its brick material (offensive to the sensibilities of A.D. White) and especially for blocking the view to the northwest from the Arts Quad. After Morse Hall's demolition, the site was empty except for a parking lot (shown on the 1966 campus plan) until construction of the Johnson Museum. Since its construction the museum has combined with Tjaden and Sibley halls and The Foundry to provide a collective home for the art and architecture programs at the north end of the Arts Quad.

Figure 42 Johnson Museum, view from Arts quad

Figure 43 Johnson Museum, north and east facades

ADDRESS/LOCATION	NAME	DATE OF CONSTRUCTION
Arts Quad, northwest corner	**OLIVE TJADEN HALL**	1883

DESCRIPTION:

Olive Tjaden Hall, originally called Franklin Hall, is a three-story red Medina sandstone block occupying the northwest corner of the Arts Quad. Built in 1881-83, it was the first building on the quad to deviate from the strict architectural vocabulary of the “Old Stone Row,” employing a different stone color and simplified elements of the Romanesque style including an asymmetrical composition, steeply pitched hipped roof with dormers and a tall elongated pyramid tower at the southwest corner. It relates to its earlier neighbors with its denticulated cornice, belt courses, round arched windows and banded slate roofs. A distinctive feature of the building is commemorative medallions, including the names and images of the world’s greatest scientists, embedded in stone masonry at the third floor level – a feature suggested by A.D. White. There is a one story addition on the north,

The pyramidal tower roof was removed in 1955 to simplify maintenance but restored to its original configuration during a renovation completed in 1998. After the relocation of the physical science departments to new facilities on East Avenue in the early years of the 20th century, Franklin Hall became part of the architecture and arts complex, and has served as the headquarters of the Department of Art since the 1998 renovation, which entailed replacement of most of the interior structure and finishes.

SIGNIFICANCE

Tjaden Hall is a contributing structure within Cornell’s Arts Quadrangle, a locally designated historic district.

Architectural significance. Tjaden Hall was designed by Charles Babcock, Cornell’s first professor of architecture and dean of the School of Architecture from its inception in 1871 to 1896. His other commissions at Cornell included Sage Chapel and Sage College in the 1870s, two Ruskinian Gothic masterpieces in the “informal group” of buildings south of the Arts Quad, as well as Lincoln Hall in 1888. Conceived as a utilitarian building, brick was considered as an exterior material for cost reasons, but red sandstone was selected instead as a compromise material to honor A.D. White’s vision of a stone quadrangle. As the first building to deviate significantly from the design details of the Old Stone Row and Sibley Hall, it set a precedent for compatible and contextual design employing more current architectural styles but respecting the scale and tone of the earlier structures on the quadrangle; this approach has prevailed for the most part and served the institution well.

Historical significance. The building originally housed the Physics Department on the ground floor and the Chemistry Department on the upper floors. It also housed Cornell’s Department of Electrical Engineering, the first such department in the country. Originally named for Benjamin Franklin, the building was renamed in 1981 after Olive Tjaden Van Sickle, a prominent woman architect in the New York area and a graduate of Cornell’s School of Architecture (Class of 1925), whose bequest funded the 1990s renovations.

Figure 44 Tjaden Hall, view from northeast

ADDRESS/LOCATION	NAME	DATE OF CONSTRUCTION
East Avenue	**BAKER LABORATORY**	1921

DESCRIPTION:

Baker Laboratory is elevated on a rise above East Avenue and is adjacent to the north side of the Physical Sciences Building project site. It is a ca. 1923, Beaux Arts style, U-shaped, three-story building incorporating a steel-frame structure clad with locally quarried stone laid in squared-rubble bonding pattern. Quoins, cornices, window surrounds, and other decorative elements are executed in cut limestone. The west-facing main façade incorporates a slightly projecting center pavilion flanked by symmetrical eight-bay wings. Within the center pavilion is a two-story, five-bay, recessed portico supported by limestone Ionic columns. The roof of the center pavilion projects above the rest of the building. In the repeating bays of all three primary facades, the first and second floor windows are housed in a single tall, narrow masonry opening. The steel spandrel panel is embellished with dentils, fish scales and a large cartouche. The third floor is articulated as an attic-story and is crowned with a prominent cornice and parapet. The identical north and south facades repeat the design elements of the main façade, including a three-bay version of the recessed portico. The unadorned exterior walls of the interior courtyard are clad with buff brick. The utilitarian interior of the building lacks the architectural development found on the exterior.

SIGNIFICANCE

Baker is not an officially recognized landmark.

Architectural significance. Baker Lab is a restrained example of the Beaux Arts style. The building was the collaborative work of local architect Arthur N. Gibb and the nationally prominent architecture firm of Day and Klauder based in Philadelphia.

Historical significance. The building is significant for its association with the chemistry department and as part of the of expansion the university experienced during the first thirty years of the 20th century.

Figure 45 Baker Laboratory, view from southwest (East Ave.)

ADDRESS/LOCATION	NAME	DATE OF CONSTRUCTION
East Avenue	**ROCKEFELLER HALL**	1906

DESCRIPTION:

Rockefeller Hall is an eclectically styled, hip-roof, three-story, steel-frame building located on the east side of East Avenue between Baker Laboratory and the A.D. White House. Its exposed foundation is clad with rock-face stone. Above the limestone water table, the exterior walls are clad with brick laid in Flemish bond. The floor-to-floor height of the second floor is greater than the first and third floors. This symmetrical building consists of a main block and two perpendicular wings. The building's two primary entrances face East Avenue and are located at recessed sections between the main block and the wings. Repeating bays of windows occur on most areas of the building's exterior. Tripartite windows at the second and third floors are contained in a single masonry opening and are distinguished by intricately detailed wood spandrel panels. The slate-clad hip roof incorporates broadly overhanging flared eaves. The eave soffit is embellished with elongated modillions.

It currently houses the Departments of Latino, Asian and Near East Studies, and provides classroom space for humanities and physical sciences.

SIGNIFICANCE

Rockefeller Hall is not an officially recognized landmark.

Architectural significance. The building is the work of Carrère and Hastings, renowned New York City architects, who designed Goldwin Smith Hall at the same time. The massing and hip roof form of Rockefeller Hall recall that of Goldwin Smith Hall. Rockefeller Hall underwent a substantial interior renovation in 1980, including minor alterations to the south façade.

Historical significance. Rockefeller Hall was the home of Cornell University's physics department from 1906 until 1965 when the department was moved to Clark Hall.

Figure 46 Rockefeller Hall, view from west

ADDRESS/LOCATION	NAME	DATE OF CONSTRUCTION
East Avenue	**A.D. WHITE HOUSE**	c. 1873

DESCRIPTION:

The Andrew Dickson White House is located at the northeast corner of the intersection of East Avenue and Tower Road, on a rise overlooking the Arts Quad and the vista to the west. It is the last remaining one and the most imposing of the group of 19th century residences known as “Faculty Row”. The house is in the Victorian Gothic style, of red brick over a rusticated stone foundation, and features a pyramidal slate roofed entrance tower, bay windows, corbelled chimneys, and elaborate cresting. The gothic arched entrance has multi-colored stone voussoirs, polished granite columns, and elaborate carvings by Robert Richardson, an English craftsman brought to the U.S. by Professor Goldwin Smith. A south wing added in 1911 complements the composition with additional Gothic elements including an open porch. The oval entrance drive, lush landscaping, an elaborate garden behind the house, and the original board and batten carriage house (converted to a small student dining facility) all contribute to this extremely well preserved part of the original Cornell campus.

The original parlors, library and conservatory are in use as reception and seminar rooms serving the Cornell Society for the Humanities. The well preserved and elaborate Victorian interiors include original fireplaces, paneling, murals, stained glass, and some historic furnishings.

SIGNIFICANCE

The A. D. White House was individually listed in the National Register of Historic Places as the “Andrew Davis White Museum of Art,” on December 4, 1973. It is one of the Cornell University campus’s most important historic buildings. The carriage house and rear gardens are not included as contributing elements in the nomination.

Architectural significance. The White house is the only house of the Faculty Row group that survives. Architecturally the house is one of Ithaca’s best domestic interpretations of the High Victorian Gothic style of architecture. Its design appears to have been based on a set of drawings published by the well-known Romantic Revival architect Calvert Vaux. After New York City architect George Hathorne failed to produce a satisfactory design, White hired Cornell University architecture student William Henry Miller to finish the drawings for the project. Charles Babcock, Miller’s teacher, was also retained to assist in the work, to design certain details, and to superintend construction. Miller went on to become Ithaca’s most prominent architect during the late 19th and early 20th centuries; he and Babcock both designed prominent buildings[45] at Cornell and throughout the area. Subsequent additions to the house, including the large south wing added in 1911, were designed by Miller.

Although the Cornell University campus has expanded to surround the White House, the immediate setting of the house remains largely intact due to the retention of extensive landscaped grounds. Between East Avenue and the west façade of the house is a steeply sloping lawn with circular drive and informally planted deciduous trees. A visual axis leads westward from the house’s main entrance, through the south

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[45] Buildings on the Cornell University campus designed by Miller include 660 Stewart Avenue (Van Cleef house), Barnes Hall, Boardman Hall (demolished), Delta Kappa Epsilon, Kahin Center (Robert H. Treman house), McGraw Tower and Uris Library, Risley Hall, Stimson Hall, and Telluride House. Babcock’s other buildings include Sage Hall (1872), Sage Chapel (1873), Franklin (now Tjaden) Hall (1883), and Lincoln Hall (1888).

end of the Arts Quad to the Cayuga Inlet Valley beyond. East of the house are extensive lawns and gardens. The gardens were first developed by “Daisy” Farrand, wife of Cornell University President Livingston Farrand, who occupied the home between 1921 and 1937.

The A. D. White House serves as an important symbolic link to Cornell’s history, with its connection to its founder and his Ruskinian ideals, its association with two prominent Ithaca and campus architects, its prominent position at a high point in the center of the campus, and its role as an elegantly landscaped and carefully preserved oasis at the heart of the busy campus

Historic significance. The house was constructed in 1873 for Cornell University’s co-founder and first president, Andrew Dickson White. Although White lived abroad during much of his retirement, the house remained his principal residence until the end of his life. White gave the house to the university before his death but retained lifetime use of it until 1918. It continued to serve as the President’s House until 1953, when it became the White Art Museum. Upon completion of the Johnson Museum in 1973, the building was converted to use as the A.D. White Center for the Humanities.

Figure 47 A.D. White House

ADDRESS/LOCATION	**NAME**	**DATE OF CONSTRUCTION**
Thurston Avenue	**RISLEY HALL**	1913

DESCRIPTION:

Risley Hall is a four-story dormitory block in the Jacobean Revival style, with four wings of residential rooms spreading from a central crenellated tower. Its walls are red brick with limestone trim and belt courses, grouped and bay windows, and a slate roof. Its site slopes down toward Fall Creek gorge, allowing for a partially exposed basement level at the southeast-facing court overlooking the wooded gorge.

Risley Hall contains various elaborately detailed interior spaces including Risley Theater and a dining room modeled after Christ Church Refectory at Oxford. Since 1970 Risley Hall has been the home of Risley Residential College for the Creative and Performing Arts, featuring generous arts facilities and student-run performances. The interior has undergone various renovations, but the exterior is largely unaltered from its original condition.

SIGNIFICANCE

Risley Hall is not an officially recognized landmark. Risley House falls within the boundaries of the original Cornell Heights subdivision but was not included in the Cornell Heights local landmark district because dormitory use was considered to be out of character with the nature of the district.

Architectural significance. Risley Hall is one of several distinguished Cornell residential buildings designed in a variety of revival styles. This is the last Cornell building by architect William H. Miller, considered the first architect to graduate from Cornell, the designer of several significant campus buildings including Uris Library and (with Charles Babcock) the A. D. White House.

Historical significance. Risley Hall was the second Cornell building built specifically to accommodate women (after the 1875 Sage College). It began Cornell's institutional expansion north of Fall Creek gorge and was an important part of proliferation of university facilities in the early decades of the 20th century.

Figure 48 Risley Hall – north façade

Figure 49 Risley Hall – south façade, facing Fall Creek

ADDRESS/LOCATION	NAME	DATE OF CONSTRUCTION
North side of Fall Creek – see Fig. 50 map	**CORNELL HEIGHTS**	1898 - 1937

DESCRIPTION:

Cornell Heights is a neighborhood consisting of 209 contributing components, mostly single-family homes and outbuildings, north of the Cornell campus on the northern rim of Fall Creek gorge, overlooking the City of Ithaca to the west. It was developed through the subdivision of two pieces of land in 1896 and 1901, and is a notably intact example of a planned residential suburban subdivision of the period. In the tradition of Frederick Law Olmsted, who pioneered the "ideal" romantic landscape in the second half of the 19th century, it has several typical turn-of-the-century subdivision features – a curvilinear street plan, dramatic geographical setting, and lavish landscape features,

Cornell Heights is bounded on the south by Fall Creek gorge, on the east by ~~the~~ Cornell residence halls and other north campus facilities, on the north by Ithaca city limits, and on the west by a steep hillside. Its boundaries roughly follow the boundaries of the lands developed by the Cornell Heights Land Company, a speculative real estate venture established in 1897 by Ithaca businessman Edward G. Wycoff and several partners. The roads and building sites were laid out by Rochester landscape architect William Webster (a student of Olmsted) in keeping with the concept of an exclusive "residence park". The subdivision lies mainly in the City of Ithaca, with about a quarter of the properties in the Village of Cayuga Heights, within the Town of Ithaca. The predominant land use is single-family residences, with multi-family residences and fraternity/sorority houses serving as secondary uses. Buildings in the area date primarily from the years 1898 to 1935, with almost half built before 1915. Only 10 buildings in the district were built after 1945.

Cornell Heights and the adjacent Falls Creek gorge are characterized by heavy foliage and many mature trees. The part of the district closest to the sites of Milstein Hall and the Central Avenue Parking Garage is Fall Creek Drive, which has two properties (#207-209 and #225) sited on the south side, and another 11 sited on the north side between Wycoff Avenue and Barton Place. Of the south side properties, 207-209 Fall Creek Drive is an apartment building in moderately good condition, built in 1906-1911, while 225 Fall Creek Drive is a nicely detailed Colonial Revival home built in 1901.

Cornell Heights has a close physical link with Cornell University with two vehicular bridges and one pedestrian bridge linking it to the campus. There is minimal visibility in either direction across the gorge due to heavy foliage, at least in the summer months, though the tops of the Sibley Dome and the Johnson Museum are barely visible above the treetops from the Cornell Heights side of the pedestrian suspension bridge.

SIGNIFICANCE

Cornell Heights is a locally-designated historic district and was listed in the National Register of Historic Places in 1989.

Community planning significance. Although automobiles have replaced the original trolley line, this subdivision is an attractive, intact, example of early suburban land subdivision in response to a desire by prosperous middle and upper class folks to\ have residences removed from the urban core.

Architectural significance. The predominant architectural styles are Colonial Revival and Craftsman, but some properties include Tudor Revival, Mission, Swiss Chalet, and Prairie Style elements. Most are unique designs, many by prominent Ithaca architects such as William Henry Miller, Clinton Vivian, Arthur Gibb, and Clarence Martin. Though some homes have been converted to apartments for student use, many retain a high degree of integrity.

Historical significance. The development of Cornell Heights coincided with Cornell's institutional expansion around the turn of the century and the establishment of the electric trolley line linking Cornell Heights to the campus and the city below. As the "Faculty Row" homes on East Avenue were replaced by University physical sciences buildings in the early decades of the 20th century, Cornell Heights developed as a "suburb" of the campus and provided homes for many distinguished professors as well as businessmen and professionals.

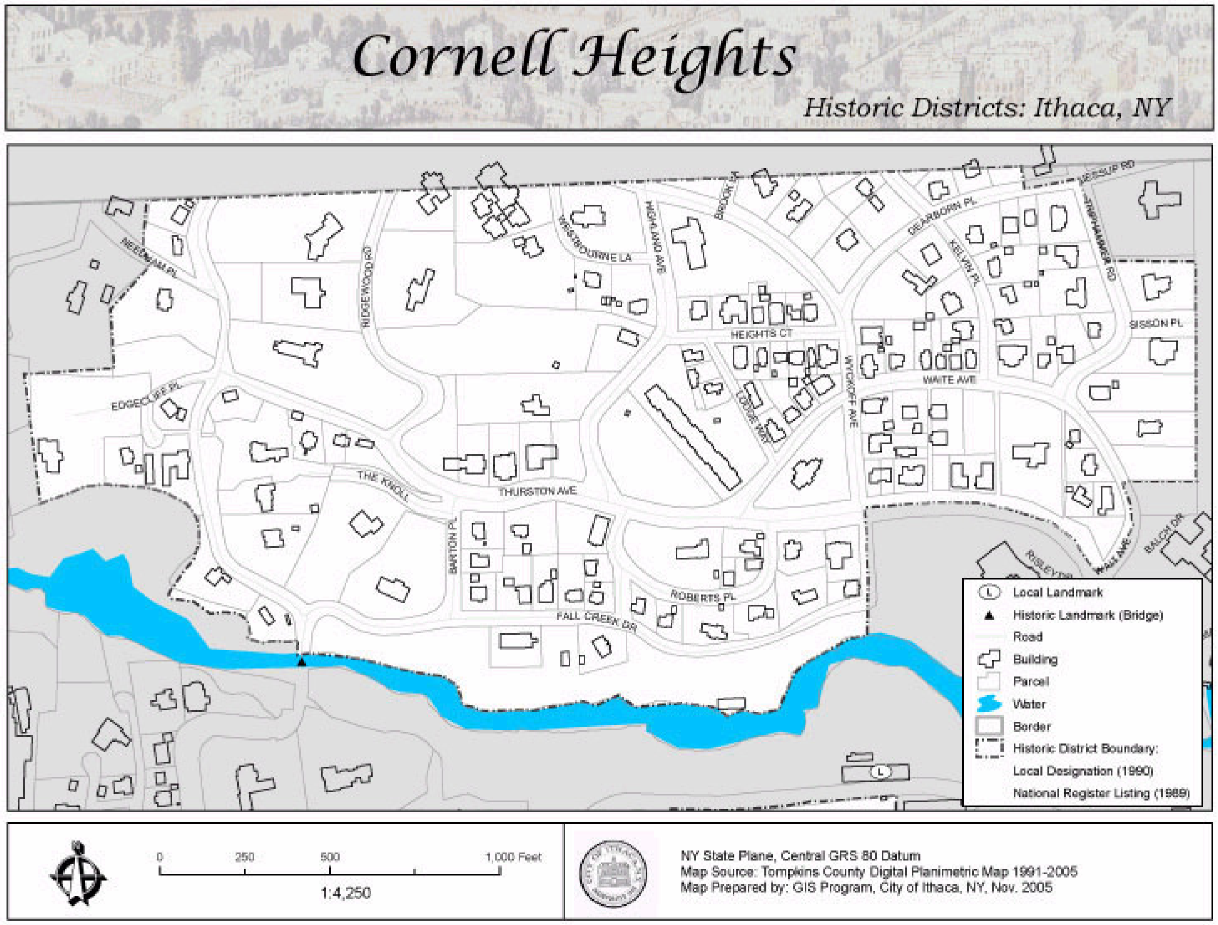

Figure 50 Cornell Heights – district boundary map

207 Fall Creek Drive (south side)

225 Fall Creek Drive (south side)

216 and 218 Fall Creek Drive (north side)

302 Fall Creek Drive (north side)

Fall Creek Gorge, looking east from suspension bridge

Figure 51 Cornell Heights photos

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FIRM QUALIFICATIONS

Bero Architecture P.C. is a full-service architecture firm with expertise in the treatment of existing buildings. Founded in 1976[1], the firm has developed a local, state, and regional reputation for excellence in master planning, building evaluations, adaptive re-use, compatible additions, restoration, and preservation planning. The firm provides professional services for new construction, rehabilitation, and preservation projects for residential, commercial, industrial, institutional, and municipal clients. Bero Architecture P.C. prepares code studies, condition reports, historic structure reports, feasibility studies, preservation reports, National Register submissions, and historic resource surveys.

The following is a list of representative historic preservation projects.

Historic Resource Surveys

Bero Architecture P.C. prepares historic resource surveys based on state and federal survey standards. Surveys are designed to meet the following objectives: 1) to identify, evaluate and document historic resources potentially eligible for local designation and/or the State and National Registers; 2) to serve as a planning tool for local and state governments; 3) to expedite OPRHP[46] review of federal and state-assisted projects (through Section 106 and State law 14.09); 4) to raise community awareness and pride; 5) to serve as an incentive for revitalization of historic resources; 6) to serve as a database of information for academic purposes; and 7) to promote historic tourism.

Village of Hamburg Reconnaissance Survey - As the first step in a village-wide survey, forty properties comprising the village's central business district were inventoried. Prepared for the Village of Hamburg (2002).

Town of Seneca Routes 5 & 20 Corridor Reconnaissance Survey - Identified approximately 80 properties. Funded by the Preservation League of New York State/New York State Council on the Arts Grant Program and Ontario County (2002).

Cornell University West Campus District Historic Resources Report - Comprehensive inventory and analysis of historic resources located within the western quadrant of the Cornell campus in the city of Ithaca. Approximately sixty historic resources were identified including residence halls, fraternities, apartment buildings,

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[1] Bero Architecture P.C., established in 2001, is the successor firm to Bero Associates Architects.

[46] The Office of Parks, Recreation and Historic Preservation is New York's State Historic Preservation Office (SHPO).

estates, single-family houses, and a cemetery. The study included an overview detailing the history of the area's development (2002).

City of Hornell Reconnaissance Level Survey - Identified approximately 375 properties including five potential historic districts. Prepared for Historic Hornell Inc.. Funded by the Preservation League of New York State/New York State Council on the Arts Grant Program and the City of Hornell (2000).

Village of Penn Yan Reconnaissance Level Survey - Identified approximately 200 properties in three potential historic districts and a proposed expansion of the village's existing district. In addition the survey identified 50 individual properties worthy of intensive survey. Prepared for the Village of Penn Yan. Funded by a Certified Local Government Subgrant administered by the historic Preservation Field Services Bureau of the New York State Department of Parks, Recreation, and Historic Preservation (2000).

Village of Little Valley Reconnaissance Level Survey - Identified 26 individual properties and delineated a potential historic district containing approximately 100 properties. Prepared for the Village of Little Valley and the Little Valley Revitalization and Economic Development Committee. Funded by a Rural New York Grant from the Preservation League of New York State (1999).

Town of Amherst Reconnaissance Level Survey - Identified approximately 245 individual properties and nine historic districts worthy of intensive survey. Prepared for the Town of Amherst Planning Dept. and the Amherst Historic Preservation Commission. CLG-funded project (1996-97).

Town of Amherst Intensive Level Survey - Inventoried 75 individual properties. Prepared for the Town of Amherst Planning Dept. and the Amherst Historic Preservation Commission. (1997-98).

Village of Springville Reconnaissance Level Survey - Identified approx. 22 individual properties and three historic districts. Prepared for the Springville Area Chamber of Commerce and the Concord Historical Society (1998).

Village of Williamsville Reconnaissance Level Survey - Identified a total of 83 individual properties and four historic districts worthy of future investigation. Prepared for the Williamsville Historic Preservation Commission. CLG-funded project (1996-97).

Village of Cuba Intensive Level Survey - Inventoried 38 individual properties and one historic district. Prepared for the Cuba Historical Society (1993-94).

City of Jamestown Intensive Level Survey - Inventoried 82 individual buildings and eight historic districts. Prepared for the Jamestown Urban Renewal Agency. Funded by a Community Development Block Grant of the U.S. Dept. of Housing and Urban Development (1993).

Village of Mt. Morris Intensive Level Survey - Inventoried 18 individual properties and five historic districts. Prepared for the Mt. Morris Historical Society (1994-95).

Town of Pittsford Intensive Level Survey - Inventoried 126 historic resources. Prepared for the Town of Pittsford Historic Preservation Commission. Funded by a Community Development Block Grant of the U.S. Dept. of Housing and Urban Development (1991).

Monroe County Department of Transportation Historic Resource Surveys - Served as consultant to J. B. Higgins & Associates. Goals were to survey and evaluate historic resources; to identify potential negative impacts; and to recommend mitigative measures. Representative projects include Turk Hill Road, Perinton, NY (1994); Titus Avenue, Irondequoit, NY (1991); Penfield Road, Penfield and Brighton, NY (1991); Irondequoit Bay Outlet Crossing, Irondequoit and Webster, NY (1990); Culver Road, Irondequoit, NY (1990); and Cooper Road, Irondequoit, NY (1990).

New York State Department of Transportation Architectural Surveys - Served as consultant to the Rochester Museum and Science Center to complete architectural surveys as part of Cultural Resource Reconnaissance. Located and identified historic properties potentially eligible for inclusion in the National Register so that their protection could be considered during planning and design of road construction projects by NYSDOT. Projects included Routes 98, 238, & 354 Attica/Alexander, NY (2001); Routes 77 & US20 Pembroke/Darien, NY (2000); Route 252/Jefferson Road/Ballantyne Road, Chili /Henrietta, NY (1999); Route 253/Mendon Center Road, Pittsford, NY (1999); Route 64, Bristol & South Bristol, NY (1999); and Routes 31 & 63 Medina, NY (1999).

National Register Nominations

Bero Architecture researches, writes and edits National Register nominations in accordance with state and federal standards. Nominations have been prepared for a variety of resource types. Clients include municipalities, non-profit organizations, and private individuals. Nominations have often included public slide presentations in conjunction with OPRHP staff to explain the benefits of listing and the role the National Register plays as a preservation planning and resource management tool at local, state and national levels.

Lockport Stone Buildings Multiple Property Submission - This multiple property submission documented the city's unique collection of nineteenth-century stone architecture, including religious, industrial, commercial and domestic buildings. The cover document described relevant historic contexts, associated property types, and provided a basis for evaluating the National Register eligibility of thematically-related historic properties. The multiple property submission included individual registration forms for ten individual properties. Client: The Lockport Architectural and Historic Preservation Committee.

Bolivar Public Library - Ca. 1910 Mission Revival style library constructed using funds donated by Andrew Carnegie. Criteria A and C. Client: Bolivar Free library (2002).

Williamsville Christian Church - Ca. 1870 Italianate church with ca. 1900 Auditorium/Akron plan interior. Criteria A and C. Client: Village of Williamsville (2002).

Pulaski Library - Early twentieth-century Neoclassical library serving Rochester's ethnic Polish community. Criteria A and C. Client: Group 14621 (2001).

Lee-Tousley House - Mid nineteenth-century Greek Revival house, located in Albion, NY, featuring elaborate interior trim based on the designs of Minard Lefever. Criteria C. Client: Orleans Chapter, National Society Daughters of the American Revolution (2001).

Immanuel Baptist Church - Urban Tudor Revival church and school complex located in Rochester, NY. Criteria A and C. Client: Immanuel Baptist Church (2001).

Hopkins Farm, Pittsford, NY - Early nineteenth-century farmstead with Federal style ca. 1815 frame house, extensive group of outbuildings, and significant landscape features including an unusually large old-growth wood lot. Criteria A, B, and C. Client: Historic Pittsford (2000).

Hemlock Fairground, Hemlock, NY - Nineteenth-century rural fairground including racetrack, grandstand, and exhibition buildings. Criteria A and C. Client: Hemlock Lake Union Agricultural Society (1999).

Maplewood Historic District, Rochester, NY - Nomination received the 1998 NYS Historic Preservation Award from SHPO. Approx. 435 resources in district. Late 19th-early 20th century residential neighborhood with national styles including Italianate, Second Empire, Shingle, Stick, Queen Anne, Colonial Revival, Neoclassical, Tudor Revival, and Prairie. Also significant for the Olmsted-designed landscape design including street malls and a park. Criteria A, C, D. CLG-funded project. Client: Maplewood Neighborhood Association and the Landmark Society of WNY (1998).

Erie Canal Lock 52 Complex, Port Byron, NY - Complex of buildings and structures associated with the transportation, engineering, and commercial history of the Enlarged Erie Canal during the period of significance, ca. 1849 to ca. 1917. Includes a saloon, blacksmith shop/ mule barn, stone canal lock, culvert, and canal prism. Potential subsurface remains. Client: State Council on Waterways (1998).

Owego Village Central Historic District (boundary increase) - Expansion of original historic district to include the residential neighborhoods adjacent to the central business district. Over 300 properties in the district. Includes mid-19th to early-20th century commercial, public, religious, and residential buildings from vernacular to high style. CLG-funded project. Client: Village of Owego (1997).

Albright Tract Historic District, Buffalo, NY - Early 20th century residential district with architect-designed revival style houses. 58 resources in district. Criteria A, B, C. Client: Private homeowners (1997).

Col. William Kelly House, Buffalo, NY - Colonial Revival style brick house built in 1937. Criteria B and C. Client: Private homeowner (1997).
Pittsford Farms, 44 North Main Street, Pittsford, NY - Late nineteenth-century farm estate including an Italianate house (built 1814, remodeled 1869), Romantic period landscape features, and an extensive collection of agricultural outbuildings. The farm was home to several of Pittsford's most prominent citizens during the nineteenth century. Criteria A, B, and C. Client: Historic Pittsford (1996).

Brocton Arch, Village of Brocton, NY - Four-cornered double-span steel arch erected in 1913 as a commemorative structure. Example of a "welcome arch," an early twentieth century civic feature popular in small towns. Distinctive engineering structure. Criteria A and C. Client: Village of Brocton (1995).

Eagle and State Streets Historic District and South Main Street Historic District, Village of Mt. Morris, NY - Late 19th-early 20th century residential neighborhoods. These district nominations were part of the Mt. Morris Multiple Property document. Criteria C. Client: Mt. Morris Historical Society (1995).

Main Street Historic District, Village of Addison, NY - Approx. 30 properties in the district. Intact commercial center representing the development of the village from ca. 1840 to ca. 1934. National architectural styles including Greek Revival, Italianate, High Victorian Gothic, etc. Criteria A and C (1995).

Maple Street Historic District, Village of Addison, NY - Approx. 70 resources in the district. 19th-century residential enclave with high style houses, two public squares, and prominent churches. The district derives additional significance for its association with several prominent citizens. Criteria B and C (1995).

Main Street Historic District, Village of Medina, NY - Village business district adjacent to Erie Canal. Distinguished by significant concentrations of buildings constructed of locally quarried Medina sandstone. Approx. 53 buildings in district. Period of significance: 1845 - 1945. Criteria A and C. Client: Village of Medina (1994).

Honeoye Falls Historic District - Historic district in center of village including commercial, industrial, religious, and residential buildings. National architectural styles ranging from Greek Revival to Colonial Revival. Approx. 220 resources in district. Criterion C. Client: Village of Honeoye Falls (1993).

Thomas Youngs House, Pittsford, NY - Federal style frame house built ca. 1818-1830. Moved from its original site. Criterion C. Client: Private homeowner. (1993).

Yates County Multiple Property Submission - Prepared the Associated Property Types section titled "Agricultural and Domestic Outbuildings" as well as the following nominations for 19th century houses: Arnold Potter House, Potter, NY; Christopher Willis House, Dresden, NY; Hampstead, Jerusalem, NY; Jemima Wilkinson House, Jerusalem, NY; John Briggs House, Milo, NY; Milton Wilson House, Middlesex, NY; Myron Weaver House, Branchport, NY; Sill Tenant House, Jerusalem, NY; and Solomon Weaver House, Branchport, NY.

Immaculate Conception Roman Catholic Church Complex, Rochester, NY - Complex includes a Romanesque Revival church (1864), Second Empire style rectory (1871), Italian Renaissance-inspired school (1926), present rectory (ca. 1900), and garage (ca. 1926). Illustrates the strength of the Irish immigrant community in Rochester during the late 19th and early 20th centuries. Criteria A and C. Client: Immaculate Conception Church (1991).

Historic Resource Evaluation and Analysis

Cornell University West Campus Residential Initiative - Provided the historic resources section of a draft environmental impact statement for a large project including the development of five residence halls housing 1500 students, a 300-car parking garage, a student recreation center, and a 250-car surface parking lot. Inventoried and evaluated existing historic resources; developed design criteria to mitigate adverse impacts; assessed actual impacts of proposed project; suggested potential mitigation measures; and determined unavoidable impacts (2002).

Belleville Subdivision, Victor, NY - Completed the historic resources section of a draft environmental impact statement for a 70-unit residential subdivision. Inventoried the cobblestone Lynaugh House within the context of the New York State Cobblestone National Register Multiple Property Submission. Analyzed the project impacts on the visual character of the resource and its context. Suggested potential mitigation measures (2001).

Cornell University Visitor's Center - Furnished historic resource section of draft environmental impact statement. Evaluated historic resources affected by proposed university visitors' facility. Identified potential adverse impacts of project on adjacent historic and scenic resources. Suggested mitigation measures and determined unavoidable impacts (2001).

Akzo Nobel Salt Mining Permit Application Project, Hampton's Corners, NY - Prepared visual impact study of significant historic resources as part of an environmental impact statement. The study was in compliance with Section 106 of the National Historic Preservation Act of 1966. The project included identification and evaluation of historic resources; assessment of effects (no effect, no adverse effect or adverse effect); and consultation with SHPO and possible mitigative efforts. Sub-consultant to the Rochester Museum and Science Center (1995).

Historic American Building Survey Documentation

Eastman Hall, Genesee Hospital, Rochester, NY - Prepared historical report on early-twentieth-century National Register-eligible nurses' dormitory on hospital campus. Took field measurements and photographs in accordance with HABS standards and submitted them to the Library of Congress for archiving. Work was required under NYS Preservation Law 14.09 (1996).

Historic Structure Reports

HSR's are the most comprehensive type of report prepared for historic structures. They are used primarily for planning the care and restoration of significant structures. HSR's document physical characteristics, chronology of construction, and architectural and historical significance. They include analysis of present condition, descriptions of recommend work, priorities, and budgets for repairs and restoration.

The Bank of Genesee, Batavia, NY - Ca. 1832 Federal style bank/residence designed by Hezekiah Eldridge a local architect/builder (2004).

Hotchkiss Essential Oil Building, Lyons NY - Ca. 1884 late nineteenth-century manufacturing facility associated with Hiram Hotchkiss.

Woodside, Rochester, NY - Ca. 1840 Greek Revival mansion (2002).

Cascadilla Boathouse, Stewart Park, Ithaca, NY - Circa 1896 Shingle style crew boathouse (2000).

Erie House, Port Byron, NY - Late 19th century Erie Canal waterside inn, tavern, and residence with associated mule shed and blacksmith shop (1999).

Graycliff, Evans, NY - Circa 1928 summer home of Darwin Martin designed by Frank Lloyd Wright (1995).

The Three Bears, Ovid, NY - Complex of three Greek Revival style brick government buildings (1998).

Morgan Hook and Ladder Company, Naples, NY - Early 19th century Federal style house converted to use as a fire hall in 1891 (1995).

Genesee Lighthouse, Charlotte, NY - Ca. 1822 stone lighthouse and adjacent brick lighthouse keeper's house on the Genesee River. Second oldest surviving lighthouse on the Great Lakes (1991).

Paddy Hill Library, Greece, NY - Late 19th century Romanesque style brick church building presently used as a library (1989).

Public Education/Historic Tourism

Historic Resource Survey Volunteer Training Program, Endicott, NY - Prepared curriculum and gave workshops on how to research building histories. Included field work. Critiqued and edited inventory forms by the volunteers. Workshops coordinated by the Endicott Historic Preservation Commission. CLG-funded project (1997).

Walking Tour Booklet, Ellington, NY - Researched, wrote and edited booklet on the history of Ellington. Focused on the buildings located around the village square. Booklet used to help promote historic tourism. Prepared for the Ellington Area Business Association (1995).

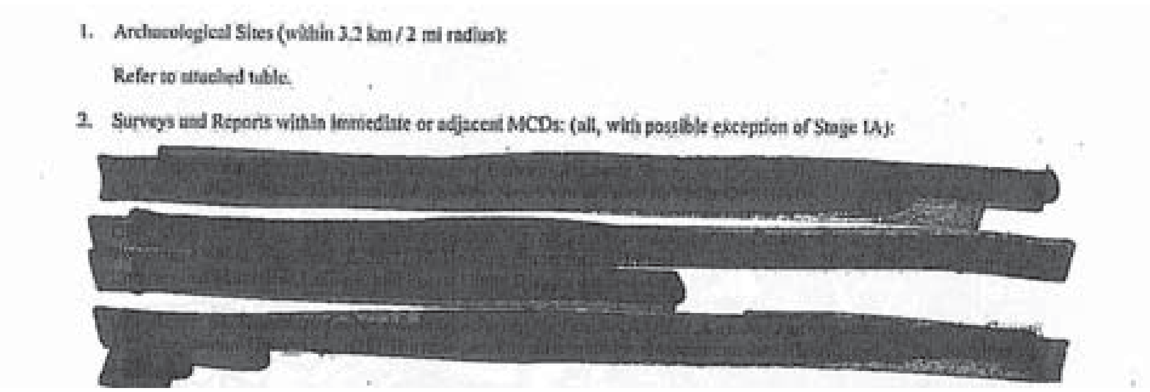
Multiple Public Presentations Members of the firm are often called upon to make public presentations regarding preservation subjects including significance of official recognition of landmarks, historic building styles, identification of historic building physical problems, and preservation and restoration techniques,

APPENDIX D: Archaeology Report

Public Archaeological Facility, Binghamton University

Note: A section of this report lists location information for sensitive historic and/or archaeological sites outside of the project limits. In order to preserve and protect the inventoried cultural resources, SHPO requires that the information remain confidential and not be released to the public. As such, sections of pages 8, 9, and 10 have been blacked out.

SAMPLE:



1. Archaeological Sites (within 3.2 km / 2 mi radius):

Refer to attached table.

2. Surveys and Reports within immediate or adjacent MCDs: (all, with possible exception of Stage IA):

[redacted]

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Public Archaeology Facility Report

PHASE 1A ARCHAEOLOGY ASSESSMENT MILSTEIN HALL AND CENTRAL AVENUE PARKING GARAGE AT CORNELL UNIVERSITY

CITY OF ITHACA,
TOMPKINS COUNTY, NY
MCD 10940

PREPARED BY:

ANDREA ZLOTUCHA KOZUB

PREPARED FOR:

TROWBRIDGE & WOLF LANDSCAPE ARCHITECTS
1001 WEST SENECA STREET, SUITE 101
ITHACA, NY 14850

JUNE 11, 2008

Binghamton University, State University of New York
Binghamton, New York 13902-6000

MANAGEMENT SUMMARY

Project Name: Milstein Hall and Central Avenue Parking Garage (Cornell University)

OPRHP #: n/a

Involved Agency: NYS OPRHP

Phase of Survey: Phase 1A Cultural Resource Assessment

Location:
Cornell University Campus: south of University Road, east of Central Avenue, and west of East Avenue
Minor Civil Division: City of Ithaca (MCD 10940)
County: Tompkins

Survey Area (Metric and English): Approximately 1.2 ha (3 ac)

USGS 7.5 Minute Quadrangle Map: Ithaca East, NY

Results of Archaeological Sensitivity Assessment:

Environmental context: The project is situated on the southern edge of the Fall Creek gorge, at an approximate elevation of 251 m (825 ft) ASL. The soils in this area were never systematically surveyed, but archaeology conducted elsewhere on campus indicates generally shallow A horizons.

Number of prehistoric sites identified: Three sites are located within 3.2 km (2 mi) of the project area, indicating sensitivity for prehistoric sites in the project area. The types of prehistoric sites that are likely to exist in or near the project area include temporary camps and small resource-processing sites.

Number of historic sites identified: Ten historic sites are documented within a 3.2 km (2 mi) radius of the project area. All are associated with map documented structures (MDS) or standing historic structures, including residential and industrial sites. Previous investigations show that the construction of Rand Hall has destroyed an MDS and its associated sheet midden which was located east of the project area. Therefore, the project has a low sensitivity for historic archaeological sites.

Results of Walkover: The project area has been previously disturbed by the construction of paved parking and walkways, buildings, and utility installations. This assessment was verified by documentation of underground utilities and two shovel probes which indicated the presence of filled soils. Because natural soils have an expected shallow A horizon, scraping for parking lots, and trenching for utilities likely impacted all potential cultural horizons.

Number of STPs recommended for project: The documentation and the walkover both indicate that the parcel has been disturbed by previous development, and is unlikely to contain any intact archaeological sites. No further work is recommended.

Report Author: Andrea Zlotucha Kozub, Public Archaeology Facility.

Date of Report: February 11, 2008

REPORT OF FIELD RECONNAISSANCE
PHASE IA ARCHAEOLOGY ASSESSMENT
MILSTEIN HALL and CENTRAL AVENUE PARKING GARAGE
AT CORNELL UNIVERSITY

Permit Applicant:
Kimberly Michaels
Trowbridge & Wolf Landscape Architects
1001 West Seneca Street, Suite 101
Ithaca, NY 14850

Location: City of Ithaca, Tompkins County, New York MCD 10940

Report prepared by: Andrea Zlotucha Kozub
Affiliation:
Public Archaeology Facility
Binghamton University
Binghamton, New York 13902
(607) 777-4786

Date: June 11, 2008

PROJECT SUMMARY

A Phase 1A cultural resource assessment was requested for the proposed Milstein Hall and associated parking garage on the campus of Cornell University in the Town of Ithaca, Tompkins County, New York. The project area is located south of University Avenue, between East and Central Avenues, and includes the area currently occupied by the parking lot for Tjaden and Sibley Halls. This area measures roughly 1.2 ha (3 ac). The project area is situated between Fall and Cascadilla Creeks, approximately 1.6 km (1 mi) east of Cayuga Lake, and at an approximate elevation of 251 m (825 ft) ASL (Attachment B, p. 7). The project area was not included in the 1965 Tompkins County soil survey, but likely contains shallow A-horizon soils as seen elsewhere on campus.

A site files check (Attachment C, p. 8) was recently conducted for the Cornell campus using the resources at the Public Archaeology Facility (PAF) and New York State Museum (NYSM)/New York Office of Parks, Recreation, and Historic Preservation (OPR&HP). Three prehistoric sites are located within a 3.2 km (2 mi) radius of the project areas, including the Late Archaic/Early Woodland Cascadilla Creek Site (Zlotucha Kozub 2003c), an Archaic site, and an area of unidentified occupation. The site files also record 10 historic sites within a 3.2 km (2 mi) radius of the project area, including historic building foundations, industrial sites, and domestic midden sites. In addition, several structures on the Cornell Campus are National Register Listed. Historic maps from 1853 and 1866 (Attachment D, pp. 11-12) indicate that the western portion of the project area does not contain any map documented structures, though an MDS lies in the eastern portion. Remains of this MDS were destroyed during the construction of Rand Hall (Zlotucha Kozub 2003b). Based on the review of historic maps and known archaeological sites in and around the University campus, the project area should be considered sensitive for prehistoric sites but is unlikely to contain historic archaeological deposits.

Archaeologists from the Public Archaeology Facility (PAF) conducted a walkover of the project area on May 1, 2007. The walkover focused on the western portion of the project area since the eastern portion had been previously evaluated (Zlotucha Kozub 2003a and 2003b). A utility map of the project area indicated that most of the ground has been disturbed by underground utilities and paving. Project area and utility maps are included as Attachment E (p. 13), and photos are included in Attachment F (pp. 14-15). Two areas of grass which did not contain any documented utility lines were tested with unscreened shovel probes, which yielded disturbed soils beneath the sod cap. The results of the background research and the walkover indicate that the project area has been previously disturbed and is unlikely to contain any intact archaeological deposits. No further archaeological work is recommended.

PART 1: DOCUMENTARY RESEARCH ADDENDUM SITE IDENTIFICATION

A. Documentary Research Addendum (if needed)

1. ..X.. **Local site inventory checked (specify)**
   Public Archaeology Facility, Binghamton University

2. ..X.. **Office of Parks, Recreation and Historic Preservation/New York State Museum**

3. ...... **Informants interviewed (name, address, specialty)**

4. ..X.. **Other sources checked (specify)**

Baugher, Sherene and Sara Clark
1998 *An Archaeological Investigation of the Indian Fort Road Site, Trumansburg, New York.* Cornell University. Ithaca, NY.

Fagan, L.
1853 *Map of Tompkins County, New York.* Horace and Charles Smith, Philadelphia, PA.

McCosh, R. J.
1995 *Development of an Archaeological Database and the Testing of an Archaeological Predictive Model in Tompkins County, New York.* Unpublished Undergraduate Honors Thesis on file in the Archaeology Program, Cornell University.

Miroff, Laurie E.
2002 *Cultural Resource Management Survey, Phase I Archaeological Reconnaissance, Cornell University West Campus Residential Project, City of Ithaca, Tompkins County, NY MCD 10940, 01PR1818.* Public Archaeology Facility, Binghamton University, Binghamton, NY.

Stone and Stewart
1866 *New Topographical Atlas of Tompkins County, New York.* D. Mason & Co., Syracuse, NY.

Trousdale, J.B.
1967 *Cornell University First Century: Lands & Holdings 1867-1967.* Manuscript prepared by the Cornell University Controllers Office.

United States Department of Agriculture (USDA)
1965 *Soil Survey, Tompkins County, New York.* U. S. Government Printing Office: Washington D. C.

United States Geological Survey (USGS)
1969 *(Photorevised 1978) Ithaca East, New York 7.5 minute quadrangle.*

Zlotucha Kozub, Andrea
2003a *Report of Field Reconnaissance, Phase 1A Cultural Resource Assessment, Milstein Hall at Cornell University.* Public Archaeology Facility, Binghamton, NY.

2003b *Report of Field Reconnaissance, Phase 1B Archaeological Survey, Milstein Hall at Cornell University.* Public Archaeology Facility, Binghamton, NY.

2003c *Cultural Resource Management Report, Phase 2 Site Examination of the Cascadilla Creek Site (SUBi-2385), Cornell Athletic Field Project, Town of Ithaca, Tompkins County, New York MCD 10906.* Public Archaeology Facility, Binghamton University.

2007 *Report of Field Reconnaissance, Phase 1A Cultural Resource Assessment, Animal Health Diagnostic Center at Cornell University.* Public Archaeology Facility, Binghamton, NY. (In progress)

Results of Documentary Research: ENVIRONMENT AND SOILS

Detailed information on the environmental setting was included in a previous Phase 1A report (Zlotucha Kozub 2003a). The project area is situated on the south bank of the Fall Creek ravine, at an average elevation of 251 m (825 ft) ASL (Attachment B, p. 7). Fall Creek drains into Cayuga Lake approximately 1.6 km (1 mi) to the west. The soils in the project areas were never surveyed in detail due to the early construction of Cornell University (USDA 1965), but the results of surveys conducted elsewhere on the campus indicate that A-horizon soil development is typically shallow (Miroff 2002). The project area consists largely of pavement bordered by structures (Sibley, Rand, and Tjaden Halls) and small areas of grass (Attachment F, pp. 14-15).

Results of Documentary Research: PREHISTORY

The prehistory of New York State and the Northeast was characterized by two broad subsistence patterns, both of which influenced settlement and land use patterns, as well as material culture. The first, designated as the pre-agricultural hunter-gatherer, began with the arrival of highly mobile groups during the Paleo-Indian and Early-Middle Archaic periods around 10,000-4000 BC. Mobility was an important adaptation, as these groups relied on gathered plants, game animals, and fish for their subsistence. These groups often followed herds of animals, or migrated from one resource-rich landform (e.g., upland wetlands) to another. Starting in the Late Archaic period and extending through the Middle Woodland (4000 BC to AD 900), hunter-gatherers became seasonally nomadic. Relatively large base camps housing as many as 100 individuals would develop in major river or lake valleys, from which daily foragers would radiate outward in search of local resources. During seasons of resource dispersal, the camps would break up into smaller, more mobile units capable of foraging for themselves. Sites associated with hunter-gatherers include the short term camps and resource processing stations used by the early nomads, as well as larger base camps and lithic scatters associated with the daily foragers of the seasonally nomadic groups.

Beginning around AD 900, the Late Woodland period is defined by the widespread shift towards agriculture as a subsistence base, along with the associated sedentism necessary for agricultural pursuits. While these groups continued to forage for plant and animal resources, they relied heavily on cultigens as a primary food source. Permanent villages developed in the region, along with a matrilineal kin structure. Increased needs for defense prompted many groups to develop their villages on elevated landforms situated above major waterways.

Prehistoric Sensitivity Assessment

A site files check was recently conducted for the Cornell campus (Zlotucha Kozub 2007) using the resources of the Public Archaeology Facility (PAF), the New York State Museum (NYSM), and the New York Office of Parks, Recreation, and Historic Preservation (OPRHP). Three documented sites are known to lie within a 3.2 km (2 mi) radius, including the multi-component Lamoka/Meadowood Cascadilla Creek Site (Zlotucha Kozub 2003c) which is situated southeast of the project area and a stray Archaic period point found north of Fall Creek (Attachment C). In addition, fluted Paleo-Indian points have been reportedly found on the Cornell campus (Baugher and Clark 1998:8; McCosh 1995:8). Based on this information and its geographic situation between Fall and Cascadilla Creeks, the project area is considered sensitive for prehistoric sites. Prehistoric occupations in the project area would have probably been limited to small camps and resource processing stations. Camp sites tend to produce low to moderate densities of artifacts including both curated and expedient tools (utilized debitage) and limited numbers of cultural features (such as storage pits and cooking hearths) indicative of short-term occupation. Resource processing sites reflect short-term land use for resource extraction. In terms of material culture, these sites are usually associated with small artifact assemblages dominated by expedient tools. These types of sites may have been used by peoples of any prehistoric cultural affiliation, and indeed many of the sites in the Ithaca/southern Cayuga Lake region have been multi-component sites that were visited by diverse groups over the ages.

Results of Documentary Research: HISTORY

The Town of Ithaca was organized in 1821, with the distinction between the Town and City of Ithaca arising some time later. One of the most significant developments in Ithaca's history is the establishment and growth of Cornell University. Cornell was one of the nation's first "land grant" colleges established under the Morrill Act of 1865. The Act appropriated public lands to aid the development of state agricultural and mechanical colleges. The University is named for one of its founders, Ezra Cornell, a local engineer, entrepreneur, and politician whose private land holdings formed a significant portion of the original parcel. The university offered a much broader curriculum than most universities, though the study of agriculture was an early focus of the school. The University opened its doors to male students in 1868, and in 1870 became the first American university to also admit women.

The Milstein Hall project area parcel is situated in the farmland purchased by Ezra Cornell in 1857, and then donated to the developing University in 1866 (Trousdale 1967). Historic maps of the area (Attachment D) indicate that the parcel is situated west of a post-1853 farmhouse originally owned by Ezra Cornell, which was demolished to make way for Rand Hall. Archaeological investigations of the unpaved area east of Rand Hall demonstrated that remains of the structure and associated sheet midden are not present (Zlotucha Kozub 2003b).

Historic Sites Sensitivity Assessment

A site files search indicated that ten historic sites are located within a 3.2 km (2 mi) radius of the project area (see below, and Attachment C, p. 8). None of these are located in the immediate vicinity of the project area, and the Cornell MDS located at the site of Rand Hall was removed during that building's construction. Based on this data, the project area has sensitivity for containing historic archaeological resources.

Documentary Summary
.... no sites reported
....X.. sites reported (describe briefly)

A site files search (Attachment C, p. 8) at the New York State Museum (NYSM)/Office of Parks Recreation and Historic Preservation (OPR&HP) supplemented the background research conducted at the Public Archaeology Facility (PAF). Three previously recorded prehistoric sites are located within a 3.2 km (2 mi) radius of the project area. The prehistoric sites include a multi-component (Meadowood and Lamoka) camp site (Zlotucha Kozub 2003c), an Archaic site, and an area of unidentified traces of occupation. Ten historic sites are located within a 3.2 km (2 mi) radius of the project area, although none are located near the project area.

PART 2: WALKOVER AND FIELD INSPECTION

Andrea Zlotucha Kozub and Erin Griffiths conducted a walkover of the project area on May 1, 2007. Perimeter and central areas were inspected for their potential sensitivity for cultural resources and to check for prior ground disturbance. The goal was to visually examine the entire project area to determine if areas have been disturbed, and to assess which parts of the project area are accessible for subsurface testing.

Milstein Hall and its associated parking garage will be located south of University Avenue and north of Sibley and Tjaden Halls, with its eastern end abutting Rand Hall. The garage will be accessed from Central Avenue, and the area around Rand Hall will be graded. A cultural resource assessment and an archaeological survey were conducted for the eastern half of the project area, and the results may be found in Zlotucha Kozub 2003a and 2003b. In summary, the 2003 project area was determined to have been previously disturbed and did not contain any intact archaeological resources. The current report focuses primarily on the western portion of the parking lot north of Sibley and Tjaden Halls and the green space surrounding this lot (Attachment E, p. 13).

The 2007 field inspection included a walkover of the project area and two unscreened shovel probes to verify the presence of filled soils. The utility map in Attachment E (p. 13) demonstrates that the majority of the project area has been disturbed by the installation of underground utilities. A few small areas of green space do not contain utilities, though their proximity to structures and landscaped areas strongly suggest that they too are disturbed. The two shovel probes excavated verified the presence of fill and the absence of an intact A-horizon. One was placed approximately 4.5 m (15 ft) southwest of Sibley Hall, and the other was placed on a grassy slope between the Sibley/Tjaden parking lot and University Avenue (Attachment E, p. 13). Both yielded mottled fill beneath the sod cap.

PART 3: RECOMMENDATIONS

The combined evidence of documented underground utilities, previous archaeological investigations, and the current walkover indicate that the project area A-horizon has been disturbed. As cultural material would have been confined to this relatively shallow horizon, we recommend that the project area does not contain any archaeological sites and that Phase1B testing is not warranted.

PART 4: SUPPORTIVE DATA

Reports should include the items listed below. Bracketed information is optional. Put a check next to each item appended.

PLEASE NOTE: Most attachments listed below often provide precise locational and compositional data on archaeological sites. This information is confidential to protect the resource from vandalism. All attachments with site specific information should be omitted from report copies which will be available to the general public.

..A.. **qualifications of the principal investigator(s)**

..B.. **topographic map with project area noted**

..C.. **site files checks (Confidential: Not for Public Release)**

..D.. **copies of relevant historic maps**

..E.. **map(s) of test locations, field inspection, and areas of cultural material; maps must have title, legend, bar scale, and directional arrow.**

..... **record of soil stratigraphy in each test unit and trench profiles.**

..... **artifact catalog**

..F.. **photographs of the project area**

..... **OPR&HP Prehistoric Site form**

..... **OPR&HP Historic Site form**

Certification: I certify that I directed the cultural resource investigation reported here, that my observations and methods are fully reported, and that this report is complete and accurate to the best of my knowledge.

6-11-08
date

signature of preparer

ATTACHMENT A:
Qualifications of the Principal Investigators

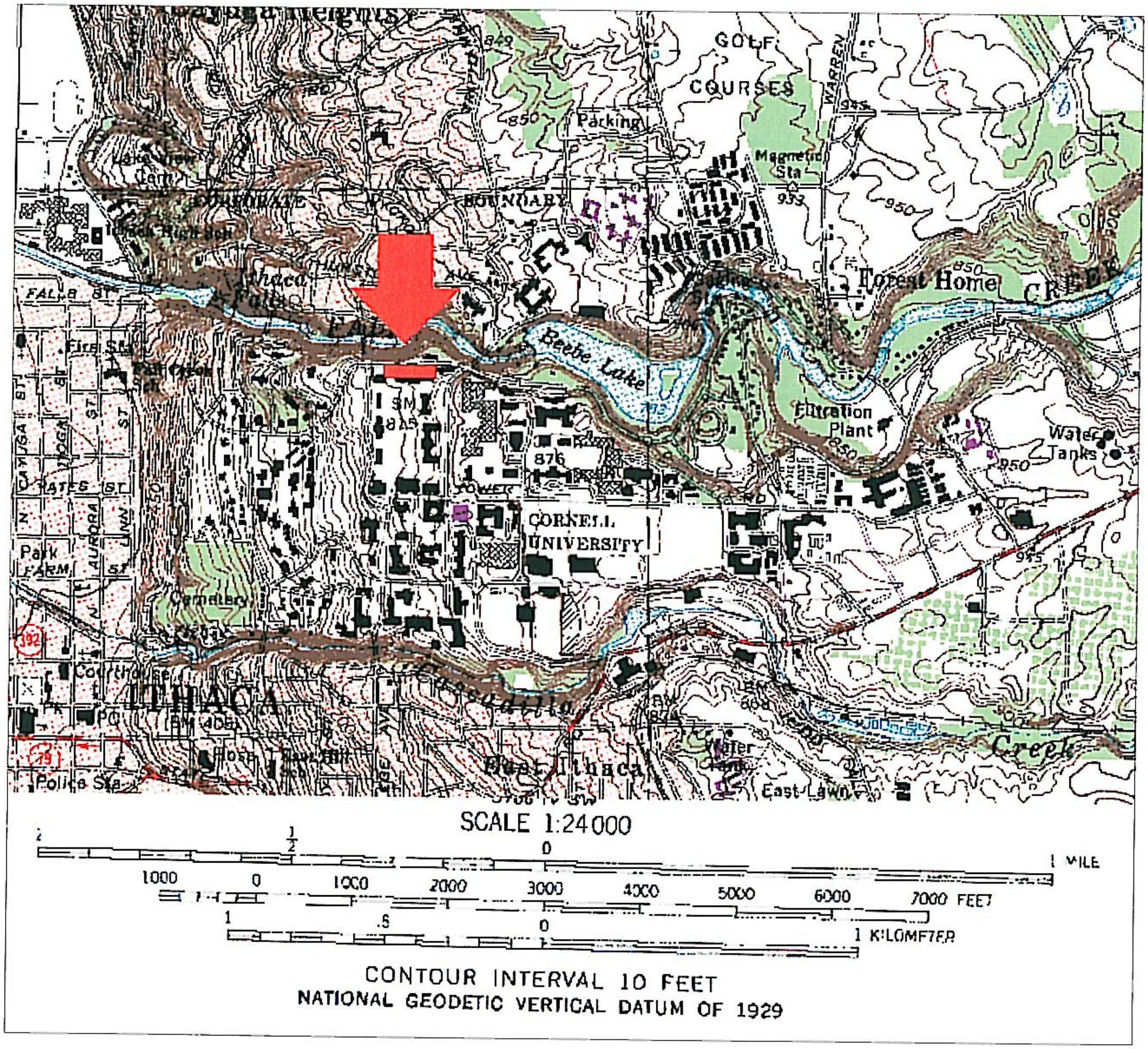
Dr. Nina M. Versaggi
Director and Principal Investigator, Public Archaeology Facility

Versaggi received her doctorate in Anthropology from SUNY-Binghamton in 1988, her MA from SUNY University at Binghamton in 1976 and her BA from Rutgers University in 1974. She has been active in professional archaeology since 1972. Professional positions held include Director of the Public Archaeology Facility since 1988, Partner in Compliance Survey Associates for 6 years, Guest Curator at the Roberson Museum and Science Center, and Post-doctoral Fellow at the Hartwick College Museums. She serves as principal investigator for all current and past projects of the Public Archaeology Facility whose recent major projects include the Broome Tech Data Recovery in Binghamton and the state-wide highway subcontract with the New York State Museum and NYSDOT. She has authored "Hunter to Farmer: 10,000 Years of Susquehanna Valley Prehistory," "Prehistoric Hunter-Gatherer Settlement Models: Interpreting the Upper Susquehanna Valley," and "Upland Foraging Sites in the Northeast: Engendering Prehistory," which are based on NYSDOT and pipeline prehistoric data. She is president of the New York Archaeological Council and a member of the board for the Preservation Association of the Southern Tier. She serves as an Adjunct Associate Professor at Binghamton University.

Andrea Zlotucha Kozub
Project Director

Zlotucha Kozub received her Master's Degree in Anthropology from SUNY Binghamton in 2000, and her BA in Studio Art and Psychology from Middlebury College in 1995. She has been active in professional archaeology since 1999. Other professional positions include Adjunct Faculty at Cazenovia College, Instructor for the 2001 SUNY Binghamton Field School at French Azilum, PA, and Museum Intern for the U.S. Fish and Wildlife Service. In 2001 she received a grant from the Pennsylvania Historical and Museum Commission to continue her research into foodways at French Azilum, and presented a portion of this research at the Society for American Archaeology convention in New Orleans. In 2002 she conducted Phase 3 data recovery at the E. Cornell Site on the Cornell University campus, and presented the preliminary results of this project at the DeWitt Historical Society of Tompkins County as part of New York Archaeology Week. Other projects for Cornell University include the Phase 2 site examination of the Cascadilla Creek Site on Game Farm Road, and Phase 1A and/or 1B work for Milstein Hall (in 2003), the Life Science Technology Building, the East Campus Research Facility, and the Animal Health Diagnostic Center.

Attachment B: Topographic Map
1969 (Photorevised 1978) Ithaca East, NY 7.5 minute quadrangle.
(Project area highlighted in red)



Attachment C: Site Files Report
(from Zlotucha Kozub 2007)

CONFIDENTIAL; Not for Public Release
NYS OFFICE OF PARKS, RECREATION AND HISTORIC PRESERVATION
Field Service Bureau Files Search

DATE: January 2007
CONDUCTED BY: B Ross
Project: Cornell University Animal Laboratory
Minor Civil Division (MCD): Town of Ithaca (10906)
County: Tompkins
USGS Quadrangle: Ithaca East

1. Archaeological Sites (within 3.2 km / 2 mi radius):

   Refer to attached table.

2. Surveys and Reports within immediate or adjacent MCDs: (all, with possible exception of Stage IA):

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

3. National Register eligible and listed properties within, adjacent or within view shed of project area:

[redacted]

4. Inventoried structures within, adjacent or within view shed of project area:

[redacted]

CONFIDENTIAL; not for public release

NYSOPRHP Site File Search Results

(sites within 3.2 km/2 mi radius from project area)

January 2007

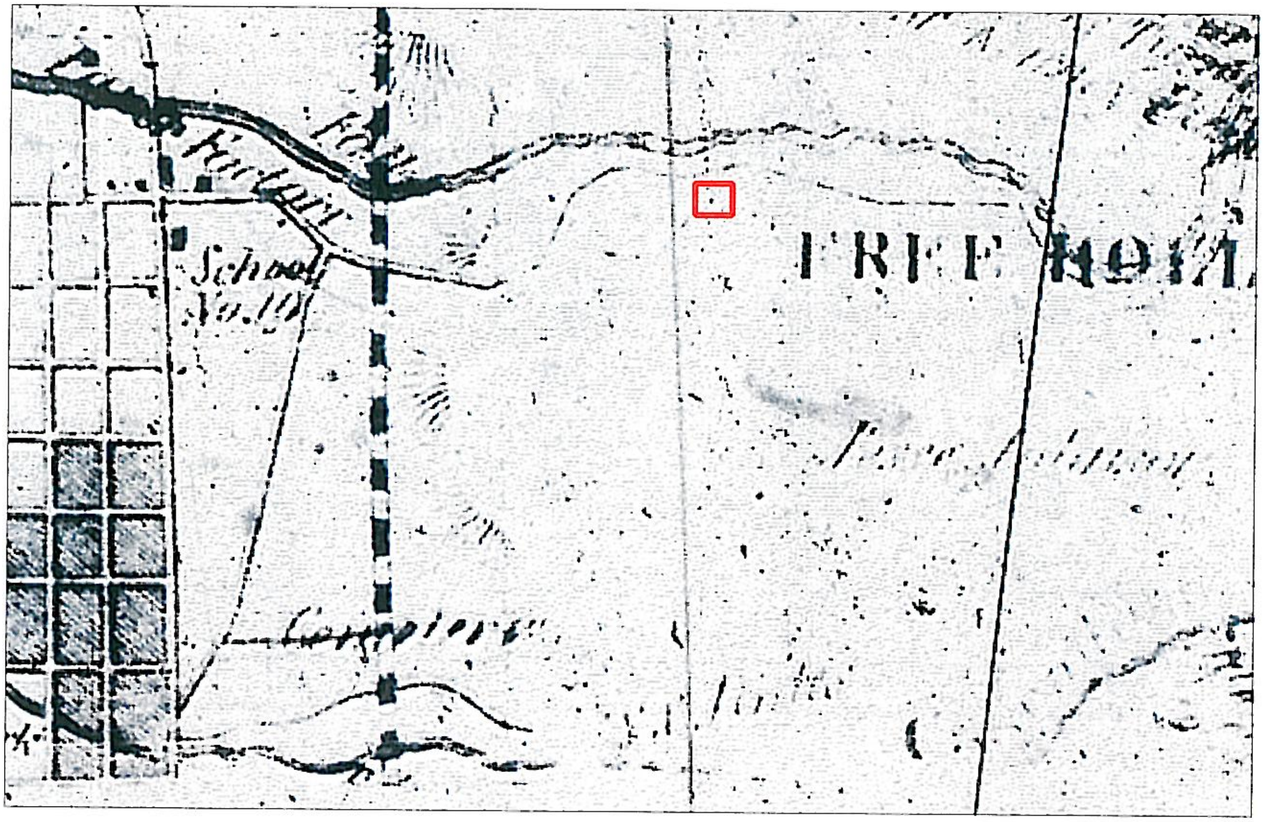
Item 1. Archaeological Site Table, Cornell Animal Laboratory Project, Town of Ithaca, Tompkins County (10906), Ithaca East Quadrangle.

Site Number	Site Name	Distance from project area / distance from water source	Elevation amsl Slope (approx)	Cultural Affiliation / Site Type	Testing / Artifacts	Report
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Parker, Arthur C "History of the Archaeology of New York State," NYS Museum Bulletins 238-239 1920-22.

Attachment D: Historic Maps

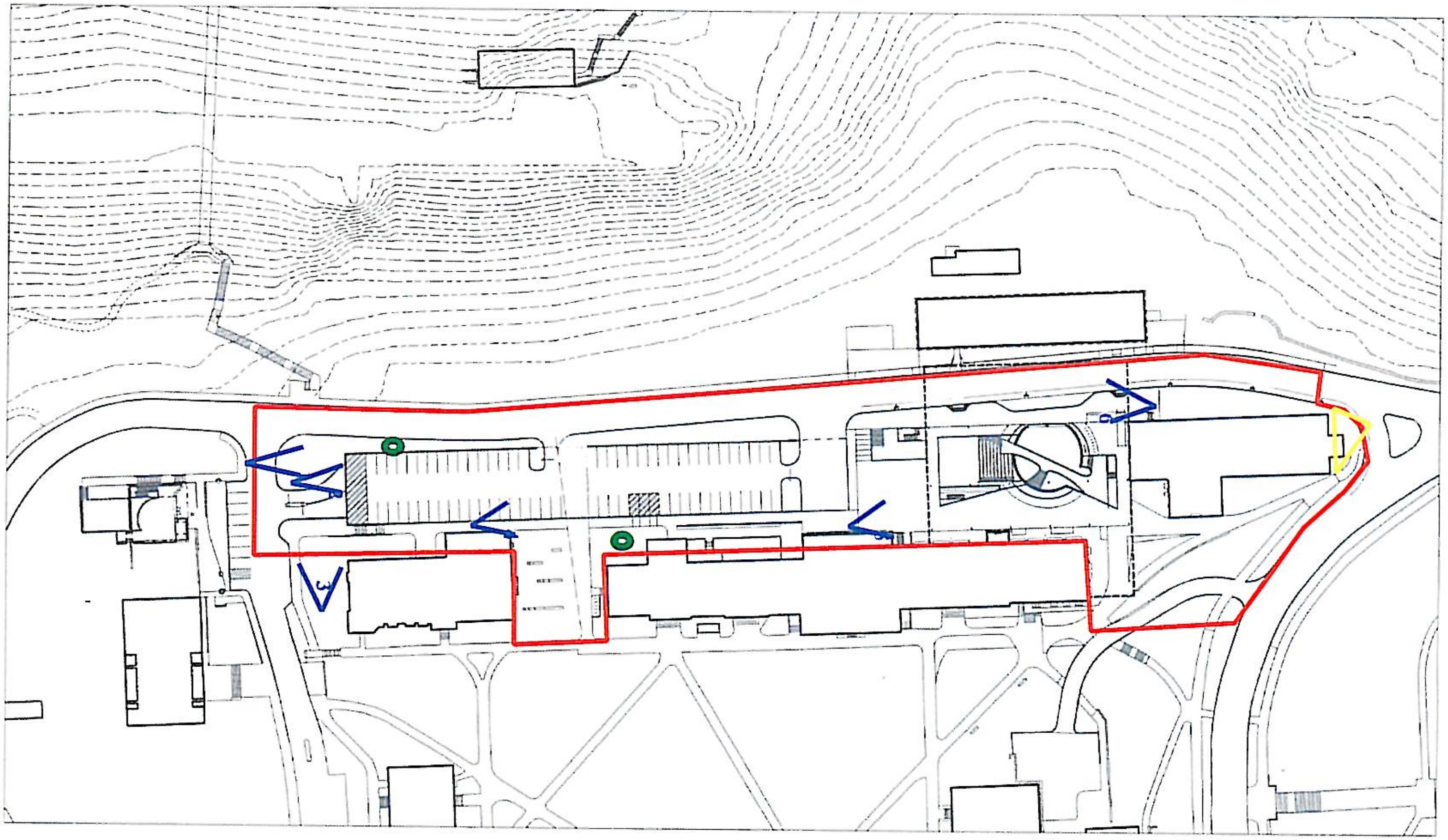
D.1. Approximate location of project area on Fagan's Map of Tompkins County (1853).



D.2. Approximate location of project area on Stone and Stewart's Atlas (1866).

Attachment E: Project Area Map

Key: Red = 2003/2007 Phase 1A limits (Approx.), Blue = photo angle (Approx.),
Yellow = 2003 Phase 1B limits (Approx.), Green = shovel probe location (Approx.)



Attachment F: Project Area Photos

Photo 1. View of project area from Central Avenue facing east, in vicinity of parking garage entrance.

Photo 2. View along western end of Sibley/Tjaden Hall parking lot, facing east. A shovel probe was excavated on the left on the grassy slope.

Photo 3. View of western end of the project area from corner of Tjaden Hall, facing north.

Photo 4. View of parking lot from the north side of Tjaden Hall, facing east towards Sibley and Rand Halls. A shovel probe was excavated on the right, in the grass near Sibley Hall.

Photo 5. View of eastern end of project area from Sibley Hall, facing east.

Photo 6. View of eastern end of project area from University Avenue bus stop, facing west.

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APPENDIX E: Traffic Report

Martin/ Alexiou/ Bryson, PLLC

Paul Milstein Hall and Central Avenue Parking Garage

Ithaca, NY

TRAFFIC IMPACT ANALYSIS

Prepared for

Ms. Kimberly Michaels, RLA, LEED, AP
Trowbridge & Wolf, LLP
1001 West Seneca Street Suite 101
Ithaca, New York 14850

Prepared by

MARTIN
ALEXIOU
BRYSON

June 18, 2008

4000 WESTCHASE BOULEVARD, SUITE 530, RALEIGH, NC 27607

EXECUTIVE SUMMARY

Project Background

Cornell University plans to redevelop a plot of land along the southern side of University Avenue between East Avenue/Thurston Avenue and Central Avenue on the Cornell University campus in Ithaca, NY. The project consists of an academic building and a parking garage. The building, Paul Milstein Hall, will be connected to the existing Sibley Hall to the south and Rand Hall to the east, and will be cantilevered over University Avenue to the north. Milstein Hall is proposed to be an approximately 59,000 square foot academic building, housing classrooms, studio space, an auditorium, meeting and exhibition space, and a gallery. In addition, a separate parking garage is planned on the west portion of the Sibley/Tjaden lot, behind Sibley Hall and adjacent to the proposed Milstein Hall project. This parking facility, referred to as the Central Avenue Parking Garage (CAPG), will consist of three levels of parking – one at grade and two sub-surface parking levels. This facility is slated to have 199 total parking spaces available, replacing the existing 108 space surface lot, resulting in a net gain of 91 parking spaces. The Paul Milstein Building project is scheduled for completion in January 2011, and the parking garage is planned for completion in October 2010. This report analyzes the potential traffic and transportation impacts of the proposed development on the adjacent roadways.

Vehicular access to the parking garage is divided between University Avenue access to surface level parking and Central Avenue access to subsurface parking. To access the surface level (70 parking spaces), vehicles will enter through a driveway off University Avenue on the east side of the lot and will exit through another driveway in the center of the lot, similar to existing access points currently serving the Sibley/Tjaden lot. To access the sub-surface levels (total 129 spaces), drivers will enter and exit through a driveway off of Central Avenue.

The existing small surface lot next to Lincoln Hall currently shares an access drive off University Avenue with the Sibley/Tjaden parking lot access driveway. In the future, the Lincoln Hall lot will be accessed through a new driveway off of East Avenue.

The following intersections were included in the study area and were analyzed for existing and future conditions as applicable:

- University Avenue at West Avenue - three separate intersections (unsignalized)
- University Avenue at Central Avenue (unsignalized)
- University Avenue at Sibley/Tjaden Lot access (west) (unsignalized)
- University Avenue at Sibley/Tjaden Lot access (east)/Lincoln Hall - existing (unsignalized)
- University Avenue/Forest Home Drive at Thurston Avenue/East Avenue (signalized)
- East Avenue at Tower Road (unsignalized)
- East Avenue at Campus Road (unsignalized)
- Campus Road at College Avenue (signalized)
- Campus Road at West Avenue (unsignalized)
- University Avenue at Stewart Avenue (unsignalized)
- Campus Road at Stewart Avenue/South Avenue (unsignalized)
- Central Avenue at Parking Ramp Entrance (future unsignalized)
- East Avenue at New Lincoln Hall Access (future unsignalized)

Analysis was performed under four scenarios: Existing (2008), No-Build+1 (2012), Build+1 (2012), and a Construction Detour scenario. The Existing (2008) scenario includes A.M. and P.M. peak hour analyses based on turning movement data predominantly collected in February 2008. The No-Build+1 (2012) scenario includes existing traffic with projected annual growth to one year after the project completion. The Build+1 (2012) scenario includes No-Build+1 (2012) scenario volumes with the addition of site trips generated by the proposed development. The Construction Detour scenario analyzes conditions during a time period when University Avenue is closed to through traffic. It includes the No-Build+1 (2012) volumes altered to project likely diversions around University Avenue.

Existing (2008) Conditions

Existing analyses were conducted based on current roadway geometrics and intersection turning movement counts. The turning movement counts were mainly collected in February 2008. As reported in the summary level of service (LOS) table on page iv, all of the intersections within the study area are currently operating at LOS C or better in both the A.M. and P.M. peak hours. Detailed information pertaining to level of service categories and their delay ranges are contained in Section 2.3 of this report.

No-Build+1 (2012) Conditions

A general background growth rate of 2.5% was applied annually to the 2008 intersection volumes to reflect conditions in 2012, one year after project completion, to simulate a worst case scenario. This was the historic growth rate calculated in the *Cornell University Transportation-focused Generic Environmental Impact Statement (t-GEIS)* to account for overall background traffic reflecting both university and non-university growth in traffic in the area.

Based on the No-Build+1 (2012) analysis, all of the intersections in the network will see a slight increase in intersection delay, but will not result in any significant traffic performance degradation (i.e., there will be no drop from acceptable LOS to unacceptable LOS).

Trip Generation and Assignment

Because traffic going to and from the new Milstein Hall building will generally be regulated by the availability of parking in the CAPG, trips were generated based on the net gain of parking spaces. The CAPG is slated to have 199 parking spaces; the existing surface lot has 108 spaces. Therefore, the net gain in parking spaces is 91 spaces. Peak hour entering and exiting traffic volumes generated by these additional spaces were calculated using traffic rates gathered from similar parking lots/decks from around Cornell's campus. The rate incorporates normal employee based traffic as well as other associated service, delivery, and drop-off trips. The data showed that on average there were 0.45 trips per parking space during the A.M. peak hour (0.35 trips/space entering and 0.10 trips/space exiting). During the P.M. peak hour, there were 0.75 trips per parking space (0.35 trips/space entering and 0.40 trips/space exiting). These rates resulted in 41 total new A.M. trips (32 entering, 9 exiting) and 68 total new P.M. trips (32 entering, 36 exiting) for the proposed parking garage.

The generated site trips were distributed through the study area network based on existing traffic patterns and available geo-coding data. It was assumed that approximately 40% of the total trips would access the surface lot (via separate one-way gated entry and exit driveways on University

Avenue), and approximately 60% would use the sub-surface levels (via a single two-way access drive along Central Avenue).

Build+1 (2012) Conditions

The Build+1 (2012) conditions account for both the No-Build+1 (2012) traffic and the site traffic generated by the proposed development. All of the intersections in the network will see a slight increase in intersection delay, but will not result in any significant traffic performance degradation (i.e., there is no drop from acceptable LOS to unacceptable LOS) due to the addition of site trips from the proposed parking garage.

Construction Diversion Conditions

The Construction Diversion scenario examines conditions of the roadway network during a phase of construction that has University Avenue completely closed to through traffic. Volumes were derived by using the No-Build+1 (2012) scenario as a base, and diverting vehicles that access University Avenue during the No-Build+1 (2012) scenario around the network via other roadways, some of which are not included in the project study area, resulting in zero trips accessing University Avenue in the vicinity of the existing Sibley/Tjaden surface lot. After through traffic was removed from University Avenue, construction traffic was added to the surrounding network as part of this scenario. This scenario represents and analyzes the point at which traffic impacts from construction will potentially be greatest, due to roadway closures and increased truck traffic related to construction. As shown in the summary LOS table, most of the intersections in the network will see a slight increase in intersection delay, but will not result in any significant traffic performance degradation (i.e., there is no drop from acceptable LOS to unacceptable LOS) due to the construction diversions.

Roadway Improvement Recommendations (Potential Mitigations)

As indicated in the traffic operations analyses, the proposed development has only a minor impact on the study area intersections. All of the study area intersections are projected to operate at acceptable levels of service one year later than the build year; therefore, no roadway improvements or other traffic capacity mitigations are recommended at these locations.

Level of Service Results Summary

Intersection	Traffic Control	Existing (2008)		No-Build+1 (2012)		Build+1 (2012)		Construction Diversion	
		A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
University Avenue/Forest Home Drive at Thurston Avenue/East Avenue	Signalized	B (EB-C)	B (EB-C)	B (EB-C)	B (EB-C)	B (EB-C)	B (EB-C)	A (WB-C)	A (WB-C)
East Avenue at Tower Road	All-Way Stop	A (SB-A)	B (SB-B)	A (SB-A)	B (SB-B)	A (SB-A)	B (SB-B)	A (SB-A)	B (NB-B)
East Avenue at Campus Road	All-Way Stop	B (EB-B)	B (EB-B)	B (EB-B)	B (EB-C)	B (EB-B)	B (EB-C)	C (EB-C)	C (EB-E)
Campus Road at College Road	Signalized	A (EB-A)	A (WB-B)	A (EB-B)	A (WB-B)	A (EB-B)	A (WB-B)	B (EB-B)	B (WB-B)
Campus Road at West Avenue	Unsignalized	(SB-B)	(SB-B)	(SB-B)	(SB-C)	(SB-B)	(SB-B)	(SB-B)	(SB-C)
West Avenue at University (south)	Unsignalized	(SB-A)	(SB-A)	(SB-A)	(SB-A)	(SB-A)	(SB-A)	(SB-A)	(SB-A)
West Avenue at University (west)	Unsignalized	(NB-B)	(NB-B)	(NB-B)	(NB-B)	(NB-B)	(NB-B)	(NB-B)	(NB-B)
West Avenue at University (north)	Unsignalized	(NB-B)	(SB-C)	(NB-B)	(SB-C)	(NB-B)	(SB-C)	(NB-B)	(SB-B)
University Avenue at Central Avenue	Unsignalized	(NB-B)	(NB-C)	(NB-B)	(NB-C)	(NB-B)	(NB-C)	(NB-B)	(NB-B)
University Avenue at Sibley/Tjaden Lot (west)	Unsignalized	(NB-A)	(NB-B)	(NB-A)	(NB-B)	(NB-B)	(NB-B)	N/A	N/A
University Avenue at Sibley/Tjaden Lot (east)	Unsignalized	(NB-B)	(NB-B)	(NB-B)	(NB-B)	(NB-B)	(NB-B)	N/A	N/A
University Avenue at Stewart Avenue	All-Way Stop	B (EB-B)	C (WB-C)	B (EB-B)	C (WB-D)	B (EB-B)	C (WB-E)	A (EB-B)	C (WB-C)
Campus Road at Stewart Avenue	Unsignalized	(WB-A)	(WB-A)	(WB-A)	(WB-B)	(WB-A)	(WB-C)	(WB-A)	(WB-A)
Central Avenue at Parking Ramp Entrance	Future Unsignalized	N/A	N/A	N/A	N/A	(WB-A)	(WB-A)	N/A	N/A
East Avenue at New Lincoln Hall Access	Future Unsignalized	N/A	N/A	N/A	N/A	(EB-B)	(EB-B)	(EB-B)	(EB-B)

LEGEND: X (Dir-X) = Overall Intersection LOS (Worst Operating Approach – Worst Operating Approach LOS)

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1.0 INTRODUCTION

Cornell University plans to redevelop a plot of land along the southern side of University Avenue between East Avenue/Thurston Avenue and Central Avenue on the Cornell University campus in Ithaca, NY (Figure 1). The project consists of an academic building and a parking garage. The building, Paul Milstein Hall, will be connected to the existing Sibley Hall to the south and Rand Hall to the east, and will be cantilevered over University Avenue to the north. the building is proposed to be an approximately 59,000 square foot academic building, with a variety of uses including classrooms, studio space, an auditorium, meeting and exhibition space, and a gallery. In addition, a parking garage is planned on the west portion of the existing Sibley/Tjaden lot, located behind Sibley Hall and adjacent to the proposed Milstein Hall project. This parking facility, referred to as the Central Avenue Parking Garage (CAPG), will consist of three levels of parking – one at grade and two sub-surface parking levels. This facility is slated to have 199 total parking spaces available, replacing the existing 108 space surface lot, resulting in a net gain of 91 parking spaces. The Paul Milstein Building project is scheduled for completion in January 2011, and the parking garage is planned for completion in October 2010. This report analyzes the potential traffic and transportation impacts of the proposed development on the adjacent roadways.

Vehicular access to the parking garage is divided between University Avenue access to surface level parking and Central Avenue access to subsurface parking. To access the surface level (70 parking spaces), vehicles will enter through a driveway off University Avenue on the east side of the lot and will exit through another driveway in the center of the lot, similar to existing access points currently serving the Sibley/Tjaden lot. To access the sub-surface levels (total 129 spaces), drivers will enter and exit through a driveway off of Central Avenue. Access configurations for the proposed parking garage are shown in Figure 2.

The existing small surface lot next to Lincoln Hall currently shares an access drive off University Avenue with the Sibley/Tjaden parking lot access driveway. In the future, the Lincoln Hall lot will be accessed through a new driveway off of East Avenue.

The following intersections were included in the study area and were analyzed for existing and future conditions as applicable:

- University Avenue at West Avenue - three separate intersections (unsignalized)
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- University Avenue/Forest Home Drive at Thurston Avenue/East Avenue (signalized)
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- Central Avenue at Parking Ramp Entrance (future unsignalized)
- East Avenue at New Lincoln Hall Access (future unsignalized)

Martin/Alexiou/Bryson, PLLC was retained by Trowbridge & Wolf, LLP to analyze the potential traffic impacts of the proposed Paul Milstein Hall and Central Avenue Parking Garage project and to identify any necessary roadway improvements. This Traffic Impact Analysis (TIA) summarizes trip generation, distribution, traffic assignment and traffic analyses for the proposed development.

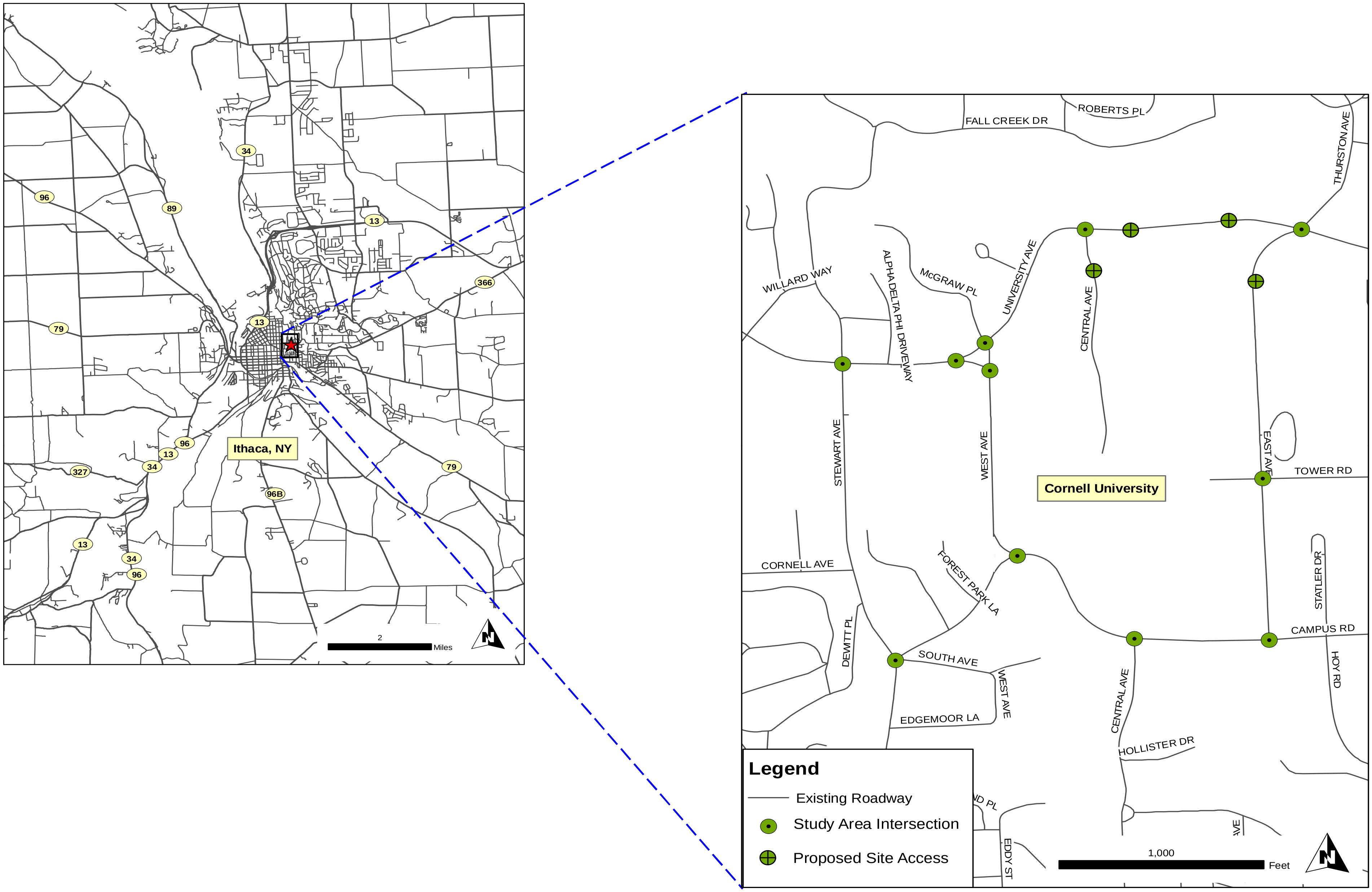


Figure 1
Vicinity Map

Milstein Hall & CAPG
Traffic Impact Analysis
Cornell University
Ithaca, NY

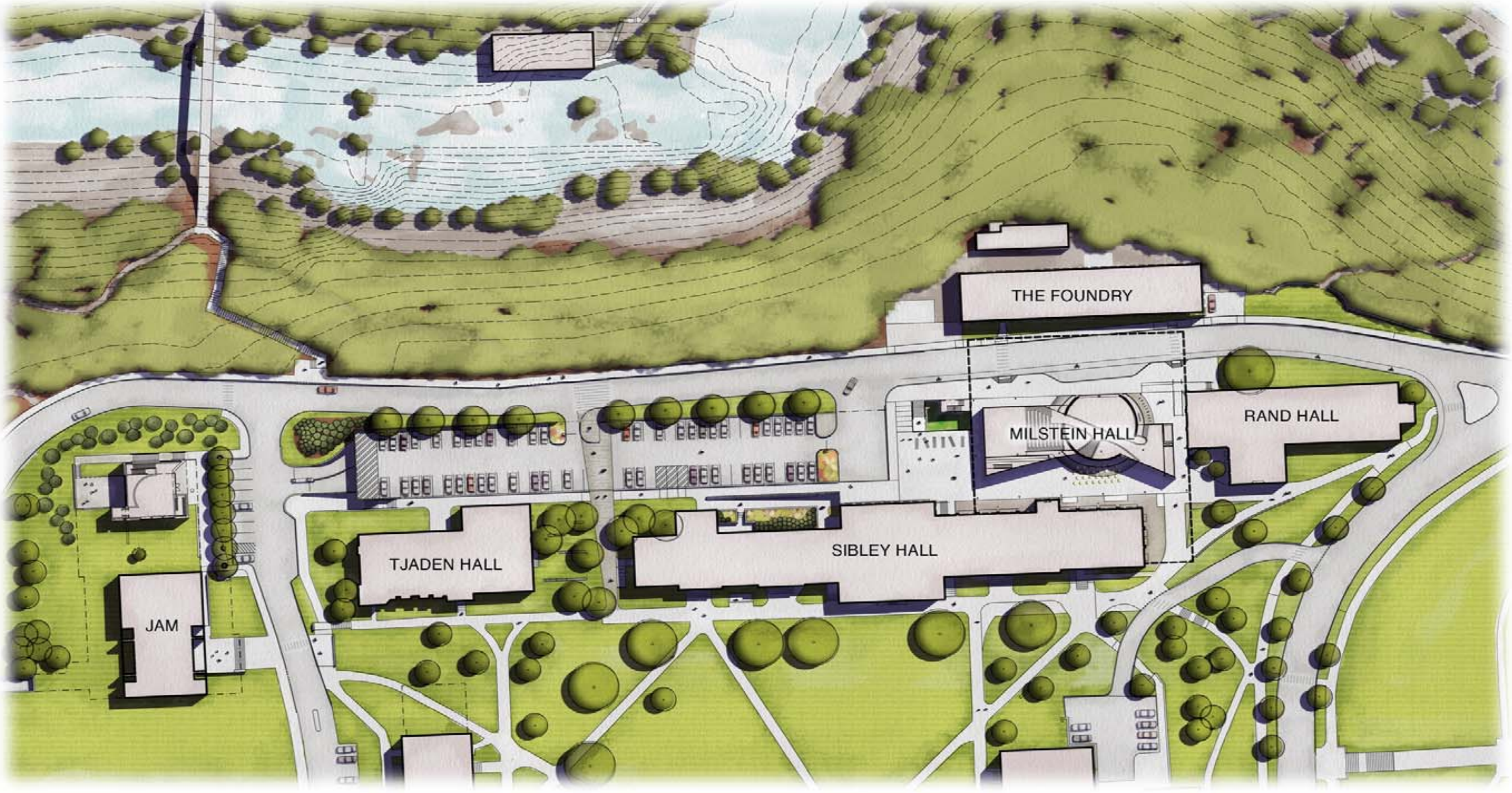


Figure 2
Conceptual Site Plan

Milstein Hall & CAPG
Traffic Impact Analysis
Cornell University
Ithaca, NY

2.0 EXISTING CONDITIONS

2.1 EXISTING ROADWAY CONDITIONS

This section describes the existing streets within the project traffic study area.

University Avenue

- University Avenue is a two-lane roadway with a posted speed limit of 30 miles per hour (mph).
- The land uses along University Avenue within the study area include residence halls and university owned or affiliated fraternity/sorority houses and other residence houses, private apartment houses primarily serving Cornell students, as well as University academic, museum and office buildings.
- University Avenue will provide direct access to the proposed Central Avenue Parking Garage's surface level parking, while providing indirect access via Central Avenue to the two sub-surface parking levels.
- University Avenue, within the vicinity of the proposed project, is a designated bike route; however, there is no exclusive bike lane along this facility.
- University Avenue has a sidewalk along its north side only within the project vicinity.

	
Looking west along University Avenue toward the proposed Milstein Hall/CAPG site.	*Eastbound approach of University Avenue at the Thurston Avenue/Forest Home Drive/East Avenue intersection*

Thurston Avenue/East Avenue

- Thurston Avenue/East Avenue is a two-lane roadway with a speed limit of 30 mph.
- North of University Avenue, this roadway is named Thurston Avenue, while south of University Avenue, it is called East Avenue.
- Land use along Thurston Avenue is primarily university residence halls, fraternity and sorority housing, and transitions to include private residences in the second and third blocks from the intersection with University Avenue.
- Land use along East Avenue is University academic and administration buildings.
- North of University Avenue (Thurston Avenue), this facility is a designated bike route with no exclusive bike lanes; however, south of University Avenue (East Avenue), the facility is a designated bike route that does have exclusive bike lanes from approximately University Avenue to Campus Road.
- East Avenue has sidewalks along both sides of the street, separated from the roadway by a landscaped buffer.

	
Looking south along East Avenue from the Tower Road intersection	*Northbound approach of East Avenue at the Thurston Avenue/University Avenue intersection*

West Avenue

- West Avenue is a two-lane roadway with a posted speed limit of 25 mph.
- Land use along West Avenue includes University residence halls on the west side of the street and on-street parking and green space on the east side of the street.
- West Avenue is not a designated bike route.
- This roadway has a sidewalk along its western side.

Looking north along West Avenue toward the University Avenue intersection

Southbound approach of West Avenue at the Campus Road intersection

Central Avenue

- Central Avenue is a two-lane, dead-end roadway with no posted speed limit. Parking along Central Avenue is generally limited to drivers with a parking permit.
- Land use along Central Avenue includes University academic buildings and the Johnson Museum of Art. Central Avenue will provide direct access to the sub-surface parking levels of the proposed parking garage.
- Across the intersection of Central Avenue and University Avenue is a pedestrian suspension bridge that provides a pedestrian connection between residential and campus development on both sides of Fall Creek.
- Central Avenue is a designated bike route; however, there is no exclusive bike lane along this roadway.

Northbound approach of Central Avenue at the University Road intersection

Looking south along Central Avenue from the University Road intersection

Campus Road

- Campus Road is a two-lane roadway with a speed limit of 30 mph.
- Land use along Campus Road includes primarily university, academic and other support buildings along the eastern portion, with residence halls and university-owned or affiliated fraternity/sorority residence houses on the western portion.
- Campus Road, within the vicinity of the proposed project, is a designated bike route; however, there is no exclusive bike lane along this roadway.
- There are sidewalks along both sides of Campus Road.

	
Westbound approach of Campus Road at the West Avenue intersection	*Looking west along Campus Road toward the West Avenue intersection*

Stewart Avenue

- Stewart Avenue is a two-lane roadway with a speed limit of 30 mph.
- Land use along Stewart Avenue includes residence halls and university-owned or affiliated residence buildings.
- Stewart Avenue is not a designated bike route.

	
Looking south along Stewart Avenue from the University Avenue intersection	*Looking south along Stewart Avenue from the Campus Road intersection*

Figure 3 provides a schematic diagram of the roadways near the proposed development including the existing intersection geometrics.

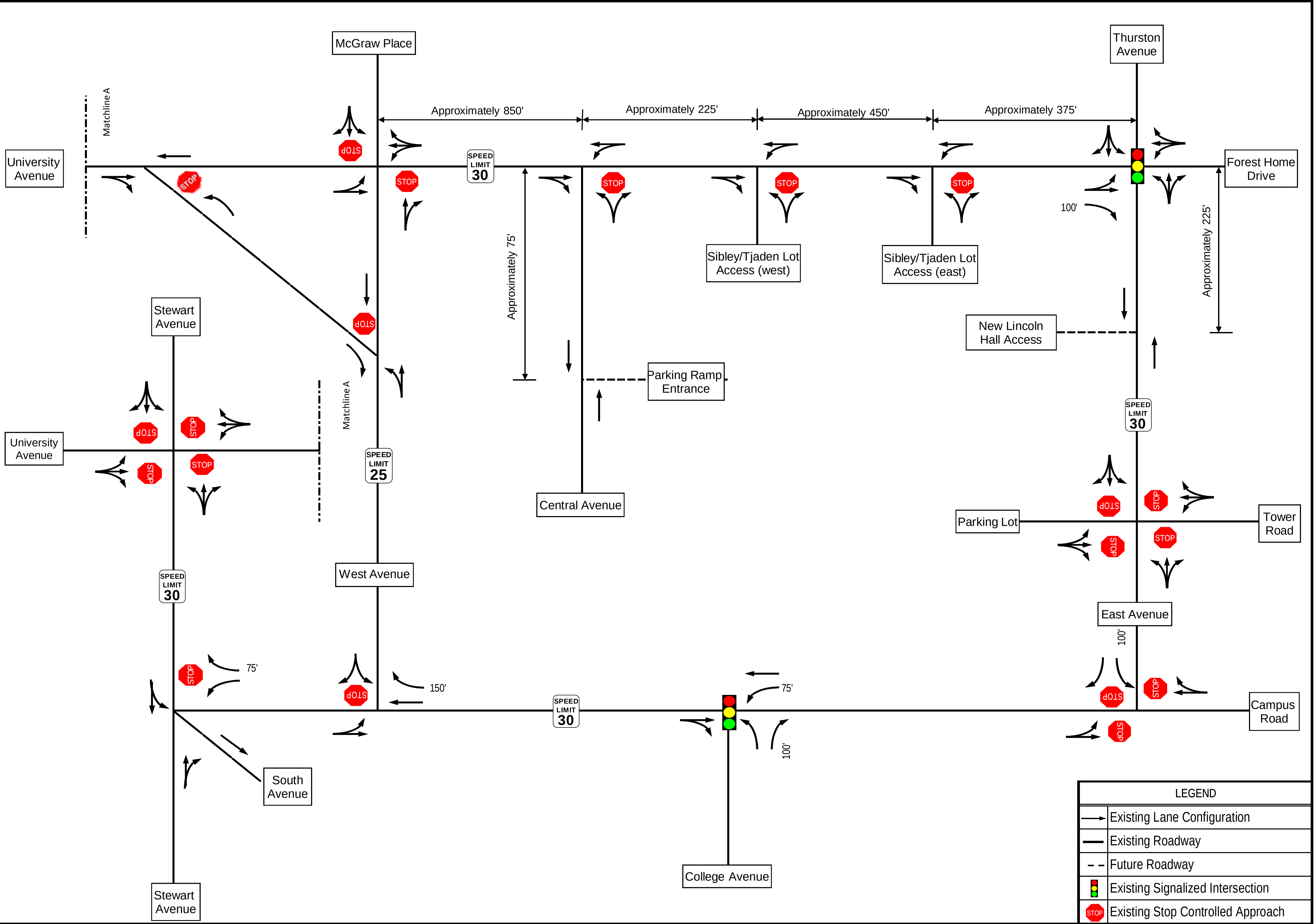


Figure 3
Existing (2008) Lane Configurations and Traffic Control

Milstein Hall & CAPG
Traffic Impact Analysis
Cornell University
Ithaca, NY

2.2 EXISTING TURNING MOVEMENT DATA

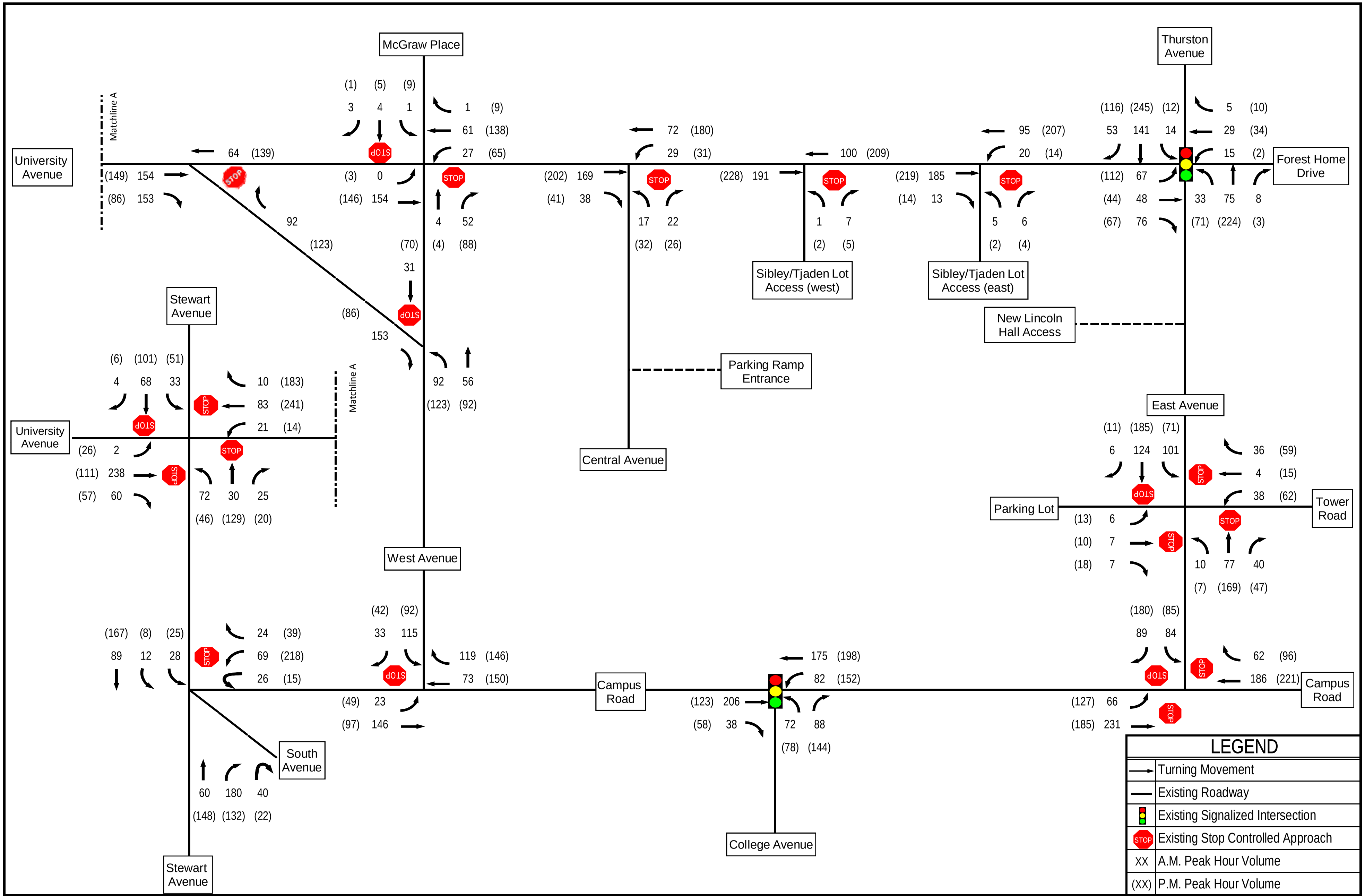
In order to analyze the worst case scenarios, typically the engineering profession analyzes the "peak hour" volumes at intersections. These hours (one in the morning and one in the evening) are chosen to represent the "rush hour" traffic for that area. For this, and most studies, the A.M. and P.M. peak hours were estimated to fall between 7:00-9:00 A.M. and 4:00-6:00 P.M., respectively. Most vehicles in the area will be predominantly University employees or vehicles travelling through campus that likely arrive on and leave campus in a fashion similar to a traditional work day. From the data collected over the two-hour period, a single 60 minute interval is selected to represent the heaviest volume of traffic at that location during the peak travel period. Table 1 summarizes the schedule used to obtain the turning movement data. A detailed summary of the traffic counts can be found in Appendix A.

Table 1 Weekday Peak Period Turning Movement Count Schedule

Intersection	Time of Data Collection	Date of Count
University Avenue/Forest Home Drive at Thurston Avenue/East Avenue	7:00 A.M. – 9:00 A.M. 4:00 P.M. – 6:00 P.M.	Wednesday February 13, 2008
East Avenue at Tower Road	7:00 A.M. – 9:00 A.M. 4:00 P.M. – 6:00 P.M.	Tuesday February 12, 2008
East Avenue at Campus Road	7:00 A.M. – 9:00 A.M. 4:00 P.M. – 6:00 P.M.	Friday, Feb. 11, 2008 Monday, Feb. 15, 2008
Campus Road at College Avenue	7:00 A.M. – 9:00 A.M. 4:00 P.M. – 6:00 P.M.	Friday, Feb. 11, 2008 Monday, Feb. 15, 2008
Campus Road at West Avenue	7:00 A.M. – 9:00 A.M. 4:00 P.M. – 6:00 P.M.	Wednesday February 13, 2008
University Avenue at West Avenue	7:00 A.M. – 9:00 A.M. 4:00 P.M. – 6:00 P.M.	Wednesday February 13, 2008
University Avenue at Central Avenue	7:00 A.M. – 9:00 A.M. 4:00 P.M. – 6:00 P.M.	Thursday February 14, 2008
University Avenue at Sibley/Tjaden Lot access (west)	7:00 A.M. – 9:00 A.M. 4:00 P.M. – 6:00 P.M.	Thursday February 14, 2008
University Avenue at Sibley/Tjaden Lot access (east)	7:00 A.M. – 9:00 A.M. 4:00 P.M. – 6:00 P.M.	Thursday February 14, 2008
University Avenue at Stewart Avenue	7:00 A.M. – 9:00 A.M.	Friday March 7, 2008

Turning movement counts at the University Avenue and Stewart Avenue (P.M.) and Campus Road and Stewart Avenue (A.M. and P.M.) intersections were obtained from previous traffic studies in the area. Existing counts were adjusted along University Avenue to balance between Thurston Avenue and West Avenue. This balancing is commonly used to offset the effect of daily variances in traffic volumes along the same roadway. This was conducted by adding vehicles to the upstream intersection in the corridor and balancing as necessary. The collected count data was compared to past count data at the same location for consistency. In this study, the balancing of traffic volumes was necessary to calculate the diversion of traffic around the area during construction of the proposed project. To be conservative, the majority of adjustments were made by increasing the traffic counts, rather than decreasing.

The existing peak hour turning movement volumes are shown in Figure 4.



MARTIN ALEXIOU BRYSON

Figure 4
Existing (2008) A.M. and P.M. Peak Hour Turning Movement Volumes

Milstein Hall & CAPG
Traffic Impact Analysis
Cornell University
Ithaca, NY

2.3 *LEVEL OF SERVICE CRITERIA*

Peak hour level of service (LOS), which measures the adequacy of intersection geometrics and traffic control of a particular intersection or approach for the given turning volumes, was used as the evaluation criterion in this analysis. Levels of service range from A through F, based on the average control delay experienced by vehicles traveling through the intersection during the peak hours. Table 2 provides a general description of the LOS categories and delay ranges for both signalized and unsignalized intersections. The engineering profession generally accepts LOS D or higher as an acceptable operating condition for signalized intersections in urban areas and LOS C for rural areas. At unsignalized intersections, a LOS E is generally considered acceptable where the side street encounters the delay. Nevertheless, side streets sometimes function at LOS F during peak traffic periods; however, the traffic volumes often do not warrant a traffic signal to assist side street traffic. For the purpose of this study an overall LOS D or worse was considered unacceptable operation for an intersection. For intersections that do not report an overall LOS, mitigation measures were considered when a single approach operated at LOS D or below. This standard was set based on expectations of the City of Ithaca and surrounding areas.

Table 2 Level of Service Descriptions for Intersections

Level of Service	Description	Signalized Intersection	Unsignalized Intersection
A	Little or no delay	<= 10 sec.	<= 10 sec.
B	Short traffic delay	10-20 sec.	10-15 sec.
C	Average traffic delay	20-35 sec.	15-25 sec.
D	Long traffic delay	35-55 sec.	25-35 sec.
E	Very long traffic delay	55-80 sec.	35-50 sec.
F	Unacceptable delay	> 80 sec.	> 50 sec.

In this report, levels of service for a signalized or an all-way stop intersection are reported as an overall LOS, with its lowest operating approach and subsequent LOS also listed (Example: A reported LOS of "B (WB-C)" would indicate that overall the intersection operates at a LOS B, but the individual westbound approach operates at a LOS C. This is because the overall LOS is an average of the individual approaches.). For intersections with partial stop control, levels of service are reported based only on the LOS of their lowest operating approach (Example: A reported LOS of "(SB-D)" would indicate that the southbound approach operates at a LOS D and all other approaches operate at a higher level than this approach.

2.4 *LEVEL OF SERVICE ANALYSIS*

Intersection levels of service analyses were performed for the typical weekday A.M. and P.M. peak hours using *Synchro/SimTraffic Professional Version 7*. *Synchro,* which uses *Highway Capacity Manual* methodology, was used for most intersections, while untraditional geometry and traffic control at some locations required the use of SimTraffic, a micro-simulation tool within the *Synchro* package. This simulation tool was used to determine LOS at the University Avenue and West Avenue (south) intersection and the Campus Road and Stewart Avenue intersection. A summary of the findings for the Existing (2008) scenario LOS analysis can be found in Table 3 and the full *Synchro/HCS* output can be found in Appendix B. As reported in Table 3, all of the intersections within the study area are operating at LOS C or better in both the A.M. and P.M. peak hours. Due to the high pedestrian volumes at the East Avenue at Campus Road intersections, simulation results show considerable queuing and delay along Campus Road. As a result, the LOS may actually be lower than reported during short time periods, such as the time span during class changes.

Table 3 Existing (2008) Level of Service Results

Intersection	Traffic Control	Existing (2008)	
		A.M.	P.M.
University Avenue/Forest Home Drive at Thurston Avenue/East Avenue	Signalized	B (EB-C)	B (EB-C)
East Avenue at Tower Road	All-Way Stop	A (SB-A)	B (SB-B)
East Avenue at Campus Road	All-Way Stop	B (EB-B)	B (EB-B)
Campus Road at College Road	Signalized	A (EB-A)	A (WB-B)
Campus Road at West Avenue	Unsignalized	(SB-B)	(SB-B)
West Avenue at University (south)	Unsignalized	(SB-A)	(SB-A)
West Avenue at University (west)	Unsignalized	(NB-B)	(NB-B)
West Avenue at University (north)	Unsignalized	(NB-B)	(SB-C)
University Avenue at Central Avenue	Unsignalized	(NB-B)	(NB-C)
University Avenue at Sibley/Tjaden Lot (west)	Unsignalized	(NB-A)	(NB-B)
University Avenue at Sibley/Tjaden Lot (east)	Unsignalized	(NB-B)	(NB-B)
University Avenue at Stewart Avenue	All-Way Stop	B (EB-B)	C (WB-C)
Campus Road at Stewart Avenue	Unsignalized	(WB-A)	(WB-A)
Central Avenue at Parking Ramp Entrance	Future Unsignalized	N/A	N/A
East Avenue at New Lincoln Hall Access	Future Unsignalized	N/A	N/A

LEGEND: X (Dir-X) = Overall Intersection LOS (Worst Operating Approach – Worst Operating Approach LOS)

3.0 NO-BUILD+1 CONDITIONS

3.1 NO-BUILD GROWTH AND DEVELOPMENT

The proposed development is scheduled for concurrent construction of Milstein Hall and the CAPG; Milstein Hall is projected to open in January 2011, while the CAPG will open in October 2010. A general background growth rate of 2.5% was applied annually to the 2008 intersection volumes to reflect conditions at one year beyond project completion to simulate a worst case scenario. This was also the historic rate calculated in the *Cornell University Transportation-focused Generic Environmental Impact Statement (t-GEIS)* to account for past overall background traffic. Using this rate reflects both university and non-university growth in traffic in the area. Currently, there are no approved developments in the immediate vicinity of the area that would substantially impact the traffic prior to the completion of the proposed Milstein Hall and CAPG. The resulting turning movement volumes used in the No-Build+1 (2012) capacity analysis are shown in Figure 5.

3.2 LEVEL OF SERVICE ANALYSIS

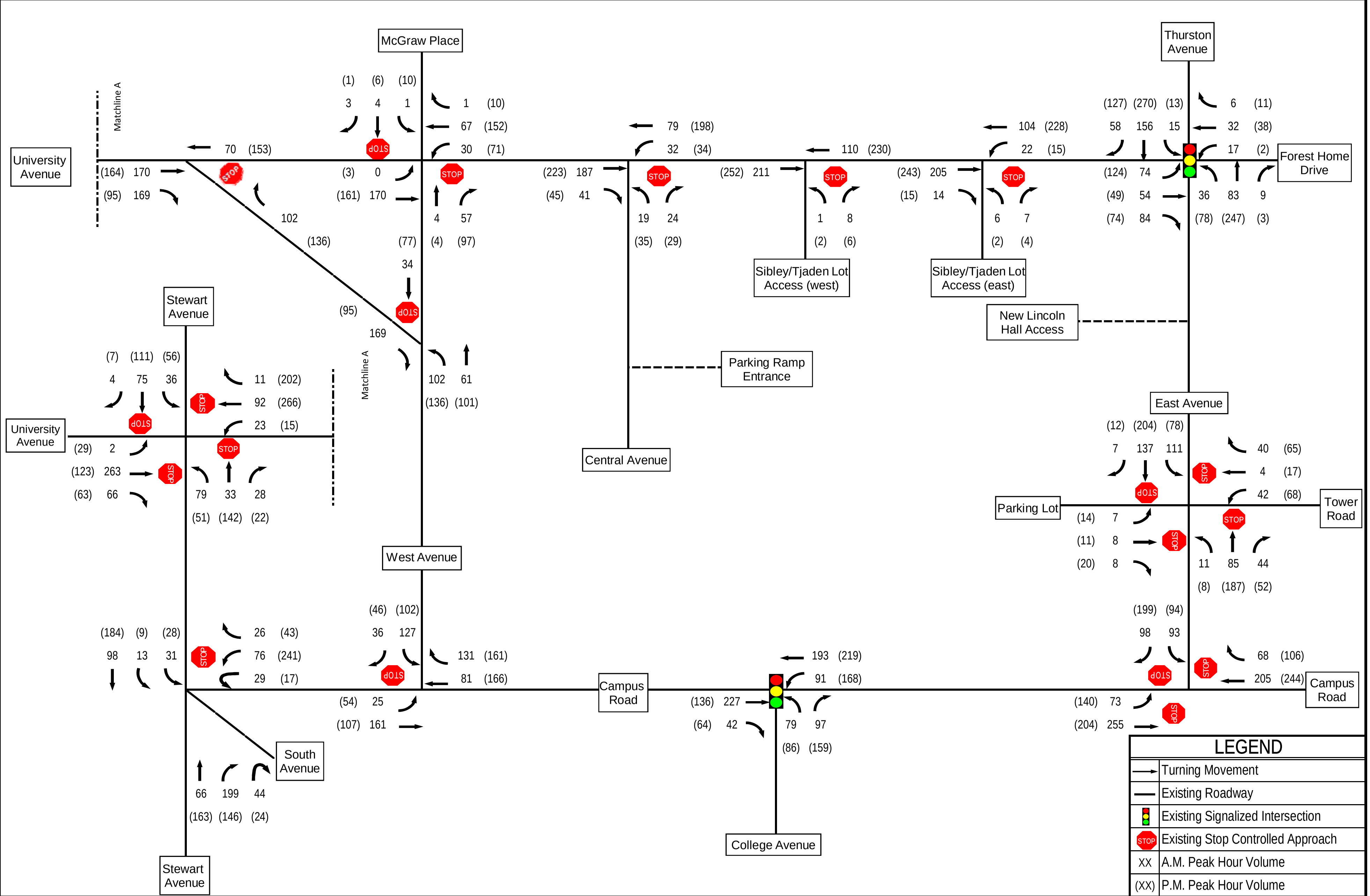
Intersection level of service analyses were performed for the typical weekday A.M. and P.M. peak hours using *Synchro/SimTraffic Professional Version 7*. A summary of the findings for the No-Build+1 (2012) scenario LOS can be found in Table 4 and the full *Synchro/HCS* output can be found in Appendix B.

Based on the No-Build+1 (2012) analysis, all of the intersections in the network will see a slight increase in intersection delay, but will not result in any significant traffic performance degradation (i.e., there will be no drop from acceptable LOS to unacceptable LOS).

Table 4 No-Build+1 (2012) Level of Service Results

Intersection	Traffic Control	No-Build+1 (2012)	
		A.M.	P.M.
University Avenue/Forest Home Drive at Thurston Avenue/East Avenue	Signalized	B (EB-C)	B (EB-C)
East Avenue at Tower Road	All-Way Stop	A (SB-A)	B (SB-B)
East Avenue at Campus Road	All-Way Stop	B (EB-B)	B (EB-C)
Campus Road at College Road	Signalized	A (EB-B)	A (WB-B)
Campus Road at West Avenue	Unsignalized	(SB-B)	(SB-C)
West Avenue at University (south)	Unsignalized	(SB-A)	(SB-A)
West Avenue at University (west)	Unsignalized	(NB-B)	(NB-B)
West Avenue at University (north)	Unsignalized	(NB-B)	(SB-C)
University Avenue at Central Avenue	Unsignalized	(NB-B)	(NB-C)
University Avenue at Sibley/Tjaden Lot (west)	Unsignalized	(NB-A)	(NB-B)
University Avenue at Sibley/Tjaden Lot (east)	Unsignalized	(NB-B)	(NB-B)
University Avenue at Stewart Avenue	All-Way Stop	B (EB-B)	C (WB-D)
Campus Road at Stewart Avenue	Unsignalized	(WB-A)	(WB-B)
Central Avenue at Parking Ramp Entrance	Future Unsignalized	N/A	N/A
East Avenue at New Lincoln Hall Access	Future Unsignalized	N/A	N/A

LEGEND: X (Dir-X) = Overall Intersection LOS (Worst Operating Approach – Worst Operating Approach LOS)



LEGEND

⟶	Turning Movement
—	Existing Roadway
🚦	Existing Signalized Intersection
STOP	Existing Stop Controlled Approach
XX	A.M. Peak Hour Volume
(XX)	P.M. Peak Hour Volume

Figure 5
No-Build+1 (2012) A.M. and P.M. Peak Hour turning Movement Volumes

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Traffic Impact Analysis
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4.0 BUILD+1 ANALYSIS

Cornell University plans to redevelop a plot of land along the southern side of University Avenue between Thurston Avenue and Central Avenue on the Cornell University campus in Ithaca, NY (Figure 1). The project consists of an academic building and a parking garage. The building, Paul Milstein Hall, will be connected to the existing Sibley Hall to the south and Rand Hall to the east, and will be cantilevered over University Avenue to the north. Milstein Hall is proposed to be an approximately 59,000 square foot academic building, housing classrooms, studio space, an auditorium, meeting and exhibition space, and a gallery. In addition, a separate parking garage is planned on the west portion of the Sibley/Tjaden lot, behind Sibley Hall and adjacent to the proposed Milstein Hall project. This parking facility, referred to as the CAPG, will consist of three levels of parking – one at grade and two sub-surface parking levels. This facility is slated to have 199 total parking spaces available, replacing the existing 108 space surface lot, resulting in a net gain of 91 parking spaces. The Paul Milstein Building project is scheduled for completion in January 2011, and the parking garage is planned for completion in October 2010.

4.1 TRIP GENERATION

New trips along University Avenue will generally be regulated by the availability of parking at the CAPG. Trips were generated based on the net gain of parking spaces. The CAPG is projected to have 199 parking spaces; the existing surface lot has 108 spaces. Therefore, the net gain in parking spaces is 91 spaces. Peak hour entering and exiting traffic volumes generated by these additional spaces were calculated using traffic rates gathered from similar parking lots/decks from around Cornell's campus. The data showed that on average there were 0.45 trips per parking space during the A.M. peak hour (0.35 trips/space entering and 0.10 trips/space exiting). During the P.M. peak hour, there were 0.75 trips per parking space (0.35 trips/space entering and 0.40 trips/space exiting). These rates resulted in 41 total new A.M. trips (32 entering, 9 exiting) and 68 total new P.M. trips (32 entering, 36 exiting) for the proposed parking garage.

Table 5 summarizes the assumed trip generation rates and resulting trips for the development during the typical A.M. and P.M. peak hours.

Table 5 Total Trip Generation Rates (Vehicle Trips)

	A.M.			P.M.		
	Enter	Exit	Total	Enter	Exit	Total
Trips per Space ratio used	0.35	0.10	0.45	0.35	0.4	0.75
Projected generated trips for net increase in parking spaces (rate x 91 spaces)	32	9	41	32	36	68

4.2 *TRIP DISTRIBUTION AND ASSIGNMENT*

The generated site trips were distributed to the study area network as follows:

- 28% to/from the north via Thurston Avenue
- 5% to/from the east via Forest Home Drive
- 7% to/from the east via Tower Road
- 10% to/from the east via Campus Road
- 2% to/from the south via College Avenue
- 19% to/from the south via Stewart Avenue
- 15% to/from the west via University Avenue
- 12% to/from the north via Stewart Avenue
- 2% to/from the west via Cornell Avenue

The above percentages were determined using the existing Sibley/Tjaden lot and Central Avenue distribution percentages applied as part of the *t-GEIS*, including geocoded addresses, and based on surrounding traffic patterns. The distribution associated with the *t-GEIS* incorporated the origins and destinations of vehicle trips based on known employee and graduate student addresses. Figure 6 illustrates the directional distribution percentages for the projected site trips. Figure 7 shows the distributed trips. Approximately 40% of the site trips were assumed to use the surface level of the CAPG, while the remaining 60% were assumed to use the two sub-surface levels. Approximately 60% of the turning movement volumes counted at the Sibley/Tjaden surface lot entrance and exit were therefore shifted to the lower level entrance/exit in the Build+1 (2012) scenario.

Table 6 compares the potential number of site trips added to the surrounding roadways if the level of trip generation assumed in this study occurred. The site traffic volumes were derived from the previously discussed campus rates and the non-site traffic volumes were estimated from the turning movement counts. During the peak time periods, the site generated traffic will generally account for less than 7% of the total traffic on the four major approach directions, with the exception of University Avenue between the Sibley/Tjaden Lot East Access and East Avenue.

Table 6 Potential Traffic Increases along Surrounding Roadway

Roadway	Trips	A.M. Peak Hour		P.M. Peak Hour	
		NB/EB	SB/WB	NB/EB	SB/WB
University Avenue between Central Ave. and West Ave.	Site Traffic	15	4	15	17
	Non-Site Traffic	228	98	268	233
	% increase	**7%**	**4%**	**6%**	**7%**
University Avenue between Parking Lot (east access) and East Ave.	Site Traffic	5	17	19	17
	Non-Site Traffic	212	126	247	243
	% increase	**2%**	**13%**	**8%**	**7%**
West Avenue south of University Ave.	Site Traffic	6	2	6	7
	Non-Site Traffic	163	203	237	172
	% increase	**4%**	**1%**	**3%**	**4%**
East Avenue between University Avenue and Tower Road	Site Traffic	6	2	6	7
	Non-Site Traffic	132	255	266	294
	% increase	**5%**	**1%**	**2%**	**2%**

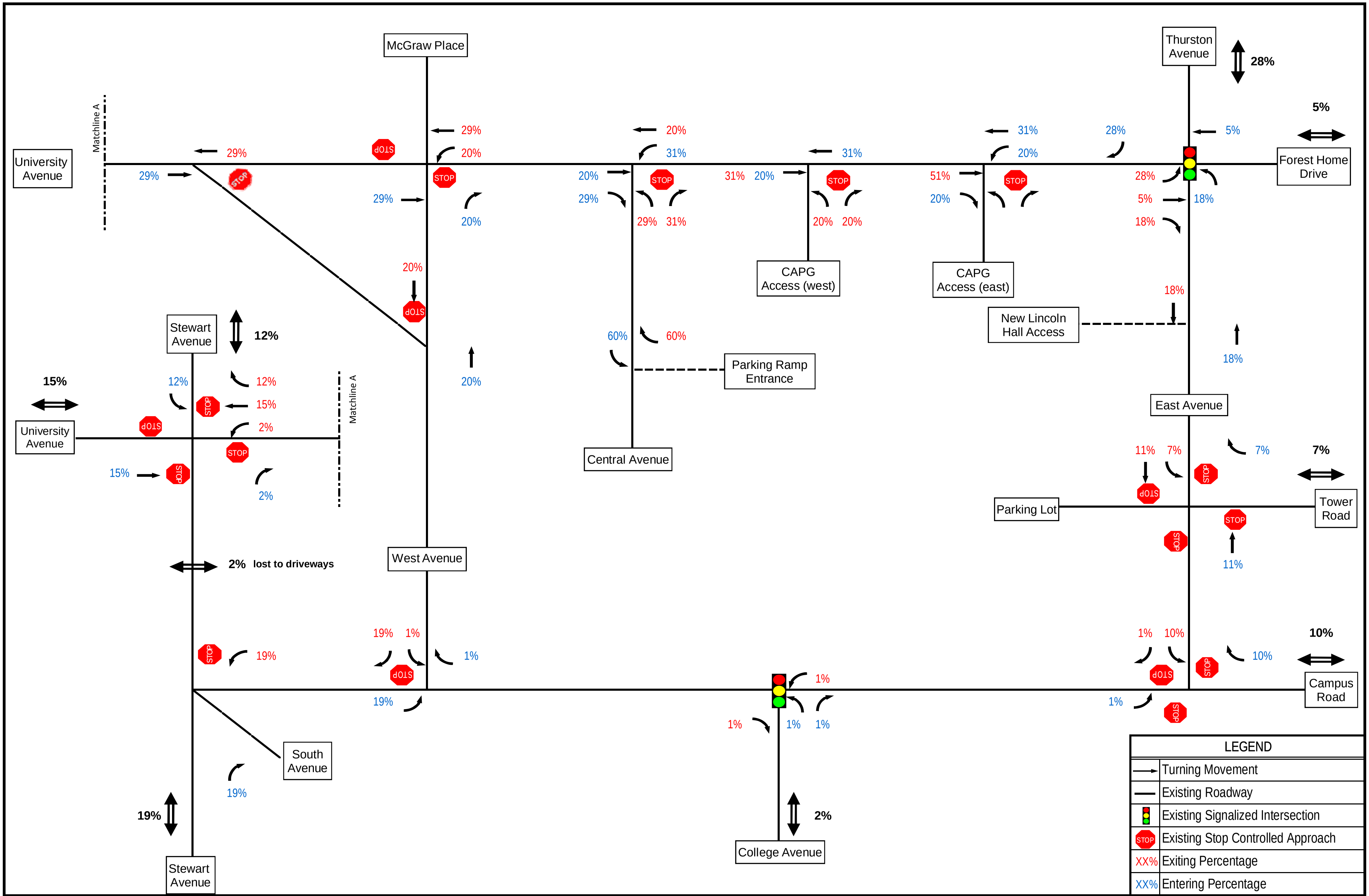

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Figure 6
A.M. and P.M. Peak Hour Directional Distribution Percentages

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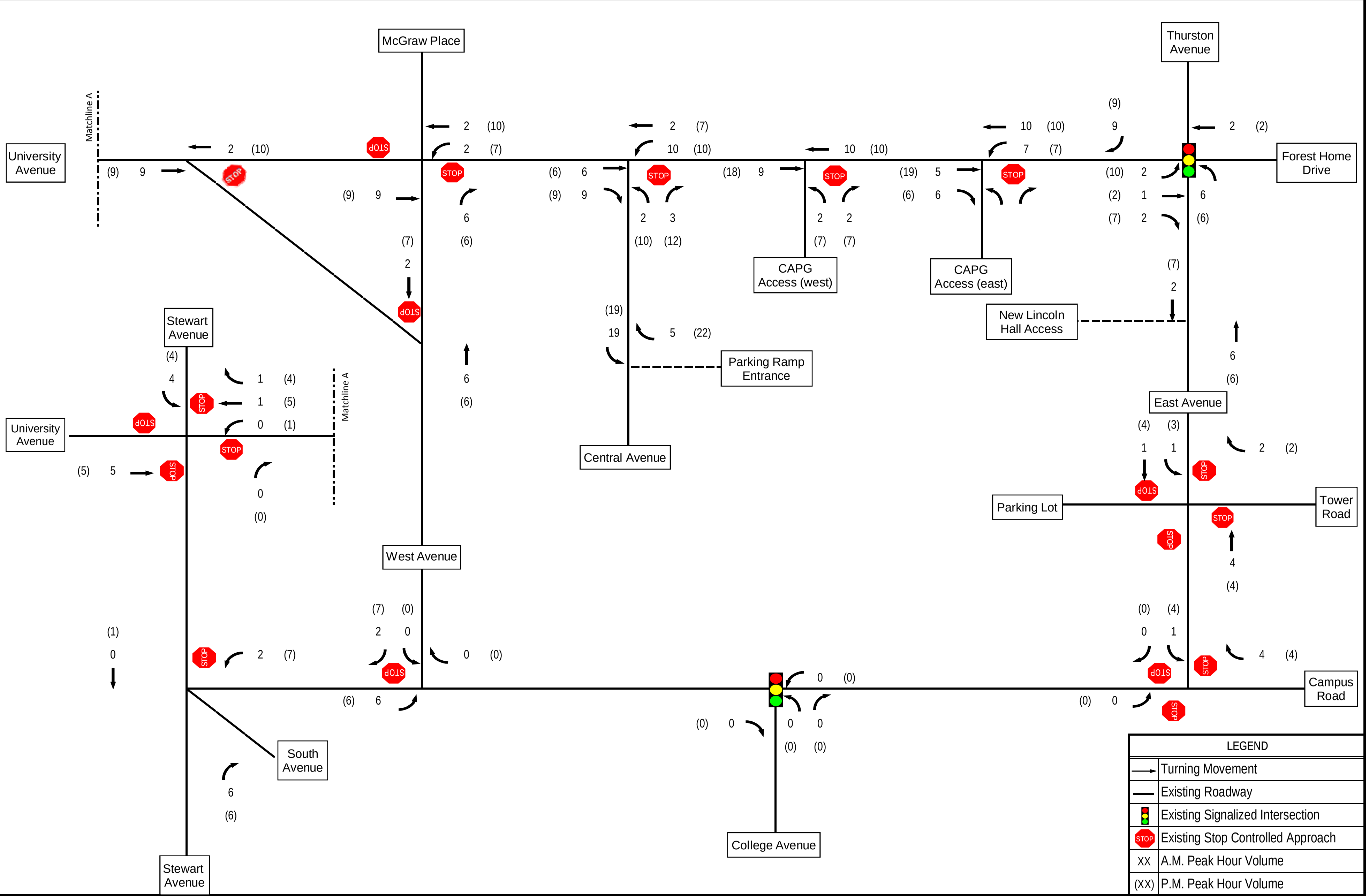

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Figure 7
A.M. and P.M. Peak Hour Site Trips

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Traffic Impact Analysis
Cornell University
Ithaca, NY

4.3 *LEVEL OF SERVICE ANALYSIS*

The Build+1 (2012) analysis scenario includes the No-Build+1 (2012) traffic as described in Section 3.0 of this report as well as site generated trips from the proposed development as described previously. Figure 8 depicts the turning movement volumes used in the Build+1 (2012) scenario analysis.

Intersection levels of service analyses were performed for the typical weekday A.M. and P.M. peak hours using *Synchro/SimTraffic Professional Version 7*. Table 7 summarizes the findings of the LOS analysis and Appendix B contains the full *Synchro/HCS* reports of the analyses.

All of the intersections in the network will see a slight increase in intersection delay, but will not result in any significant traffic performance degradation (i.e., from acceptable LOS to unacceptable LOS) due to the addition of site trips from the proposed parking garage. The new Central Avenue ramp entrance to the subsurface portion of the garage is projected to operate at a LOS A for the westbound approach during both peak hours. A one lane ingress and one lane egress driveway configuration is projected to sufficiently accommodate vehicle traffic to and from the proposed CAPG. As was the case in the Existing (2008) scenario, the East Avenue at Campus Road intersection has the potential to experience lower levels of service than reported in the results table due to high pedestrian volumes at this location. However, this worst case scenario is unlikely since the high pedestrian volumes are most likely to occur when most classes are scheduled (mid-morning to mid-afternoon) Overall, the project's impact at this location is very minor (less than 5 site related vehicles on any approach during a peak hour). In addition, only two locations are projected to experience any change in LOS. Specifically, the average delay for the westbound approach of University Avenue at Stewart Avenue is expected to increase by less than 4 seconds; however, this increase is enough to drop the approach LOS from a D to an E. This small increase, though, does not affect the overall LOS reported for this all-way stop intersection, as it remains a LOS C; therefore, operations are still considered acceptable.

4.4 *TRAFFIC IMPACTS OF MILSTEIN HALL AND SURFACE LOT ONLY*

If the CAPG project is not approved, but the Milstein Hall project is, then the loss of parking from the existing Sibley/Tjaden lot due to Milstein Hall is expected to be absorbed into other parking facilities on campus. The completion of Milstein Hall is expected to eliminate approximately 50 of the existing spaces in this surface lot, resulting in less parking availability in the area. If there is less parking available, generally fewer cars will be in the area. Some additional drop-off or loading traffic could be added due to the completion of Milstein Hall only; however, the removal of approximately 50 spaces would offset this potential gain. Consequently, the LOS results would be roughly equal to, or slightly better than, the No-Build+1 (2012) values shown in Table 4. As discussed previously, even one year later, under the full build out conditions of both projects, no operational issues are projected at any study area intersections. Therefore, it can be concluded that traffic operations will remain acceptable if the CAPG is not built.

Table 7 Build+1 (2012) Level of Service Results

Intersection	Traffic Control	Build+1 (2012)	
		A.M.	P.M.
University Avenue/Forest Home Drive at Thurston Avenue/East Avenue	Signalized	B (EB-C)	B (EB-C)
East Avenue at Tower Road	All-Way Stop	A (SB-A)	B (SB-B)
East Avenue at Campus Road	All-Way Stop	B (EB-B)	B (EB-C)
Campus Road at College Road	Signalized	A (EB-B)	A (WB-B)
Campus Road at West Avenue	Unsignalized	(SB-B)	(SB-B)
West Avenue at University (south)	Unsignalized	(SB-A)	(SB-A)
West Avenue at University (west)	Unsignalized	(NB-B)	(NB-B)
West Avenue at University (north)	Unsignalized	(NB-B)	(SB-C)
University Avenue at Central Avenue	Unsignalized	(NB-B)	(NB-C)
University Avenue at Sibley/Tjaden Lot (west)	Unsignalized	(NB-B)	(NB-B)
University Avenue at Sibley/Tjaden Lot (east)	Unsignalized	(NB-B)	(NB-B)
University Avenue at Stewart Avenue	All-Way Stop	B (EB-B)	C (WB-E)
Campus Road at Stewart Avenue	Unsignalized	(WB-A)	(WB-C)
Central Avenue at Parking Ramp Entrance	Future Unsignalized	(WB-A)	(WB-A)
East Avenue at New Lincoln Hall Access	Future Unsignalized	(EB-B)	(EB-B)

LEGEND: X (Dir-X) = Overall Intersection LOS (Worst Operating Approach – Worst Operating Approach LOS)

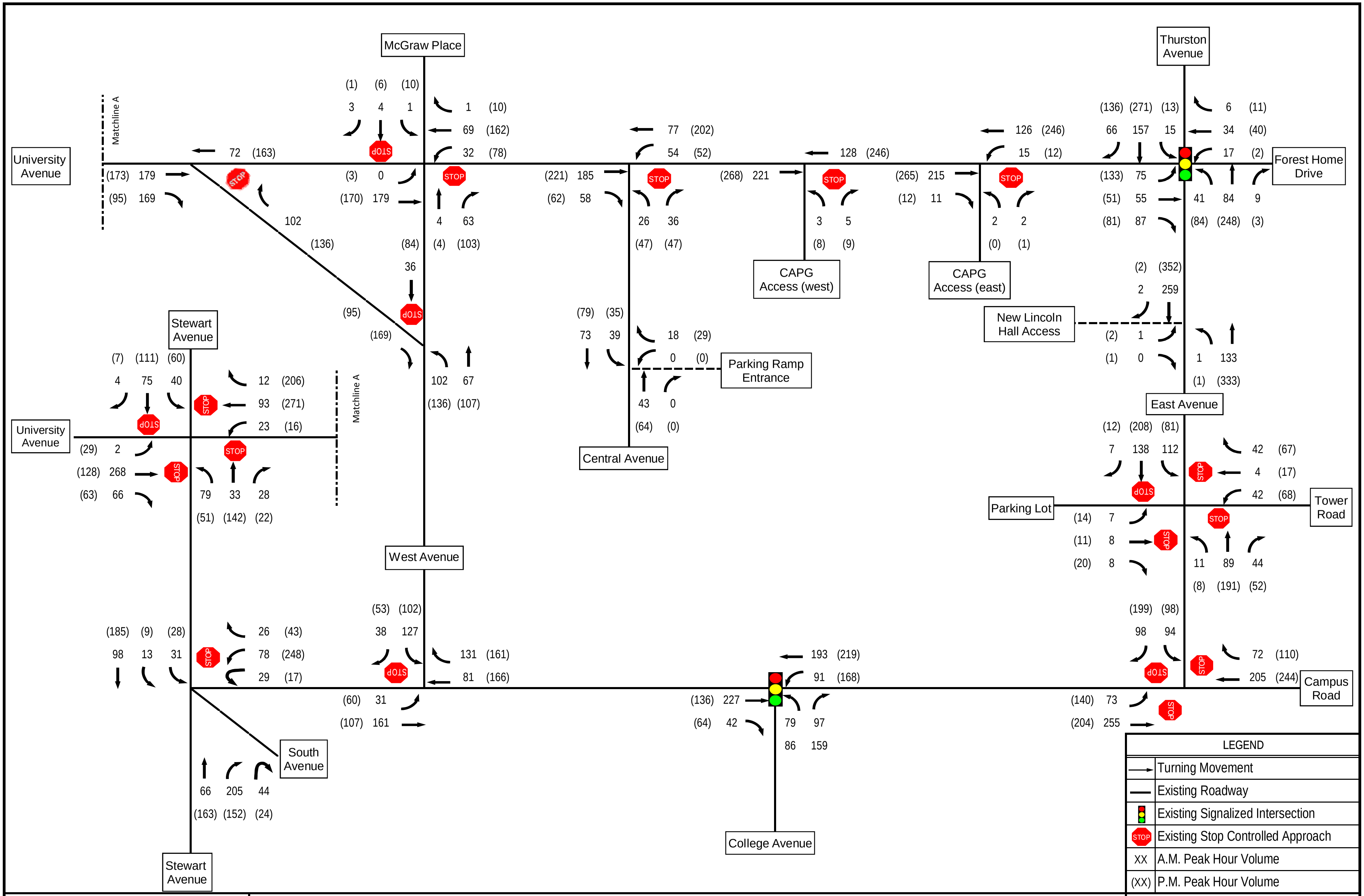

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Figure 8
Build+1 (2012) A.M. and P.M. Peak Hour Turning Movement Volumes

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Cornell University
Ithaca, NY

5.0 CONSTRUCTION ANALYSIS

5.1 CONSTRUCTION DIVERSION VOLUMES

For the majority of Milstein Hall and the CAPG's expected construction University Avenue will be closed to through traffic between East Avenue and Central Avenue. This report is based on the closure of University Avenue from March 2009 through November 2010.

The Construction Diversion scenario examines conditions of the roadway network during the final phases of garage construction that has University Avenue completely closed to through traffic. Volumes were derived by using the No-Build+1 (2012) scenario as a base, and diverting vehicles that access University Avenue within the proposed construction area. Rerouting the traffic was conducted iteratively by isolating and then removing the Central Avenue, McGraw Place, Sibley/Tjaden, and then general through traffic that passes through the construction area. When this facility closes temporarily, University Avenue traffic will generally shift to the proposed detour route shown in Figure 9; however some through traffic may use alternate routes, such as Thurston Avenue to the Stewart Avenue bridge, which is outside of the study area. Selecting the route for the specific movements was predicted using available traffic and destination information. In addition, some construction-related traffic was added in this scenario. The precise level of construction-related traffic will be highly dependent on the specific operation occurring. Cornell University staff will work with appropriate City and Town officials to develop strategies for managing the construction traffic, including identifying the appropriate routes between the designated truck routes and the project site. For this analysis, the truck traffic was assumed to enter from the west via University Avenue. The series of detailed construction detour maps are included in Appendix C. The volumes used in the Construction Diversion analysis can be found in Figure 10.

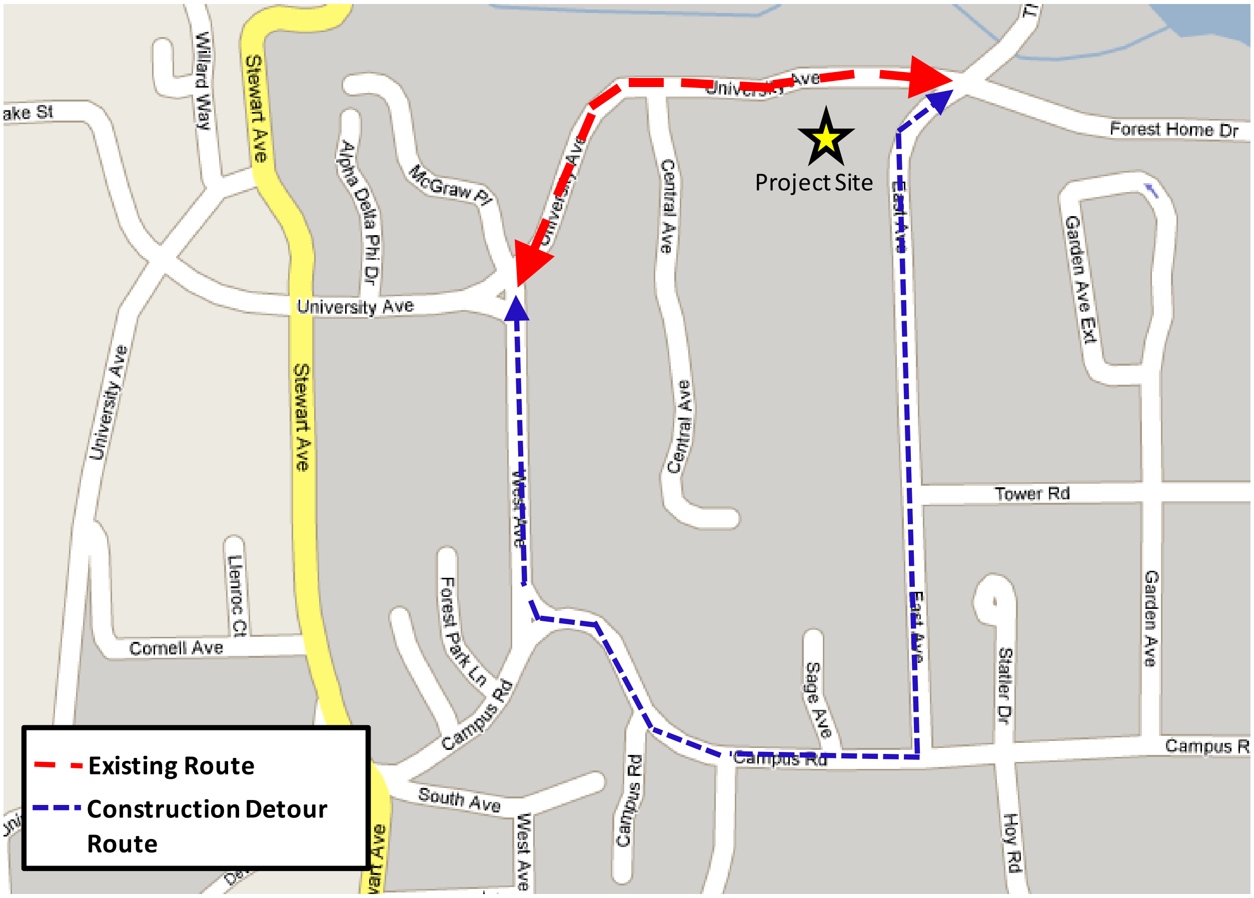

Figure 9 University Avenue Detour Route During Construction

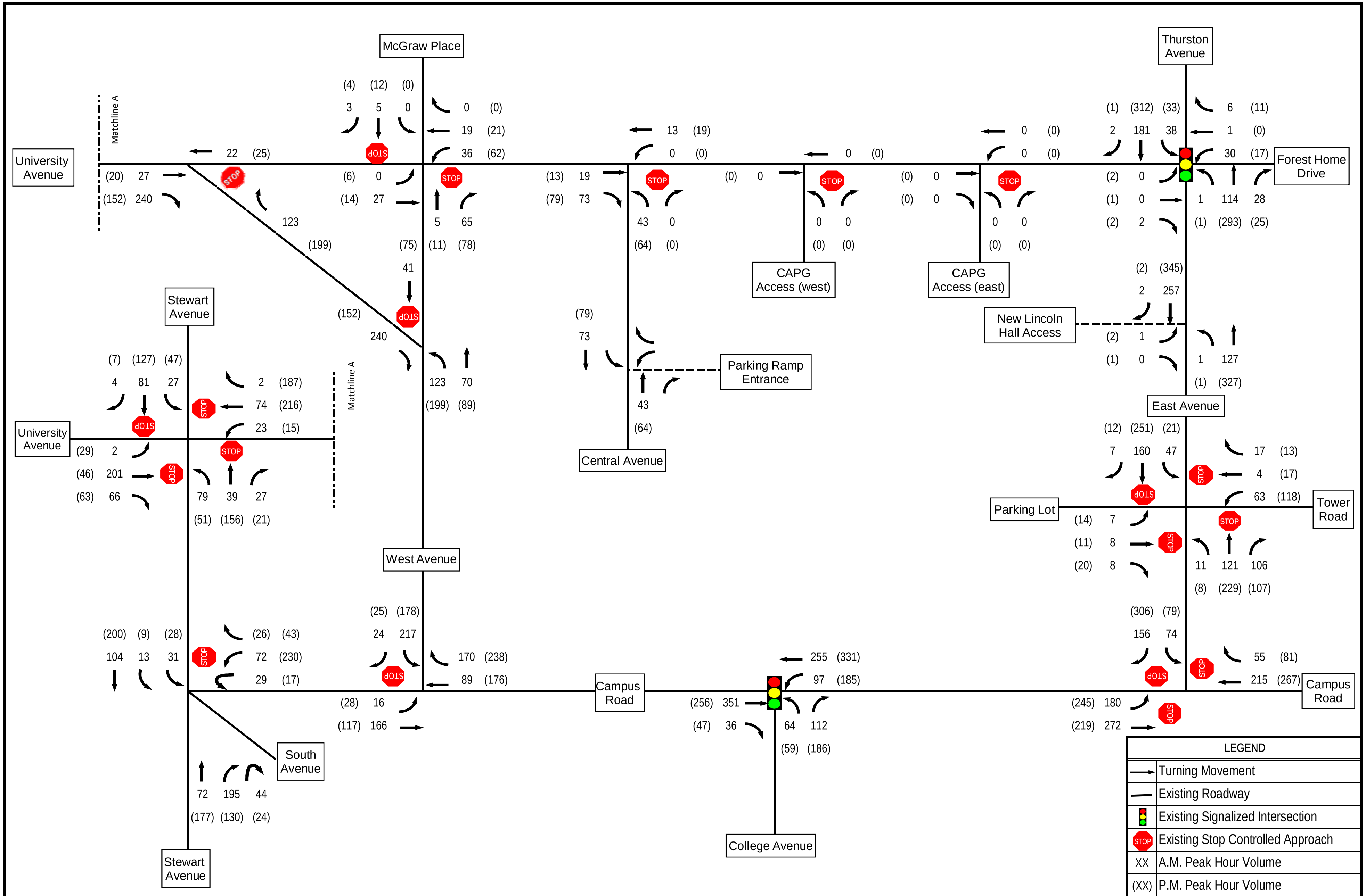

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Figure 10
A.M. and P.M. Peak Hour Construction Detour Turning Movement Volumes

Milstein Hall & CAPG
Traffic Impact Analysis
Cornell University
Ithaca, NY

5.2 *LEVEL OF SERVICE ANALYSIS*

As shown in Table 8, most of the intersections in the network will see a slight increase in intersection delay, but will not result in any significant traffic performance degradation (i.e., there will be no drop from acceptable LOS to unacceptable LOS) due to the construction diversions. Because of the significantly reduced volume accessing University Avenue at the Thurston Avenue/East Avenue intersection, this signalized intersection will actually see a slight improvement in LOS. The all-way stop controlled intersection of East Avenue and Campus Road will drop to a LOS C during both peak hours; however, this drop still leaves the intersection operating acceptably overall.

Table 8 Construction Diversion Level of Service Results

Intersection	Traffic Control	Construction Diversion	
		A.M.	P.M.
University Avenue/Forest Home Drive at Thurston Avenue/East Avenue	Signalized	A (WB-C)	A (WB-C)
East Avenue at Tower Road	All-Way Stop	A (SB-A)	B (NB-B)
East Avenue at Campus Road	All-Way Stop	C (EB-C)	C (EB-E)
Campus Road at College Road	Signalized	B (EB-B)	B (WB-B)
Campus Road at West Avenue	Unsignalized	(SB-B)	(SB-C)
West Avenue at University (south)	Unsignalized	(SB-A)	(SB-A)
West Avenue at University (west)	Unsignalized	(NB-B)	(NB-B)
West Avenue at University (north)	Unsignalized	(NB-B)	(SB-B)
University Avenue at Central Avenue	Unsignalized	(NB-B)	(NB-B)
University Avenue at Sibley/Tjaden Lot (west)	Unsignalized	N/A	N/A
University Avenue at Sibley/Tjaden Lot (east)	Unsignalized	N/A	N/A
University Avenue at Stewart Avenue	All-Way Stop	A (EB-B)	C (WB-C)
Campus Road at Stewart Avenue	Unsignalized	(WB-A)	(WB-A)
Central Avenue at Parking Ramp Entrance	Future Unsignalized	N/A	N/A
East Avenue at New Lincoln Hall Access	Future Unsignalized	(EB-B)	(EB-B)

LEGEND: X (Dir-X) = Overall Intersection LOS (Worst Operating Approach – Worst Operating Approach LOS)

5.3 *TEMPORARY IMPACTS TO TRANSIT OPERATIONS*

Transit in Tompkins County is operated by Tompkins Consolidated Area Transit (TCAT). TCAT currently operates approximately 40 fixed routes across the County. According to the *t-GEIS Travel Survey*, approximately 12 percent of Cornell employees, 38% of off-campus graduate students, and 15% of off-campus undergraduate students use the TCAT buses to reach the campus. Several TCAT routes use University Avenue and individuals traveling to Milstein Hall will be well positioned to take advantage of these routes. A 50 foot bus pull-off will be constructed on the southern side of University Avenue next to (and under) Milstein Hall.

The temporary closure of University Avenue during the construction of Milstein Hall and the CAPG will impact the TCAT routes that regularly use that roadway. Specifically, Route 10 which provides regular and rapid service between Cornell and downtown uses University Avenue and has a bus stop just west of Rand Hall. There are a few other routes such as the 86 (day service), 92 (night service), and 93 (night service) that also use University Avenue. Cornell University transportation staff is working with TCAT officials to determine the most appropriate detour route according to the needs of the patrons of the route. Any number of roadway facilities surrounding University Avenue, such as West Avenue, East Avenue, Thurston Avenue, and Stewart Avenue may be used for transit and already accommodate buses for other TCAT routes. Figure 11 illustrates the transit routes and a potential alternate path for each transit route.

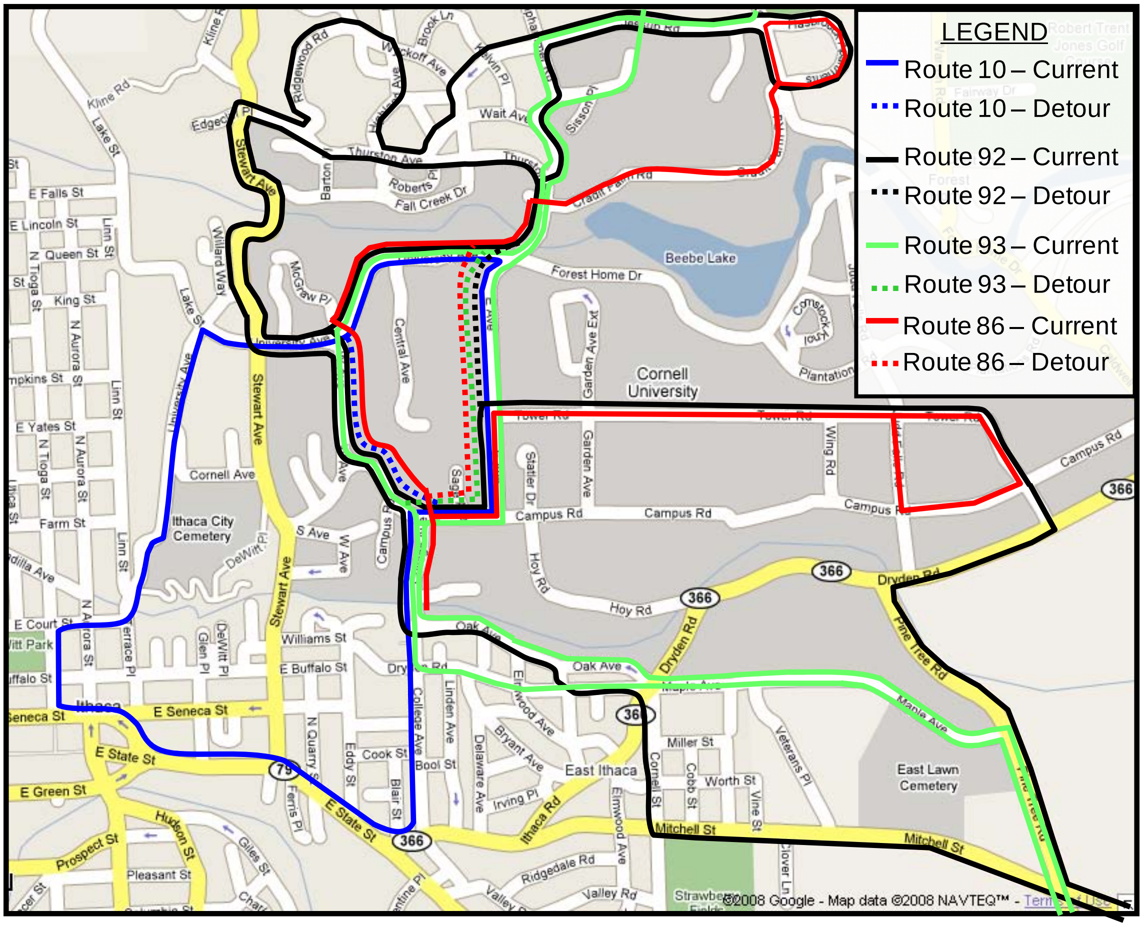


Figure 11 TCAT Transit Routes along University Avenue

5.4 STRUCTURE OVER UNIVERSITY AVENUE

a. Safety

Structures or other large roadside fixed objects within the clear zone, such as support columns, typically require some type of shielding (typically a barrier) to deflect and or absorb impacts of vehicles in the event a vehicle leaves the road. The particular design selected to for Milstein Hall is a cantilevered option which does not require support columns along the north side of University Avenue. Although more expensive due to the additional structural support required, this design was selected due partly to the safety improvements associated with it, in comparison to other designs. Specifically, the lack of support columns located adjacent to the road removes a potential object that could be struck by a vehicle. Additionally, it removes an obstruction that could block the line of sight between the driver and a crossing pedestrian.

b. Clearance

Vertical Clearance

According to the NYS Building Code, Section 3202.3.3, encroachments upon the public right-of-way shall not be limited when they are more than 15 feet above the ground. The actual vertical clearance of the proposed cantilevered section of the Milstein Hall building is 15'1", which satisfies New York State Building Code for structures over roadways. In addition, although this project is not a bridge, the clearance also satisfies NYSDOT design recommendations for bridges over roadways. The proposed vertical clearance will accommodate large vehicles such as fire trucks and ambulances, as well as utility vehicles such as snow plows and street sweepers.

In accordance with the *NYSDOT Bridge Manual,* desirable vertical clearance is 4.45 meters (14'7") and the absolute minimum is 4.3 meters (14'1"). The profile of the road and deflection of the building above must be taken into account when calculating the clearance space. An additional 6" is desirable for future paving of the road and the application of any raised pedestrian crosswalks or traffic calming measures should be considered in measuring the vertical clearance.

Horizontal Clearance

This roadway can be classified as an 'urban street' due to the low speed limit and the campus environment with a large number of pedestrians. According to the *AASHTO: A Policy on Geometric Design of Highways,* a curb with a minimum height of 6" should be placed along areas with high pedestrian activity. In addition, a minimum of 1'-6" should be provided between the curb face and any obstructions, including fire hydrants and the building structure, although 2'-0" is preferred (typical extension of a truck mirror). The Milstein Hall project exceeds these requirements.

c. *Emergency/Large Vehicle Access*

The vertical and horizontal clearance allows emergency vehicles, such as fire trucks and ambulances, to pass under Milstein Hall, along University Avenue. The typical height of large emergency vehicles, like a fire engine with ladder, is approximately 14'0". Large vehicles such as transit busses and tractor trailers are typically 10'6" and 13'6", respectively according to the design standards set forth by the American Association of State Highway and Transportation Officials (AASHTO). The actual vertical clearance of this building is 15'1", which will accommodate large and emergency vehicles. If there is an instance when a vehicle larger than these design standards, such as a construction crane, needs to pass along University Avenue, is must be disassembled first or utilize alternate routes.

d. *Utilities and Road Maintenance*

The clearances needed for utility and maintenance vehicles vary widely based on the task to be preformed. Typically, a backhoe loader or other machines that may be used for roadway maintenance (repaving, pipe repair, etc) do not exceed 14 feet in operating height. In the case that machinery utilizing extendable arms or booms is necessary, there are a variety of specialized, miniature machines available for working within small spaces, and can be assessed on a case by case basis. However, because the vertical and horizontal clearance of Milstein Hall, as it is cantilevered over University Avenue, meets the minimum clearance standards set forth by the State of New York, roadway construction vehicles should not have problems operating under the structure.

The vertical and horizontal clearance also ensures that regular maintenance and utility vehicles, such as street sweepers and snow plows are able to pass under Milstein Hall, along University Avenue when necessary.

e. *NYSDOT Guidelines*

The roadway improvements and structural design along University Avenue will conform to the NYSDOT engineering standards. The roadway will maintain 11 foot wide travel lanes and a 5 foot wide bicycle lane along the southern side of University Avenue.

In accordance with the NYSDOT Bridge Manual, desirable vertical clearance is 4.45 meters (14'7") and the absolute minimum is 4.3 meters (14'1").

6.0 TRANSPORTATION AND CIRCULATION

Up to 30,000 pedestrians and 5,000 cyclists make their way around and through the University's campus on any given day during the academic school year. Because of the prominence of alternatives to single-occupancy vehicles as modes of transportation on this campus, it is important to examine the impacts of constructing new buildings and parking facilities on pedestrians and cyclists, in addition to vehicular impacts. This section will give a brief overview of the existing conditions within the study area as they relate to pedestrians and cyclists and how the proposed project will impact these conditions. Additionally, if needed, mitigation measures to maintain safety and accessibility will be examined. Finally, there are likely to be unavoidable impacts on pedestrian and bicycle circulation due to construction of the proposed project. These impacts will also be discussed.

6.1 PEDESTRIAN CIRCULATION

a. Existing Conditions

As is the case on most university campuses, pedestrians make up a large portion of the traffic at any given location. Cornell is no exception, with up to 30,000 pedestrians using the campus daily. Cornell's pedestrian network is made up of almost 60 miles of paved and unpaved sidewalks on campus. Cornell University was a pioneer in installing yellow/green fluorescent in-street pedestrian crossing signs on campus. There are also in street signs to remind the public about the prominence of pedestrians on the campus. All roads within the project study area for the Milstein Hall and Central Avenue Parking Garage projects have sidewalks along at least one side of the roadway, both sides in most cases. Additionally, most intersections have striped pedestrian crosswalks, and the two signalized intersections have pedestrian signal heads indicating when crossing the street at those locations is allowed. When A.M. and P.M. peak period vehicle turning movement counts were conducted at study area intersections, pedestrian crossing movements were also recorded. Figure 13 illustrates pedestrian traffic volumes within the study area during the vehicle peak hours (typically 8:00-9:00 A.M. and 4:00-5:00 P.M. for this area). A special 7:00 A.M. – 6:00 P.M. count was conducted at the University Avenue at Central Avenue intersection to gather an understanding of pedestrian movements to and from the suspension bridge adjacent to the site. This count is included in Figure 13 as an inset, and shows a heavy demand for pedestrians crossing University Avenue, with a much smaller volume walking along University Avenue west of the project site. The figure shows how many pedestrians crossed a given approach during the peak hour at other intersections. Exact pedestrian movements (i.e. turning movements) were not recorded.

b. Impacts of the Proposed Project

Once construction for the proposed projects is completed and all roadways are reopened to traffic, there are projected to be no significant impacts to pedestrian circulation, with regards to changes in existing sidewalk facilities.

The sidewalk along the north side of University Avenue will be maintained. In addition, the existing parallel sidewalk, immediately north of Sibley and Tjaden halls and south of the garage will be maintained and enhanced.

In order to eliminate conflicts between vehicles using the new CAPG driveway and pedestrians crossing at this location, the existing crosswalk on the east side of the University Avenue/Central Avenue intersection will be relocated to the west side of the intersection. This will connect pedestrians using the suspension bridge over Fall Creek to the entrance of the Johnson Museum of Art. Additionally, the CAPG plans call for a landscaped berm at the southeast quadrant of the same intersection. This will further deter pedestrians from crossing University Avenue and walking in front of the garage entrance.

The driveway access to Lincoln Hall will be moved from University Avenue to East Avenue. This will reduce vehicular conflicts with the large numbers of pedestrians moving between north campus and the Arts Quad. This relocated driveway will carry a very low traffic volume as it serves only a few parking spaces and service traffic to Lincoln Hall. Its new curb cut on East Avenue has a relatively low volume of pedestrian traffic.

A new high visibility crosswalk will be located across University Avenue and will continue on a designated pedestrian path across the surface level of the CAPG, providing a straight connection to the pedestrian sidewalks of the Arts Quad. It is likely that the majority of pedestrians crossing University Avenue from the suspension bridge will use this crosswalk, as it provides the most direct route to the Arts Quad.

A sidewalk and wide paved area will be constructed along the southern side of University Avenue between Milstein Hall and the Foundry. In addition, two new high visibility crosswalks will be placed across University Avenue between the Foundry and Milstein Hall. Accessible wheelchair curb ramps will be placed at all proposed crosswalk/sidewalk connections.

After a review of the pedestrian counts and their origins and destinations, the planned pedestrian facilities within and surrounding the site are deemed sufficient to accommodate the flow of pedestrian traffic. Please refer to Figure 12 for an illustration of all proposed pedestrian sidewalks and crosswalks for the projects.

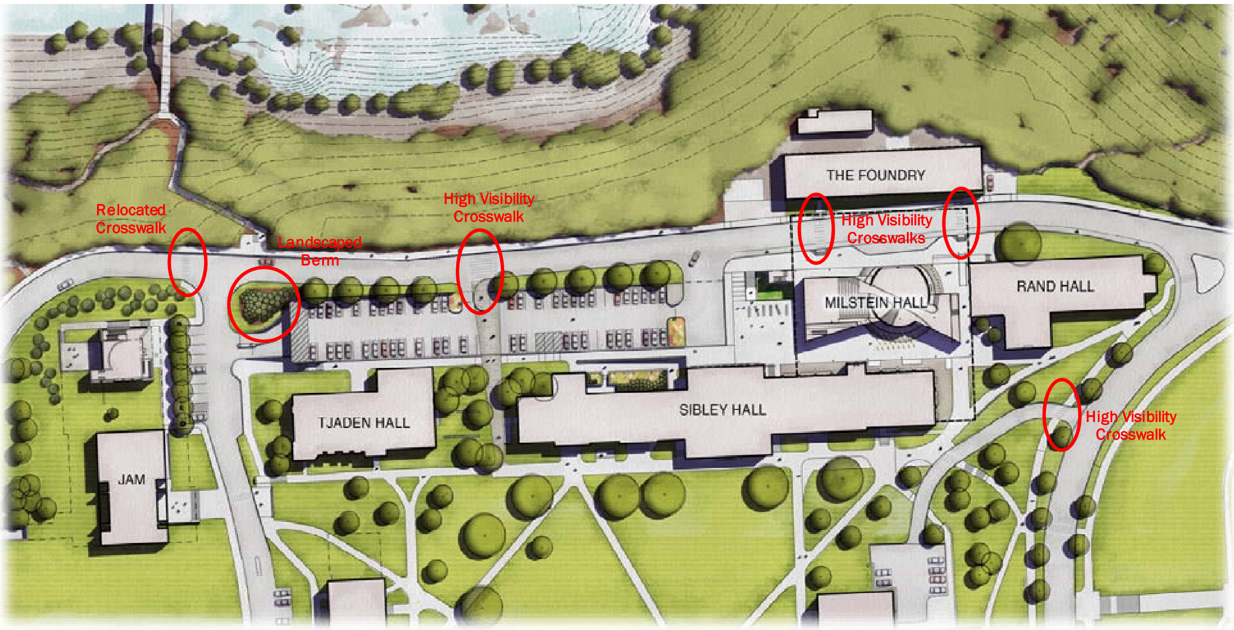


Figure 12 Mitigations Related to Pedestrian Circulation

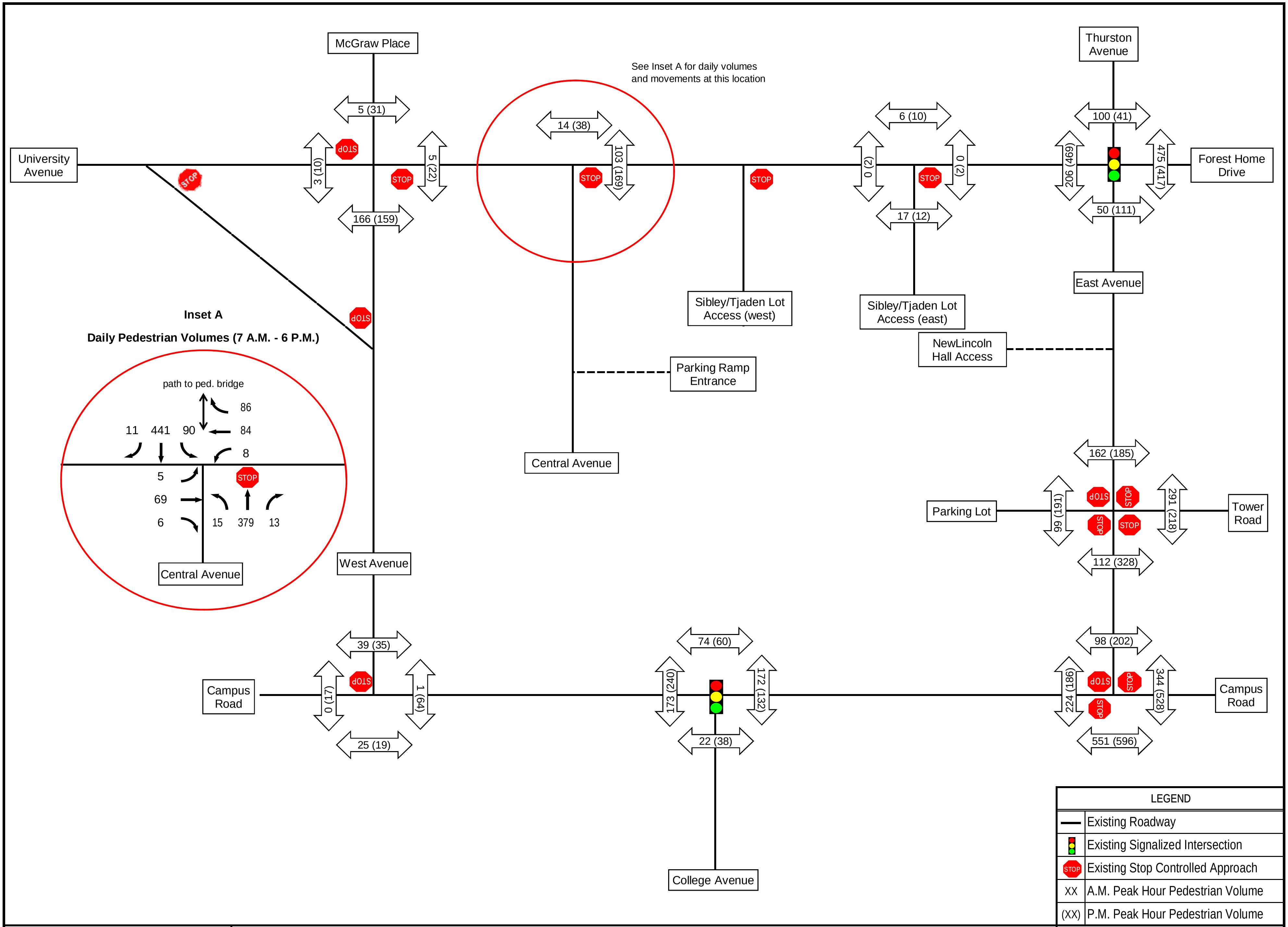
c. *Mitigation Measures*

There are no significant negative impacts to pedestrian circulation as a result of these projects; therefore, no additional mitigations measures are necessary.

d. Unavoidable Impacts

Improvements to the pedestrian connections in this area of campus are an unavoidable impact of these projects.

Due to the nature of a major construction project, there are certain impacts that are unavoidable with regards to pedestrians. Some sidewalks will require temporary closure to allow for construction of pedestrian facilities that will serve the new developments. This will likely result in an increased travel time for pedestrians, as they will be required to find new routes around the construction. However, once construction is fully complete, pedestrians are not projected to experience any long-term negative impacts from this project.



MARTIN ALEXIOU BRYSON

Figure 13
A.M. and P.M. Vehicle Peak Hour Pedestrian Volumes (February 2008)

Milstein Hall & CAPG
Traffic Impact Analysis
Cornell University
Ithaca, NY

6.2 *BICYCLE CIRCULATION*

a. *Existing Conditions*

Currently, is it estimated that up to 5,000 bicycles access the Cornell University campus on a daily basis. Cornell University, in turn, has established an extensive bike network on the campus that provides bike racks, bike lanes, and incentives for bike riders to continue biking. In addition, all University buses are equipped with bike racks to encourage passengers to use multi-modal transportation to traverse the campus. Within the project study area, Central Avenue, Campus Road, East Avenue, and University Avenue east of Central Avenue are all designated bike routes. East Avenue, from Campus Road to University Avenue, provides exclusive bike lanes for cyclists. In addition, there are multiple shared use paths (for both pedestrians and cyclists) that crisscross the study area. Within the study area, there are 17 exterior bike racks available for storage of bikes. Certain areas are designated as "Dismount Zones" where cyclists are required to get off of their bike and walk, such as the suspension pedestrian bridge over Fall Creek, or especially high pedestrian traffic areas such as the walkway behind Rand Hall. Due to the extensive network, as well as the campus's endorsement of biking as a positive alternative transportation mode, cycling is an integral part of the transportation network on the Cornell University campus.

b. *Impacts of the Proposed Project*

Once construction for the proposed projects is completed and all roadways are reopened to traffic, bicyclists will be able to traverse the roadway and sidewalks as they do today. Bicyclists regularly using University Avenue will be negatively impacted while the facility is temporarily closed during construction. There will also be some additional vehicular traffic generated by the proposed site on the surrounding roadways.

c. *Mitigation Measures*

As part of the Milstein Hall project, a 5' bike lane will be constructed along the south side of University Avenue between East Avenue and the CAPG entrance drive. Bike racks will be provided within the new CAPG and under Milstein Hall.

d. *Unavoidable Impacts*

There are no permanent unavoidable impacts to bicycle circulation as a result of these projects.

At certain times during construction, University Avenue will be closed to through traffic. Temporary alternate bike routes will be established and announced prior to construction of the proposed development. Once construction is fully complete, cyclists are not projected to experience any long-term negative impacts from this project, as bike facilities will be improved overall.

7.0 FINDINGS AND CONCLUSIONS

7.1 ROADWAY IMPROVEMENTS

As indicated in the traffic operations analyses, the proposed development has only a minor impact on the study area intersections. All of the study area intersections are projected to operate at acceptable levels of service one year later than the build year; therefore, no roadway improvements are recommended at these locations.

7.2 SIGHT LINES AT UNIVERSITY AVENUE AND CENTRAL AVENUE INTERSECTION

Vehicles traveling to and from the lower levels of the CAPG must use University Avenue to access the deck's driveway along Central Avenue. Due to the relatively low traffic volumes projected on both Central Avenue and University, the intersection is expected to continue to operate at an acceptable level of service. However, as a result to the unique alignment of University Avenue, it is also necessary to review the safety implications at this location. University Avenue increases in elevation as it travels east. Recent maps show the roadway climbing 80 feet in elevation between West Avenue and Central Avenue, a distance of less than 900 feet, resulting in an approximate 9-percent grade. There is also a horizontal curve as the roadway transitions from the northerly to easterly direction.

From a pedestrian safety standpoint, the volume of pedestrians crossing at this intersection is expected to be reduced in the future with the introduction of the new high visibility crosswalk located approximately 200 feet east of the suspension bridge path along University Avenue. This crossing would provide a more direct path to most of the Arts Quad and other campus buildings south of University Avenue. Vehicles approaching from the south and east have clear sight lines to pedestrians on all corners of the intersection. Vehicles from the west have a shorter sight line due to the vertical and horizontal curves, but still have a sufficient stopping sight distance between the curve and the proposed crosswalk. The stopping sight distance length is reduced for vehicles on this approach due to the uphill grade as well as the low speeds of vehicles traveling up this hill. Advanced warning signs should be maintained on this approach to warn drivers of the potential stop ahead.

To improve vehicle to vehicle sight lines, any obstructions at the corners of the intersection should be reduced as much as possible. There are currently adequate sight lines between the northbound and westbound directions as the approaches are straight and there are no substantial obstructions within the sight triangle on the southeastern corner of the intersection. Any landscaping placed on this corner should be no taller than 3.5 feet, which is representative of the height of the driver's eye above the roadway surface. A less than desirable sight line exists between eastbound and northbound vehicles due to the vertical and horizontal curves along University Avenue. Due to the grade and low speeds in the eastbound direction, vehicles do have adequate stopping sight distance; however, visual obstructions should be minimized along the southern side of University Avenue as much as possible to give Central Avenue vehicles more time to make a turning maneuver. Removal or pruning of an existing willow tree along the southern side of University Avenue and shifting the Johnson Museum of Art sign further back from University Avenue would help maximize this sight line as is visible in the illustration to the right. In addition,

shifting the existing stop sign and painted stop bar closer to University Avenue would better enable vehicles on Central Avenue to see vehicles approaching along University Avenue.

A summary of LOS results for all scenarios is shown in Table 9. Figure 14 illustrates the Future (2012) lane geometrics and recommended traffic control at the proposed CAPG entrance.

Table 9 Summary LOS Results

Intersection	Traffic Control	Existing (2008)		No-Build+1 (2012)		Build+1 (2012)		Construction Diversion	
		A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
University Avenue/Forest Home Drive at Thurston Avenue/East Avenue	Signalized	B (EB-C)	B (EB-C)	B (EB-C)	B (EB-C)	B (EB-C)	B (EB-C)	A (WB-C)	A (WB-C)
East Avenue at Tower Road	All-Way Stop	A (SB-A)	B (SB-B)	A (SB-A)	B (SB-B)	A (SB-A)	B (SB-B)	A (SB-A)	B (NB-B)
East Avenue at Campus Road	All-Way Stop	B (EB-B)	B (EB-B)	B (EB-B)	B (EB-C)	B (EB-B)	B (EB-C)	C (EB-C)	C (EB-E)
Campus Road at College Road	Signalized	A (EB-A)	A (WB-B)	A (EB-B)	A (WB-B)	A (EB-B)	A (WB-B)	B (EB-B)	B (WB-B)
Campus Road at West Avenue	Unsignalized	(SB-B)	(SB-B)	(SB-B)	(SB-C)	(SB-B)	(SB-B)	(SB-B)	(SB-C)
West Avenue at University (south)	Unsignalized	(SB-A)	(SB-A)	(SB-A)	(SB-A)	(SB-A)	(SB-A)	(SB-A)	(SB-A)
West Avenue at University (west)	Unsignalized	(NB-B)	(NB-B)	(NB-B)	(NB-B)	(NB-B)	(NB-B)	(NB-B)	(NB-B)
West Avenue at University (north)	Unsignalized	(NB-B)	(SB-C)	(NB-B)	(SB-C)	(NB-B)	(SB-C)	(NB-B)	(SB-B)
University Avenue at Central Avenue	Unsignalized	(NB-B)	(NB-C)	(NB-B)	(NB-C)	(NB-B)	(NB-C)	(NB-B)	(NB-B)
University Avenue at Sibley/Tjaden Lot (west)	Unsignalized	(NB-A)	(NB-B)	(NB-A)	(NB-B)	(NB-B)	(NB-B)	N/A	N/A
University Avenue at Sibley/Tjaden Lot (east)	Unsignalized	(NB-B)	(NB-B)	(NB-B)	(NB-B)	(NB-B)	(NB-B)	N/A	N/A
University Avenue at Stewart Avenue	All-Way Stop	B (EB-B)	C (WB-C)	B (EB-B)	C (WB-D)	B (EB-B)	C (WB-E)	A (EB-B)	C (WB-C)
Campus Road at Stewart Avenue	Unsignalized	(WB-A)	(WB-A)	(WB-A)	(WB-B)	(WB-A)	(WB-C)	(WB-A)	(WB-A)
Central Avenue at Parking Ramp Entrance	Future Unsignalized	N/A	N/A	N/A	N/A	(WB-A)	(WB-A)	N/A	N/A
East Avenue at New Lincoln Hall Access	Future Unsignalized	N/A	N/A	N/A	N/A	(EB-B)	(EB-B)	(EB-B)	(EB-B)

LEGEND: X (Dir-X) = Overall Intersection LOS (Worst Operating Approach – Worst Operating Approach LOS)

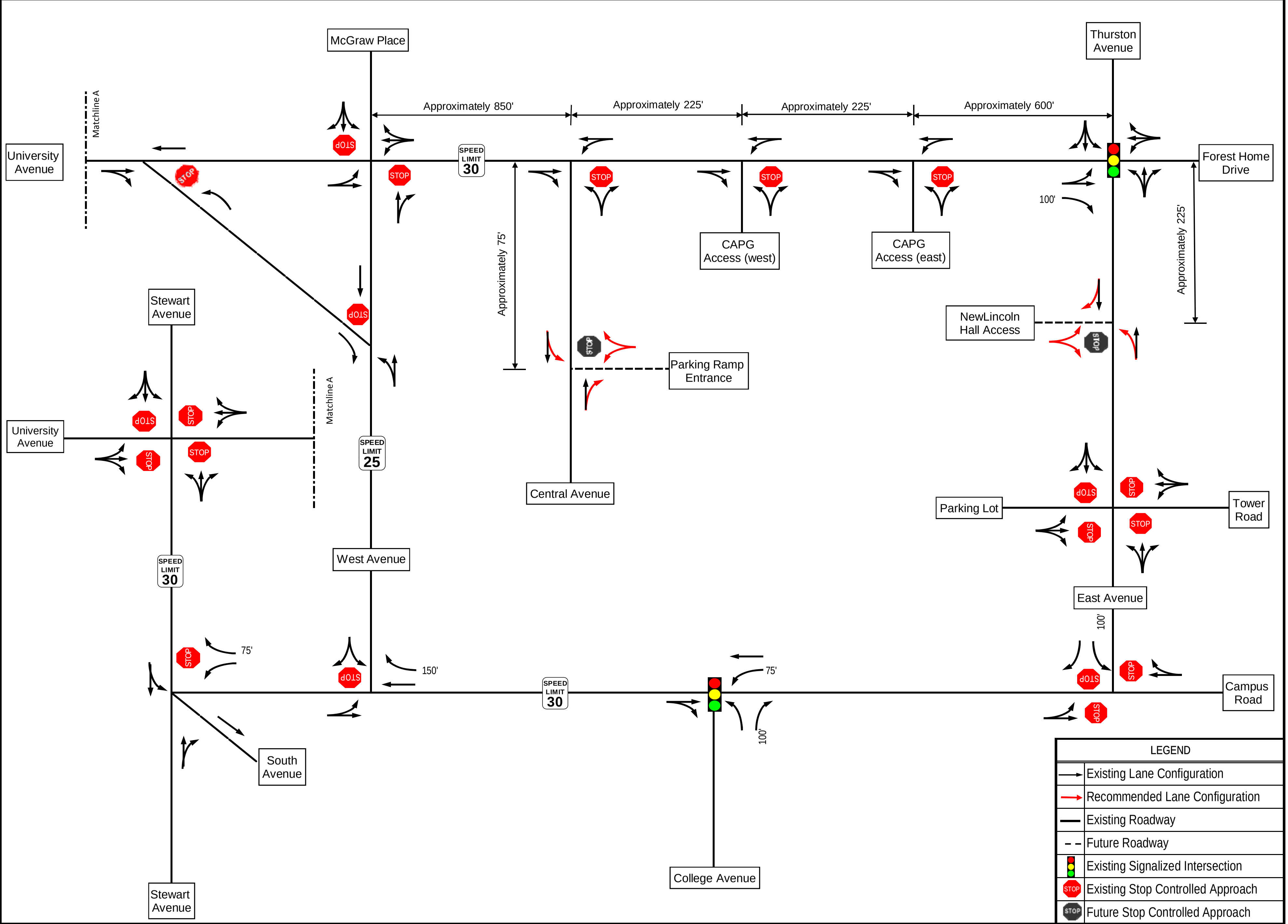


Figure 14

Future (2012) Lane Configurations and Traffic Control

Milstein Hall & CAPG
Traffic Impact Analysis
Cornell University
Ithaca, NY

APPENDICES

Appendix A:

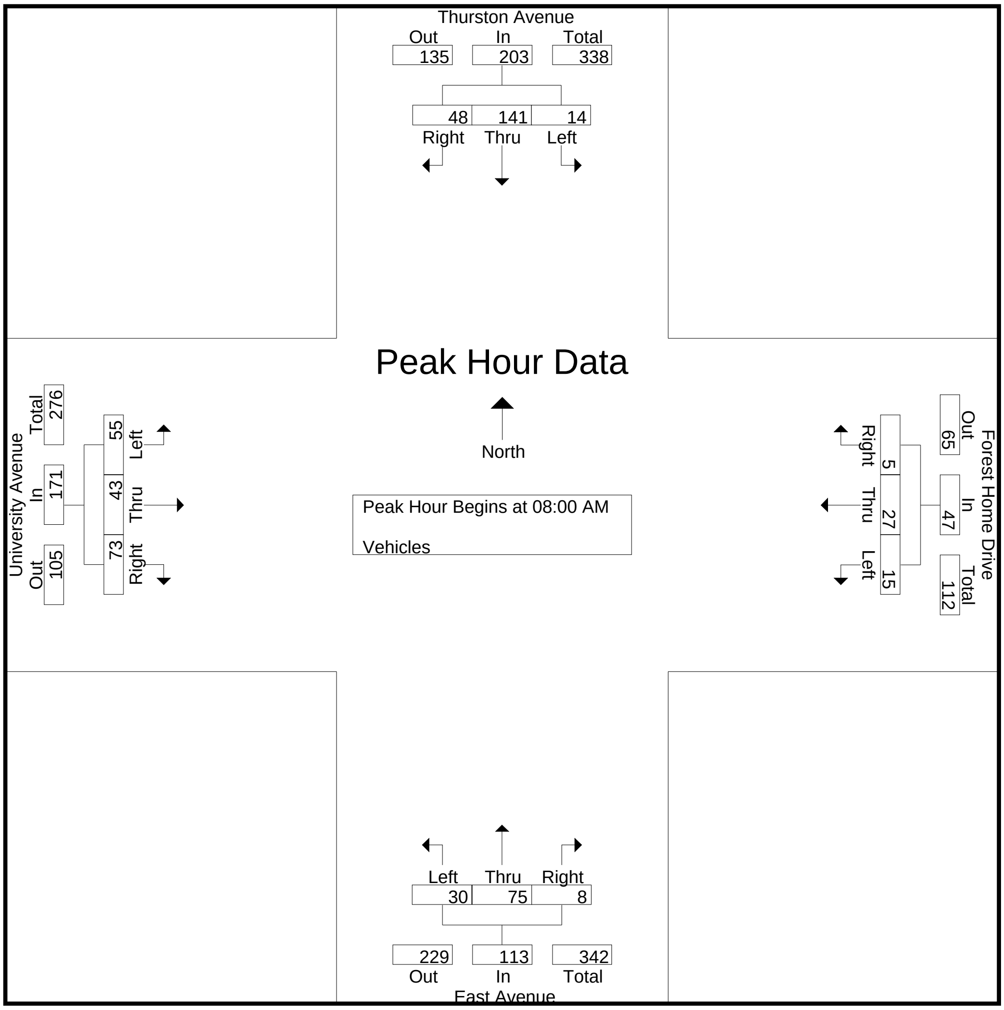
Existing (2008) Turning Movement Counts

File Name : Thurston@University
Site Code : 11470204
Start Date : 2/13/2008
Page No : 1

Groups Printed- Vehicles

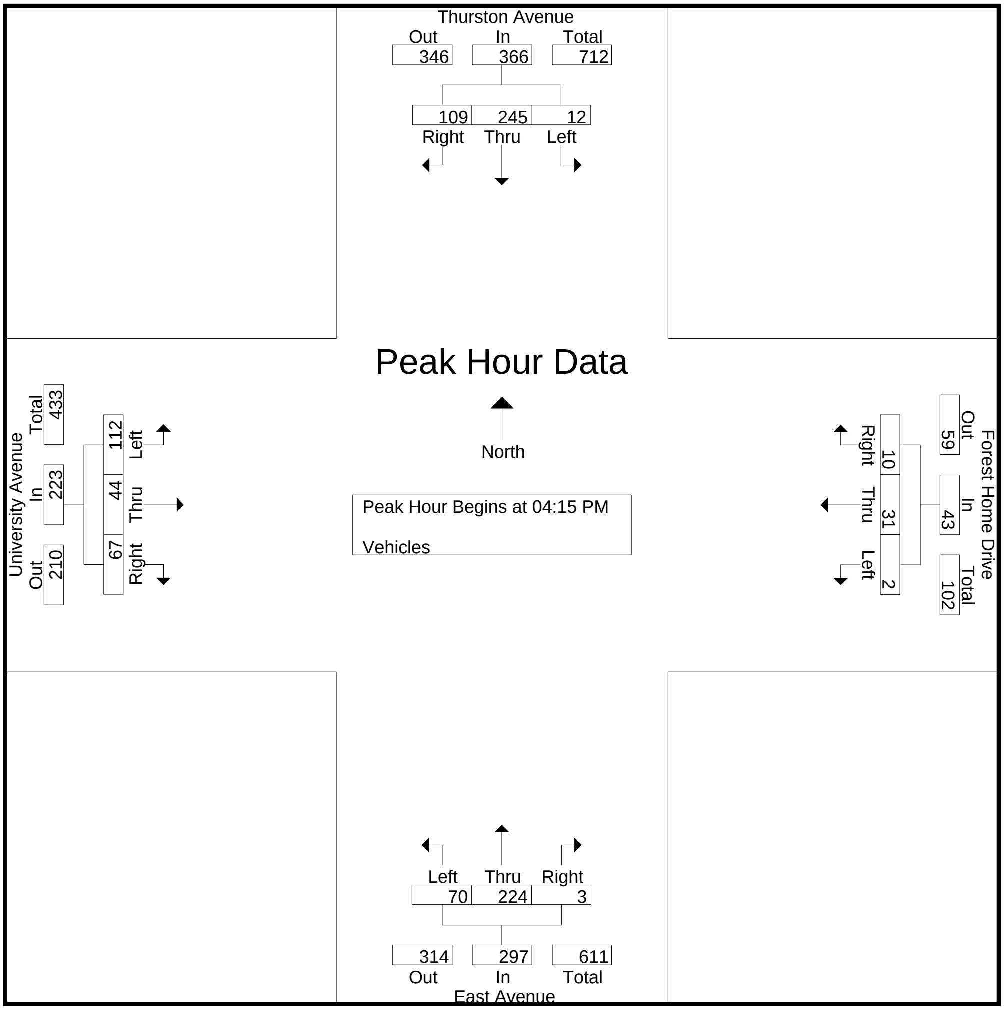
	Thurston Avenue Southbound				Forest Home Drive Westbound				East Avenue Northbound				University Avenue Eastbound						
Start Time	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	1	10	5	1	1	3	3	1	5	14	0	0	7	5	6	0	2	60	62
07:15 AM	0	18	2	0	0	3	1	0	2	16	1	0	6	5	3	0	0	57	57
07:30 AM	0	18	11	0	1	4	5	1	5	18	2	0	9	4	7	0	1	84	85
07:45 AM	1	33	15	0	3	7	3	1	4	24	2	1	16	6	9	0	2	123	125
Total	2	79	33	1	5	17	12	3	16	72	5	1	38	20	25	0	5	324	329
08:00 AM	3	39	13	0	5	5	0	0	11	26	2	0	18	12	19	2	2	153	155
08:15 AM	6	42	18	0	2	10	0	0	6	18	3	1	9	11	22	0	1	147	148
08:30 AM	2	30	6	0	5	6	2	1	6	15	1	1	12	10	12	0	2	107	109
08:45 AM	3	30	11	0	3	6	3	1	7	16	2	0	16	10	20	0	1	127	128
Total	14	141	48	0	15	27	5	2	30	75	8	2	55	43	73	2	6	534	540
*** BREAK ***																			
04:00 PM	3	40	22	0	3	5	2	0	14	26	0	0	13	8	15	0	0	151	151
04:15 PM	3	63	17	0	0	7	3	0	13	54	1	0	21	14	16	0	0	212	212
04:30 PM	1	81	22	0	1	8	3	0	27	61	0	0	24	14	24	0	0	266	266
04:45 PM	5	55	38	0	1	11	0	0	16	61	2	0	35	8	13	0	0	245	245
Total	12	239	99	0	5	31	8	0	70	202	3	0	93	44	68	0	0	874	874
05:00 PM	3	46	32	0	0	5	4	0	14	48	0	0	32	8	14	0	0	206	206
05:15 PM	4	47	18	0	0	3	0	0	18	47	0	0	34	6	14	0	0	191	191
05:30 PM	1	41	12	0	2	5	5	0	7	70	1	0	27	9	9	0	0	189	189
05:45 PM	2	58	31	0	1	5	0	0	13	63	0	0	15	6	12	0	0	206	206
Total	10	192	93	0	3	18	9	0	52	228	1	0	108	29	49	0	0	792	792
Grand Total	38	651	273	1	28	93	34	5	168	577	17	3	294	136	215	2	11	2524	2535
Apprch %	4	67.7	28.4		18.1	60	21.9		22	75.7	2.2		45.6	21.1	33.3				
Total %	1.5	25.8	10.8		1.1	3.7	1.3		6.7	22.9	0.7		11.6	5.4	8.5		0.4	99.6	

	Thurston Avenue Southbound				Forest Home Drive Westbound				East Avenue Northbound				University Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	3	39	13	55	5	5	0	10	11	26	2	39	18	12	19	49	153
08:15 AM	6	42	18	66	2	10	0	12	6	18	3	27	9	11	22	42	147
08:30 AM	2	30	6	38	5	6	2	13	6	15	1	22	12	10	12	34	107
08:45 AM	3	30	11	44	3	6	3	12	7	16	2	25	16	10	20	46	127
Total Volume	14	141	48	203	15	27	5	47	30	75	8	113	55	43	73	171	534
% App. Total	6.9	69.5	23.6		31.9	57.4	10.6		26.5	66.4	7.1		32.2	25.1	42.7		
PHF	.583	.839	.667	.769	.750	.675	.417	.904	.682	.721	.667	.724	.764	.896	.830	.872	.873



File Name : Thurston@University
Site Code : 11470204
Start Date : 2/13/2008
Page No : 3

	Thurston Avenue Southbound				Forest Home Drive Westbound				East Avenue Northbound				University Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	3	63	17	83	0	7	3	10	13	54	1	68	21	14	16	51	212
04:30 PM	1	81	22	104	1	8	3	12	27	61	0	88	24	14	24	62	266
04:45 PM	5	55	38	98	1	11	0	12	16	61	2	79	35	8	13	56	245
05:00 PM	3	46	32	81	0	5	4	9	14	48	0	62	32	8	14	54	206
Total Volume	12	245	109	366	2	31	10	43	70	224	3	297	112	44	67	223	929
% App. Total	3.3	66.9	29.8		4.7	72.1	23.3		23.6	75.4	1		50.2	19.7	30		
PHF	.600	.756	.717	.880	.500	.705	.625	.896	.648	.918	.375	.844	.800	.786	.698	.899	.873



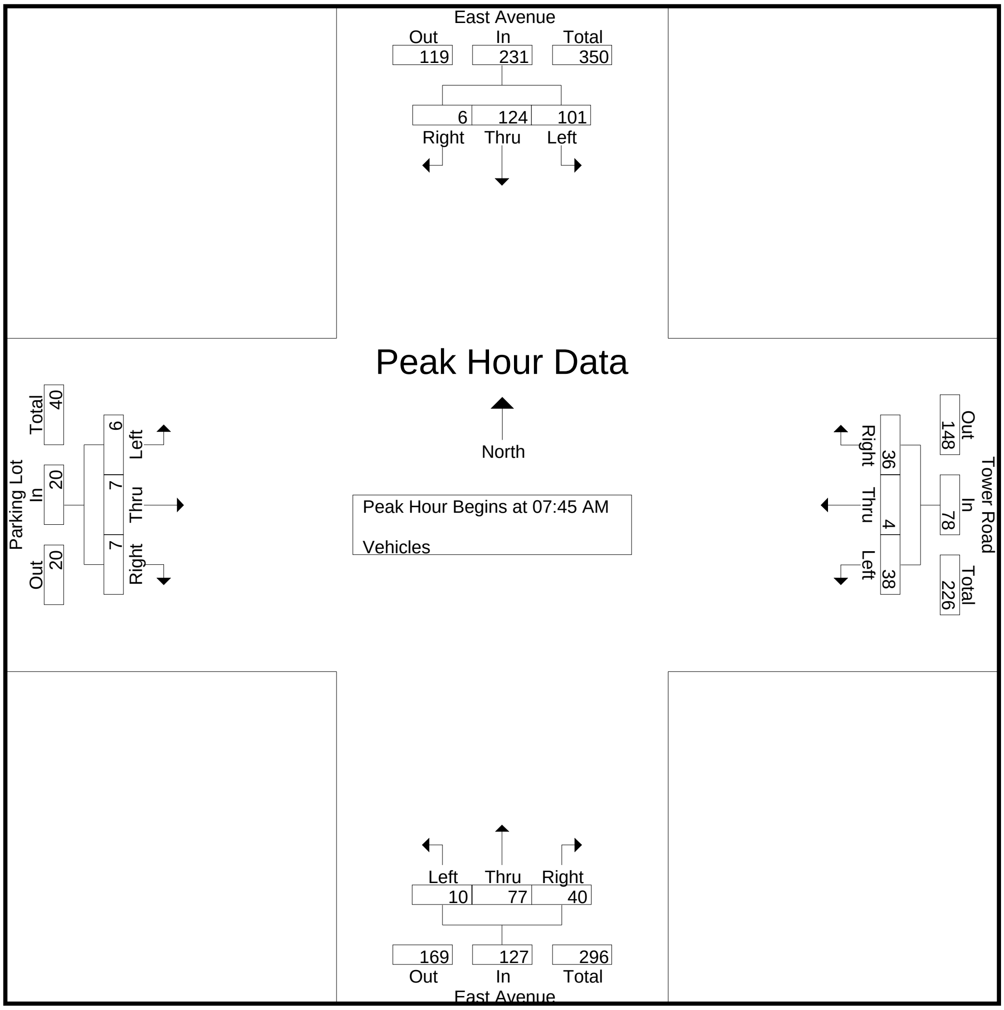
Martin / Alexiou / Bryson, PLLC
4000 Westchase Boulevard, Suite 530
Raleigh, NC 27607
Phone: (919) 829-0328; Fax: (919) 829-0329

File Name : East@Tower
Site Code : 11470208
Start Date : 2/12/2008
Page No : 1

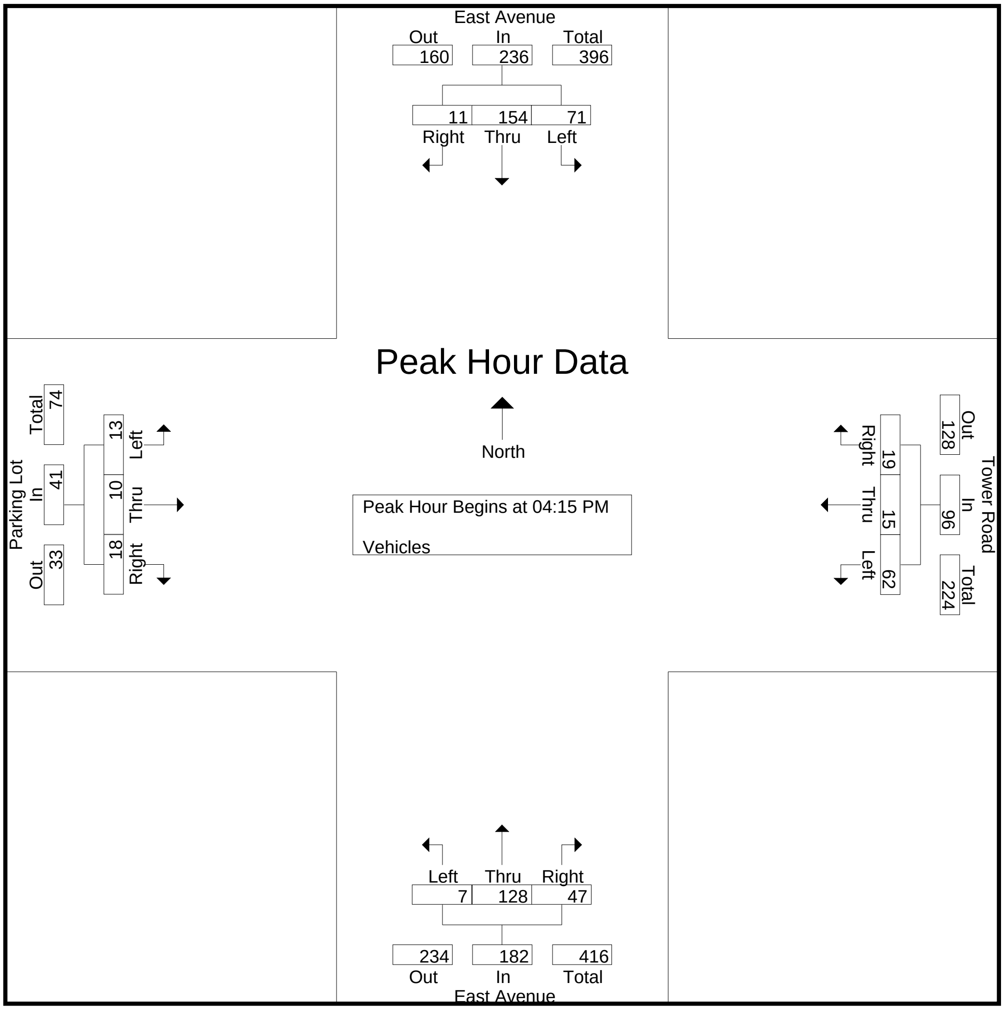
Groups Printed- Vehicles

	East Avenue Southbound				Tower Road Westbound				East Avenue Northbound				Parking Lot Eastbound						
Start Time	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	7	13	1	1	1	1	7	0	0	15	6	0	0	1	2	0	1	54	55
07:15 AM	7	13	0	0	4	1	4	0	1	18	7	1	0	2	0	0	1	57	58
07:30 AM	13	16	2	1	8	2	10	1	3	18	8	0	0	0	1	0	2	81	83
07:45 AM	17	29	1	1	7	1	11	0	3	17	7	1	1	1	2	0	2	97	99
Total	44	71	4	3	20	5	32	1	7	68	28	2	1	4	5	0	6	289	295
08:00 AM	31	28	5	1	17	1	13	0	2	27	9	0	3	3	3	0	1	142	143
08:15 AM	31	34	0	1	5	0	7	0	4	15	13	1	1	2	1	0	2	113	115
08:30 AM	22	33	0	1	9	2	5	0	1	18	11	2	1	1	1	0	3	104	107
08:45 AM	26	22	1	1	8	0	13	0	1	13	11	1	0	0	1	0	2	96	98
Total	110	117	6	4	39	3	38	0	8	73	44	4	5	6	6	0	8	455	463
*** BREAK ***																			
04:00 PM	16	25	0	0	15	4	5	0	0	20	16	0	1	2	2	0	0	106	106
04:15 PM	6	39	3	0	17	9	3	0	2	29	14	0	0	3	7	0	0	132	132
04:30 PM	20	41	2	0	16	2	5	0	1	26	9	0	4	4	4	0	0	134	134
04:45 PM	21	41	0	0	13	4	2	0	1	39	15	1	2	0	4	0	1	142	143
Total	63	146	5	0	61	19	15	0	4	114	54	1	7	9	17	0	1	514	515
05:00 PM	24	33	6	1	16	0	9	0	3	34	9	0	7	3	3	0	1	147	148
05:15 PM	19	40	2	0	12	5	5	0	1	31	6	0	0	6	5	0	0	132	132
05:30 PM	19	34	0	0	9	6	9	0	3	38	9	0	4	1	2	0	0	134	134
05:45 PM	9	48	1	0	10	1	3	0	0	42	11	0	0	0	1	0	0	126	126
Total	71	155	9	1	47	12	26	0	7	145	35	0	11	10	11	0	1	539	540
Grand Total	288	489	24	8	167	39	111	1	26	400	161	7	24	29	39	0	16	1797	1813
Apprch %	36	61	3		52.7	12.3	35		4.4	68.1	27.4		26.1	31.5	42.4				
Total %	16	27.2	1.3		9.3	2.2	6.2		1.4	22.3	9		1.3	1.6	2.2		0.9	99.1	

	East Avenue Southbound				Tower Road Westbound				East Avenue Northbound				Parking Lot Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	17	29	1	47	7	1	11	19	3	17	7	27	1	1	2	4	97
08:00 AM	31	28	5	64	17	1	13	31	2	27	9	38	3	3	3	9	142
08:15 AM	31	34	0	65	5	0	7	12	4	15	13	32	1	2	1	4	113
08:30 AM	22	33	0	55	9	2	5	16	1	18	11	30	1	1	1	3	104
Total Volume	101	124	6	231	38	4	36	78	10	77	40	127	6	7	7	20	456
% App. Total	43.7	53.7	2.6		48.7	5.1	46.2		7.9	60.6	31.5		30	35	35		
PHF	.815	.912	.300	.888	.559	.500	.692	.629	.625	.713	.769	.836	.500	.583	.583	.556	.803



	East Avenue Southbound				Tower Road Westbound				East Avenue Northbound				Parking Lot Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	6	39	3	48	17	9	3	29	2	29	14	45	0	3	7	10	132
04:30 PM	20	41	2	63	16	2	5	23	1	26	9	36	4	4	4	12	134
04:45 PM	21	41	0	62	13	4	2	19	1	39	15	55	2	0	4	6	142
05:00 PM	24	33	6	63	16	0	9	25	3	34	9	46	7	3	3	13	147
Total Volume	71	154	11	236	62	15	19	96	7	128	47	182	13	10	18	41	555
% App. Total	30.1	65.3	4.7		64.6	15.6	19.8		3.8	70.3	25.8		31.7	24.4	43.9		
PHF	.740	.939	.458	.937	.912	.417	.528	.828	.583	.821	.783	.827	.464	.625	.643	.788	.944

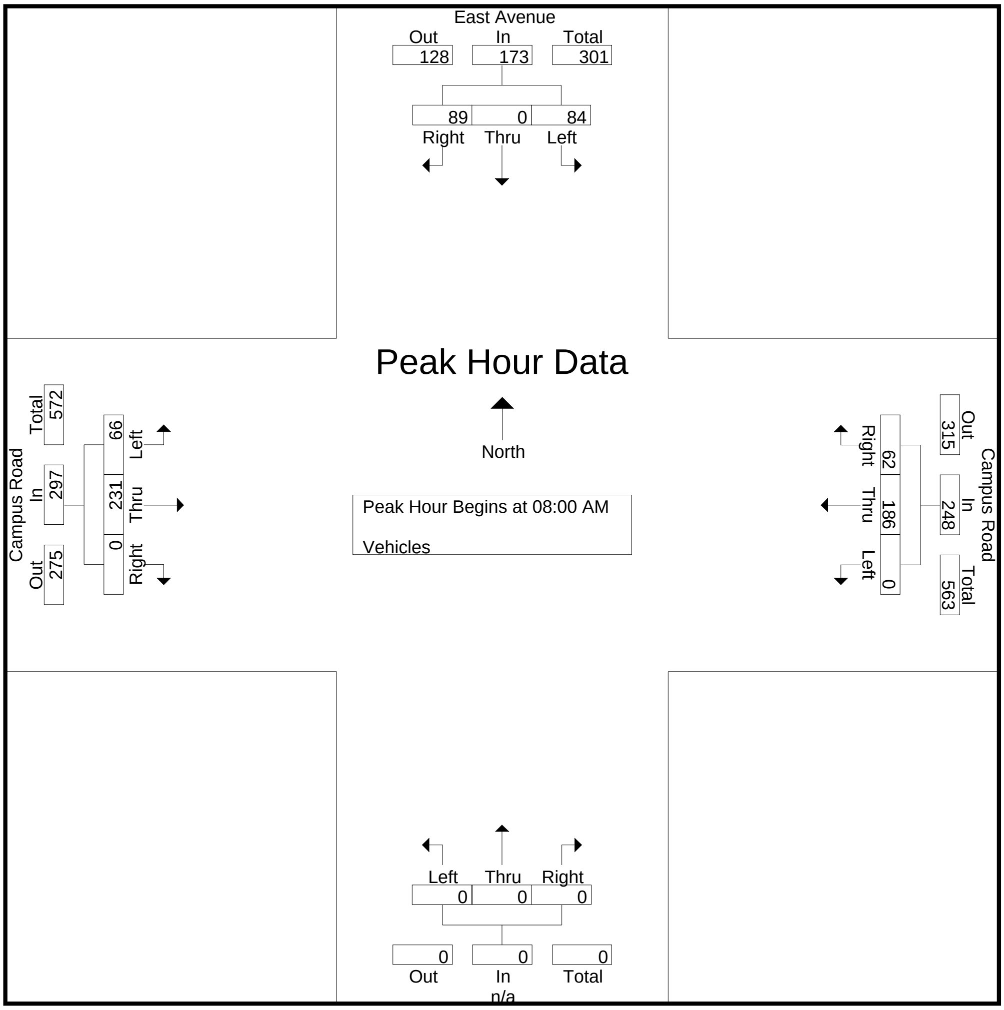


File Name : East@Campus
Site Code : 11470207
Start Date : 2/11/2008
Page No : 1

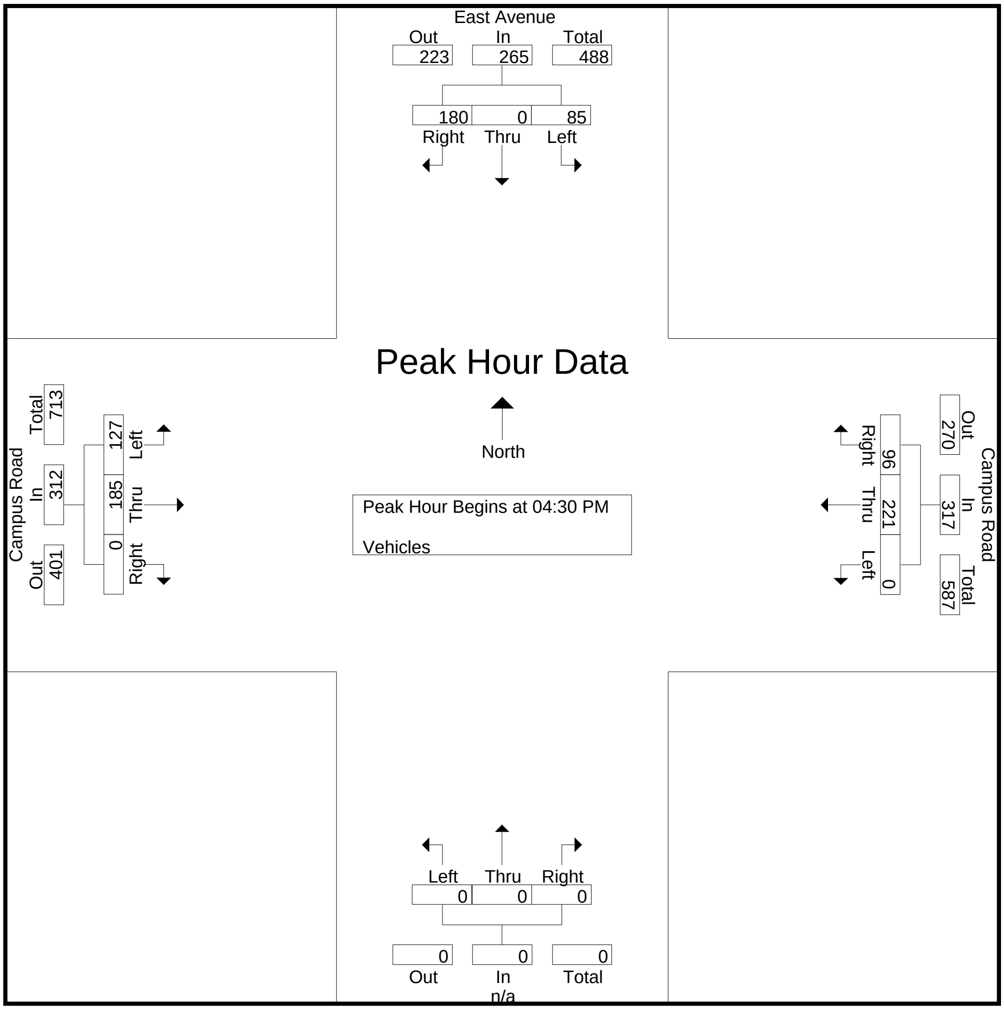
Groups Printed- Vehicles

	East Avenue Southbound				Campus Road Westbound				n/a Northbound				Campus Road Eastbound						
Start Time	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	10	0	4	4	0	23	10	3	0	0	0	0	14	28	0	0	7	89	96
07:15 AM	11	0	8	3	0	17	10	1	0	0	0	0	17	36	0	1	5	99	104
07:30 AM	14	0	16	1	0	47	16	0	0	0	0	0	19	38	0	0	1	150	151
07:45 AM	23	0	20	0	0	40	19	2	0	0	0	0	15	40	0	0	2	157	159
Total	58	0	48	8	0	127	55	6	0	0	0	0	65	142	0	1	15	495	510
08:00 AM	22	0	21	2	0	45	17	2	0	0	0	0	18	58	0	2	6	181	187
08:15 AM	27	0	20	4	0	39	10	1	0	0	0	0	15	63	0	0	5	174	179
08:30 AM	19	0	23	0	0	62	14	1	0	0	0	0	18	50	0	0	1	186	187
08:45 AM	16	0	25	1	0	40	21	5	0	0	0	0	15	60	0	0	6	177	183
Total	84	0	89	7	0	186	62	9	0	0	0	0	66	231	0	2	18	718	736
*** BREAK ***																			
04:00 PM	13	0	32	0	0	45	17	0	0	0	0	0	19	41	0	0	0	167	167
04:15 PM	19	0	45	0	0	32	14	0	0	0	0	0	25	34	0	0	0	169	169
04:30 PM	22	0	48	0	0	56	18	0	0	0	0	0	37	36	0	0	0	217	217
04:45 PM	12	0	51	0	0	63	33	0	0	0	0	0	32	60	0	0	0	251	251
Total	66	0	176	0	0	196	82	0	0	0	0	0	113	171	0	0	0	804	804
05:00 PM	28	0	44	1	0	57	26	0	0	0	0	0	33	53	0	0	1	241	242
05:15 PM	23	0	37	0	0	45	19	0	0	0	0	0	25	36	0	0	0	185	185
05:30 PM	15	0	38	0	0	42	21	0	0	0	0	0	23	44	0	0	0	183	183
05:45 PM	17	0	32	0	0	41	22	0	0	0	0	0	36	36	0	0	0	184	184
Total	83	0	151	1	0	185	88	0	0	0	0	0	117	169	0	0	1	793	794
Grand Total	291	0	464	16	0	694	287	15	0	0	0	0	361	713	0	3	34	2810	2844
Apprch %	38.5	0	61.5		0	70.7	29.3		0	0	0		33.6	66.4	0				
Total %	10.4	0	16.5		0	24.7	10.2		0	0	0		12.8	25.4	0		1.2	98.8	

	East Avenue Southbound				Campus Road Westbound				n/a Northbound				Campus Road Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	22	0	21	43	0	45	17	62	0	0	0	0	18	58	0	76	181
08:15 AM	27	0	20	47	0	39	10	49	0	0	0	0	15	63	0	78	174
08:30 AM	19	0	23	42	0	62	14	76	0	0	0	0	18	50	0	68	186
08:45 AM	16	0	25	41	0	40	21	61	0	0	0	0	15	60	0	75	177
Total Volume	84	0	89	173	0	186	62	248	0	0	0	0	66	231	0	297	718
% App. Total	48.6	0	51.4		0	75	25		0	0	0		22.2	77.8	0		
PHF	.778	.000	.890	.920	.000	.750	.738	.816	.000	.000	.000	.000	.917	.917	.000	.952	.965



	East Avenue Southbound				Campus Road Westbound				n/a Northbound				Campus Road Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	22	0	48	70	0	56	18	74	0	0	0	0	37	36	0	73	217
04:45 PM	12	0	51	63	0	63	33	96	0	0	0	0	32	60	0	92	251
05:00 PM	28	0	44	72	0	57	26	83	0	0	0	0	33	53	0	86	241
05:15 PM	23	0	37	60	0	45	19	64	0	0	0	0	25	36	0	61	185
Total Volume	85	0	180	265	0	221	96	317	0	0	0	0	127	185	0	312	894
% App. Total	32.1	0	67.9		0	69.7	30.3		0	0	0		40.7	59.3	0		
PHF	.759	.000	.882	.920	.000	.877	.727	.826	.000	.000	.000	.000	.858	.771	.000	.848	.890



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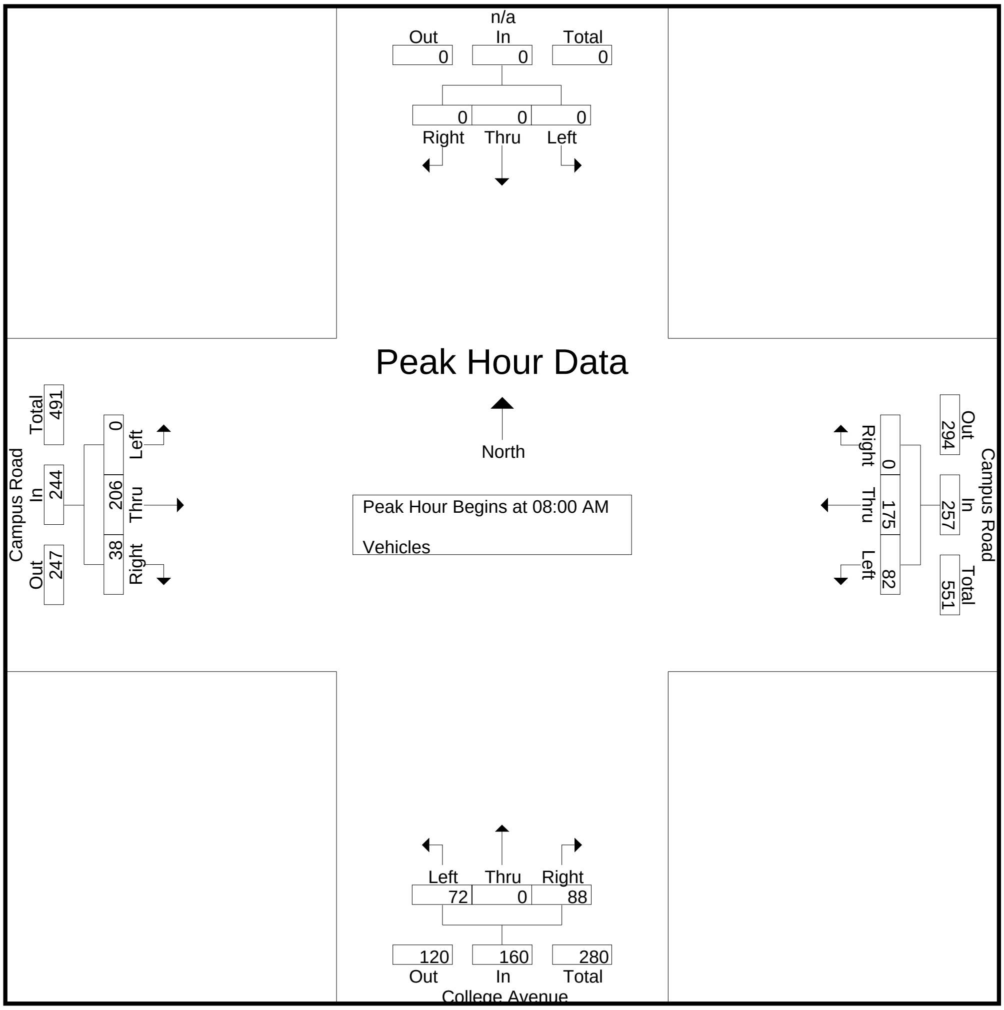
File Name : College@Campus
Site Code : 00114706
Start Date : 2/11/2008
Page No : 1

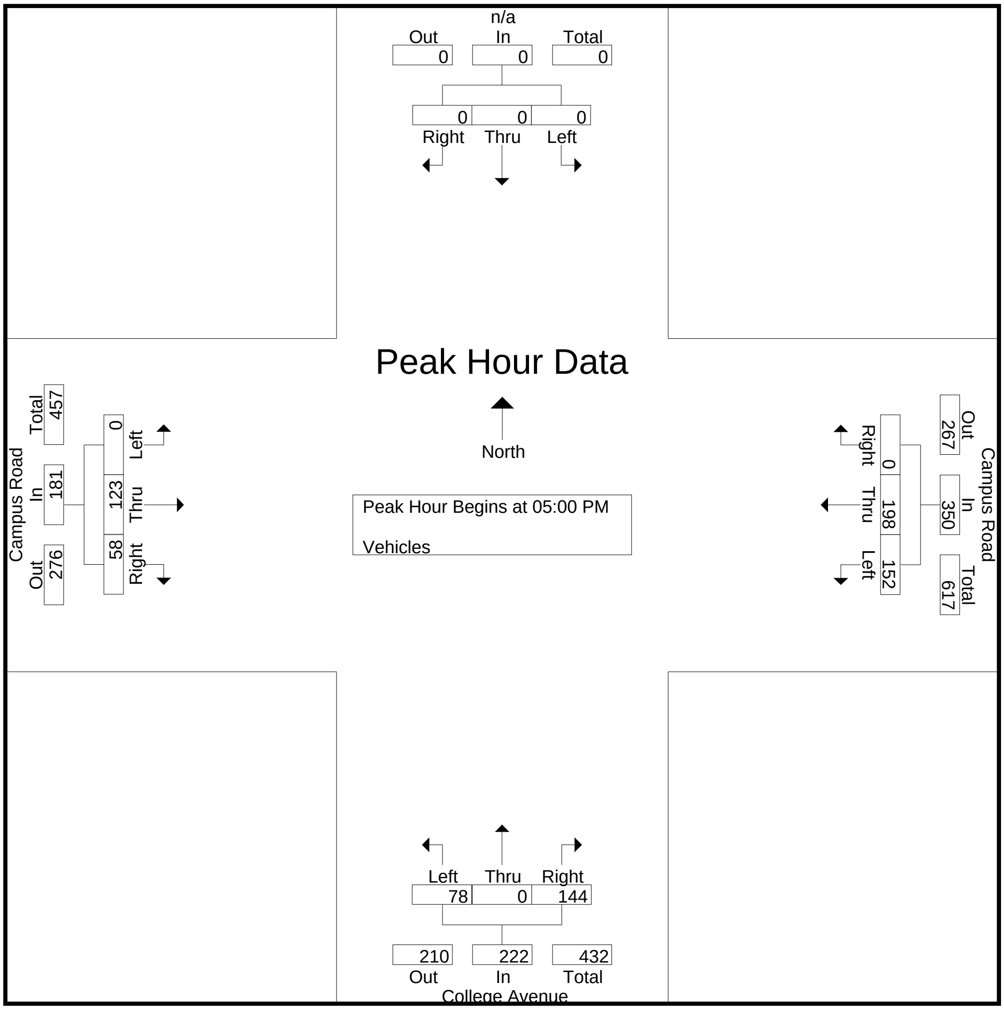
Groups Printed- Vehicles

	n/a Southbound				Campus Road Westbound				College Avenue Northbound				Campus Road Eastbound						
Start Time	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	0	0	0	6	19	0	0	1	0	14	1	0	19	2	0	1	61	62
07:15 AM	0	0	0	0	6	13	0	1	1	0	12	1	0	39	2	1	3	73	76
07:30 AM	0	0	0	0	14	45	0	0	7	0	18	0	0	45	3	0	0	132	132
07:45 AM	0	0	0	0	11	37	0	1	9	0	22	0	0	47	6	1	2	132	134
Total	0	0	0	0	37	114	0	2	18	0	66	2	0	150	13	2	6	398	404
08:00 AM	0	0	0	0	15	47	0	0	13	0	23	0	0	52	8	1	1	158	159
08:15 AM	0	0	0	0	19	31	0	0	13	0	26	0	0	46	4	0	0	139	139
08:30 AM	0	0	0	0	24	59	0	1	21	0	15	1	0	52	12	0	2	183	185
08:45 AM	0	0	0	0	24	38	0	3	25	0	24	0	0	56	14	0	3	181	184
Total	0	0	0	0	82	175	0	4	72	0	88	1	0	206	38	1	6	661	667
*** BREAK ***																			
04:00 PM	0	0	0	0	27	49	0	0	12	0	29	0	0	39	13	1	1	169	170
04:15 PM	0	0	0	0	32	64	0	0	23	0	25	0	0	20	6	0	0	170	170
04:30 PM	0	0	0	0	42	69	0	0	25	0	33	0	0	41	9	0	0	219	219
04:45 PM	0	0	0	0	43	45	0	0	15	0	26	0	0	28	11	0	0	168	168
Total	0	0	0	0	144	227	0	0	75	0	113	0	0	128	39	1	1	726	727
05:00 PM	0	0	0	0	25	46	0	0	16	0	26	0	0	15	9	0	0	137	137
05:15 PM	0	0	0	0	39	61	0	0	15	0	24	0	0	30	15	0	0	184	184
05:30 PM	0	0	0	0	50	54	0	0	30	0	42	0	0	44	14	0	0	234	234
05:45 PM	0	0	0	0	38	37	0	0	17	0	52	0	0	34	20	0	0	198	198
Total	0	0	0	0	152	198	0	0	78	0	144	0	0	123	58	0	0	753	753
Grand Total	0	0	0	0	415	714	0	6	243	0	411	3	0	607	148	4	13	2538	2551
Apprch %	0	0	0		36.8	63.2	0		37.2	0	62.8		0	80.4	19.6				
Total %	0	0	0		16.4	28.1	0		9.6	0	16.2		0	23.9	5.8		0.5	99.5	

	n/a Southbound				Campus Road Westbound				College Avenue Northbound				Campus Road Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	0	0	0	0	15	47	0	62	13	0	23	36	0	52	8	60	158
08:15 AM	0	0	0	0	19	31	0	50	13	0	26	39	0	46	4	50	139
08:30 AM	0	0	0	0	24	59	0	83	21	0	15	36	0	52	12	64	183
08:45 AM	0	0	0	0	24	38	0	62	25	0	24	49	0	56	14	70	181
Total Volume	0	0	0	0	82	175	0	257	72	0	88	160	0	206	38	244	661
% App. Total	0	0	0		31.9	68.1	0		45	0	55		0	84.4	15.6		
PHF	.000	.000	.000	.000	.854	.742	.000	.774	.720	.000	.846	.816	.000	.920	.679	.871	.903



	n/a Southbound				Campus Road Westbound				College Avenue Northbound				Campus Road Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	0	0	0	0	25	46	0	71	16	0	26	42	0	15	9	24	137
05:15 PM	0	0	0	0	39	61	0	100	15	0	24	39	0	30	15	45	184
05:30 PM	0	0	0	0	50	54	0	104	30	0	42	72	0	44	14	58	234
05:45 PM	0	0	0	0	38	37	0	75	17	0	52	69	0	34	20	54	198
Total Volume	0	0	0	0	152	198	0	350	78	0	144	222	0	123	58	181	753
% App. Total	0	0	0		43.4	56.6	0		35.1	0	64.9		0	68	32		
PHF	.000	.000	.000	.000	.760	.811	.000	.841	.650	.000	.692	.771	.000	.699	.725	.780	.804



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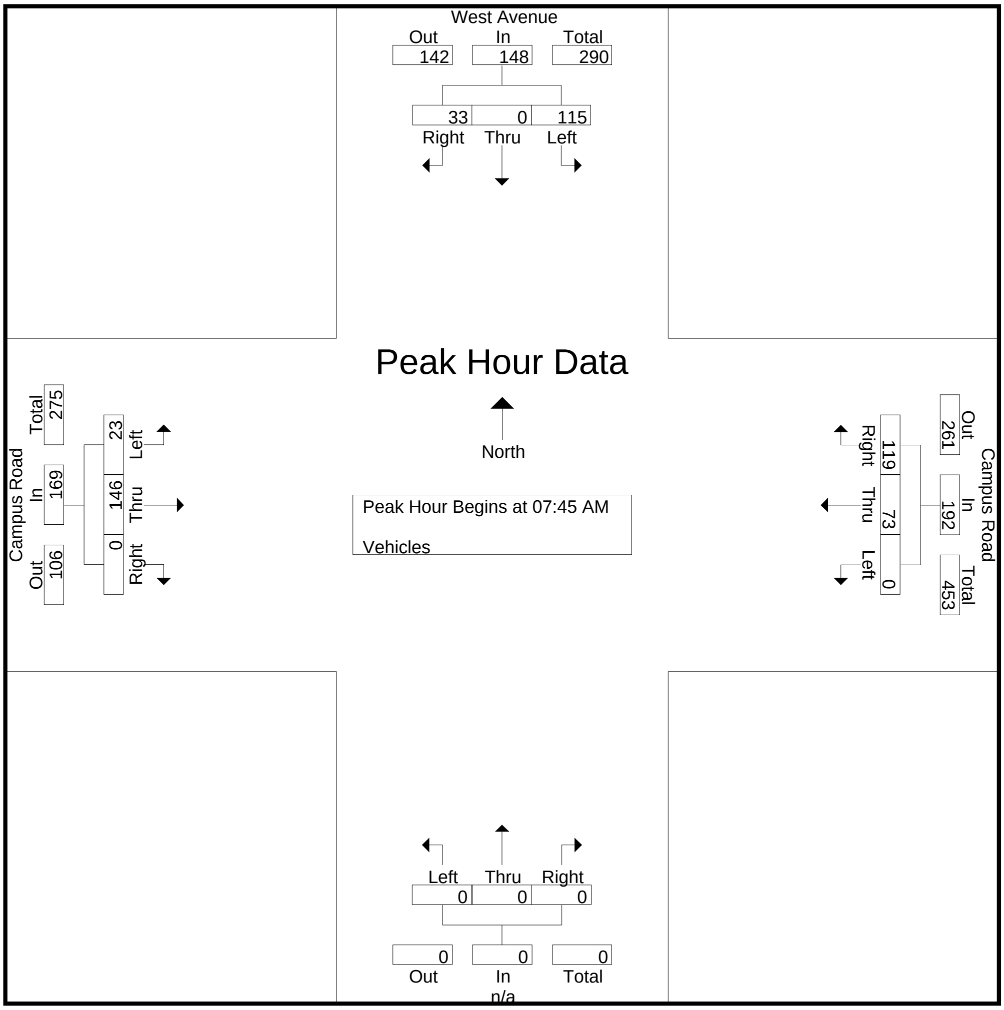
File Name : Campus@West-Revised
Site Code : 11470205
Start Date : 2/13/2008
Page No : 1

Groups Printed- Vehicles

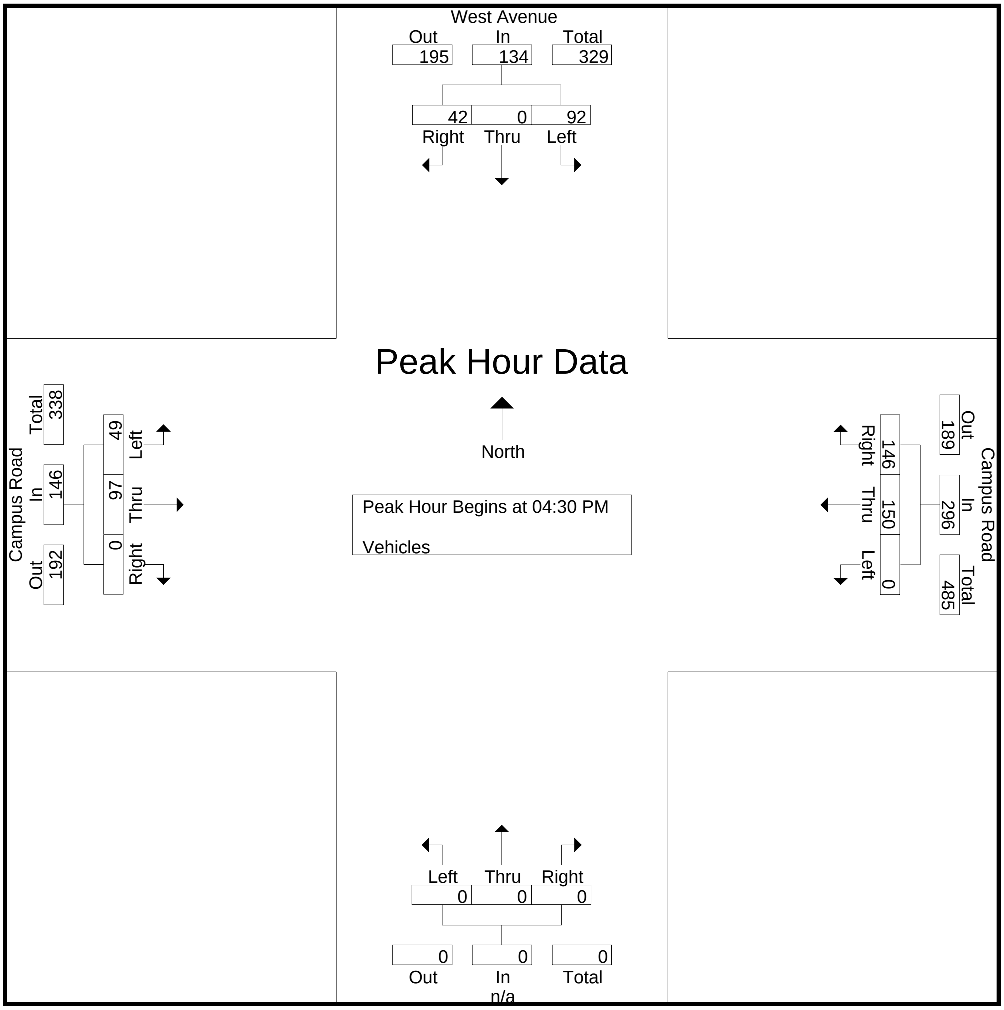
	West Avenue Southbound				Campus Road Westbound				n/a Northbound				Campus Road Eastbound						
Start Time	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	9	0	1	1	0	9	9	1	0	0	0	0	4	8	0	0	2	40	42
07:15 AM	14	0	5	0	0	10	14	0	0	0	0	0	6	39	0	1	1	88	89
07:30 AM	17	0	10	0	0	17	21	0	0	0	0	0	11	20	0	0	0	96	96
07:45 AM	27	0	9	2	0	17	26	0	0	0	0	0	9	43	0	0	2	131	133
Total	67	0	25	3	0	53	70	1	0	0	0	0	30	110	0	1	5	355	360
08:00 AM	25	0	3	0	0	16	23	0	0	0	0	0	6	36	0	0	0	109	109
08:15 AM	25	0	13	3	0	24	33	2	0	0	0	0	7	23	0	2	7	125	132
08:30 AM	38	0	8	0	0	16	37	0	0	0	0	0	1	44	0	0	0	144	144
08:45 AM	43	0	3	0	0	25	22	2	0	0	0	0	6	31	0	1	3	130	133
Total	131	0	27	3	0	81	115	4	0	0	0	0	20	134	0	3	10	508	518
*** BREAK ***																			
04:00 PM	29	0	7	0	0	25	26	0	0	0	0	0	7	19	0	0	0	113	113
04:15 PM	21	0	3	0	0	20	31	0	0	0	0	0	10	24	0	0	0	109	109
04:30 PM	28	0	15	0	0	44	34	0	0	0	0	0	14	17	0	0	0	152	152
04:45 PM	21	0	9	0	0	42	43	1	0	0	0	0	12	26	0	0	1	153	154
Total	99	0	34	0	0	131	134	1	0	0	0	0	43	86	0	0	1	527	528
05:00 PM	20	0	10	0	0	28	35	0	0	0	0	0	16	30	0	0	0	139	139
05:15 PM	23	0	8	0	0	36	34	0	0	0	0	0	7	24	0	0	0	132	132
05:30 PM	24	0	6	0	0	23	41	1	0	0	0	0	11	14	0	0	1	119	120
05:45 PM	30	0	8	0	0	27	50	0	0	0	0	0	12	18	0	0	0	145	145
Total	97	0	32	0	0	114	160	1	0	0	0	0	46	86	0	0	1	535	536
Grand Total	394	0	118	6	0	379	479	7	0	0	0	0	139	416	0	4	17	1925	1942
Apprch %	77	0	23		0	44.2	55.8		0	0	0		25	75	0				
Total %	20.5	0	6.1		0	19.7	24.9		0	0	0		7.2	21.6	0		0.9	99.1	

	West Avenue Southbound				Campus Road Westbound				n/a Northbound				Campus Road Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	27	0	9	36	0	17	26	43	0	0	0	0	9	43	0	52	131
08:00 AM	25	0	3	28	0	16	23	39	0	0	0	0	6	36	0	42	109
08:15 AM	25	0	13	38	0	24	33	57	0	0	0	0	7	23	0	30	125
08:30 AM	38	0	8	46	0	16	37	53	0	0	0	0	1	44	0	45	144
Total Volume	115	0	33	148	0	73	119	192	0	0	0	0	23	146	0	169	509
% App. Total	77.7	0	22.3		0	38	62		0	0	0		13.6	86.4	0		
PHF	.757	.000	.635	.804	.000	.760	.804	.842	.000	.000	.000	.000	.639	.830	.000	.813	.884



File Name : Campus@West-Revised
Site Code : 11470205
Start Date : 2/13/2008

	West Avenue Southbound				Campus Road Westbound				n/a Northbound				Campus Road Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	28	0	15	43	0	44	34	78	0	0	0	0	14	17	0	31	152
04:45 PM	21	0	9	30	0	42	43	85	0	0	0	0	12	26	0	38	153
05:00 PM	20	0	10	30	0	28	35	63	0	0	0	0	16	30	0	46	139
05:15 PM	23	0	8	31	0	36	34	70	0	0	0	0	7	24	0	31	132
Total Volume	92	0	42	134	0	150	146	296	0	0	0	0	49	97	0	146	576
% App. Total	68.7	0	31.3		0	50.7	49.3		0	0	0		33.6	66.4	0		
PHF	.821	.000	.700	.779	.000	.852	.849	.871	.000	.000	.000	.000	.766	.808	.000	.793	.941



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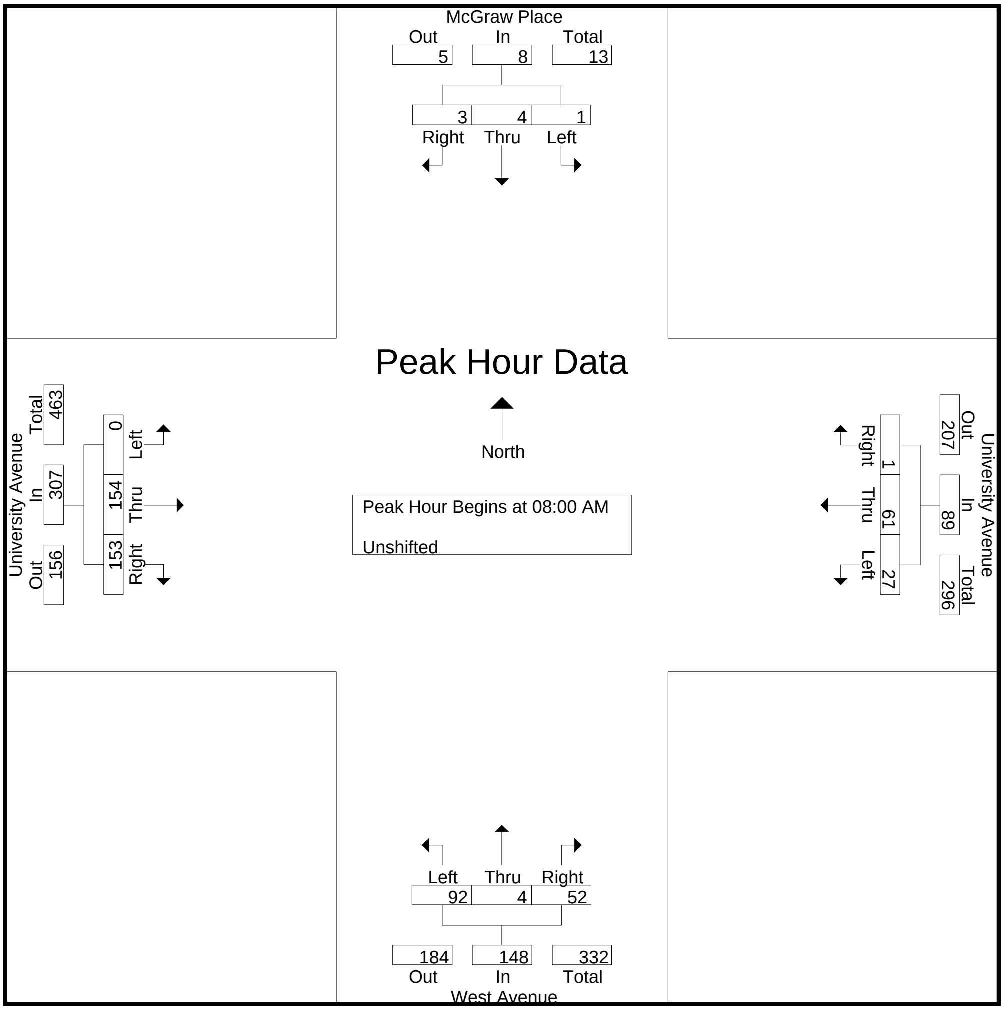
File Name : University@West
Site Code : 11470201
Start Date : 2/13/2008
Page No : 1

Groups Printed- Unshifted

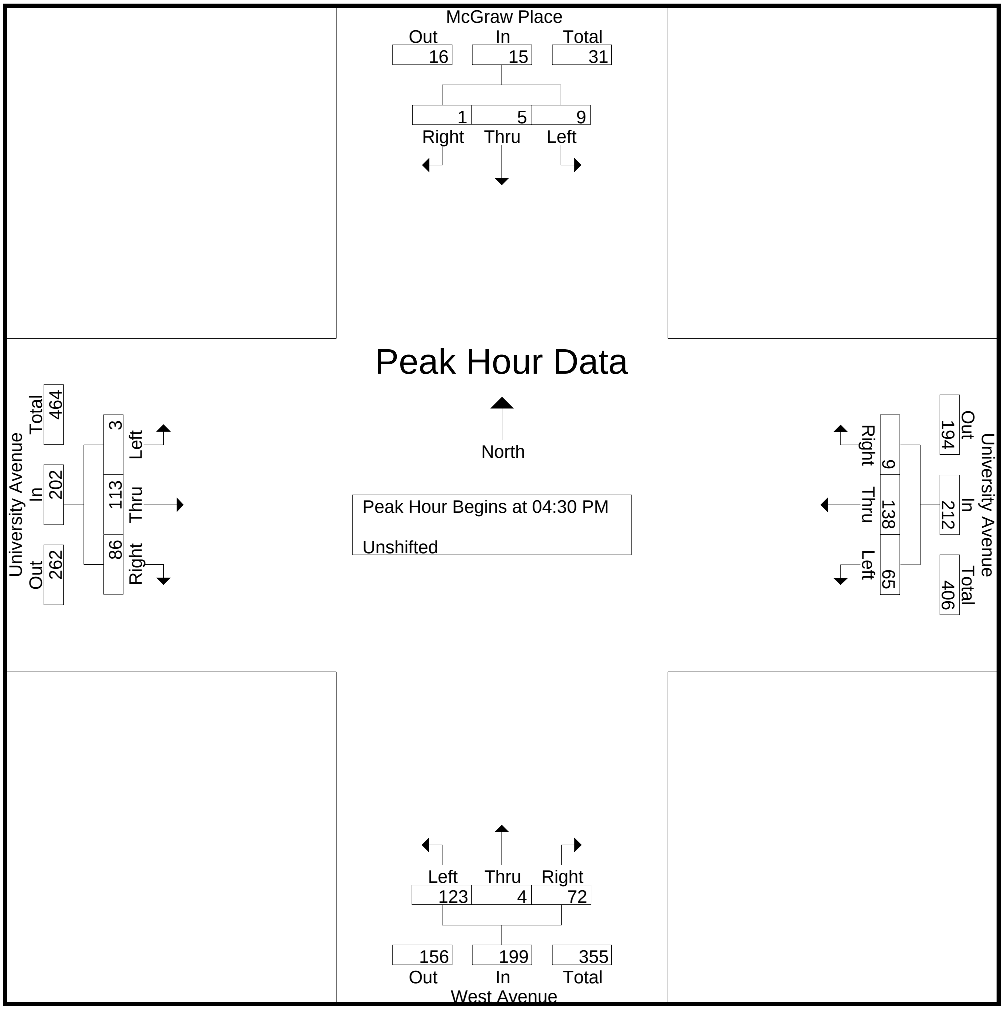
	McGraw Place Southbound				University Avenue Westbound				West Avenue Northbound				University Avenue Eastbound						
Start Time	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	0	0	0	2	6	0	0	6	0	5	0	1	8	9	1	1	37	38
07:15 AM	0	1	0	0	6	6	0	0	11	1	6	0	0	20	22	0	0	73	73
07:30 AM	0	0	1	0	7	15	0	0	20	1	11	0	0	25	21	0	0	101	101
07:45 AM	0	1	0	0	3	14	1	0	25	2	5	0	0	29	34	3	3	114	117
Total	0	2	1	0	18	41	1	0	62	4	27	0	1	82	86	4	4	325	329
08:00 AM	0	0	1	0	9	8	0	0	15	1	15	0	0	33	29	0	0	111	111
08:15 AM	0	2	0	0	7	15	0	0	22	2	14	1	0	32	30	4	5	124	129
08:30 AM	0	0	2	0	7	15	0	0	34	0	10	0	0	42	42	1	1	152	153
08:45 AM	1	2	0	0	4	23	1	0	21	1	13	1	0	47	52	0	1	165	166
Total	1	4	3	0	27	61	1	0	92	4	52	2	0	154	153	5	7	552	559
*** BREAK ***																			
04:00 PM	1	2	4	0	10	24	0	0	17	3	16	0	1	17	20	0	0	115	115
04:15 PM	1	3	0	0	10	18	1	0	20	3	16	0	1	18	15	0	0	106	106
04:30 PM	2	3	1	0	12	29	3	0	28	1	17	0	1	28	29	0	0	154	154
04:45 PM	3	1	0	0	16	41	3	0	38	0	18	0	0	29	18	0	0	167	167
Total	7	9	5	0	48	112	7	0	103	7	67	0	3	92	82	0	0	542	542
05:00 PM	3	0	0	0	17	40	3	0	27	2	26	0	0	29	19	0	0	166	166
05:15 PM	1	1	0	0	20	28	0	0	30	1	11	0	2	27	20	0	0	141	141
05:30 PM	0	1	1	0	13	35	4	0	30	1	14	0	1	17	24	0	0	141	141
05:45 PM	3	0	0	0	13	32	5	0	43	0	20	0	1	21	23	0	0	161	161
Total	7	2	1	0	63	135	12	0	130	4	71	0	4	94	86	0	0	609	609
Grand Total	15	17	10	0	156	349	21	0	387	19	217	2	8	422	407	9	11	2028	2039
Apprch %	35.7	40.5	23.8		29.7	66.3	4		62.1	3	34.8		1	50.4	48.6				
Total %	0.7	0.8	0.5		7.7	17.2	1		19.1	0.9	10.7		0.4	20.8	20.1		0.5	99.5	

	McGraw Place Southbound				University Avenue Westbound				West Avenue Northbound				University Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	0	0	1	1	9	8	0	17	15	1	15	31	0	33	29	62	111
08:15 AM	0	2	0	2	7	15	0	22	22	2	14	38	0	32	30	62	124
08:30 AM	0	0	2	2	7	15	0	22	34	0	10	44	0	42	42	84	152
08:45 AM	1	2	0	3	4	23	1	28	21	1	13	35	0	47	52	99	165
Total Volume	1	4	3	8	27	61	1	89	92	4	52	148	0	154	153	307	552
% App. Total	12.5	50	37.5		30.3	68.5	1.1		62.2	2.7	35.1		0	50.2	49.8		
PHF	.250	.500	.375	.667	.750	.663	.250	.795	.676	.500	.867	.841	.000	.819	.736	.775	.836



File Name : University@West
Site Code : 11470201
Start Date : 2/13/2008
Page No : 3

	McGraw Place Southbound				University Avenue Westbound				West Avenue Northbound				University Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	2	3	1	6	12	29	3	44	28	1	17	46	1	28	29	58	154
04:45 PM	3	1	0	4	16	41	3	60	38	0	18	56	0	29	18	47	167
05:00 PM	3	0	0	3	17	40	3	60	27	2	26	55	0	29	19	48	166
05:15 PM	1	1	0	2	20	28	0	48	30	1	11	42	2	27	20	49	141
Total Volume	9	5	1	15	65	138	9	212	123	4	72	199	3	113	86	202	628
% App. Total	60	33.3	6.7		30.7	65.1	4.2		61.8	2	36.2		1.5	55.9	42.6		
PHF	.750	.417	.250	.625	.813	.841	.750	.883	.809	.500	.692	.888	.375	.974	.741	.871	.940



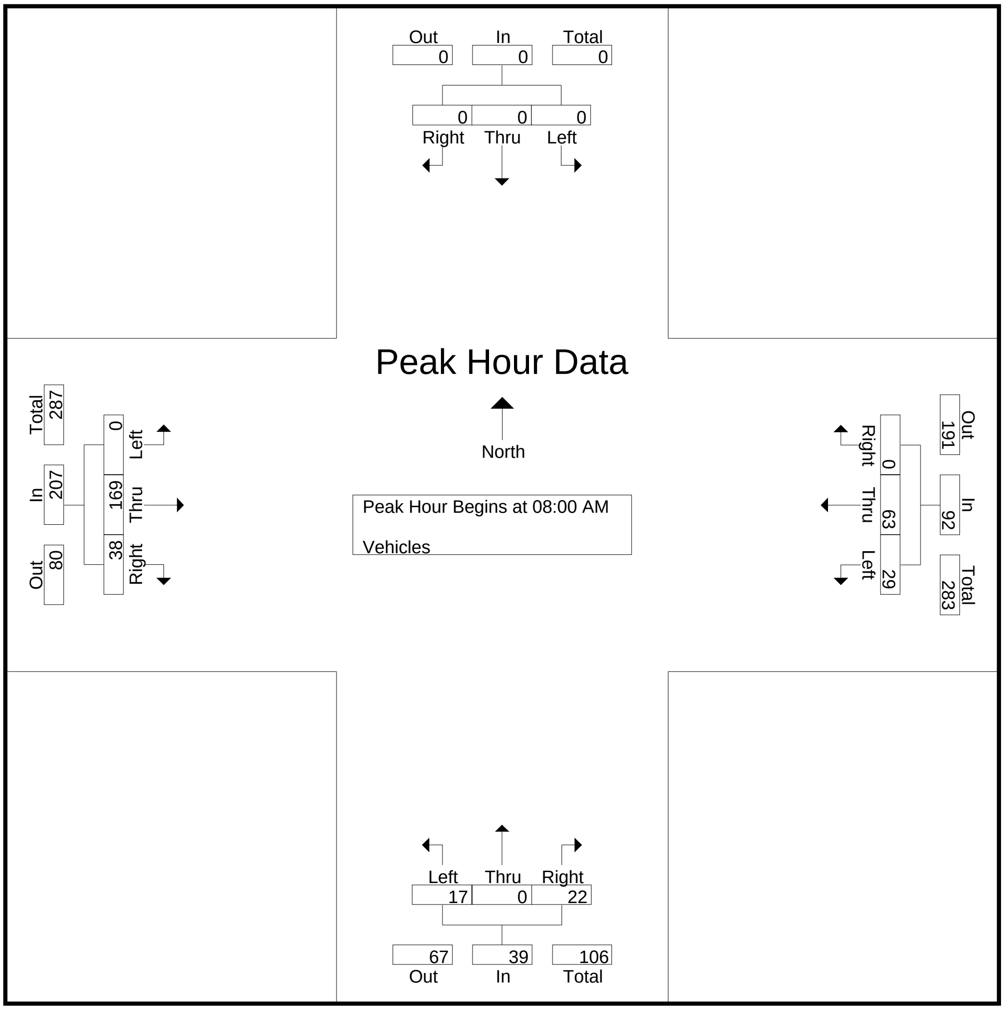
M a r t in / A l e x i o u / B r y s o n, P L L C
4000 Westchase Boulevard, Suite 530
Raleigh, NC 27607
Phone: (919) 829-0328; Fax: (919) 829-0329

File Name : Central@University
Site Code : 11470202
Start Date : 2/14/2008
Page No : 1

Groups Printed- Vehicles

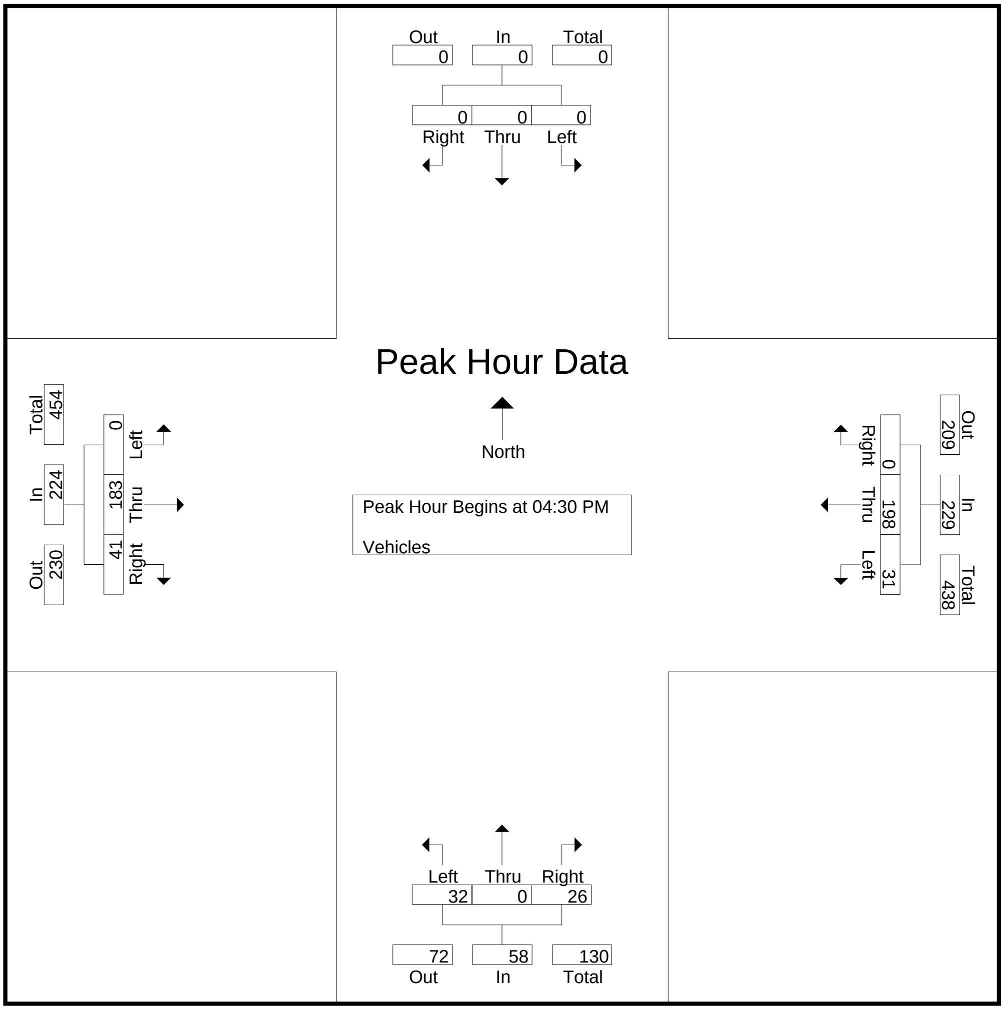
	Southbound				Westbound				Northbound				Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	0	0	0	1	3	0	0	2	0	3	0	0	13	0	0	0	22	22
07:15 AM	0	0	0	0	5	7	0	0	3	0	3	0	0	14	4	0	0	36	36
07:30 AM	0	0	0	0	5	18	0	0	3	0	2	0	0	26	5	0	0	59	59
07:45 AM	0	0	0	0	5	14	0	0	2	0	2	0	0	33	3	0	0	59	59
Total	0	0	0	0	16	42	0	0	10	0	10	0	0	86	12	0	0	176	176
08:00 AM	0	0	0	0	9	12	0	0	2	0	9	0	0	40	13	0	0	85	85
08:15 AM	0	0	0	0	6	12	0	0	4	0	9	0	0	33	7	0	0	71	71
08:30 AM	0	0	0	0	7	23	0	0	5	0	1	0	0	43	7	0	0	86	86
08:45 AM	0	0	0	0	7	16	0	1	6	0	3	0	0	53	11	0	1	96	97
Total	0	0	0	0	29	63	0	1	17	0	22	0	0	169	38	0	1	338	339
*** BREAK ***																			
04:00 PM	0	0	0	0	3	36	0	0	8	0	5	0	0	34	7	0	0	93	93
04:15 PM	0	0	0	0	4	39	0	0	6	0	10	0	0	51	4	0	0	114	114
04:30 PM	0	0	0	0	7	64	0	0	11	0	8	0	0	45	10	0	0	145	145
04:45 PM	0	0	0	0	10	48	0	0	9	0	6	0	0	54	4	0	0	131	131
Total	0	0	0	0	24	187	0	0	34	0	29	0	0	184	25	0	0	483	483
05:00 PM	0	0	0	0	8	46	0	0	4	0	6	0	0	42	14	0	0	120	120
05:15 PM	0	0	0	0	6	40	0	0	8	0	6	0	0	42	13	0	0	115	115
05:30 PM	0	0	0	0	2	44	0	0	16	0	4	0	0	38	5	0	0	109	109
05:45 PM	0	0	0	0	6	43	0	0	7	0	2	0	0	40	7	0	0	105	105
Total	0	0	0	0	22	173	0	0	35	0	18	0	0	162	39	0	0	449	449
Grand Total	0	0	0	0	91	465	0	1	96	0	79	0	0	601	114	0	1	1446	1447
Apprch %	0	0	0		16.4	83.6	0		54.9	0	45.1		0	84.1	15.9				
Total %	0	0	0		6.3	32.2	0		6.6	0	5.5		0	41.6	7.9		0.1	99.9	

	Southbound				Westbound				Northbound				Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	0	0	0	0	9	12	0	21	2	0	9	11	0	40	13	53	85
08:15 AM	0	0	0	0	6	12	0	18	4	0	9	13	0	33	7	40	71
08:30 AM	0	0	0	0	7	23	0	30	5	0	1	6	0	43	7	50	86
08:45 AM	0	0	0	0	7	16	0	23	6	0	3	9	0	53	11	64	96
Total Volume	0	0	0	0	29	63	0	92	17	0	22	39	0	169	38	207	338
% App. Total	0	0	0		31.5	68.5	0		43.6	0	56.4		0	81.6	18.4		
PHF	.000	.000	.000	.000	.806	.685	.000	.767	.708	.000	.611	.750	.000	.797	.731	.809	.880



File Name : Central@University
Site Code : 11470202
Start Date : 2/14/2008

	Southbound				Westbound				Northbound				Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	0	0	0	0	7	64	0	71	11	0	8	19	0	45	10	55	145
04:45 PM	0	0	0	0	10	48	0	58	9	0	6	15	0	54	4	58	131
05:00 PM	0	0	0	0	8	46	0	54	4	0	6	10	0	42	14	56	120
05:15 PM	0	0	0	0	6	40	0	46	8	0	6	14	0	42	13	55	115
Total Volume	0	0	0	0	31	198	0	229	32	0	26	58	0	183	41	224	511
% App. Total	0	0	0		13.5	86.5	0		55.2	0	44.8		0	81.7	18.3		
PHF	.000	.000	.000	.000	.775	.773	.000	.806	.727	.000	.813	.763	.000	.847	.732	.966	.881



Martin / Alexiou / Bryson, PLLC

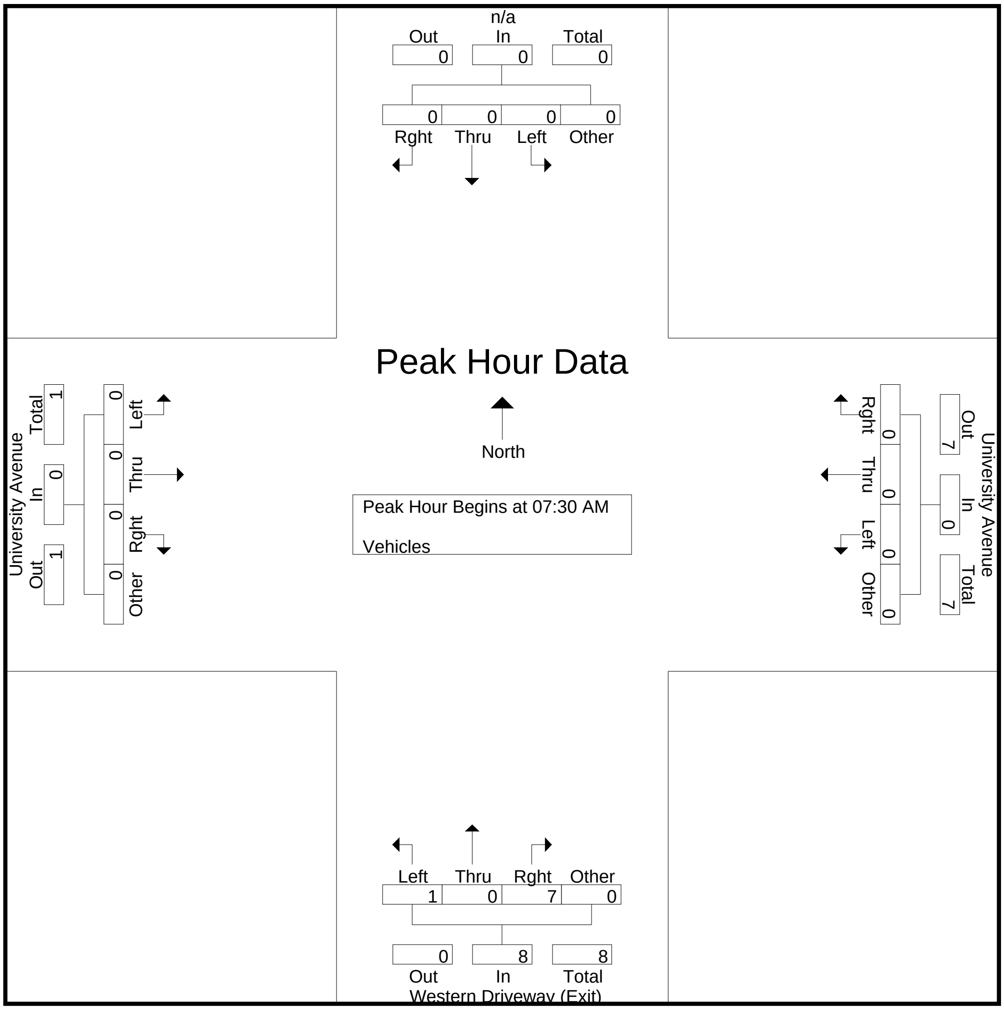
4000 Westchase Boulevard, Suite 530
Raleigh, NC 27607
Phone: (919) 829-0328; Fax: (919) 829-0329

File Name : University@WestDriveway
Site Code : 00000000
Start Date : 2/14/2008
Page No : 1

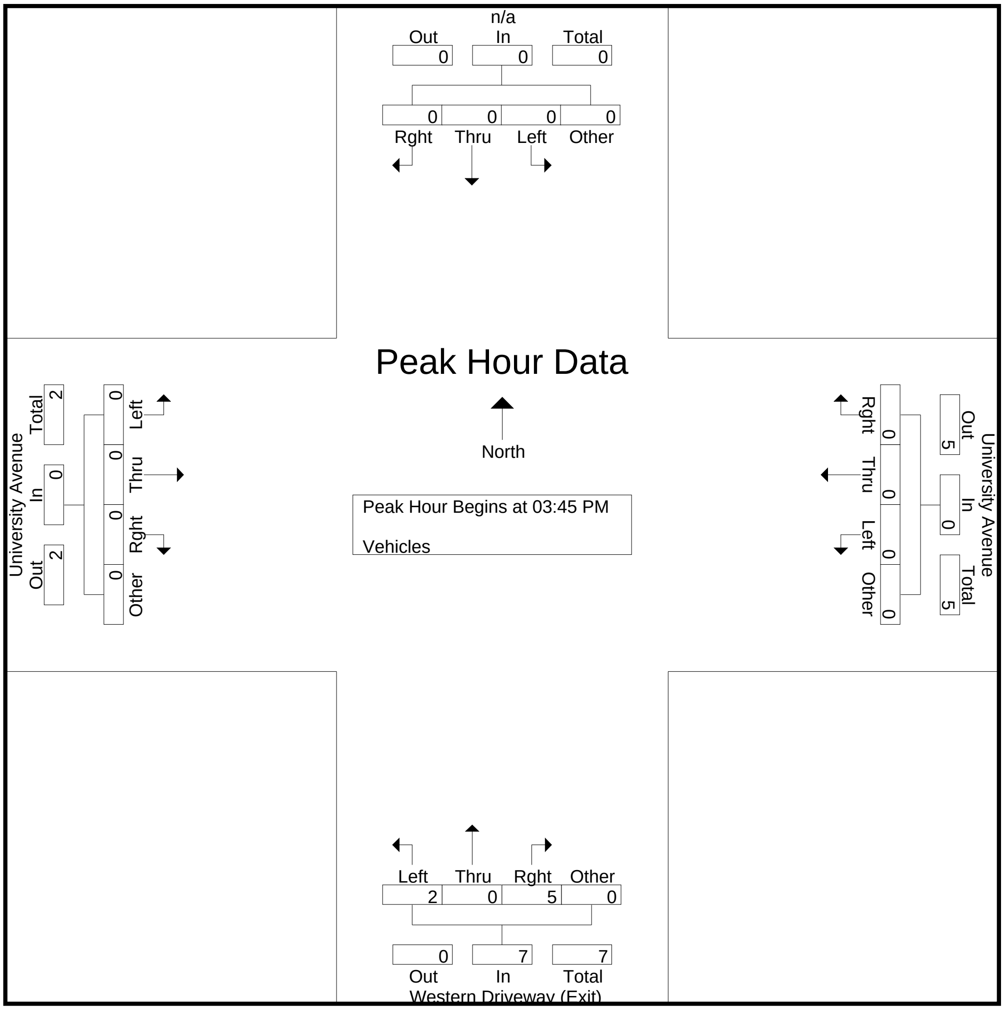
Groups Printed- Vehicles

	n/a Southbound				University Avenue Westbound				Western Driveway (Exit) Northbound				University Avenue Eastbound				
Start Time	Left	Thru	Rght	Other	Left	Thru	Rght	Other	Left	Thru	Rght	Other	Left	Thru	Rght	Other	Int. Total
07:30 AM	0	0	0	0	0	0	0	0	1	0	4	0	0	0	0	0	5
07:45 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Total	0	0	0	0	0	0	0	0	1	0	5	0	0	0	0	0	6
08:00 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
08:15 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Total	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2
04:00 PM	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	3
04:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
04:30 PM	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	3
Total	0	0	0	0	0	0	0	0	2	0	5	0	0	0	0	0	7
Grand Total	0	0	0	0	0	0	0	0	3	0	12	0	0	0	0	0	15
Apprch %	0	0	0	0	0	0	0	0	20	0	80	0	0	0	0	0	
Total %	0	0	0	0	0	0	0	0	20	0	80	0	0	0	0	0	

	n/a Southbound					University Avenue Westbound					Western Driveway (Exit) Northbound					University Avenue Eastbound					
Start Time	Left	Thru	Rght	Other	App. Total	Left	Thru	Rght	Other	App. Total	Left	Thru	Rght	Other	App. Total	Left	Thru	Rght	Other	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	0	0	0	0	0	0	0	0	0	1	0	4	0	5	0	0	0	0	0	5
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
Total Volume	0	0	0	0	0	0	0	0	0	0	1	0	7	0	8	0	0	0	0	0	8
% App. Total	0	0	0	0		0	0	0	0		12.5	0	87.5	0		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.000	.438	.000	.400	.000	.000	.000	.000	.000	.400



	n/a Southbound					University Avenue Westbound					Western Driveway (Exit) Northbound					University Avenue Eastbound					
Start Time	Left	Thru	Rght	Other	App. Total	Left	Thru	Rght	Other	App. Total	Left	Thru	Rght	Other	App. Total	Left	Thru	Rght	Other	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:45 PM																					
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00 PM	0	0	0	0	0	0	0	0	0	0	2	0	1	0	3	0	0	0	0	0	3
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	0	0	0	0	0	3
Total Volume	0	0	0	0	0	0	0	0	0	0	2	0	5	0	7	0	0	0	0	0	7
% App. Total	0	0	0	0		0	0	0	0		28.6	0	71.4	0		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.000	.417	.000	.583	.000	.000	.000	.000	.000	.583



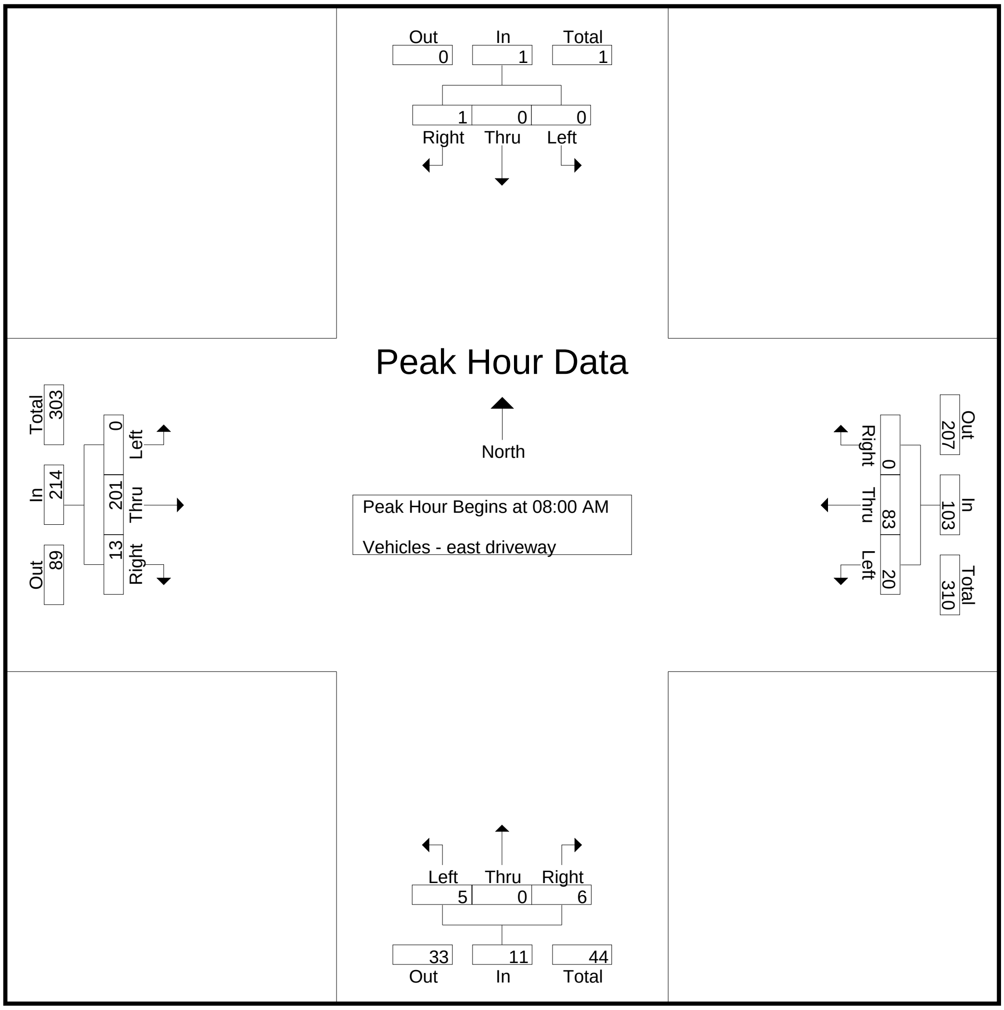
Martin / Alexiou / Bryson, PLLC
4000 Westchase Boulevard, Suite 530
Raleigh, NC 27607
Phone: (919) 829-0328; Fax: (919) 829-0329

File Name : University@EastDriveway
Site Code : 11470203
Start Date : 2/14/2008
Page No : 1

Groups Printed- east driveway

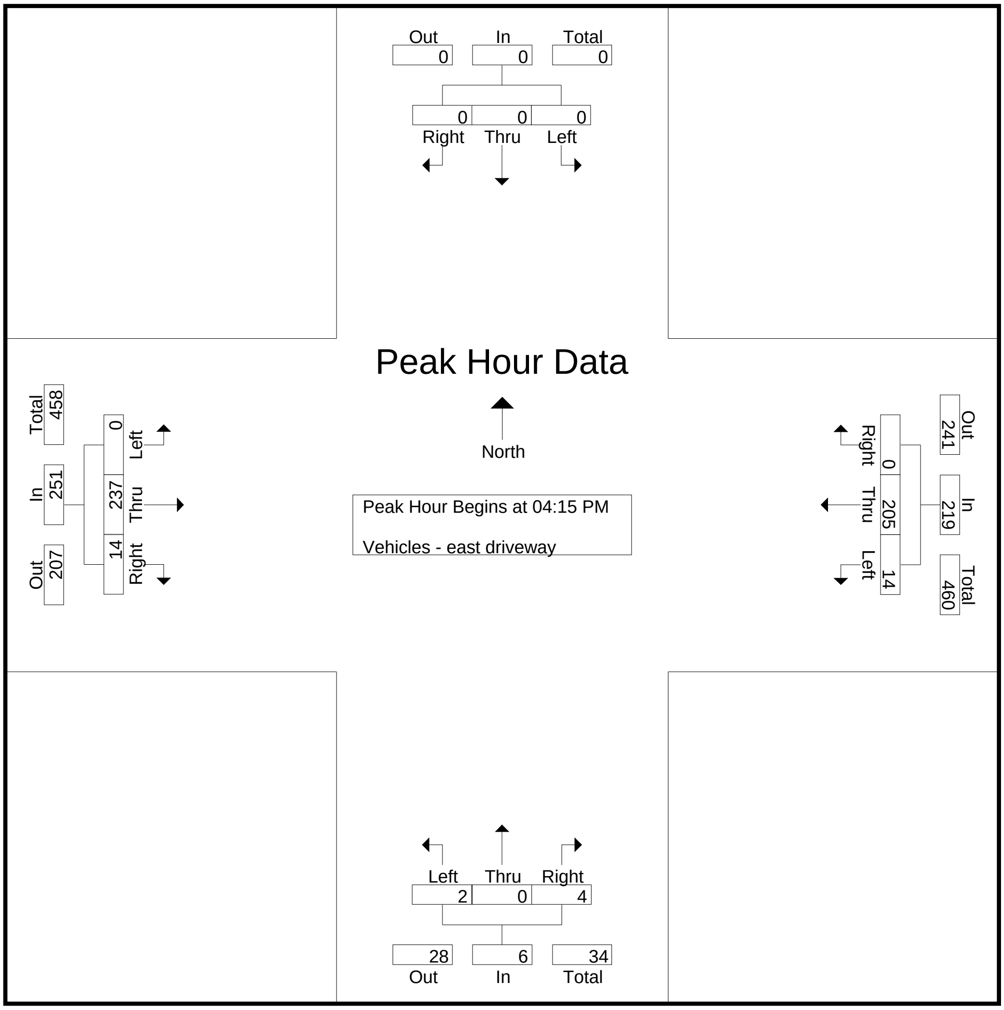
	Southbound				Westbound				Northbound				Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	0	0	0	1	3	0	1	1	0	2	0	0	16	3	0	1	26	27
07:15 AM	0	0	0	0	3	12	0	0	0	0	1	0	0	15	2	0	0	33	33
07:30 AM	0	0	0	0	4	20	0	0	0	0	0	0	0	24	1	0	0	49	49
07:45 AM	0	0	0	0	0	18	0	0	0	0	1	0	0	32	3	0	0	54	54
Total	0	0	0	0	8	53	0	1	1	0	4	0	0	87	9	0	1	162	163
08:00 AM	0	0	1	0	4	18	0	1	0	0	0	0	0	48	3	0	1	74	75
08:15 AM	0	0	0	0	6	18	0	0	1	0	4	0	0	47	3	0	0	79	79
08:30 AM	0	0	0	0	5	24	0	0	2	0	0	0	0	42	3	0	0	76	76
08:45 AM	0	0	0	0	5	23	0	0	2	0	2	1	0	64	4	0	1	100	101
Total	0	0	1	0	20	83	0	1	5	0	6	1	0	201	13	0	2	329	331
*** BREAK ***																			
04:00 PM	0	0	0	0	3	37	0	0	2	0	0	0	0	36	0	0	0	78	78
04:15 PM	0	0	0	0	2	41	0	0	2	0	3	0	0	58	6	0	0	112	112
04:30 PM	0	0	0	0	3	66	0	0	0	0	0	0	0	61	1	0	0	131	131
04:45 PM	0	0	0	0	4	48	0	0	0	0	0	0	0	63	6	0	0	121	121
Total	0	0	0	0	12	192	0	0	4	0	3	0	0	218	13	0	0	442	442
05:00 PM	0	0	0	0	5	50	0	0	0	0	1	0	0	55	1	0	0	112	112
05:15 PM	0	0	0	0	1	36	0	0	1	0	0	0	0	44	1	0	0	83	83
05:30 PM	0	0	0	0	1	41	0	0	0	0	0	0	0	51	1	0	0	94	94
05:45 PM	0	0	0	0	4	42	0	0	0	0	0	0	0	43	5	0	0	94	94
Total	0	0	0	0	11	169	0	0	1	0	1	0	0	193	8	0	0	383	383
Grand Total	0	0	1	0	51	497	0	2	11	0	14	1	0	699	43	0	3	1316	1319
Apprch %	0	0	100		9.3	90.7	0		44	0	56		0	94.2	5.8				
Total %	0	0	0.1		3.9	37.8	0		0.8	0	1.1		0	53.1	3.3		0.2	99.8	

	Southbound				Westbound				Northbound				Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	0	0	1	1	4	18	0	22	0	0	0	0	0	48	3	51	74
08:15 AM	0	0	0	0	6	18	0	24	1	0	4	5	0	47	3	50	79
08:30 AM	0	0	0	0	5	24	0	29	2	0	0	2	0	42	3	45	76
08:45 AM	0	0	0	0	5	23	0	28	2	0	2	4	0	64	4	68	100
Total Volume	0	0	1	1	20	83	0	103	5	0	6	11	0	201	13	214	329
% App. Total	0	0	100		19.4	80.6	0		45.5	0	54.5		0	93.9	6.1		
PHF	.000	.000	.250	.250	.833	.865	.000	.888	.625	.000	.375	.550	.000	.785	.813	.787	.823



File Name : University@EastDriveway
Site Code : 11470203
Start Date : 2/14/2008
Page No : 3

	Southbound				Westbound				Northbound				Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	0	0	0	0	2	41	0	43	2	0	3	5	0	58	6	64	112
04:30 PM	0	0	0	0	3	66	0	69	0	0	0	0	0	61	1	62	131
04:45 PM	0	0	0	0	4	48	0	52	0	0	0	0	0	63	6	69	121
05:00 PM	0	0	0	0	5	50	0	55	0	0	1	1	0	55	1	56	112
Total Volume	0	0	0	0	14	205	0	219	2	0	4	6	0	237	14	251	476
% App. Total	0	0	0		6.4	93.6	0		33.3	0	66.7		0	94.4	5.6		
PHF	.000	.000	.000	.000	.700	.777	.000	.793	.250	.000	.333	.300	.000	.940	.583	.909	.908



Martin / Alexiou / Bryson, PLLC

4000 Westchase Boulevard, Suite 530
Raleigh, NC 27607
Phone: (919) 829-0328; Fax: (919) 829-0329

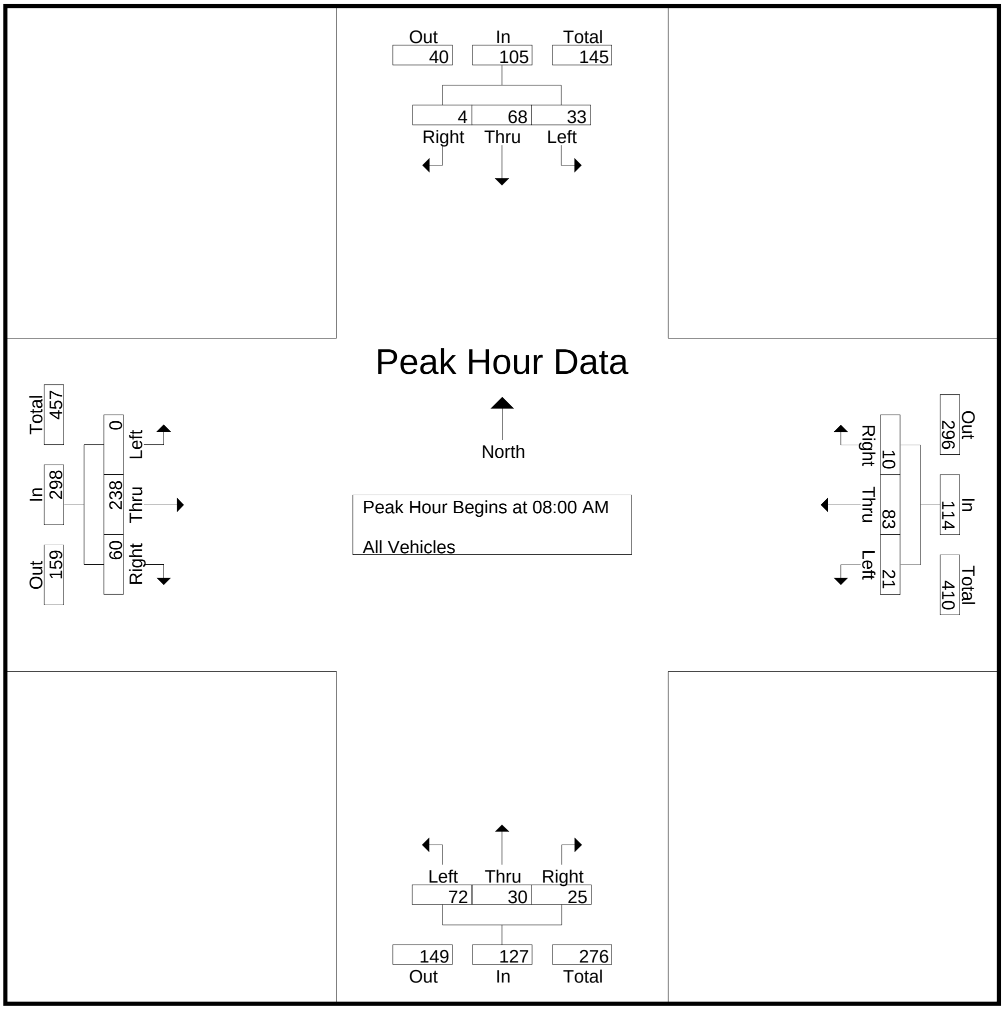
File Name : Stewart@University AM
Site Code : 00000123
Start Date : 3/7/2008
Page No : 1

Groups Printed- All Vehicles

	Southbound				Westbound				Northbound				Eastbound						
Start Time	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	3	2	2	1	0	6	3	2	9	4	2	1	0	25	4	3	7	60	67
07:15 AM	1	3	0	1	2	15	1	0	6	2	2	1	0	27	2	5	7	61	68
07:30 AM	1	9	0	2	4	30	0	0	16	4	5	0	0	34	6	3	5	109	114
07:45 AM	9	14	2	0	5	27	3	0	14	3	6	0	0	41	8	4	4	132	136
Total	14	28	4	4	11	78	7	2	45	13	15	2	0	127	20	15	23	362	385
08:00 AM	7	19	1	2	3	15	1	3	8	5	6	0	0	55	12	8	13	132	145
08:15 AM	9	11	0	1	10	17	4	1	9	9	4	0	0	48	6	3	5	127	132
08:30 AM	7	16	0	1	4	24	2	0	25	6	7	2	0	45	22	8	11	158	169
08:45 AM	10	22	3	2	4	27	3	10	30	10	8	3	0	90	20	23	38	227	265
Total	33	68	4	6	21	83	10	14	72	30	25	5	0	238	60	42	67	644	711
Grand Total	47	96	8	10	32	161	17	16	117	43	40	7	0	365	80	57	90	1006	1096
Apprch %	31.1	63.6	5.3		15.2	76.7	8.1		58.5	21.5	20		0	82	18				
Total %	4.7	9.5	0.8		3.2	16	1.7		11.6	4.3	4		0	36.3	8		8.2	91.8	

File Name : Stewart@University AM
Site Code : 00000123
Start Date : 3/7/2008

	Southbound				**Westbound**				**Northbound**				**Eastbound**				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	7	19	1	27	3	15	1	19	8	5	6	19	0	55	12	67	132
08:15 AM	9	11	0	20	10	17	4	31	9	9	4	22	0	48	6	54	127
08:30 AM	7	16	0	23	4	24	2	30	25	6	7	38	0	45	22	67	158
08:45 AM	10	22	3	35	4	27	3	34	30	10	8	48	0	90	20	110	227
Total Volume	33	68	4	105	21	83	10	114	72	30	25	127	0	238	60	298	644
% App. Total	31.4	64.8	3.8		18.4	72.8	8.8		56.7	23.6	19.7		0	79.9	20.1		
PHF	.825	.773	.333	.750	.525	.769	.625	.838	.600	.750	.781	.661	.000	.661	.682	.677	.709

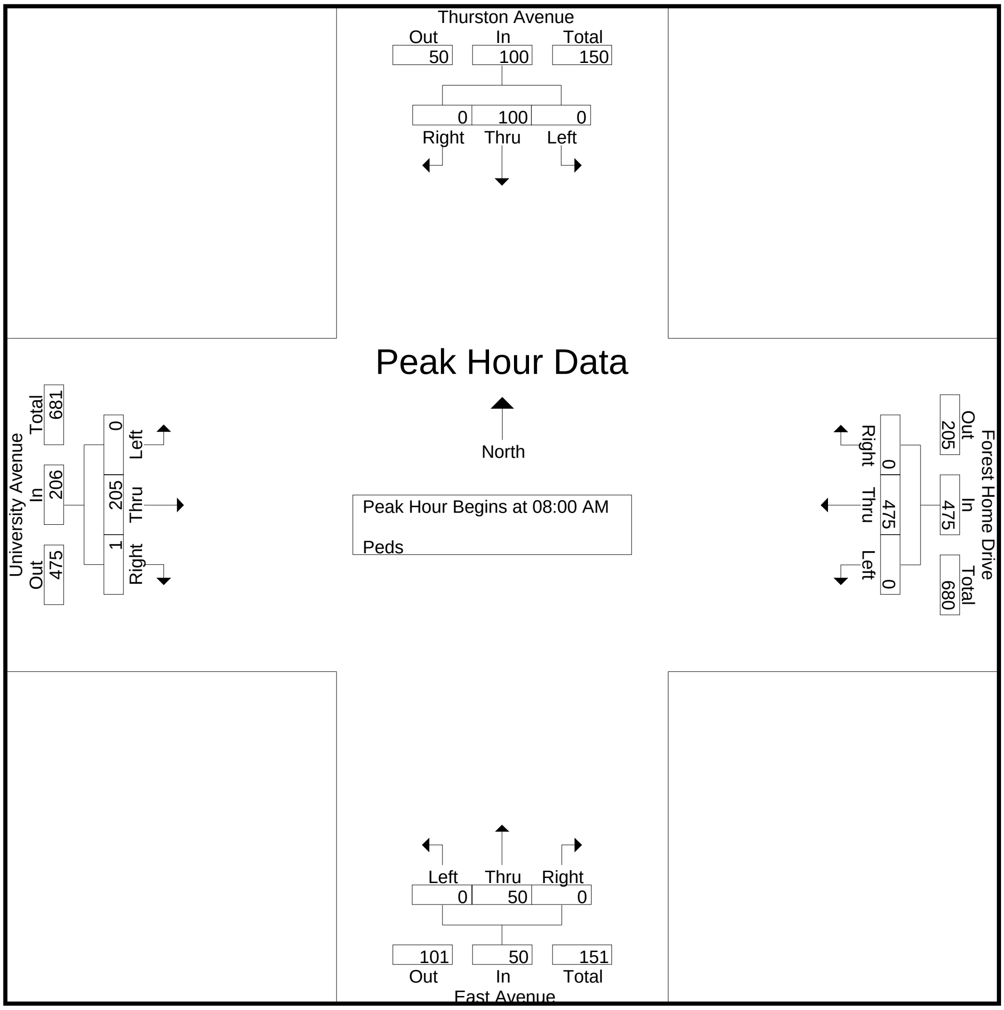


File Name : Thurston@University
Site Code : 11470204
Start Date : 2/13/2008
Page No : 1

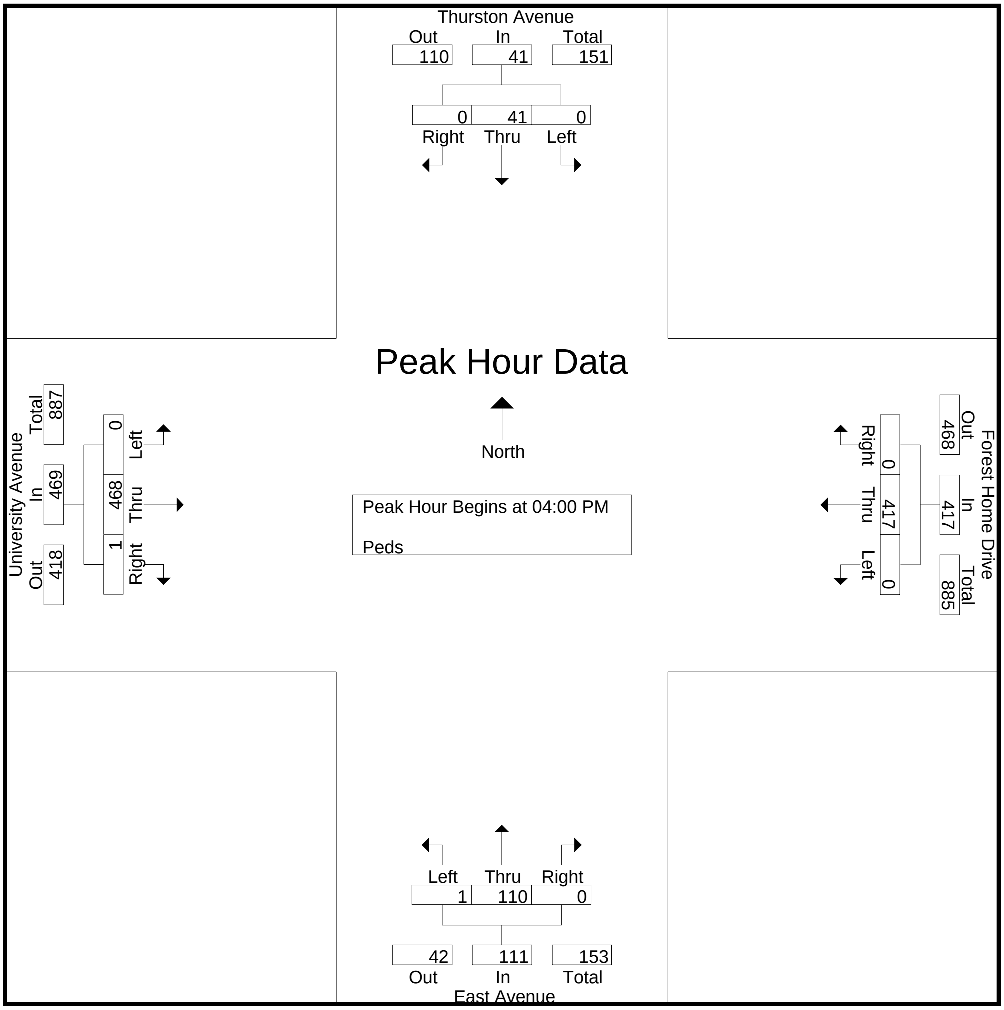
Groups Printed- Peds

	Thurston Avenue Southbound				Forest Home Drive Westbound				East Avenue Northbound				University Avenue Eastbound						
Start Time	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	3	0	0	0	4	0	0	0	1	0	0	0	4	0	0	0	12	12
07:15 AM	0	0	0	0	0	2	0	0	0	4	0	0	0	1	0	0	0	7	7
07:30 AM	0	2	0	0	0	10	0	0	0	0	0	0	0	6	0	0	0	18	18
07:45 AM	0	1	0	0	1	21	0	0	0	7	0	0	0	25	0	0	0	55	55
Total	0	6	0	0	1	37	0	0	0	12	0	0	0	36	0	0	0	92	92
08:00 AM	0	2	0	0	0	15	0	0	0	4	0	0	0	21	0	0	0	42	42
08:15 AM	0	1	0	0	0	37	0	0	0	5	0	0	0	13	0	0	0	56	56
08:30 AM	0	36	0	0	0	91	0	0	0	6	0	0	0	41	1	0	0	175	175
08:45 AM	0	61	0	0	0	332	0	0	0	35	0	0	0	130	0	0	0	558	558
Total	0	100	0	0	0	475	0	0	0	50	0	0	0	205	1	0	0	831	831
*** BREAK ***																			
04:00 PM	0	11	0	0	0	59	0	0	0	18	0	0	0	64	0	0	0	152	152
04:15 PM	0	12	0	0	0	173	0	0	0	34	0	0	0	229	0	0	0	448	448
04:30 PM	0	15	0	0	0	118	0	0	1	22	0	0	0	113	1	0	0	270	270
04:45 PM	0	3	0	0	0	67	0	0	0	36	0	0	0	62	0	0	0	168	168
Total	0	41	0	0	0	417	0	0	1	110	0	0	0	468	1	0	0	1038	1038
05:00 PM	0	0	0	0	0	58	0	0	0	3	0	0	0	44	0	0	0	105	105
05:15 PM	0	1	0	0	0	31	0	0	0	7	0	0	0	53	0	0	0	92	92
05:30 PM	0	1	3	0	0	45	0	0	0	3	0	0	0	41	0	0	0	93	93
05:45 PM	0	0	0	0	0	33	0	0	0	4	0	0	0	47	0	0	0	84	84
Total	0	2	3	0	0	167	0	0	0	17	0	0	0	185	0	0	0	374	374
Grand Total	0	149	3	0	1	1096	0	0	1	189	0	0	0	894	2	0	0	2335	2335
Apprch %	0	98	2		0.1	99.9	0		0.5	99.5	0		0	99.8	0.2				
Total %	0	6.4	0.1		0	46.9	0		0	8.1	0		0	38.3	0.1		0	100	

	Thurston Avenue Southbound				Forest Home Drive Westbound				East Avenue Northbound				University Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	0	2	0	2	0	15	0	15	0	4	0	4	0	21	0	21	42
08:15 AM	0	1	0	1	0	37	0	37	0	5	0	5	0	13	0	13	56
08:30 AM	0	36	0	36	0	91	0	91	0	6	0	6	0	41	1	42	175
08:45 AM	0	61	0	61	0	332	0	332	0	35	0	35	0	130	0	130	558
Total Volume	0	100	0	100	0	475	0	475	0	50	0	50	0	205	1	206	831
% App. Total	0	100	0		0	100	0		0	100	0		0	99.5	0.5		
PHF	.000	.410	.000	.410	.000	.358	.000	.358	.000	.357	.000	.357	.000	.394	.250	.396	.372



	Thurston Avenue Southbound				Forest Home Drive Westbound				East Avenue Northbound				University Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	11	0	11	0	59	0	59	0	18	0	18	0	64	0	64	152
04:15 PM	0	12	0	12	0	173	0	173	0	34	0	34	0	229	0	229	448
04:30 PM	0	15	0	15	0	118	0	118	1	22	0	23	0	113	1	114	270
04:45 PM	0	3	0	3	0	67	0	67	0	36	0	36	0	62	0	62	168
Total Volume	0	41	0	41	0	417	0	417	1	110	0	111	0	468	1	469	1038
% App. Total	0	100	0		0	100	0		0.9	99.1	0		0	99.8	0.2		
PHF	.000	.683	.000	.683	.000	.603	.000	.603	.250	.764	.000	.771	.000	.511	.250	.512	.579



Martin / Alexiou / Bryson, PLLC

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File Name : ped count - Thurston-Univ
Site Code : 11470210
Start Date : 2/12/2008
Page No : 1

Groups Printed- Peds

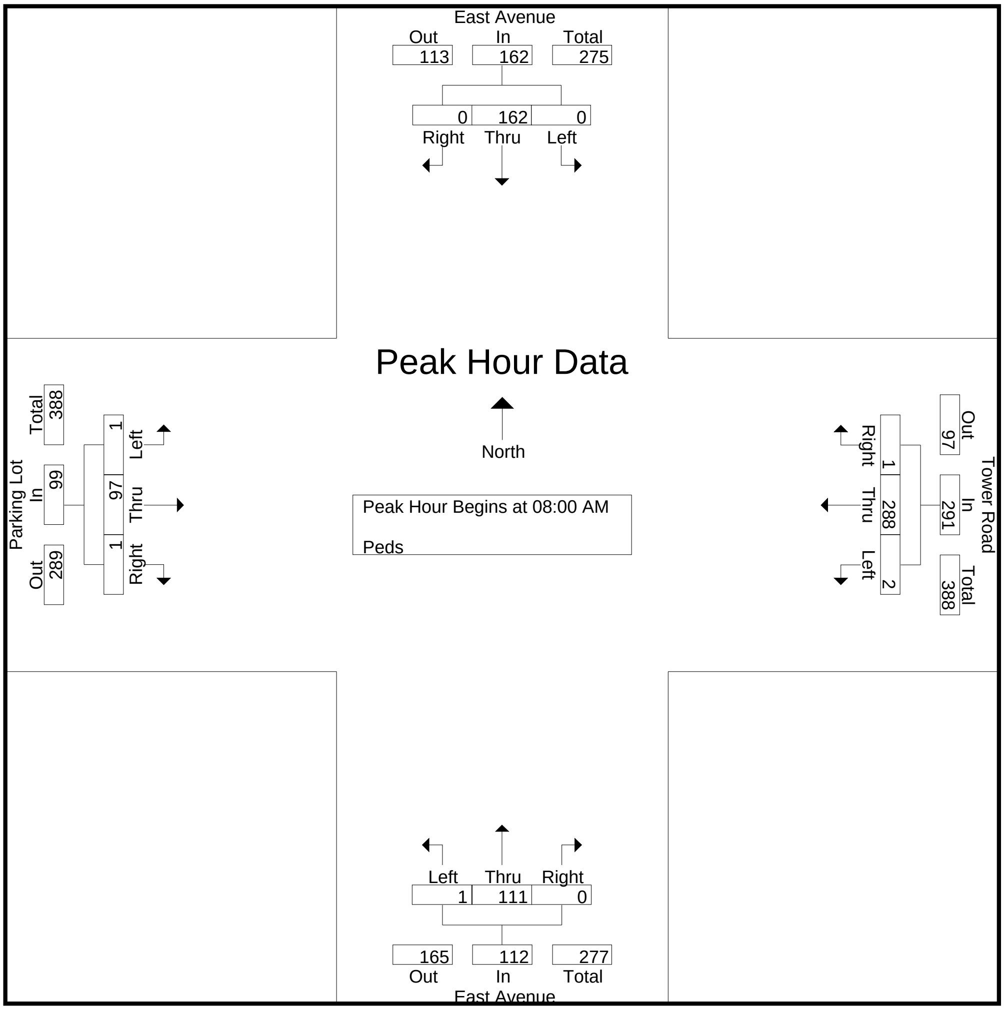
	Southbound				Westbound				Northbound				Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
11:00 AM	5	13	27	0	30	0	31	0	3	0	2	0	6	0	12	0	129
11:15 AM	4	0	12	0	1	0	0	0	9	0	0	0	3	0	0	0	29
11:30 AM	14	0	40	0	1	0	1	0	25	0	8	0	12	0	5	0	106
11:45 AM	10	0	27	0	0	0	0	0	28	0	3	0	3	0	0	0	71
Total	33	13	106	0	32	0	32	0	65	0	13	0	24	0	17	0	335
12:00 PM	26	5	49	0	0	0	0	0	32	0	21	0	3	0	0	0	136
12:15 PM	9	0	10	0	0	0	3	0	15	0	3	0	1	0	0	0	41
12:30 PM	10	0	23	0	0	0	0	0	9	5	7	0	6	0	0	0	60
12:45 PM	6	4	38	0	0	0	0	0	30	2	1	0	0	0	0	0	81
Total	51	9	120	0	0	0	3	0	86	7	32	0	10	0	0	0	318
01:00 PM	3	0	22	0	0	0	1	0	15	2	10	0	2	0	0	0	55
01:15 PM	3	0	16	0	0	0	0	0	18	3	8	0	0	0	0	0	48
01:30 PM	10	0	30	0	0	0	1	0	45	0	40	0	0	0	1	0	127
01:45 PM	16	0	42	0	0	0	4	0	35	0	33	0	0	0	0	0	130
Total	32	0	110	0	0	0	6	0	113	5	91	0	2	0	1	0	360
02:00 PM	0	0	9	0	0	0	1	0	17	0	7	0	7	0	1	0	42
02:15 PM	3	0	13	0	0	0	0	0	17	0	1	0	0	0	0	0	34
02:30 PM	6	0	11	0	1	0	0	0	18	0	0	0	1	0	0	0	37
02:45 PM	12	1	26	0	0	0	1	0	24	0	13	0	3	0	0	0	80
Total	21	1	59	0	1	0	2	0	76	0	21	0	11	0	1	0	193
Grand Total	137	23	395	0	33	0	43	0	340	12	157	0	47	0	19	0	1206
Apprch %	24.7	4.1	71.2	0	43.4	0	56.6	0	66.8	2.4	30.8	0	71.2	0	28.8	0	
Total %	11.4	1.9	32.8	0	2.7	0	3.6	0	28.2	1	13	0	3.9	0	1.6	0	

File Name : East@Tower
Site Code : 11470208
Start Date : 2/12/2008

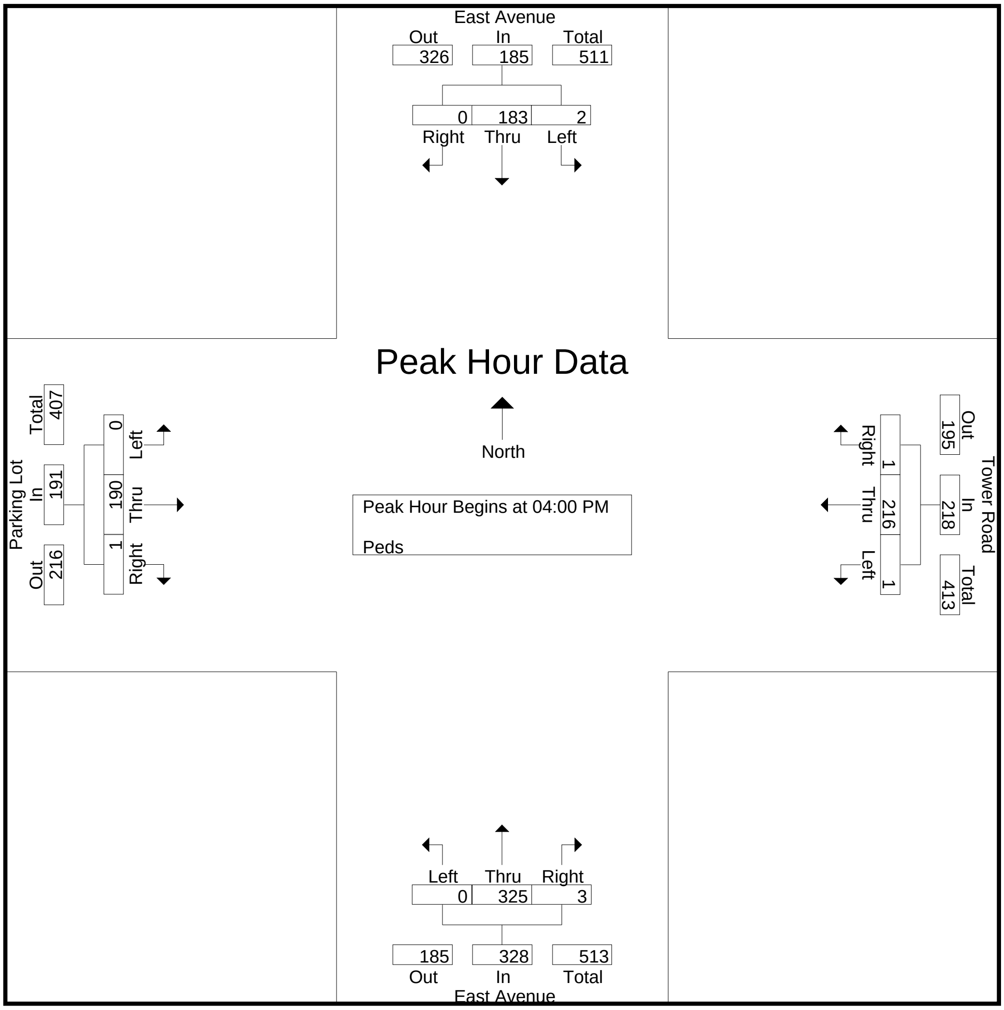
Groups Printed- Peds

	East Avenue Southbound				Tower Road Westbound				East Avenue Northbound				Parking Lot Eastbound						
Start Time	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	2	0	0	0	1	0	0	0	2	0	0	0	0	0	0	0	5	5
07:15 AM	0	5	0	0	0	2	0	0	0	2	0	0	0	6	0	0	0	15	15
07:30 AM	0	12	0	0	0	8	0	0	0	8	0	0	0	7	0	0	0	35	35
07:45 AM	0	29	0	0	0	14	0	0	0	11	1	0	0	20	0	0	0	75	75
Total	0	48	0	0	0	25	0	0	0	23	1	0	0	33	0	0	0	130	130
08:00 AM	0	32	0	0	0	9	0	0	0	7	0	0	0	24	0	0	0	72	72
08:15 AM	0	30	0	0	0	33	0	0	0	28	0	0	0	17	0	0	0	108	108
08:30 AM	0	43	0	0	2	55	1	0	1	27	0	0	0	20	1	0	0	150	150
08:45 AM	0	57	0	0	0	191	0	0	0	49	0	0	1	36	0	0	0	334	334
Total	0	162	0	0	2	288	1	0	1	111	0	0	1	97	1	0	0	664	664
*** BREAK ***																			
04:00 PM	0	41	0	0	0	54	0	0	0	75	1	0	0	44	0	0	0	215	215
04:15 PM	0	66	0	0	0	76	0	0	0	118	0	0	0	59	0	0	0	319	319
04:30 PM	1	53	0	0	0	33	1	0	0	63	1	0	0	51	1	0	0	204	204
04:45 PM	1	23	0	0	1	53	0	0	0	69	1	0	0	36	0	0	0	184	184
Total	2	183	0	0	1	216	1	0	0	325	3	0	0	190	1	0	0	922	922
05:00 PM	0	32	0	0	0	54	0	0	0	30	0	0	0	27	0	0	0	143	143
05:15 PM	0	30	0	0	1	29	0	0	0	22	0	0	0	16	0	0	0	98	98
05:30 PM	1	32	0	0	0	27	0	0	0	20	0	0	0	15	0	0	0	95	95
05:45 PM	0	35	0	0	1	14	0	0	0	27	0	0	0	31	0	0	0	108	108
Total	1	129	0	0	2	124	0	0	0	99	0	0	0	89	0	0	0	444	444
Grand Total	3	522	0	0	5	653	2	0	1	558	4	0	1	409	2	0	0	2160	2160
Apprch %	0.6	99.4	0		0.8	98.9	0.3		0.2	99.1	0.7		0.2	99.3	0.5				
Total %	0.1	24.2	0		0.2	30.2	0.1		0	25.8	0.2		0	18.9	0.1		0	100	

	East Avenue Southbound				Tower Road Westbound				East Avenue Northbound				Parking Lot Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	0	32	0	32	0	9	0	9	0	7	0	7	0	24	0	24	72
08:15 AM	0	30	0	30	0	33	0	33	0	28	0	28	0	17	0	17	108
08:30 AM	0	43	0	43	2	55	1	58	1	27	0	28	0	20	1	21	150
08:45 AM	0	57	0	57	0	191	0	191	0	49	0	49	1	36	0	37	334
Total Volume	0	162	0	162	2	288	1	291	1	111	0	112	1	97	1	99	664
% App. Total	0	100	0		0.7	99	0.3		0.9	99.1	0		1	98	1		
PHF	.000	.711	.000	.711	.250	.377	.250	.381	.250	.566	.000	.571	.250	.674	.250	.669	.497



	East Avenue Southbound				Tower Road Westbound				East Avenue Northbound				Parking Lot Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	41	0	41	0	54	0	54	0	75	1	76	0	44	0	44	215
04:15 PM	0	66	0	66	0	76	0	76	0	118	0	118	0	59	0	59	319
04:30 PM	1	53	0	54	0	33	1	34	0	63	1	64	0	51	1	52	204
04:45 PM	1	23	0	24	1	53	0	54	0	69	1	70	0	36	0	36	184
Total Volume	2	183	0	185	1	216	1	218	0	325	3	328	0	190	1	191	922
% App. Total	1.1	98.9	0		0.5	99.1	0.5		0	99.1	0.9		0	99.5	0.5		
PHF	.500	.693	.000	.701	.250	.711	.250	.717	.000	.689	.750	.695	.000	.805	.250	.809	.723



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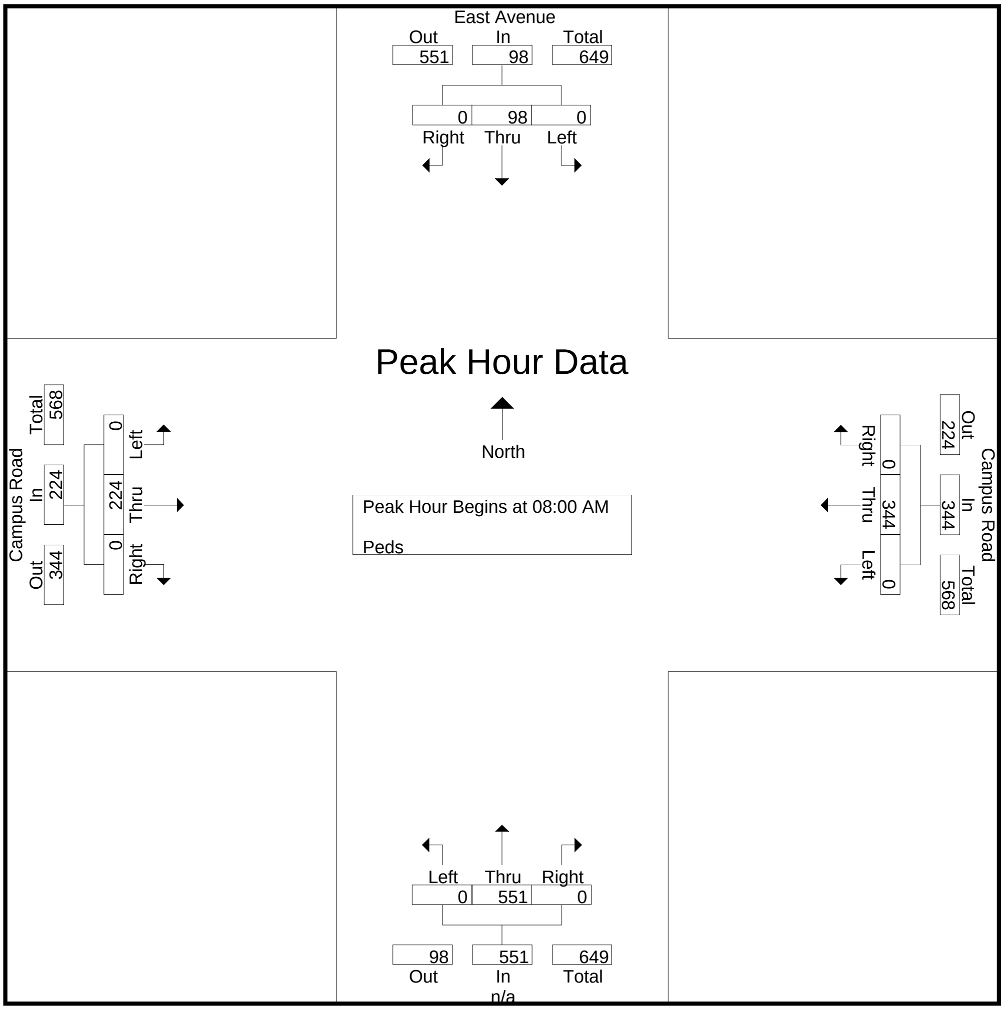
File Name : East@Campus
Site Code : 11470207
Start Date : 2/11/2008
Page No : 1

Groups Printed- Peds

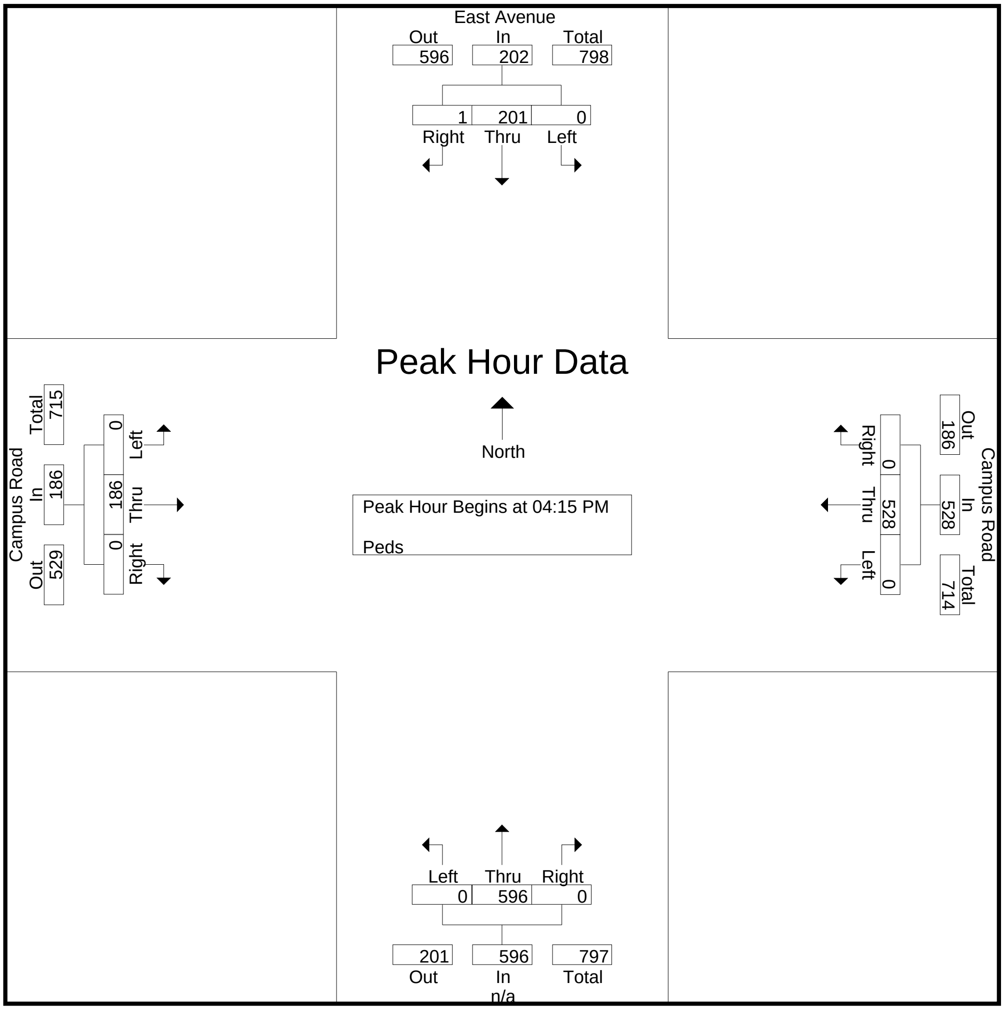
	East Avenue Southbound				Campus Road Westbound				n/a Northbound				Campus Road Eastbound						
Start Time	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	1	2	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	10	10
07:15 AM	0	6	0	0	0	5	0	0	0	12	0	0	0	9	0	0	0	32	32
07:30 AM	1	9	1	0	0	12	0	0	0	23	0	0	0	19	0	0	0	65	65
07:45 AM	0	11	0	0	0	21	0	0	0	39	0	0	0	24	0	0	0	95	95
Total	2	28	1	0	0	38	0	0	0	81	0	0	0	52	0	0	0	202	202
08:00 AM	0	14	0	0	0	35	0	0	0	66	0	0	0	34	0	0	0	149	149
08:15 AM	0	21	0	0	0	83	0	0	0	114	0	0	0	51	0	0	0	269	269
08:30 AM	0	29	0	0	0	141	0	0	0	216	0	0	0	83	0	0	0	469	469
08:45 AM	0	34	0	0	0	85	0	0	0	155	0	0	0	56	0	0	0	330	330
Total	0	98	0	0	0	344	0	0	0	551	0	0	0	224	0	0	0	1217	1217
*** BREAK ***																			
04:00 PM	0	19	0	0	0	48	0	0	0	69	0	0	0	24	0	0	0	160	160
04:15 PM	0	79	1	0	0	221	0	0	0	248	0	0	0	68	0	0	0	617	617
04:30 PM	0	64	0	0	0	154	0	0	0	191	0	0	0	79	0	0	0	488	488
04:45 PM	0	36	0	0	0	85	0	0	0	82	0	0	0	20	0	0	0	223	223
Total	0	198	1	0	0	508	0	0	0	590	0	0	0	191	0	0	0	1488	1488
05:00 PM	0	22	0	0	0	68	0	0	0	75	0	0	0	19	0	0	0	184	184
05:15 PM	0	32	0	0	0	87	0	0	0	78	0	0	0	30	0	0	0	227	227
05:30 PM	0	25	0	0	0	55	0	0	0	65	0	0	0	17	0	0	0	162	162
05:45 PM	0	43	0	0	0	83	1	0	0	99	0	0	1	34	0	0	0	261	261
Total	0	122	0	0	0	293	1	0	0	317	0	0	1	100	0	0	0	834	834
Grand Total	2	446	2	0	0	1183	1	0	0	1539	0	0	1	567	0	0	0	3741	3741
Apprch %	0.4	99.1	0.4		0	99.9	0.1		0	100	0		0.2	99.8	0				
Total %	0.1	11.9	0.1		0	31.6	0		0	41.1	0		0	15.2	0		0	100	

	East Avenue Southbound				Campus Road Westbound				n/a Northbound				Campus Road Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	0	14	0	14	0	35	0	35	0	66	0	66	0	34	0	34	149
08:15 AM	0	21	0	21	0	83	0	83	0	114	0	114	0	51	0	51	269
08:30 AM	0	29	0	29	0	141	0	141	0	216	0	216	0	83	0	83	469
08:45 AM	0	34	0	34	0	85	0	85	0	155	0	155	0	56	0	56	330
Total Volume	0	98	0	98	0	344	0	344	0	551	0	551	0	224	0	224	1217
% App. Total	0	100	0		0	100	0		0	100	0		0	100	0		
PHF	.000	.721	.000	.721	.000	.610	.000	.610	.000	.638	.000	.638	.000	.675	.000	.675	.649



Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 04:15 PM

	East Avenue Southbound				Campus Road Westbound				n/a Northbound				Campus Road Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:15 PM	0	79	1	80	0	221	0	221	0	248	0	248	0	68	0	68	617
04:30 PM	0	64	0	64	0	154	0	154	0	191	0	191	0	79	0	79	488
04:45 PM	0	36	0	36	0	85	0	85	0	82	0	82	0	20	0	20	223
05:00 PM	0	22	0	22	0	68	0	68	0	75	0	75	0	19	0	19	184
Total Volume	0	201	1	202	0	528	0	528	0	596	0	596	0	186	0	186	1512
% App. Total	0	99.5	0.5		0	100	0		0	100	0		0	100	0		
PHF	.000	.636	.250	.631	.000	.597	.000	.597	.000	.601	.000	.601	.000	.589	.000	.589	.613

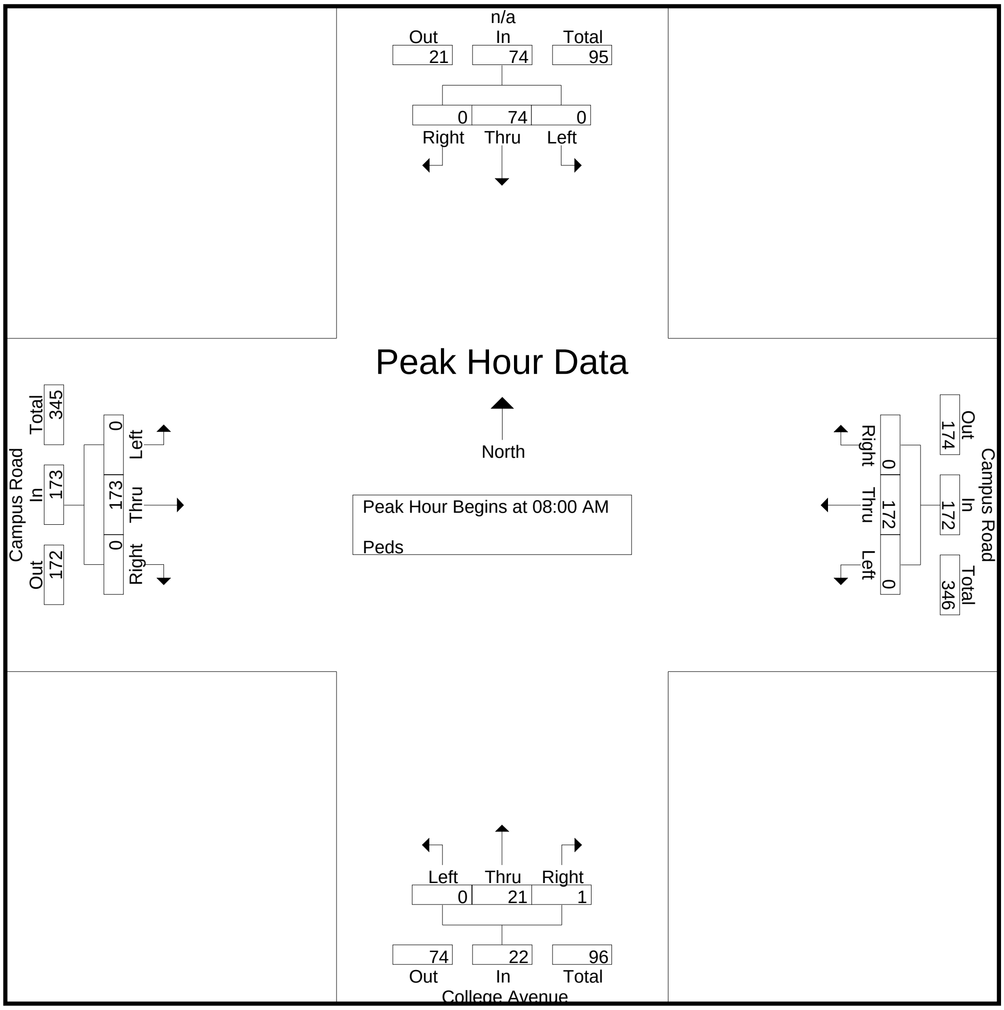


File Name : College@Campus
Site Code : 00114706
Start Date : 2/11/2008
Page No : 1

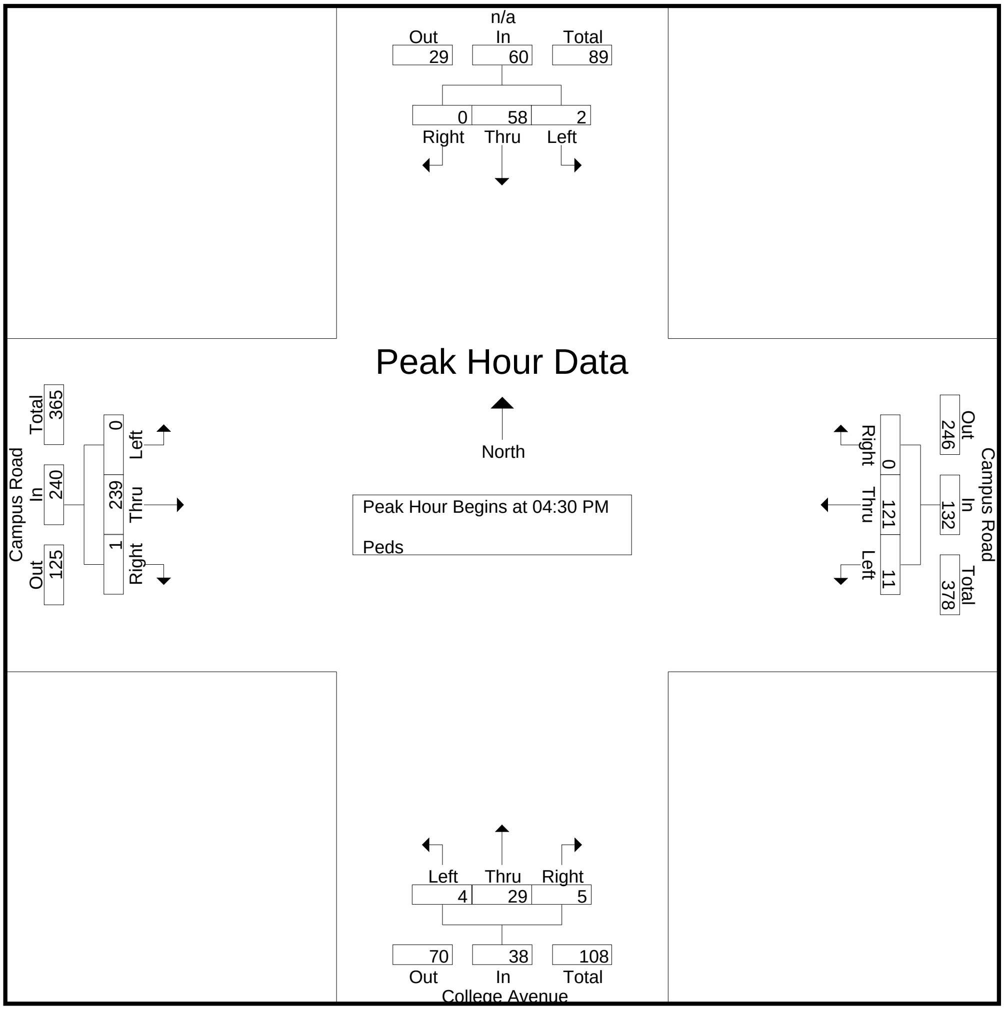
Groups Printed- Peds

	n/a Southbound				Campus Road Westbound				College Avenue Northbound				Campus Road Eastbound						
Start Time	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	2	0	0	0	3	0	0	0	0	0	0	0	4	0	0	0	9	9
07:15 AM	0	1	0	0	0	6	0	0	0	2	0	0	0	7	0	0	0	16	16
07:30 AM	0	1	0	0	0	14	0	0	0	2	0	0	0	9	0	0	0	26	26
07:45 AM	0	4	0	0	0	9	0	0	0	6	1	0	0	28	0	0	0	48	48
Total	0	8	0	0	0	32	0	0	0	10	1	0	0	48	0	0	0	99	99
08:00 AM	0	7	0	0	0	19	0	0	0	0	0	0	0	21	0	0	0	47	47
08:15 AM	0	17	0	0	0	33	0	0	0	4	0	0	0	41	0	0	0	95	95
08:30 AM	0	34	0	0	0	65	0	0	0	10	0	0	0	58	0	0	0	167	167
08:45 AM	0	16	0	0	0	55	0	0	0	7	1	0	0	53	0	0	0	132	132
Total	0	74	0	0	0	172	0	0	0	21	1	0	0	173	0	0	0	441	441
*** BREAK ***																			
04:00 PM	0	24	0	0	0	26	0	0	0	8	0	0	0	65	0	0	0	123	123
04:15 PM	0	23	0	0	0	29	0	0	0	6	0	0	0	43	0	0	0	101	101
04:30 PM	0	27	0	0	2	38	0	0	0	10	0	0	0	65	0	0	0	142	142
04:45 PM	2	10	0	0	0	22	0	0	0	11	0	0	0	44	1	0	0	90	90
Total	2	84	0	0	2	115	0	0	0	35	0	0	0	217	1	0	0	456	456
05:00 PM	0	14	0	0	6	25	0	0	0	3	0	0	0	69	0	0	0	117	117
05:15 PM	0	7	0	0	3	36	0	0	4	5	5	0	0	61	0	0	0	121	121
05:30 PM	0	15	0	0	1	23	0	0	3	6	1	0	0	33	0	0	0	82	82
05:45 PM	0	5	0	0	1	15	0	0	4	3	6	0	0	39	0	0	0	73	73
Total	0	41	0	0	11	99	0	0	11	17	12	0	0	202	0	0	0	393	393
Grand Total	2	207	0	0	13	418	0	0	11	83	14	0	0	640	1	0	0	1389	1389
Apprch %	1	99	0		3	97	0		10.2	76.9	13		0	99.8	0.2				
Total %	0.1	14.9	0		0.9	30.1	0		0.8	6	1		0	46.1	0.1		0	100	

	n/a Southbound				Campus Road Westbound				College Avenue Northbound				Campus Road Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	0	7	0	7	0	19	0	19	0	0	0	0	0	21	0	21	47
08:15 AM	0	17	0	17	0	33	0	33	0	4	0	4	0	41	0	41	95
08:30 AM	0	34	0	34	0	65	0	65	0	10	0	10	0	58	0	58	167
08:45 AM	0	16	0	16	0	55	0	55	0	7	1	8	0	53	0	53	132
Total Volume	0	74	0	74	0	172	0	172	0	21	1	22	0	173	0	173	441
% App. Total	0	100	0		0	100	0		0	95.5	4.5		0	100	0		
PHF	.000	.544	.000	.544	.000	.662	.000	.662	.000	.525	.250	.550	.000	.746	.000	.746	.660



	n/a Southbound				Campus Road Westbound				College Avenue Northbound				Campus Road Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	0	27	0	27	2	38	0	40	0	10	0	10	0	65	0	65	142
04:45 PM	2	10	0	12	0	22	0	22	0	11	0	11	0	44	1	45	90
05:00 PM	0	14	0	14	6	25	0	31	0	3	0	3	0	69	0	69	117
05:15 PM	0	7	0	7	3	36	0	39	4	5	5	14	0	61	0	61	121
Total Volume	2	58	0	60	11	121	0	132	4	29	5	38	0	239	1	240	470
% App. Total	3.3	96.7	0		8.3	91.7	0		10.5	76.3	13.2		0	99.6	0.4		
PHF	.250	.537	.000	.556	.458	.796	.000	.825	.250	.659	.250	.679	.000	.866	.250	.870	.827



Martin / Alexiou / Bryson, PLLC
4000 Westchase Boulevard, Suite 530
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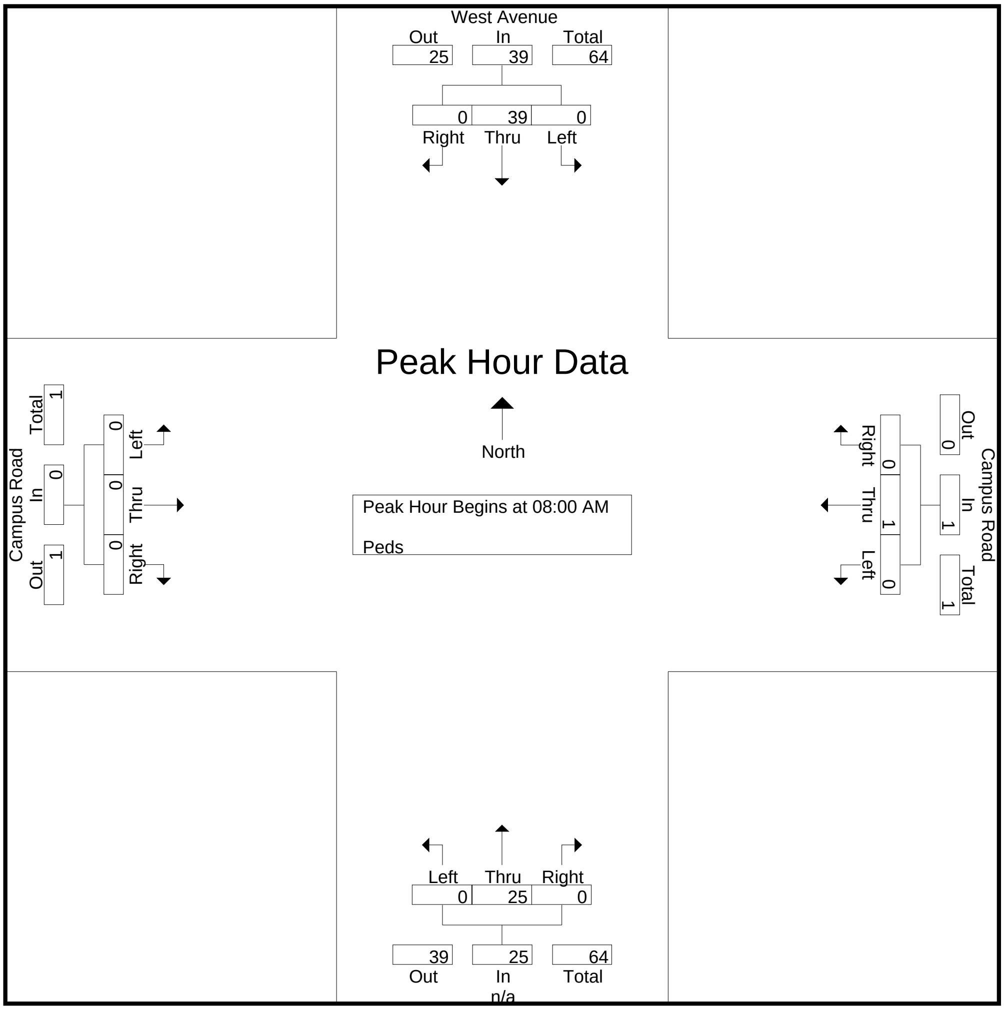
File Name : Campus@West-Revised
Site Code : 11470205
Start Date : 2/13/2008
Page No : 1

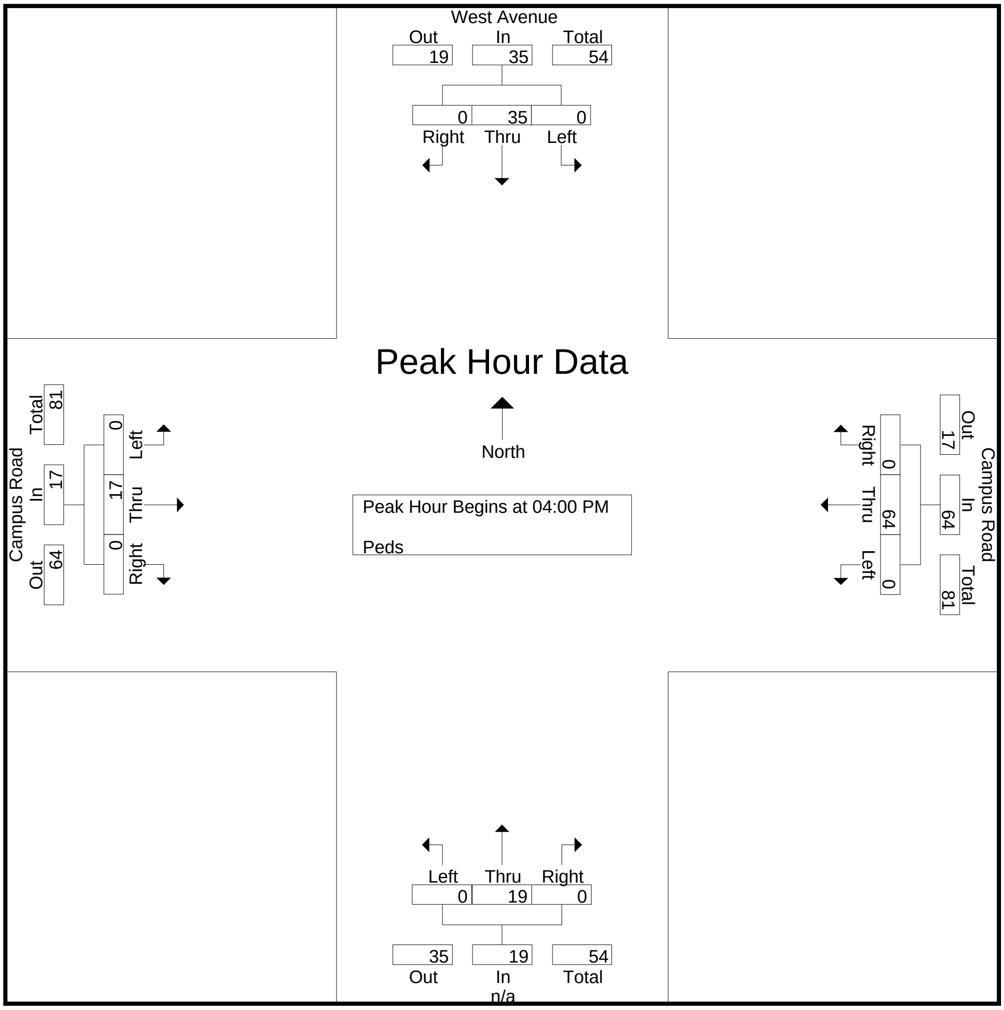
Groups Printed- Peds

	West Avenue Southbound				Campus Road Westbound				n/a Northbound				Campus Road Eastbound						
Start Time	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Exclu. Total	Inclu. Total	Int. Total
*** BREAK ***																			
07:15 AM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
07:30 AM	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4
07:45 AM	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	7
Total	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	12
08:00 AM	0	4	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	7	7
08:15 AM	0	7	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	8	8
08:30 AM	0	9	0	0	0	1	0	0	0	10	0	0	0	0	0	0	0	20	20
08:45 AM	0	19	0	1	0	0	0	0	0	11	0	0	0	0	0	0	1	30	31
Total	0	39	0	1	0	1	0	0	0	25	0	0	0	0	0	0	1	65	66
*** BREAK ***																			
04:00 PM	0	0	0	0	0	12	0	0	0	2	0	0	0	11	0	0	0	25	25
04:15 PM	0	8	0	0	0	22	0	0	0	5	0	0	0	4	0	0	0	39	39
04:30 PM	0	17	0	0	0	22	0	0	0	7	0	0	0	0	0	0	0	46	46
04:45 PM	0	10	0	0	0	8	0	0	0	5	0	0	0	2	0	0	0	25	25
Total	0	35	0	0	0	64	0	0	0	19	0	0	0	17	0	0	0	135	135
05:00 PM	0	7	0	0	0	6	0	0	0	12	0	0	0	0	0	0	0	25	25
05:15 PM	0	5	0	0	0	16	2	0	0	2	0	0	0	0	0	0	0	25	25
05:30 PM	0	12	0	0	0	8	0	0	0	2	0	0	0	0	0	0	0	22	22
05:45 PM	0	10	0	0	0	10	0	0	0	1	0	0	0	0	0	0	0	21	21
Total	0	34	0	0	0	40	2	0	0	17	0	0	0	0	0	0	0	93	93
Grand Total	0	120	0	1	0	105	2	0	0	61	0	0	0	17	0	0	1	305	306
Apprch %	0	100	0		0	98.1	1.9		0	100	0		0	100	0				
Total %	0	39.3	0		0	34.4	0.7		0	20	0		0	5.6	0		0.3	99.7	

	West Avenue Southbound				Campus Road Westbound				n/a Northbound				Campus Road Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	0	4	0	4	0	0	0	0	0	3	0	3	0	0	0	0	7
08:15 AM	0	7	0	7	0	0	0	0	0	1	0	1	0	0	0	0	8
08:30 AM	0	9	0	9	0	1	0	1	0	10	0	10	0	0	0	0	20
08:45 AM	0	19	0	19	0	0	0	0	0	11	0	11	0	0	0	0	30
Total Volume	0	39	0	39	0	1	0	1	0	25	0	25	0	0	0	0	65
% App. Total	0	100	0		0	100	0		0	100	0		0	0	0		
PHF	.000	.513	.000	.513	.000	.250	.000	.250	.000	.568	.000	.568	.000	.000	.000	.000	.542



	West Avenue Southbound				Campus Road Westbound				n/a Northbound				Campus Road Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	0	0	0	0	12	0	12	0	2	0	2	0	11	0	11	25
04:15 PM	0	8	0	8	0	22	0	22	0	5	0	5	0	4	0	4	39
04:30 PM	0	17	0	17	0	22	0	22	0	7	0	7	0	0	0	0	46
04:45 PM	0	10	0	10	0	8	0	8	0	5	0	5	0	2	0	2	25
Total Volume	0	35	0	35	0	64	0	64	0	19	0	19	0	17	0	17	135
% App. Total	0	100	0		0	100	0		0	100	0		0	100	0		
PHF	.000	.515	.000	.515	.000	.727	.000	.727	.000	.679	.000	.679	.000	.386	.000	.386	.734



Martin / Alexiou / Bryson, PLLC

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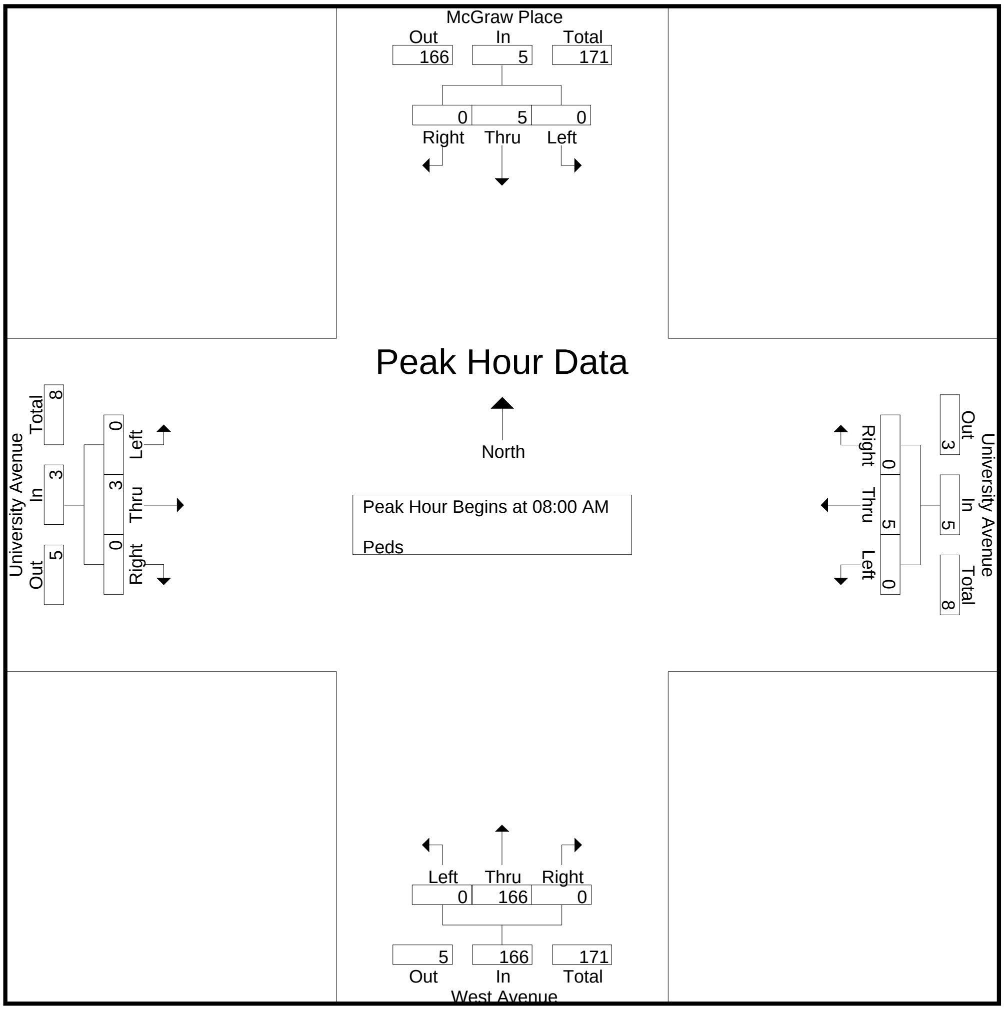
File Name : University@West
Site Code : 11470201
Start Date : 2/13/2008
Page No : 1

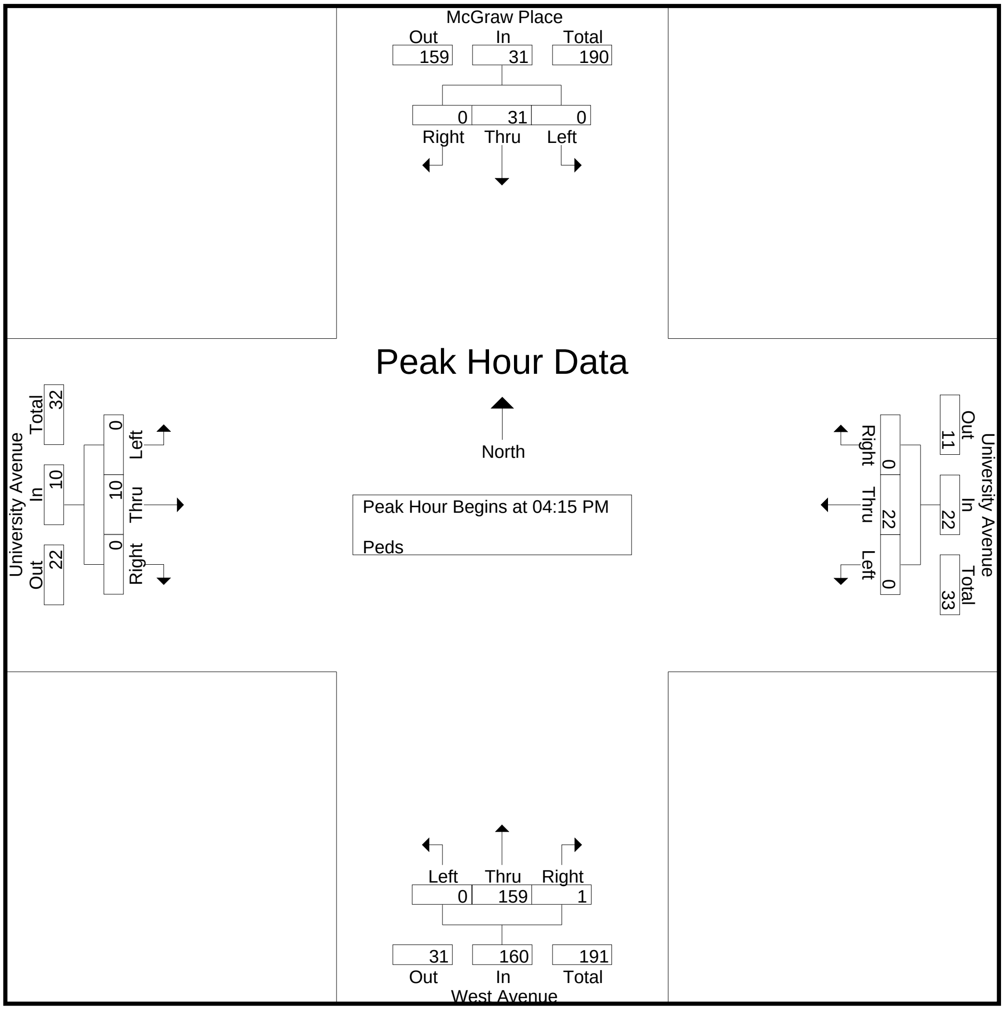
Groups Printed- Peds

	McGraw Place Southbound				University Avenue Westbound				West Avenue Northbound				University Avenue Eastbound						
Start Time	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	5	5
07:15 AM	0	1	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	4	4
07:30 AM	0	1	0	0	0	1	0	0	0	7	0	0	0	0	0	0	0	9	9
07:45 AM	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	5	5
Total	0	2	0	0	0	1	0	0	0	20	0	0	0	0	0	0	0	23	23
08:00 AM	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	9	9
08:15 AM	0	0	0	0	0	1	0	0	0	11	0	0	0	1	0	0	0	13	13
08:30 AM	0	1	0	0	0	1	0	0	0	22	0	0	0	0	0	0	0	24	24
08:45 AM	0	4	0	0	0	3	0	0	0	124	0	0	0	2	0	0	0	133	133
Total	0	5	0	0	0	5	0	0	0	166	0	0	0	3	0	0	0	179	179
*** BREAK ***																			
04:00 PM	0	2	0	0	0	5	0	0	0	20	0	0	0	2	0	0	0	29	29
04:15 PM	0	5	0	0	0	8	0	0	0	53	0	0	0	5	0	0	0	71	71
04:30 PM	0	8	0	0	0	7	0	0	0	48	1	0	0	0	0	0	0	64	64
04:45 PM	0	10	0	0	0	3	0	0	0	24	0	0	0	4	0	0	0	41	41
Total	0	25	0	0	0	23	0	0	0	145	1	0	0	11	0	0	0	205	205
05:00 PM	0	8	0	0	0	4	0	0	0	34	0	0	0	1	0	0	0	47	47
05:15 PM	0	9	0	0	0	5	0	0	1	25	0	0	0	2	0	0	0	42	42
05:30 PM	0	9	0	0	0	3	0	0	0	32	0	0	0	8	0	0	0	52	52
05:45 PM	0	13	0	0	0	5	0	0	0	26	0	0	0	6	0	0	0	50	50
Total	0	39	0	0	0	17	0	0	1	117	0	0	0	17	0	0	0	191	191
Grand Total	0	71	0	0	0	46	0	0	1	448	1	0	0	31	0	0	0	598	598
Apprch %	0	100	0		0	100	0		0.2	99.6	0.2		0	100	0				
Total %	0	11.9	0		0	7.7	0		0.2	74.9	0.2		0	5.2	0		0	100	

	McGraw Place Southbound				University Avenue Westbound				West Avenue Northbound				University Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	0	0	0	0	0	0	0	0	0	9	0	9	0	0	0	0	9
08:15 AM	0	0	0	0	0	1	0	1	0	11	0	11	0	1	0	1	13
08:30 AM	0	1	0	1	0	1	0	1	0	22	0	22	0	0	0	0	24
08:45 AM	0	4	0	4	0	3	0	3	0	124	0	124	0	2	0	2	133
Total Volume	0	5	0	5	0	5	0	5	0	166	0	166	0	3	0	3	179
% App. Total	0	100	0		0	100	0		0	100	0		0	100	0		
PHF	.000	.313	.000	.313	.000	.417	.000	.417	.000	.335	.000	.335	.000	.375	.000	.375	.336



	McGraw Place Southbound				University Avenue Westbound				West Avenue Northbound				University Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	0	5	0	5	0	8	0	8	0	53	0	53	0	5	0	5	71
04:30 PM	0	8	0	8	0	7	0	7	0	48	1	49	0	0	0	0	64
04:45 PM	0	10	0	10	0	3	0	3	0	24	0	24	0	4	0	4	41
05:00 PM	0	8	0	8	0	4	0	4	0	34	0	34	0	1	0	1	47
Total Volume	0	31	0	31	0	22	0	22	0	159	1	160	0	10	0	10	223
% App. Total	0	100	0		0	100	0		0	99.4	0.6		0	100	0		
PHF	.000	.775	.000	.775	.000	.688	.000	.688	.000	.750	.250	.755	.000	.500	.000	.500	.785



File Name : Central@University
Site Code : 11470202
Start Date : 2/14/2008

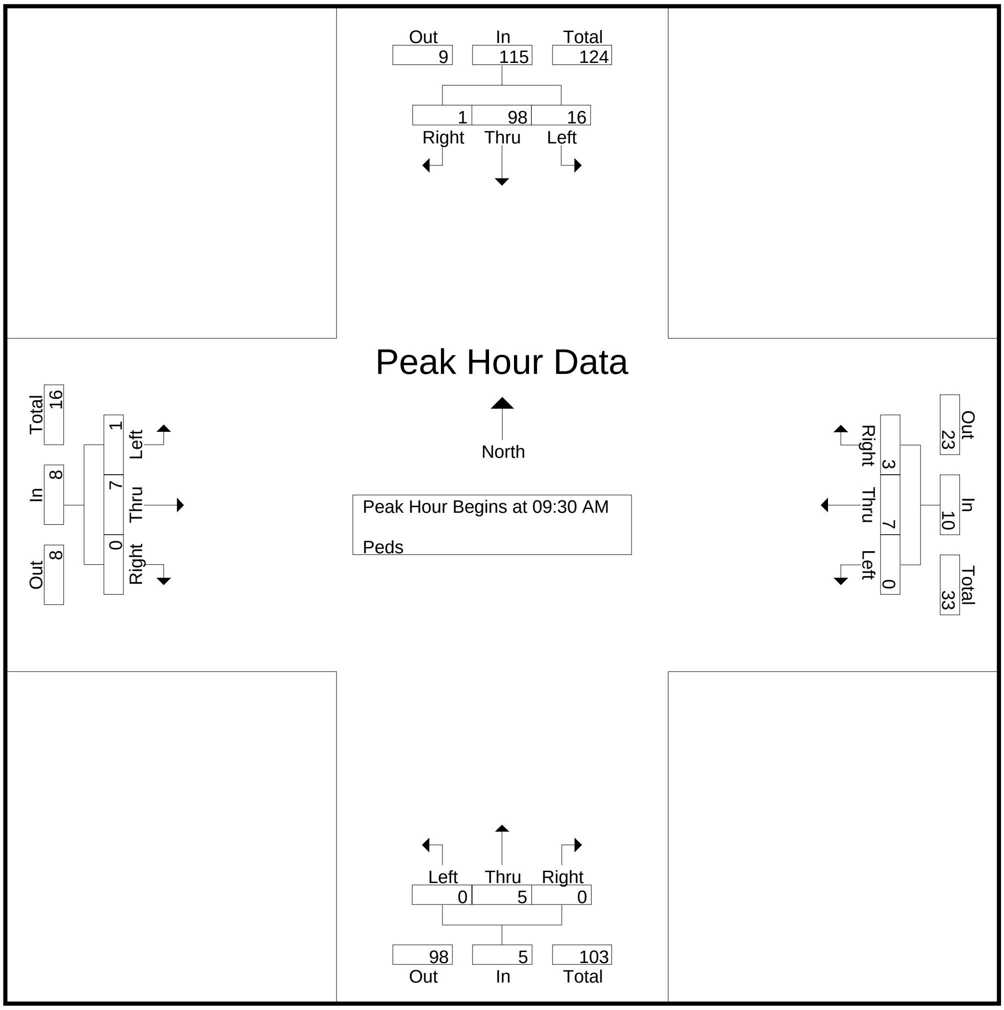
Groups Printed- Peds

	Southbound				Westbound				Northbound				Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	2	1	1	0	0	0	0	0	0	3	0	0	0	1	0	0	0	8	8
07:15 AM	1	7	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	9	9
07:30 AM	4	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	9
07:45 AM	3	11	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	16	16
Total	10	24	1	0	0	2	0	0	0	4	0	0	0	1	0	0	0	42	42
08:00 AM	2	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	9
08:15 AM	5	25	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	32	32
08:30 AM	6	25	0	0	1	0	0	0	0	1	1	0	0	2	0	0	0	36	36
08:45 AM	7	30	1	0	0	1	2	0	0	4	0	0	0	0	1	0	0	46	46
Total	20	87	1	0	1	1	2	0	0	5	1	0	0	3	2	0	0	123	123
09:00 AM	3	17	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	21	21
09:15 AM	0	9	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	10
09:30 AM	4	20	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	25	25
09:45 AM	5	46	1	0	0	2	2	0	0	1	0	0	0	3	0	0	0	60	60
Total	12	92	2	0	0	2	3	0	0	1	0	0	0	4	0	0	0	116	116
10:00 AM	5	25	0	0	0	3	1	0	0	1	0	0	1	2	0	0	0	38	38
10:15 AM	2	7	0	0	0	2	0	0	0	3	0	0	0	1	0	0	0	15	15
10:30 AM	3	10	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	15	15
10:45 AM	3	9	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	15	15
Total	13	51	0	0	0	7	3	0	0	4	0	0	1	4	0	0	0	83	83
11:00 AM	5	17	0	0	0	1	1	0	1	6	0	0	0	3	0	0	0	34	34
11:15 AM	4	16	0	0	0	2	1	0	0	4	0	0	0	3	2	0	0	32	32
11:30 AM	3	15	0	0	0	2	3	0	0	7	2	0	0	3	0	0	0	35	35
11:45 AM	1	4	0	0	0	0	2	0	0	2	0	0	1	0	0	0	0	10	10
Total	13	52	0	0	0	5	7	0	1	19	2	0	1	9	2	0	0	111	111
12:00 PM	3	21	0	0	0	3	1	0	0	4	0	0	0	4	0	0	0	36	36
12:15 PM	0	7	0	0	0	1	2	0	0	4	1	0	0	1	0	0	0	16	16
12:30 PM	0	2	0	0	0	0	1	0	0	4	0	0	0	2	0	0	0	9	9
12:45 PM	1	3	0	0	0	2	2	0	0	4	0	0	0	0	0	0	0	12	12
Total	4	33	0	0	0	6	6	0	0	16	1	0	0	7	0	0	0	73	73
01:00 PM	5	6	0	0	1	2	2	0	0	9	3	0	0	1	0	0	0	29	29
01:15 PM	2	4	1	0	2	0	1	0	1	12	0	0	0	0	1	0	0	24	24
01:30 PM	1	8	0	0	1	1	6	0	1	6	1	0	0	1	0	0	0	26	26
01:45 PM	0	3	0	0	0	1	0	0	1	1	0	0	0	1	1	0	0	8	8
Total	8	21	1	0	4	4	9	0	3	28	4	0	0	3	2	0	0	87	87
02:00 PM	1	1	0	0	0	0	1	0	0	6	0	0	0	0	0	0	0	9	9
02:15 PM	0	7	0	0	0	4	3	0	1	9	1	0	0	0	0	0	0	25	25
02:30 PM	1	5	0	0	0	1	2	0	2	6	0	0	1	0	0	0	0	18	18
02:45 PM	2	8	0	0	0	1	4	0	0	23	2	0	0	1	0	0	0	41	41
Total	4	21	0	0	0	6	10	0	3	44	3	0	1	1	0	0	0	93	93
03:00 PM	0	1	0	0	0	3	3	0	0	9	0	0	0	1	0	0	0	17	17
03:15 PM	0	1	0	0	0	1	4	0	2	19	0	0	0	6	0	0	0	33	33
03:30 PM	1	1	0	0	0	0	2	0	0	3	0	0	0	1	0	0	0	8	8
03:45 PM	0	7	2	0	0	1	2	0	0	11	0	0	0	2	0	0	0	25	25
Total	1	10	2	0	0	5	11	0	2	42	0	0	0	10	0	0	0	83	83
04:00 PM	0	10	1	0	0	3	4	0	0	22	0	0	0	4	0	0	0	44	44
04:15 PM	0	4	0	0	0	5	6	2	5	56	0	0	0	0	0	0	2	76	78
04:30 PM	3	7	0	0	0	5	2	0	1	37	2	0	0	3	0	0	0	60	60
04:45 PM	0	13	0	0	0	8	11	0	0	20	0	0	0	10	0	0	0	62	62
Total	3	34	1	0	0	21	23	2	6	135	2	0	0	17	0	0	2	242	244
05:00 PM	0	7	0	0	0	7	4	0	0	20	0	0	0	0	0	0	0	38	38
05:15 PM	0	7	3	0	0	5	3	0	0	16	0	0	1	2	0	0	0	37	37
05:30 PM	0	2	0	0	0	5	1	0	0	20	0	0	0	3	0	0	0	31	31
05:45 PM	2	0	0	0	3	8	4	0	0	25	0	0	1	5	0	0	0	48	48
Total	2	16	3	0	3	25	12	0	0	81	0	0	2	10	0	0	0	154	154

Groups Printed- Peds

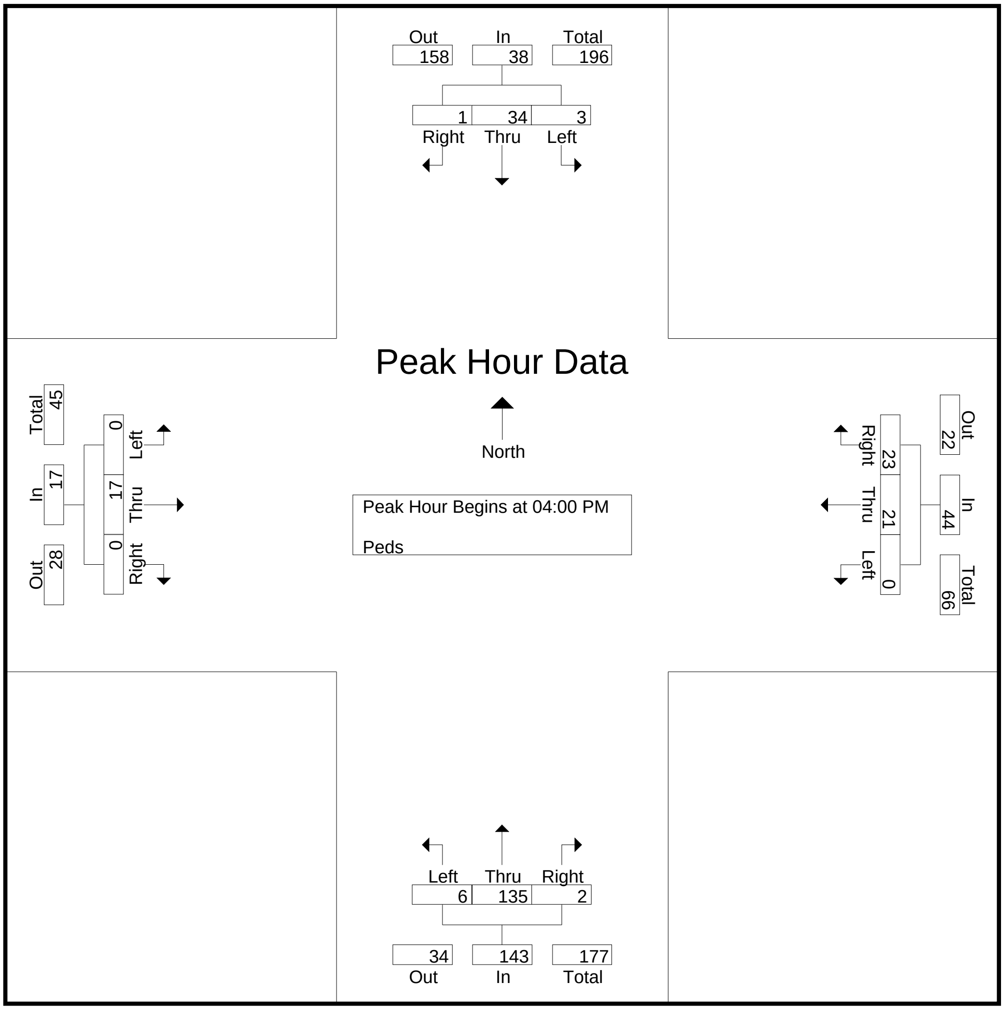
	Southbound				Westbound				Northbound				Eastbound						
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
Grand Total	90	441	11	0	8	84	86	2	15	379	13	0	5	69	6	0	2	1207	1209
Apprch %	16.6	81.4	2		4.5	47.2	48.3		3.7	93.1	3.2		6.2	86.2	7.5				
Total %	7.5	36.5	0.9		0.7	7	7.1		1.2	31.4	1.1		0.4	5.7	0.5		0.2	99.8	

	Southbound				Westbound				Northbound				Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 09:30 AM																	
09:30 AM	4	20	0	24	0	0	0	0	0	0	0	0	0	1	0	1	25
09:45 AM	5	46	1	52	0	2	2	4	0	1	0	1	0	3	0	3	60
10:00 AM	5	25	0	30	0	3	1	4	0	1	0	1	1	2	0	3	38
10:15 AM	2	7	0	9	0	2	0	2	0	3	0	3	0	1	0	1	15
Total Volume	16	98	1	115	0	7	3	10	0	5	0	5	1	7	0	8	138
% App. Total	13.9	85.2	0.9		0	70	30		0	100	0		12.5	87.5	0		
PHF	.800	.533	.250	.553	.000	.583	.375	.625	.000	.417	.000	.417	.250	.583	.000	.667	.575



File Name : Central@University
Site Code : 11470202
Start Date : 2/14/2008
Page No : 4

	Southbound				Westbound				Northbound				Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	10	1	11	0	3	4	7	0	22	0	22	0	4	0	4	44
04:15 PM	0	4	0	4	0	5	6	11	5	56	0	61	0	0	0	0	76
04:30 PM	3	7	0	10	0	5	2	7	1	37	2	40	0	3	0	3	60
04:45 PM	0	13	0	13	0	8	11	19	0	20	0	20	0	10	0	10	62
Total Volume	3	34	1	38	0	21	23	44	6	135	2	143	0	17	0	17	242
% App. Total	7.9	89.5	2.6		0	47.7	52.3		4.2	94.4	1.4		0	100	0		
PHF	.250	.654	.250	.731	.000	.656	.523	.579	.300	.603	.250	.586	.000	.425	.000	.425	.796



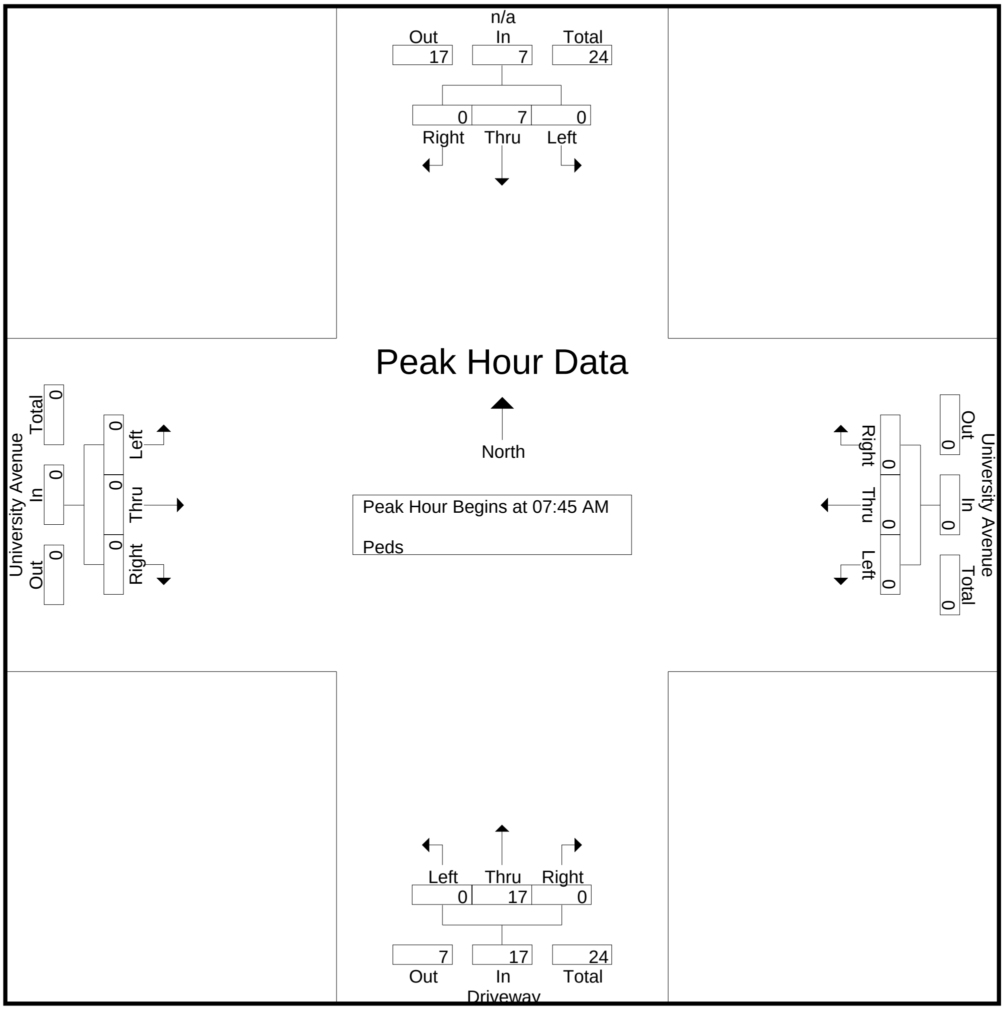
Martin / Alexiou / Bryson, PLLC
4000 Westchase Boulevard, Suite 530
Raleigh, NC 27607
Phone: (919) 829-0328; Fax: (919) 829-0329

File Name : University@WestDriveway
Site Code : 11470203
Start Date : 2/14/2008
Page No : 1

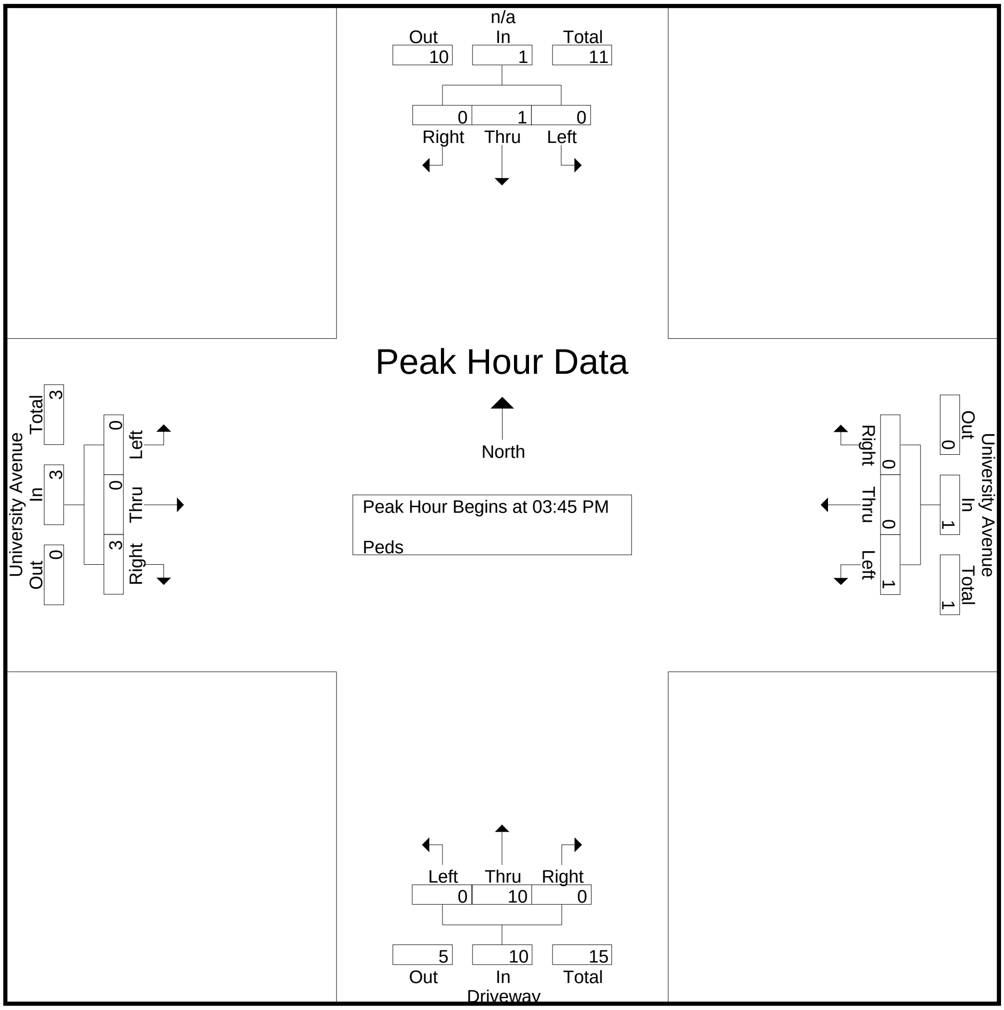
Groups Printed- Peds

	n/a Southbound				University Avenue Westbound				Driveway Northbound				University Avenue Eastbound						
Start Time	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Left	Thru	Right	Trks	Exclu. Total	Inclu. Total	Int. Total
*** BREAK ***																			
07:45 AM	0	1	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	8	8
Total	0	1	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	8	8
08:00 AM	0	4	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	7	7
08:15 AM	0	1	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	7	7
08:30 AM	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	2
08:45 AM	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	3	3
Total	0	7	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	19	19
*** BREAK ***																			
04:00 PM	0	0	0	0	1	0	0	0	0	3	0	0	0	0	3	0	0	7	7
04:15 PM	0	1	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	4	4
04:30 PM	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4	4
*** BREAK ***																			
Total	0	1	0	0	1	0	0	0	0	10	0	0	0	0	3	0	0	15	15
*** BREAK ***																			
Grand Total	0	9	0	0	1	0	0	0	0	29	0	0	0	0	3	0	0	42	42
Apprch %	0	100	0		100	0	0		0	100	0		0	0	100				
Total %	0	21.4	0		2.4	0	0		0	69	0		0	0	7.1		0	100	

	n/a Southbound				University Avenue Westbound				Driveway Northbound				University Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	0	1	0	1	0	0	0	0	0	7	0	7	0	0	0	0	8
08:00 AM	0	4	0	4	0	0	0	0	0	3	0	3	0	0	0	0	7
08:15 AM	0	1	0	1	0	0	0	0	0	6	0	6	0	0	0	0	7
08:30 AM	0	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	2
Total Volume	0	7	0	7	0	0	0	0	0	17	0	17	0	0	0	0	24
% App. Total	0	100	0		0	0	0		0	100	0		0	0	0		
PHF	.000	.438	.000	.438	.000	.000	.000	.000	.000	.607	.000	.607	.000	.000	.000	.000	.750



	n/a Southbound				University Avenue Westbound				Driveway Northbound				University Avenue Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 03:45 PM																	
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00 PM	0	0	0	0	1	0	0	1	0	3	0	3	0	0	3	3	7
04:15 PM	0	1	0	1	0	0	0	0	0	3	0	3	0	0	0	0	4
04:30 PM	0	0	0	0	0	0	0	0	0	4	0	4	0	0	0	0	4
Total Volume	0	1	0	1	1	0	0	1	0	10	0	10	0	0	3	3	15
% App. Total	0	100	0		100	0	0		0	100	0		0	0	100		
PHF	.000	.250	.000	.250	.250	.000	.000	.250	.000	.625	.000	.625	.000	.000	.250	.250	.536



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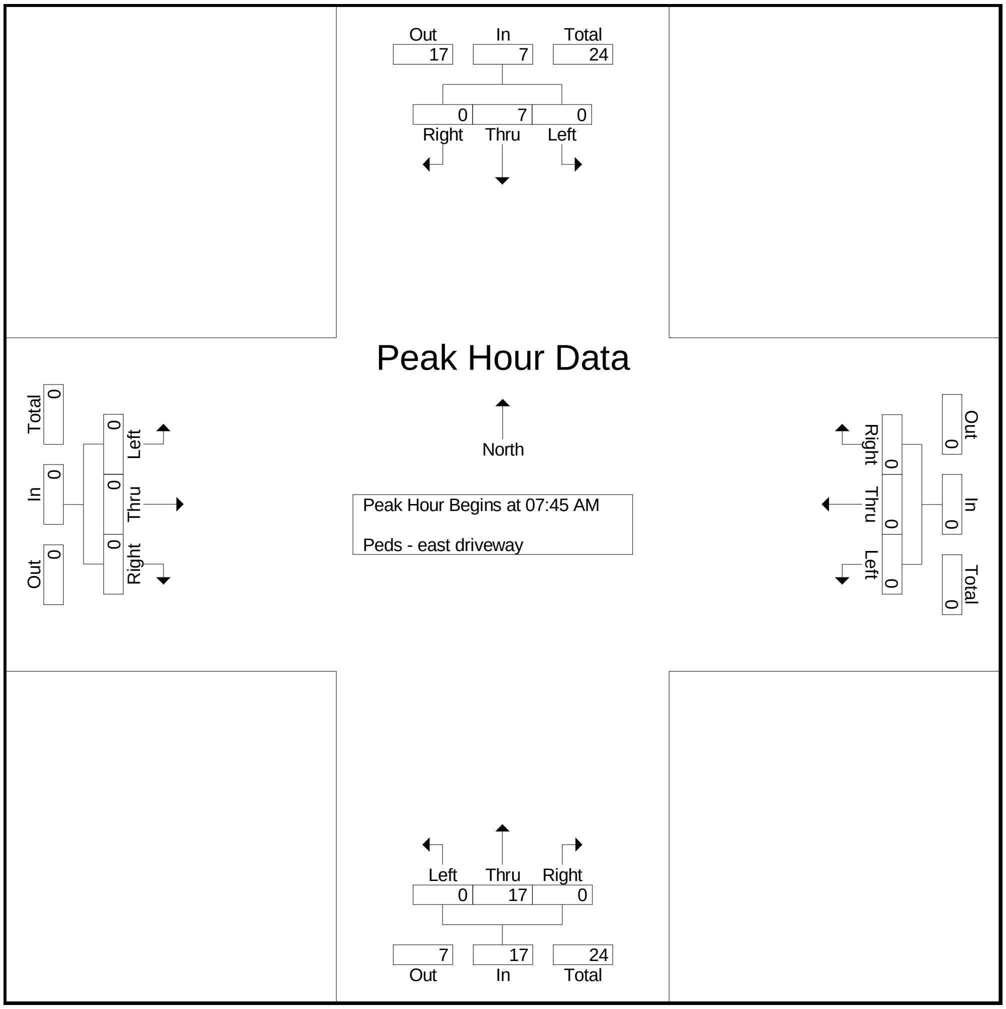
File Name : University@EastDriveway
Site Code : 11470203
Start Date : 2/14/2008
Page No : 1

Groups Printed- east driveway

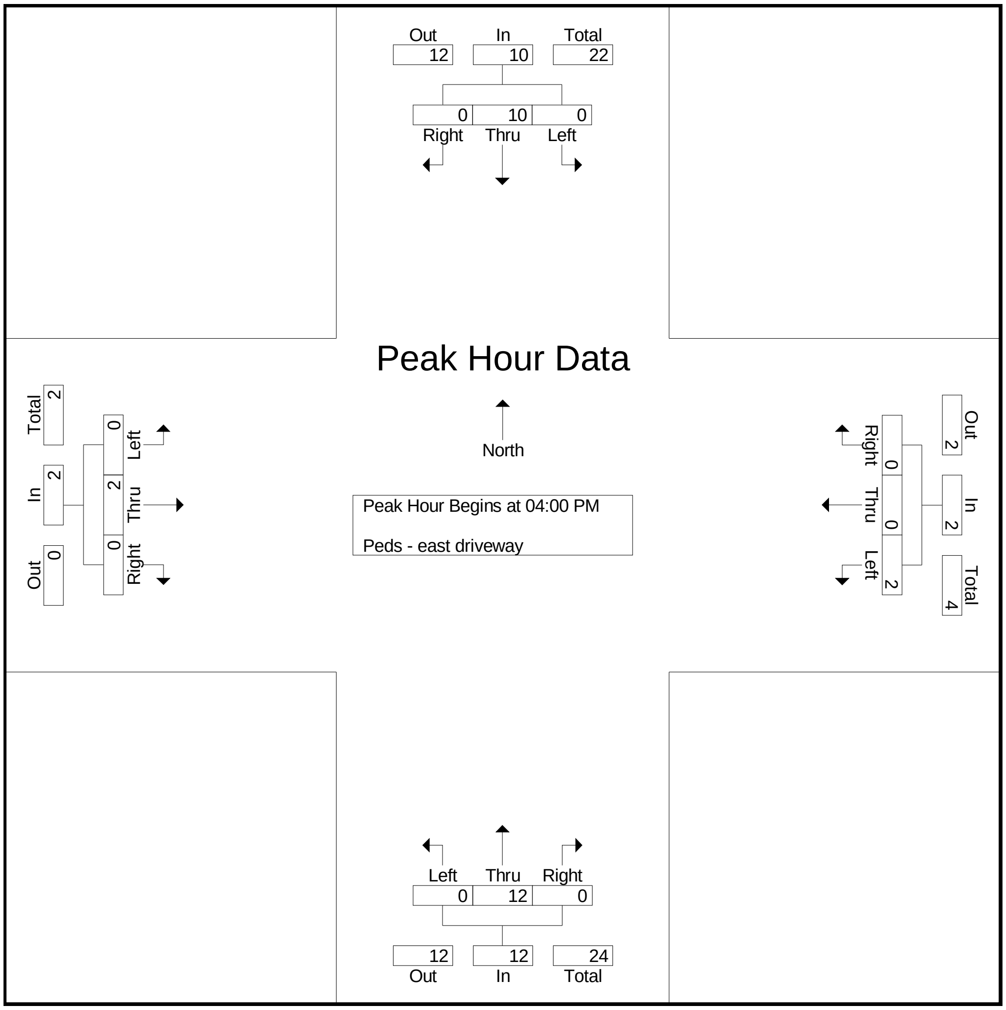
	Southbound				Westbound				Northbound				Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
*** BREAK ***																			
07:45 AM	0	1	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	8	8
Total	0	1	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	8	8
08:00 AM	0	4	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	7	7
08:15 AM	0	1	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	7	7
08:30 AM	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	2
08:45 AM	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	3	3
Total	0	7	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	19	19
*** BREAK ***																			
04:00 PM	0	2	0	0	1	0	0	0	0	3	0	0	0	1	0	0	0	7	7
04:15 PM	0	4	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	7	7
04:30 PM	0	1	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	4	4
04:45 PM	0	3	0	0	1	0	0	0	0	4	0	0	0	0	0	0	0	8	8
Total	0	10	0	0	2	0	0	0	0	12	0	0	0	2	0	0	0	26	26
05:00 PM	0	4	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	7	7
05:15 PM	0	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	4	4
05:30 PM	0	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	4	4
05:45 PM	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Total	0	12	0	0	0	0	0	0	0	4	0	0	0	1	0	0	0	17	17
Grand Total	0	30	0	0	2	0	0	0	0	35	0	0	0	3	0	0	0	70	70
Apprch %	0	100	0		100	0	0		0	100	0		0	100	0				
Total %	0	42.9	0		2.9	0	0		0	50	0		0	4.3	0		0	100	

File Name : University@EastDriveway
Site Code : 11470203
Start Date : 2/14/2008

	Southbound				Westbound				Northbound				Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	0	1	0	1	0	0	0	0	0	**7**	0	**7**	0	0	0	0	**8**
08:00 AM	0	**4**	0	**4**	0	0	0	0	0	3	0	3	0	0	0	0	7
08:15 AM	0	1	0	1	0	0	0	0	0	6	0	6	0	0	0	0	7
08:30 AM	0	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	2
Total Volume	0	7	0	7	0	0	0	0	0	17	0	17	0	0	0	0	24
% App. Total	0	100	0		0	0	0		0	100	0		0	0	0		
PHF	.000	.438	.000	.438	.000	.000	.000	.000	.000	.607	.000	.607	.000	.000	.000	.000	.750

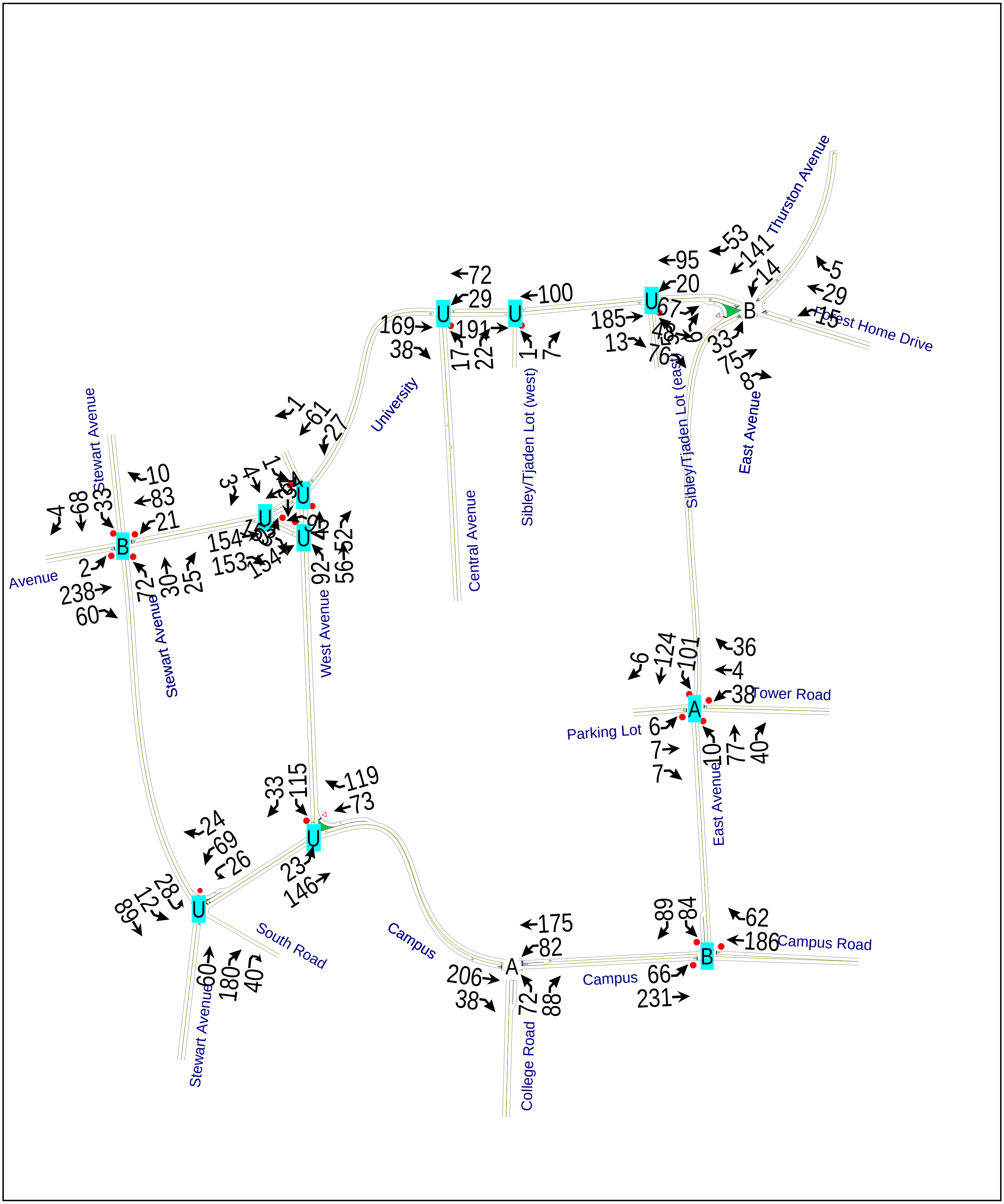


	Southbound				Westbound				Northbound				Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	2	0	2	**1**	0	0	**1**	0	3	0	3	0	**1**	0	**1**	7
04:15 PM	0	**4**	0	**4**	0	0	0	0	0	3	0	3	0	0	0	0	7
04:30 PM	0	1	0	1	0	0	0	0	0	2	0	2	0	1	0	1	4
04:45 PM	0	3	0	3	1	0	0	1	0	**4**	0	**4**	0	0	0	0	**8**
Total Volume	0	10	0	10	2	0	0	2	0	12	0	12	0	2	0	2	26
% App. Total	0	100	0		100	0	0		0	100	0		0	100	0		
PHF	.000	.625	.000	.625	.500	.000	.000	.500	.000	.750	.000	.750	.000	.500	.000	.500	.813



Appendix B:

Intersection Capacity Analysis


Thurston Avenue
Forest Home Drive
East Avenue
Sibley/Tjaden Lot (east)
Sibley/Tjaden Lot (west)
Central Avenue
University
Stewart Avenue
Avenue
West Avenue
Tower Road
Parking Lot
South Road
Campus
College Road
Campus Road
B
U
A
53
141
14
5
29
15
95
20
185
13
67
33
75
8
72
29
100
169
38
191
17
22
1
7
1
61
27
10
83
21
4
68
33
2
238
60
72
30
25
154
153
154
92
56
52
36
4
38
124
101
6
6
7
7
10
77
40
119
73
33
115
23
146
24
69
26
28
12
89
60
180
40
175
82
206
38
72
88
89
84
62
186
66
231

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✥			✥			✥	
Volume (vph)	67	48	76	15	29	5	33	75	8	14	141	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	11	11	11	11	11	11
Grade (%)		0%			-5%			-3%			1%	
Storage Length (ft)	0		100	0		0	0		0	0		0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.96	0.77		0.94			0.85			0.82	
Frt			0.850		0.985			0.991			0.966	
Flt Protected		0.972			0.985			0.986			0.997	
Satd. Flow (prot)	0	1811	1583	0	1832	0	0	1715	0	0	1469	0
Flt Permitted		0.789			0.849			0.888			0.982	
Satd. Flow (perm)	0	1409	1222	0	1494	0	0	1368	0	0	1400	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		333			424			1400			628	
Travel Time (s)		7.6			9.6			31.8			14.3	
Confl. Peds. (#/hr)	41		111	111		41	469		417	417		469
Confl. Bikes (#/hr)			5			4			1			1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	74	53	84	17	32	6	37	83	9	16	157	59
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	127	84	0	55	0	0	129	0	0	232	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2	2		6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0		22.0	22.0		22.0	22.0	
Total Split (s)	27.0	27.0	27.0	27.0	27.0	0.0	33.0	33.0	0.0	33.0	33.0	0.0
Total Split (%)	45.0%	45.0%	45.0%	45.0%	45.0%	0.0%	55.0%	55.0%	0.0%	55.0%	55.0%	0.0%
Maximum Green (s)	21.0	21.0	21.0	21.0	21.0		27.0	27.0		27.0	27.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		Max	Max		Max	Max	
Walk Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)		9.6	9.6		9.5			32.2			32.2	
Actuated g/C Ratio		0.19	0.19		0.19			0.64			0.64	

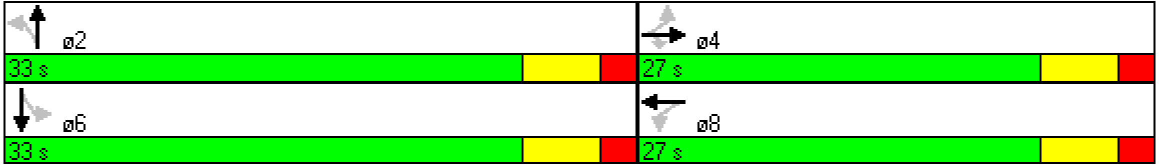
1: University Avenue & Thurston Avenue

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio		0.47	0.36		0.19			0.15			0.26	
Control Delay		23.3	21.3		17.7			6.6			7.2	
Queue Delay		0.0	0.0		0.0			0.0			0.0	
Total Delay		23.3	21.3		17.7			6.6			7.2	
LOS		C	C		B			A			A	
Approach Delay		22.5			17.7			6.6			7.2	
Approach LOS		C			B			A			A	
Queue Length 50th (ft)		32	21		13			15			30	
Queue Length 95th (ft)		70	51		35			43			76	
Internal Link Dist (ft)		253			344			1320			548	
Turn Bay Length (ft)			100									
Base Capacity (vph)		591	513		627			879			900	
Starvation Cap Reductn		0	0		0			0			0	
Spillback Cap Reductn		0	0		0			0			0	
Storage Cap Reductn		0	0		0			0			0	
Reduced v/c Ratio		0.21	0.16		0.09			0.15			0.26	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 50.1
Natural Cycle: 45
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.47
Intersection Signal Delay: 13.2 Intersection LOS: B
Intersection Capacity Utilization 53.0% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 1: University Avenue & Thurston Avenue



	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	6	7	7	38	4	36	10	77	40	101	124	6
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	7	8	8	42	4	40	11	86	44	112	138	7

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	22	87	141	257
Volume Left (vph)	7	42	11	112
Volume Right (vph)	8	40	44	7
Hadj (s)	-0.12	-0.15	-0.14	0.11
Departure Headway (s)	4.8	4.7	4.3	4.4
Degree Utilization, x	0.03	0.11	0.17	0.32
Capacity (veh/h)	674	702	799	783
Control Delay (s)	8.0	8.3	8.2	9.5
Approach Delay (s)	8.0	8.3	8.2	9.5
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.8		
HCM Level of Service	A		
Intersection Capacity Utilization	39.3%	ICU Level of Service	A
Analysis Period (min)	15		

3: Campus Road & East Avenue

	↗	→	←	↖	↘	↙
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		↰	↱
Sign Control		Stop	Stop		Stop	
Volume (vph)	66	231	186	62	84	89
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	73	257	207	69	93	99

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total (vph)	330	276	93	99
Volume Left (vph)	73	0	93	0
Volume Right (vph)	0	69	0	99
Hadj (s)	0.08	-0.12	0.53	-0.67
Departure Headway (s)	4.9	4.8	6.5	5.3
Degree Utilization, x	0.45	0.36	0.17	0.14
Capacity (veh/h)	708	723	516	625
Control Delay (s)	11.7	10.4	9.6	8.0
Approach Delay (s)	11.7	10.4	8.8	
Approach LOS	B	B	A	

Intersection Summary			
Delay	10.6		
HCM Level of Service	B		
Intersection Capacity Utilization	54.6%	ICU Level of Service	A
Analysis Period (min)	15		

4: Campus Road & College Road

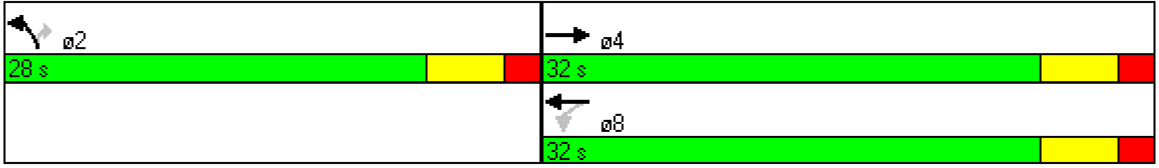
	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱		↰	↑	↰	↱
Volume (vph)	206	38	82	175	72	88
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	9	9	12	12
Storage Length (ft)		0	75		0	100
Storage Lanes		0	1		1	1
Taper Length (ft)		25	25		25	25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99		0.95		0.55	0.74
Frt	0.979					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1798	0	1593	1676	1770	1583
Flt Permitted			0.593		0.950	
Satd. Flow (perm)	1798	0	946	1676	973	1168
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	19					98
Link Speed (mph)	30			30	30	
Link Distance (ft)	891			659	512	
Travel Time (s)	20.3			15.0	11.6	
Confl. Peds. (#/hr)		38	38		240	132
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	229	42	91	194	80	98
Shared Lane Traffic (%)						
Lane Group Flow (vph)	271	0	91	194	80	98
Turn Type			Perm			Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Detector Phase	4		8	8	2	2
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0
Minimum Split (s)	22.0		22.0	22.0	22.0	22.0
Total Split (s)	32.0	0.0	32.0	32.0	28.0	28.0
Total Split (%)	53.3%	0.0%	53.3%	53.3%	46.7%	46.7%
Maximum Green (s)	26.0		26.0	26.0	22.0	22.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	4.0	6.0	6.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	None	Min	Min
Walk Time (s)	5.0		5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0		0	0	0	0
Act Effct Green (s)	9.3		9.2	9.2	11.0	11.0
Actuated g/C Ratio	0.34		0.33	0.33	0.40	0.40
v/c Ratio	0.44		0.29	0.35	0.11	0.19
Control Delay	9.5		9.9	9.3	9.7	4.1

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	9.5		9.9	9.3	9.7	4.1
LOS	A		A	A	A	A
Approach Delay	9.5			9.5	6.6	
Approach LOS	A			A	A	
Queue Length 50th (ft)	26		9	19	9	0
Queue Length 95th (ft)	63		29	48	29	19
Internal Link Dist (ft)	811			579	432	
Turn Bay Length (ft)			75			100
Base Capacity (vph)	1650		867	1536	1428	961
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.16		0.10	0.13	0.06	0.10

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 27.7
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.44
Intersection Signal Delay: 8.8 Intersection LOS: A
Intersection Capacity Utilization 46.4% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 4: Campus Road & College Road



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↑	↱	⇅	
Volume (veh/h)	23	146	73	119	115	33
Sign Control		Free	Free		Stop	
Grade		3%	-5%		1%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	26	162	81	132	128	37
Pedestrians		17	64		35	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		1	5		3	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			891			
pX, platoon unblocked						
vC, conflicting volume	116				393	133
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	116				393	133
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				77	96
cM capacity (veh/h)	1430				551	877

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	188	81	132	164
Volume Left	26	0	0	128
Volume Right	0	0	132	37
cSH	1430	1700	1700	601
Volume to Capacity	0.02	0.05	0.08	0.27
Queue Length 95th (ft)	1	0	0	28
Control Delay (s)	1.2	0.0	0.0	13.2
Lane LOS	A			B
Approach Delay (s)	1.2	0.0		13.2
Approach LOS				B

Intersection Summary			
Average Delay	4.2		
Intersection Capacity Utilization	33.0%	ICU Level of Service	A
Analysis Period (min)	15		

7: University Avenue & West Avenue

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↑	↰	
Volume (veh/h)	154	153	0	64	92	0
Sign Control	Free			Free	Stop	
Grade	3%			-3%	-1%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	171	170	0	71	102	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			341		327	256
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			341		327	256
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		85	100
cM capacity (veh/h)			1218		667	783

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	341	71	102
Volume Left	0	0	102
Volume Right	170	0	0
cSH	1700	1700	667
Volume to Capacity	0.20	0.04	0.15
Queue Length 95th (ft)	0	0	13
Control Delay (s)	0.0	0.0	11.4
Lane LOS			B
Approach Delay (s)	0.0	0.0	11.4
Approach LOS			B

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	29.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰			✣			↱			✣	
Volume (veh/h)	0	154	0	27	61	1	0	4	52	1	4	3
Sign Control		Free			Free			Stop			Stop	
Grade		-4%			3%			3%			-3%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	171	0	30	68	1	0	4	58	1	4	3
Pedestrians		10			22			159			31	
Lane Width (ft)		12.0			12.0			14.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		1			2			15			3	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	100			330			474	490	352	412	489	109
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	100			330			474	490	352	412	489	109
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			100	99	90	100	99	100
cM capacity (veh/h)	1454			1039			351	383	574	397	384	912

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	171	99	62	9
Volume Left	0	30	0	1
Volume Right	0	1	58	3
cSH	1454	1039	554	493
Volume to Capacity	0.00	0.03	0.11	0.02
Queue Length 95th (ft)	0	2	9	1
Control Delay (s)	0.0	2.8	12.3	12.4
Lane LOS		A	B	B
Approach Delay (s)	0.0	2.8	12.3	12.4
Approach LOS			B	B

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	43.1%	ICU Level of Service	A
Analysis Period (min)	15		

9: University Avenue & Central Avenue

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	Y	
Volume (veh/h)	169	38	29	72	17	22
Sign Control	Free			Free	Stop	
Grade	3%			-1%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	188	42	32	80	19	24
Pedestrians	17			55	135	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	1			5	11	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				1037		
pX, platoon unblocked						
vC, conflicting volume			365		505	399
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			365		505	399
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		96	96
cM capacity (veh/h)			1059		447	551

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	230	112	43
Volume Left	0	32	19
Volume Right	42	0	24
cSH	1700	1059	500
Volume to Capacity	0.14	0.03	0.09
Queue Length 95th (ft)	0	2	7
Control Delay (s)	0.0	2.6	12.9
Lane LOS		A	B
Approach Delay (s)	0.0	2.6	12.9
Approach LOS			B

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	40.7%	ICU Level of Service	A
Analysis Period (min)	15		

10: University Avenue & Sibley/Tjaden Lot (west)

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	Y	
Volume (veh/h)	191	0	0	100	1	7
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	212	0	0	111	1	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				795		
pX, platoon unblocked						
vC, conflicting volume			212		323	212
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			212		323	212
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	99
cM capacity (veh/h)			1358		670	828

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	212	111	9
Volume Left	0	0	1
Volume Right	0	0	8
cSH	1700	1700	804
Volume to Capacity	0.12	0.07	0.01
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.0	0.0	9.5
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.5
Approach LOS			A

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	20.1%	ICU Level of Service	A
Analysis Period (min)	15		

11: University Avenue & Sibley/Tjaden Lot (east)

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	↰↱	
Volume (veh/h)	185	13	20	95	5	6
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	206	14	22	106	6	7
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				333		
pX, platoon unblocked						
vC, conflicting volume			220		363	213
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			220		363	213
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		99	99
cM capacity (veh/h)			1349		626	827

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	220	128	12
Volume Left	0	22	6
Volume Right	14	0	7
cSH	1700	1349	722
Volume to Capacity	0.13	0.02	0.02
Queue Length 95th (ft)	0	1	1
Control Delay (s)	0.0	1.5	10.1
Lane LOS		A	B
Approach Delay (s)	0.0	1.5	10.1
Approach LOS			B

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	30.0%	ICU Level of Service	A
Analysis Period (min)	15		

12: University Avenue & Stewart Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	2	238	60	21	83	10	72	30	25	33	68	4
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	2	264	67	23	92	11	80	33	28	37	76	4

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	333	127	141	117
Volume Left (vph)	2	23	80	37
Volume Right (vph)	67	11	28	4
Hadj (s)	-0.08	0.02	0.03	0.07
Departure Headway (s)	4.7	5.1	5.2	5.3
Degree Utilization, x	0.43	0.18	0.21	0.17
Capacity (veh/h)	727	655	624	608
Control Delay (s)	11.3	9.1	9.6	9.4
Approach Delay (s)	11.3	9.1	9.6	9.4
Approach LOS	B	A	A	A

Intersection Summary			
Delay	10.3		
HCM Level of Service	B		
Intersection Capacity Utilization	39.8%	ICU Level of Service	A
Analysis Period (min)	15		

6: West Avenue & Performance by approach

Approach	EB	NB	SB	All
Total Delay (hr)	0.0	0.1	0.0	0.1
Delay / Veh (s)	0.1	1.3	5.0	1.1

13: Campus Road & Stewart Avenue Performance by approach

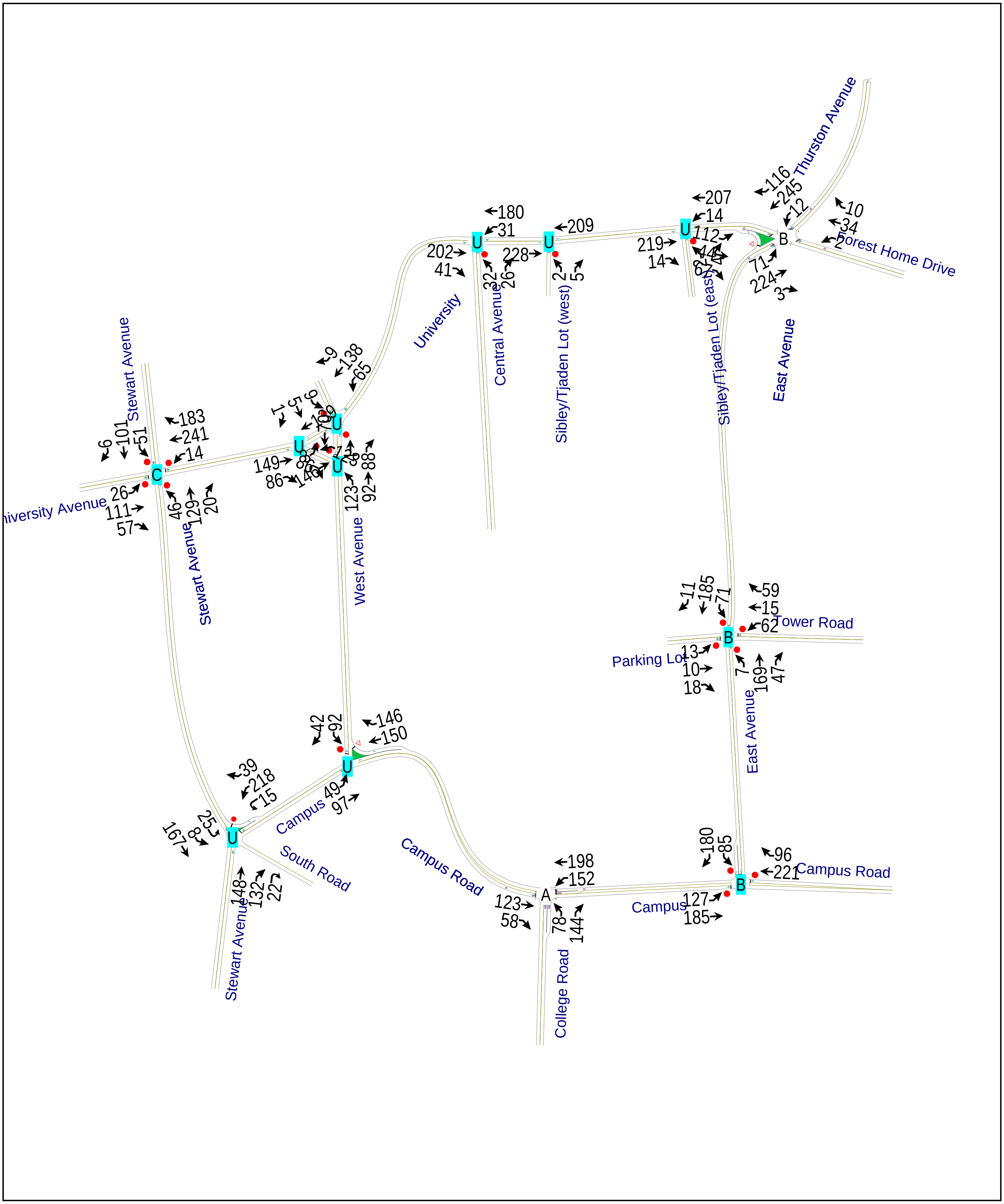
Approach	WB	NB	SB	All
Total Delay (hr)	0.1	0.1	0.1	0.3
Delay / Veh (s)	4.8	0.9	2.5	2.2

Total Zone Performance

Total Delay (hr)	0.4
Delay / Veh (s)	52.1

Milstein Hall/Central Avenue Parking TIA **Existing (2008) PM**

Levels of Service **6/4/2008**



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Milstein Hall/Central Avenue Parking TIA

Existing (2008) PM

1: University Avenue & Thurston Avenue

6/4/2008

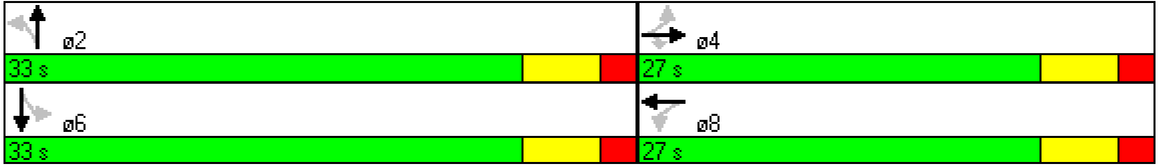
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✣			✣			✣	
Volume (vph)	112	44	67	2	34	10	71	224	3	12	245	116
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	11	11	11	11	11	11
Grade (%)		0%			-5%			-3%			1%	
Storage Length (ft)	0		100	0		0	0		0	0		0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.95	0.77		0.97			0.93			0.81	
Frt			0.850		0.971			0.999			0.958	
Flt Protected		0.965			0.998			0.988			0.998	
Satd. Flow (prot)	0	1798	1583	0	1811	0	0	1795	0	0	1401	0
Flt Permitted		0.755			0.983			0.831			0.987	
Satd. Flow (perm)	0	1334	1222	0	1772	0	0	1413	0	0	1372	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		333			424			1400			628	
Travel Time (s)		7.6			9.6			31.8			14.3	
Confl. Peds. (#/hr)	41		111	111		41	469		417	417		469
Confl. Bikes (#/hr)			5			4			1			1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	124	49	74	2	38	11	79	249	3	13	272	129
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	173	74	0	51	0	0	331	0	0	414	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2	2		6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0		22.0	22.0		22.0	22.0	
Total Split (s)	27.0	27.0	27.0	27.0	27.0	0.0	33.0	33.0	0.0	33.0	33.0	0.0
Total Split (%)	45.0%	45.0%	45.0%	45.0%	45.0%	0.0%	55.0%	55.0%	0.0%	55.0%	55.0%	0.0%
Maximum Green (s)	21.0	21.0	21.0	21.0	21.0		27.0	27.0		27.0	27.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		Max	Max		Max	Max	
Walk Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)		11.8	11.8		11.5			31.9			31.9	
Actuated g/C Ratio		0.23	0.23		0.22			0.62			0.62	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio		0.57	0.27		0.13			0.38			0.49	
Control Delay		24.9	18.1		15.6			9.7			11.3	
Queue Delay		0.0	0.0		0.0			0.0			0.0	
Total Delay		24.9	18.1		15.6			9.7			11.3	
LOS		C	B		B			A			B	
Approach Delay		22.9			15.6			9.7			11.3	
Approach LOS		C			B			A			B	
Queue Length 50th (ft)		46	18		12			53			73	
Queue Length 95th (ft)		93	45		32			132			182	
Internal Link Dist (ft)		253			344			1320			548	
Turn Bay Length (ft)			100									
Base Capacity (vph)		544	498		722			873			847	
Starvation Cap Reductn		0	0		0			0			0	
Spillback Cap Reductn		0	0		0			0			0	
Storage Cap Reductn		0	0		0			0			0	
Reduced v/c Ratio		0.32	0.15		0.07			0.38			0.49	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 51.7
Natural Cycle: 50
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.57
Intersection Signal Delay: 13.8 Intersection LOS: B
Intersection Capacity Utilization 69.8% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 1: University Avenue & Thurston Avenue



2: Parking Lot & East Avenue

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	13	10	18	62	15	59	7	169	47	71	185	11
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	14	11	20	69	17	66	8	188	52	79	206	12

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	46	151	248	297
Volume Left (vph)	14	69	8	79
Volume Right (vph)	20	66	52	12
Hadj (s)	-0.17	-0.14	-0.09	0.06
Departure Headway (s)	5.3	5.1	4.7	4.8
Degree Utilization, x	0.07	0.22	0.32	0.40
Capacity (veh/h)	589	631	725	714
Control Delay (s)	8.7	9.6	10.0	10.9
Approach Delay (s)	8.7	9.6	10.0	10.9
Approach LOS	A	A	A	B

Intersection Summary			
Delay	10.2		
HCM Level of Service	B		
Intersection Capacity Utilization	53.9%	ICU Level of Service	A
Analysis Period (min)	15		

3: Campus Road & East Avenue

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		↰	↱
Sign Control		Stop	Stop		Stop	
Volume (vph)	127	185	221	96	85	180
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	141	206	246	107	94	200

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total (vph)	347	352	94	200
Volume Left (vph)	141	0	94	0
Volume Right (vph)	0	107	0	200
Hadj (s)	0.12	-0.15	0.53	-0.67
Departure Headway (s)	5.4	5.1	6.8	5.6
Degree Utilization, x	0.52	0.50	0.18	0.31
Capacity (veh/h)	645	677	495	594
Control Delay (s)	13.9	13.1	10.1	9.9
Approach Delay (s)	13.9	13.1	10.0	
Approach LOS	B	B	A	

Intersection Summary			
Delay	12.5		
HCM Level of Service	B		
Intersection Capacity Utilization	59.9%	ICU Level of Service	B
Analysis Period (min)	15		

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱		↰	↑	↰	↱
Volume (vph)	123	58	152	198	78	144
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	9	9	12	12
Storage Length (ft)		0	75		0	100
Storage Lanes		0	1		1	1
Taper Length (ft)		25	25		25	25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.97		0.95		0.55	0.74
Frt	0.957					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1732	0	1593	1676	1770	1583
Flt Permitted			0.632		0.950	
Satd. Flow (perm)	1732	0	1002	1676	973	1168
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	49					160
Link Speed (mph)	30			30	30	
Link Distance (ft)	891			659	512	
Travel Time (s)	20.3			15.0	11.6	
Confl. Peds. (#/hr)		38	38		240	132
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	137	64	169	220	87	160
Shared Lane Traffic (%)						
Lane Group Flow (vph)	201	0	169	220	87	160
Turn Type			Perm			Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Detector Phase	4		8	8	2	2
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0
Minimum Split (s)	22.0		22.0	22.0	22.0	22.0
Total Split (s)	32.0	0.0	32.0	32.0	28.0	28.0
Total Split (%)	53.3%	0.0%	53.3%	53.3%	46.7%	46.7%
Maximum Green (s)	26.0		26.0	26.0	22.0	22.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	4.0	6.0	6.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	None	Min	Min
Walk Time (s)	5.0		5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0		0	0	0	0
Act Effct Green (s)	10.2		10.5	10.5	11.7	11.7
Actuated g/C Ratio	0.35		0.36	0.36	0.40	0.40
v/c Ratio	0.32		0.47	0.37	0.12	0.29
Control Delay	7.0		12.8	9.3	10.8	4.5

4: Campus Road & College Road

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	7.0		12.8	9.3	10.8	4.5
LOS	A		B	A	B	A
Approach Delay	7.0			10.8	6.7	
Approach LOS	A			B	A	
Queue Length 50th (ft)	15		18	23	10	0
Queue Length 95th (ft)	48		59	62	39	30
Internal Link Dist (ft)	811			579	432	
Turn Bay Length (ft)			75			100
Base Capacity (vph)	1515		873	1460	1359	934
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.13		0.19	0.15	0.06	0.17

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 29.5

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

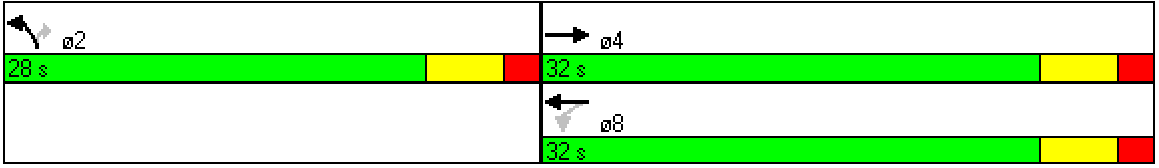
Maximum v/c Ratio: 0.47

Intersection Signal Delay: 8.7 Intersection LOS: A

Intersection Capacity Utilization 49.3% ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 4: Campus Road & College Road



5: Campus Road & West Avenue

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↑	↱	⋎	
Volume (veh/h)	49	97	150	146	92	42
Sign Control		Free	Free		Stop	
Grade		3%	-5%		1%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	54	108	167	162	102	47
Pedestrians		17	64		35	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		1	5		3	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			891			
pX, platoon unblocked						
vC, conflicting volume	202				482	219
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	202				482	219
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				79	94
cM capacity (veh/h)	1330				478	786

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	162	167	162	149
Volume Left	54	0	0	102
Volume Right	0	0	162	47
cSH	1330	1700	1700	545
Volume to Capacity	0.04	0.10	0.10	0.27
Queue Length 95th (ft)	3	0	0	28
Control Delay (s)	2.9	0.0	0.0	14.1
Lane LOS	A			B
Approach Delay (s)	2.9	0.0		14.1
Approach LOS				B

Intersection Summary			
Average Delay	4.0		
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		

7: University Avenue & West Avenue

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↑	↰	
Volume (veh/h)	149	86	0	139	123	0
Sign Control	Free			Free	Stop	
Grade	3%			-3%	-1%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	166	96	0	154	137	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			261		368	213
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			261		368	213
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		78	100
cM capacity (veh/h)			1303		632	827

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	261	154	137
Volume Left	0	0	137
Volume Right	96	0	0
cSH	1700	1700	632
Volume to Capacity	0.15	0.09	0.22
Queue Length 95th (ft)	0	0	20
Control Delay (s)	0.0	0.0	12.3
Lane LOS			B
Approach Delay (s)	0.0	0.0	12.3
Approach LOS			B

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	26.6%	ICU Level of Service	A
Analysis Period (min)	15		

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰			✥			↱			✥	
Volume (veh/h)	3	146	0	65	138	9	0	4	88	9	5	1
Sign Control		Free			Free			Stop			Stop	
Grade		-4%			3%			3%			-3%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	3	162	0	72	153	10	0	4	98	10	6	1
Pedestrians		10			22			159			31	
Lane Width (ft)		12.0			12.0			14.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		1			2			15			3	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	194			321			645	667	343	625	662	199
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	194			321			645	667	343	625	662	199
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			93			100	98	83	96	98	100
cM capacity (veh/h)	1343			1047			260	290	580	256	293	813

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	166	236	102	17
Volume Left	3	72	0	10
Volume Right	0	10	98	1
cSH	1343	1047	556	281
Volume to Capacity	0.00	0.07	0.18	0.06
Queue Length 95th (ft)	0	6	17	5
Control Delay (s)	0.2	3.1	12.9	18.6
Lane LOS	A	A	B	C
Approach Delay (s)	0.2	3.1	12.9	18.6
Approach LOS			B	C

Intersection Summary			
Average Delay	4.6		
Intersection Capacity Utilization	46.6%	ICU Level of Service	A
Analysis Period (min)	15		

9: University Avenue & Central Avenue

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	Y	
Volume (veh/h)	202	41	31	180	32	26
Sign Control	Free			Free	Stop	
Grade	3%			-1%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	224	46	34	200	36	29
Pedestrians	17			55	135	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	1			5	11	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				1037		
pX, platoon unblocked						
vC, conflicting volume			405		668	437
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			405		668	437
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		90	94
cM capacity (veh/h)			1024		358	524

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	270	234	64
Volume Left	0	34	36
Volume Right	46	0	29
cSH	1700	1024	417
Volume to Capacity	0.16	0.03	0.15
Queue Length 95th (ft)	0	3	14
Control Delay (s)	0.0	1.6	15.2
Lane LOS		A	C
Approach Delay (s)	0.0	1.6	15.2
Approach LOS			C

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	47.5%	ICU Level of Service	A
Analysis Period (min)	15		

10: University Avenue & Sibley/Tjaden Lot (west)

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↖↗	
Volume (veh/h)	228	0	0	209	2	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	253	0	0	232	2	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				795		
pX, platoon unblocked						
vC, conflicting volume			253		486	253
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			253		486	253
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	99
cM capacity (veh/h)			1312		541	785

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	253	232	8
Volume Left	0	0	2
Volume Right	0	0	6
cSH	1700	1700	695
Volume to Capacity	0.15	0.14	0.01
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.0	0.0	10.2
Lane LOS			B
Approach Delay (s)	0.0	0.0	10.2
Approach LOS			B

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	22.0%	ICU Level of Service	A
Analysis Period (min)	15		

11: University Avenue & Sibley/Tjaden Lot (east)

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	Y	
Volume (veh/h)	219	14	14	207	2	4
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	243	16	16	230	2	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				333		
pX, platoon unblocked						
vC, conflicting volume			259		512	251
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			259		512	251
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		100	99
cM capacity (veh/h)			1306		516	788

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	259	246	7
Volume Left	0	16	2
Volume Right	16	0	4
cSH	1700	1306	670
Volume to Capacity	0.15	0.01	0.01
Queue Length 95th (ft)	0	1	1
Control Delay (s)	0.0	0.6	10.4
Lane LOS		A	B
Approach Delay (s)	0.0	0.6	10.4
Approach LOS			B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	32.4%	ICU Level of Service	A
Analysis Period (min)	15		

12: University Avenue & Stewart Avenue

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	26	111	57	14	241	183	46	129	20	51	101	6
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	29	123	63	16	268	203	51	143	22	57	112	7

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	216	487	217	176
Volume Left (vph)	29	16	51	57
Volume Right (vph)	63	203	22	7
Hadj (s)	-0.12	-0.21	0.02	0.08
Departure Headway (s)	6.0	5.4	6.3	6.5
Degree Utilization, x	0.36	0.73	0.38	0.32
Capacity (veh/h)	544	644	503	477
Control Delay (s)	12.2	21.5	13.2	12.5
Approach Delay (s)	12.2	21.5	13.2	12.5
Approach LOS	B	C	B	B

Intersection Summary			
Delay	16.6		
HCM Level of Service	C		
Intersection Capacity Utilization	45.8%	ICU Level of Service	A
Analysis Period (min)	15		

6: West Avenue & Performance by approach

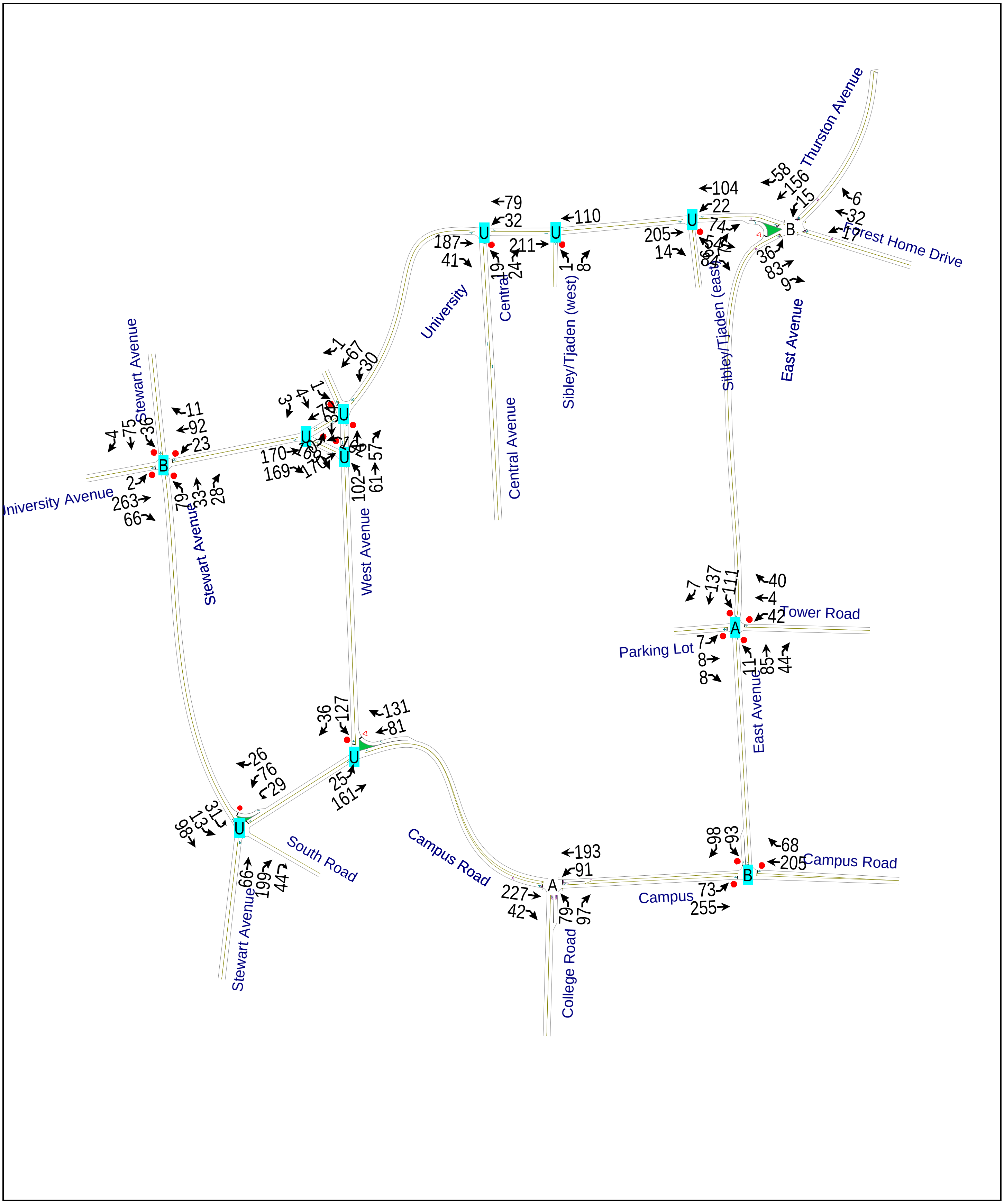
Approach	EB	NB	SB	All
Total Delay (hr)	0.0	0.1	0.1	0.2
Delay / Veh (s)	0.1	1.4	5.2	1.9

13: Campus Road & Stewart Avenue Performance by approach

Approach	WB	NB	SB	All
Total Delay (hr)	0.7	0.1	0.2	1.0
Delay / Veh (s)	8.9	1.0	3.3	4.4

Total Zone Performance

Total Delay (hr)	1.2
Delay / Veh (s)	1046.3


Thurston Avenue
Forest Home Drive
East Avenue
Sibley/Tjaden (east)
Sibley/Tjaden (west)
Central Avenue
Central
University
University Avenue
Stewart Avenue
West Avenue
Tower Road
Parking Lot
Campus Road
Campus
College Road
South Road
B
U
A
4
75
36
11
92
23
2
263
66
79
33
28
1
67
30
3
4
1
74
34
170
169
102
61
57
79
32
187
41
19
24
110
211
1
8
104
22
205
14
74
54
66
84
58
156
15
6
32
17
36
83
9
7
137
111
40
4
42
7
8
8
11
85
44
131
81
36
127
25
161
26
76
29
31
13
98
66
199
44
193
91
227
42
79
97
98
93
68
205
73
255

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✥			✥			✥	
Volume (vph)	74	54	84	17	32	6	36	83	9	15	156	58
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	11	11	11	11	11	11
Grade (%)		0%			-5%			-3%			1%	
Storage Length (ft)	0		100	0		0	0		0	0		0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.90	0.88		0.95			0.89			0.87	
Frt			0.850		0.985			0.990			0.966	
Flt Protected		0.972			0.985			0.986			0.997	
Satd. Flow (prot)	0	1811	1583	0	1809	0	0	1710	0	0	1552	0
Flt Permitted		0.787			0.850			0.881			0.981	
Satd. Flow (perm)	0	1320	1400	0	1524	0	0	1418	0	0	1478	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		333			424			1400			628	
Travel Time (s)		7.6			9.6			31.8			14.3	
Confl. Peds. (#/hr)	100		50	50		100	206		475	475		206
Confl. Bikes (#/hr)			4			6						2
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	82	60	93	19	36	7	40	92	10	17	173	64
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	142	93	0	62	0	0	142	0	0	254	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2	2		6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0		22.0	22.0		22.0	22.0	
Total Split (s)	27.0	27.0	27.0	27.0	27.0	0.0	33.0	33.0	0.0	33.0	33.0	0.0
Total Split (%)	45.0%	45.0%	45.0%	45.0%	45.0%	0.0%	55.0%	55.0%	0.0%	55.0%	55.0%	0.0%
Maximum Green (s)	21.0	21.0	21.0	21.0	21.0		27.0	27.0		27.0	27.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		Max	Max		Max	Max	
Walk Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)		10.5	10.5		10.3			31.8			31.8	
Actuated g/C Ratio		0.21	0.21		0.20			0.63			0.63	

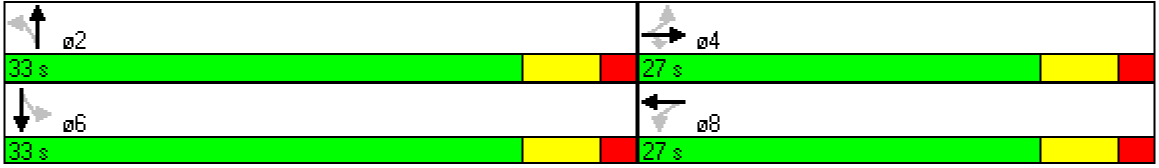
1: University Avenue & Thurston Avenue

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio		0.52	0.32		0.20			0.16			0.27	
Control Delay		24.3	19.3		17.2			7.2			7.8	
Queue Delay		0.0	0.0		0.0			0.0			0.0	
Total Delay		24.3	19.3		17.2			7.2			7.8	
LOS		C	B		B			A			A	
Approach Delay		22.3			17.2			7.2			7.8	
Approach LOS		C			B			A			A	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 50.5
Natural Cycle: 45
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.52
Intersection Signal Delay: 13.4 Intersection LOS: B
Intersection Capacity Utilization 55.1% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 1: University Avenue & Thurston Avenue



2: Parking Lot & East Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	7	8	8	42	4	40	11	85	44	111	137	7
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	8	9	9	47	4	44	12	94	49	123	152	8

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	26	96	156	283
Volume Left (vph)	8	47	12	123
Volume Right (vph)	9	44	49	8
Hadj (s)	-0.11	-0.15	-0.14	0.10
Departure Headway (s)	4.9	4.8	4.4	4.5
Degree Utilization, x	0.03	0.13	0.19	0.35
Capacity (veh/h)	652	682	784	773
Control Delay (s)	8.1	8.5	8.4	9.9
Approach Delay (s)	8.1	8.5	8.4	9.9
Approach LOS	A	A	A	A

Intersection Summary			
Delay	9.2		
HCM Level of Service	A		
Intersection Capacity Utilization	50.6%	ICU Level of Service	A
Analysis Period (min)	15		

3: Campus Road & East Avenue

Movement	EBL	EBT	WBT	WBR	SBL	SBR
	↗	→	←	↖	↘	↙
Lane Configurations		↰	↱		↰	↱
Sign Control		Stop	Stop		Stop	
Volume (vph)	73	255	205	68	93	98
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	81	283	228	76	103	109

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total (vph)	364	303	103	109
Volume Left (vph)	81	0	103	0
Volume Right (vph)	0	76	0	109
Hadj (s)	0.08	-0.12	0.53	-0.67
Departure Headway (s)	5.0	4.9	6.7	5.5
Degree Utilization, x	0.51	0.41	0.19	0.17
Capacity (veh/h)	692	705	491	603
Control Delay (s)	13.0	11.3	10.1	8.3
Approach Delay (s)	13.0	11.3	9.2	
Approach LOS	B	B	A	

Intersection Summary			
Delay	11.5		
HCM Level of Service	B		
Intersection Capacity Utilization	57.2%	ICU Level of Service	B
Analysis Period (min)	15		

4: Campus Road & College Road

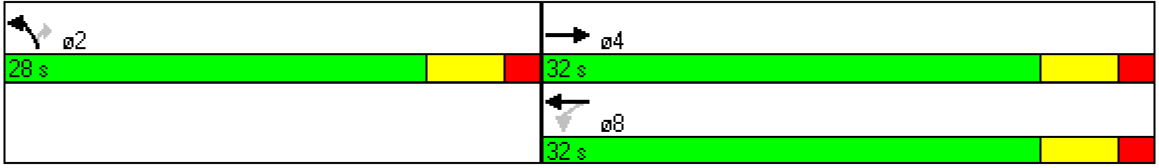
	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱		↰	↑	↰	↱
Volume (vph)	227	42	91	193	79	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	9	9	12	12
Storage Length (ft)		0	75		0	100
Storage Lanes		0	1		1	1
Taper Length (ft)		25	25		25	25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99		0.97		0.68	0.66
Frt	0.979					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1806	0	1593	1676	1770	1583
Flt Permitted			0.578		0.950	
Satd. Flow (perm)	1806	0	943	1676	1196	1048
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	20					108
Link Speed (mph)	30			30	30	
Link Distance (ft)	891			659	512	
Travel Time (s)	20.3			15.0	11.6	
Confl. Peds. (#/hr)		22	22		173	172
Confl. Bikes (#/hr)						3
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	252	47	101	214	88	108
Shared Lane Traffic (%)						
Lane Group Flow (vph)	299	0	101	214	88	108
Turn Type			Perm			Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Detector Phase	4		8	8	2	2
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0
Minimum Split (s)	22.0		22.0	22.0	22.0	22.0
Total Split (s)	32.0	0.0	32.0	32.0	28.0	28.0
Total Split (%)	53.3%	0.0%	53.3%	53.3%	46.7%	46.7%
Maximum Green (s)	26.0		26.0	26.0	22.0	22.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	4.0	6.0	6.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	None	Min	Min
Walk Time (s)	5.0		5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0		0	0	0	0
Act Effct Green (s)	9.8		9.8	9.8	7.4	7.4
Actuated g/C Ratio	0.33		0.33	0.33	0.25	0.25
v/c Ratio	0.49		0.32	0.38	0.20	0.31

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Control Delay	10.2		10.4	9.7	10.7	5.7
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	10.2		10.4	9.7	10.7	5.7
LOS	B		B	A	B	A
Approach Delay	10.2			9.9	7.9	
Approach LOS	B			A	A	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 29.3
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.49
Intersection Signal Delay: 9.5 Intersection LOS: A
Intersection Capacity Utilization 48.2% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 4: Campus Road & College Road



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰↑	↑	↱	↰↱	
Volume (veh/h)	25	161	81	131	127	36
Sign Control		Free	Free		Stop	
Grade		3%	-5%		1%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	28	179	90	146	141	40
Pedestrians			1		39	
Lane Width (ft)			12.0		12.0	
Walking Speed (ft/s)			4.0		4.0	
Percent Blockage			0		3	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			891			
pX, platoon unblocked						
vC, conflicting volume	129				364	129
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	129				364	129
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				77	96
cM capacity (veh/h)	1409				602	891

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	207	90	146	181
Volume Left	28	0	0	141
Volume Right	0	0	146	40
cSH	1409	1700	1700	648
Volume to Capacity	0.02	0.05	0.09	0.28
Queue Length 95th (ft)	2	0	0	29
Control Delay (s)	1.2	0.0	0.0	12.7
Lane LOS	A			B
Approach Delay (s)	1.2	0.0		12.7
Approach LOS				B

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	32.4%	ICU Level of Service	A
Analysis Period (min)	15		

7: University Avenue & West Avenue

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↑	↰	
Volume (veh/h)	170	169	0	70	102	0
Sign Control	Free			Free	Stop	
Grade	3%			-3%	-1%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	189	188	0	78	113	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			377		361	283
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			377		361	283
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		82	100
cM capacity (veh/h)			1182		638	756

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	377	78	113
Volume Left	0	0	113
Volume Right	188	0	0
cSH	1700	1700	638
Volume to Capacity	0.22	0.05	0.18
Queue Length 95th (ft)	0	0	16
Control Delay (s)	0.0	0.0	11.9
Lane LOS			B
Approach Delay (s)	0.0	0.0	11.9
Approach LOS			B

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	31.6%	ICU Level of Service	A
Analysis Period (min)	15		

8: University Avenue & West Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰			✥			↱			✥	
Volume (veh/h)	0	170	0	30	67	1	0	4	57	1	4	3
Sign Control		Free			Free			Stop			Stop	
Grade		-4%			3%			3%			-3%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	189	0	33	74	1	0	4	63	1	4	3
Pedestrians		3			5			166			5	
Lane Width (ft)		12.0			12.0			14.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			16			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	81			355			505	502	360	406	502	83
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	81			355			505	502	360	406	502	83
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			100	99	89	100	99	100
cM capacity (veh/h)	1511			1010			336	380	572	414	381	970

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	189	109	68	9
Volume Left	0	33	0	1
Volume Right	0	1	63	3
cSH	1511	1010	553	500
Volume to Capacity	0.00	0.03	0.12	0.02
Queue Length 95th (ft)	0	3	10	1
Control Delay (s)	0.0	2.9	12.4	12.3
Lane LOS		A	B	B
Approach Delay (s)	0.0	2.9	12.4	12.3
Approach LOS			B	B

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	35.4%	ICU Level of Service	A
Analysis Period (min)	15		

9: University Avenue & Central Avenue

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	↰↱	
Volume (veh/h)	187	41	32	79	19	24
Sign Control	Free			Free	Stop	
Grade	3%			-1%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	208	46	36	88	21	27
Pedestrians	8			98	98	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	1			8	8	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				1037		
pX, platoon unblocked						
vC, conflicting volume			351		495	427
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			351		495	427
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		96	95
cM capacity (veh/h)			1109		471	530

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	253	123	48
Volume Left	0	36	21
Volume Right	46	0	27
cSH	1700	1109	502
Volume to Capacity	0.15	0.03	0.10
Queue Length 95th (ft)	0	2	8
Control Delay (s)	0.0	2.6	12.9
Lane LOS		A	B
Approach Delay (s)	0.0	2.6	12.9
Approach LOS			B

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	41.5%	ICU Level of Service	A
Analysis Period (min)	15		

10: University Avenue & Sibley/Tjaden (west)

6/4/2008

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	Y	
Volume (veh/h)	211	0	0	110	1	8
Sign Control	Free			Free	Stop	
Grade	2%			-2%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	234	0	0	122	1	9
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				795		
pX, platoon unblocked						
vC, conflicting volume			234		357	234
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			234		357	234
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	99
cM capacity (veh/h)			1333		642	805

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	234	122	10
Volume Left	0	0	1
Volume Right	0	0	9
cSH	1700	1700	783
Volume to Capacity	0.14	0.07	0.01
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.0	0.0	9.7
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.7
Approach LOS			A

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	21.1%	ICU Level of Service	A
Analysis Period (min)	15		

11: University Avenue & Sibley/Tjaden (east)

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	Y	
Volume (veh/h)	205	14	22	104	6	7
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	228	16	24	116	7	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				333		
pX, platoon unblocked						
vC, conflicting volume			243		400	236
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			243		400	236
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		99	99
cM capacity (veh/h)			1323		595	803

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	243	140	14
Volume Left	0	24	7
Volume Right	16	0	8
cSH	1700	1323	691
Volume to Capacity	0.14	0.02	0.02
Queue Length 95th (ft)	0	1	2
Control Delay (s)	0.0	1.5	10.3
Lane LOS		A	B
Approach Delay (s)	0.0	1.5	10.3
Approach LOS			B

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	31.7%	ICU Level of Service	A
Analysis Period (min)	15		

12: University Avenue & Stewart Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	2	263	66	23	92	11	79	33	28	36	75	4
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	2	292	73	26	102	12	88	37	31	40	83	4

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	368	140	156	128
Volume Left (vph)	2	26	88	40
Volume Right (vph)	73	12	31	4
Hadj (s)	-0.08	0.02	0.03	0.08
Departure Headway (s)	4.8	5.2	5.4	5.5
Degree Utilization, x	0.49	0.20	0.24	0.20
Capacity (veh/h)	710	631	592	584
Control Delay (s)	12.5	9.6	10.1	9.9
Approach Delay (s)	12.5	9.6	10.1	9.9
Approach LOS	B	A	B	A

Intersection Summary			
Delay	11.1		
HCM Level of Service	B		
Intersection Capacity Utilization	43.3%	ICU Level of Service	A
Analysis Period (min)	15		

6: West Avenue & Performance by approach

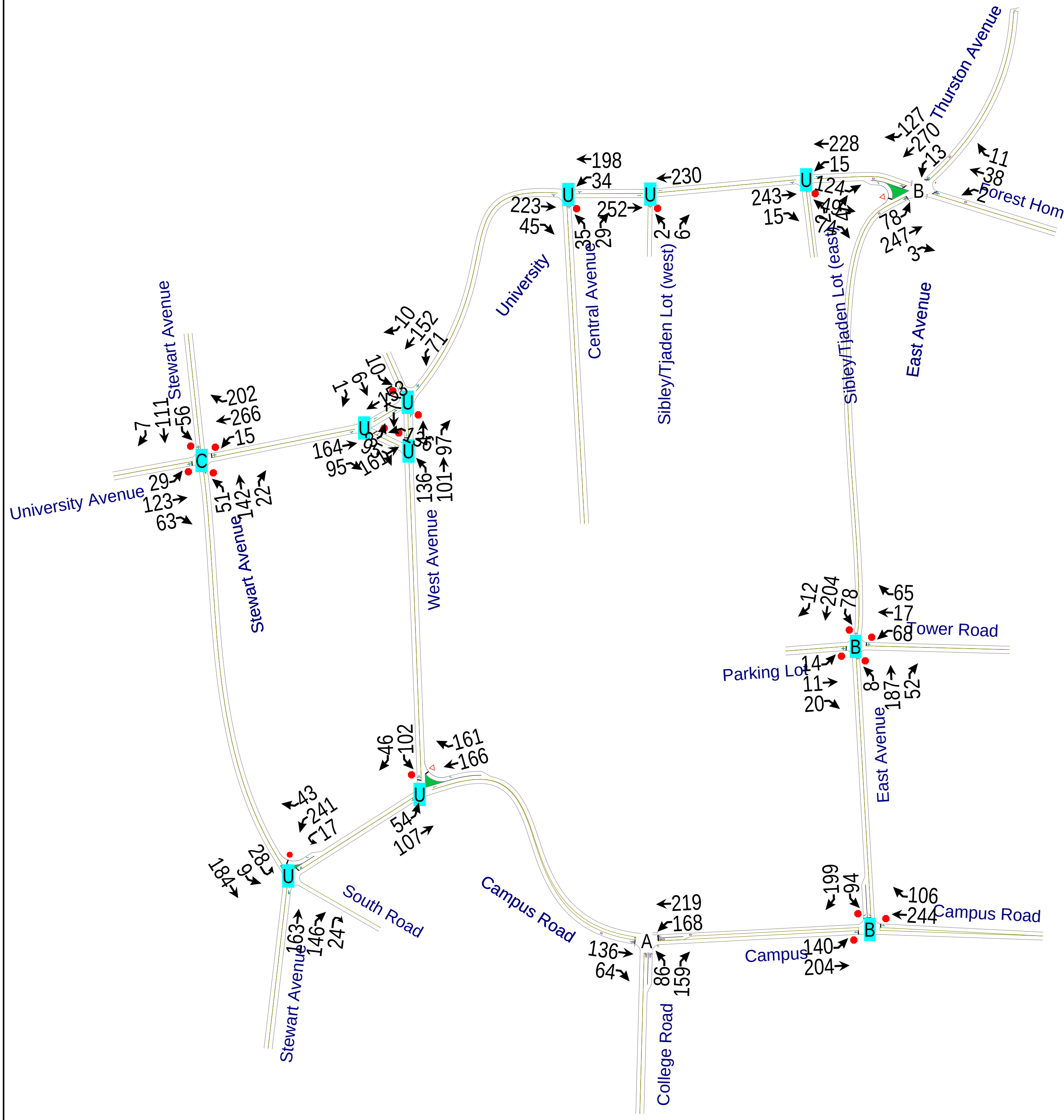
Approach	EB	NB	SB	All
Total Delay (hr)	0.0	0.1	0.1	0.1
Delay / Veh (s)	0.1	1.3	6.3	1.1

13: Campus Road & Stewart Avenue Performance by approach

Approach	WB	NB	SB	All
Total Delay (hr)	0.2	0.1	0.1	0.4
Delay / Veh (s)	5.7	1.0	2.9	2.6

Total Zone Performance

Total Delay (hr)	0.6
Delay / Veh (s)	79.7


Thurston Avenue
Forest Home Drive
East Avenue
Sibley/Tjaden Lot (east)
Sibley/Tjaden Lot (west)
Central Avenue
University
University Avenue
Stewart Avenue
West Avenue
Tower Road
Parking Lot
South Road
Campus Road
Campus
College Road
Stewart Avenue
C
U
B
A

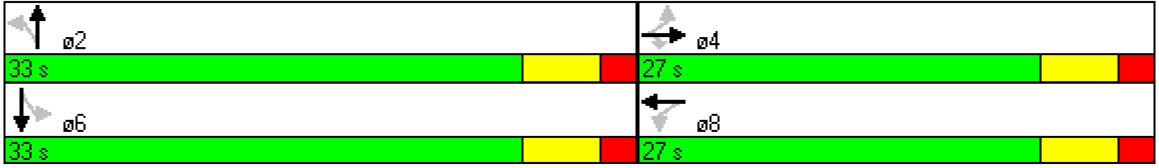
	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✥			✥			✥	
Volume (vph)	124	49	74	2	38	11	78	247	3	13	270	127
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	11	11	11	11	11	11
Grade (%)		0%			-5%			-3%			1%	
Storage Length (ft)	0		100	0		0	0		0	0		0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.95	0.77		0.97			0.94			0.81	
Frt			0.850		0.971			0.999			0.958	
Flt Protected		0.965			0.998			0.988			0.998	
Satd. Flow (prot)	0	1798	1583	0	1811	0	0	1796	0	0	1403	0
Flt Permitted		0.751			0.985			0.814			0.986	
Satd. Flow (perm)	0	1327	1222	0	1777	0	0	1392	0	0	1373	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		333			424			1400			628	
Travel Time (s)		7.6			9.6			31.8			14.3	
Confl. Peds. (#/hr)	41		111	111		41	469		417	417		469
Confl. Bikes (#/hr)			5			4			1			1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	138	54	82	2	42	12	87	274	3	14	300	141
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	192	82	0	56	0	0	364	0	0	455	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2	2		6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0		22.0	22.0		22.0	22.0	
Total Split (s)	27.0	27.0	27.0	27.0	27.0	0.0	33.0	33.0	0.0	33.0	33.0	0.0
Total Split (%)	45.0%	45.0%	45.0%	45.0%	45.0%	0.0%	55.0%	55.0%	0.0%	55.0%	55.0%	0.0%
Maximum Green (s)	21.0	21.0	21.0	21.0	21.0		27.0	27.0		27.0	27.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		Max	Max		Max	Max	
Walk Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)		12.6	12.6		12.2			31.7			31.7	
Actuated g/C Ratio		0.24	0.24		0.23			0.61			0.61	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio		0.60	0.28		0.13			0.43			0.55	
Control Delay		25.3	17.8		15.3			10.9			13.4	
Queue Delay		0.0	0.0		0.0			0.0			0.0	
Total Delay		25.3	17.8		15.3			10.9			13.4	
LOS		C	B		B			B			B	
Approach Delay		23.1			15.3			10.9			13.4	
Approach LOS		C			B			B			B	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 52.2
Natural Cycle: 55
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.60
Intersection Signal Delay: 15.0
Intersection LOS: B
Intersection Capacity Utilization 74.4%
ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 1: University Avenue & Thurston Avenue



2: Parking Lot & East Avenue

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	14	11	20	68	17	65	8	187	52	78	204	12
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	16	12	22	76	19	72	9	208	58	87	227	13

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	50	167	274	327
Volume Left (vph)	16	76	9	87
Volume Right (vph)	22	72	58	13
Hadj (s)	-0.17	-0.14	-0.09	0.06
Departure Headway (s)	5.5	5.3	4.9	4.9
Degree Utilization, x	0.08	0.25	0.37	0.45
Capacity (veh/h)	558	608	703	697
Control Delay (s)	9.0	10.1	10.7	11.9
Approach Delay (s)	9.0	10.1	10.7	11.9
Approach LOS	A	B	B	B

Intersection Summary			
Delay	11.0		
HCM Level of Service	B		
Intersection Capacity Utilization	58.0%	ICU Level of Service	B
Analysis Period (min)	15		

	↗	→	←	↖	↘	↙
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰↑	↑↱		↰	↱
Sign Control		Stop	Stop		Stop	
Volume (vph)	140	204	244	106	94	199
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	156	227	271	118	104	221

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total (vph)	382	389	104	221
Volume Left (vph)	156	0	104	0
Volume Right (vph)	0	118	0	221
Hadj (s)	0.12	-0.15	0.53	-0.67
Departure Headway (s)	5.6	5.3	7.1	5.8
Degree Utilization, x	0.59	0.57	0.20	0.36
Capacity (veh/h)	625	655	478	572
Control Delay (s)	16.2	15.2	10.7	10.9
Approach Delay (s)	16.2	15.2	10.8	
Approach LOS	C	C	B	

Intersection Summary			
Delay	14.2		
HCM Level of Service	B		
Intersection Capacity Utilization	63.5%	ICU Level of Service	B
Analysis Period (min)	15		

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱		↰	↑	↰	↱
Volume (vph)	136	64	168	219	86	159
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	9	9	12	12
Storage Length (ft)		0	75		0	100
Storage Lanes		0	1		1	1
Taper Length (ft)		25	25		25	25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.97		0.95		0.55	0.74
Frt	0.957					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1731	0	1593	1676	1770	1583
Flt Permitted			0.620		0.950	
Satd. Flow (perm)	1731	0	985	1676	973	1168
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	50					177
Link Speed (mph)	30			30	30	
Link Distance (ft)	891			659	512	
Travel Time (s)	20.3			15.0	11.6	
Confl. Peds. (#/hr)		38	38		240	132
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	151	71	187	243	96	177
Shared Lane Traffic (%)						
Lane Group Flow (vph)	222	0	187	243	96	177
Turn Type			Perm			Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Detector Phase	4		8	8	2	2
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0
Minimum Split (s)	22.0		22.0	22.0	22.0	22.0
Total Split (s)	32.0	0.0	32.0	32.0	28.0	28.0
Total Split (%)	53.3%	0.0%	53.3%	53.3%	46.7%	46.7%
Maximum Green (s)	26.0		26.0	26.0	22.0	22.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	4.0	6.0	6.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	None	Min	Min
Walk Time (s)	5.0		5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0		0	0	0	0
Act Effct Green (s)	11.3		11.3	11.3	7.7	7.7
Actuated g/C Ratio	0.36		0.36	0.36	0.25	0.25
v/c Ratio	0.34		0.53	0.40	0.22	0.42
Control Delay	7.2		14.1	9.7	12.2	6.3

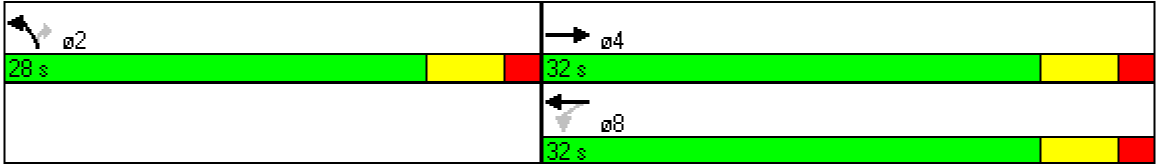
4: Campus Road & College Road

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	7.2		14.1	9.7	12.2	6.3
LOS	A		B	A	B	A
Approach Delay	7.2			11.6	8.3	
Approach LOS	A			B	A	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 31.4
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.53
Intersection Signal Delay: 9.6 Intersection LOS: A
Intersection Capacity Utilization 50.5% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 4: Campus Road & College Road



5: Campus Road & West Avenue

	↗	→	←	↖	↘	↙
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰↑	↑	↱	Y	
Volume (veh/h)	54	107	166	161	102	46
Sign Control		Free	Free		Stop	
Grade		3%	-5%		1%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	60	119	184	179	113	51
Pedestrians		17	64		35	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		1	5		3	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			891			
pX, platoon unblocked						
vC, conflicting volume	219				522	236
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	219				522	236
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				75	93
cM capacity (veh/h)	1311				451	768

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	179	184	179	164
Volume Left	60	0	0	113
Volume Right	0	0	179	51
cSH	1311	1700	1700	518
Volume to Capacity	0.05	0.11	0.11	0.32
Queue Length 95th (ft)	4	0	0	34
Control Delay (s)	2.9	0.0	0.0	15.2
Lane LOS	A			C
Approach Delay (s)	2.9	0.0		15.2
Approach LOS				C

Intersection Summary			
Average Delay	4.3		
Intersection Capacity Utilization	41.4%	ICU Level of Service	A
Analysis Period (min)	15		

7: University Avenue & West Avenue

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↑	↰	
Volume (veh/h)	164	95	0	153	136	0
Sign Control	Free			Free	Stop	
Grade	3%			-3%	-1%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	182	106	0	170	151	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			288		405	235
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			288		405	235
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		75	100
cM capacity (veh/h)			1274		602	804

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	288	170	151
Volume Left	0	0	151
Volume Right	106	0	0
cSH	1700	1700	602
Volume to Capacity	0.17	0.10	0.25
Queue Length 95th (ft)	0	0	25
Control Delay (s)	0.0	0.0	13.0
Lane LOS			B
Approach Delay (s)	0.0	0.0	13.0
Approach LOS			B

Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	28.6%	ICU Level of Service	A
Analysis Period (min)	15		

8: University Avenue & West Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰			✥			↱			✥	
Volume (veh/h)	3	161	0	71	152	10	0	4	97	10	6	1
Sign Control		Free			Free			Stop			Stop	
Grade		-4%			3%			3%			-3%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	3	179	0	79	169	11	0	4	108	11	7	1
Pedestrians		10			22			159			31	
Lane Width (ft)		12.0			12.0			14.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		1			2			15			3	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	211			338			691	713	360	681	708	215
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	211			338			691	713	360	681	708	215
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			92			100	98	81	95	98	100
cM capacity (veh/h)	1324			1033			240	271	568	227	273	797

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	182	259	112	19
Volume Left	3	79	0	11
Volume Right	0	11	108	1
cSH	1324	1033	544	253
Volume to Capacity	0.00	0.08	0.21	0.07
Queue Length 95th (ft)	0	6	19	6
Control Delay (s)	0.2	3.2	13.3	20.4
Lane LOS	A	A	B	C
Approach Delay (s)	0.2	3.2	13.3	20.4
Approach LOS			B	C

Intersection Summary			
Average Delay	4.8		
Intersection Capacity Utilization	47.3%	ICU Level of Service	A
Analysis Period (min)	15		

9: University Avenue & Central Avenue

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	Y	
Volume (veh/h)	223	45	34	198	35	29
Sign Control	Free			Free	Stop	
Grade	3%			-1%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	248	50	38	220	39	32
Pedestrians	17			55	135	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	1			5	11	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				1037		
pX, platoon unblocked						
vC, conflicting volume			433		720	463
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			433		720	463
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		88	94
cM capacity (veh/h)			1000		332	507

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	298	258	71
Volume Left	0	38	39
Volume Right	50	0	32
cSH	1700	1000	394
Volume to Capacity	0.18	0.04	0.18
Queue Length 95th (ft)	0	3	16
Control Delay (s)	0.0	1.6	16.1
Lane LOS		A	C
Approach Delay (s)	0.0	1.6	16.1
Approach LOS			C

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	50.0%	ICU Level of Service	A
Analysis Period (min)	15		

10: University Avenue & Sibley/Tjaden Lot (west)

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	Y	
Volume (veh/h)	252	0	0	230	2	6
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	280	0	0	256	2	7
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				795		
pX, platoon unblocked						
vC, conflicting volume			280		536	280
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			280		536	280
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	99
cM capacity (veh/h)			1283		506	759

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	280	256	9
Volume Left	0	0	2
Volume Right	0	0	7
cSH	1700	1700	674
Volume to Capacity	0.16	0.15	0.01
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.0	0.0	10.4
Lane LOS			B
Approach Delay (s)	0.0	0.0	10.4
Approach LOS			B

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	23.3%	ICU Level of Service	A
Analysis Period (min)	15		

11: University Avenue & Sibley/Tjaden Lot (east)

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	⋎	
Volume (veh/h)	243	15	15	228	2	4
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	270	17	17	253	2	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				333		
pX, platoon unblocked						
vC, conflicting volume			287		565	278
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			287		565	278
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		100	99
cM capacity (veh/h)			1275		480	760

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	287	270	7
Volume Left	0	17	2
Volume Right	17	0	4
cSH	1700	1275	636
Volume to Capacity	0.17	0.01	0.01
Queue Length 95th (ft)	0	1	1
Control Delay (s)	0.0	0.6	10.7
Lane LOS		A	B
Approach Delay (s)	0.0	0.6	10.7
Approach LOS			B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	34.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	29	123	63	15	266	202	51	142	22	56	111	7
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	32	137	70	17	296	224	57	158	24	62	123	8

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	239	537	239	193
Volume Left (vph)	32	17	57	62
Volume Right (vph)	70	224	24	8
Hadj (s)	-0.11	-0.21	0.02	0.07
Departure Headway (s)	6.4	5.7	6.8	7.0
Degree Utilization, x	0.42	0.85	0.45	0.37
Capacity (veh/h)	513	615	485	470
Control Delay (s)	14.0	33.1	15.2	14.1
Approach Delay (s)	14.0	33.1	15.2	14.1
Approach LOS	B	D	C	B

Intersection Summary			
Delay	22.8		
HCM Level of Service	C		
Intersection Capacity Utilization	49.7%	ICU Level of Service	A
Analysis Period (min)	15		

6: West Avenue & Performance by approach

Approach	EB	NB	SB	All
Total Delay (hr)	0.0	0.1	0.1	0.2
Delay / Veh (s)	0.1	1.6	5.3	2.0

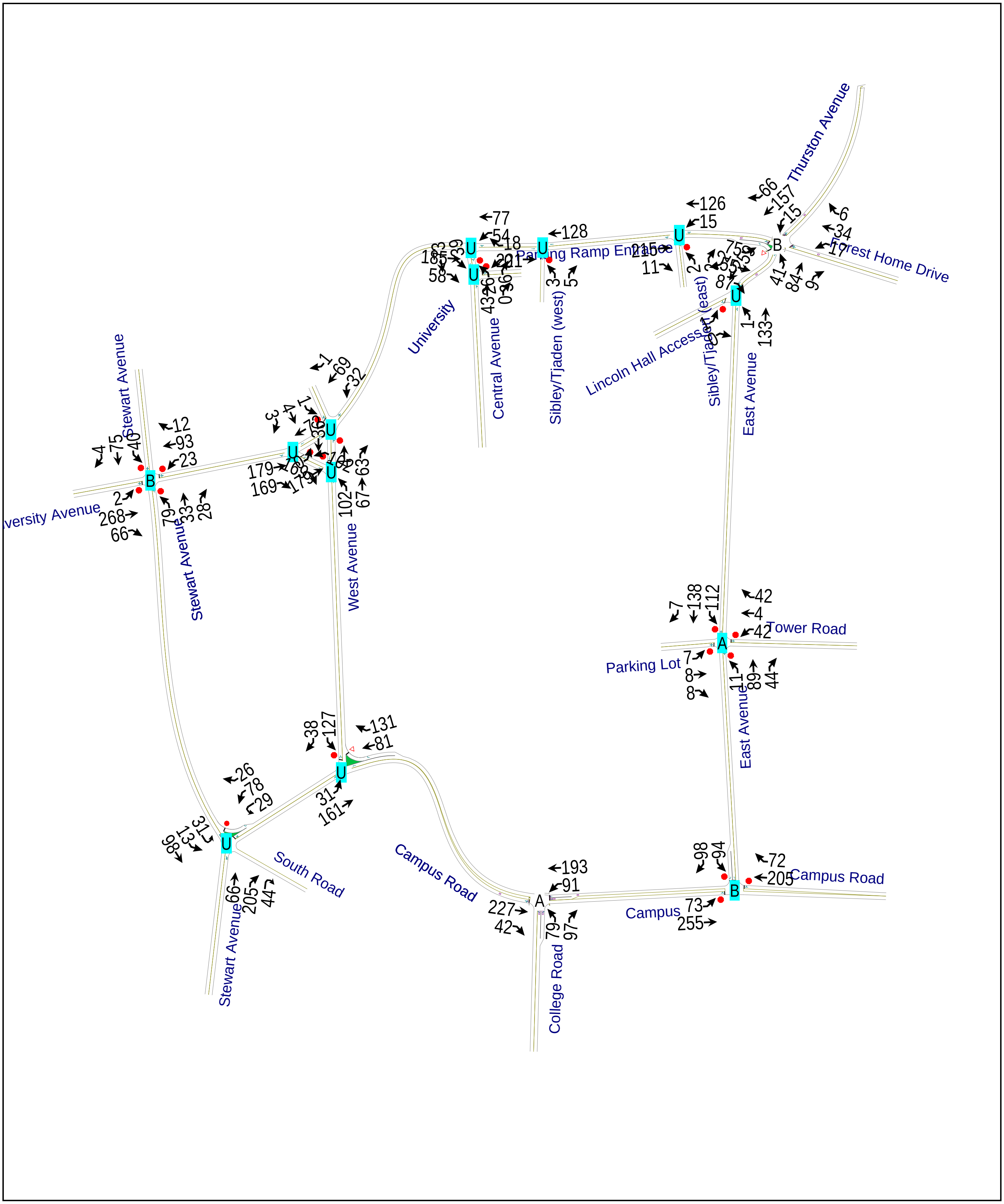
13: Campus Road & Stewart Avenue Performance by approach

Approach	WB	NB	SB	All
Total Delay (hr)	1.1	0.1	0.2	1.4
Delay / Veh (s)	12.1	1.4	2.6	5.6

Total Zone Performance

Total Delay (hr)	1.6
Delay / Veh (s)	5931.4

Milstein Hall/Central Avenue Parking TIA **Build (2012) AM**
Levels of Service **6/4/2008**



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	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✥			✥			✥	
Volume (vph)	75	55	87	17	34	6	41	84	9	15	157	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	11	11	11	11	11	11
Grade (%)		0%			-5%			-3%			1%	
Storage Length (ft)	0		100	0		0	0		0	0		0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.90	0.88		0.95			0.89			0.86	
Frt			0.850		0.985			0.991			0.963	
Flt Protected		0.972			0.985			0.985			0.997	
Satd. Flow (prot)	0	1811	1583	0	1810	0	0	1714	0	0	1530	0
Flt Permitted		0.786			0.853			0.863			0.981	
Satd. Flow (perm)	0	1319	1400	0	1532	0	0	1386	0	0	1460	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		333			424			223			628	
Travel Time (s)		7.6			9.6			5.1			14.3	
Confl. Peds. (#/hr)	100		50	50		100	206		475	475		206
Confl. Bikes (#/hr)			4			6						2
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	83	61	97	19	38	7	46	93	10	17	174	73
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	144	97	0	64	0	0	149	0	0	264	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2	2		6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0		22.0	22.0		22.0	22.0	
Total Split (s)	27.0	27.0	27.0	27.0	27.0	0.0	33.0	33.0	0.0	33.0	33.0	0.0
Total Split (%)	45.0%	45.0%	45.0%	45.0%	45.0%	0.0%	55.0%	55.0%	0.0%	55.0%	55.0%	0.0%
Maximum Green (s)	21.0	21.0	21.0	21.0	21.0		27.0	27.0		27.0	27.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		Max	Max		Max	Max	
Walk Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)		10.6	10.6		10.4			31.8			31.8	
Actuated g/C Ratio		0.21	0.21		0.21			0.63			0.63	

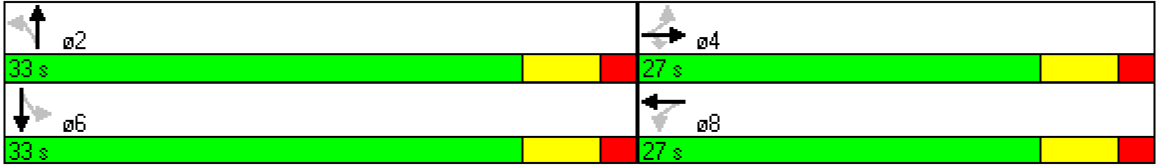
1: University Avenue & Thurston Avenue

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio		0.52	0.33		0.20			0.17			0.29	
Control Delay		24.3	19.5		17.2			7.3			8.0	
Queue Delay		0.0	0.0		0.0			0.0			0.0	
Total Delay		24.3	19.5		17.2			7.3			8.0	
LOS		C	B		B			A			A	
Approach Delay		22.4			17.2			7.3			8.0	
Approach LOS		C			B			A			A	
Queue Length 50th (ft)		37	24		15			19			37	
Queue Length 95th (ft)		79	55		39			53			93	
Internal Link Dist (ft)		253			344			143			548	
Turn Bay Length (ft)			100									
Base Capacity (vph)		550	583		638			872			918	
Starvation Cap Reductn		0	0		0			0			0	
Spillback Cap Reductn		0	0		0			0			0	
Storage Cap Reductn		0	0		0			0			0	
Reduced v/c Ratio		0.26	0.17		0.10			0.17			0.29	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 50.5
Natural Cycle: 45
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.52
Intersection Signal Delay: 13.5 Intersection LOS: B
Intersection Capacity Utilization 55.9% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 1: University Avenue & Thurston Avenue



2: Parking Lot & East Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	7	8	8	42	4	42	11	89	44	112	138	7
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	8	9	9	47	4	47	12	99	49	124	153	8

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	26	98	160	286
Volume Left (vph)	8	47	12	124
Volume Right (vph)	9	47	49	8
Hadj (s)	-0.11	-0.16	-0.13	0.10
Departure Headway (s)	5.0	4.8	4.4	4.5
Degree Utilization, x	0.04	0.13	0.20	0.36
Capacity (veh/h)	649	681	781	771
Control Delay (s)	8.1	8.5	8.5	10.0
Approach Delay (s)	8.1	8.5	8.5	10.0
Approach LOS	A	A	A	A

Intersection Summary			
Delay	9.2		
HCM Level of Service	A		
Intersection Capacity Utilization	50.7%	ICU Level of Service	A
Analysis Period (min)	15		

	↗	→	←	↖	↘	↙
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		↰	↱
Sign Control		Stop	Stop		Stop	
Volume (vph)	73	255	205	72	94	98
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	81	283	228	80	104	109

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total (vph)	364	308	104	109
Volume Left (vph)	81	0	104	0
Volume Right (vph)	0	80	0	109
Hadj (s)	0.08	-0.12	0.53	-0.67
Departure Headway (s)	5.0	4.9	6.7	5.5
Degree Utilization, x	0.51	0.42	0.19	0.17
Capacity (veh/h)	691	705	490	602
Control Delay (s)	13.1	11.4	10.1	8.4
Approach Delay (s)	13.1	11.4	9.2	
Approach LOS	B	B	A	

Intersection Summary			
Delay	11.5		
HCM Level of Service	B		
Intersection Capacity Utilization	57.5%	ICU Level of Service	B
Analysis Period (min)	15		

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱		↰	↑	↰	↱
Volume (vph)	227	42	91	193	79	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	9	9	12	12
Storage Length (ft)		0	75		0	100
Storage Lanes		0	1		1	1
Taper Length (ft)		25	25		25	25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99		0.97		0.68	0.66
Frt	0.979					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1806	0	1593	1676	1770	1583
Flt Permitted			0.578		0.950	
Satd. Flow (perm)	1806	0	943	1676	1196	1048
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	20					108
Link Speed (mph)	30			30	30	
Link Distance (ft)	891			659	512	
Travel Time (s)	20.3			15.0	11.6	
Confl. Peds. (#/hr)		22	22		173	172
Confl. Bikes (#/hr)						3
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	252	47	101	214	88	108
Shared Lane Traffic (%)						
Lane Group Flow (vph)	299	0	101	214	88	108
Turn Type			Perm			Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Detector Phase	4		8	8	2	2
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0
Minimum Split (s)	22.0		22.0	22.0	22.0	22.0
Total Split (s)	32.0	0.0	32.0	32.0	28.0	28.0
Total Split (%)	53.3%	0.0%	53.3%	53.3%	46.7%	46.7%
Maximum Green (s)	26.0		26.0	26.0	22.0	22.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	4.0	6.0	6.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	None	Min	Min
Walk Time (s)	5.0		5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0		0	0	0	0
Act Effct Green (s)	9.8		9.8	9.8	7.4	7.4
Actuated g/C Ratio	0.33		0.33	0.33	0.25	0.25
v/c Ratio	0.49		0.32	0.38	0.20	0.31

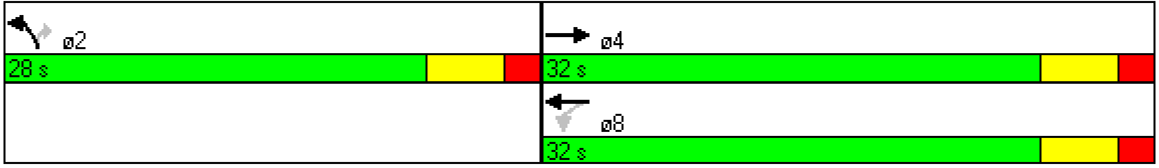
4: Campus Road & College Road

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Control Delay	10.2		10.4	9.7	10.7	5.7
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	10.2		10.4	9.7	10.7	5.7
LOS	B		B	A	B	A
Approach Delay	10.2			9.9	7.9	
Approach LOS	B			A	A	
Queue Length 50th (ft)	29		10	22	10	0
Queue Length 95th (ft)	73		33	56	33	21
Internal Link Dist (ft)	811			579	432	
Turn Bay Length (ft)			75			100
Base Capacity (vph)	1622		846	1503	1345	823
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.18		0.12	0.14	0.07	0.13

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 29.3
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.49
Intersection Signal Delay: 9.5 Intersection LOS: A
Intersection Capacity Utilization 48.2% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 4: Campus Road & College Road



5: Campus Road & West Avenue

	↗	→	←	↖	↘	↙
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↑	↱	Y	
Volume (veh/h)	31	161	81	131	127	38
Sign Control		Free	Free		Stop	
Grade		3%	-5%		1%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	34	179	90	146	141	42
Pedestrians			1		39	
Lane Width (ft)			12.0		12.0	
Walking Speed (ft/s)			4.0		4.0	
Percent Blockage			0		3	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			891			
pX, platoon unblocked						
vC, conflicting volume	129				378	129
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	129				378	129
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				76	95
cM capacity (veh/h)	1409				588	891

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	213	90	146	183
Volume Left	34	0	0	141
Volume Right	0	0	146	42
cSH	1409	1700	1700	638
Volume to Capacity	0.02	0.05	0.09	0.29
Queue Length 95th (ft)	2	0	0	30
Control Delay (s)	1.4	0.0	0.0	12.9
Lane LOS	A			B
Approach Delay (s)	1.4	0.0		12.9
Approach LOS				B

Intersection Summary			
Average Delay	4.2		
Intersection Capacity Utilization	32.9%	ICU Level of Service	A
Analysis Period (min)	15		

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↑	↰	
Volume (veh/h)	179	169	0	72	102	0
Sign Control	Free			Free	Stop	
Grade	3%			-3%	-1%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	199	188	0	80	113	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			387		373	293
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			387		373	293
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		82	100
cM capacity (veh/h)			1172		628	747

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	387	80	113
Volume Left	0	0	113
Volume Right	188	0	0
cSH	1700	1700	628
Volume to Capacity	0.23	0.05	0.18
Queue Length 95th (ft)	0	0	16
Control Delay (s)	0.0	0.0	12.0
Lane LOS			B
Approach Delay (s)	0.0	0.0	12.0
Approach LOS			B

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	32.1%	ICU Level of Service	A
Analysis Period (min)	15		

8: University Avenue & West Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰			✥			↱			✥	
Volume (veh/h)	0	179	0	32	69	1	0	4	63	1	4	3
Sign Control		Free			Free			Stop			Stop	
Grade		-4%			3%			3%			-3%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	199	0	36	77	1	0	4	70	1	4	3
Pedestrians		3			5			166			5	
Lane Width (ft)		12.0			12.0			14.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			16			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	83			365			522	519	370	429	518	85
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	83			365			522	519	370	429	518	85
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			96			100	99	88	100	99	100
cM capacity (veh/h)	1508			1001			327	371	564	393	372	967

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	199	113	74	9
Volume Left	0	36	0	1
Volume Right	0	1	70	3
cSH	1508	1001	547	488
Volume to Capacity	0.00	0.04	0.14	0.02
Queue Length 95th (ft)	0	3	12	1
Control Delay (s)	0.0	3.0	12.6	12.5
Lane LOS		A	B	B
Approach Delay (s)	0.0	3.0	12.6	12.5
Approach LOS			B	B

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	35.9%	ICU Level of Service	A
Analysis Period (min)	15		

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	Y	
Volume (veh/h)	185	58	54	77	26	36
Sign Control	Free			Free	Stop	
Grade	3%			-1%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	206	64	60	86	29	40
Pedestrians	8			98	98	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	1			8	8	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				1037		
pX, platoon unblocked						
vC, conflicting volume			368		549	434
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			368		549	434
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		93	92
cM capacity (veh/h)			1093		428	525

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	270	146	69
Volume Left	0	60	29
Volume Right	64	0	40
cSH	1700	1093	479
Volume to Capacity	0.16	0.05	0.14
Queue Length 95th (ft)	0	4	12
Control Delay (s)	0.0	3.8	13.8
Lane LOS		A	B
Approach Delay (s)	0.0	3.8	13.8
Approach LOS			B

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	43.5%	ICU Level of Service	A
Analysis Period (min)	15		

10: University Avenue & Sibley/Tjaden (west)

6/4/2008

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↖↗	
Volume (veh/h)	221	0	0	128	3	5
Sign Control	Free			Free	Stop	
Grade	2%			-2%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	246	0	0	142	3	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				795		
pX, platoon unblocked						
vC, conflicting volume			246		388	246
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			246		388	246
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		99	99
cM capacity (veh/h)			1320		616	793

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	246	142	9
Volume Left	0	0	3
Volume Right	0	0	6
cSH	1700	1700	716
Volume to Capacity	0.14	0.08	0.01
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.0	0.0	10.1
Lane LOS			B
Approach Delay (s)	0.0	0.0	10.1
Approach LOS			B

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	21.6%	ICU Level of Service	A
Analysis Period (min)	15		

11: University Avenue & Sibley/Tjaden (east)

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	Y	
Volume (veh/h)	215	11	15	126	2	2
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	239	12	17	140	2	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				333		
pX, platoon unblocked						
vC, conflicting volume			251		418	245
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			251		418	245
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		100	100
cM capacity (veh/h)			1314		584	794

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	251	157	4
Volume Left	0	17	2
Volume Right	12	0	2
cSH	1700	1314	673
Volume to Capacity	0.15	0.01	0.01
Queue Length 95th (ft)	0	1	0
Control Delay (s)	0.0	0.9	10.4
Lane LOS		A	B
Approach Delay (s)	0.0	0.9	10.4
Approach LOS			B

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	29.2%	ICU Level of Service	A
Analysis Period (min)	15		

12: University Avenue & Stewart Avenue

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	2	268	66	23	93	12	79	33	28	40	75	4
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	2	298	73	26	103	13	88	37	31	44	83	4

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	373	142	156	132
Volume Left (vph)	2	26	88	44
Volume Right (vph)	73	13	31	4
Hadj (s)	-0.08	0.01	0.03	0.08
Departure Headway (s)	4.9	5.3	5.5	5.6
Degree Utilization, x	0.50	0.21	0.24	0.20
Capacity (veh/h)	706	627	587	580
Control Delay (s)	12.7	9.7	10.2	10.0
Approach Delay (s)	12.7	9.7	10.2	10.0
Approach LOS	B	A	B	B

Intersection Summary			
Delay	11.2		
HCM Level of Service	B		
Intersection Capacity Utilization	42.8%	ICU Level of Service	A
Analysis Period (min)	15		

14: Parking Ramp Entrance & Central Avenue

	↙	↖	↑	↗	↘	↓
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Volume (veh/h)	0	18	43	0	39	73
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	20	48	0	43	81
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	216	48			48	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	216	48			48	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	98			97	
cM capacity (veh/h)	751	1021			1559	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	20	48	124
Volume Left	0	0	43
Volume Right	20	0	0
cSH	1021	1700	1559
Volume to Capacity	0.02	0.03	0.03
Queue Length 95th (ft)	1	0	2
Control Delay (s)	8.6	0.0	2.7
Lane LOS	A		A
Approach Delay (s)	8.6	0.0	2.7
Approach LOS	A		

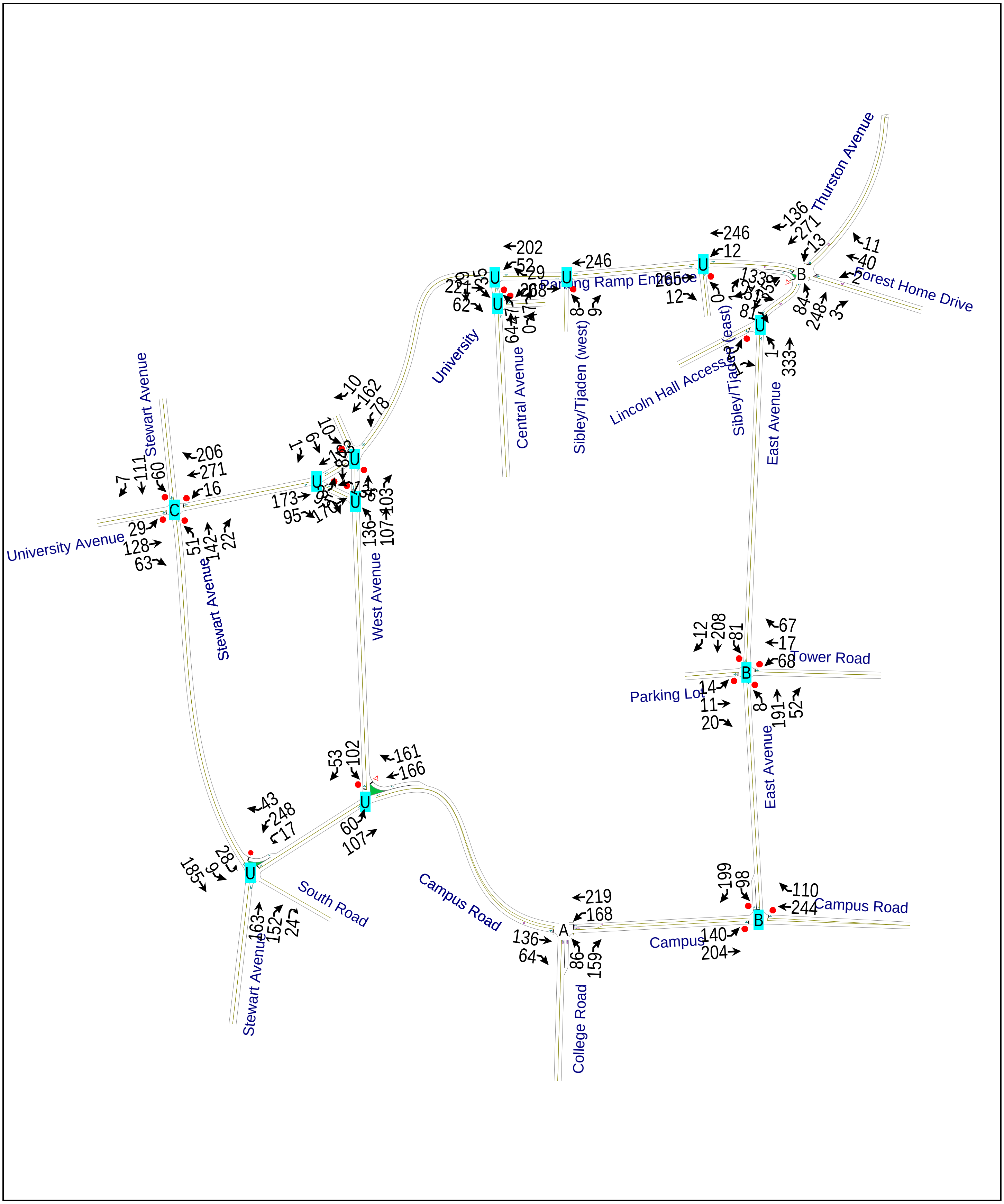
Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	22.7%	ICU Level of Service	A
Analysis Period (min)	15		

15: Lincoln Hall Access & East Avenue

Movement	EBL	EBR	NBL	NBT	SBT	SBR
	↗	↘	↖	↑	↓	↙
Lane Configurations	↰↱			↰↑	↓↳	
Volume (veh/h)	1	0	1	133	259	2
Sign Control	Stop			Free	Free	
Grade	0%			-3%	-1%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	1	0	1	148	288	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)					223	
pX, platoon unblocked						
vC, conflicting volume	439	289	290			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	439	289	290			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	575	750	1272			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	1	149	290
Volume Left	1	1	0
Volume Right	0	0	2
cSH	575	1272	1700
Volume to Capacity	0.00	0.00	0.17
Queue Length 95th (ft)	0	0	0
Control Delay (s)	11.3	0.1	0.0
Lane LOS	B	A	
Approach Delay (s)	11.3	0.1	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	23.8%	ICU Level of Service	A
Analysis Period (min)	15		


Thurston Avenue
Forest Home Drive
Parking Ramp Entrance
University
Central Avenue
Sibley/Tjaden (west)
Lincoln Hall Access
Sibley/Tjaden (east)
East Avenue
Stewart Avenue
University Avenue
West Avenue
Tower Road
Parking Lot
South Road
Campus Road
Campus
College Road

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✥			✥			✥	
Volume (vph)	133	51	81	2	40	11	84	248	3	13	271	136
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	11	11	11	11	11	11
Grade (%)		0%			-5%			-3%			1%	
Storage Length (ft)	0		100	0		0	0		0	0		0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.88	0.88		0.95			0.96			0.86	
Frt			0.850		0.972			0.999			0.956	
Flt Protected		0.965			0.998			0.988			0.999	
Satd. Flow (prot)	0	1798	1583	0	1772	0	0	1795	0	0	1490	0
Flt Permitted		0.749			0.988			0.798			0.986	
Satd. Flow (perm)	0	1221	1400	0	1750	0	0	1392	0	0	1457	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		333			424			223			628	
Travel Time (s)		7.6			9.6			5.1			14.3	
Confl. Peds. (#/hr)	100		50	50		100	206		475	475		206
Confl. Bikes (#/hr)			4			6						2
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	148	57	90	2	44	12	93	276	3	14	301	151
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	205	90	0	58	0	0	372	0	0	466	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2	2		6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0		22.0	22.0		22.0	22.0	
Total Split (s)	27.0	27.0	27.0	27.0	27.0	0.0	33.0	33.0	0.0	33.0	33.0	0.0
Total Split (%)	45.0%	45.0%	45.0%	45.0%	45.0%	0.0%	55.0%	55.0%	0.0%	55.0%	55.0%	0.0%
Maximum Green (s)	21.0	21.0	21.0	21.0	21.0		27.0	27.0		27.0	27.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		Max	Max		Max	Max	
Walk Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)		14.3	14.3		14.3			29.9			29.9	
Actuated g/C Ratio		0.25	0.25		0.25			0.53			0.53	

1: University Avenue & Thurston Avenue

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio		0.66	0.25		0.13			0.50			0.60	
Control Delay		28.5	16.7		14.9			12.9			15.0	
Queue Delay		0.0	0.0		0.0			0.0			0.0	
Total Delay		28.5	16.7		14.9			12.9			15.0	
LOS		C	B		B			B			B	
Approach Delay		24.9			14.9			12.9			15.0	
Approach LOS		C			B			B			B	
Queue Length 50th (ft)		56	22		14			70			94	
Queue Length 95th (ft)		112	50		35			174			#238	
Internal Link Dist (ft)		253			344			143			548	
Turn Bay Length (ft)			100									
Base Capacity (vph)		459	526		658			739			774	
Starvation Cap Reductn		0	0		0			0			0	
Spillback Cap Reductn		0	0		0			0			0	
Storage Cap Reductn		0	0		0			0			0	
Reduced v/c Ratio		0.45	0.17		0.09			0.50			0.60	

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 56.2

Natural Cycle: 55

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.66

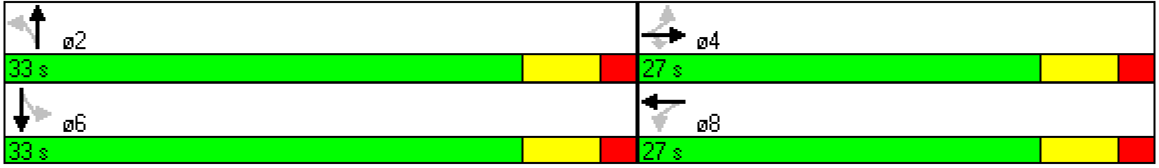
Intersection Signal Delay: 16.8 Intersection LOS: B

Intersection Capacity Utilization 75.5% ICU Level of Service D

Analysis Period (min) 15

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: University Avenue & Thurston Avenue



	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	14	11	20	68	17	67	8	191	52	81	208	12
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	16	12	22	76	19	74	9	212	58	90	231	13

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	50	169	279	334
Volume Left (vph)	16	76	9	90
Volume Right (vph)	22	74	58	13
Hadj (s)	-0.17	-0.14	-0.08	0.06
Departure Headway (s)	5.6	5.4	4.9	5.0
Degree Utilization, x	0.08	0.25	0.38	0.46
Capacity (veh/h)	552	604	699	695
Control Delay (s)	9.0	10.2	10.8	12.1
Approach Delay (s)	9.0	10.2	10.8	12.1
Approach LOS	A	B	B	B

Intersection Summary			
Delay	11.1		
HCM Level of Service	B		
Intersection Capacity Utilization	58.6%	ICU Level of Service	B
Analysis Period (min)	15		

	↗	→	←	↖	↘	↙
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		↰	↱
Sign Control		Stop	Stop		Stop	
Volume (vph)	140	204	244	110	98	199
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	156	227	271	122	109	221

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total (vph)	382	393	109	221
Volume Left (vph)	156	0	109	0
Volume Right (vph)	0	122	0	221
Hadj (s)	0.12	-0.15	0.53	-0.67
Departure Headway (s)	5.6	5.3	7.1	5.9
Degree Utilization, x	0.59	0.58	0.21	0.36
Capacity (veh/h)	623	654	467	571
Control Delay (s)	16.3	15.4	10.8	10.9
Approach Delay (s)	16.3	15.4	10.9	
Approach LOS	C	C	B	

Intersection Summary			
Delay	14.4		
HCM Level of Service	B		
Intersection Capacity Utilization	63.2%	ICU Level of Service	B
Analysis Period (min)	15		

4: Campus Road & College Road

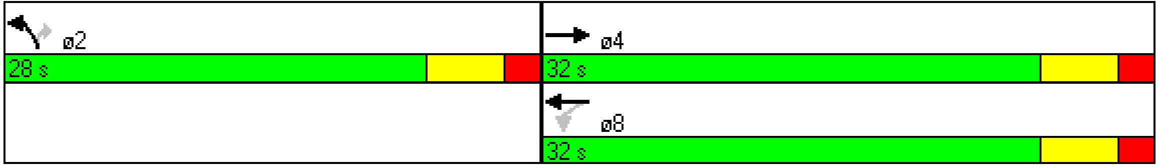
	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱		↰	↑	↰	↱
Volume (vph)	136	64	168	219	86	159
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	9	9	12	12
Storage Length (ft)		0	75		0	100
Storage Lanes		0	1		1	1
Taper Length (ft)		25	25		25	25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.98		0.97		0.68	0.66
Frt	0.957					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1748	0	1593	1676	1770	1583
Flt Permitted			0.620		0.950	
Satd. Flow (perm)	1748	0	1008	1676	1196	1048
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	50					177
Link Speed (mph)	30			30	30	
Link Distance (ft)	891			659	512	
Travel Time (s)	20.3			15.0	11.6	
Confl. Peds. (#/hr)		22	22		173	172
Confl. Bikes (#/hr)						3
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	151	71	187	243	96	177
Shared Lane Traffic (%)						
Lane Group Flow (vph)	222	0	187	243	96	177
Turn Type			Perm			Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Detector Phase	4		8	8	2	2
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0
Minimum Split (s)	22.0		22.0	22.0	22.0	22.0
Total Split (s)	32.0	0.0	32.0	32.0	28.0	28.0
Total Split (%)	53.3%	0.0%	53.3%	53.3%	46.7%	46.7%
Maximum Green (s)	26.0		26.0	26.0	22.0	22.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	4.0	6.0	6.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	None	Min	Min
Walk Time (s)	5.0		5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0		0	0	0	0
Act Effct Green (s)	11.2		11.2	11.2	7.8	7.8
Actuated g/C Ratio	0.36		0.36	0.36	0.25	0.25
v/c Ratio	0.34		0.52	0.41	0.22	0.45

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Control Delay	7.3		14.0	9.9	12.0	6.8
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	7.3		14.0	9.9	12.0	6.8
LOS	A		B	A	B	A
Approach Delay	7.3			11.7	8.6	
Approach LOS	A			B	A	
Queue Length 50th (ft)	17		21	26	12	0
Queue Length 95th (ft)	56		69	73	44	34
Internal Link Dist (ft)	811			579	432	
Turn Bay Length (ft)			75			100
Base Capacity (vph)	1486		852	1417	1284	809
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.15		0.22	0.17	0.07	0.22

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 31.5
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.52
Intersection Signal Delay: 9.8 Intersection LOS: A
Intersection Capacity Utilization 50.2% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 4: Campus Road & College Road



5: Campus Road & West Avenue

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰↑	↑	↱	↰↱	
Volume (veh/h)	60	107	166	161	102	53
Sign Control		Free	Free		Stop	
Grade		3%	-5%		1%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	67	119	184	179	113	59
Pedestrians			1		39	
Lane Width (ft)			12.0		12.0	
Walking Speed (ft/s)			4.0		4.0	
Percent Blockage			0		3	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			891			
pX, platoon unblocked						
vC, conflicting volume	223				477	223
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	223				477	223
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				77	93
cM capacity (veh/h)	1302				502	789

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	186	184	179	172
Volume Left	67	0	0	113
Volume Right	0	0	179	59
cSH	1302	1700	1700	573
Volume to Capacity	0.05	0.11	0.11	0.30
Queue Length 95th (ft)	4	0	0	31
Control Delay (s)	3.1	0.0	0.0	14.0
Lane LOS	A			B
Approach Delay (s)	3.1	0.0		14.0
Approach LOS				B

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↑	↰	
Volume (veh/h)	173	95	0	163	136	0
Sign Control	Free			Free	Stop	
Grade	3%			-3%	-1%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	192	106	0	181	151	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			298		426	245
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			298		426	245
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		74	100
cM capacity (veh/h)			1263		585	794

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	298	181	151
Volume Left	0	0	151
Volume Right	106	0	0
cSH	1700	1700	585
Volume to Capacity	0.18	0.11	0.26
Queue Length 95th (ft)	0	0	26
Control Delay (s)	0.0	0.0	13.3
Lane LOS			B
Approach Delay (s)	0.0	0.0	13.3
Approach LOS			B

Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	29.1%	ICU Level of Service	A
Analysis Period (min)	15		

8: University Avenue & West Avenue

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰			✥			↱			✥	
Volume (veh/h)	3	170	0	78	162	10	0	4	103	10	6	1
Sign Control		Free			Free			Stop			Stop	
Grade		-4%			3%			3%			-3%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	3	189	0	87	180	11	0	4	114	11	7	1
Pedestrians		3			5			166			5	
Lane Width (ft)		12.0			12.0			14.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			16			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	196			355			728	731	360	681	725	194
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	196			355			728	731	360	681	725	194
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			91			100	98	80	95	98	100
cM capacity (veh/h)	1371			1010			227	265	572	233	268	842

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	192	278	119	19
Volume Left	3	87	0	11
Volume Right	0	11	114	1
cSH	1371	1010	548	256
Volume to Capacity	0.00	0.09	0.22	0.07
Queue Length 95th (ft)	0	7	20	6
Control Delay (s)	0.2	3.4	13.4	20.2
Lane LOS	A	A	B	C
Approach Delay (s)	0.2	3.4	13.4	20.2
Approach LOS			B	C

Intersection Summary

Average Delay	4.8		
Intersection Capacity Utilization	44.9%	ICU Level of Service	A
Analysis Period (min)	15		

9: University Avenue & Central Avenue

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	Y	
Volume (veh/h)	221	62	52	202	47	47
Sign Control	Free			Free	Stop	
Grade	3%			-1%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	246	69	58	224	52	52
Pedestrians	8			98	98	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	1			8	8	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				1037		
pX, platoon unblocked						
vC, conflicting volume			412		726	476
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			412		726	476
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		85	89
cM capacity (veh/h)			1053		338	497

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	314	282	104
Volume Left	0	58	52
Volume Right	69	0	52
cSH	1700	1053	402
Volume to Capacity	0.18	0.05	0.26
Queue Length 95th (ft)	0	4	26
Control Delay (s)	0.0	2.2	17.1
Lane LOS		A	C
Approach Delay (s)	0.0	2.2	17.1
Approach LOS			C

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	52.2%	ICU Level of Service	A
Analysis Period (min)	15		

10: University Avenue & Sibley/Tjaden (west)

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↖↗	
Volume (veh/h)	268	0	0	246	8	9
Sign Control	Free			Free	Stop	
Grade	2%			-2%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	298	0	0	273	9	10
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				795		
pX, platoon unblocked						
vC, conflicting volume			298		571	298
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			298		571	298
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		98	99
cM capacity (veh/h)			1263		482	742

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	298	273	19
Volume Left	0	0	9
Volume Right	0	0	10
cSH	1700	1700	592
Volume to Capacity	0.18	0.16	0.03
Queue Length 95th (ft)	0	0	2
Control Delay (s)	0.0	0.0	11.3
Lane LOS			B
Approach Delay (s)	0.0	0.0	11.3
Approach LOS			B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	24.1%	ICU Level of Service	A
Analysis Period (min)	15		

11: University Avenue & Sibley/Tjaden (east)

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	⋎	
Volume (veh/h)	265	12	12	246	0	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	294	13	13	273	0	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				333		
pX, platoon unblocked						
vC, conflicting volume			308		601	301
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			308		601	301
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		100	100
cM capacity (veh/h)			1253		458	739

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	308	287	1
Volume Left	0	13	0
Volume Right	13	0	1
cSH	1700	1253	739
Volume to Capacity	0.18	0.01	0.00
Queue Length 95th (ft)	0	1	0
Control Delay (s)	0.0	0.5	9.9
Lane LOS		A	A
Approach Delay (s)	0.0	0.5	9.9
Approach LOS			A

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	32.7%	ICU Level of Service	A
Analysis Period (min)	15		

12: University Avenue & Stewart Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	29	128	63	16	271	206	51	142	22	60	111	7
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	32	142	70	18	301	229	57	158	24	67	123	8

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	244	548	239	198
Volume Left (vph)	32	18	57	67
Volume Right (vph)	70	229	24	8
Hadj (s)	-0.11	-0.21	0.02	0.08
Departure Headway (s)	6.5	5.8	6.9	7.1
Degree Utilization, x	0.44	0.88	0.46	0.39
Capacity (veh/h)	511	600	481	468
Control Delay (s)	14.5	36.9	15.6	14.5
Approach Delay (s)	14.5	36.9	15.6	14.5
Approach LOS	B	E	C	B

Intersection Summary			
Delay	24.7		
HCM Level of Service	C		
Intersection Capacity Utilization	51.1%	ICU Level of Service	A
Analysis Period (min)	15		

14: Parking Ramp Entrance & Central Avenue

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	⋎		↱			↰
Volume (veh/h)	0	29	64	0	35	79
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	32	71	0	39	88
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	237	71			71	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	237	71			71	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	97			97	
cM capacity (veh/h)	732	991			1529	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	32	71	127
Volume Left	0	0	39
Volume Right	32	0	0
cSH	991	1700	1529
Volume to Capacity	0.03	0.04	0.03
Queue Length 95th (ft)	3	0	2
Control Delay (s)	8.8	0.0	2.4
Lane LOS	A		A
Approach Delay (s)	8.8	0.0	2.4
Approach LOS	A		

Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	22.8%	ICU Level of Service	A
Analysis Period (min)	15		

15: Lincoln Hall Access & East Avenue

	↗	↘	↖	↑	↓	↙
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↱			↰↑	↑↱	
Volume (veh/h)	2	1	1	333	352	2
Sign Control	Stop			Free	Free	
Grade	0%			-3%	-1%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	2	1	1	370	391	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)					223	
pX, platoon unblocked						
vC, conflicting volume	764	392	393			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	764	392	393			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	100	100			
cM capacity (veh/h)	371	657	1165			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	3	371	393
Volume Left	2	1	0
Volume Right	1	0	2
cSH	434	1165	1700
Volume to Capacity	0.01	0.00	0.23
Queue Length 95th (ft)	1	0	0
Control Delay (s)	13.4	0.0	0.0
Lane LOS	B	A	
Approach Delay (s)	13.4	0.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	28.6%	ICU Level of Service	A
Analysis Period (min)	15		

6: West Avenue & Performance by approach

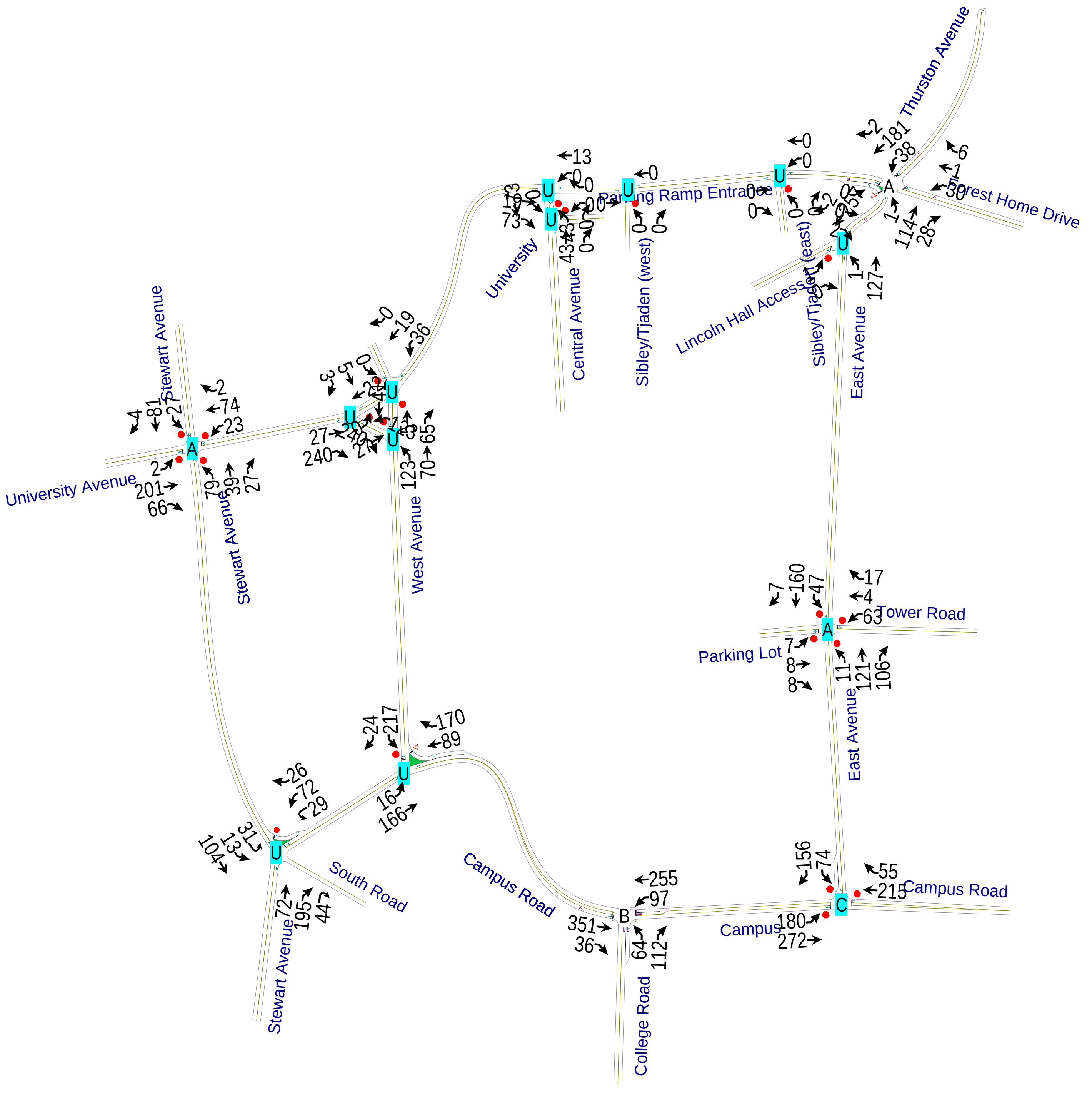
Approach	EB	NB	SB	All
Total Delay (hr)	0.0	0.1	0.2	0.3
Delay / Veh (s)	0.1	1.5	5.8	2.1

13: Campus Road & Stewart Avenue Performance by approach

Approach	WB	NB	SB	All
Total Delay (hr)	1.4	0.1	0.2	1.7
Delay / Veh (s)	17.3	1.2	3.0	7.2

Total Zone Performance

Total Delay (hr)	2.0
Delay / Veh (s)	


Thurston Avenue
Forest Home Drive
Parking Ramp Entrance
University
Central Avenue
Sibley/Tjaden (west)
Sibley/Tjaden (east)
Lincoln Hall Access
East Avenue
Stewart Avenue
University Avenue
West Avenue
Tower Road
Parking Lot
South Road
Campus Road
Campus
College Road
A
U
B
C
2
181
38
6
1
30
1
114
28
1
127
13
0
19
73
43
0
17
4
63
160
47
7
8
11
121
106
4
81
27
2
74
23
201
66
79
39
27
0
19
36
3
5
27
240
123
70
65
24
217
170
89
16
166
26
72
29
31
13
104
72
195
44
255
97
351
36
64
112
156
74
55
215
180
272

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✥			✥			✥	
Volume (vph)	0	0	2	30	1	6	1	114	28	38	181	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	11	11	11	11	11	11
Grade (%)		0%			-5%			-3%			1%	
Storage Length (ft)	0		100	0		0	0		0	0		0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.88		0.89			0.88			0.92	
Frt			0.850		0.977			0.974			0.999	
Flt Protected					0.961						0.992	
Satd. Flow (prot)	0	1863	1583	0	1729	0	0	1577	0	0	1770	0
Flt Permitted								0.999			0.939	
Satd. Flow (perm)	0	1863	1399	0	1663	0	0	1572	0	0	1542	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		333			424			223			628	
Travel Time (s)		7.6			9.6			5.1			14.3	
Confl. Peds. (#/hr)	100		50	50		100	206		475	475		206
Confl. Bikes (#/hr)			4			6						2
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	0	2	33	1	7	1	127	31	42	201	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	2	0	41	0	0	159	0	0	245	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2	2		6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0		22.0	22.0		22.0	22.0	
Total Split (s)	25.0	25.0	25.0	25.0	25.0	0.0	35.0	35.0	0.0	35.0	35.0	0.0
Total Split (%)	41.7%	41.7%	41.7%	41.7%	41.7%	0.0%	58.3%	58.3%	0.0%	58.3%	58.3%	0.0%
Maximum Green (s)	19.0	19.0	19.0	19.0	19.0		29.0	29.0		29.0	29.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		Max	Max		Max	Max	
Walk Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)			6.9		7.3			47.2			47.2	
Actuated g/C Ratio			0.13		0.13			0.86			0.86	

1: University Avenue & Thurston Avenue

6/4/2008

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio			0.01		0.19			0.12			0.18	
Control Delay			22.0		24.1			3.0			3.1	
Queue Delay			0.0		0.0			0.0			0.0	
Total Delay			22.0		24.1			3.0			3.1	
LOS			C		C			A			A	
Approach Delay					24.1			3.0			3.1	
Approach LOS					C			A			A	
Queue Length 50th (ft)			1		11			0			0	
Queue Length 95th (ft)			6		36			39			60	
Internal Link Dist (ft)		253			344			143			548	
Turn Bay Length (ft)			100									
Base Capacity (vph)			491		584			1356			1330	
Starvation Cap Reductn			0		0			0			0	
Spillback Cap Reductn			0		0			0			0	
Storage Cap Reductn			0		0			0			0	
Reduced v/c Ratio			0.00		0.07			0.12			0.18	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 54.7
Natural Cycle: 45
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.19
Intersection Signal Delay: 5.1 Intersection LOS: A
Intersection Capacity Utilization 54.9% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 1: University Avenue & Thurston Avenue

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	7	8	8	63	4	17	11	121	106	47	160	7
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	8	9	9	70	4	19	12	134	118	52	178	8

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	26	93	264	238
Volume Left (vph)	8	70	12	52
Volume Right (vph)	9	19	118	8
Hadj (s)	-0.11	0.06	-0.22	0.06
Departure Headway (s)	5.1	5.1	4.3	4.6
Degree Utilization, x	0.04	0.13	0.31	0.30
Capacity (veh/h)	628	634	812	756
Control Delay (s)	8.3	8.9	9.2	9.5
Approach Delay (s)	8.3	8.9	9.2	9.5
Approach LOS	A	A	A	A

Intersection Summary			
Delay	9.2		
HCM Level of Service	A		
Intersection Capacity Utilization	48.2%	ICU Level of Service	A
Analysis Period (min)	15		

3: Campus Road & East Avenue

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		↰	↱
Sign Control		Stop	Stop		Stop	
Volume (vph)	180	272	215	55	74	156
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	200	302	239	61	82	173

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total (vph)	502	300	82	173
Volume Left (vph)	200	0	82	0
Volume Right (vph)	0	61	0	173
Hadj (s)	0.11	-0.09	0.53	-0.67
Departure Headway (s)	5.2	5.3	7.1	5.9
Degree Utilization, x	0.73	0.44	0.16	0.28
Capacity (veh/h)	673	650	471	562
Control Delay (s)	20.9	12.4	10.3	10.0
Approach Delay (s)	20.9	12.4	10.1	
Approach LOS	C	B	B	

Intersection Summary			
Delay	15.9		
HCM Level of Service	C		
Intersection Capacity Utilization	63.5%	ICU Level of Service	B
Analysis Period (min)	15		

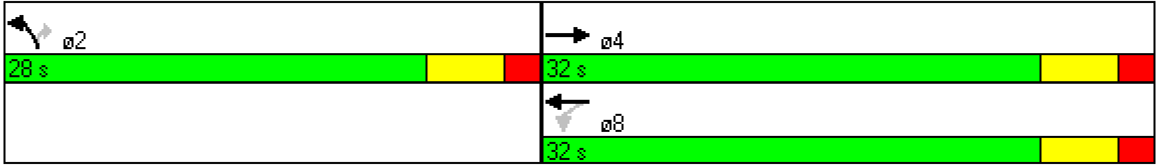
	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱		↰	↑	↰	↱
Volume (vph)	351	36	97	255	64	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	9	9	12	12
Storage Length (ft)		0	75		0	100
Storage Lanes		0	1		1	1
Taper Length (ft)		25	25		25	25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99		0.98		0.68	0.66
Frt	0.987					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1828	0	1593	1676	1770	1583
Flt Permitted			0.510		0.950	
Satd. Flow (perm)	1828	0	838	1676	1196	1048
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	11					124
Link Speed (mph)	30			30	30	
Link Distance (ft)	891			659	512	
Travel Time (s)	20.3			15.0	11.6	
Confl. Peds. (#/hr)		22	22		173	172
Confl. Bikes (#/hr)						3
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	390	40	108	283	71	124
Shared Lane Traffic (%)						
Lane Group Flow (vph)	430	0	108	283	71	124
Turn Type			Perm			Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Detector Phase	4		8	8	2	2
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0
Minimum Split (s)	22.0		22.0	22.0	22.0	22.0
Total Split (s)	32.0	0.0	32.0	32.0	28.0	28.0
Total Split (%)	53.3%	0.0%	53.3%	53.3%	46.7%	46.7%
Maximum Green (s)	26.0		26.0	26.0	22.0	22.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	4.0	6.0	6.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	None	Min	Min
Walk Time (s)	5.0		5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0		0	0	0	0
Act Effct Green (s)	12.5		12.5	12.5	7.3	7.3
Actuated g/C Ratio	0.39		0.39	0.39	0.23	0.23
v/c Ratio	0.60		0.33	0.43	0.18	0.37

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Control Delay	11.6		10.1	9.6	12.4	7.0
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	11.6		10.1	9.6	12.4	7.0
LOS	B		B	A	B	A
Approach Delay	11.6			9.7	9.0	
Approach LOS	B			A	A	
Queue Length 50th (ft)	48		11	30	9	0
Queue Length 95th (ft)	122		39	80	35	29
Internal Link Dist (ft)	811			579	432	
Turn Bay Length (ft)			75			100
Base Capacity (vph)	1519		695	1391	1247	775
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.28		0.16	0.20	0.06	0.16

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 32.2
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.60
Intersection Signal Delay: 10.4 Intersection LOS: B
Intersection Capacity Utilization 54.5% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 4: Campus Road & College Road



5: Campus Road & West Avenue

	↗	→	←	↖	↘	↙
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↑	↱	Y	
Volume (veh/h)	16	166	89	170	217	24
Sign Control		Free	Free		Stop	
Grade		3%	-5%		1%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	18	184	99	189	241	27
Pedestrians			1		39	
Lane Width (ft)			12.0		12.0	
Walking Speed (ft/s)			4.0		4.0	
Percent Blockage			0		3	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			891			
pX, platoon unblocked						
vC, conflicting volume	138				359	138
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	138				359	138
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				61	97
cM capacity (veh/h)	1399				610	881

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	202	99	189	268
Volume Left	18	0	0	241
Volume Right	0	0	189	27
cSH	1399	1700	1700	630
Volume to Capacity	0.01	0.06	0.11	0.43
Queue Length 95th (ft)	1	0	0	53
Control Delay (s)	0.8	0.0	0.0	14.9
Lane LOS	A			B
Approach Delay (s)	0.8	0.0		14.9
Approach LOS				B

Intersection Summary			
Average Delay	5.5		
Intersection Capacity Utilization	36.4%	ICU Level of Service	A
Analysis Period (min)	15		

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↑	↰	
Volume (veh/h)	27	240	0	22	123	0
Sign Control	Free			Free	Stop	
Grade	3%			-3%	-1%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	30	267	0	24	137	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			297		188	163
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			297		188	163
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		83	100
cM capacity (veh/h)			1265		801	881

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	297	24	137
Volume Left	0	0	137
Volume Right	267	0	0
cSH	1700	1700	801
Volume to Capacity	0.17	0.01	0.17
Queue Length 95th (ft)	0	0	15
Control Delay (s)	0.0	0.0	10.4
Lane LOS			B
Approach Delay (s)	0.0	0.0	10.4
Approach LOS			B

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	29.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰			✥			↱			✥	
Volume (veh/h)	0	27	0	36	19	0	0	5	65	0	5	3
Sign Control		Free			Free			Stop			Stop	
Grade		-4%			3%			3%			-3%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	30	0	40	21	0	0	6	72	0	6	3
Pedestrians		3			5			166			5	
Lane Width (ft)		12.0			12.0			14.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			16			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	26			196			306	302	201	216	302	29
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	26			196			306	302	201	216	302	29
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			100	99	90	100	99	100
cM capacity (veh/h)	1581			1155			454	492	701	556	493	1039

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	30	61	78	9
Volume Left	0	40	0	0
Volume Right	0	0	72	3
cSH	1581	1155	681	614
Volume to Capacity	0.00	0.03	0.11	0.01
Queue Length 95th (ft)	0	3	10	1
Control Delay (s)	0.0	5.5	11.0	11.0
Lane LOS		A	B	B
Approach Delay (s)	0.0	5.5	11.0	11.0
Approach LOS			B	B

Intersection Summary			
Average Delay	7.2		
Intersection Capacity Utilization	26.1%	ICU Level of Service	A
Analysis Period (min)	15		

9: University Avenue & Central Avenue

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	⇅	
Volume (veh/h)	19	73	0	13	43	0
Sign Control	Free			Free	Stop	
Grade	3%			-1%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	21	81	0	14	48	0
Pedestrians	8			98	98	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	1			8	8	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				1037		
pX, platoon unblocked						
vC, conflicting volume			200		182	258
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			200		182	258
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		94	100
cM capacity (veh/h)			1260		736	659

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	102	14	48
Volume Left	0	0	48
Volume Right	81	0	0
cSH	1700	1260	736
Volume to Capacity	0.06	0.00	0.06
Queue Length 95th (ft)	0	0	5
Control Delay (s)	0.0	0.0	10.2
Lane LOS			B
Approach Delay (s)	0.0	0.0	10.2
Approach LOS			B

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	26.7%	ICU Level of Service	A
Analysis Period (min)	15		

12: University Avenue & Stewart Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	2	201	66	23	74	2	79	39	27	27	81	4
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	2	223	73	26	82	2	88	43	30	30	90	4

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	299	110	161	124
Volume Left (vph)	2	26	88	30
Volume Right (vph)	73	2	30	4
Hadj (s)	-0.11	0.07	0.03	0.06
Departure Headway (s)	4.7	5.1	5.1	5.2
Degree Utilization, x	0.39	0.16	0.23	0.18
Capacity (veh/h)	721	643	644	626
Control Delay (s)	10.7	9.1	9.7	9.4
Approach Delay (s)	10.7	9.1	9.7	9.4
Approach LOS	B	A	A	A

Intersection Summary			
Delay	10.0		
HCM Level of Service	A		
Intersection Capacity Utilization	42.4%	ICU Level of Service	A
Analysis Period (min)	15		

	↙	↖	↑	↗	↘	↓
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Volume (veh/h)	0	0	43	0	0	73
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	0	48	0	0	81
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	129	48			48	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	129	48			48	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	865	1021			1559	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	0	48	81
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	1559
Volume to Capacity	0.00	0.03	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	7.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	1	0	1	127	257	2
Sign Control	Stop			Free	Free	
Grade	0%			-3%	-1%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	1	0	1	141	286	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)					223	
pX, platoon unblocked						
vC, conflicting volume	430	287	288			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	430	287	288			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	582	752	1274			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	1	142	288
Volume Left	1	1	0
Volume Right	0	0	2
cSH	582	1274	1700
Volume to Capacity	0.00	0.00	0.17
Queue Length 95th (ft)	0	0	0
Control Delay (s)	11.2	0.1	0.0
Lane LOS	B	A	
Approach Delay (s)	11.2	0.1	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	23.6%	ICU Level of Service	A
Analysis Period (min)	15		

6: West Avenue & Performance by approach

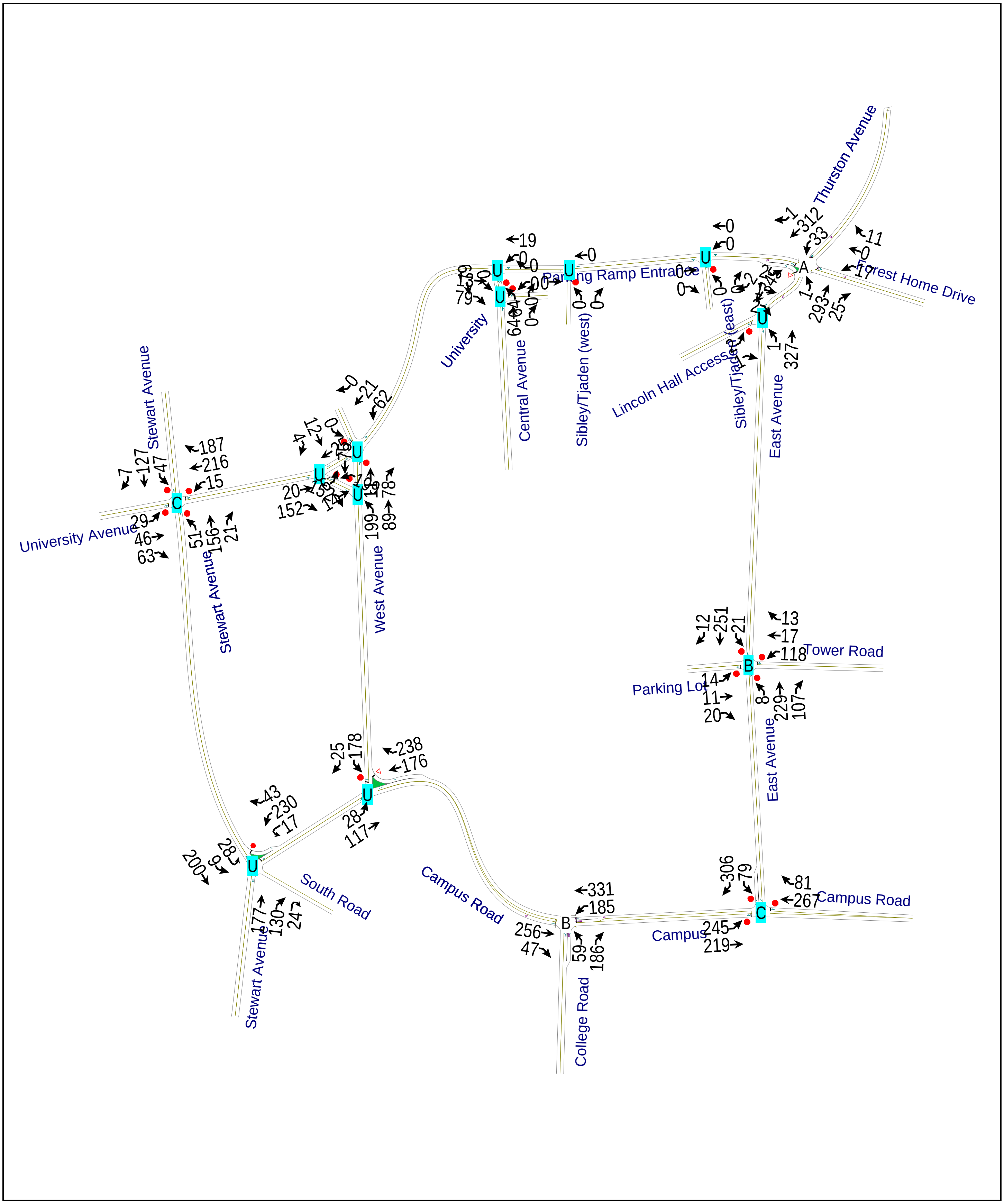
Approach	EB	NB	SB	All
Total Delay (hr)	0.0	0.1	0.1	0.2
Delay / Veh (s)	0.1	1.5	6.2	1.2

13: Campus Road & Stewart Avenue Performance by approach

Approach	WB	NB	SB	All
Total Delay (hr)	0.2	0.1	0.1	0.5
Delay / Veh (s)	6.7	1.3	2.7	2.8

Total Zone Performance

Total Delay (hr)	0.6
Delay / Veh (s)	114.5


Thurston Avenue
Forest Home Drive
Parking Ramp Entrance
University
Central Avenue
Sibley/Tjaden (west)
Lincoln Hall Access
Sibley/Tjaden (east)
East Avenue
Stewart Avenue
University Avenue
West Avenue
Tower Road
Parking Lot
South Road
Campus Road
Campus
College Road
A
B
C
U
1
312
33
11
0
17
1
293
25
1
327
19
0
0
0
0
0
187
216
15
7
127
47
29
46
63
51
156
21
0
21
62
12
4
20
152
199
89
78
13
17
118
12
251
21
14
11
20
8
229
107
238
176
25
178
43
230
17
28
9
200
28
117
177
130
24
331
185
256
47
59
186
306
79
81
267
245
219

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✥			✥			✥	
Volume (vph)	2	1	2	17	0	11	1	293	25	33	312	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	11	11	11	11	11	11
Grade (%)		0%			-5%			-3%			1%	
Storage Length (ft)	0		100	0		0	0		0	0		0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.88	0.88		0.87			0.95			0.97	
Frt			0.850		0.948			0.989				
Flt Protected		0.968			0.970						0.995	
Satd. Flow (prot)	0	1803	1583	0	1614	0	0	1724	0	0	1781	0
Flt Permitted								0.999			0.948	
Satd. Flow (perm)	0	1640	1400	0	1568	0	0	1721	0	0	1647	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		333			424			223			628	
Travel Time (s)		7.6			9.6			5.1			14.3	
Confl. Peds. (#/hr)	100		50	50		100	206		475	475		206
Confl. Bikes (#/hr)			4			6						2
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	2	1	2	19	0	12	1	326	28	37	347	1
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	3	2	0	31	0	0	355	0	0	385	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2	2		6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0		22.0	22.0		22.0	22.0	
Total Split (s)	27.0	27.0	27.0	27.0	27.0	0.0	33.0	33.0	0.0	33.0	33.0	0.0
Total Split (%)	45.0%	45.0%	45.0%	45.0%	45.0%	0.0%	55.0%	55.0%	0.0%	55.0%	55.0%	0.0%
Maximum Green (s)	21.0	21.0	21.0	21.0	21.0		27.0	27.0		27.0	27.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		Max	Max		Max	Max	
Walk Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)		6.2	6.2		6.7			45.9			45.9	
Actuated g/C Ratio		0.12	0.12		0.14			0.93			0.93	

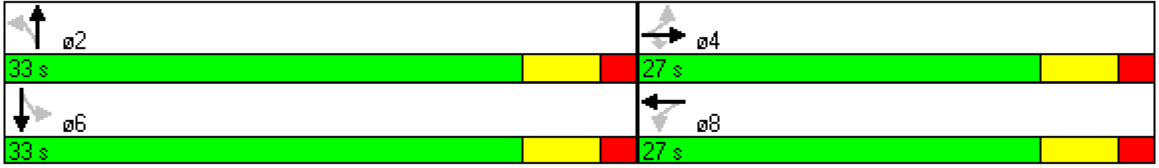
1: University Avenue & Thurston Avenue

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio		0.01	0.01		0.15			0.22			0.25	
Control Delay		19.7	19.5		21.0			2.1			2.2	
Queue Delay		0.0	0.0		0.0			0.0			0.0	
Total Delay		19.7	19.5		21.0			2.1			2.2	
LOS		B	B		C			A			A	
Approach Delay		19.6			21.0			2.1			2.2	
Approach LOS		B			C			A			A	
Queue Length 50th (ft)		1	1		8			0			0	
Queue Length 95th (ft)		7	6		29			81			92	
Internal Link Dist (ft)		253			344			143			548	
Turn Bay Length (ft)			100									
Base Capacity (vph)		698	596		667			1594			1525	
Starvation Cap Reductn		0	0		0			0			0	
Spillback Cap Reductn		0	0		0			0			0	
Storage Cap Reductn		0	0		0			0			0	
Reduced v/c Ratio		0.00	0.00		0.05			0.22			0.25	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 49.6
Natural Cycle: 45
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.25
Intersection Signal Delay: 3.0 Intersection LOS: A
Intersection Capacity Utilization 64.3% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 1: University Avenue & Thurston Avenue



	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	14	11	20	118	17	13	8	229	107	21	251	12
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	16	12	22	131	19	14	9	254	119	23	279	13

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	50	164	382	316
Volume Left (vph)	16	131	9	23
Volume Right (vph)	22	14	119	13
Hadj (s)	-0.17	0.14	-0.15	0.02
Departure Headway (s)	5.8	5.9	4.9	5.1
Degree Utilization, x	0.08	0.27	0.52	0.45
Capacity (veh/h)	509	550	705	673
Control Delay (s)	9.3	11.0	12.9	12.1
Approach Delay (s)	9.3	11.0	12.9	12.1
Approach LOS	A	B	B	B

Intersection Summary			
Delay	12.1		
HCM Level of Service	B		
Intersection Capacity Utilization	47.0%	ICU Level of Service	A
Analysis Period (min)	15		

3: Campus Road & East Avenue

	↗	→	←	↖	↘	↙
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		↰	↱
Sign Control		Stop	Stop		Stop	
Volume (vph)	245	219	267	81	79	306
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	272	243	297	90	88	340

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total (vph)	516	387	88	340
Volume Left (vph)	272	0	88	0
Volume Right (vph)	0	90	0	340
Hadj (s)	0.14	-0.11	0.53	-0.67
Departure Headway (s)	6.1	6.1	7.6	6.4
Degree Utilization, x	0.87	0.65	0.19	0.60
Capacity (veh/h)	516	571	450	530
Control Delay (s)	36.2	19.6	11.1	17.3
Approach Delay (s)	36.2	19.6	16.0	
Approach LOS	E	C	C	

Intersection Summary			
Delay	24.9		
HCM Level of Service	C		
Intersection Capacity Utilization	68.8%	ICU Level of Service	C
Analysis Period (min)	15		

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱		↰	↑	↰	↱
Volume (vph)	256	47	185	331	59	186
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	9	9	12	12
Storage Length (ft)		0	75		0	100
Storage Lanes		0	1		1	1
Taper Length (ft)		25	25		25	25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99		0.98		0.68	0.66
Frt	0.979					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1807	0	1593	1676	1770	1583
Flt Permitted			0.558		0.950	
Satd. Flow (perm)	1807	0	913	1676	1196	1048
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	19					207
Link Speed (mph)	30			30	30	
Link Distance (ft)	891			659	512	
Travel Time (s)	20.3			15.0	11.6	
Confl. Peds. (#/hr)		22	22		173	172
Confl. Bikes (#/hr)						3
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	284	52	206	368	66	207
Shared Lane Traffic (%)						
Lane Group Flow (vph)	336	0	206	368	66	207
Turn Type			Perm			Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Detector Phase	4		8	8	2	2
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0
Minimum Split (s)	22.0		22.0	22.0	22.0	22.0
Total Split (s)	32.0	0.0	32.0	32.0	28.0	28.0
Total Split (%)	53.3%	0.0%	53.3%	53.3%	46.7%	46.7%
Maximum Green (s)	26.0		26.0	26.0	22.0	22.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	4.0	6.0	6.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	None	Min	Min
Walk Time (s)	5.0		5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0		0	0	0	0
Act Effct Green (s)	13.9		13.9	13.9	7.9	7.9
Actuated g/C Ratio	0.40		0.40	0.40	0.23	0.23
v/c Ratio	0.45		0.56	0.55	0.16	0.52

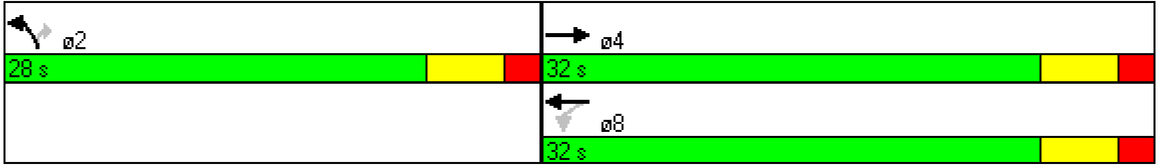
4: Campus Road & College Road

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Control Delay	9.2		14.6	11.2	13.6	8.2
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	9.2		14.6	11.2	13.6	8.2
LOS	A		B	B	B	A
Approach Delay	9.2			12.4	9.5	
Approach LOS	A			B	A	
Queue Length 50th (ft)	34		24	42	9	0
Queue Length 95th (ft)	98		83	118	39	41
Internal Link Dist (ft)	811			579	432	
Turn Bay Length (ft)			75			100
Base Capacity (vph)	1441		726	1333	1200	777
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.23		0.28	0.28	0.06	0.27

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 34.6
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.56
Intersection Signal Delay: 10.8 Intersection LOS: B
Intersection Capacity Utilization 55.2% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 4: Campus Road & College Road



5: Campus Road & West Avenue

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↑	↱	Y	
Volume (veh/h)	28	117	176	238	178	25
Sign Control		Free	Free		Stop	
Grade		3%	-5%		1%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	31	130	196	264	198	28
Pedestrians			1		39	
Lane Width (ft)			12.0		12.0	
Walking Speed (ft/s)			4.0		4.0	
Percent Blockage			0		3	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			891			
pX, platoon unblocked						
vC, conflicting volume	235				428	235
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	235				428	235
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				64	96
cM capacity (veh/h)	1289				551	778

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	161	196	264	226
Volume Left	31	0	0	198
Volume Right	0	0	264	28
cSH	1289	1700	1700	571
Volume to Capacity	0.02	0.12	0.16	0.39
Queue Length 95th (ft)	2	0	0	47
Control Delay (s)	1.7	0.0	0.0	15.4
Lane LOS	A			C
Approach Delay (s)	1.7	0.0		15.4
Approach LOS				C

Intersection Summary			
Average Delay	4.4		
Intersection Capacity Utilization	41.3%	ICU Level of Service	A
Analysis Period (min)	15		

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↑	↰	
Volume (veh/h)	20	152	0	25	199	0
Sign Control	Free			Free	Stop	
Grade	3%			-3%	-1%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	22	169	0	28	221	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			191		134	107
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			191		134	107
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		74	100
cM capacity (veh/h)			1383		859	947

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	191	28	221
Volume Left	0	0	221
Volume Right	169	0	0
cSH	1700	1700	859
Volume to Capacity	0.11	0.02	0.26
Queue Length 95th (ft)	0	0	26
Control Delay (s)	0.0	0.0	10.6
Lane LOS			B
Approach Delay (s)	0.0	0.0	10.6
Approach LOS			B

Intersection Summary			
Average Delay	5.3		
Intersection Capacity Utilization	28.1%	ICU Level of Service	A
Analysis Period (min)	15		

8: University Avenue & West Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰			✥			↱			✥	
Volume (veh/h)	6	14	0	62	21	0	0	11	78	0	12	4
Sign Control		Free			Free			Stop			Stop	
Grade		-4%			3%			3%			-3%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	7	16	0	69	23	0	0	12	87	0	13	4
Pedestrians		3			5			166			5	
Lane Width (ft)		12.0			12.0			14.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			16			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	28			182			370	361	187	293	361	31
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	28			182			370	361	187	293	361	31
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			94			100	97	88	100	97	100
cM capacity (veh/h)	1578			1169			398	443	714	469	443	1036

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	22	92	99	18
Volume Left	7	69	0	0
Volume Right	0	0	87	4
cSH	1578	1169	664	517
Volume to Capacity	0.00	0.06	0.15	0.03
Queue Length 95th (ft)	0	5	13	3
Control Delay (s)	2.2	6.3	11.4	12.2
Lane LOS	A	A	B	B
Approach Delay (s)	2.2	6.3	11.4	12.2
Approach LOS			B	B

Intersection Summary			
Average Delay	8.5		
Intersection Capacity Utilization	27.0%	ICU Level of Service	A
Analysis Period (min)	15		

9: University Avenue & Central Avenue

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	Y	
Volume (veh/h)	13	79	0	19	64	0
Sign Control	Free			Free	Stop	
Grade	3%			-1%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	14	88	0	21	71	0
Pedestrians	8			98	98	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	1			8	8	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				1037		
pX, platoon unblocked						
vC, conflicting volume			200		185	254
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			200		185	254
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		90	100
cM capacity (veh/h)			1260		733	661

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	102	21	71
Volume Left	0	0	71
Volume Right	88	0	0
cSH	1700	1260	733
Volume to Capacity	0.06	0.00	0.10
Queue Length 95th (ft)	0	0	8
Control Delay (s)	0.0	0.0	10.4
Lane LOS			B
Approach Delay (s)	0.0	0.0	10.4
Approach LOS			B

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	26.8%	ICU Level of Service	A
Analysis Period (min)	15		

12: University Avenue & Stewart Avenue

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	29	46	63	15	216	187	51	156	21	47	127	7
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	32	51	70	17	240	208	57	173	23	52	141	8

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	153	464	253	201
Volume Left (vph)	32	17	57	52
Volume Right (vph)	70	208	23	8
Hadj (s)	-0.20	-0.23	0.02	0.06
Departure Headway (s)	6.0	5.4	6.1	6.3
Degree Utilization, x	0.26	0.70	0.43	0.35
Capacity (veh/h)	508	638	530	499
Control Delay (s)	11.1	20.0	13.8	12.7
Approach Delay (s)	11.1	20.0	13.8	12.7
Approach LOS	B	C	B	B

Intersection Summary			
Delay	15.9		
HCM Level of Service	C		
Intersection Capacity Utilization	46.9%	ICU Level of Service	A
Analysis Period (min)	15		

14: Parking Ramp Entrance & Central Avenue

	↙	↖	↑	↗	↘	↓
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Volume (veh/h)	0	0	64	0	0	79
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	0	71	0	0	88
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	159	71			71	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	159	71			71	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	832	991			1529	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	0	71	88
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	1529
Volume to Capacity	0.00	0.04	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	7.5%	ICU Level of Service	A
Analysis Period (min)	15		

15: Lincoln Hall Access & East Avenue

	↗	↘	↖	↑	↓	↙
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↰	↱	
Volume (veh/h)	2	1	1	327	345	2
Sign Control	Stop			Free	Free	
Grade	0%			-3%	-1%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	2	1	1	363	383	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)					223	
pX, platoon unblocked	0.96	0.96	0.96			
vC, conflicting volume	750	384	386			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	716	334	335			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	100	100			
cM capacity (veh/h)	379	677	1171			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	3	364	386
Volume Left	2	1	0
Volume Right	1	0	2
cSH	444	1171	1700
Volume to Capacity	0.01	0.00	0.23
Queue Length 95th (ft)	1	0	0
Control Delay (s)	13.2	0.0	0.0
Lane LOS	B	A	
Approach Delay (s)	13.2	0.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	28.3%	ICU Level of Service	A
Analysis Period (min)	15		

6: West Avenue & Performance by approach

Approach	EB	NB	SB	All
Total Delay (hr)	0.0	0.0	0.0	0.0
Delay / Veh (s)	0.1	1.4	6.4	2.0

13: Campus Road & Stewart Avenue Performance by approach

Approach	WB	NB	SB	All
Total Delay (hr)	0.1	0.0	0.0	0.2
Delay / Veh (s)	8.6	1.6	3.9	4.3

Total Zone Performance

Total Delay (hr)	0.2
Delay / Veh (s)	-761.6

Appendix C:

Construction Detour Figures

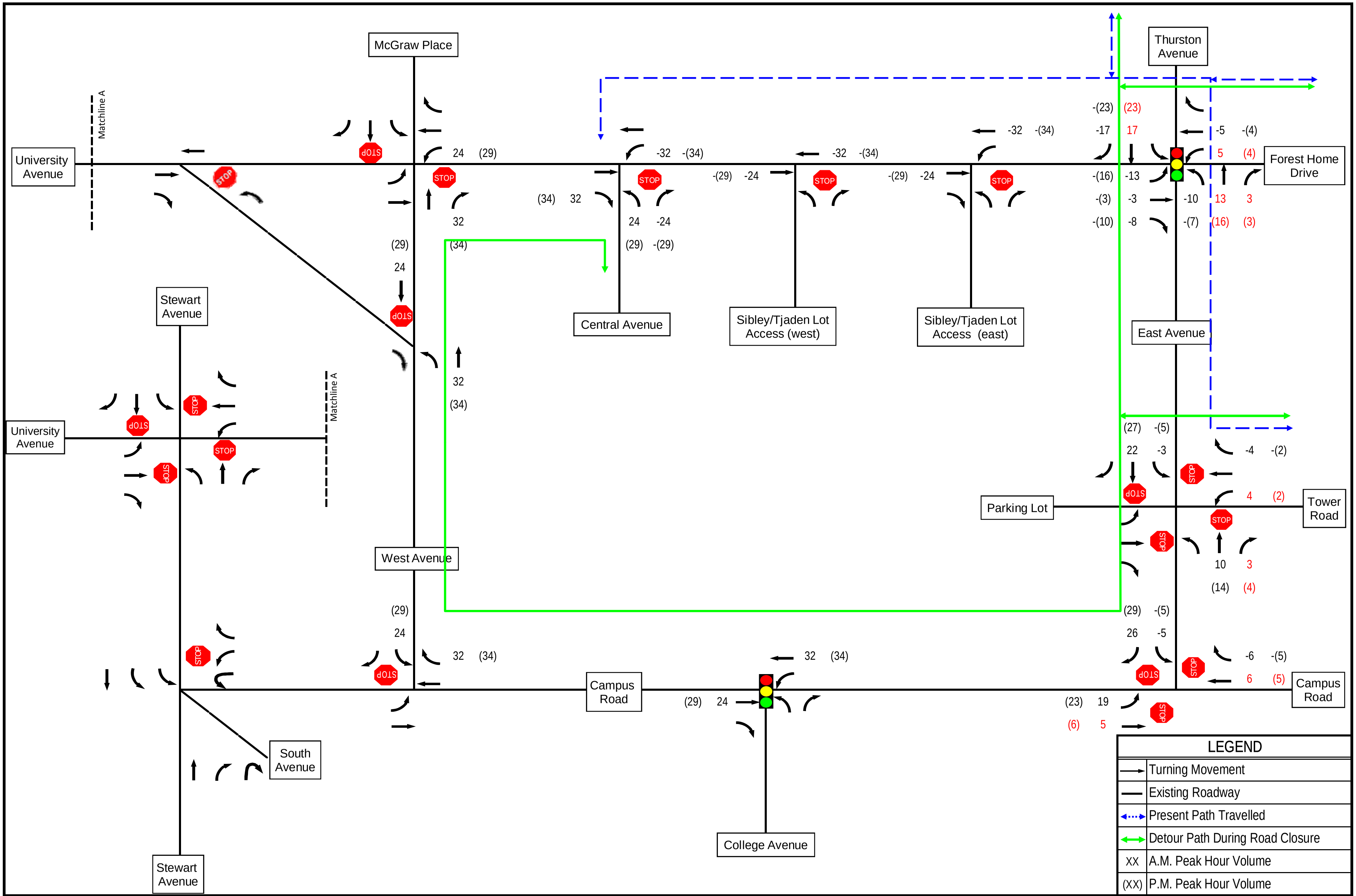
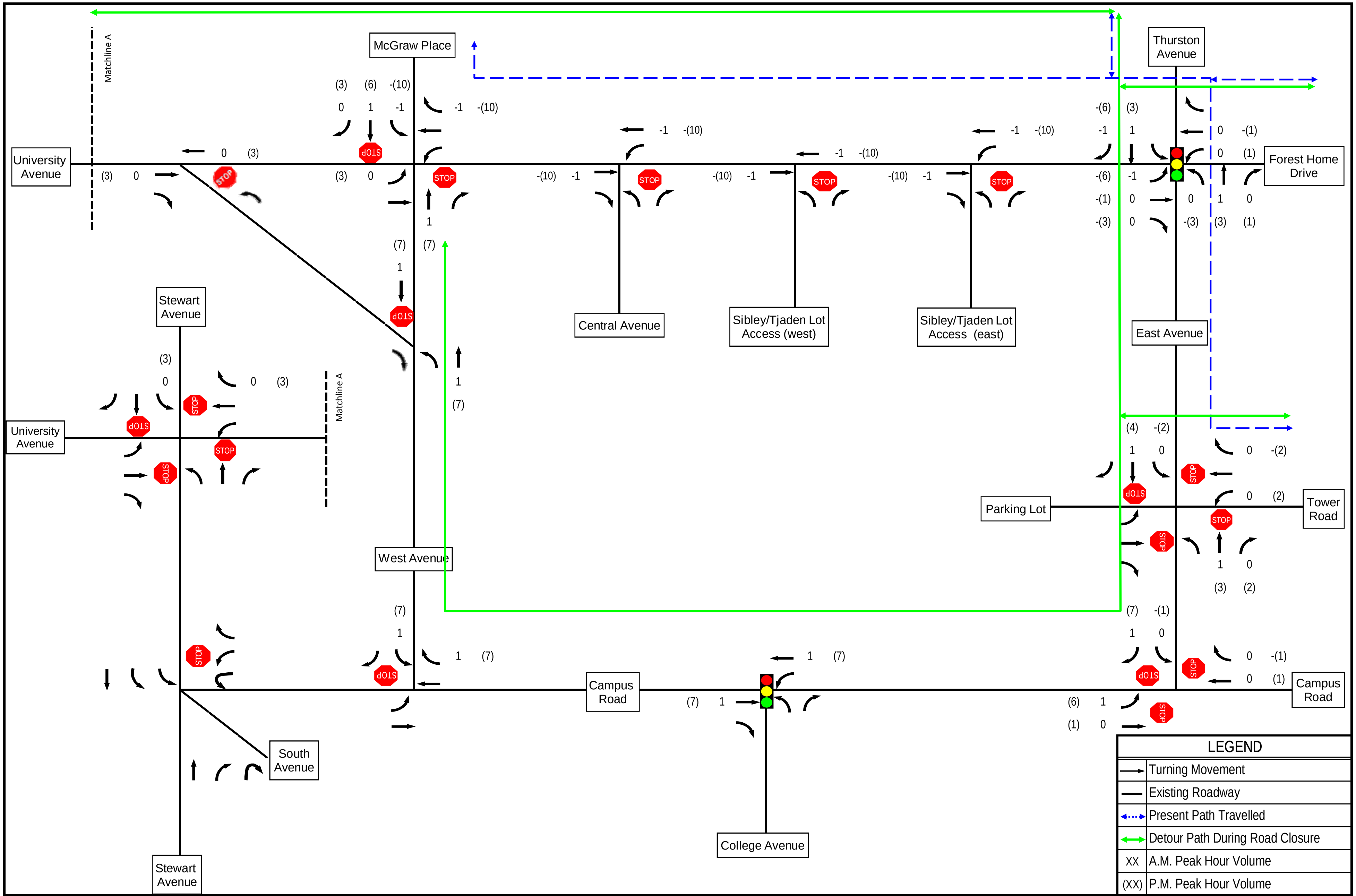


Figure C-1
University Diversion - Central Avenue Traffic

Milstein Hall TIA

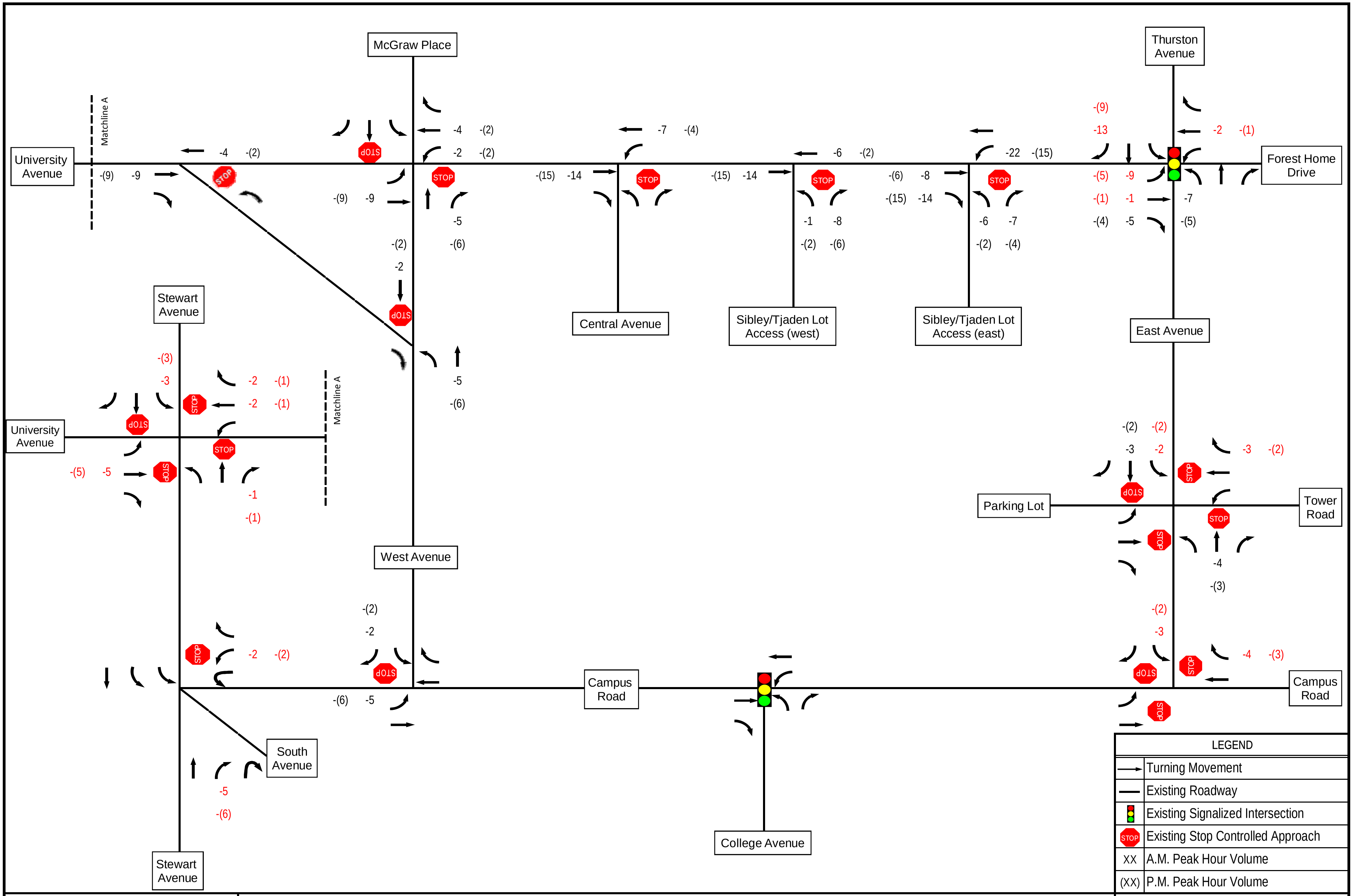
Cornell University
Ithaca, NY



MARTIN ALEXIOU BRYSON

Figure C-2
University Diversion - McGraw Place Traffic

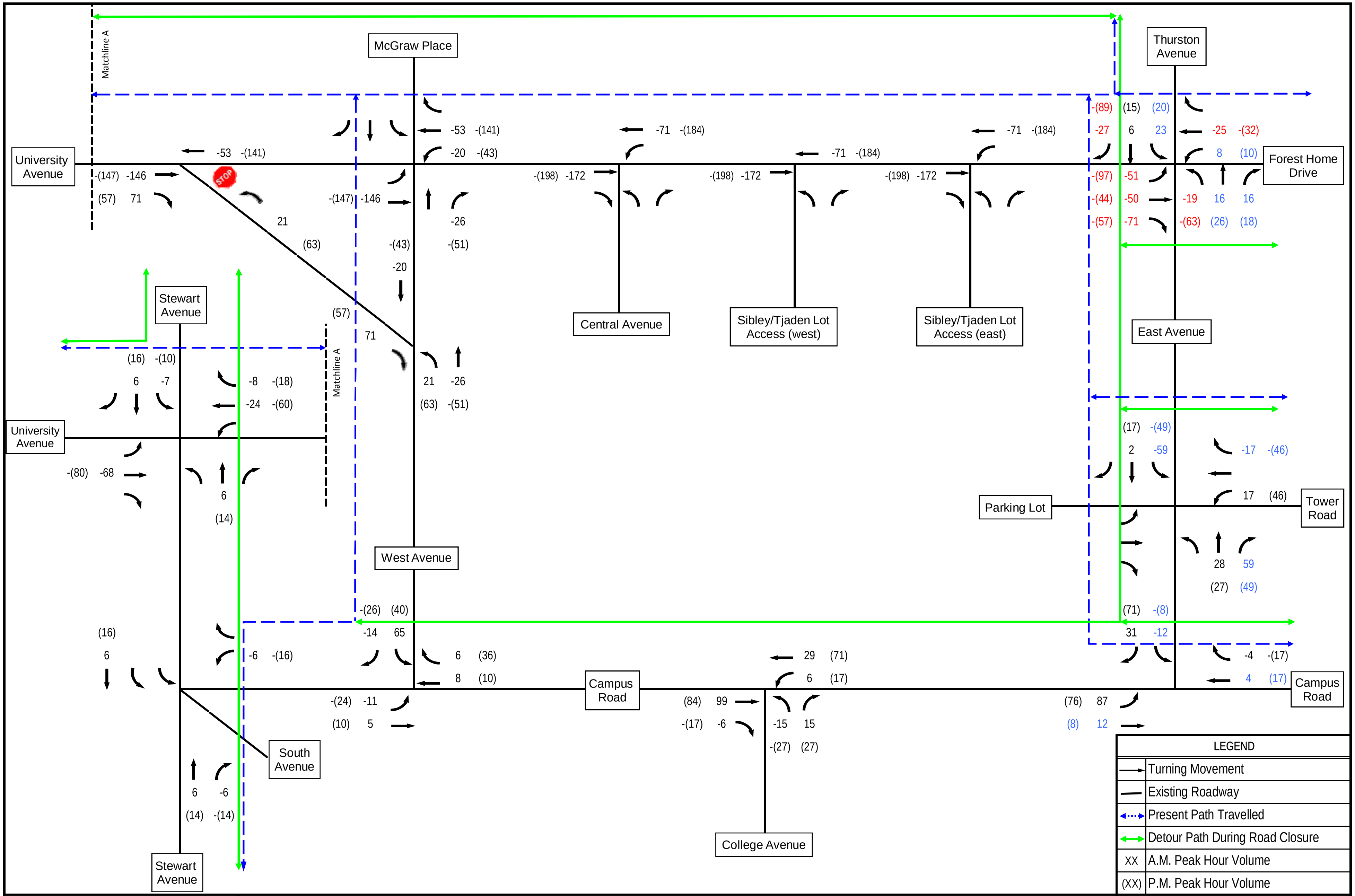
Milstein Hall TIA
Cornell University
Ithaca, NY



MARTIN ALEXIOU BRYSON

Figure C-3
University Diversion - Current Sibley/Tjaden Lot Traffic

Milstein Hall TIA
Cornell University
Ithaca, NY



MARTIN
ALEXIOU
BRYSON

Figure C-4
University Diversion - Through Traffic

Milstein Hall TIA
Cornell University
Ithaca, NY

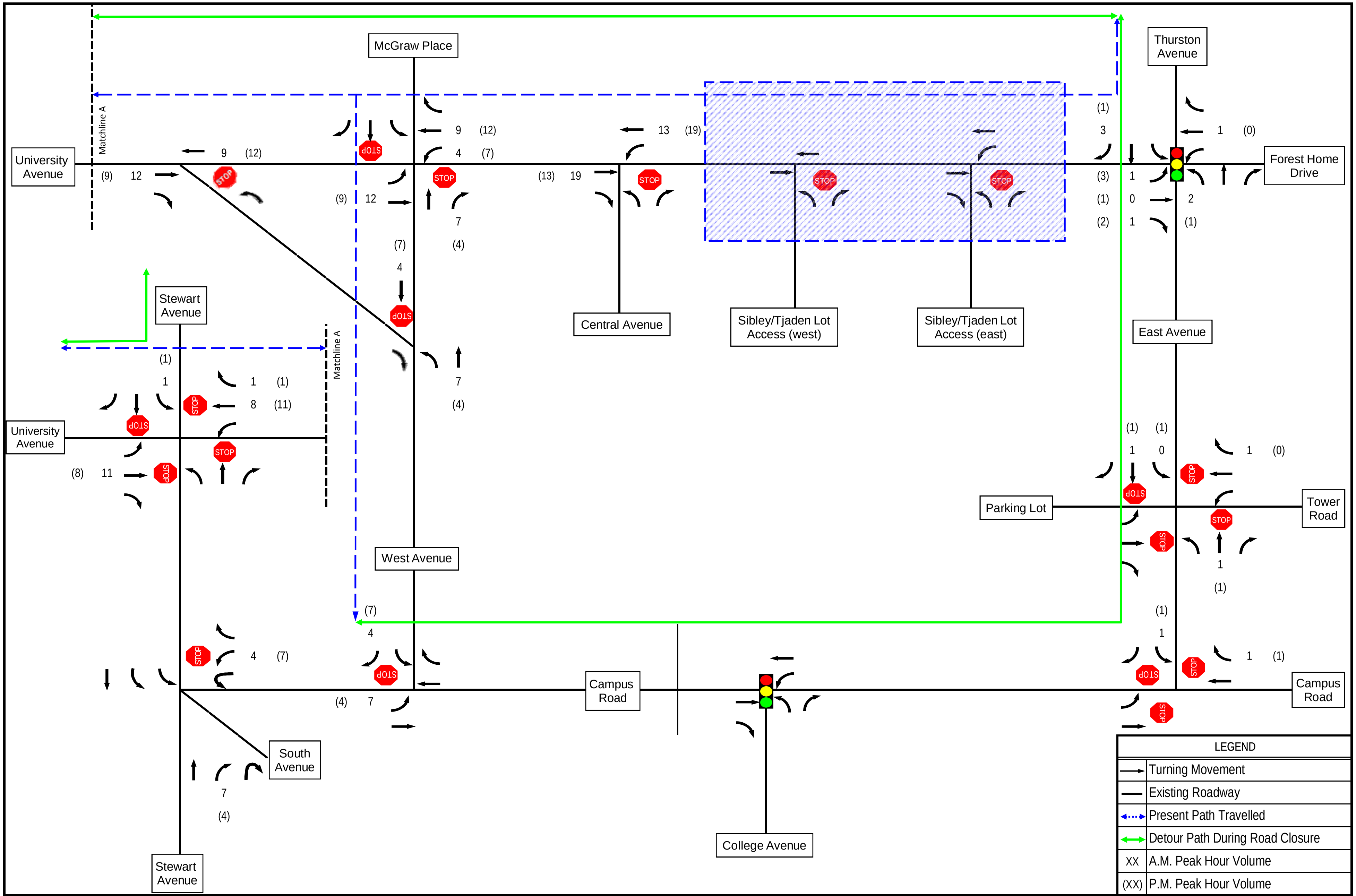


Figure C-5
University Diversion - Construction Traffic

Milstein Hall TIA
Cornell University
Ithaca, NY

APPENDIX F: Shade Study

Tillotson Design Associates

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Appendix F – Shading Study

Table of Contents:

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Shading Impacts to Day Lighting within the Foundry

Introduction

The open space to the south of the Foundry, the northeast side of Sibley Hall and the west side of Rand Hall will be referred to as the Milstein site. This area is currently occupied by University Avenue, a surface parking lot, and several sidewalks as illustrated on the overall site plan on page 3.

The shading impact of the new Milstein Hall on the Foundry interior and the outdoor areas to be covered by the new Milstein Hall was studied using AGI32 version 1.95; a light modeling computer application. Light measurements and renderings were calculated for the Summer Solstice (June 21st) and Equinox (September 21st) at 9am, noon, 3 pm and 6pm.[1] Light measurements and renderings were calculated for the Winter Solstice (December 21st) at 9 am, noon and 3 pm (sun sets in Ithaca at 4:32 pm on December 21st). All calculations assume a clear sky (no cloud cover) and ground reflectances of 20%. The calculation plane is at 36” above the finished floor or ground. All light levels discussed in the report are based on the AGI models and were checked for accuracy during the February 21st site visit by Tillotson Design. The north façade of the new Milstein Hall as well as Sibley Hall, Rand Hall and the Foundry are aligned 2.425 degrees east of North NAD83 as verified by the project Civil Engineer T. G. Miller, P.C.[2]

Three factors impact daylight contribution: direct sunlight, diffuse skylight and light reflected from the ground. Direct sun light is defined as the part of the solar radiation (sunlight) that reaches the earth’s surface after reduction and dispersion by the atmosphere. Diffuse sun light is defined as the sunlight that reaches the surface of the earth as a result of being scattered by air molecules, aerosol particles, cloud particles or other particles. The total lumens from direct sunlight and diffuse sunlight can vary significantly depending on the solar azimuth[3], solar elevation[4] and atmospheric conditions but account for the most of the daylight contribution. Light reflected from the ground typically accounts for 10 to 15 percent of the total daylight reaching a window. If snow is covering the ground, the amount of daylight reaching the window from reflected light will increase[5].

A. Summary

Currently the south façade of the Foundry receives full sun most of the year and the east and west facades receive full sun in the morning and evening respectively. November through January, Rand Hall and Sibley Hall cast shadows on the Foundry. The new

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[1] Note that the Summer Solstice and Equinox account for daylight savings time

[2] NAD 83 (North American Datum 1983) is aligned with true north as opposed to magnetic north

[3] Solar Azimuth is the angular position of the sun measured around the Horizon with North being 0 degrees, East 90 degrees, South 180 degrees and West 270 degrees (IESNA RP-55-99)

[4] Solar Elevation is measured in degrees above the horizon with the horizon being 0 degrees and straight up being 90 degrees (NOAA)

[5] IESNA Lighting Handbook Ninth Edition

Milstein Hall impacts the daylight in the Foundry interior least during the summer months when direct sunlight reaches the South, East and West facades. During the September 21st equinox and December 21st winter solstice, when the sun is lower in the southern hemisphere, the new Milstein Hall will cast a shadow on the Foundry during more of the day.

Discomfort and disability glare are a serious concern in art studio spaces and are caused by the contrast between a task and direct sunlight through windows. When the eye is focused on a particular task it establishes a level of adaptation to the light. As the eye shifts from one luminance to another (model or drawing to window), it must adapt to the new light level. Too much of a difference between the two levels, requires a period of time for the eye to adjust which slows visual performance and, if the difference is great, causes discomfort and fatigue. For good visual performance and comfort, the brightness of any source in the field of view should not exceed a contrast ratio of 5 to 1[6]. During the site visit, the brightness of the window was measured at 1,411 footlamberts while brightness of the task plane was 42 footlamberts; a contrast of 34 to 1[7]. The new Milstein Hall will reduce glare within the Foundry by shading the direct sunlight.

Although daylight levels are reduced within the Foundry by the new Milstein Hall, the daylight levels during most of the day and throughout the year remain appropriate (and in many cases are more appropriate) for an art studio. The IESNA recommend a range of 30 to 50 footcandles in art studios for tasks ranging from drawing to sculpting[8]. On overcast days when light levels are further reduced, the existing electric lighting will supplement the daylight levels with an additional 35 footcandles[9].

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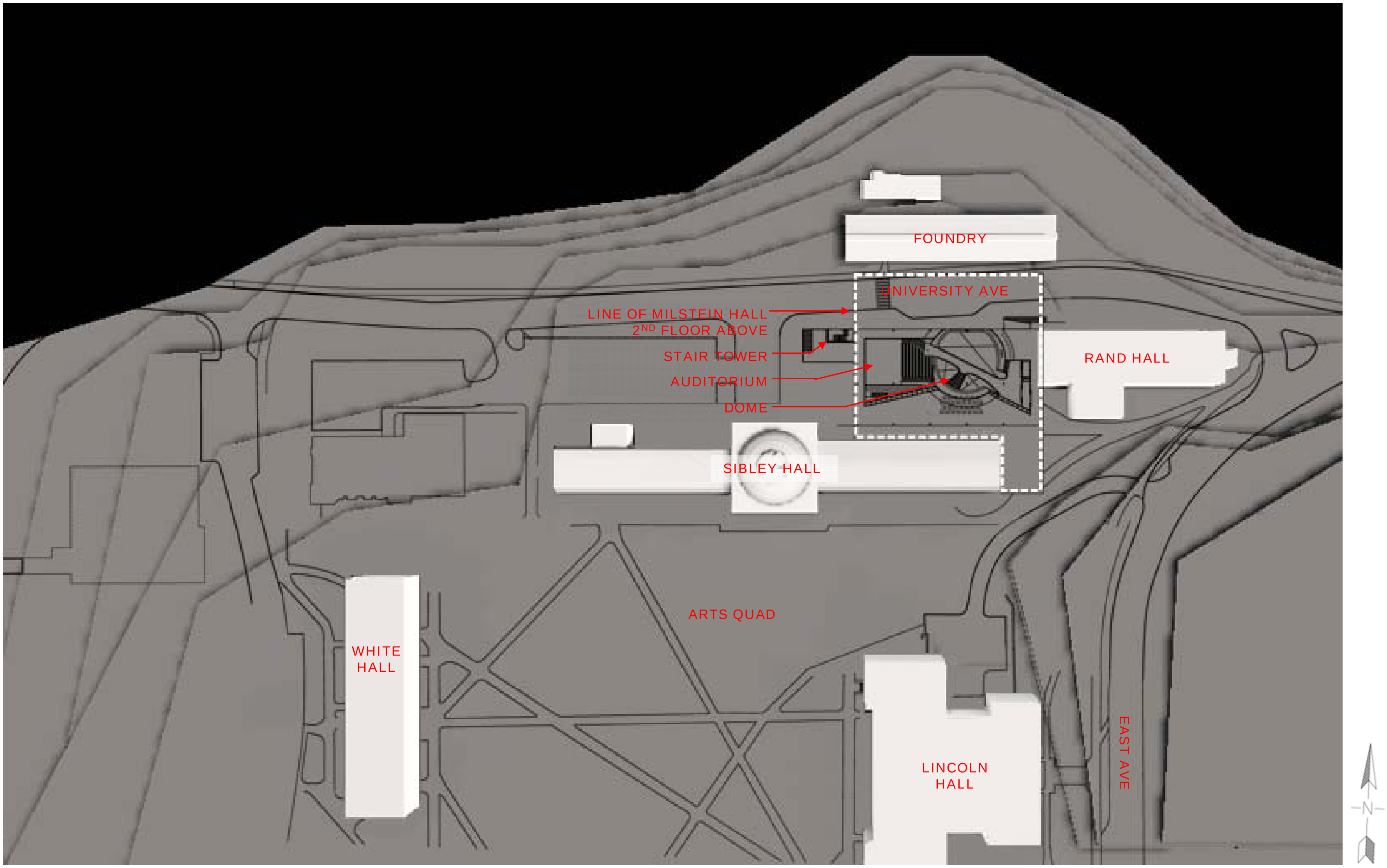
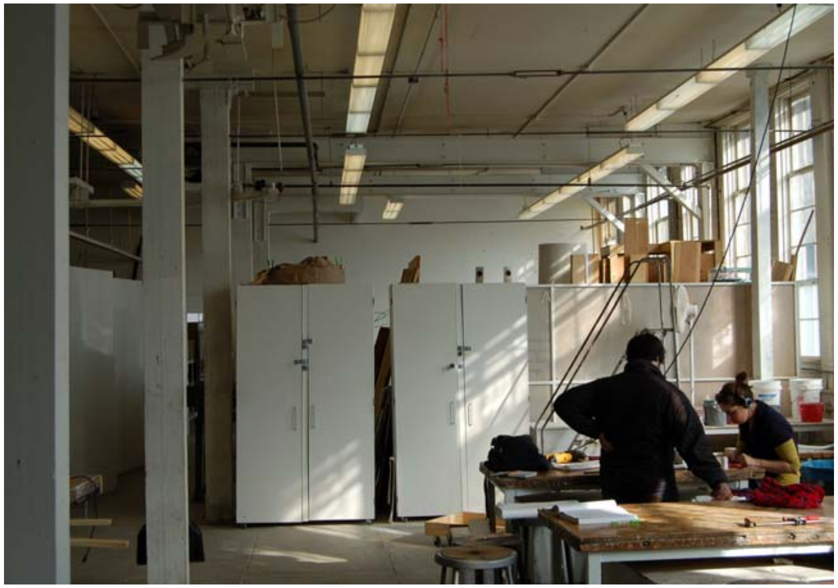
[6] IESNA Lighting Handbook Ninth Edition 12-3

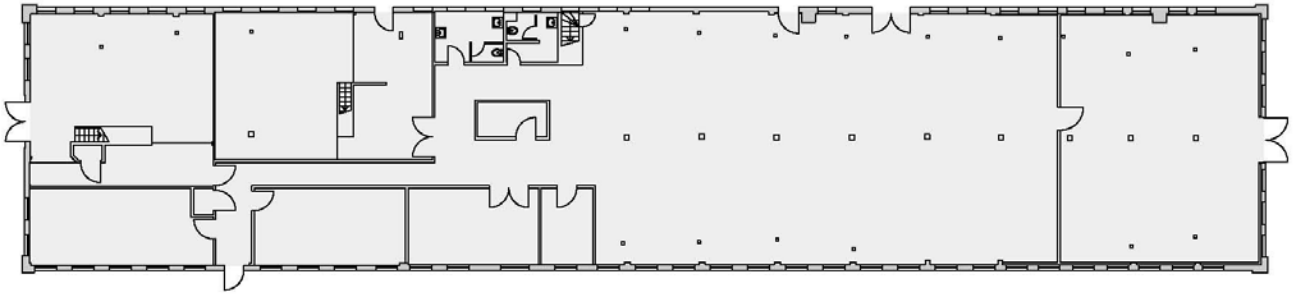
[7] Brightness or luminance is the amount of luminous intensity (light) being reflected from any given surface measured as a footlambert

[8] IESNA Lighting Handbook Ninth Edition

[9] Metered during February 21st 2008 site visit


FOUNDRY
UNIVERSITY AVE
LINE OF MILSTEIN HALL
2ND FLOOR ABOVE
STAIR TOWER
AUDITORIUM
DOME
RAND HALL
SIBLEY HALL
ARTS QUAD
WHITE
HALL
LINCOLN
HALL
EAST AVE
N





B. Summer Solstice June 21st

1. Existing Conditions: Summer Solstice June 21st

In the morning during the summer months and peaking on June 21st, the south and east facades of the Foundry receive full sun exposure. Much of the morning light is captured in the east room of the building where light levels average 350 footcandles with a peak of 5,000 footcandles from direct sunlight. The open studio space and westernmost rooms receive very little direct sunlight and have a range of light levels from 100-175 footcandles near the windows to 50 footcandles away from the windows where the daylight is interreflected.

At noon, the interior light levels at the south side of the building increase as the sun moves perpendicular to the South building face at a solar elevation of 66 degrees[10]. The average light levels range from 225 and 325 footcandles near the south wall and 75-125 footcandles in the other interior spaces. The light levels in the open studio do not change as the afternoon progresses but the light levels in the east rooms decrease while the west rooms' light levels increase as the sun move west.

At 6:00 pm, the light levels in the east room and open studio decrease to between 75-125 footcandles. The sun is nearly perpendicular to the west façade and only 27 degrees above the horizon increasing the light levels in the west room to an average of 350 footcandles to a maximum of 4,000 footcandles in direct sunlight.

2. Impacts of Milstein Hall: Summer Solstice June 21st

The new Milstein Hall shades the Foundry least during the summer months. At no point during the summer does Milstein Hall cast a shadow directly onto the Foundry. The decreased interior daylight levels are caused by a blockage of 51 percent of the southern sky dome by the new Milstein Hall. A small percentage of light is also lost by the blockage by Milstein of light that used to reflect back off the ground and back up into the Foundry windows.

At 9:00 am shading from the new Milstein Hall results in an interior light level reduction of 10-15 percent. There is no reduction in the light levels of the east room as the majority of light is provided by direct sunlight through the windows.

At noon and 3:00 pm, the shading from the new Milstein Hall causes a 50 percent reduction in the interior daylight levels. Milstein Hall does not block any of the direct sunlight into the Foundry as the sun angle is very steep, but does block much of the diffuse sun light.

By 6:00 pm, the amount of light contribution from direct sunlight increases while light provided from diffuse sunlight wanes. This reduces the impact of Milstein Hall on the Foundry only reducing the interior daylight levels by 25-40 percent.

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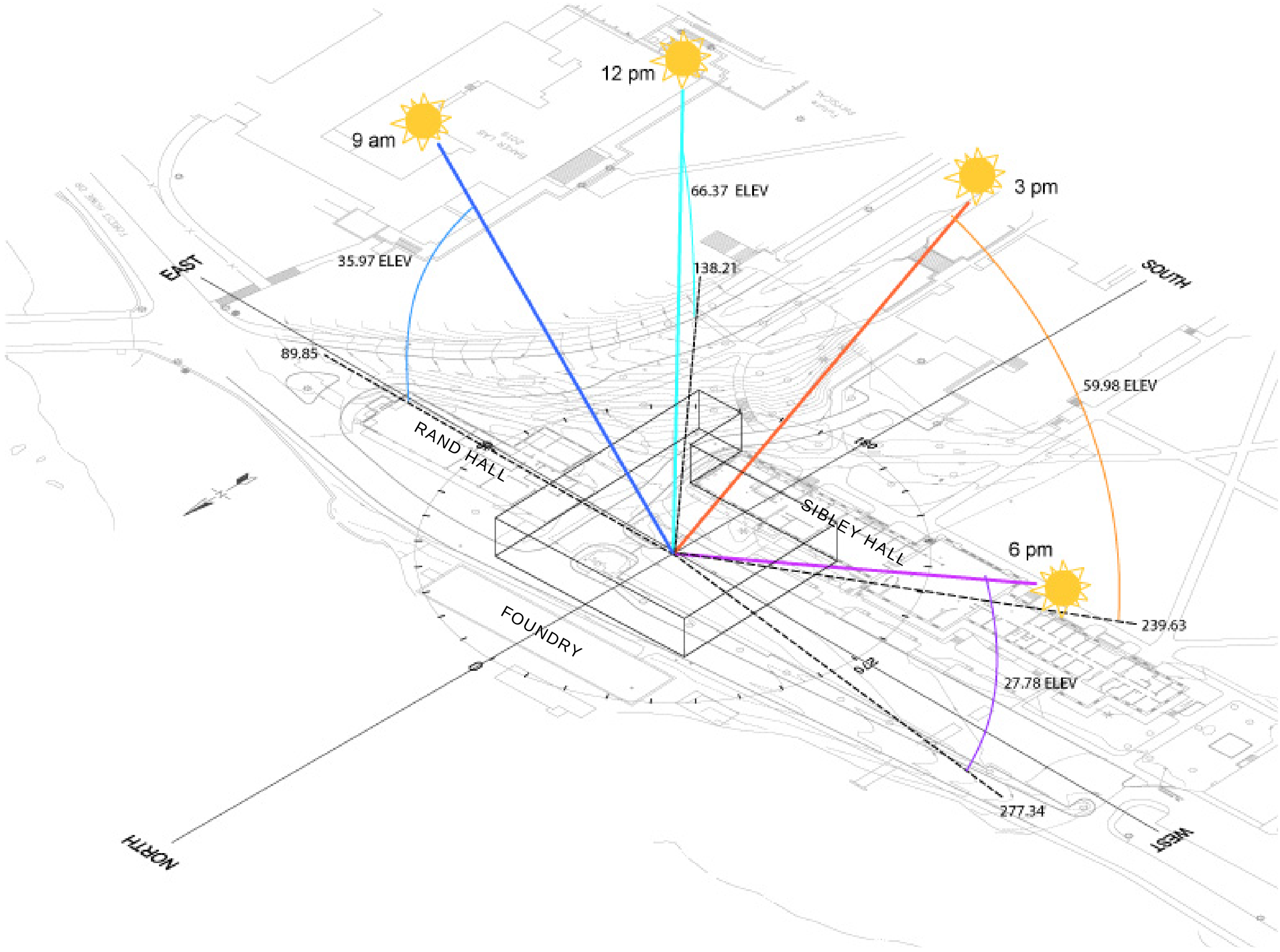
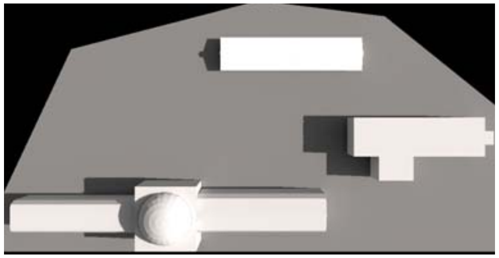
[10] Solar elevations are derived from the National Oceanic and Atmospheric Administration www.srr.noaa.gov

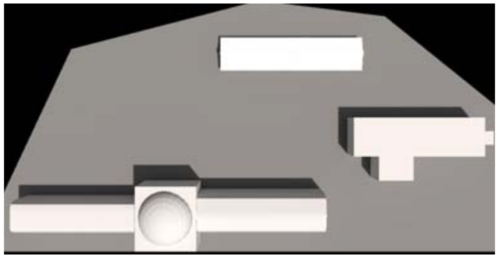


SOLAR POSITION
JUNE 21ST – SUMMER SOLSTICE

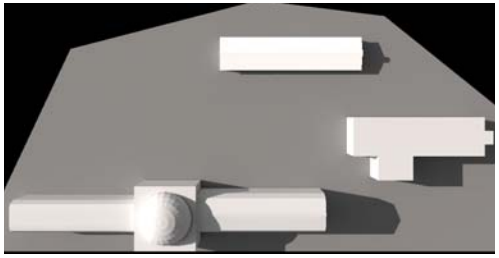
FOUNDRY EXISTING CONDITION



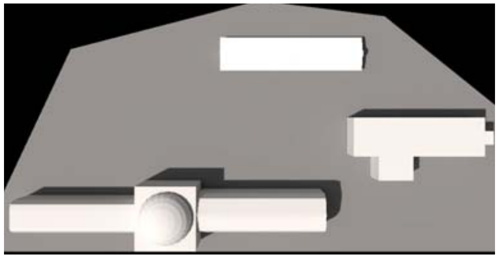
9:00 AM



12:00 PM

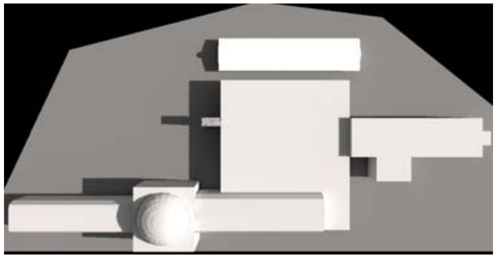


3:00 PM

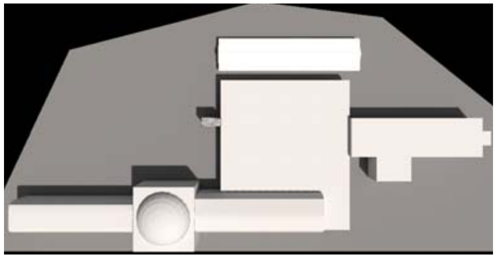


6:00 PM

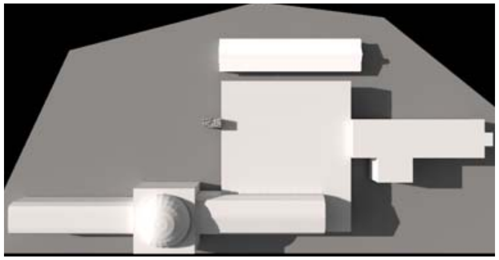
FOUNDRY WITH NEW MILSTEIN HALL



9:00 AM



12:00 PM



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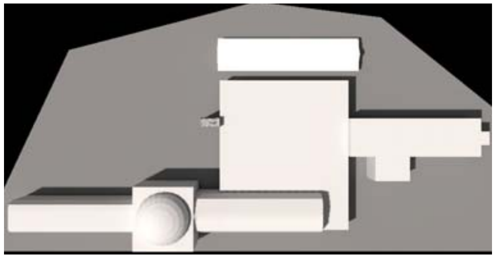


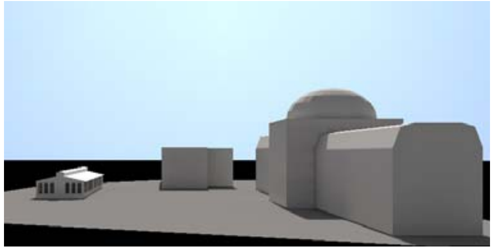
6:00 PM

tillotson design associates

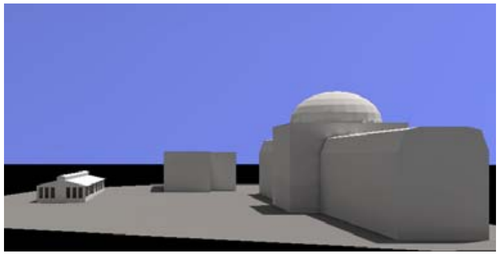
PLAN RENDERINGS

JUNE 21ST – SUMMER SOLSTICE

FOUNDRY EXISTING CONDITION



9:00 AM



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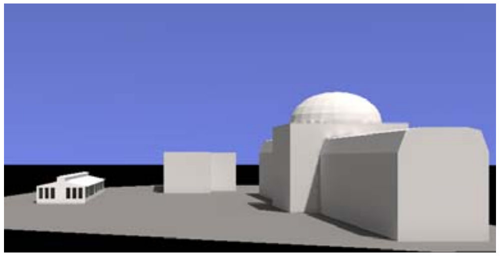

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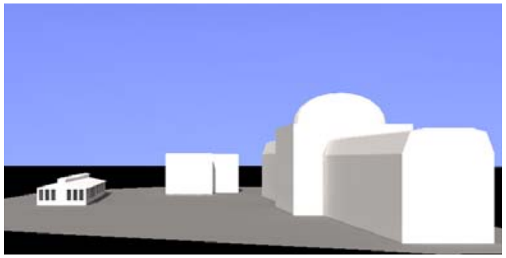

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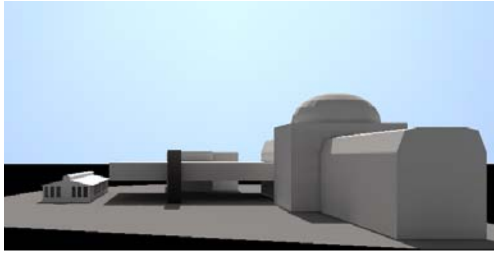
FOUNDRY WITH NEW MILSTEIN HALL



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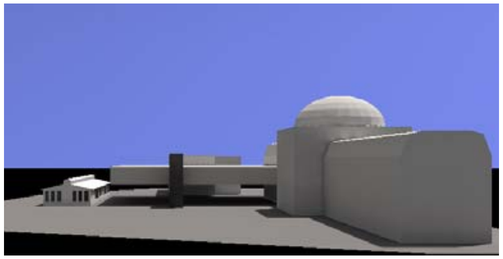

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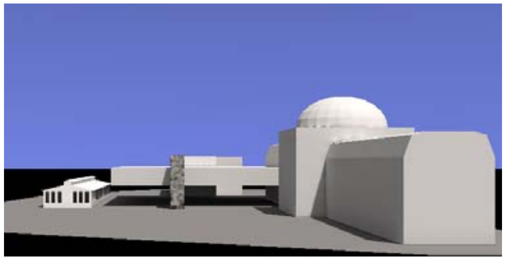

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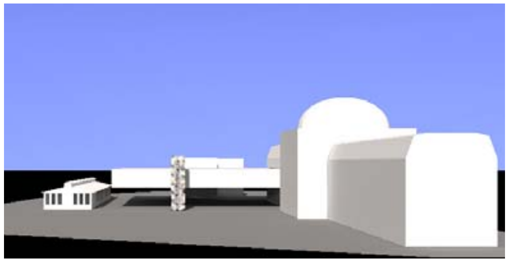

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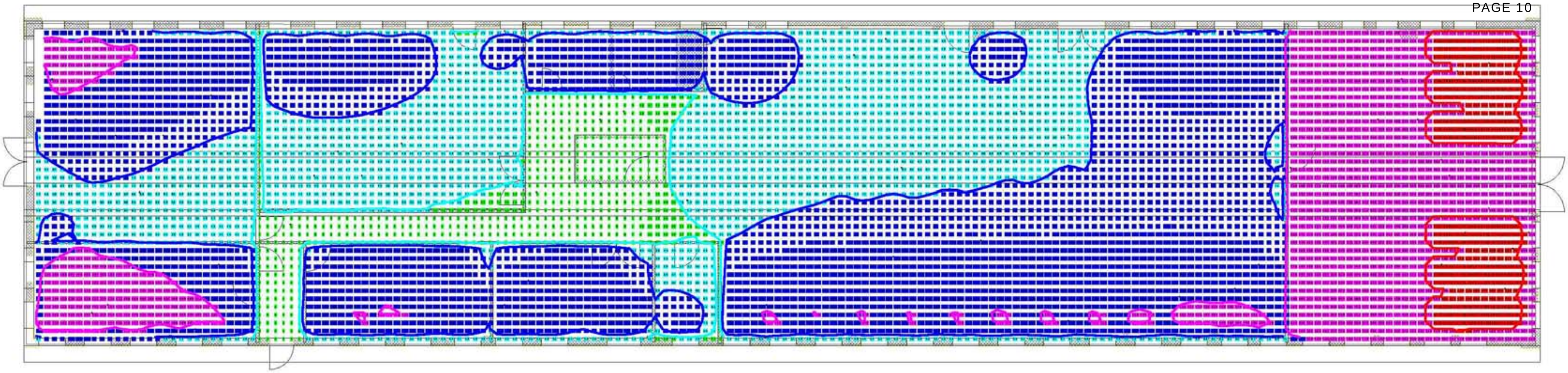
PERSPECTIVES
JUNE 21ST – SUMMER SOLSTICE



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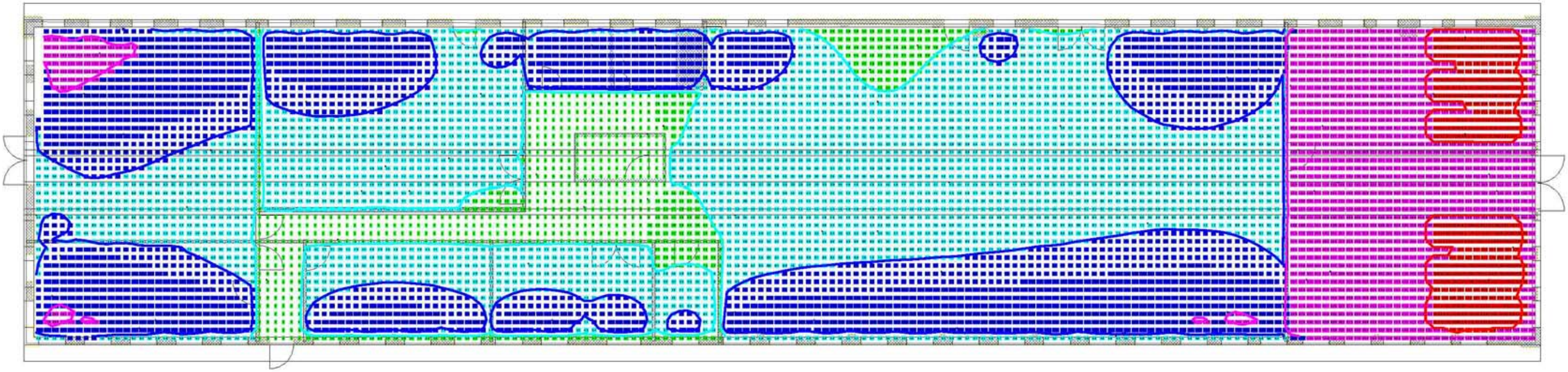


FOUNDRY WITH NEW MILSTEIN HALL

LIGHT LEVELS IN FOOTCANDLES

0 - 25	🟩
25 - 75	🟦
75 - 175	🟦
175 - 500	🟥
500 +	🟥

NOTE: FOOTCANDLE LEVELS
ARE TAKEN AT 36" AFF

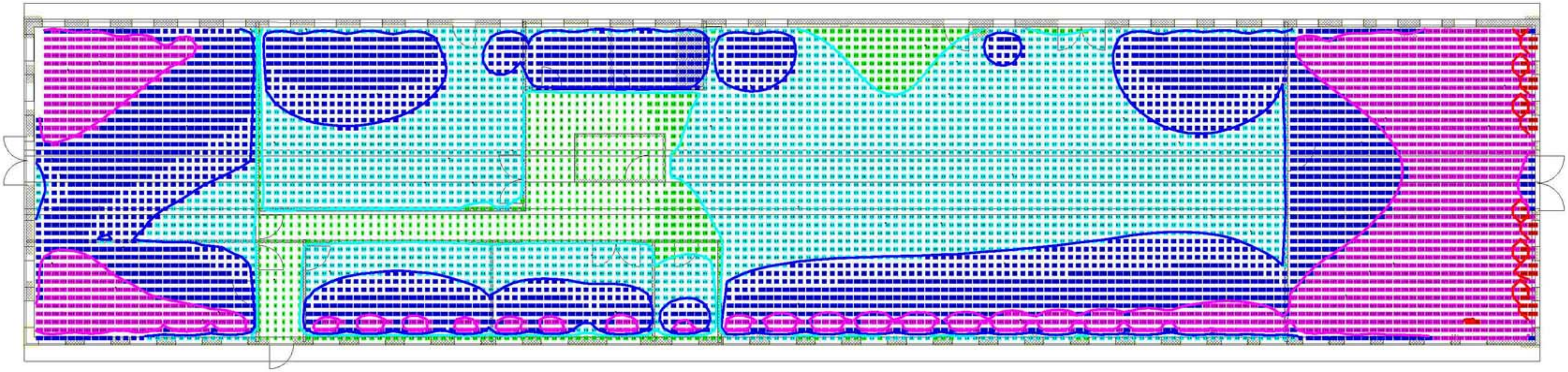
LIGHT LEVEL DIAGRAM

FOUNDRY INTERIOR DAYLIGHT LEVELS

JUNE 21ST – 9:00 AM

tillotson design associates

FOUNDRY EXISTING CONDITION



FOUNDRY WITH NEW MILSTEIN HALL

LIGHT LEVELS IN FOOTCANDLES

0 - 25	🟩
25 - 75	🟦
75 - 175	🟦
175 - 500	🟪
500 +	🟥

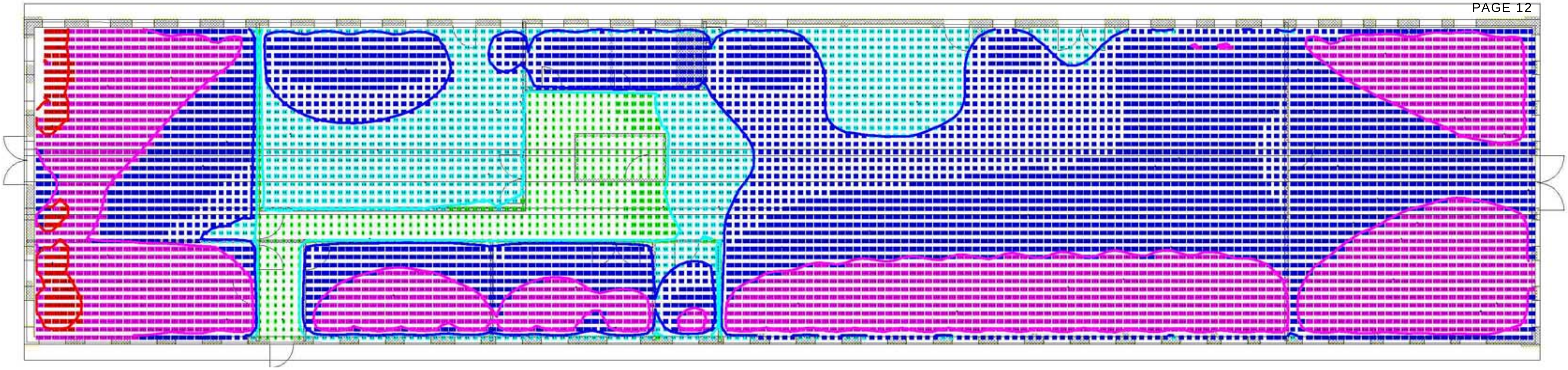
NOTE: FOOTCANDLE LEVELS
ARE TAKEN AT 36" AFF

LIGHT LEVEL DIAGRAM

FOUNDRY INTERIOR DAYLIGHT LEVELS

JUNE 21ST – 12:00 PM

tillotson design associates



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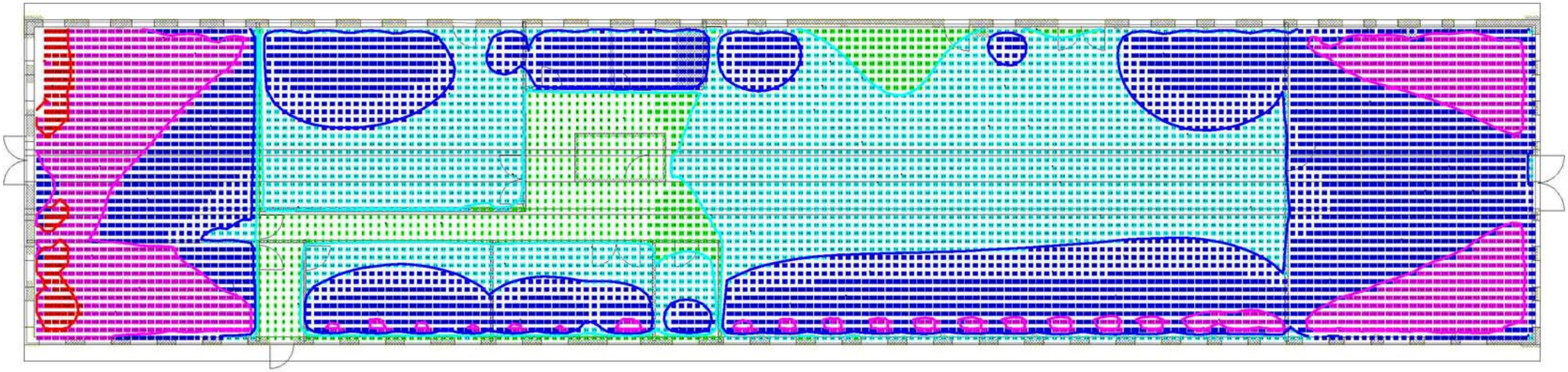


FOUNDRY WITH NEW MILSTEIN HALL

LIGHT LEVELS IN FOOTCANDLES

0 - 25	🟩
25 - 75	🟦
75 - 175	🟦
175 - 500	🟪
500 +	🟥

NOTE: FOOTCANDLE LEVELS
ARE TAKEN AT 36" AFF

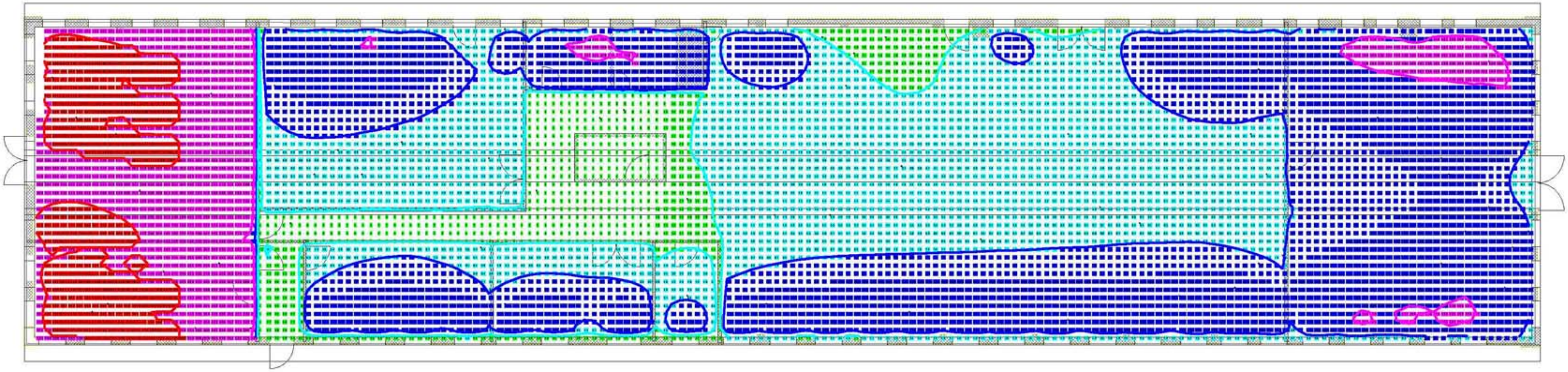
LIGHT LEVEL DIAGRAM

FOUNDRY INTERIOR DAYLIGHT LEVELS

JUNE 21^{ST} – 3:00 PM

tillotson design associates

FOUNDRY EXISTING CONDITION



FOUNDRY WITH NEW MILSTEIN HALL

LIGHT LEVELS IN FOOTCANDLES

0 - 25	🟩
25 - 75	🟦
75 - 175	🟦
175 - 500	🟪
500 +	🟥

NOTE: FOOTCANDLE LEVELS
ARE TAKEN AT 36" AFF

LIGHT LEVEL DIAGRAM

FOUNDRY INTERIOR DAYLIGHT LEVELS

JUNE 21ST – 6:00 PM

tillotson **design** associates

C. Equinox September 21st

1. Existing Conditions: Equinox September 21st

During the equinox, when the sun is lower in the southern hemisphere than during the summer solstice, direct sunlight penetrates deeper into the Foundry. At 9:00 am, the light levels in the southern quarter of the open studio, east room and south west rooms increase from the 100-175 footcandles during the same hour in summer to between 200-300 footcandles with areas of direct sunlight averaging 2,700 footcandles. Moving north in the open studio space, the light levels at the center decrease to 75 footcandles with 30-50 footcandles near the north side.

At noon and 3:00 pm, the light levels increase with many areas at the south side of the building in direct sunlight with average light levels of 5,700-6,700 footcandles. Light levels outside areas of direct sun average 350 footcandles. The zones of direct sunlight move from a northwest orientation to a northeast orientation as the sun moves into the western hemisphere later in the afternoon. Light levels at the center of the open studio range between 110-140 footcandles and levels near the north wall are between 60-90 footcandles.

At 6:00 pm the solar elevation is only 11 degrees above the horizon and nearly perpendicular to the west façade. The light levels in the east room and open studio decrease to between 75-100 footcandles near the south wall and 40-50 footcandles in the rest of the room. The west room has high light levels due to direct sunlight penetration. Areas with direct sunlight average over 1,000 footcandles and the light levels in the remainder are between 200 and 300 footcandles.

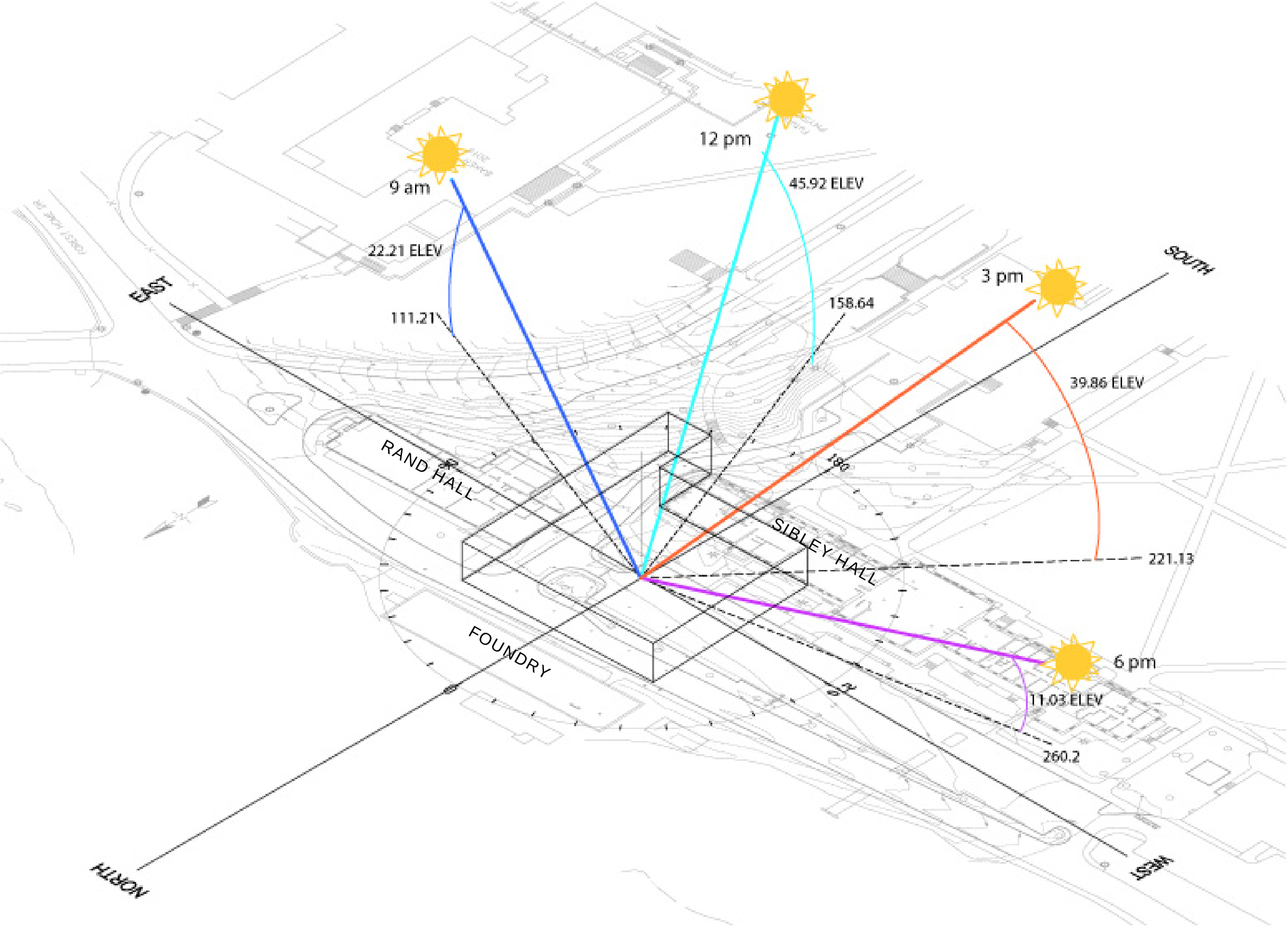
2. Impacts of Milstein Hall: Equinox September 21st

At 9:00 am, the new Milstein Hall blocks direct sunlight to the east third of the Foundry building and a large portion of the diffuse sun light and light reflected off the ground. While light levels in the east room are not affected as the sun is in the eastern hemisphere, light levels in the open studio space and west rooms decrease to an average of 50 footcandles with portions of the rooms interior light levels decreasing to between 10-15 footcandles; a reduction of 60 to 70 percent.

At noon, Milstein Hall will block all of the direct sunlight at the south façade with interior light levels in the west rooms and open studio reduced to between 80 and 120 footcandles. Average light levels in the rest of the room are reduced by 70-80 percent due to the loss of diffuse sunlight and interreflected direct sunlight. The greatest impact to the open studio is at the north central zone of the Foundry where there are fewer north facing windows resulting in an 85 percent reduction of light levels from 50-70 footcandles before Milstein to 5-15 footcandles with Milstein. The impact of Milstein Hall on the east room is minimal as Milstein Hall does not yet cast a shadow on this portion of the building. Average light levels are slightly reduced and direct sunlight is only blocked at the south west corner.

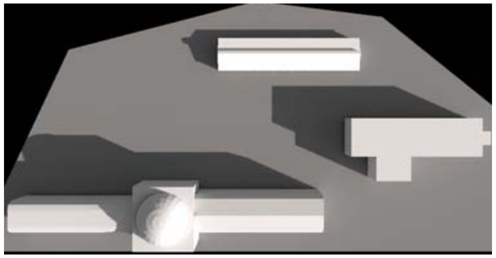
At 3:00 pm, the light levels in the open studio are similar to the noon conditions. The east room receives more shading from Milstein with light levels in this room reduced 65 percent at the south side of the room and 50 percent in the center. Light levels at the north side of the east room remain largely unaffected.

At 6:00 pm, the shadow of the new Milstein Hall has moved off the western half of the Foundry and the low sun angle of 11 degrees reduces the impact inside the Foundry. Light levels in the open studio and the east room are reduced by 50 percent at the south side and 25 percent at the north side. The west rooms are unaffected by Milstein Hall at this hour of the day.

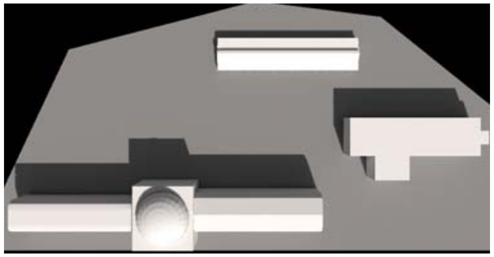


SOLAR POSITION
SEPTEMBER 21ST – EQUINOX

FOUNDRY EXISTING CONDITION



9:00 AM



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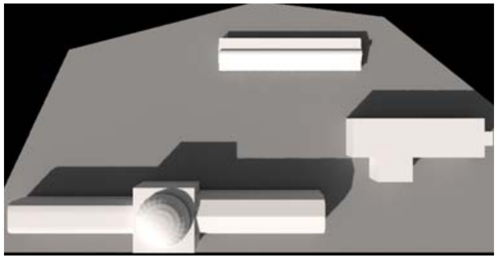

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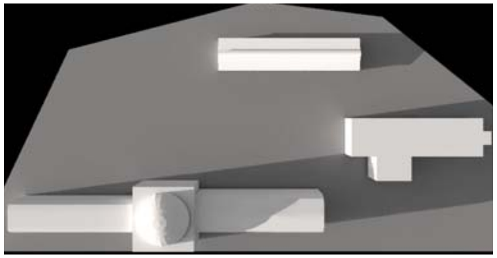
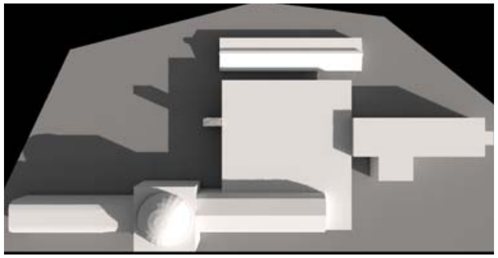


6:00 PM

FOUNDRY WITH NEW MILSTEIN HALL



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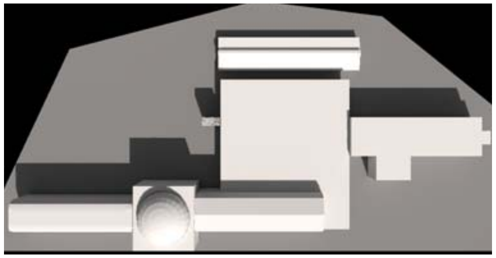

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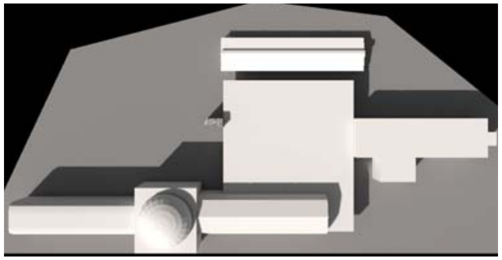

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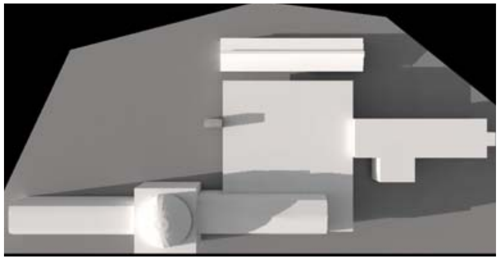
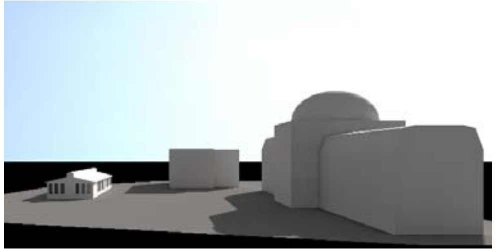


6:00 PM

FOUNDRY EXISTING CONDITION



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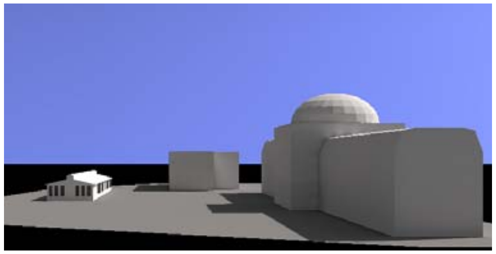

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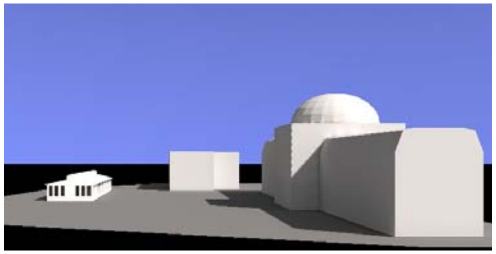

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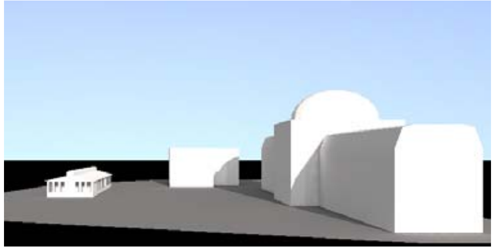
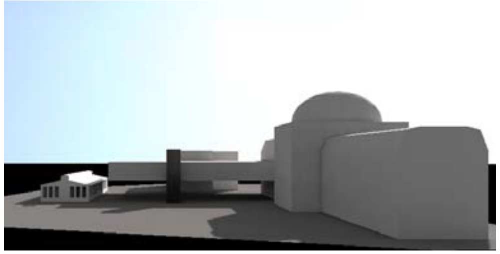


6:00 PM

FOUNDRY WITH NEW MILSTEIN HALL



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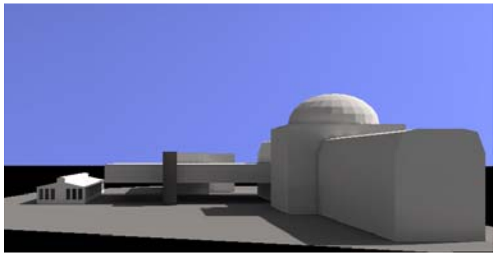

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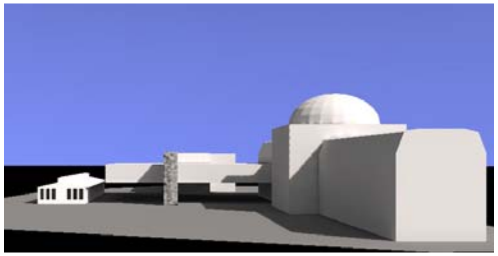

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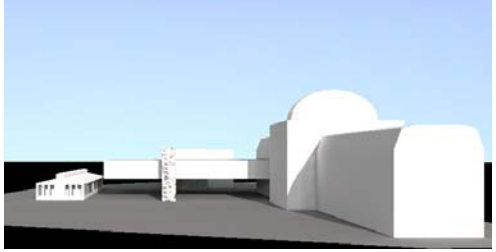

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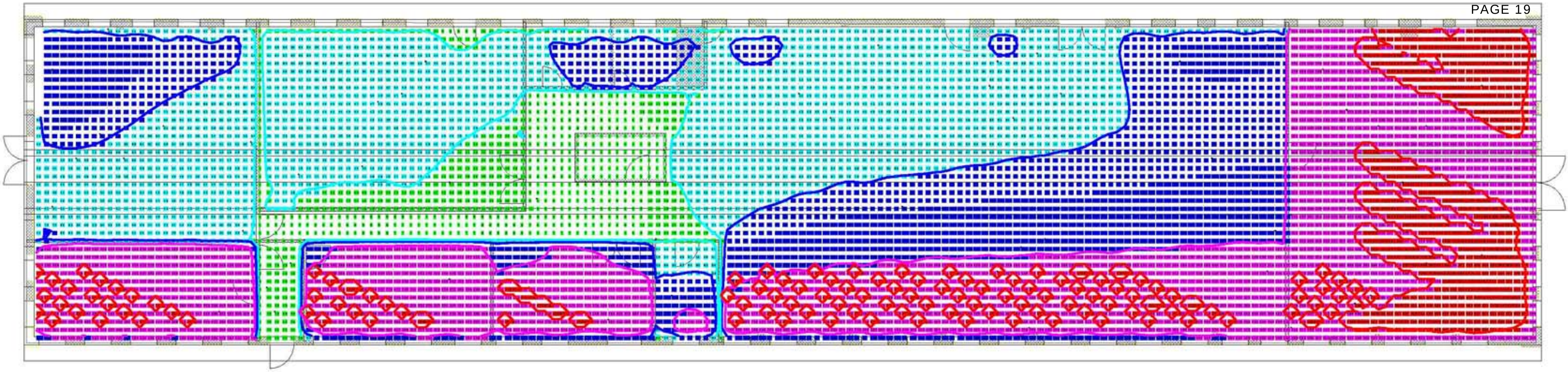
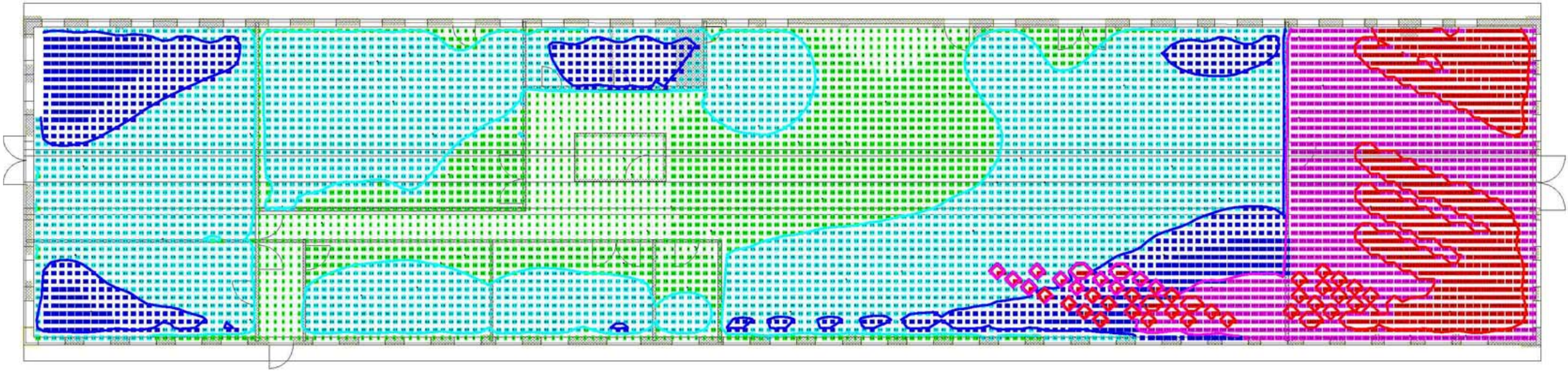


FOUNDRY EXISTING CONDITION



FOUNDRY WITH NEW MILSTEIN HALL

LIGHT LEVELS IN FOOTCANDLES

0 - 25	🟩
25 - 75	🟦
75 - 175	🟦
175 - 500	🟪
500 +	🟥

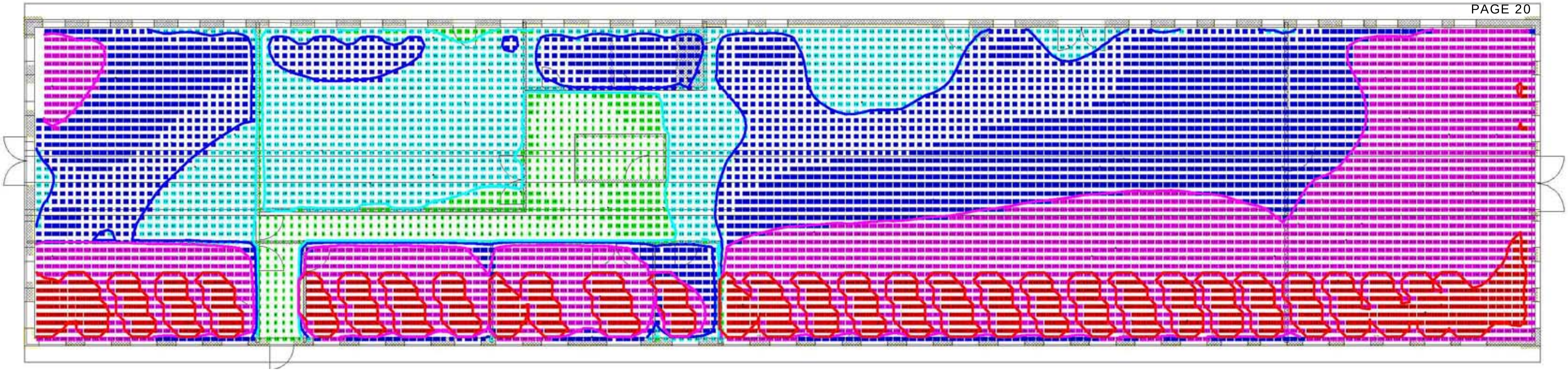
NOTE: FOOTCANDLE LEVELS
ARE TAKEN AT 36" AFF

LIGHT LEVEL DIAGRAM

FOUNDRY INTERIOR DAYLIGHT LEVELS

SEPTEMBER 21ST – 9:00 AM

tillotson design associates



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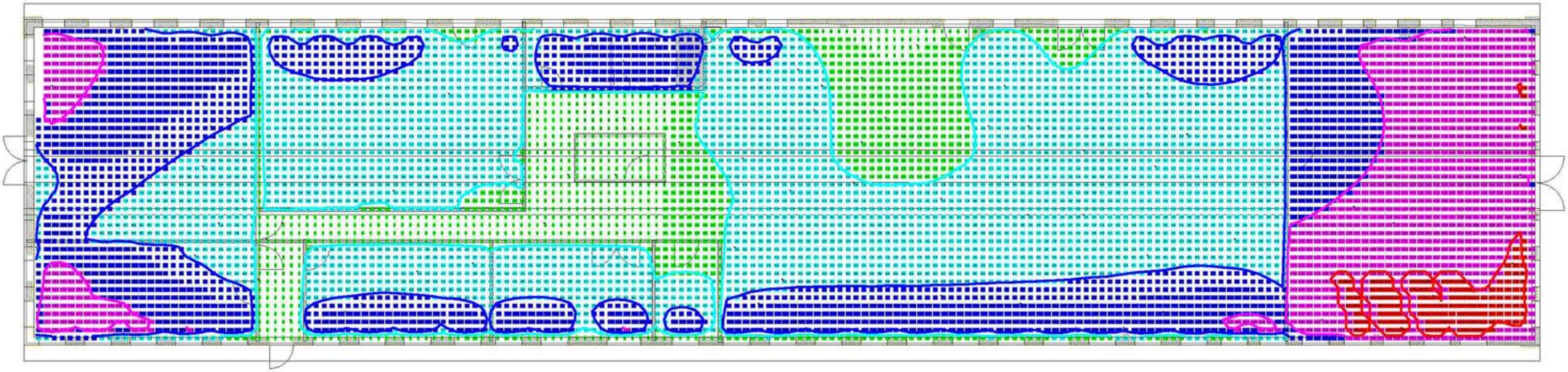


FOUNDRY WITH NEW MILSTEIN HALL

LIGHT LEVELS IN FOOTCANDLES

0 - 25	🟩
25 - 75	🟦
75 - 175	🟦
175 - 500	🟪
500 +	🟥

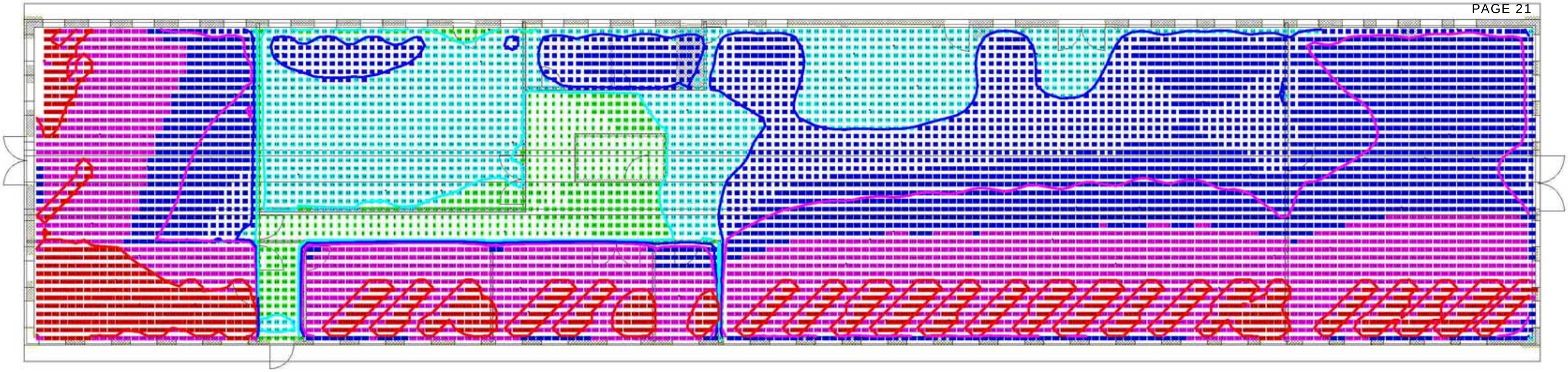
NOTE: FOOTCANDLE LEVELS
ARE TAKEN AT 36" AFF

LIGHT LEVEL DIAGRAM

FOUNDRY INTERIOR DAYLIGHT LEVELS

SEPTEMBER 21ST – 12:00 PM

tillotson design associates



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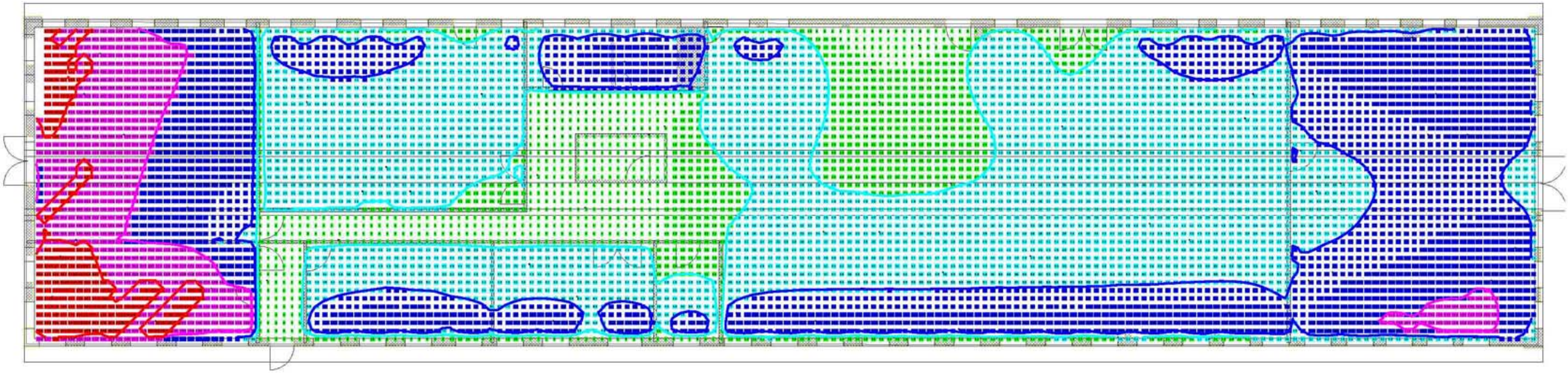


FOUNDRY WITH NEW MILSTEIN HALL

LIGHT LEVELS IN FOOTCANDLES

0 - 25	🟩
25 - 75	🟦
75 - 175	🟦
175 - 500	🟪
500 +	🟥

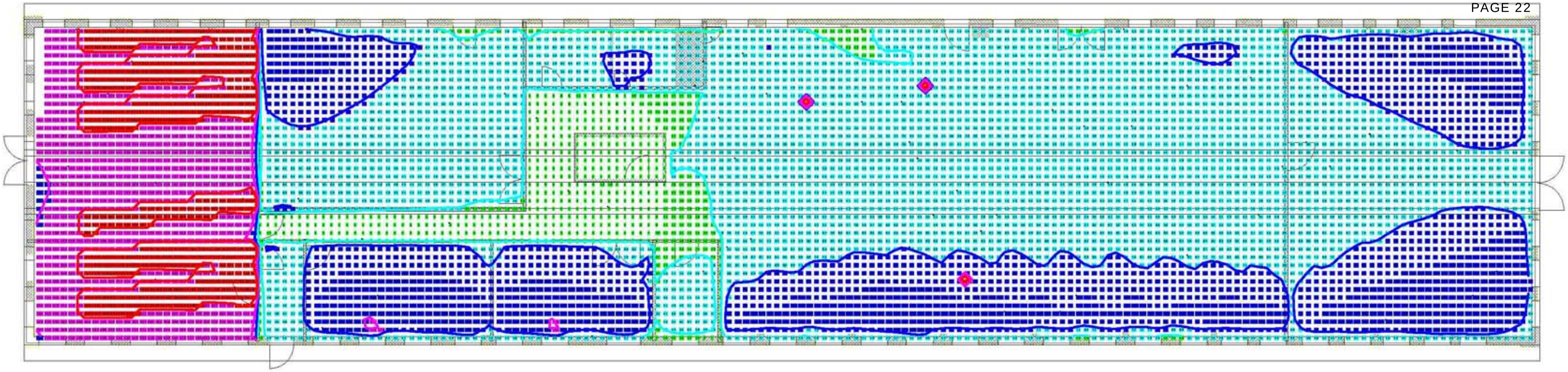
NOTE: FOOTCANDLE LEVELS
ARE TAKEN AT 36" AFF

LIGHT LEVEL DIAGRAM

FOUNDRY INTERIOR DAYLIGHT LEVELS

SEPTEMBER 21ST – 3:00 PM

tillotson design associates



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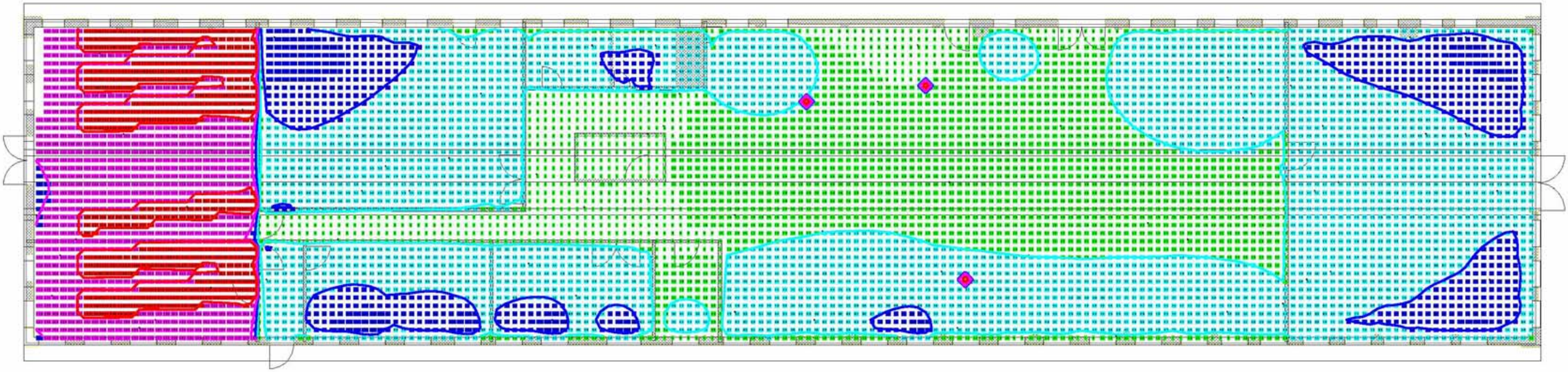


FOUNDRY WITH NEW MILSTEIN HALL

LIGHT LEVELS IN FOOTCANDLES

0 - 25	🟩
25 - 75	🟦
75 - 175	🟦
175 - 500	🟥
500 +	🟥

NOTE: FOOTCANDLE LEVELS
ARE TAKEN AT 36" AFF

LIGHT LEVEL DIAGRAM

FOUNDRY INTERIOR DAYLIGHT LEVELS

SEPTEMBER 21ST – 6:00 PM

tillotson **design** associates

D. Winter Solstice December 21st

1. Existing Conditions: Winter Solstice December 21st

At 9:00 am on December 21st, the east half of the southern Foundry facade is in the shade of Rand Hall. Light levels in the open studio average 120 footcandles at the south façade and 50 footcandles at the north façade. Only in the south westernmost corner of the open studio does direct sunlight enter the room with light levels averaging near 1,000 footcandles. The south west rooms of the foundry are in direct sunlight and the very low solar elevation at this time of year, only 12 degrees above the horizon at 9:00 am, allows very intense direct sunlight through the windows. Light levels average 1,500 footcandles in rooms fronting the south façade.

The south facade of the foundry receives even more intense direct sunlight at noon. The sun is only 24 degrees above the horizon and almost perpendicular to the south face. Direct sunlight reaches more than halfway into the Foundry interior with average light levels of 2000 footcandles at the south side and 175-250 footcandles at the north side.

By 3:00 pm, the Sibley rotunda and dome are shading the center two thirds of the south façade. Although much of the direct sunlight is blocked, the diffuse sun light still contributes a large amount of daylight to the interior with light levels ranging from 75-150 footcandles at the south side and 30-50 footcandles on the north side. The east and west rooms receive significant portions of direct sunlight increasing the light levels to 200-300 footcandles and 1,200 footcandles in direct sunlight.

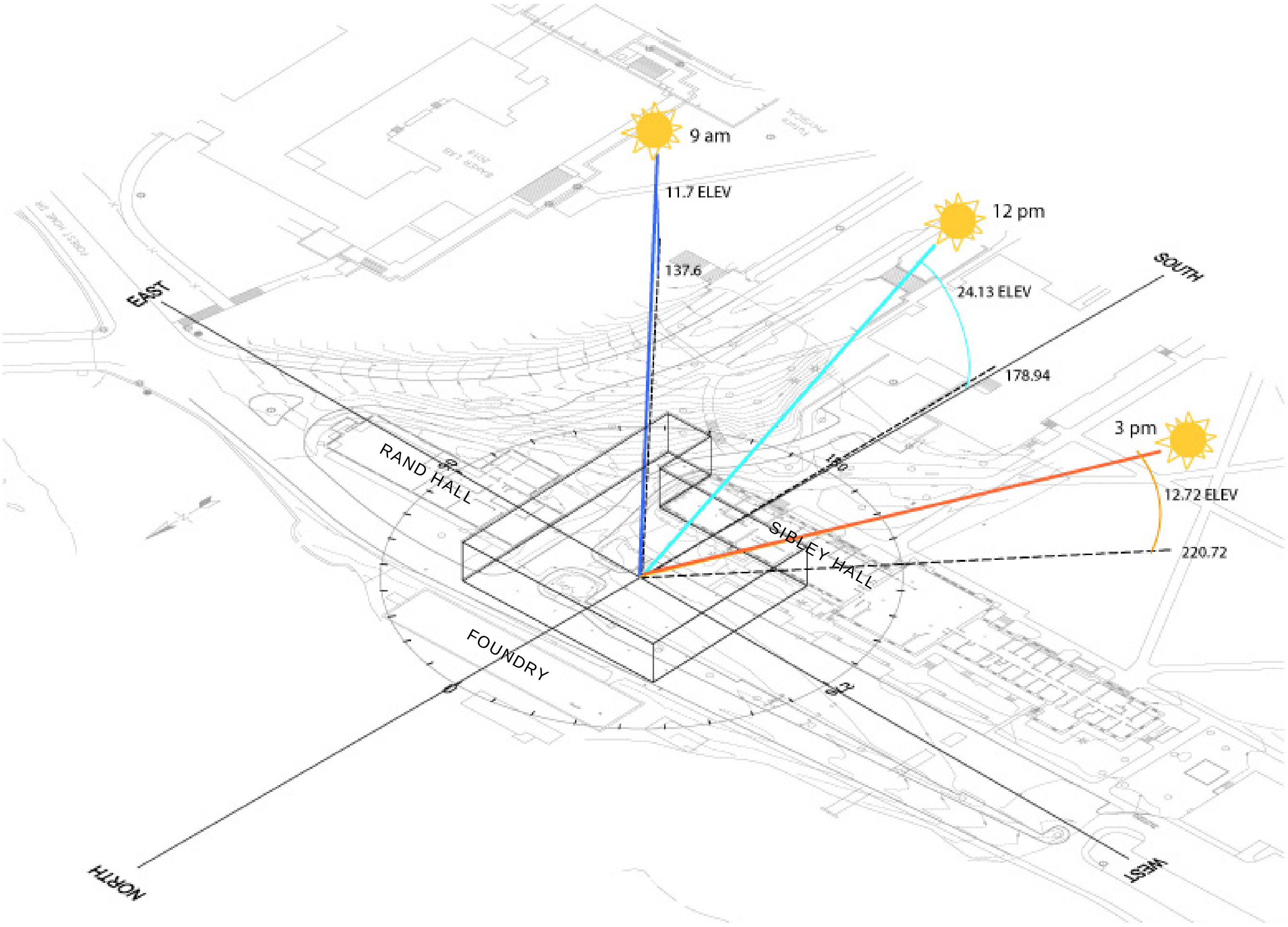
2. Impacts of Milstein Hall: Winter Solstice December 21st

Although Milstein Hall will impact interior daylight levels within the Foundry most during the winter, it will also provide the most relief from intense glare. The low angle of the sun in the winter positions the sun in the direct field of view of occupants facing south and causes harsh disability and discomfort glare.

Currently, Rand Hall casts a shadow over the east part of the Foundry so the impact from the new Milstein Hall is less at 9:00 in the winter than during the fall. Milstein Hall reduces average light levels 65 percent on the south side and 25 percent on the north side. The western half of the building currently receives very intense direct sunlight through the window so the shading from Milstein will cause a decrease in light levels from 1,500 footcandles average to between 10-30 footcandles.

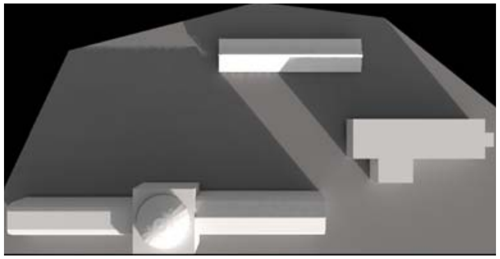
At noon, the new Milstein Hall blocks all of the direct sunlight and most of the diffuse sunlight and light reflected off the ground from the interior of the Foundry. Daylight levels at the south side of the Foundry decrease an average of 98 percent from 2000 footcandles to between 25-50 footcandles. The light levels on the north side decrease 70-80 percent from 175-250 footcandles to between 5-25 footcandles.

Although the Sibley Rotunda and Dome currently shade two thirds of the central part of the south façade at 3:00 pm, Milstein Hall will shade the entire façade. Milstein also blocks most of the diffuse sunlight to the interior decreasing light levels by 70-85 percent with averages of between 15-20 footcandles in the open studio and 50 footcandles average at the east room. Only in the west room, where direct sunlight is not blocked, do the light levels remain unaffected.

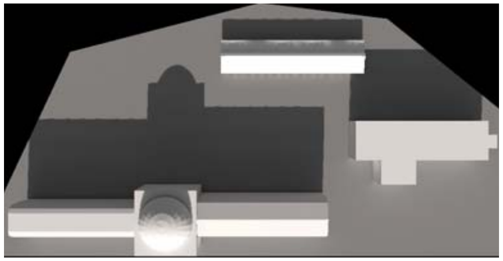


SOLAR POSITION
DECEMBER 21ST – WINTER SOLSTICE

FOUNDRY EXISTING CONDITION



9:00 AM



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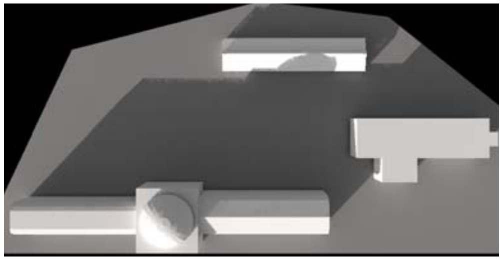
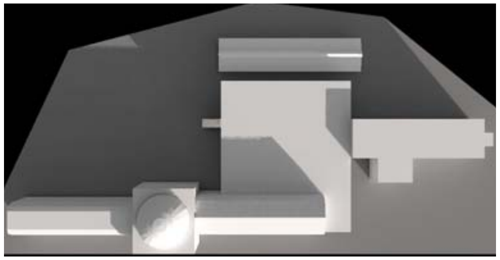


3:00 PM

SUN SETS AT 4 PM DURING WINTER SOLSTICE.

FOUNDRY WITH NEW MILSTEIN HALL



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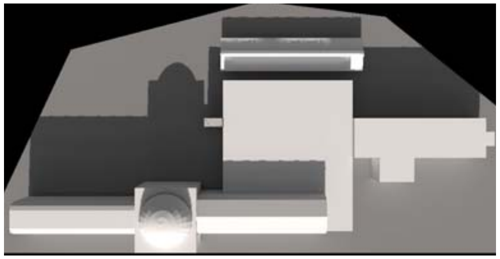

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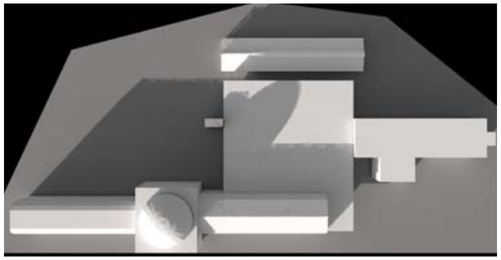
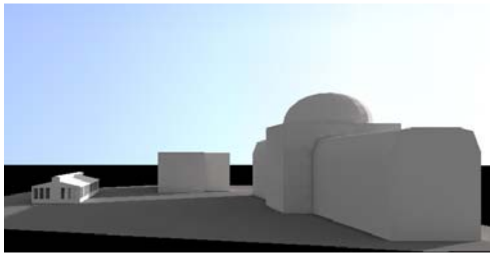


3:00 PM

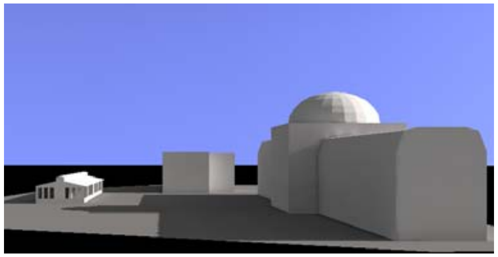
SUN SETS AT 4 PM DURING WINTER SOLSTICE.

PLAN RENDERINGS
DECEMBER 21ST – WINTER SOLSTICE

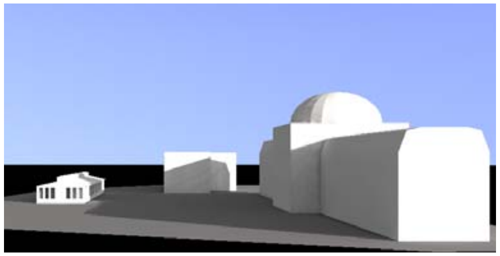
FOUNDRY EXISTING CONDITION



9:00 AM



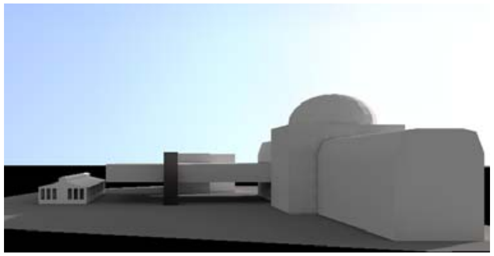
12:00 PM



3:00 PM

SUN SETS AT 4 PM DURING WINTER SOLSTICE.

FOUNDRY WITH NEW MILSTEIN HALL



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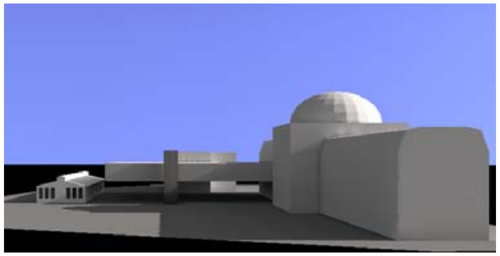

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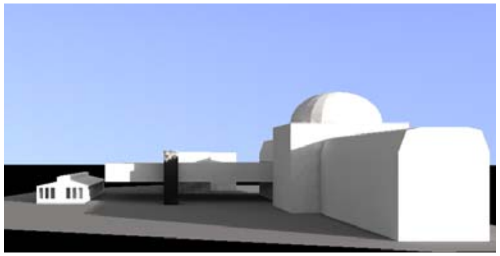
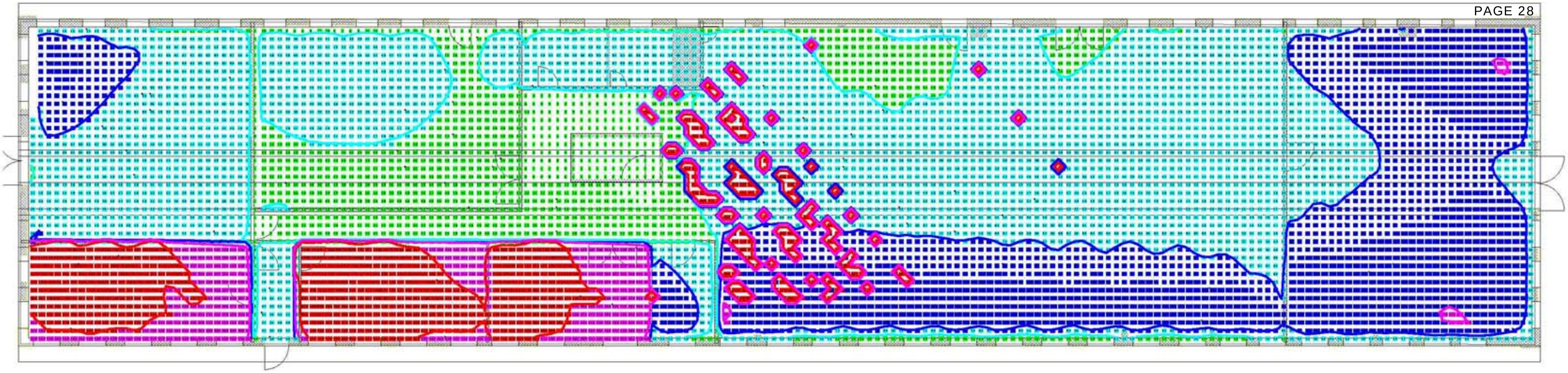


3:00 PM

SUN SETS AT 4 PM DURING WINTER SOLSTICE.



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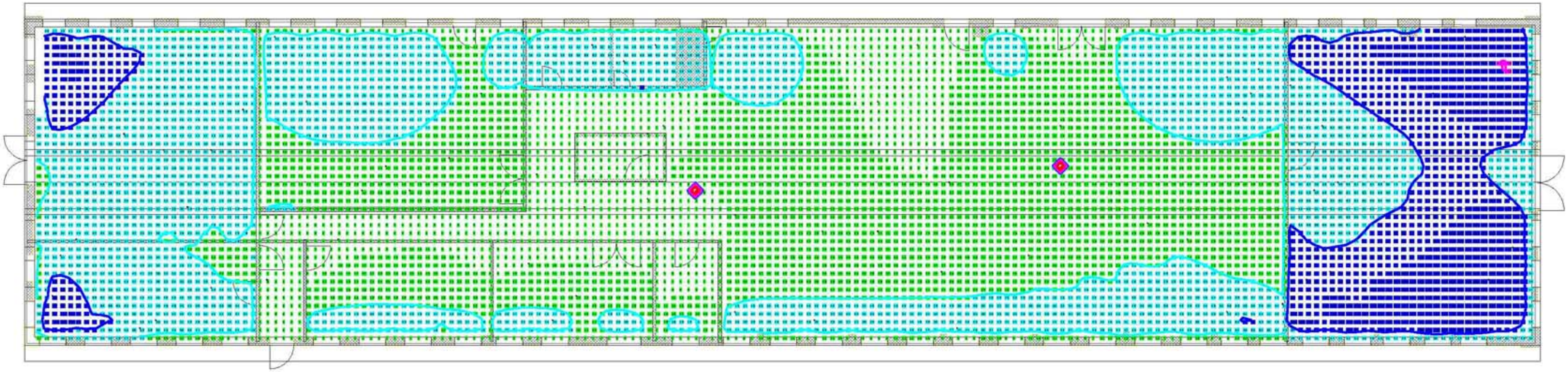


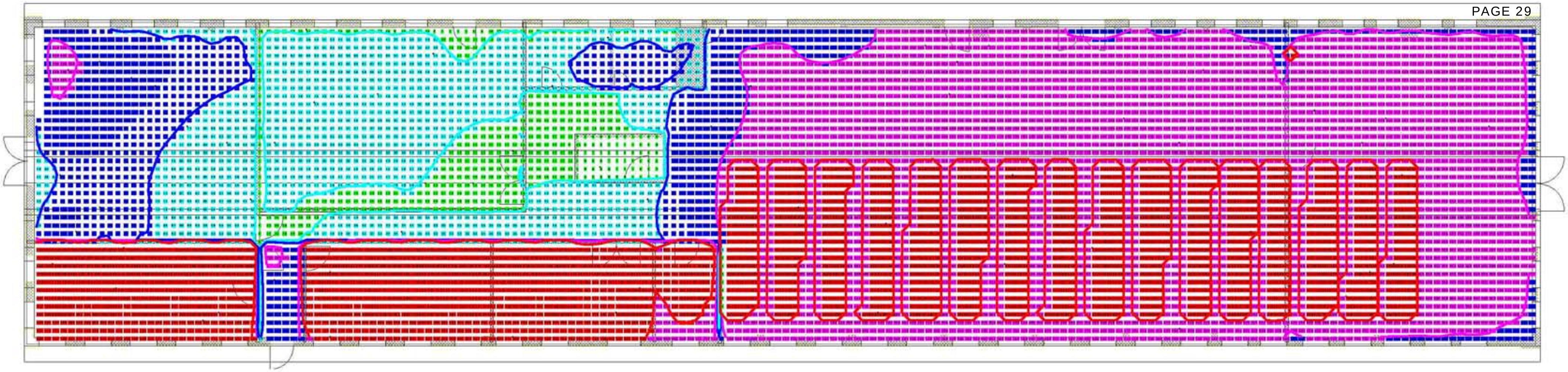
FOUNDRY WITH NEW MILSTEIN HALL

LIGHT LEVEL DIAGRAM

INTERIOR DAYLIGHT LEVELS

DECEMBER 21ST – 9:00 AM

tillotson design associates



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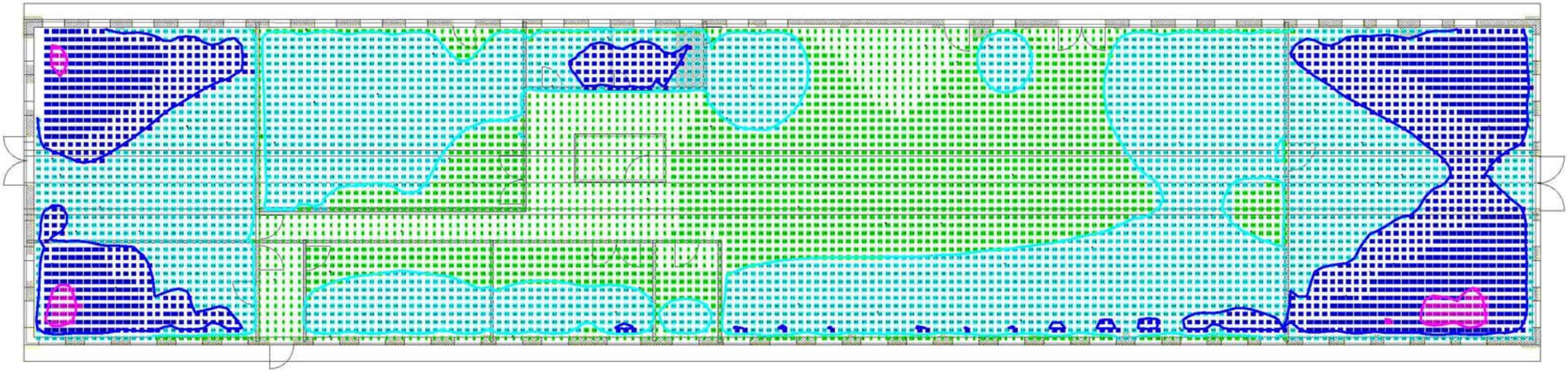


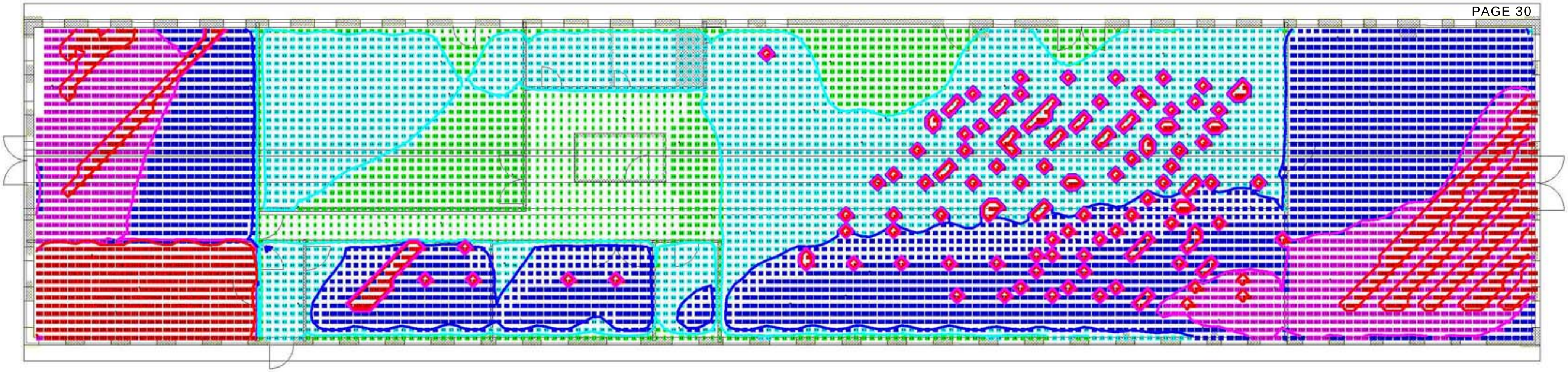
FOUNDRY WITH NEW MILSTEIN HALL

LIGHT LEVEL DIAGRAM

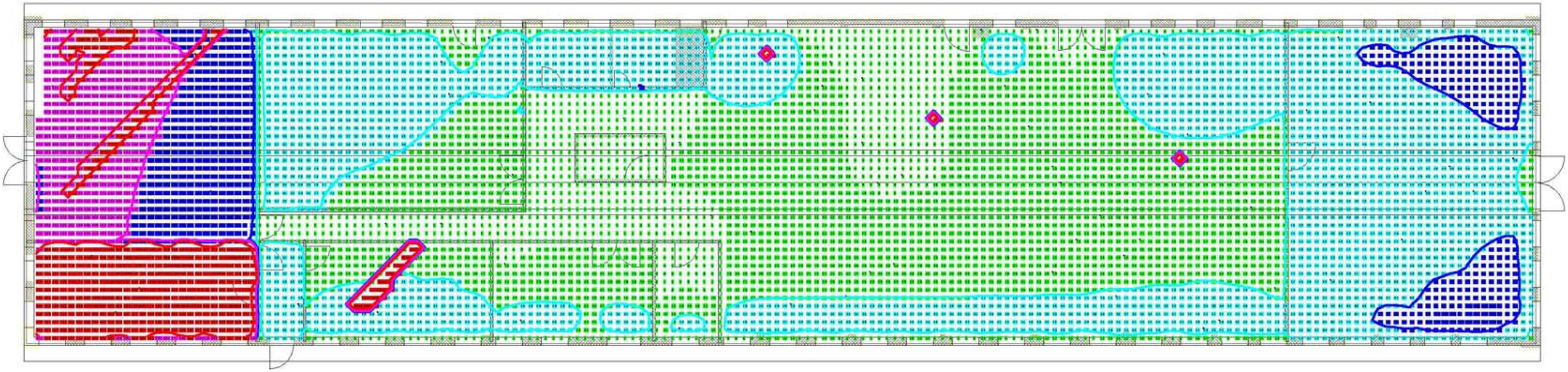
FOUNDRY INTERIOR DAYLIGHT LEVELS

DECEMBER 21ST – 12:00 PM

tillotson design associates



FOUNDRY EXISTING CONDITION



FOUNDRY WITH NEW MILSTEIN HALL

LIGHT LEVEL DIAGRAM

FOUNDRY INTERIOR DAYLIGHT LEVELS

DECEMBER 21ST – 3:00 PM

E. Conclusion and Mitigation Measures

The new Milstein Hall will reduce the daylight levels within the Foundry. Although actual light level reductions vary in each room by time of day and month of the year, there is always some impact to daylight levels in the east room, open studio and south west rooms. A positive impact of the new Milstein Hall will be the reduction of disability and discomfort glare to the occupants of the Foundry as a result of direct sunlight through the windows.

The Foundry, even after the construction of Milstein Hall, will be adequately lit for the tasks performed within it. Electric light provides consistent lighting for occupants working in the space day and night.

Improvements to the existing lighting, though not required, would improve light uniformity and increase the visual comfort for occupants of the space. Replacing the existing T12 fluorescent wraparound fixtures with T8 or T5 indirect or semi-indirect fixtures will illuminate the ceiling and reduce the contrast between the interior surfaces and the windows providing better visual comfort for the occupant. Indirect lighting also increases the light level uniformity ratio while virtually eliminating shadows, providing appropriate art studio lighting.

Supplemental daylight could be gained by opening the Foundry ceiling to the clerestory windows. The clerestory will increase the perceived brightness of the interior and emphasize the height and openness of the open studio space. The new clerestory glazing should provide as much light transmission as possible. Diffuse glass should be studied as an alternate to the clear glazing as it may improve light levels and uniformity.

Shading Impacts to Outdoor Areas Covered by the Second Floor of Milstein

Introduction

The open space to the south of the Foundry, the northeast side of Sibley Hall and the west side of Rand Hall will be referred to as the Milstein site. This area is currently occupied by University Avenue, a surface parking lot, and several sidewalks as illustrated on the overall site plan on page 3.

The shading impact of the new Milstein Hall on the Foundry interior and the outdoor areas to be covered by the new Milstein Hall was studied using AGI32 version 1.95; a light modeling computer application. Light measurements and renderings were calculated for the Summer Solstice (June 21st) and Equinox (September 21st) at 9am, noon, 3 pm and 6pm.[11] Light measurements and renderings were calculated for the Winter Solstice (December 21st) at 9 am, noon and 3 pm (sun sets in Ithaca at 4:32 pm on December 21st). All calculations assume a clear sky (no cloud cover) and ground reflectances of 20%. The calculation plane is at 36" above the finished floor or ground. All light levels discussed in the report are based on the AGI models and were checked for accuracy during the February 21st site visit by Tillotson Design. The north façade of the new Milstein Hall as well as Sibley Hall, Rand Hall and the Foundry are aligned 2.425 degrees east of North NAD83 as verified by the project Civil Engineer T. G. Miller, P.C.[12]

Three factors impact daylight contribution: direct sunlight, diffuse skylight and light reflected from the ground. Direct sun light is defined as the part of the solar radiation (sunlight) that reaches the earth's surface after reduction and dispersion by the atmosphere. Diffuse sun light is defined as the sunlight that reaches the surface of the earth as a result of being scattered by air molecules, aerosol particles, cloud particles or other particles. The total lumens from direct sunlight and diffuse sunlight can vary significantly depending on the solar azimuth[13], solar elevation[14] and atmospheric conditions but account for the most of the daylight contribution. Light reflected from the ground typically accounts for 10 to 15 percent of the total daylight reaching a window. If snow is covering the ground, the amount of daylight reaching the window from reflected light will increase[15].

A. Summary

Throughout the year, portions of the Milstein Hall site are already shaded by Sibley and Rand Hall. Although the new Milstein Hall will increase the area in shade, it will provide a welcome and pleasant escape from the elements during the winter and a shady place for

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[11] Note that the Summer Solstice and Equinox account for daylight savings time

[12] NAD 83 (North American Datum 1983) is aligned with true north as opposed to magnetic north

[13] Solar Azimuth is the angular position of the sun measured around the Horizon with North being 0 degrees, East 90 degrees, South 180 degrees and West 270 degrees (IESNA RP-55-99)

[14] Solar Elevation is measured in degrees above the horizon with the horizon being 0 degrees and straight up being 90 degrees (NOAA)

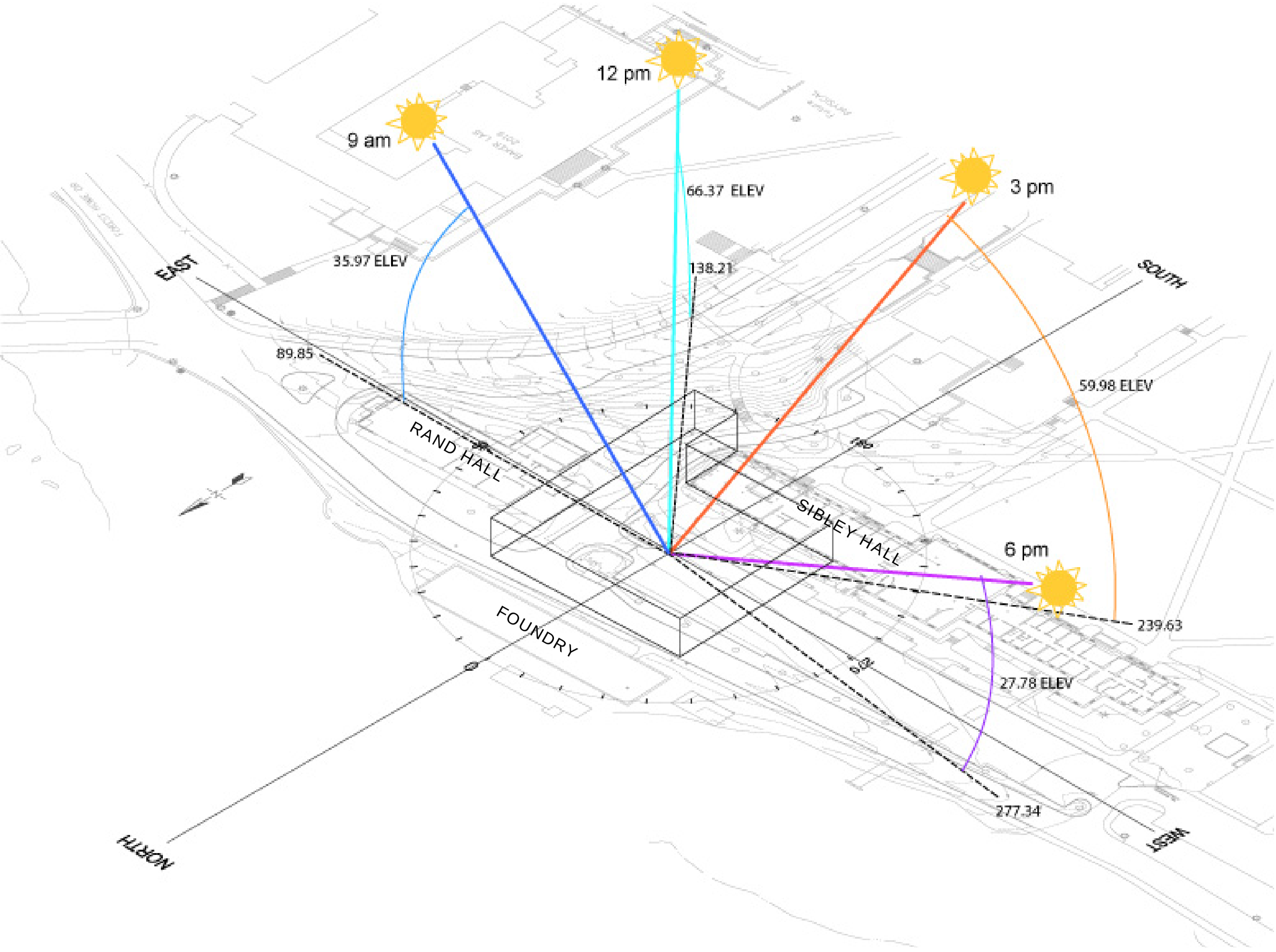
[15] IESNA Lighting Handbook Ninth Edition

reading or relaxing in the summer. Downlights mounted in the ceiling over the Plaza will provide additional ambient light for people using the space and create an interesting and pleasant environment. When the sun is at lower elevations during the morning and late afternoon, direct sunlight will fall inside the perimeter of the outdoor area covered by the second floor of Milstein with the amount of sunlight and distance inside the perimeter varying according to the time of the day and month of the year. Direct sunlight travels furthest into the covered plaza during the morning and afternoon at the equinox.

B. Existing Condition of Outdoor Area

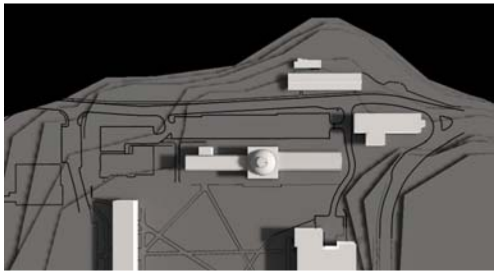
1. Summer Solstice June 21st

On June 21st, the Milstein Hall site receives very little shading from Sibley Hall except in a narrow zone around the north and east perimeter (refer to pages 33-38). At 9:00 am, Rand Hall casts a shadow to the east edge of the surface parking but otherwise the site is in direct sunlight throughout the day. Light levels during the summer range from 5,500 footcandles at 9:00 am to 10,000 footcandles at noon and 3:00 pm and 4,500 footcandles at 6:00 pm.



SOLAR POSITION
JUNE 21ST – SUMMER SOLSTICE

SITE EXISTING CONDITION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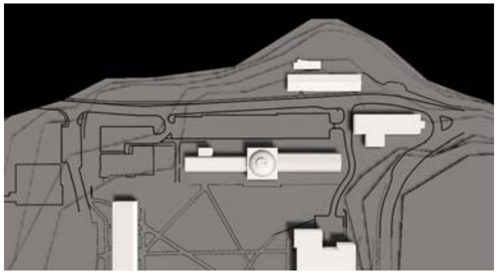
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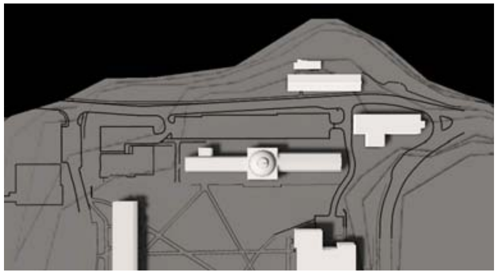
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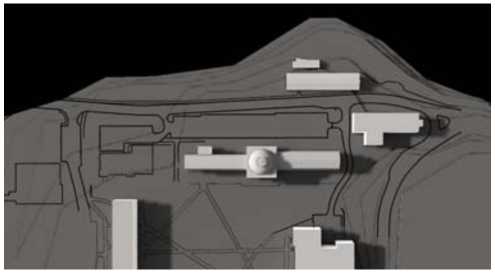
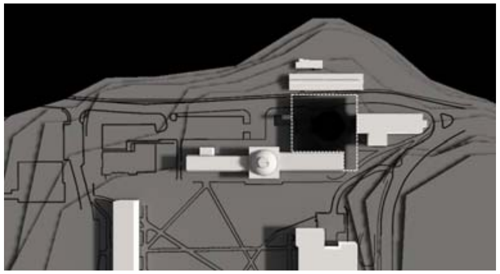
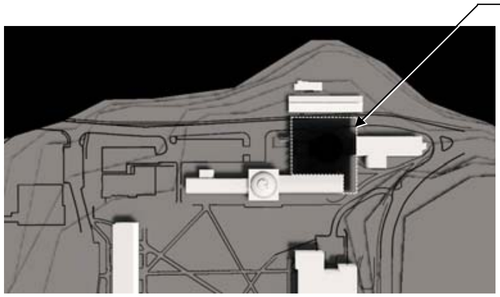
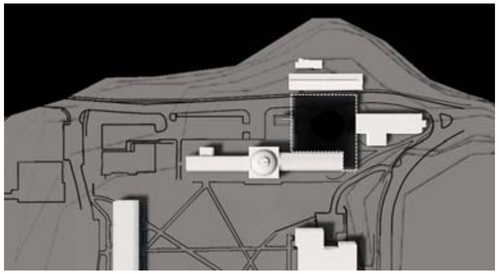

6:00 PM

FOUNDRY WITH NEW MILSTEIN HALL


9:00 AM


12:00 PM

OUTLINE OF MILSTEIN HALL 2ND FLOOR ABOVE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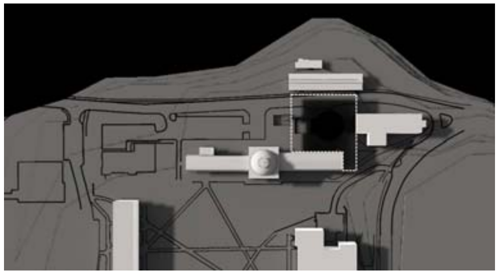
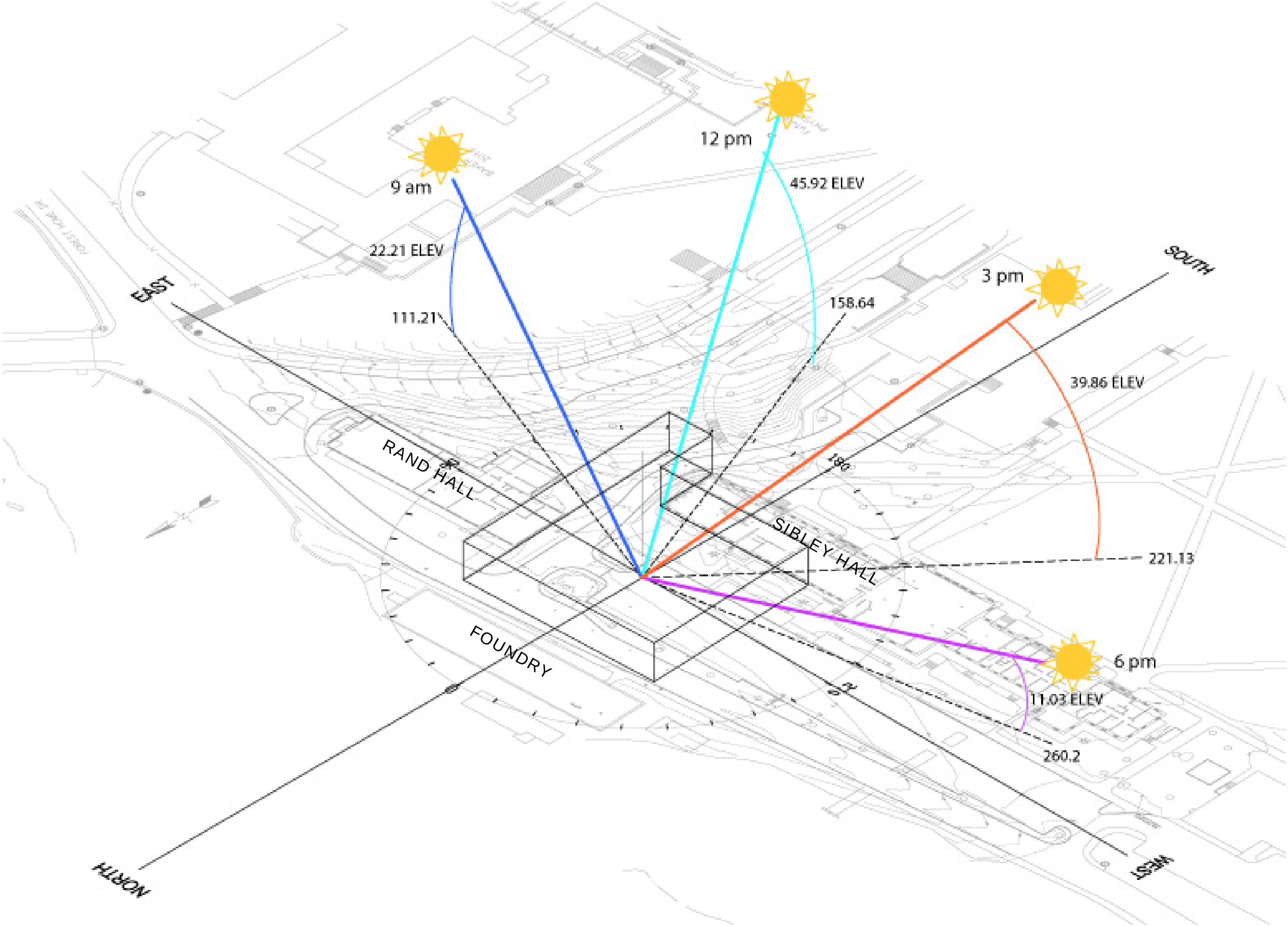

6:00 PM

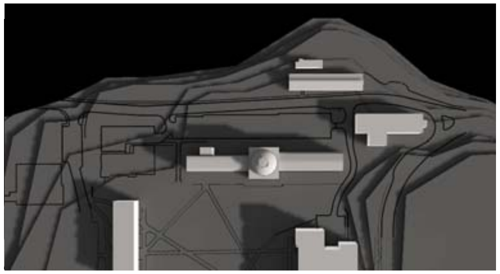
2. Equinox September 21st

At the September 21st equinox, the shadow from Sibley Hall and Rand Hall projects further north due to the lower sun elevation (refer to pages 38, 43, 50-53). Throughout most of the day, the shadow from Sibley Hall reaches the southern edge of the surface parking. Rand Hall casts a shadow over small sections of University Avenue with the shadow traveling from north west of the building at 9:00 am to north east at 6:00 pm. Light levels during the equinox range from 3,500 footcandles at 9:00 am to 7,500 footcandles at noon and 3:00 pm and 1,400 footcandles at 6:00 pm.



SOLAR POSITION
SEPTEMBER 21ST – EQUINOX

SITE EXISTING CONDITION



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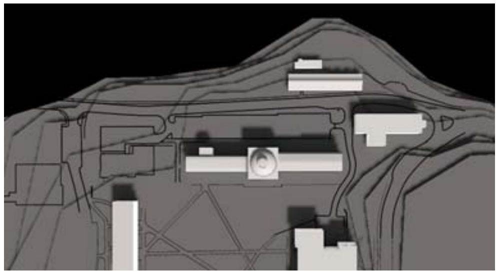

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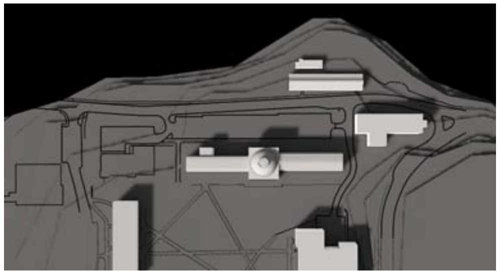

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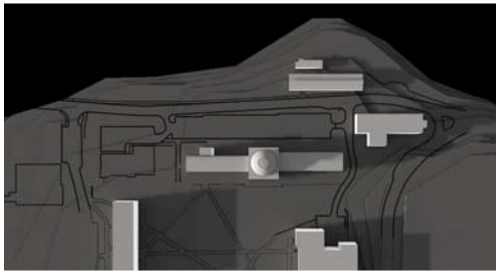
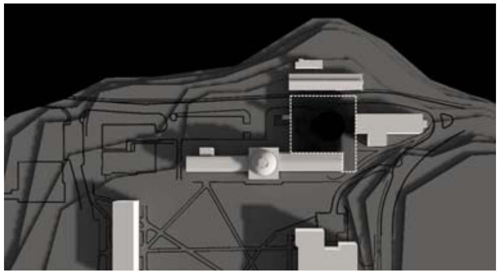


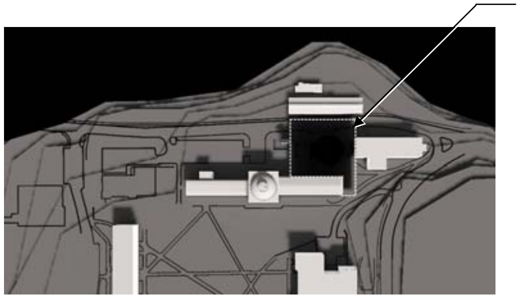
6:00 PM

FOUNDRY WITH NEW MILSTEIN HALL



9:00 AM

OUTLINE OF MILSTEIN HALL 2ND FLOOR ABOVE



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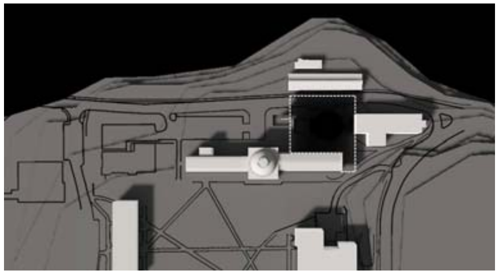

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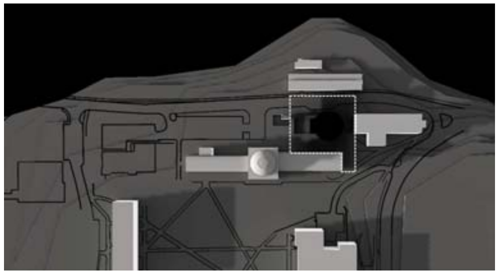
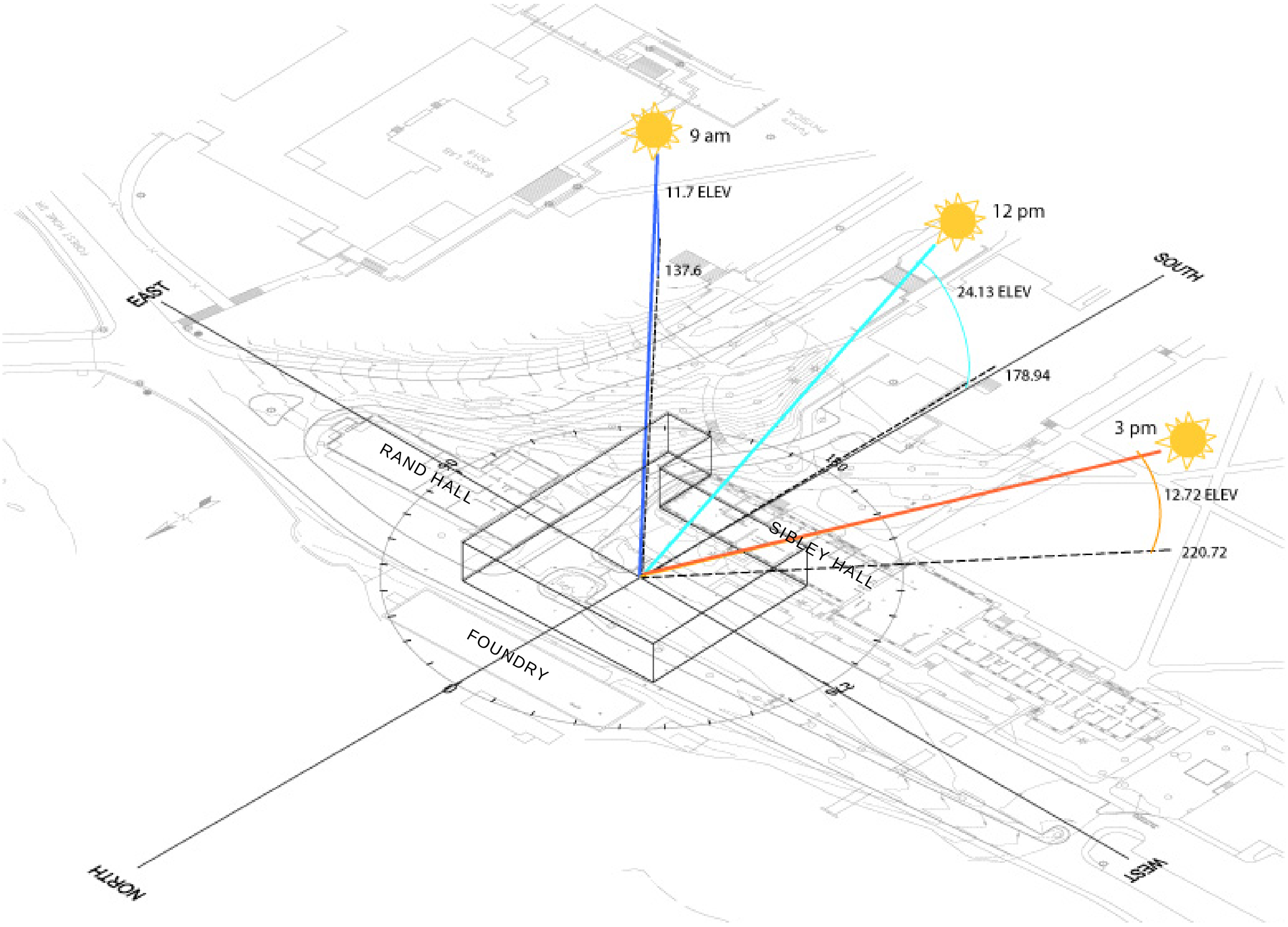


6:00 PM

PLAN RENDERINGS
SEPTEMBER 21ST – EQUINOX

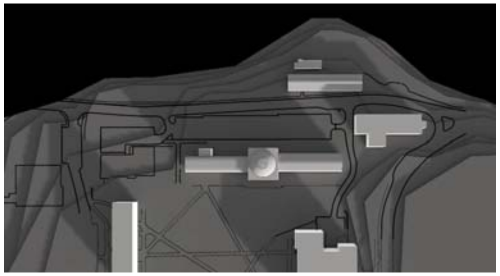
3. Winter Solstice December 21st

On December 21st Sibley Hall and Rand Hall cast shadows over much of the Milstein Hall site for most of the day due to the low sun angles (refer to pages 41, 45, 54-56). Only a small area between Sibley Hall and Rand Hall and a narrow zone at the southern façade of the Foundry receive direct sunlight at 9am and noon. Light levels in the shade during the winter solstice range from 450-550 footcandles at 9:00 am to 550-850 footcandles at noon and 500-700 footcandles at 3:00 pm. Where direct sunlight reaches the ground, light levels average 1,500 footcandles at 9:00 am and 4,000-5,000 footcandles at 3:00 pm.



SOLAR POSITION
DECEMBER 21ST – WINTER SOLSTICE

SITE EXISTING CONDITION



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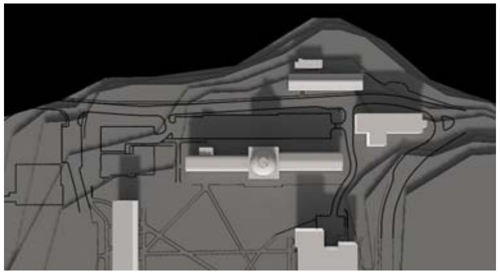

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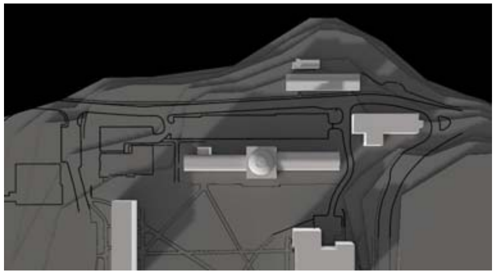
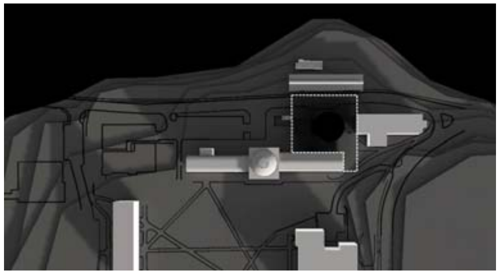


3:00 PM

FOUNDRY WITH NEW MILSTEIN HALL



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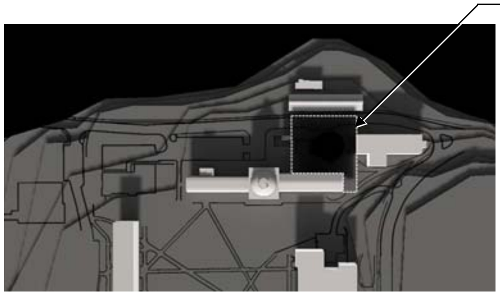
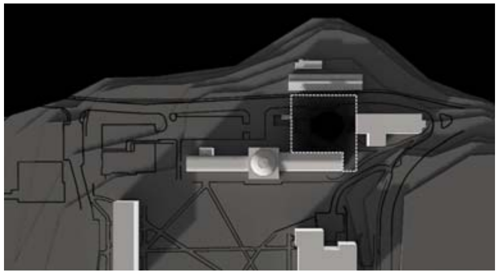


12:00 PM

OUTLINE OF MILSTEIN HALL 2ND FLOOR ABOVE

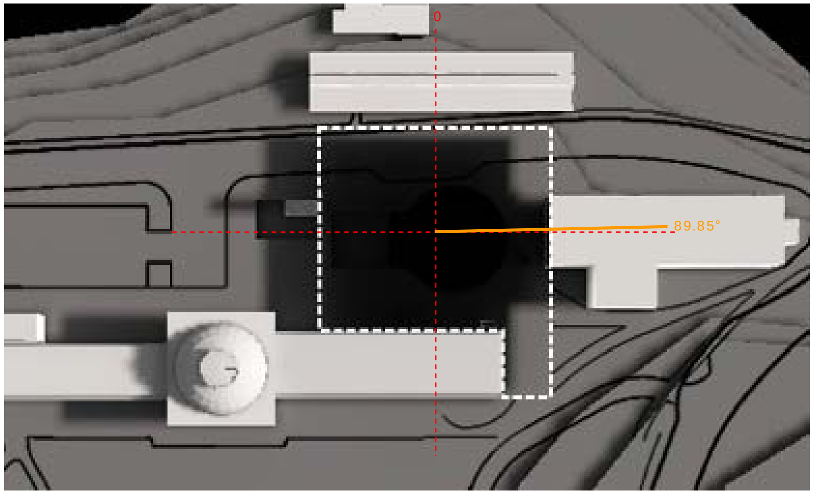


3:00 PM

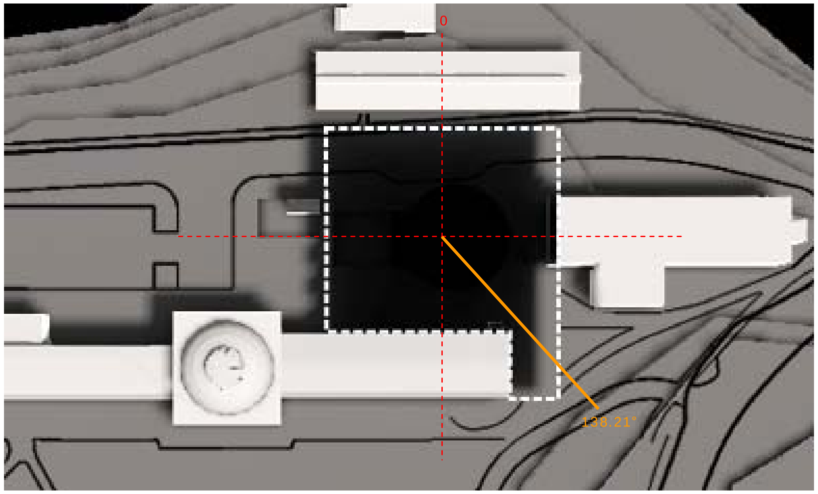
C. Impact of Milstein Hall to Outdoor Area

The new Milstein Hall will shade the area beneath it. In the morning at all times of year, direct sunlight will illuminate 30 feet at the southeast and northeast corners nearest the perimeter of the covered plaza (refer to pages 35, 38, 41). Light levels in this zone are only slightly lower than the light levels of the existing condition due to a loss of diffuse sunlight. At noon during all times of year, all direct sunlight is blocked from entering the covered plaza by the east wing and rotunda of Sibley Hall. By 3:00 pm during the summer solstice and equinox, direct sunlight once again enters the covered plaza at the west perimeter with light levels similar to those of the existing condition. At 3:00 pm during the winter solstice, the solar elevation is only 13 degrees above the horizon and, as in the existing condition, all direct sunlight is blocked by Sibley Hall. During the summer solstice and equinox, the distance of direct sunlight penetration increases at 6:00 pm when the sun elevation is lower in the western sky.

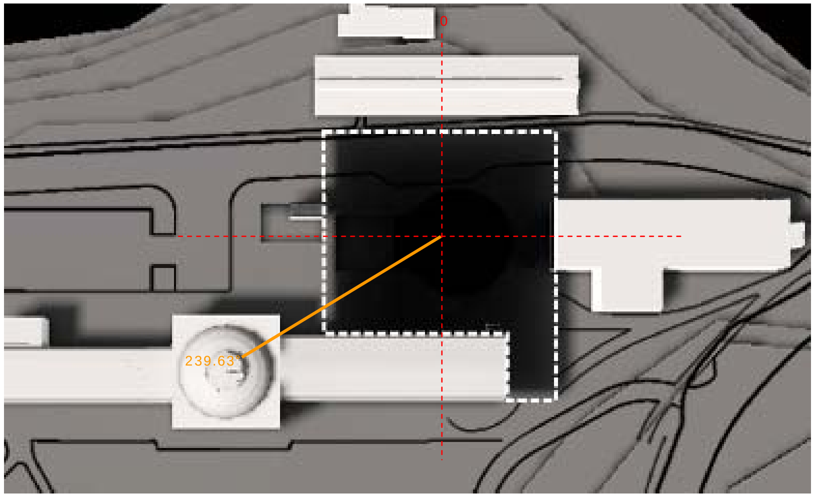
Although Milstein Hall shades the area it covers from direct sunlight, the high ceiling within the Plaza will allow diffuse sunlight and interreflected light to travel deep into the Plaza. Light levels decrease steadily from the perimeter to the dome at the center of the Milstein Hall. Perimeter areas not in direct sunlight average between 100-200 footcandles of daylight throughout the year and daylight levels nearer the dome average between 30-60 footcandles (see light level diagrams for additional information).



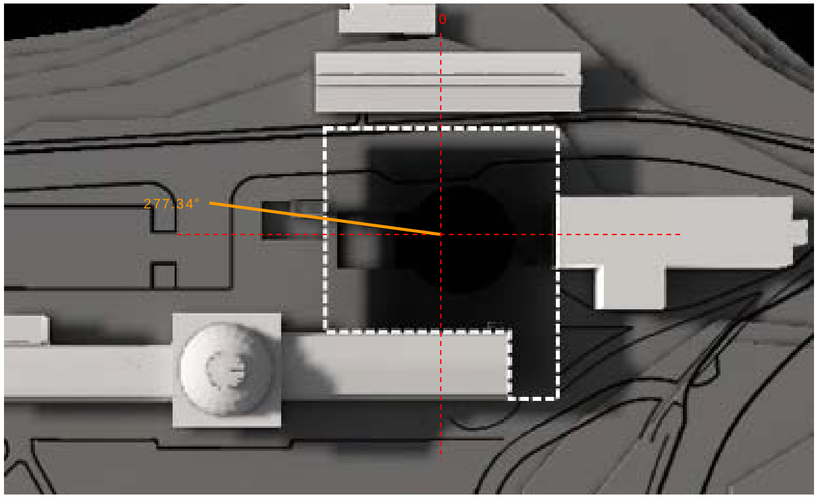
JUNE 21ST 9:00 AM – ALTITUDE: 35.97°



JUNE 21ST 12:00 PM - ALTITUDE: 66.37°



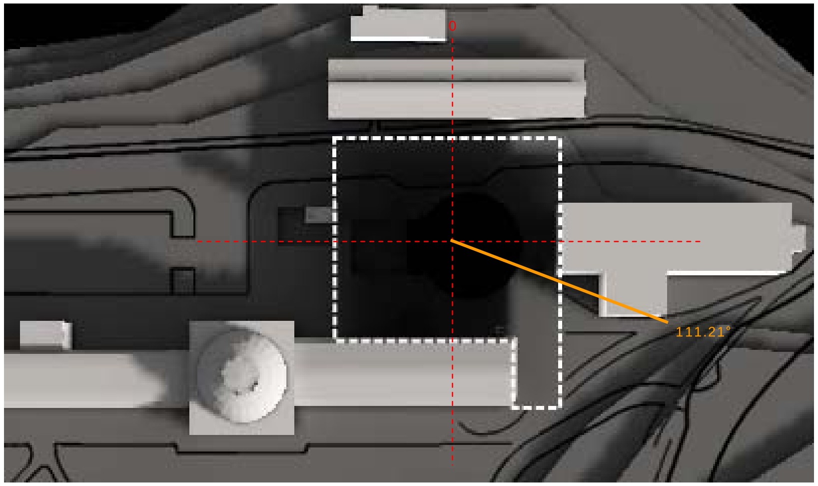
JUNE 21ST 3:00 PM - ALTITUDE: 59.98°



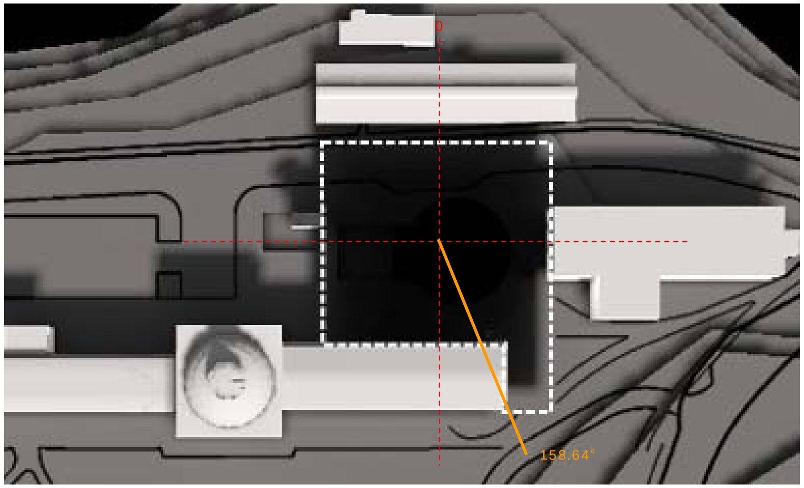
JUNE 21ST 6:00 PM - ALTITUDE: 27.78°

SHADOW DIAGRAM

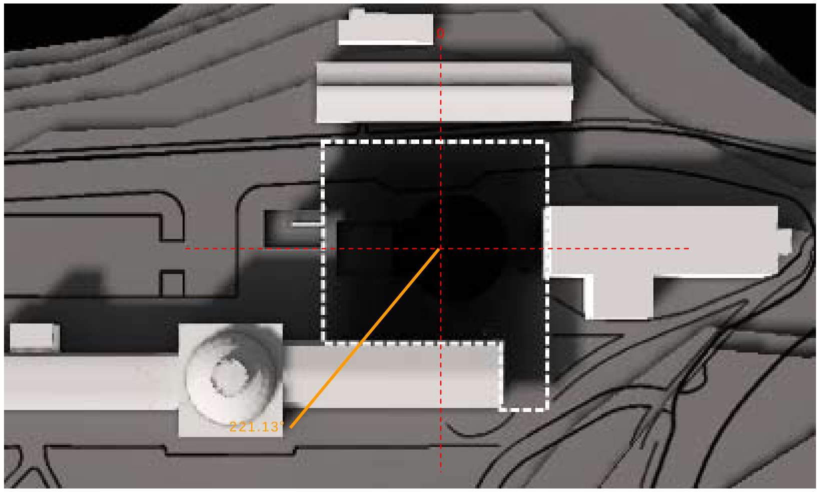
JUNE 21ST –SUMMER SOLSTICE



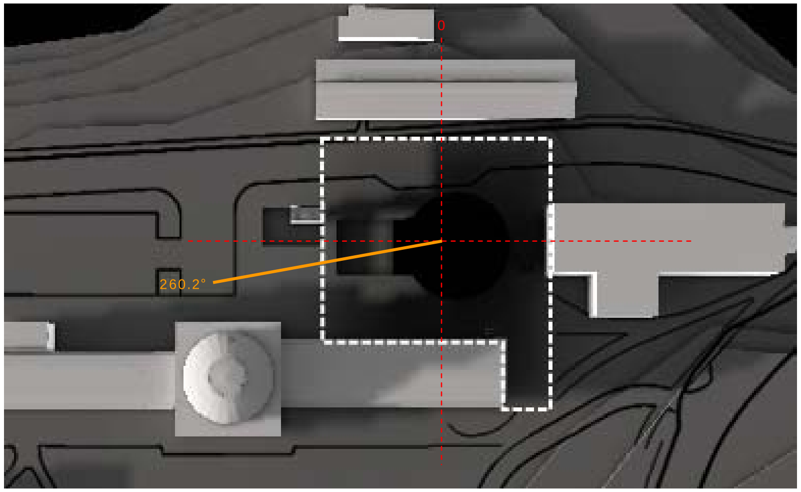
SEPTEMBER 21ST 9:00 AM – ALTITUDE 22.21°



SEPTEMBER 21ST 12:00 PM - ALTITUDE 45.92°



SEPTEMBER 21ST 3:00 PM - ALTITUDE 39.86°



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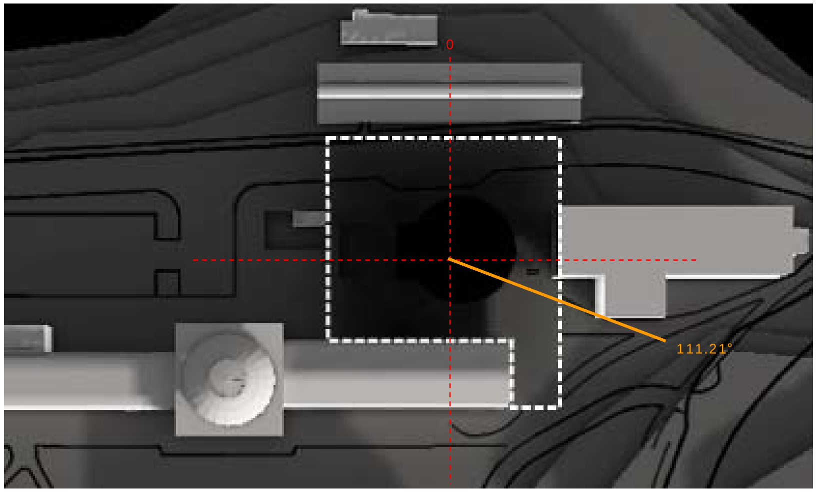
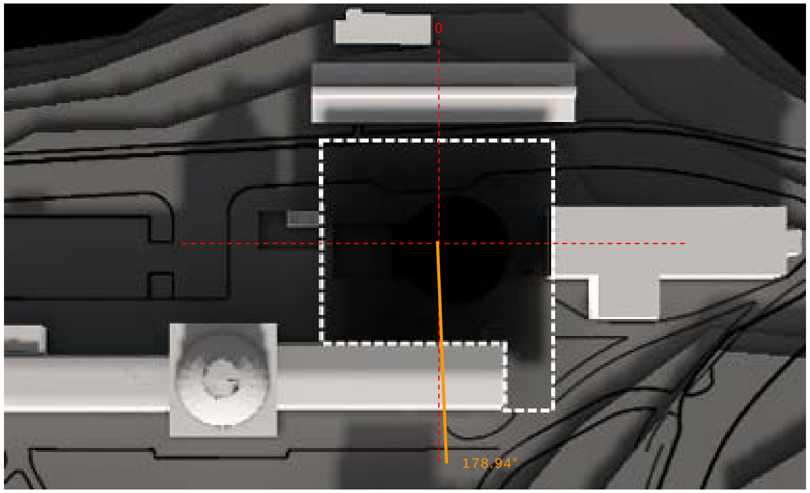


DECEMBER 21ST 9:00 AM – ALTITUDE 11.7°



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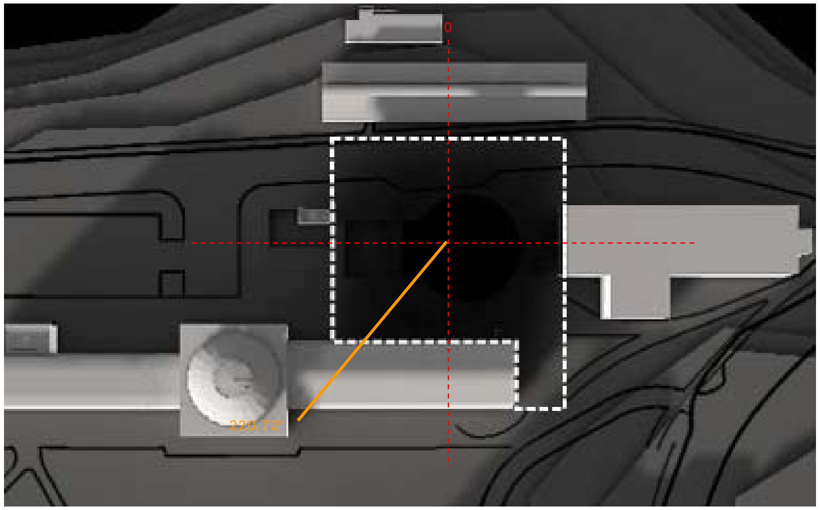

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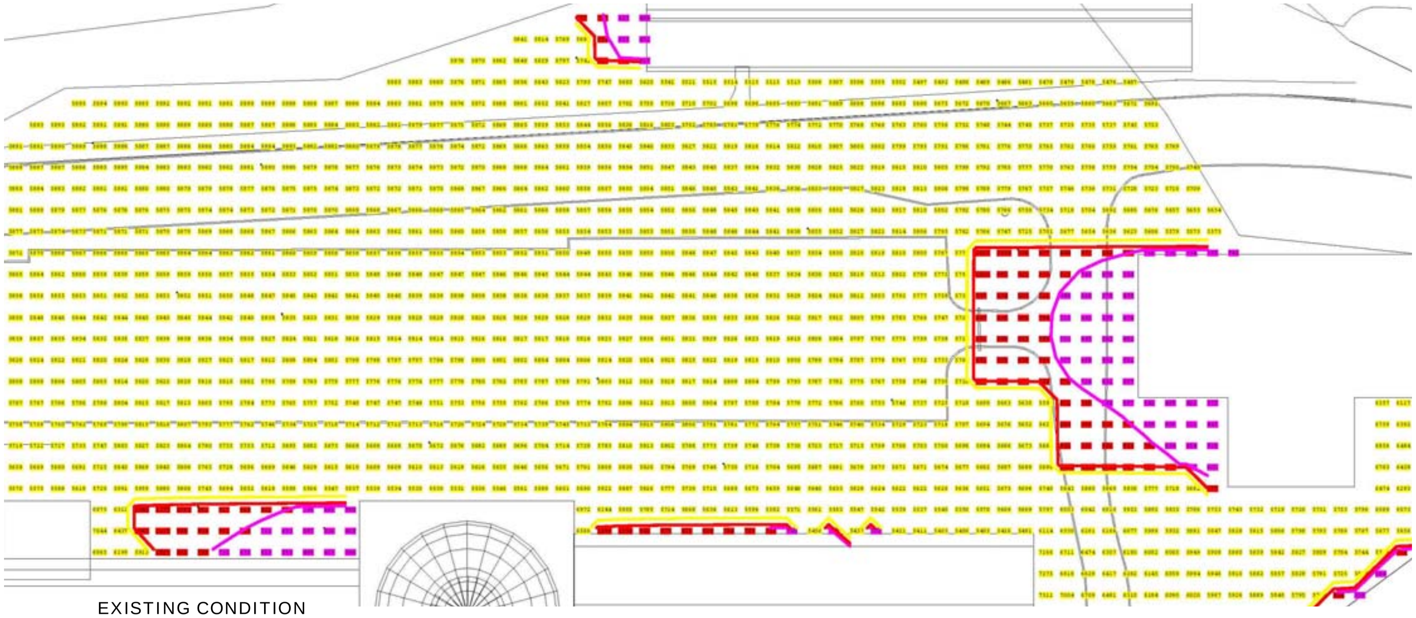
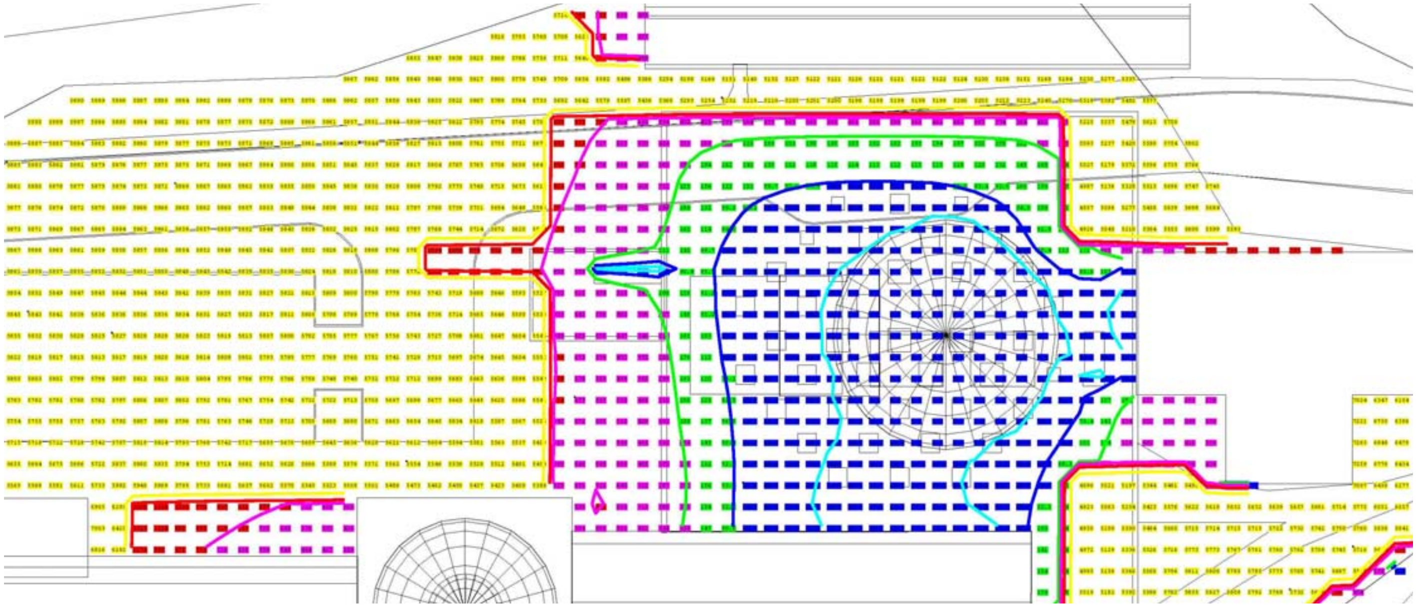
SHADOW DIAGRAM
DECEMBER 21ST – WINTER SOLSTICE



EXISTING CONDITION



WITH NEW MILSTEIN HALL

LIGHT LEVELS IN FOOTCANDLES

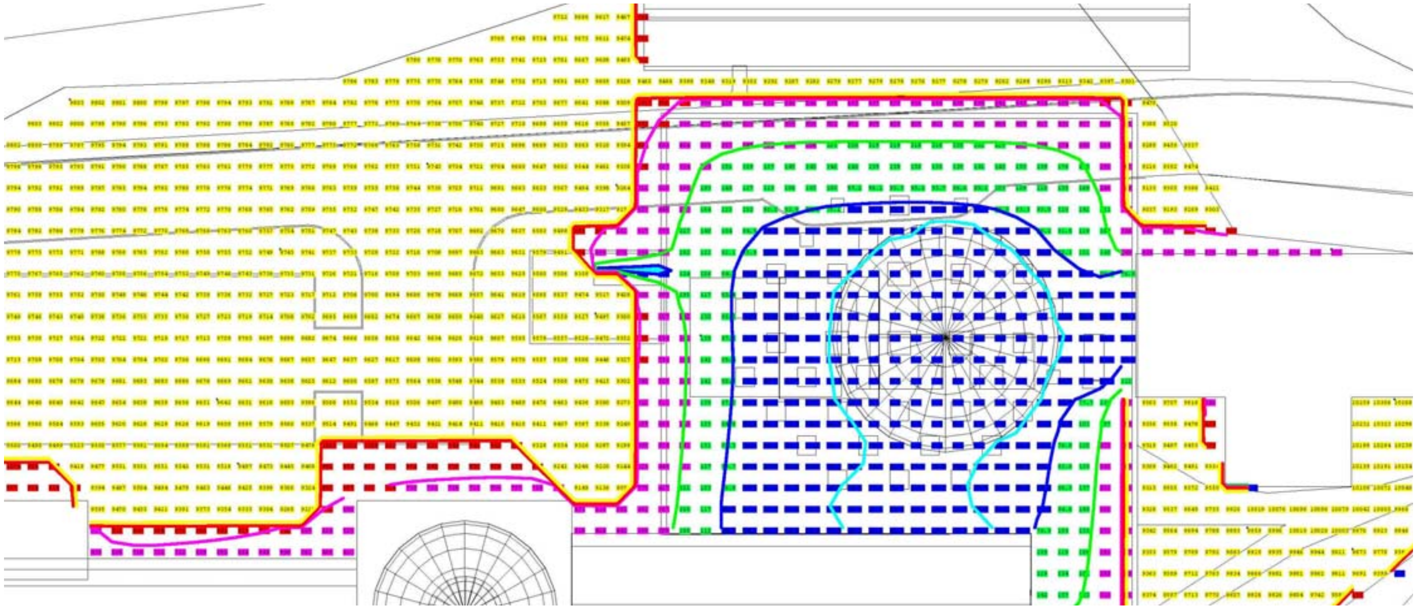
0- 75	🟦	750-1500	🟥
75-225	🟩	1500+	🟨
225-750	🟪		

NUMERIC SUMMARY

EXTERIOR DAYLIGHT LEVELS

JUNE 21ST – 9:00 AM

EXISTING CONDITION



WITH NEW MILSTEIN HALL

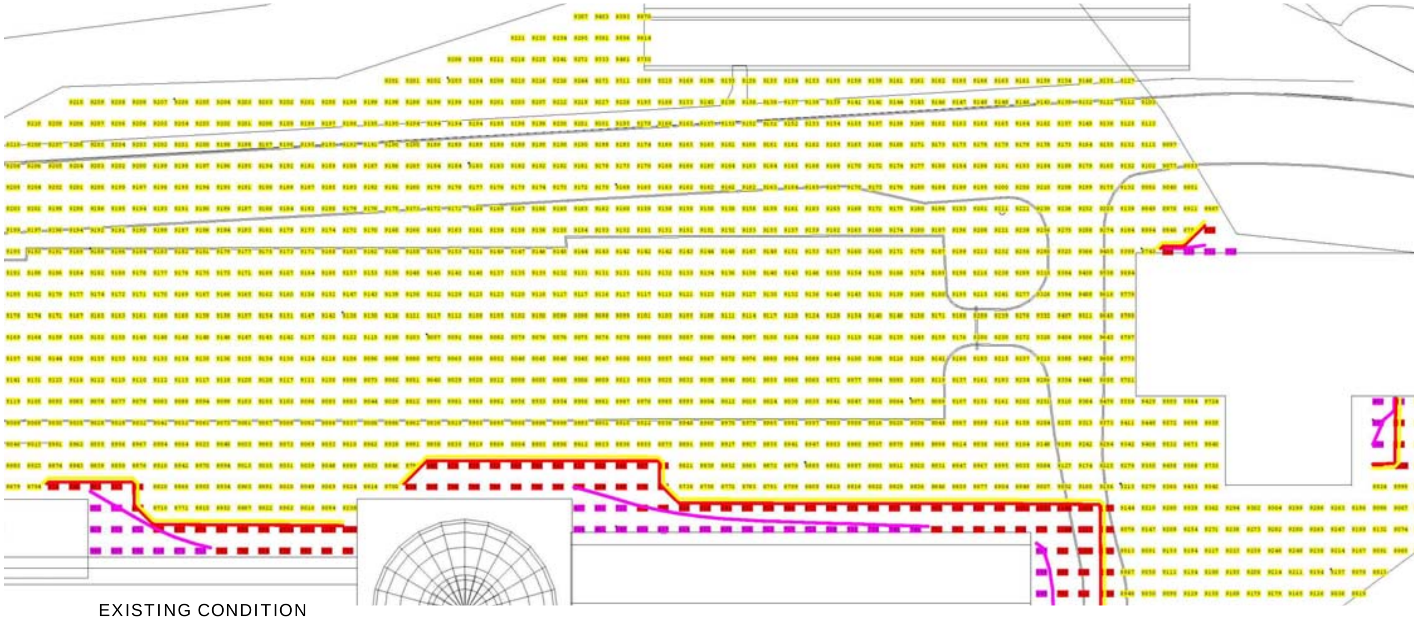
LIGHT LEVELS IN FOOTCANDLES

0- 75 🟦
75-225 🟩
225-750 🟥
750-1500 🟥
1500+ 🟨

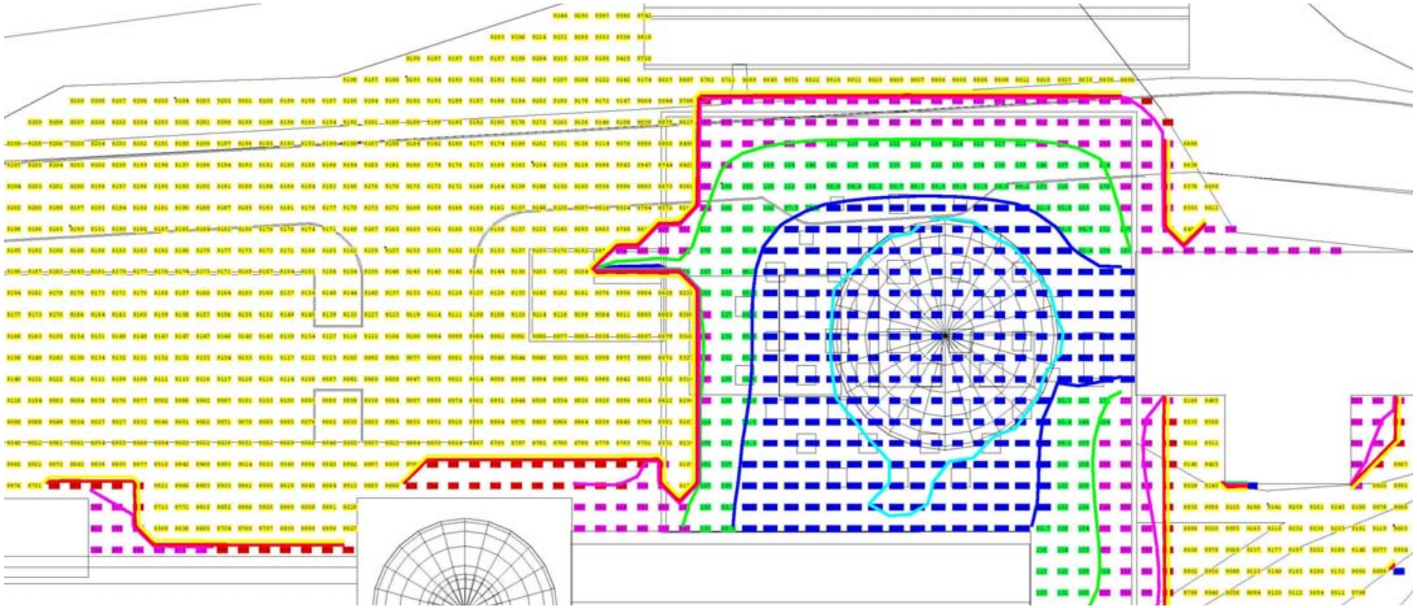
NUMERIC SUMMARY

EXTERIOR DAYLIGHT LEVELS

JUNE 21ST – 12:00 PM



EXISTING CONDITION



WITH NEW MILSTEIN HALL

LIGHT LEVELS IN FOOTCANDLES

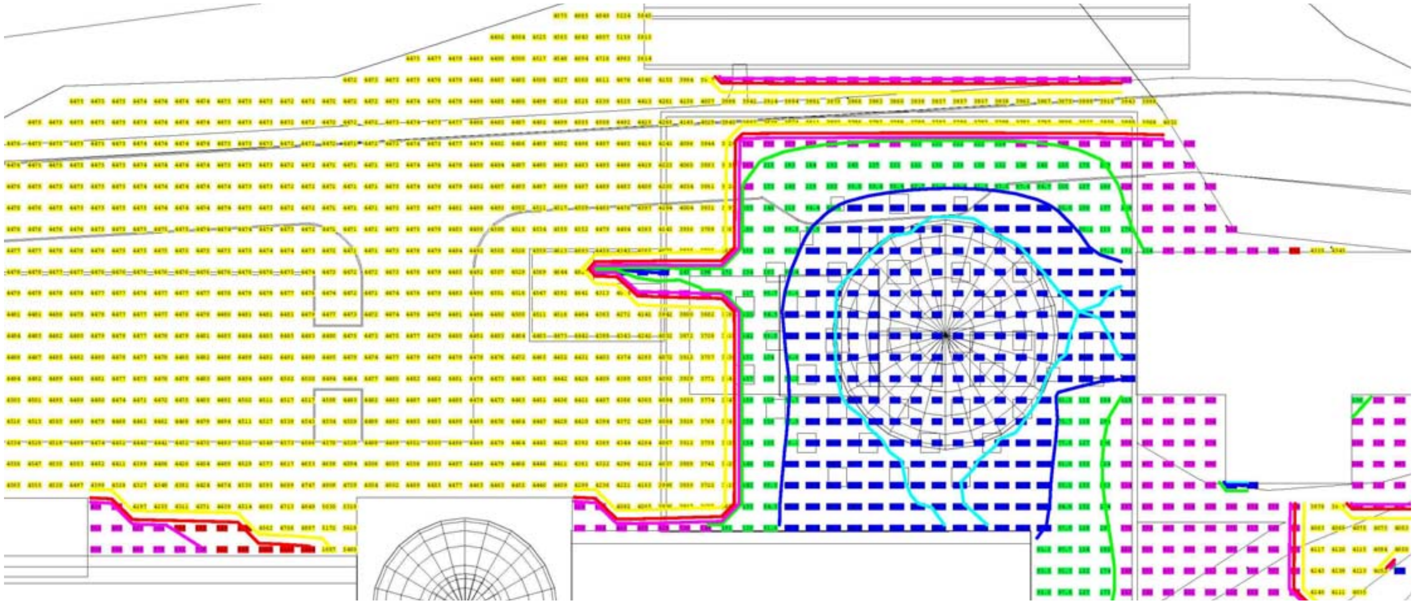
0- 75 🟦
75-225 🟩
225-750 🟪
750-1500 🟥
1500+ 🟨

NUMERIC SUMMARY

EXTERIOR DAYLIGHT LEVELS

JUNE 21ST – 3:00 PM

EXISTING CONDITION



WITH NEW MILSTEIN HALL

LIGHT LEVELS IN FOOTCANDLES

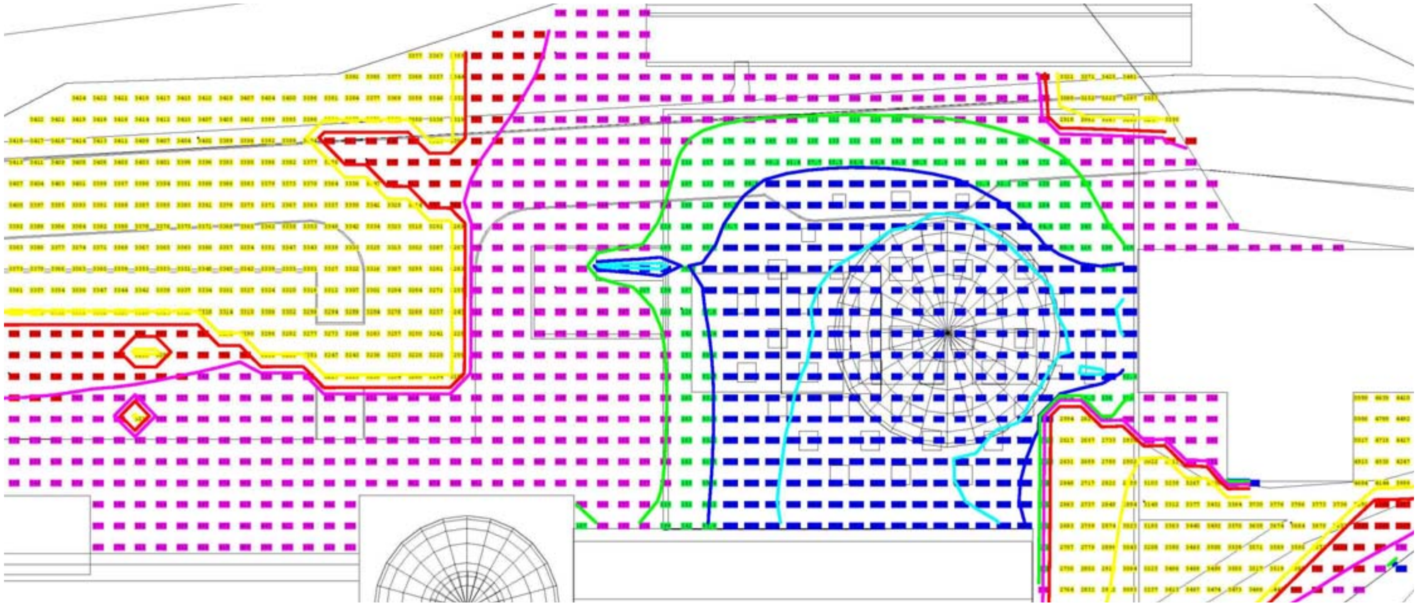
0- 75 🟦
75-225 🟩
225-750 🟥
750-1500 🟥
1500+ 🟨

NUMERIC SUMMARY

EXTERIOR DAYLIGHT LEVELS

JUNE 21ST – 6:00 PM

EXISTING CONDITION



WITH NEW MILSTEIN HALL

LIGHT LEVELS IN FOOTCANDLES

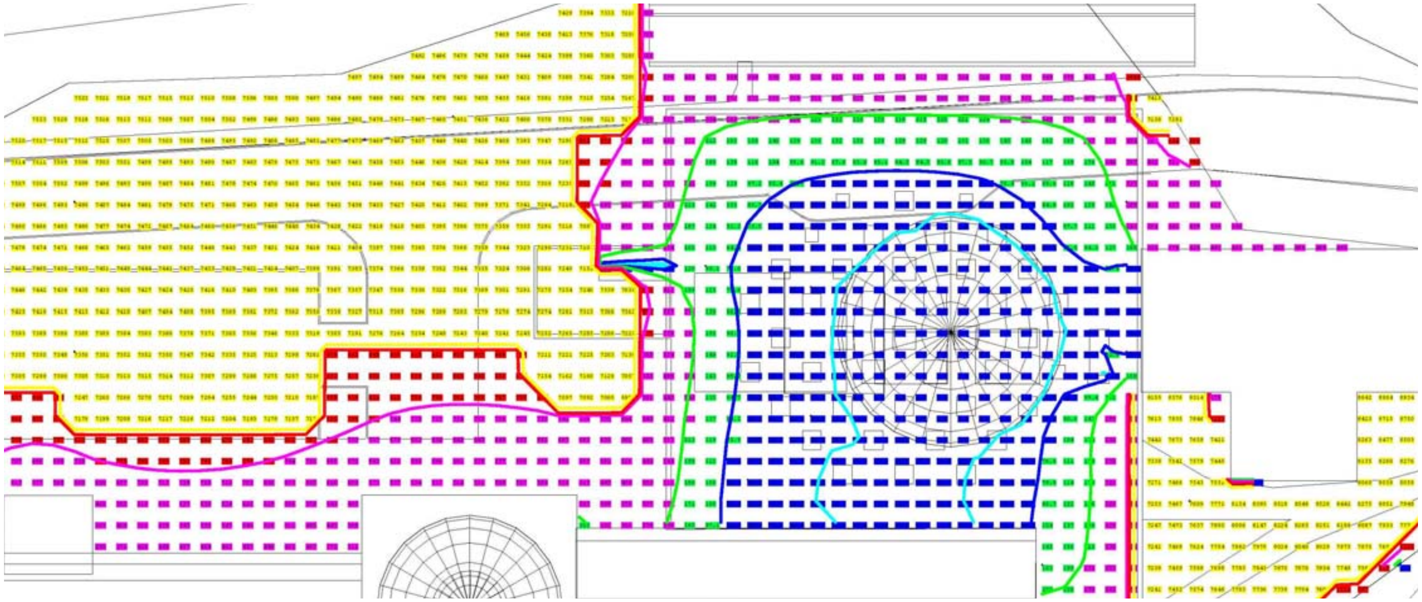
0- 75 🟦
75-225 🟩
225-750 🟥
750-1500 🟥
1500+ 🟨

NUMERIC SUMMARY

EXTERIOR DAYLIGHT LEVELS

SEPTEMBER 21ST – 9:00 AM

EXISTING CONDITION



WITH NEW MILSTEIN HALL

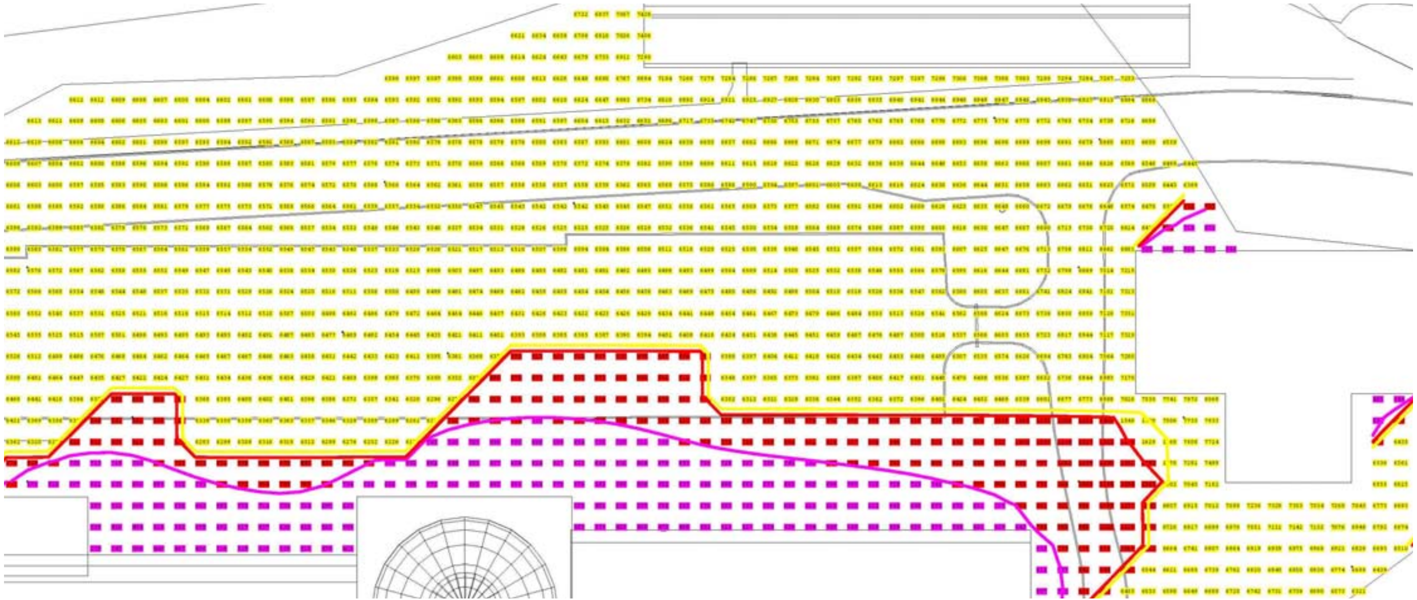
LIGHT LEVELS IN FOOTCANDLES

0- 75 🟦
75-225 🟩
225-750 🟥
750-1500 🟥
1500+ 🟨

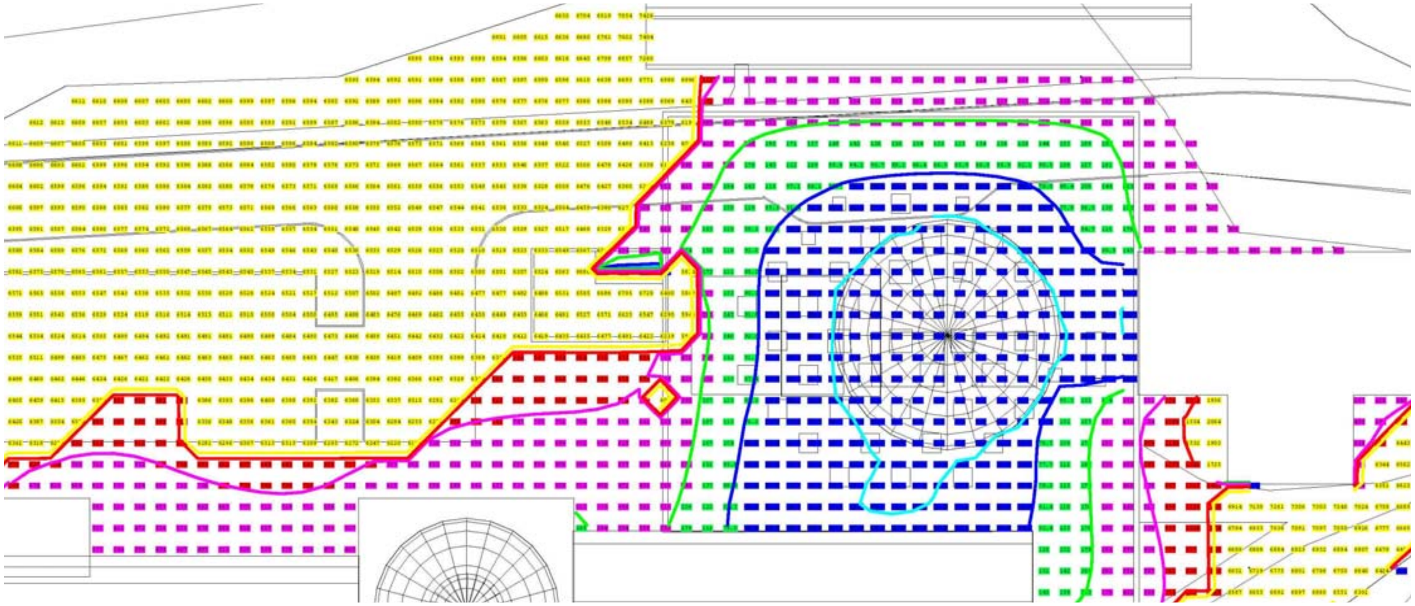
NUMERIC SUMMARY

EXTERIOR DAYLIGHT LEVELS

SEPTEMBER 21ST – 12:00 PM



EXISTING CONDITION



WITH NEW MILSTEIN HALL

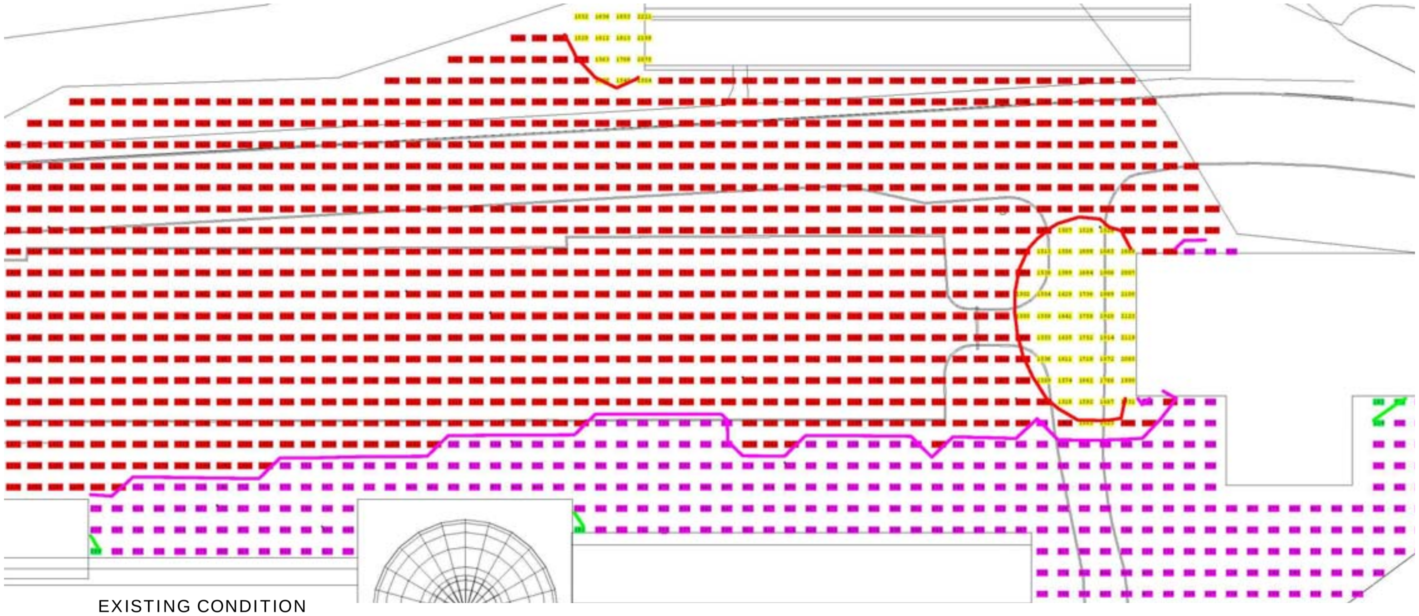
LIGHT LEVELS IN FOOTCANDLES

0- 75 🟦
75-225 🟩
225-750 🟪
750-1500 🟥
1500+ 🟨

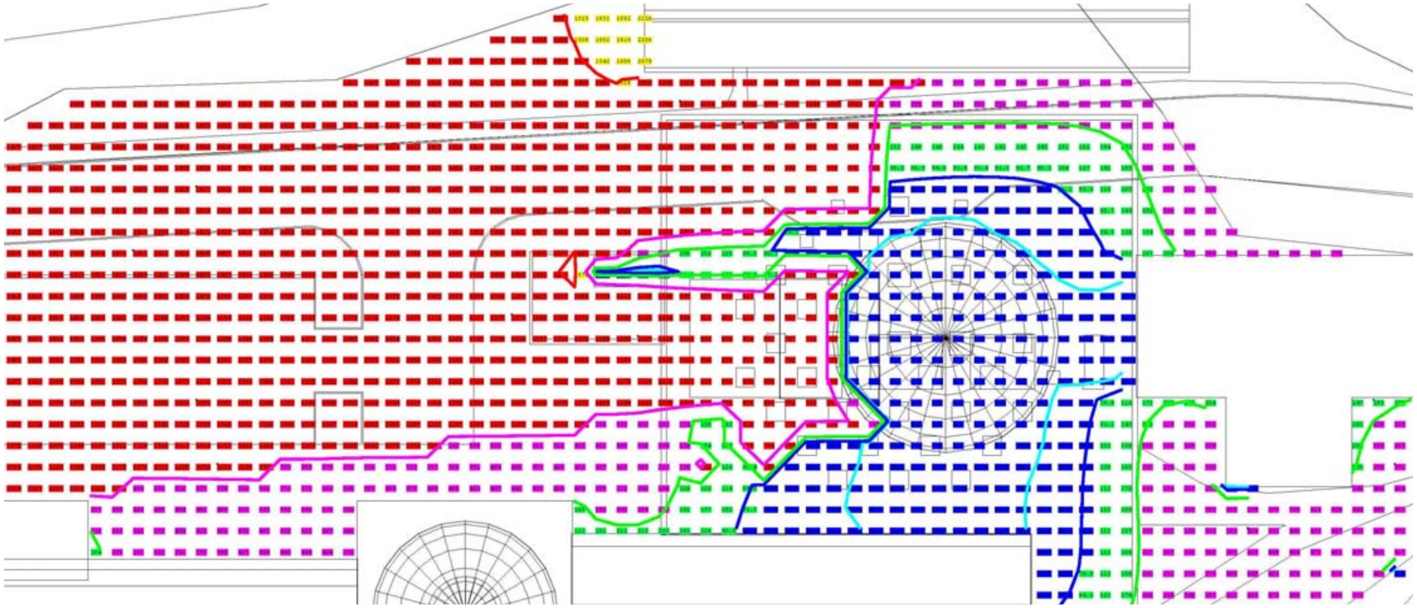
NUMERIC SUMMARY

EXTERIOR DAYLIGHT LEVELS

SEPTEMBER 21ST – 3:00 PM



EXISTING CONDITION



WITH NEW MILSTEIN HALL

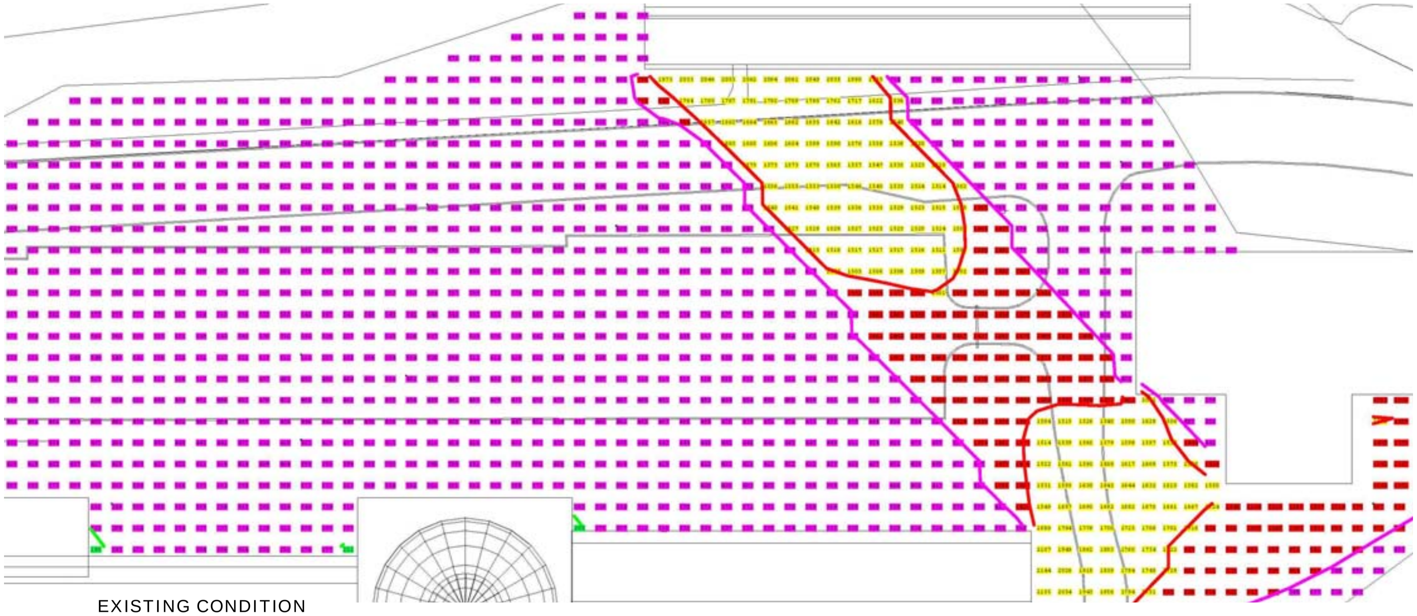
LIGHT LEVELS IN FOOTCANDLES

0- 75 🟦
75-225 🟩
225-750 🟪
750-1500 🟥
1500+ 🟨

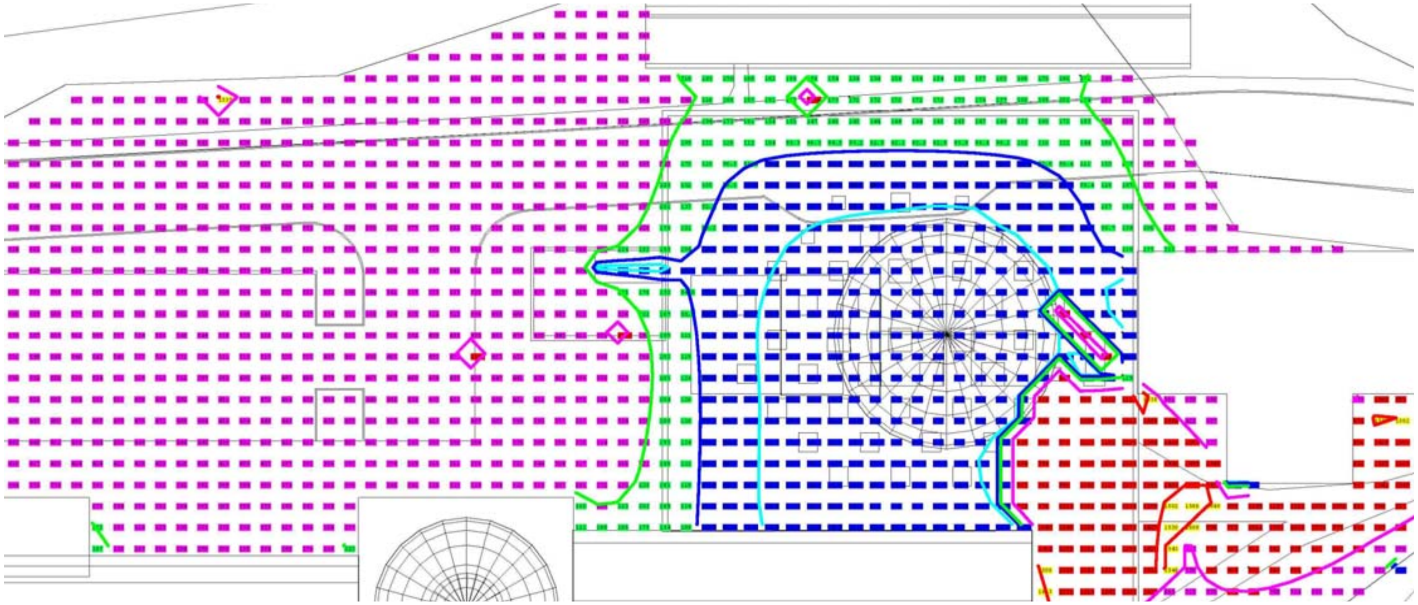
NUMERIC SUMMARY

EXTERIOR DAYLIGHT LEVELS

SEPTEMBER 21ST – 6:00 PM



EXISTING CONDITION



WITH NEW MILSTEIN HALL

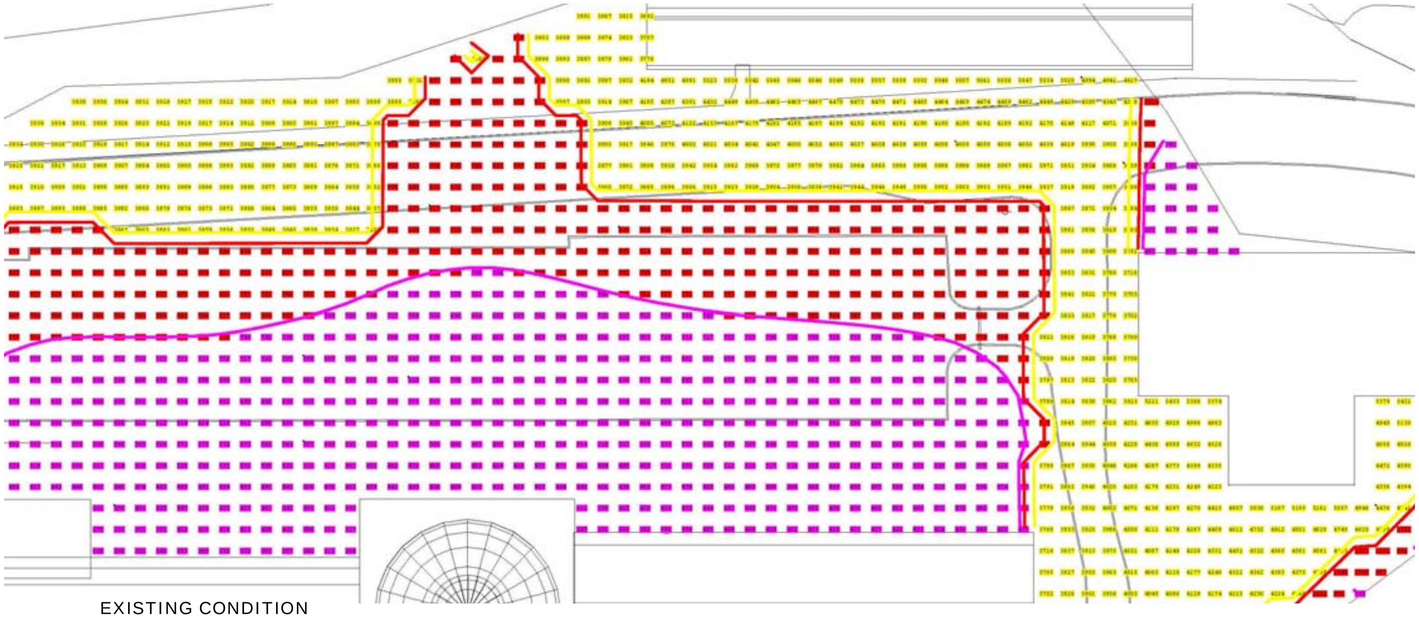
LIGHT LEVELS IN FOOTCANDLES

0- 75 🟦
75-225 🟩
225-750 🟥
750-1500 🟥
1500+ 🟨

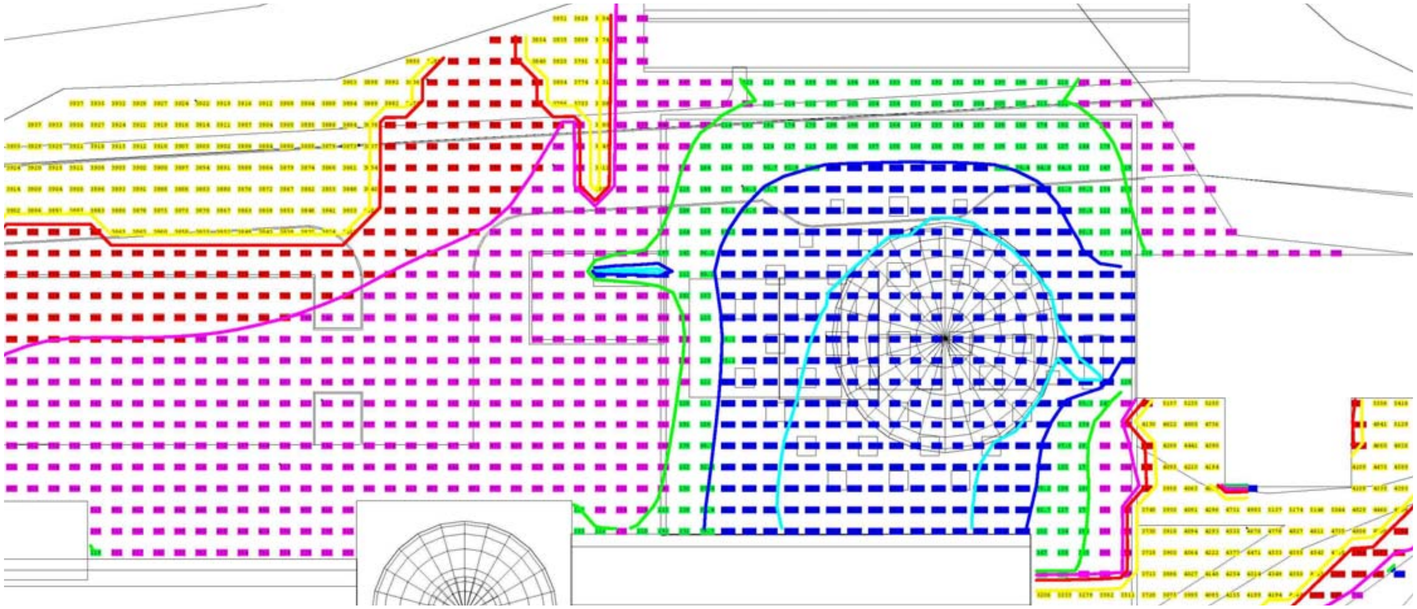
NUMERIC SUMMARY

EXTERIOR DAYLIGHT LEVELS

DECEMBER 21ST – 9:00 AM



EXISTING CONDITION



WITH NEW MILSTEIN HALL

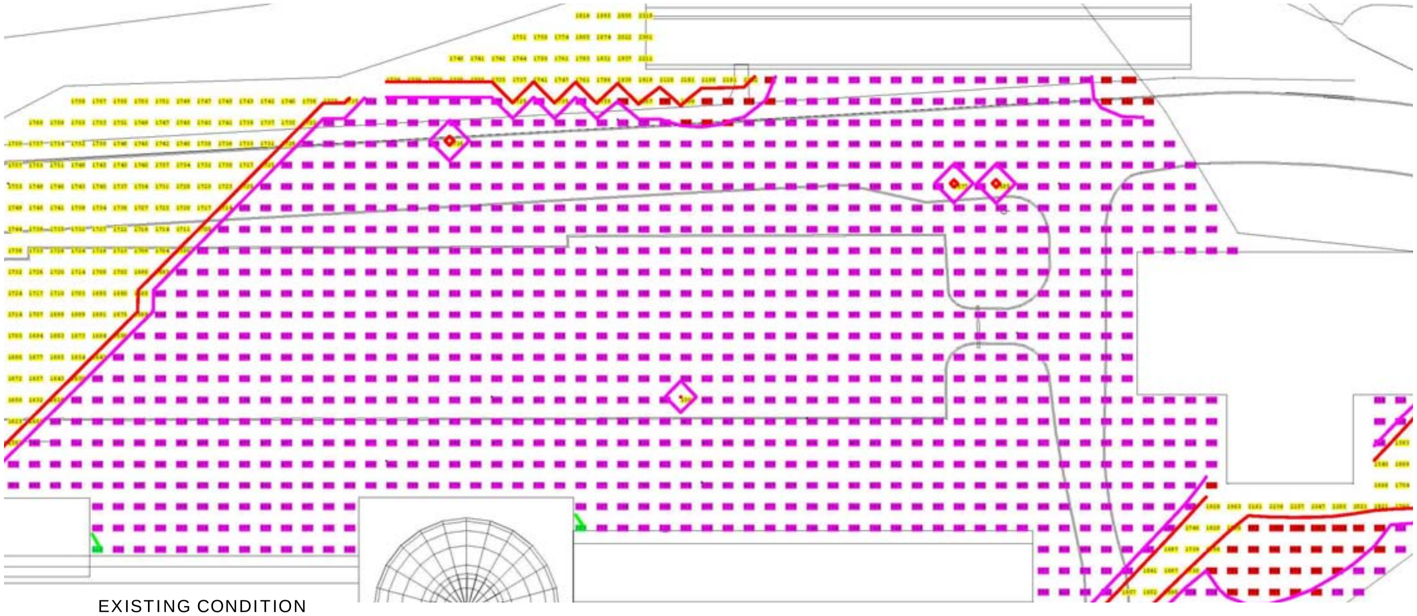
LIGHT LEVELS IN FOOTCANDLES

0- 75 🟦
75-225 🟩
225-750 🟪
750-1500 🟥
1500+ 🟨

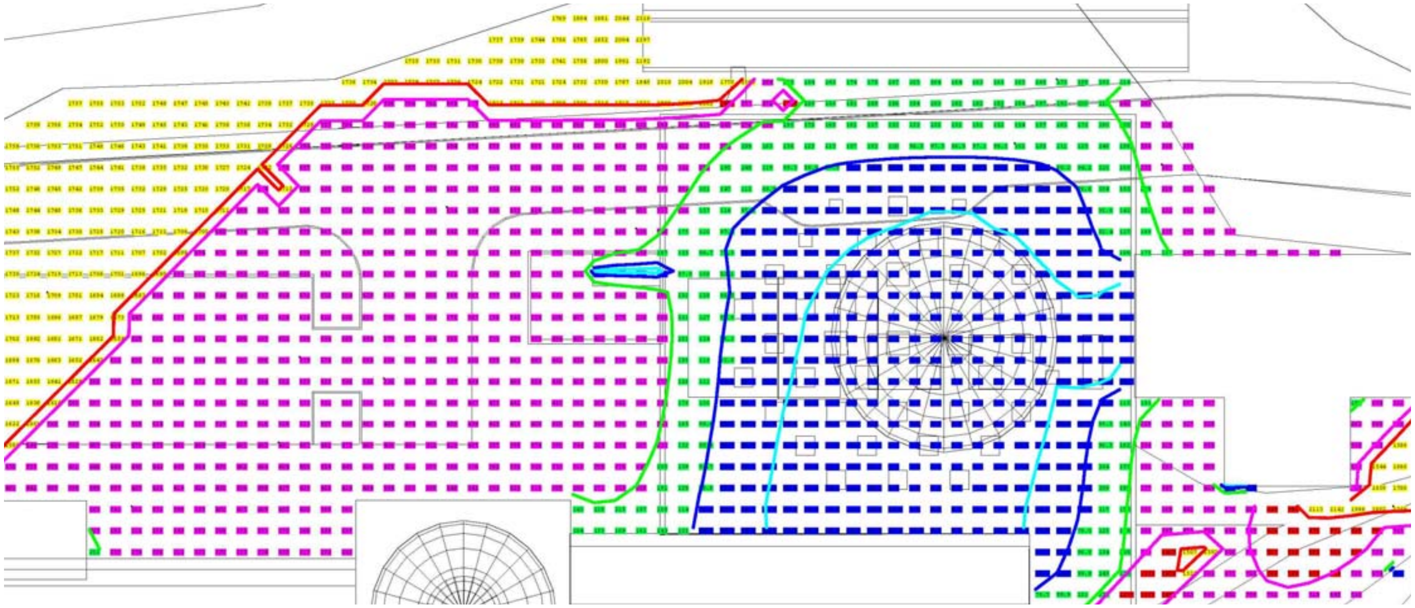
NUMERIC SUMMARY

EXTERIOR DAYLIGHT LEVELS

DECEMBER 21ST – 12:00 PM



EXISTING CONDITION



WITH NEW MILSTEIN HALL

LIGHT LEVELS IN FOOTCANDLES

0- 75	🟦	750-1500	🟥
75-225	🟩	1500+	🟨
225-750	🟪		

NUMERIC SUMMARY

EXTERIOR DAYLIGHT LEVELS

DECEMBER 21ST – 3:00 PM

D. Conclusion

The shading impact of the new Milstein Hall is of most concern at University Avenue. The high contrast ratio between the roadway to be covered by Milstein and the roadway in direct sunlight means that driver's eyes may have difficulty adapting to the lower light levels at the east and west vehicular entry making it more difficult to see obstacles. Although supplemental lighting is not necessary as obstacles are visible from their silhouette against the exit portal electric lighting is provided by downlights over the roadway to supplement the daylight by 12-15 footcandles and improve pedestrian and vehicular visibility[16]. Although the lighting is completely adequate, a textural change or speed bumps could be added to alert drivers to the pedestrian crosswalks and ensure slower speeds at this section of roadway .

A positive impact of the location of Milstein Hall over University Avenue is the shading from intense glare caused by direct sunlight in the field of view when traveling east in the morning and west in the afternoon and evening. Glare from the sun at low solar elevations can blind drivers rendering them unable to see obstacles. The new Milstein Hall will screen this glare and increase the safety of drivers as well as pedestrians in cross walks near to and under Milstein.

The new Milstein Hall will shade much of the direct sunlight to the plaza, however diffuse and interreflected sunlight will penetrate deep into the covered space. Electric lighting will provide additional light and sparkle in the covered plaza creating a unique environment where occupants are sheltered from the elements.

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[16] IESNA Lighting Handbook Ninth Edition 22-19

APPENDIX G: Nighttime Lighting Study

Tillotson Design Associates

Appendix G – Nighttime Lighting Impacts

Table of Contents:

Nighttime Lighting Impacts

Nighttime Lighting Impacts

Methodology

The existing nighttime conditions were recorded during the February 21st 2008 site visit by Tillotson Design. Sky conditions were clear (no cloud cover) with a full moon. Light levels were measured using a Konica Minolta T-10 Illuminance meter with all reading measured at 36" above the ground. Small areas of the ground were covered with snow but most of the ground was bare and dry. Light levels and luminance values were modeled using AGI32 version 1.95, a light modeling computer application, with light fixture locations and types based on the 50% Construction Document lighting design for the new Milstein Hall. Reflectances of 50% are assigned for the exterior of the Foundry, Sibley Hall and Rand Hall. Reflectances of 50% are also assigned to the Ground and Second Floor ceilings of the new Milstein Hall based on the finishes indicated in the 50% Construction Document drawings. The ground reflectance used is 20%.

The human eye is able to adjust to a wide range of light levels from 10,000 footcandles on a sunny day to about 0.01 footcandles under full moonlight[1]. Although the eye can respond to very low light levels, the IESNA has established average recommended light levels optimal for outdoor locations at night (see table below). This criteria is designed to provide adequate light for safety and security while minimizing glare and trespass light from the light sources.

Location	*Average horizontal illuminance (footcandles)*
Sidewalk	0.4
Parking Lot	0.2
Roadway with high pedestrian conflict (Collector/Major)	1.2 - 1.7
Outdoor Terrace	5
Lobby	10

A. Executive Summary

The future Milstein Hall site and surrounding area is currently illuminated with seven different types of exterior fixtures that create unnecessary spill light and glare. The architectural lighting at the new Milstein Hall will only minimally increase light levels in the area immediately adjacent to the new building and light levels will not increase at all beyond 250 feet from the perimeter of the building. The brightness of the Milstein Hall ceiling planes visible from outside the building will be similar to or less than those of existing buildings nearby. The existing roadway fixtures will be replaced with fixtures that are 10' shorter and using lower wattage 175 watt lamps instead of the 400 watt lamps currently being used. These fixtures will reduce glare and spill light into the Gorge from the existing fixtures located along University Avenue. This report details the worst case winter condition when there are no leaves on the trees. In the summer, when visibility decreases, any building brightness and spill light will be further diminished.

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[1] www.lightsearch.com light guide reference

B. Existing Conditions

The standard Cornell University roadway fixture used at University Avenue is a type IV[2] distribution McGraw-Edison 400 watt metal halide fixture head mounted on a 30 foot pole (refer to page 12). This fixture is classified by the IES as full cutoff meaning that zero of its candela intensity occurs at an angle above 90° from vertical and the candela above 80° from vertical does not exceed 10% of the total lamp lumens[3]. The fixtures are spaced on the south side of University Avenue with two heads mounted on each pole in a 180° orientation. The fixture spacing ranges from 110 to 130 feet on center. Light levels at the south curb of the roadway range from 6.25 to 6.5 footcandles directly beneath the fixtures and 0.25 footcandles between fixtures. Light levels at the north curb range from 1.5 to 2 footcandles directly across the road from the fixtures and 0.15 to 0.25 between fixtures (see page 9 for site survey light levels and page 30 for a calculation showing spill light from these fixtures). The tall mounting height of the fixture and high wattage of the lamp add unnecessary spill light to the Gorge and cause the fixtures to be glary from the north side of the Gorge.

Cornell University's standard pedestrian pole is a 100 watt metal halide type V[4] distribution Gothic styled fixture manufactured by Spring City and mounted on a 12-15 foot pole (refer to page 13). The fixture is classified by the IES as cutoff meaning that the candela curve does not exceed 2.5% above 90° from nadir and 10% above 80° from nadir. Pedestrian scale fixtures are located in the vicinity of the new Milstein Hall site at the parking lot north of Lincoln Hall and the pathway to East Ave east of Sibley Hall.

Façade mounted 100 watt metal halide wall packs are located near most of the doors of Sibley Hall (refer to page 14). These fixtures illuminate the area near the doors but have no shielding and cause objectionable glare. Fixtures mounted to the roof of Sibley Hall and all of the other buildings surrounding the Arts Quad flood light the Quad and provide between 0.5 to 0.25 footcandles (refer to page 16). These fixtures are also unshielded and are extremely glary.

There are no exterior lights on the south façade of the Foundry facing University Avenue. Light near the south entry door is provided by the street lights on the south side of University Avenue. Wall packs with 100 and 175 watt metal halide lamps are mounted on the east and north facades to illuminate the parking area and alley (refer to page 15). The wall pack mounted to the east façade is visible from Fall Creek drive and contributes spill light into the Gorge. The wall packs mounted on the north façade are not visible from Fall Creek Drive and do not contribute light into the Gorge because the Foundry Kiln Shed north of the Foundry blocks the view and light.

The pathway from University Ave to the suspension bridge is illuminated with metal halide flood lights mounted on poles between 10 and 20 feet in height (refer to page 17).

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[2] Type IV distribution produces a semicircular distribution with essentially the same candlepower at lateral angles from 270 to 0 to 90 degrees - www.pseg.com

[3] IESNA TM-10-00

[4] Type V distribution provides symmetrical photometric distribution 360° around the fixture

Light levels on the pathway range from 1 – 2 footcandles. The flood lights at the path are unshielded and aimed into the Gorge causing excessive light trespass in the Gorge and glare from Fall Creek Drive.

The pedestrian bridge and suspension towers are illuminated with 400 watt flood lights mounted to the towers (refer to page 18). Light levels average 7.4 footcandles near the south side of the bridge and 0.05 footcandles at the center of the bridge. The high aiming angle and excessive wattage of the fixtures lighting the walkway make them very glary to pedestrians on the bridge and from Fall Creek Drive.

Cobrahead streetlights are located at a varying spacing along the south side of Fall Creek Drive (refer to page 19). The fixtures are unshielded and are extremely glary from the nearby residences. In addition, their spacing create uneven light levels on the roadway as high as 1.2 footcandles near the fixtures and as low as zero footcandles between fixtures.

The surface brightness of the ground measured within the Gorge ranges from zero to 0.3 footlamberts[5]. This is caused by light pollution from fixtures on the pedestrian path, bridge and, to a lesser extent, the buildings and roadway lights outside of the Gorge. Interior light from the windows and the wall mounted fixture on the hydroelectric plant at the bottom of the Gorge also contribute light (refer to page 19). A barely perceptible amount of light was contributed by moonlight but these levels were below the minimum range of the light meter used for the site survey.

C. Impact of Milstein Hall to Outdoor Area

The new Milstein Hall has two ceiling planes that will contribute light to the surrounding site. The outdoor area covered by the second floor of Milstein is illuminated with recessed 36° 50 watt MR16 downlights mounted in the ceiling and spaced 8’-0” on center (type TQ – see page 25). These downlights provide average light levels of 13 footcandles on the ground plane with light levels near the perimeter of the covered plaza decreasing to 8 footcandles average. The controlled optics of the MR16 lamp will contain all of the direct light within the footprint of the building. Only light reflected from the ground and ceiling contribute low levels of illumination to the adjacent site. The downlight reflector blocks the view of the lamp beyond 45° from vertical so that the MR16 lamps are not visible beyond 11’ from the downlights. The light levels create a pleasant exterior environment that will draw people into the covered plaza and allow it to be used for many activities from studying to casual lectures and gatherings. The downlights continue over the roadway to unify the covered plaza and increase pedestrian safety at the crosswalks.

The second floor studio is illuminated with a staggered grid of custom six (6) lamp direct T8 fluorescent pendants (type TA – see page 25). The light from these fixtures is evenly distributed with full candela cutoff at 68° from vertical. A small amount of light from these fixtures exits through the curtain wall providing low levels of illumination to the surrounding site. These lights are controlled by a dimming system and astronomical time

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[5] A footlambert is the unit of measurement for the amount of luminous intensity (light) being reflected from any given surface.

clock. When the level 2 studio space is unoccupied, the lights will be dimmed to 10% output, further reducing the light trespass (see page 28).

Spill light from the ground and second floor lighting increase light levels by an average 1 - 4 footcandles in a 50’ zone nearest the perimeter of the new Milstein Hall (see page 26). The spill light provides the ambient light at the pedestrian pathways near the building and service plaza. Light levels 50’-80’ from the perimeter of the building will increase an average of 0.5 - 1 footcandle. Light levels 80’ – 250’ beyond the building perimeter increase an average of 0.1 - 0.5 footcandles. No additional light will be contributed to the site or Gorge beyond 250’ from Milstein Hall.

The Foundry will block most of the spill light north of Milstein Hall from the Gorge. It will also limit the view of Milstein Hall from Fall Creek Drive in an 80° zone northeast of the building. Sibley Hall will block most of the spill light into the Arts Quad. Only 40’ of the Milstein Hall façade due east of Sibley will be visible from the Arts Quad. Rand Hall and the hill east of Milstein Hall will restrict the spill light to within 125’ from the east façade.

The new Milstein Hall will most often be viewed from the ground level or from across the Gorge making the ceiling planes of the ground and second floor the most visible surfaces. The luminance of the new Milstein Hall ground floor ceiling averages 2 footlamberts and the second floor ceiling averages 16 footlamberts. Brightness or luminance is the amount of luminous intensity (light) being reflected from any given surface measured as a footlambert[6]. The gray finish of the second floor ceiling reduces the brightness of the surface when compared with the white ceilings of Sibley Hall, Rand Hall and the Foundry. As illustrated in the table on page 5, the footlambert levels of the new Milstein Hall ceiling will be similar to those of Sibley and Rand Hall and less than those of Olive Tjaden Hall and the Foundry. The brightness of any object is relative to its brightness compared with other objects in the field of view and the immediate background. The Milstein Hall brightness will be significantly less than that of the existing streetlights, pedestrian poles, wall packs and flood lights also in the field of view. Although the second floor has glazing on the north, east and west facades facing the Gorge, the new Milstein Hall will contribute less light trespass and visual brightness than the existing exterior fixtures.

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[6] IESNA G-22

Location	*Footlambert Reading*
new Milstein Hall - ground floor ceiling[7]	2
new Milstein Hall - second floor ceiling	16

Sibley Hall third floor window[8]	9.39
Rand Hall third floor window	7.33
Sibley Hall second floor window	10.19
Olive Tjaden Hall second floor window	25.22
Foundry window	35.4
Flood light mounted on suspension bridge tower	467
Cornell standard street light at University Ave	782
Cornell standard gothic style pedestrian pole	685
Quadrangle floodlight mounted to Sibley Hall	69,000

The existing roadway and parking pole lights along University Avenue will be replaced with new 20 feet tall, dual head pole light fixtures with type III roadway optics facing University Avenue and type IV optics facing the surface parking side. The precision optics will allow the lamp wattage to be reduced from the existing 400 watts to 175 watt metal halide lamps. The 10 foot shorter pole height and low lamp wattage will reduce glare while maintaining the required light levels on the roadway, the surface parking and the sidewalk on the north side of University Avenue. The new fixtures will be significantly less visible and glary from the north side of the Gorge and will contribute less spill light than the existing fixture.

D. Mitigation Measures

To mitigate the impact of lighting from the New Milstein Hall on the surrounding site, the lighting is designed to minimize spill light outside the building perimeter and limit direct glare from fixtures. Nighttime illumination levels at the plaza will provide a safe and pleasant environment without providing unnecessary spill light. Light levels at the second floor are higher to support the function of the studio space but the fixtures are well shielded with full candela cutoff at 68° from vertical and the low reflectance grey ceiling will help reduce visual brightness. All of the second floor fixtures are controlled by a dimming system to allow the nighttime light levels to be adjusted once the building is complete. When the studio space is not occupied, the lights will dim to 10% output further reducing spill light and visible brightness. The existing 30 foot 400 watt roadway lights will be replaced with 20 foot 175 watt fixtures which will also reduce glare and spill light into the Gorge.

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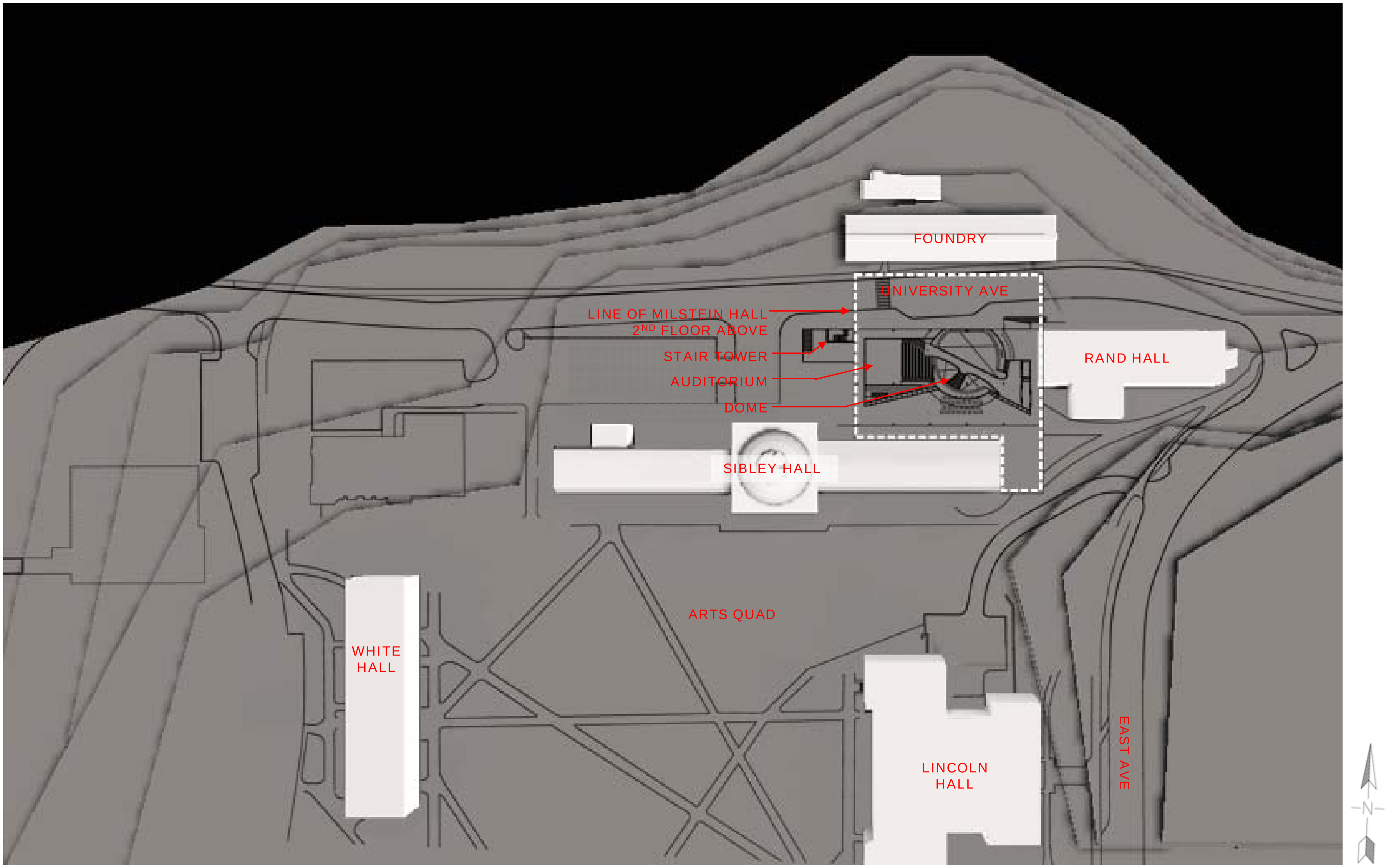
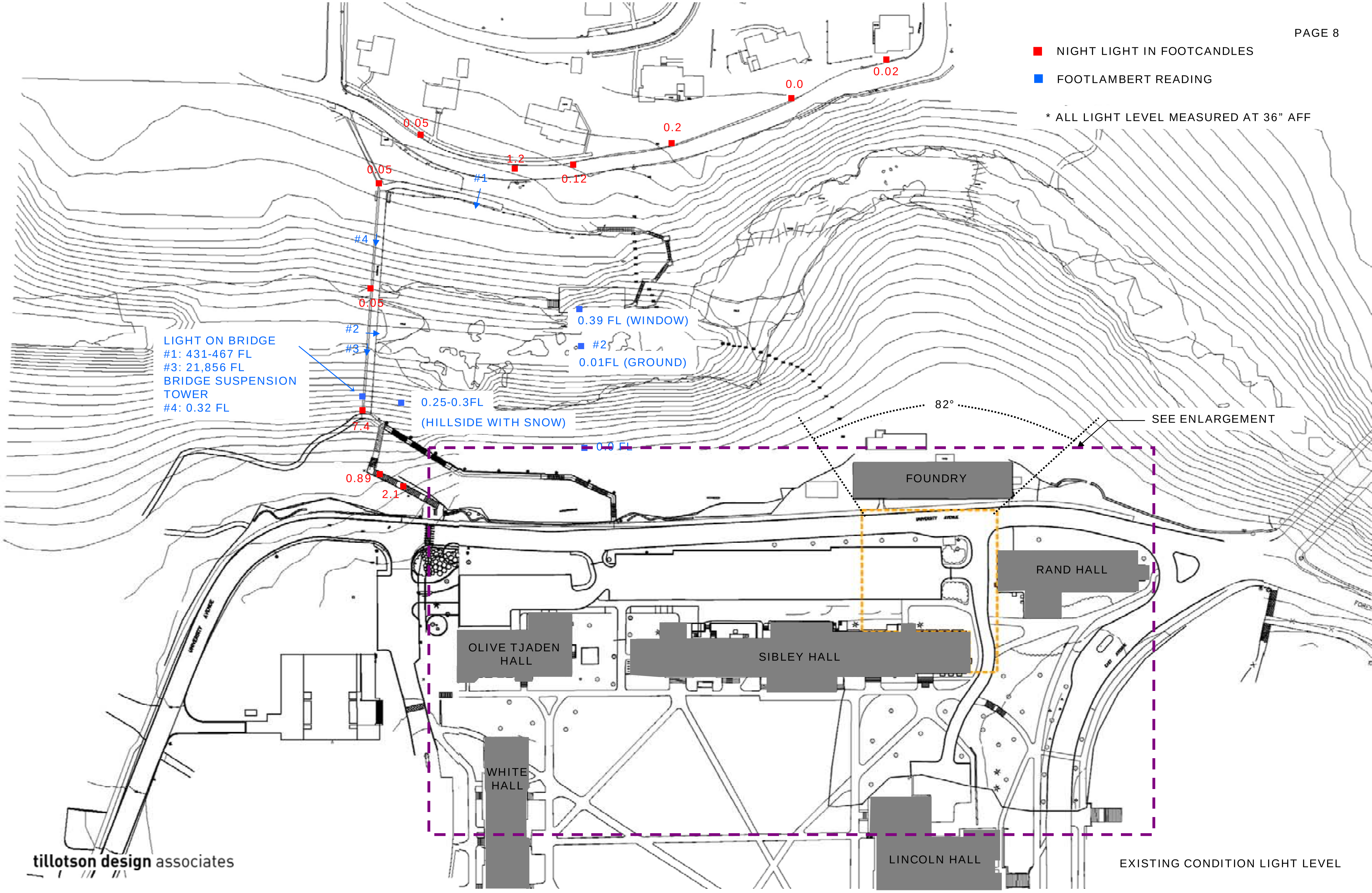
[7] Footlambert readings for the new Milstein Hall were generated using AGI32 version 1.95 and are maintained levels prior to dimming Light levels 36” AFF average 13 footcandles at the ground floor and 50 footcandles at the second floor.

[8] Footlambert levels recorded by Tillotson Design during February 21st site visit. See pages 6-7 for additional information Light levels in Sibley and Rand Hall at 36” AFF range from 20-30 footcandles

E. Conclusion

Although Milstein Hall will provide additional light in the area immediately adjacent to the new building, spill light from the building will not increase light levels beyond 250’ from the building or in the Gorge. The brightness of the ceiling surfaces visible outside the building will be of similar brightness to Sibley and Rand Hall and will not be offensive. Spill light and views of the new Milstein Hall will be significantly reduced in the summer when the trees have foliage.


FOUNDRY
UNIVERSITY AVE
LINE OF MILSTEIN HALL
2ND FLOOR ABOVE
STAIR TOWER
AUDITORIUM
DOME
RAND HALL
SIBLEY HALL
ARTS QUAD
WHITE HALL
LINCOLN HALL
EAST AVE
N



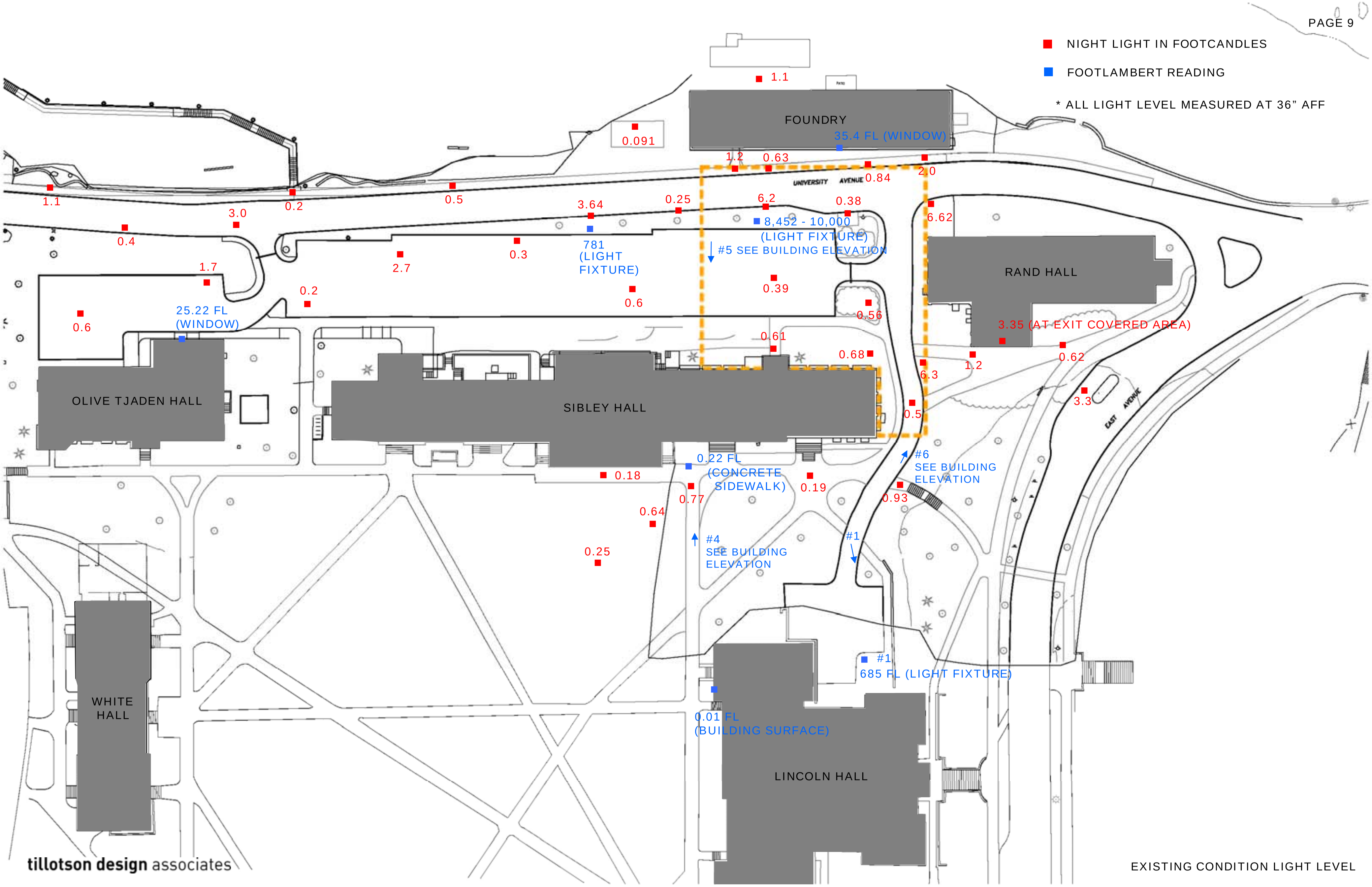
* ALL LIGHT LEVEL MEASURED AT 36" AFF

EXISTING CONDITION LIGHT LEVEL

🟥 NIGHT LIGHT IN FOOTCANDLES

🟦 FOOTLAMBERT READING

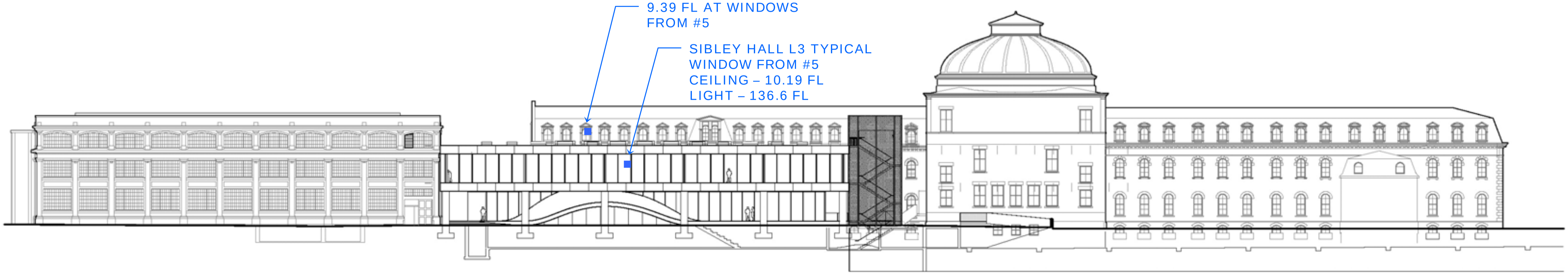
* ALL LIGHT LEVEL MEASURED AT 36" AFF

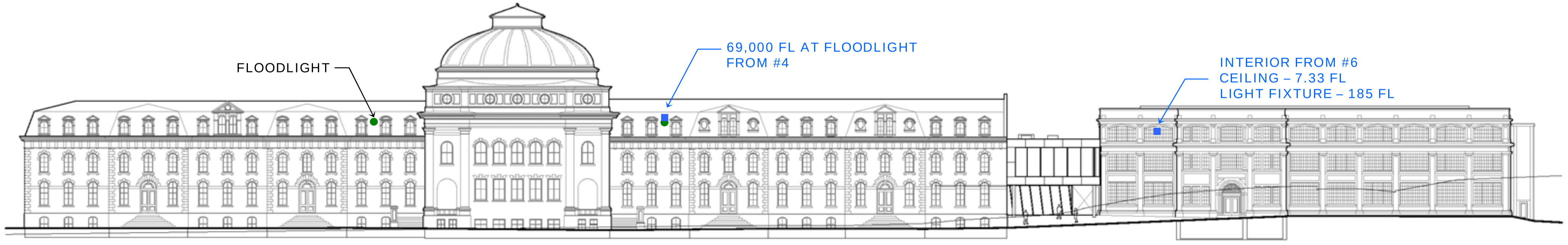


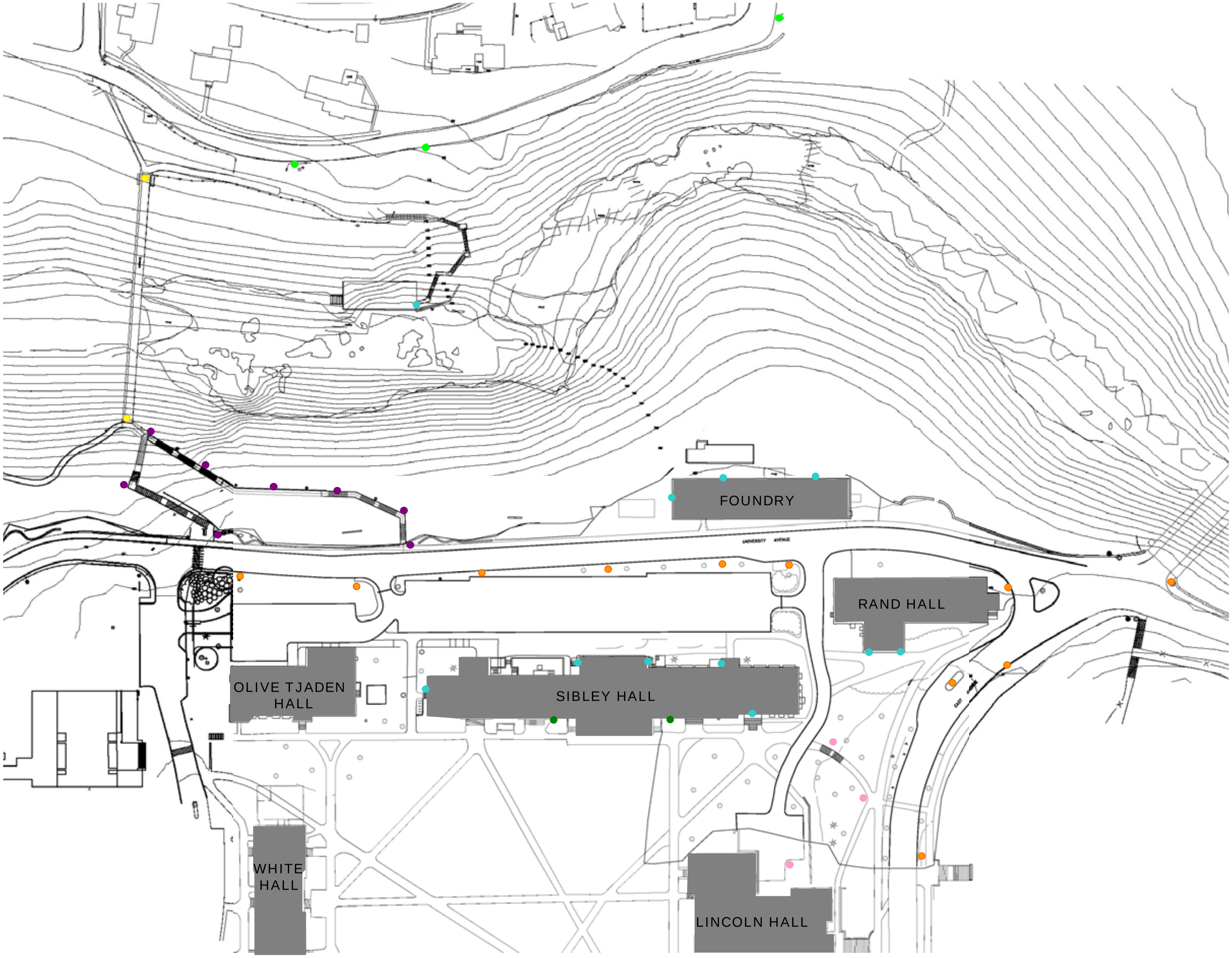
tillotson design associates

EXISTING CONDITION LIGHT LEVEL

■ FOOTLAMBERT READING








● COBRA HEAD


● 30' STREET BOX


● PEDESTRIAN POLE


● PATHWAY LIGHTING


● BRIDGE LIGHTING


● BULDING MOUNTED LIGHT


● BULDING MOUNTED FLOODLIGHT

EXISTING LIGHT LOCATION

DUAL FIXTURE HEAD ON 30' POLE AT UNIVERSITY AVE

NIGHT IMAGE OF 30' STREETLIGHTS AT UNIVERSITY AVE

QUAD FIXTURE HEAD ON 30' POLE AT CORNER OF UNIVERSITY AND EAST AVE

GOTHIC STYLE FIXTURE NEAR LINCOLN HALL

NIGHT IMAGE OF GOTHIC POLE

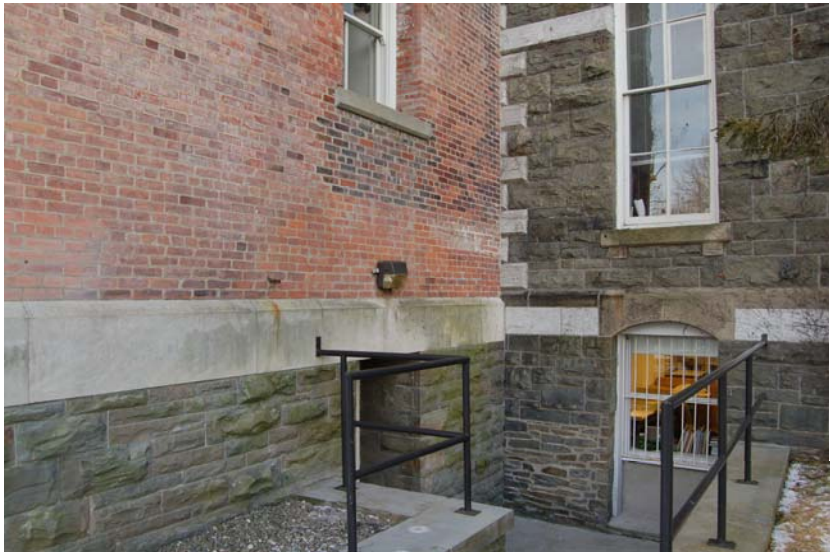
DUAL HEAD ON 20’ POLE AT SECURITY BOOTH ON EAST AVE NORTH OF RAND HALL

DUAL FIXTURE HEAD ON 30 ‘ POLE AT SERVICE ROAD SOUTH WEST OF RAND HALL

WALL MOUNTED FIXTURE ON NORTH FAÇADE OF SIBLEY HALL

FLUORESCENT STRIPLIGHT AT ENTRY TO SIBLEY ROTUNDA

WALL MOUNTED FIXTURES ON TRAILERS AT EXISTING SURFACE PARKING



WALL MOUNTED FIXTURE AT SIBLEY ROTUNDA ENTRY

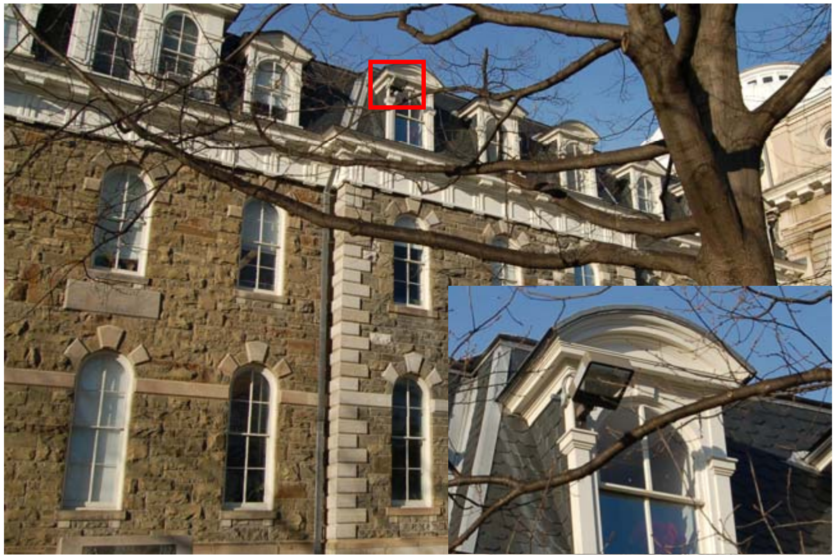
WALL MOUNTED FIXTURES ON THE NORTH FOUNDRY FACADE

ALLEY NORTH OF SIBLEY

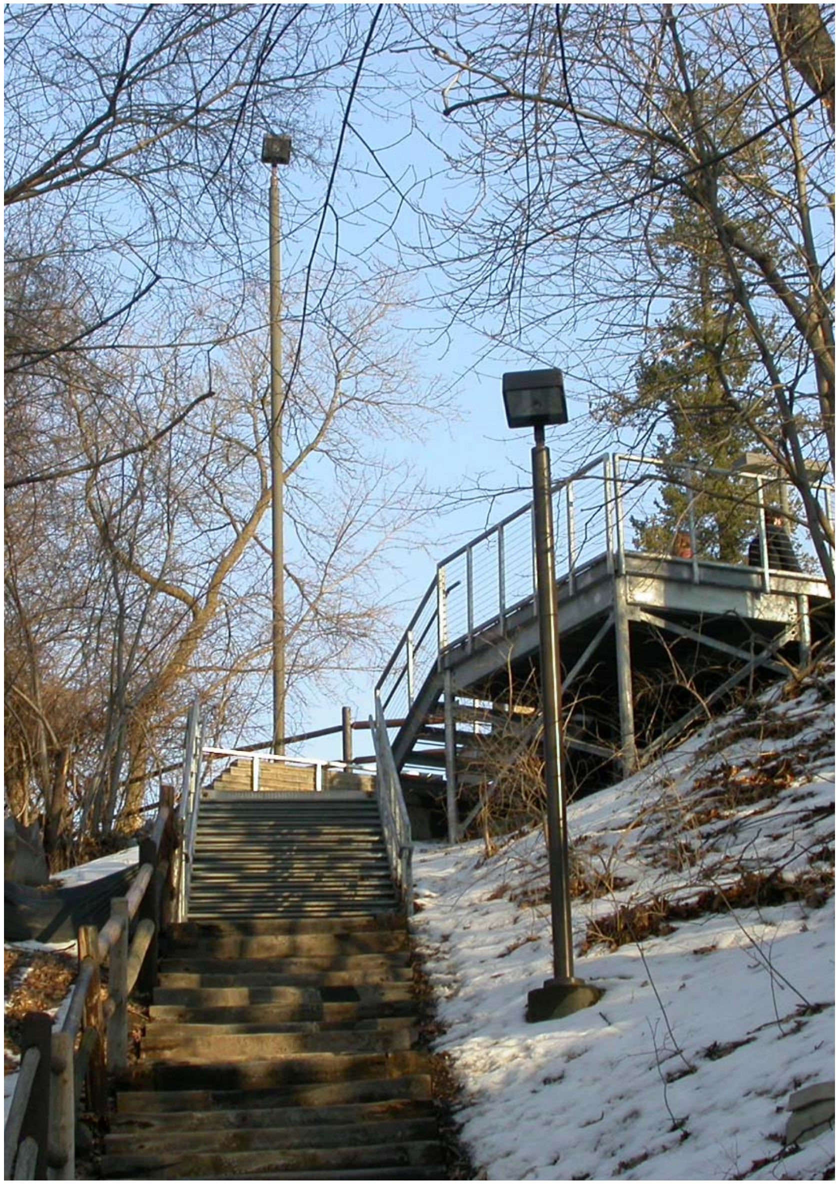
WALL MOUNTED FIXTURES ON THE WEST FOUNDRY FACADE


GOTHIC FIXTURES AT SIDEWALK SOUTH EAST OF SIBLEY HALL


NIGHT IMAGE OF FLOOD LIGHTS MOUNTED TO SIBLEY HALL


FLOOD LIGHTS MOUNTED TO SIBLEY HALL FLOOD LIGHTING QUAD


NIGHT IMAGE OF FLOOD LIGHTS MOUNTED TO WHITE HALL



FLOOD LIGHTS AT PATHWAY FROM UNIVERSITY AVE TO SUSPENSION BRIDGE

FLOOD LIGHTS AT PATHWAY FROM UNIVERSITY AVE TO SUSPENSION BRIDGE

FLOOD LIGHTS AT PATHWAY FROM UNIVERSITY AVE TO SUSPENSION BRIDGE

FLOOD LIGHTS MOUNTED TO SOUTH SUSPENSION BRIDGE TOWER

NIGHT IMAGE OF SUSPENSION BRIDGE

FLOOD LIGHTS MOUNTED TO SOUTH SUSPENSION BRIDGE TOWER

FLOOD LIGHT MOUNTED TO NORTH SUSPENSION BRIDGE TOWER

COBRAHEAD STREETLIGHT AT FALL CREEK DRIVE

FLOOD LIGHT AT PATH TO HYDRO-ELECTRIC PLANT

WALL MOUNTED FIXTURE ON HYDRO-ELECTRIC PLANT

NIGHTTIME IMAGE OF THE FOUNDRY (CENTER) AND RAND HALL (RIGHT)

NIGHTTIME VIEW OF SIBLEY HALL FROM FALL CREEK DRIVE

NIGHTTIME IMAGE OF NORTH FAÇADE OF SIBLEY HALL FROM SURFACE PARKING

NIGHTTIME IMAGE OF SUSPENSION BRIDGE AND PATH TO UNIVERSITY AVE

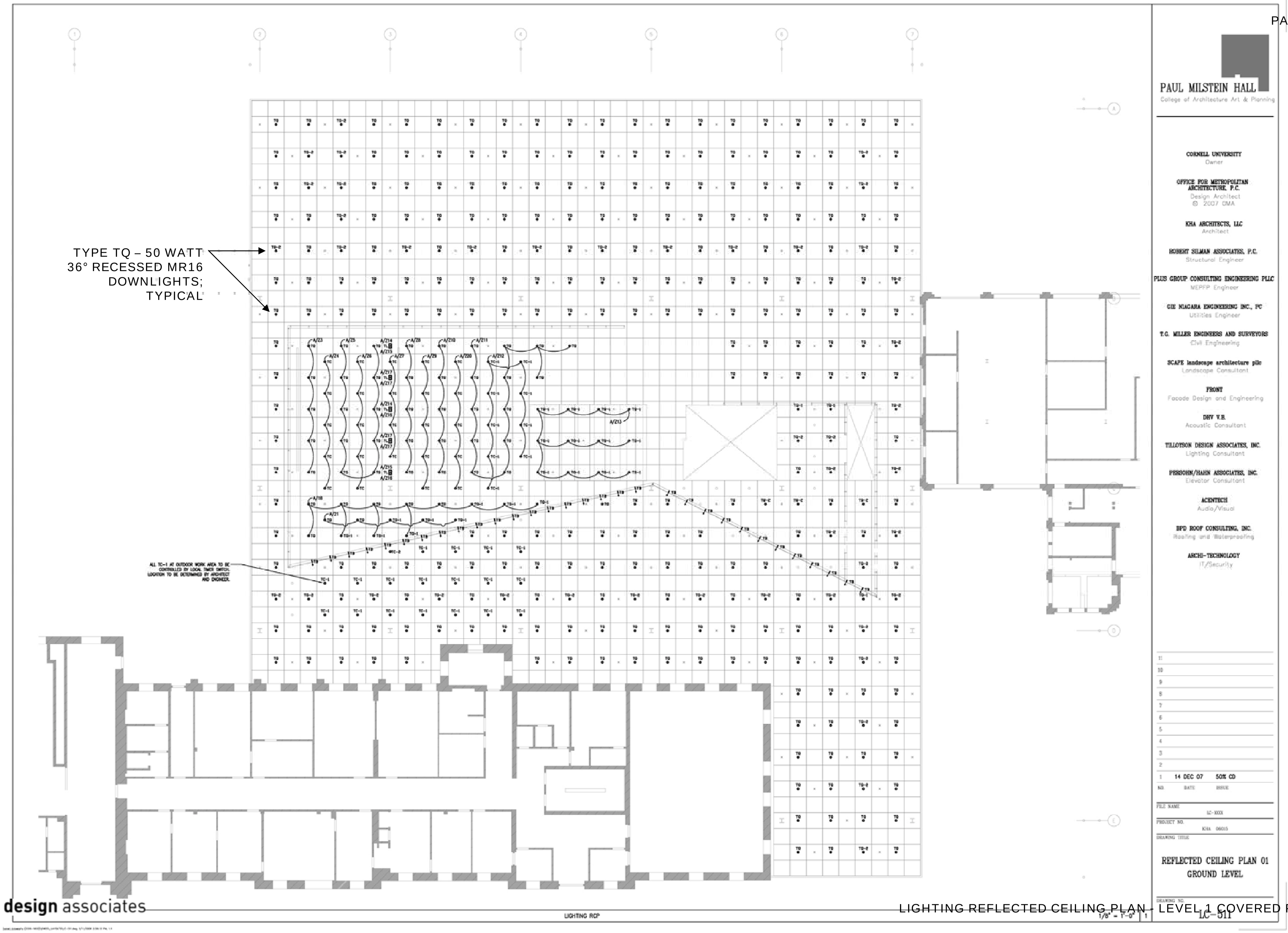
RENDERING OF MILSTEIN HALL FROM UNIVERSITY AVE

RENDERING OF MILSTEIN HALL LEVEL 2 STUDIO

RENDERING OF MILSTEIN HALL LEVEL 1 COVERED PLAZA

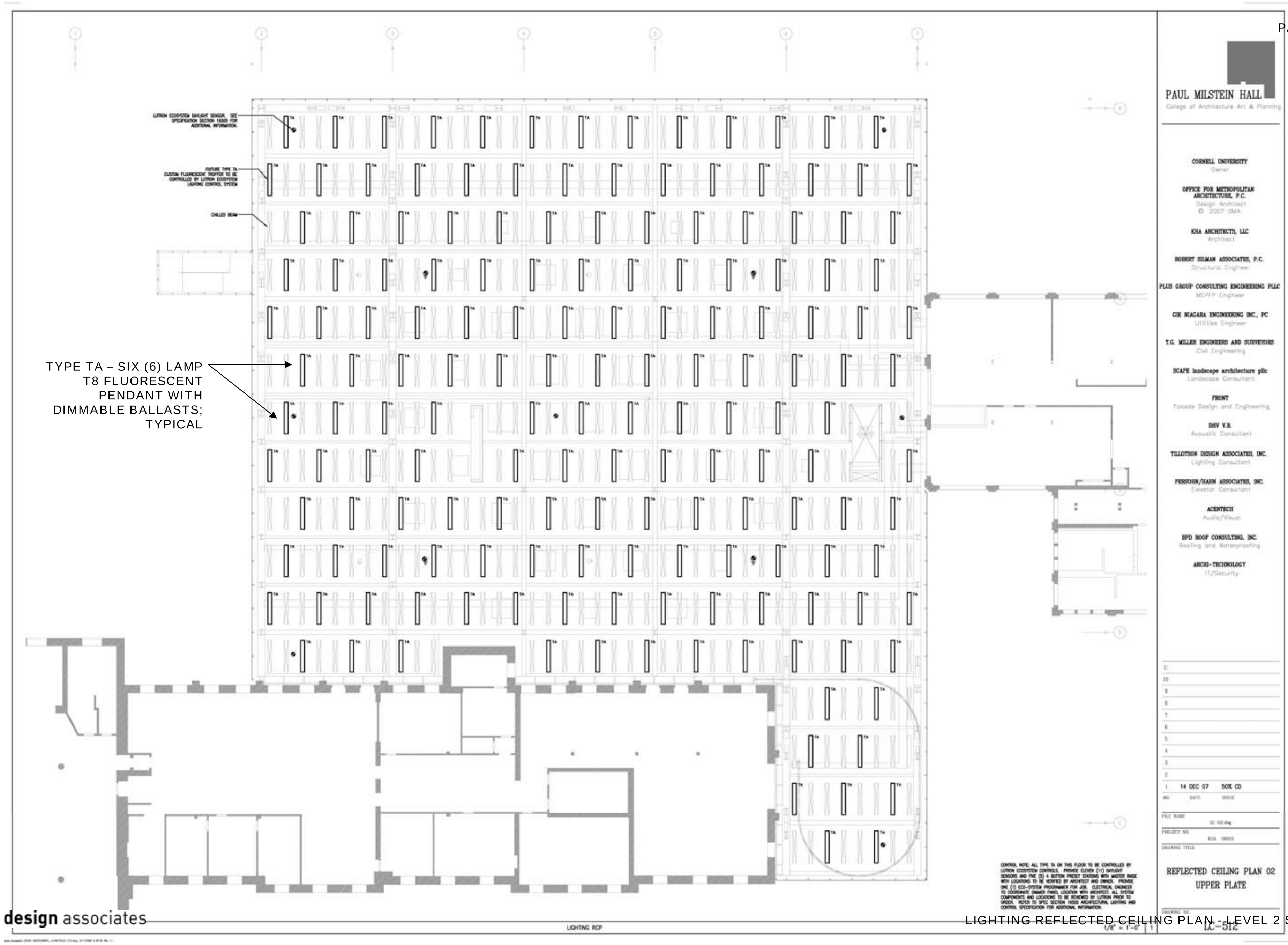
RENDERING OF MILSTEIN HALL LEVEL 2 STUDIO

TYPE TQ – 50 WATT
36° RECESSED MR16
DOWNLIGHTS;
TYPICAL

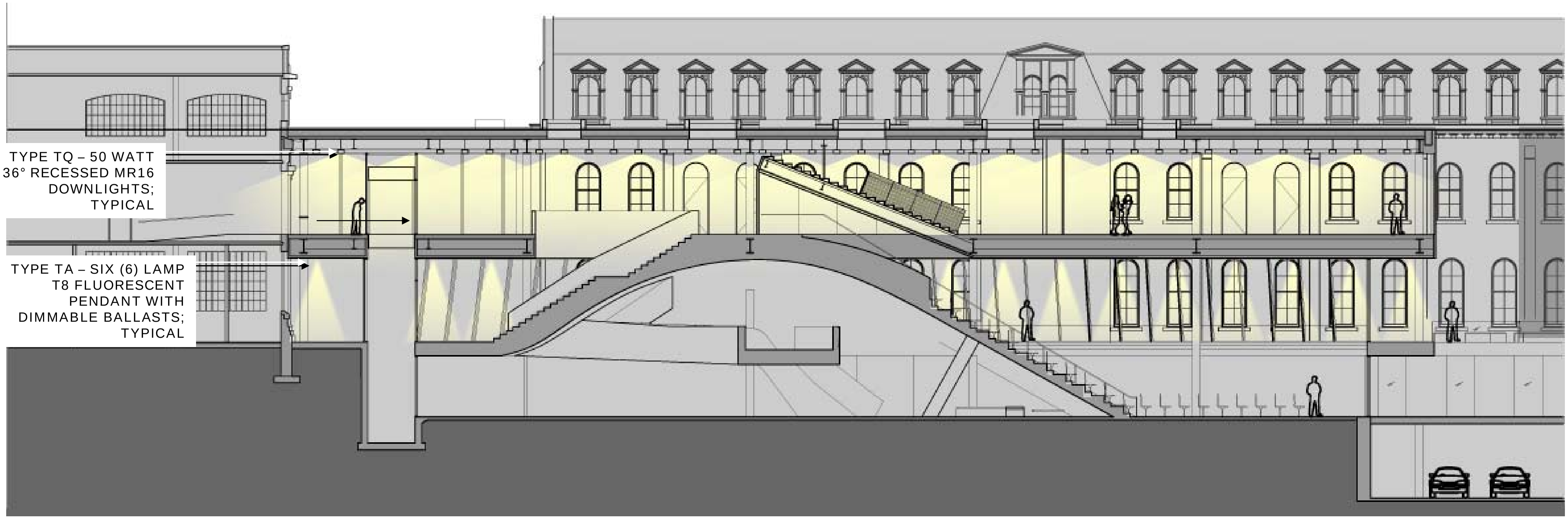


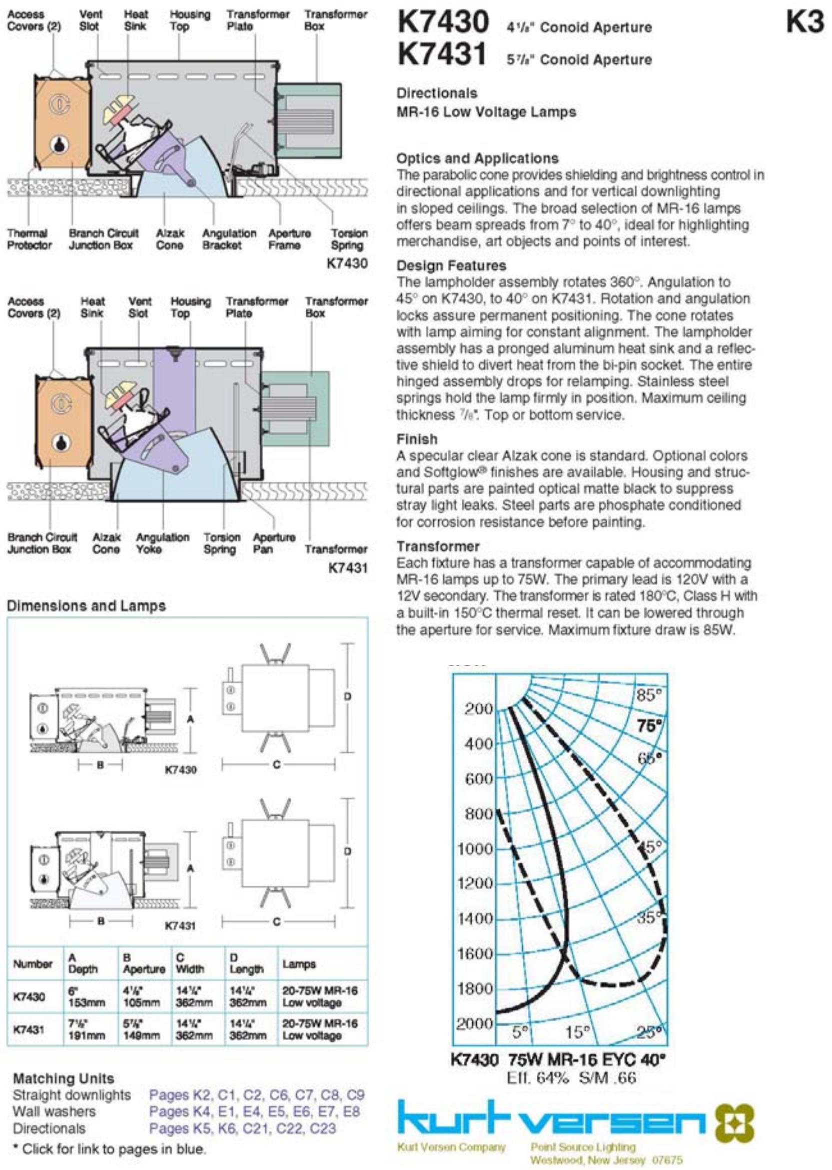
LIGHTING REFLECTED CEILING PLAN - LEVEL 1 COVERED PLAZA

tillotson design associates



TYPE TA – SIX (6) LAMP
T8 FLUORESCENT
PENDANT WITH
DIMMABLE BALLASTS;
TYPICAL


TYPE TQ – 50 WATT 36° RECESSED MR16 DOWNLIGHTS; TYPICAL
TYPE TA – SIX (6) LAMP T8 FLUORESCENT PENDANT WITH DIMMABLE BALLASTS; TYPICAL



K7430 4⅛" Conoid Aperture **K3**

K7431 5⅞" Conoid Aperture

Directionals
MR-16 Low Voltage Lamps

Optics and Applications
The parabolic cone provides shielding and brightness control in directional applications and for vertical downlighting in sloped ceilings. The broad selection of MR-16 lamps offers beam spreads from 7° to 40°, ideal for highlighting merchandise, art objects and points of interest.

Design Features
The lampholder assembly rotates 360°. Angulation to 45° on K7430, to 40° on K7431. Rotation and angulation locks assure permanent positioning. The cone rotates with lamp aiming for constant alignment. The lampholder assembly has a pronged aluminum heat sink and a reflective shield to divert heat from the bi-pin socket. The entire hinged assembly drops for relamping. Stainless steel springs hold the lamp firmly in position. Maximum ceiling thickness ⅞". Top or bottom service.

Finish
A specular clear Alzak cone is standard. Optional colors and Softglow® finishes are available. Housing and structural parts are painted optical matte black to suppress stray light leaks. Steel parts are phosphate conditioned for corrosion resistance before painting.

Transformer
Each fixture has a transformer capable of accommodating MR-16 lamps up to 75W. The primary lead is 120V with a 12V secondary. The transformer is rated 180°C, Class H with a built-in 150°C thermal reset. It can be lowered through the aperture for service. Maximum fixture draw is 85W.

Dimensions and Lamps

Number	A Depth	B Aperture	C Width	D Length	Lamps
K7430	6" 153mm	4⅛" 105mm	14¼" 362mm	14¼" 362mm	20-75W MR-16 Low voltage
K7431	7½" 191mm	5⅞" 149mm	14¼" 362mm	14¼" 362mm	20-75W MR-16 Low voltage

K7430 75W MR-16 EYC 40°
Eff. 64% S/M .66

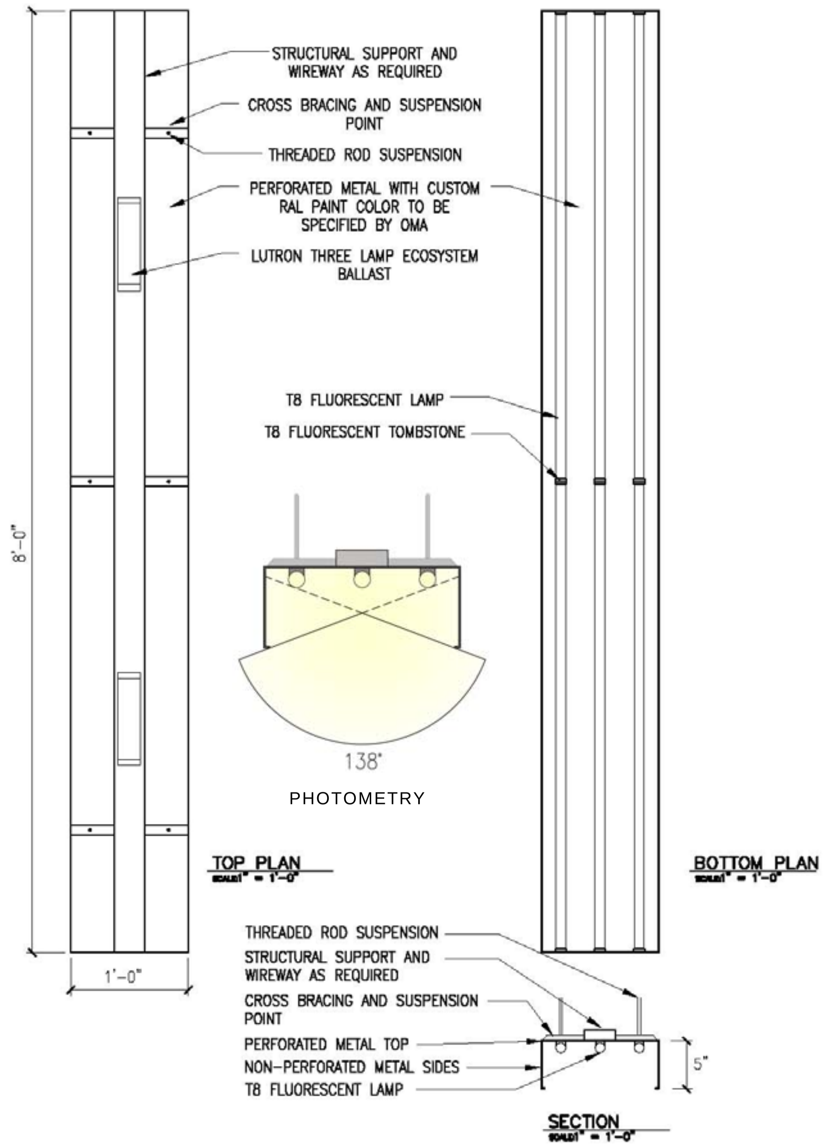
Matching Units

Straight downlights	Pages K2, C1, C2, C6, C7, C8, C9
Wall washers	Pages K4, E1, E4, E5, E6, E7, E8
Directionals	Pages K5, K6, C21, C22, C23

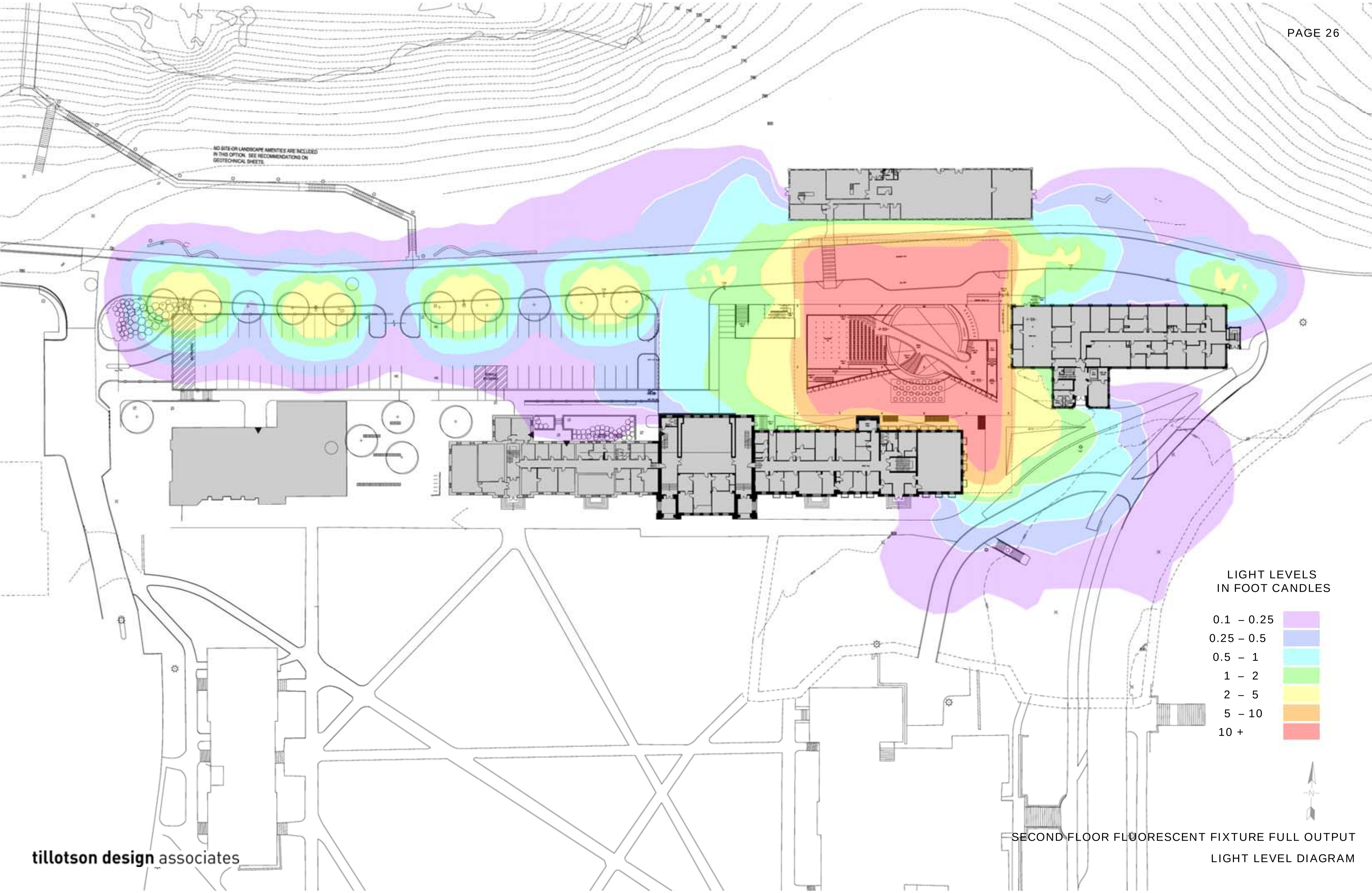
* Click for link to pages in blue.

kurt versen
Kurt Versen Company
Point Source Lighting
Westwood, New Jersey 07675

TYPE TQ - DOWNLIGHT AT LEVEL 1 COVERED PLAZA



TYPE TA – CUSTOM FLUORESCENT PENDANT AT LEVEL TWO STUDIO



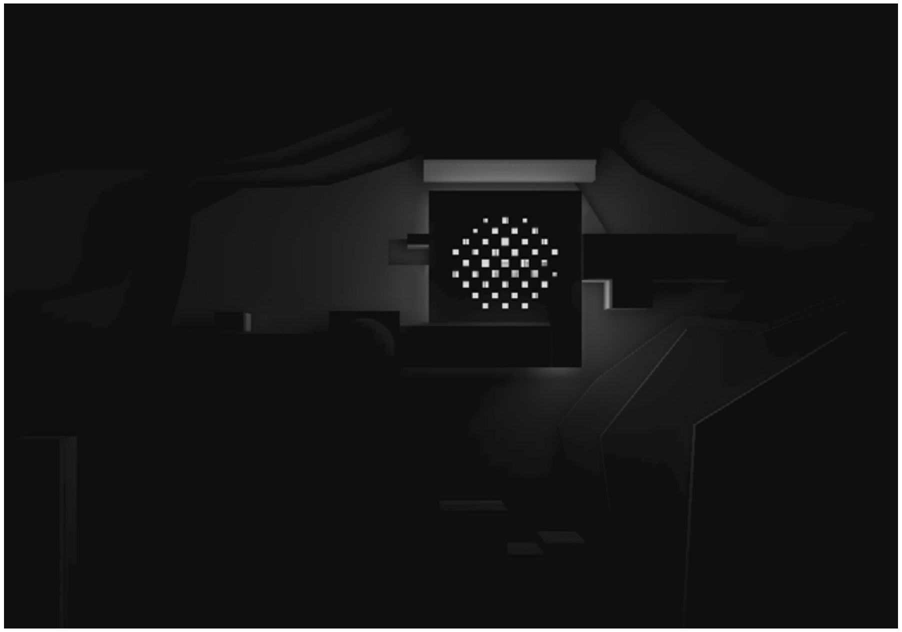
LIGHT LEVELS
IN FOOT CANDLES

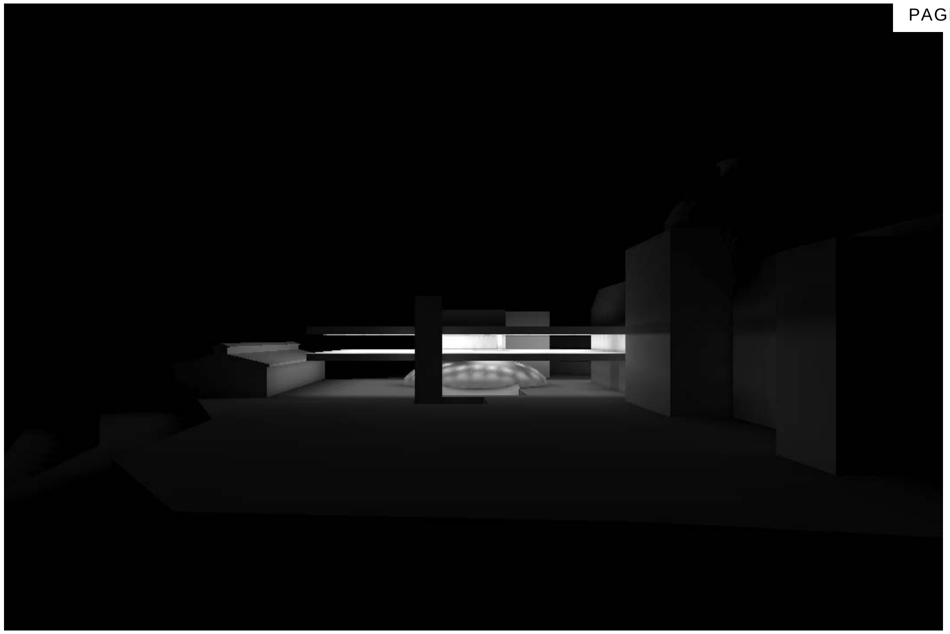
0.1 – 0.25	🟪
0.25 – 0.5	🟦
0.5 – 1	🟦
1 – 2	🟩
2 – 5	🟨
5 – 10	🟧
10 +	🟥

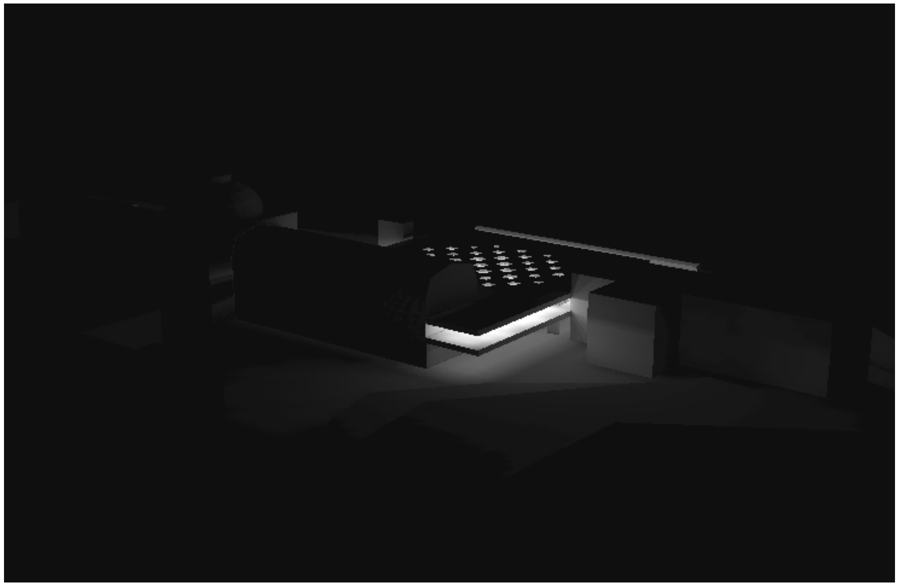
SECOND FLOOR FLUORESCENT FIXTURE FULL OUTPUT

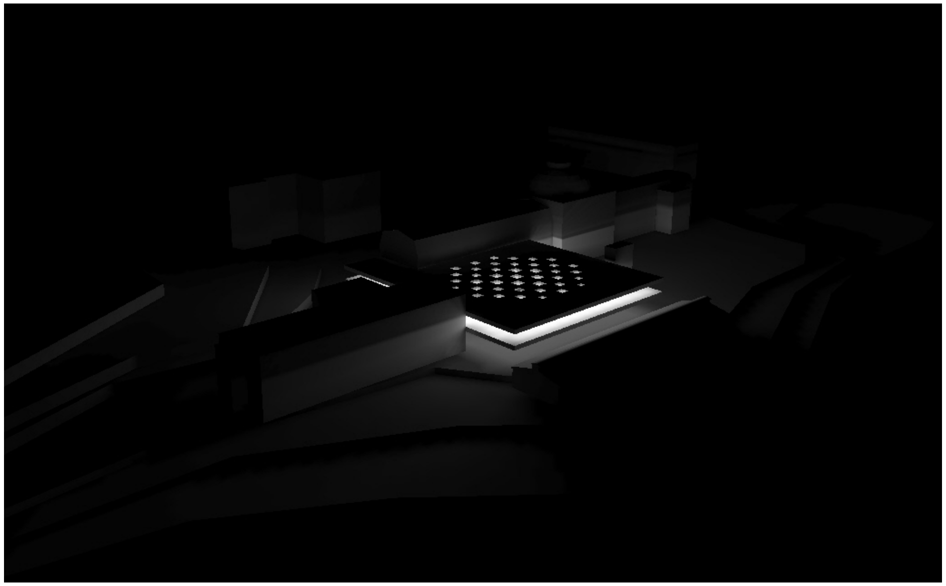
LIGHT LEVEL DIAGRAM

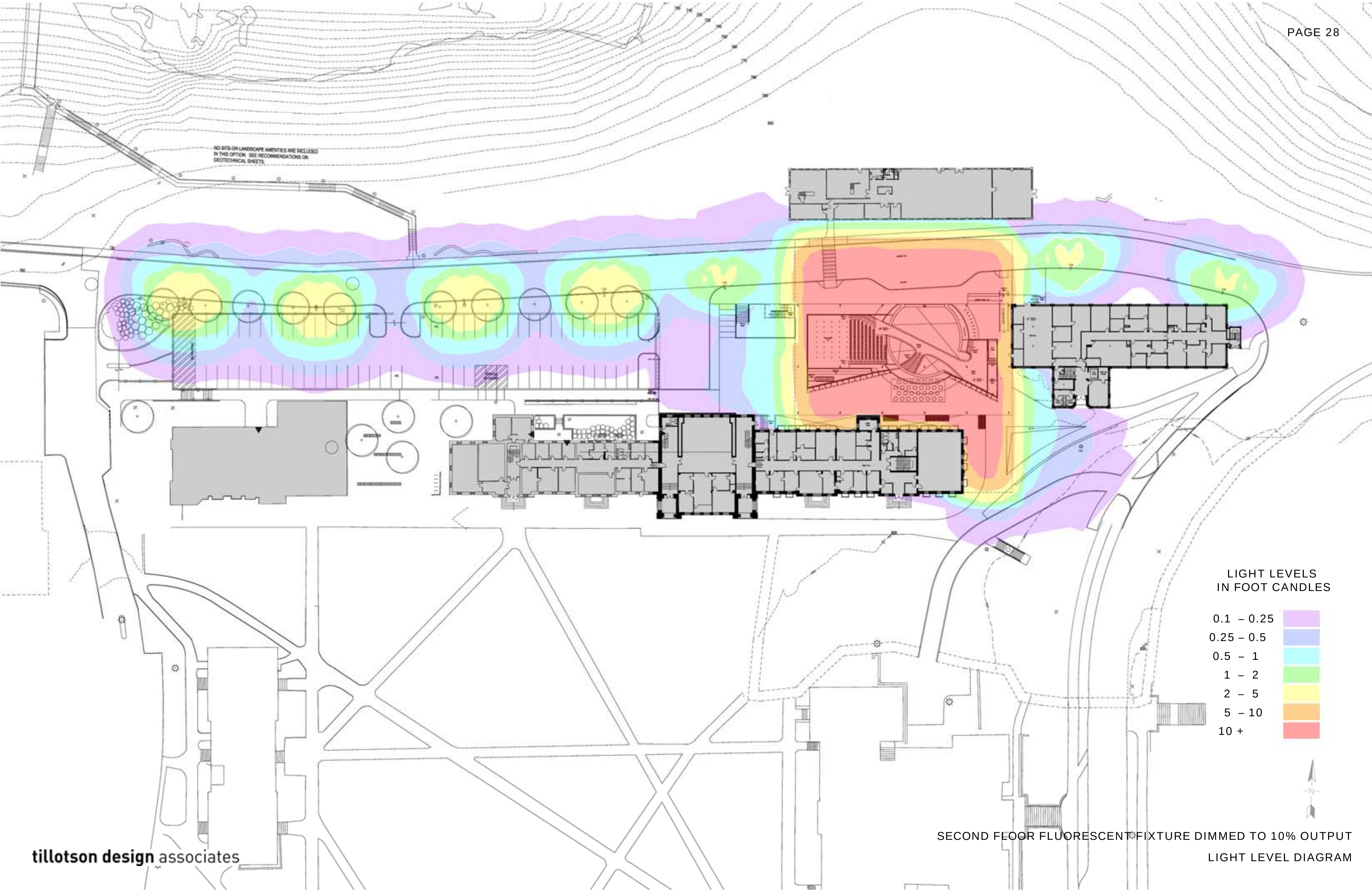
tillotson design associates







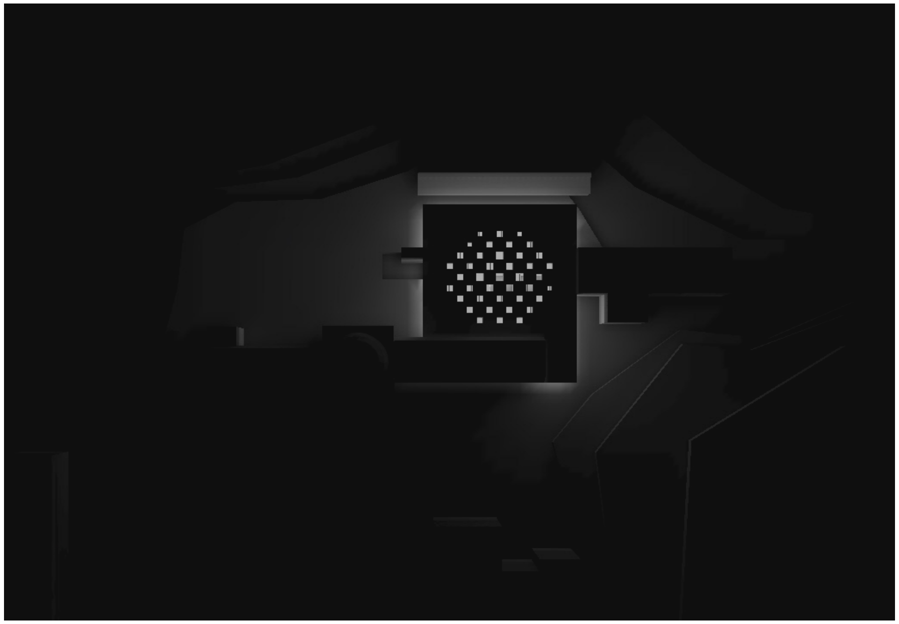


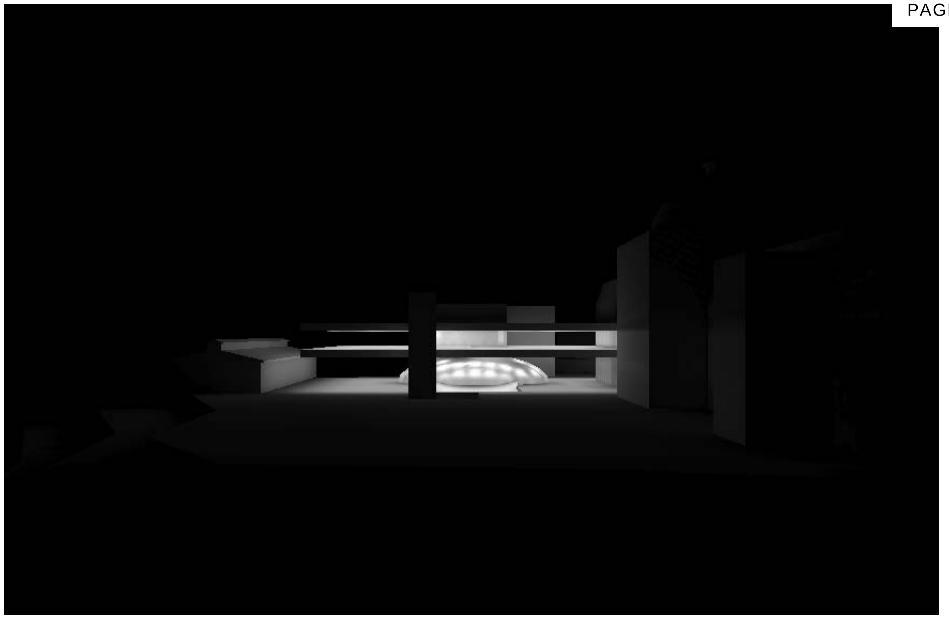


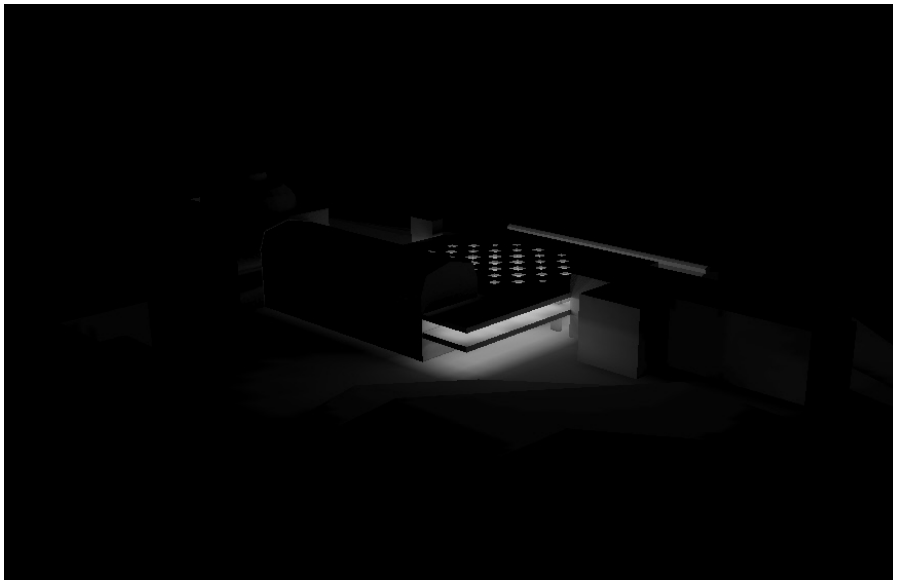
SECOND FLOOR FLUORESCENT FIXTURE DIMMED TO 10% OUTPUT

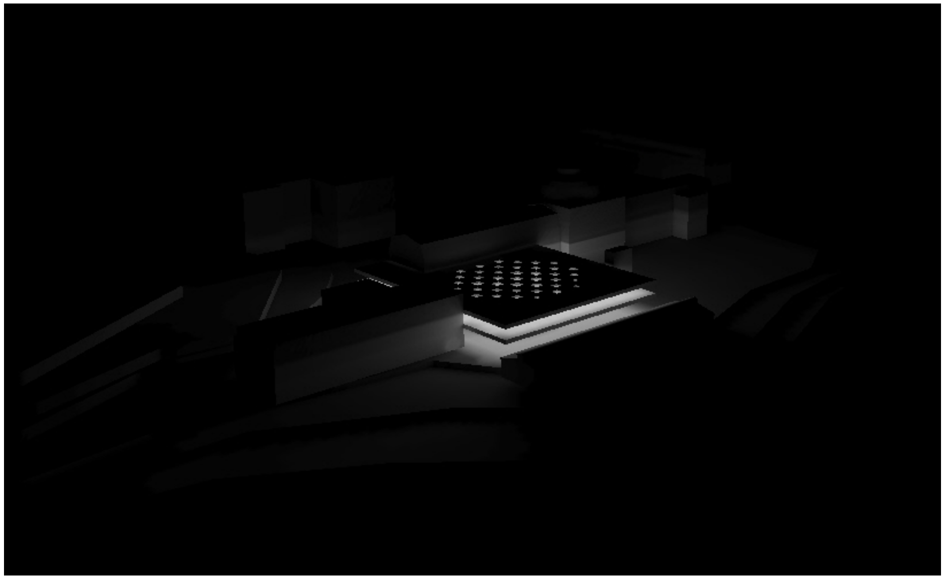
LIGHT LEVEL DIAGRAM

tillotson design associates

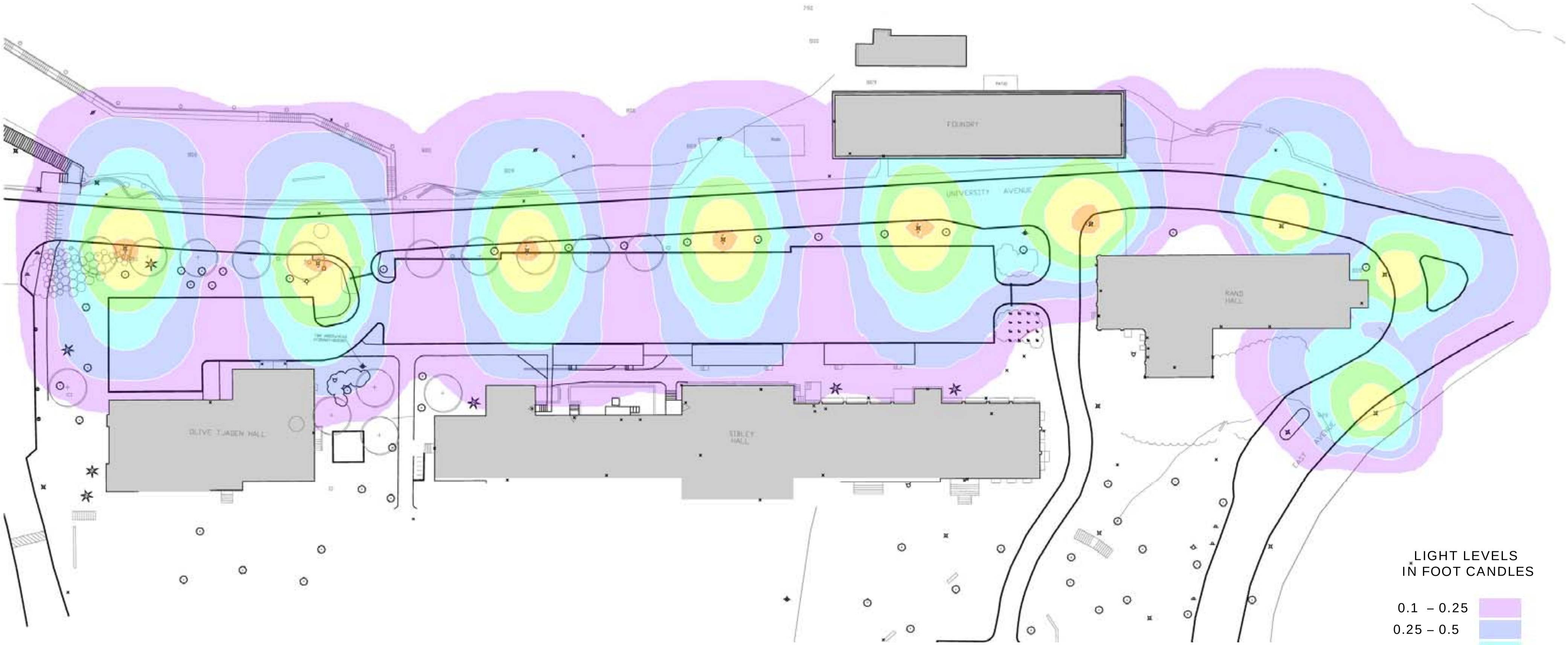








10% LIGHT OUTPUT
RENDERINGS



LIGHT LEVELS
IN FOOT CANDLES

0.1 – 0.25	🟪
0.25 – 0.5	🟦
0.5 – 1	🟦
1 – 2	🟩
2 – 5	🟨
5 – 10	🟧
10 +	🟥

N

EXISTING ROADWAY FIXTURE CALCULATION
30 FT POLE, 400 WATT LAMP, TYPE IV DISTRIBUTION
LIGHT LEVEL DIAGRAM

tillotson design associates

APPENDIX H: Acoustic Report

DHV B.V.

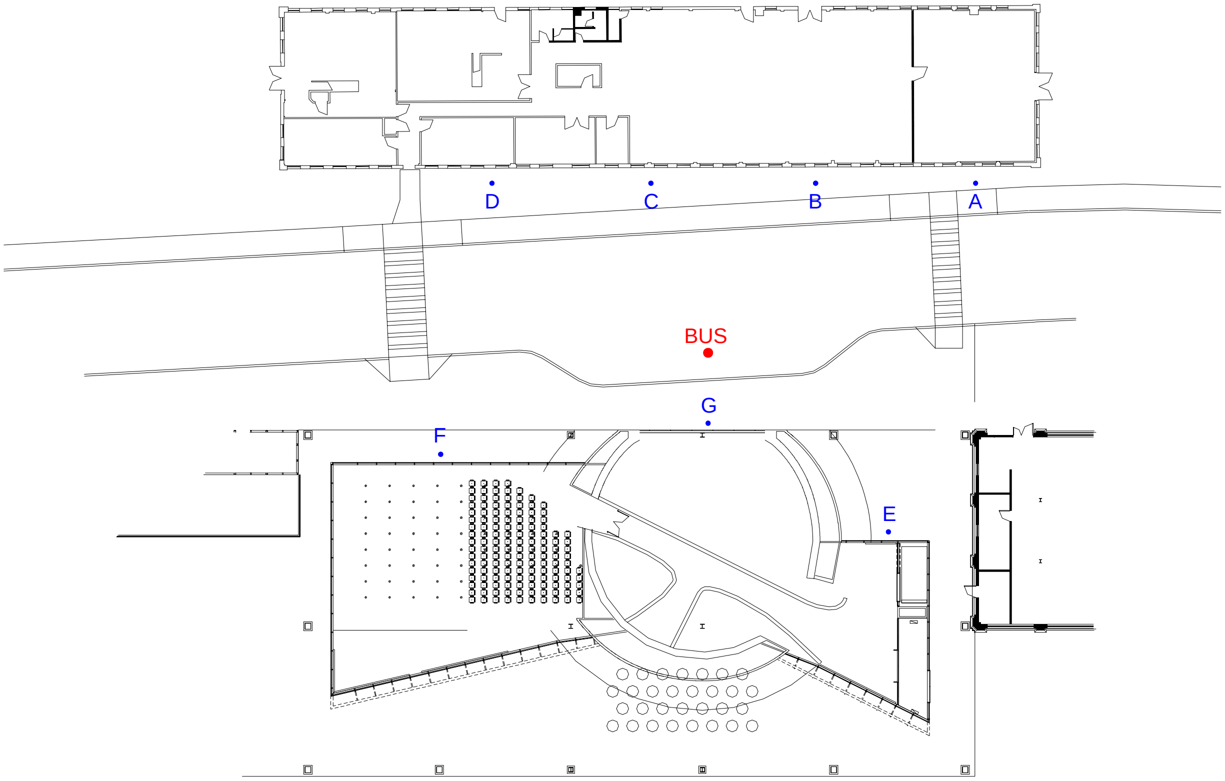
EXTERIOR NOISE ASSESSMENT
Milstein Hall, Cornell University
Effect of cantilever on noise from bus stop

DHV Engineering and Consultants
P.O. Box 80007
5600 JZ Eindhoven
The Netherlands

June 4th 2008

Based on the 75% Construction Documents for Milstein Hall (dated April 18, 2008), DHV Engineering and Consulting conducted a study to review the acoustic effect of the bus stop under the Milstein Hall cantilever on the Foundry. The noise exposure to the facade of the Milstein lobby, the dome's eyebrow and the Milstein auditorium caused by the bus stop were also studied. The results are presented in this report.

In the figure below the noise source position (BUS) and the 7 receiver positions are indicated in the site plan.



Receiver positions A, B, C and D represent the sound pressure level along the Foundry facade. The highest sound pressure level along the Foundry facade is expected at position B. This position is therefore considered decisive. Receiver position E represents the Milstein Hall Lobby facade. Receiver position F represents the Milstein Hall Auditorium facade. Receiver position G represents the dome's eyebrow.

The sound power level of the bus is estimated 105 dB(A) in passing condition and when accelerating or braking. For each receiver position we took into account the equivalent sound pressure level (SPLeq) of a bus passing by approximately six times every hour (six events of 105 dB(A) spreaded over 60 minutes), and the single event peak level (SPLp) caused by a single bus passing by, accelerating or braking.

In case of a hybrid bus, we expect the sound power level to be substantially lower. This report reviews the worst case scenario of a non-hybrid bus (at 105 dB(A)).

Estimations

Two configurations were modeled. Configuration 1 modeled the existing site and sound conditions (without Milstein Hall). In Configurations 2 the effect of the Milstein cantilever is taken into account, both with a sound-reflecting ceiling (2A) and with a sound-absorbing ceiling (2B). In the next three tables the estimated sound pressure levels for each configuration are presented.

Configuration 1 – existing conditions (without Milstein Hall)

Position	Sound Pressure Level (SPL)	
	Equivalent [dB(A)]	Peak [dB(A)]
Foundry (A – D)*	65.3	75.3
Milstein Lobby (E)**	64.5	74.5
Milstein Auditorium (F)**	61.7	71.7
Milstein Dome (G)**	70.1	80.1

Configuration 2A – Milstein Hall, reflecting ceiling

Position	Sound Pressure Level (SPL)	
	Equivalent [dB(A)]	Peak [dB(A)]
Foundry (A – D)*	69.9	79.9
Milstein Lobby (E)	70.5	80.5
Milstein Auditorium (F)	68.7	78.7
Milstein Dome (G)	73.7	83.7

Configuration 2B – Milstein Hall, absorbing ceiling (current design model)

Position	Sound Pressure Level (SPL)	
	Equivalent [dB(A)]	Peak [dB(A)]
Foundry (A – D)*	66.3	76.3
Milstein Lobby (E)	66.0	76.0
Milstein Auditorium (F)	63.4	73.4
Milstein Dome (G)	70.1	80.1

*At relevant position (B)

**In this configuration noise levels at positions E – G are estimated without the presence of Milstein Hall, which implies no reflections from a building opposite the Foundry.

With configuration 1 as starting point, we estimate that sound pressure level caused by the bus at the Foundry facade will increase approximately 1.0 dB(A), as well in equivalent level as the single event peak noise level, due to the new

Milstein Hall building (including the cantilever), assuming a sound absorbing finish of the ceiling. Such a difference will not be noticeable.

For the receiver positions, both in front of the Foundry and in front of Milstein Hall, the influence of a sound absorbing ceiling finish compared to a reflecting ceiling finish is at least 3.5 dB(A). A sound absorbing finish is therefore highly recommended from an acoustic point of view. The sound absorbing finish is included in the current design plans.

If the current traditional bus will be replaced by a hybrid bus, the sound pressure level at all receiver positions is likely to decrease substantially. Technical references indicate an expected decrease of between 4 to 8 dB(A), depending on the type of bus.

Expected intruding noise levels in the Foundry

Based on the existing facade construction, the interior noise level within the Foundry caused by a normal bus was estimated.

The existing Foundry facade construction consists of:
_ Single glass;
_ Wooden window frames;
_ Damp course of brickwork;
_ Sandwich panels of plywood and gypsum board, filled with mineral wool.

As sound travels through the façade, levels will be decreased by 24 to 29 dB(A), based on the Foundry exterior wall construction.

The existing sound level conditions inside the east side Foundry studio (based on a bus passing on University Avenue) are estimated between 34 dB(A) and 39 dB(A). Existing peak noise levels inside the east side Foundry studio caused by accelerating or braking of a bus are estimated between 44 dB(A) and 54 dB(A).

The existing sound level conditions inside the west side Foundry offices (based on a bus passing on University Avenue) are estimated between 39 dB(A) and 44 dB(A). Existing peak noise levels inside the west side Foundry offices caused by accelerating or braking of a bus are estimated between 49 dB(A) and 54 dB(A).

With the sound absorbent ceiling to Milstein Hall, there will be no noticeable difference to the sound levels within the Foundry.

The proposed sound level conditions inside the east side Foundry studio (based on a bus passing on University Avenue) are estimated between 35 dB(A) and 40 dB(A). Proposed peak noise levels inside the east side Foundry studio caused by accelerating or braking of a bus are estimated between 45 dB(A) and 55 dB(A).

The proposed sound level conditions inside the west side Foundry offices (based on a bus passing on University Avenue) are estimated between 40 dB(A) and 45 dB(A). Proposed peak noise levels inside the west side Foundry offices caused by accelerating or braking of a bus are estimated between 50 dB(A) and 55 dB(A).

The proposed project will increase interior noise levels in the foundry with approximately 1 dB(A). This increase will not be noticeable. The sound absorbing ceiling of Milstein Hall is the only mitigation necessary.

If the existing sound conditions inside the foundry are currently undesirable to the university, replacement windows would reduce sound levels. The condition of the sealing between glass and window framework influences the interior background noise level in the Foundry. If the windows are replaced with a well-sealed, double-pane insulated glass unit (IGU) the noise levels will be 5 dB(A) lower.

APPENDIX I: Wind Evaluation

RWDI, Inc.

CONSULTING ENGINEERS
& SCIENTISTS

FINAL REPORT

ASSESSMENT OF WIND ON PEDESTRIAN COMFORT AND SAFETY
MILSTEIN HALL – CORNELL UNIVERSITY
ITHACA, NEW YORK

Project Number: #08-1360A **May 22, 2008**

SUBMITTED TO: **Larry Burns**
Kendall/Heaton Associates

SUBMITTED BY: **Rowan Williams Davies & Irwin Inc.**
Consulting Engineers & Scientists
650 Woodlawn Road West
Guelph, Ontario N1K 1B8

P: (519) 823-1311
F: (519) 823-1316

Technical Coordinator: Tahrana B. Lovlin, P.Eng.
Project Manager: Analene Belanger, B.A.Sc. (Eng.)
Project Director: Hanqing Wu, Ph.D., P.Eng.

1. INTRODUCTION

Rowan Williams Davies & Irwin Inc. (RWDI) was retained by Kendall/Heaton Associates to conduct a Pedestrian Wind Assessment for the proposed Milstein Hall at Cornell University in Ithaca, New York. The objective of this qualitative analysis is to estimate the pedestrian wind conditions on and around the proposed development. This assessment is based on the local wind climate, design drawings received by RWDI on April 7 and 9, 2008, a site visit conducted by RWDI on March 31, 2008, our experience with similar projects and our engineering judgment.

A desktop analysis, using software developed by RWDI to evaluate wind flow around general building forms, was conducted in combination with local wind data, to estimate the potential pedestrian wind conditions. The numerical analysis, referred to as *Windestimator*[1,2] was developed from our extensive experience of wind tunnel modeling of similar developments. In the absence of wind tunnel testing, this numerical approach provides a screening-level estimation of potential wind conditions at a massing level.

2. SITE INFORMATION

As shown in Figure 1, the proposed Milstein Hall is a two storey building, to be attached to the existing Rand Hall to the east and the existing Sibley Hall to the south. The second level of the proposed Mistein Hall extends over University Avenue to the north. On the north side of University Avenue is the one-storey Foundry Building. Pedestrian areas on and around the proposed development include the proposed pod seating area (C), protected outdoor work space (C), a bus stop (E), the west plaza (D) and various walkways at the ground level (A, B), underneath the second floor.

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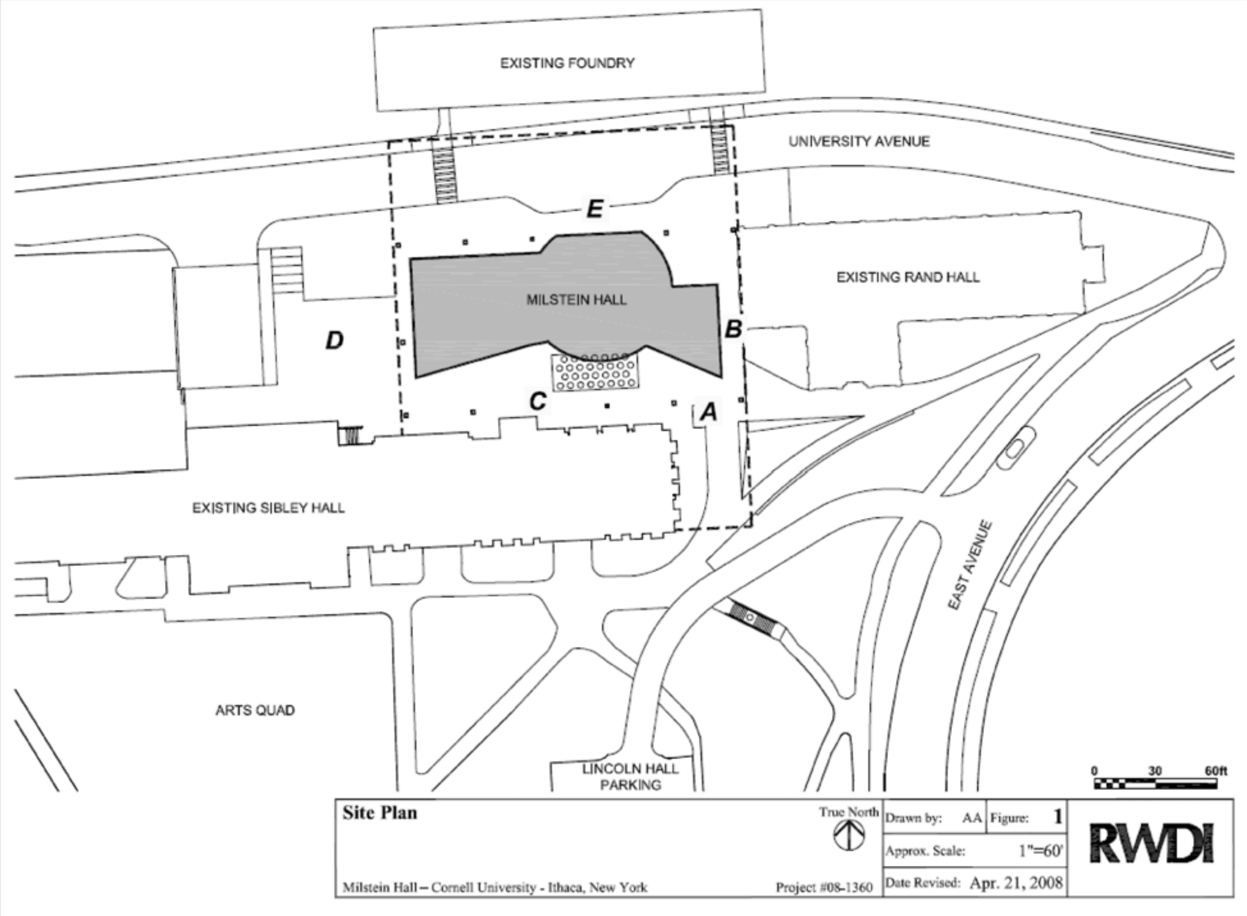
[1] H. Wu., C.J. Williams, H.A. Baker and W.F. Waechter (2004). "Knowledge-based Desk-Top Analysis of Pedestrian Wind Conditions". *ASCE Strcuture Congress 2004*. Nashville, Tennessee.

[2] C.J. Williams, H.Wu., W.F. Waechter and H.A. Baker (1999). "Experience with Remedial Solutions to Control Pedestrian Wind Problems". *10th International Conference on Wind Engineering*. Copenhagen, Denmark.



The development site is currently a parking lot. There are significant grade changes around the site, including a deep creek to the north and large buildings on higher ground to the southeast. Four site photos are presented below, demonstrating some of these features.

Image 1: *Looking west along University Avenue at the proposed site*

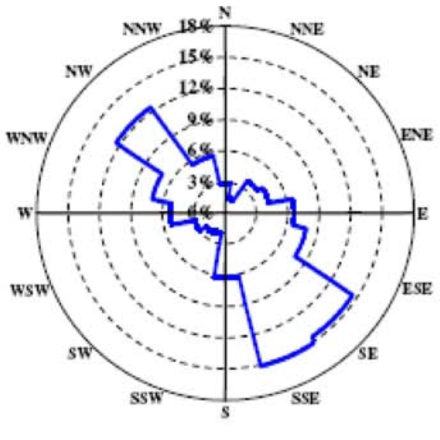
Image 2: *Looking northeast at the site, from the southwest corner of the existing parking lot*

Image 3: *Looking southeast at existing bus stop, Rand Hall, Sibley Hall with higher ground and large buildings to the southeast*

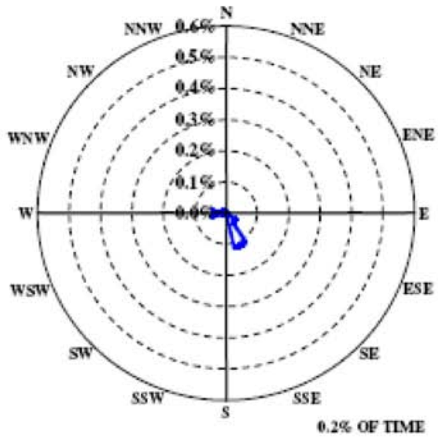
Image 4: *Deciduous trees and deep ravine north of University Avenue*

3. METEOROLOGICAL DATA

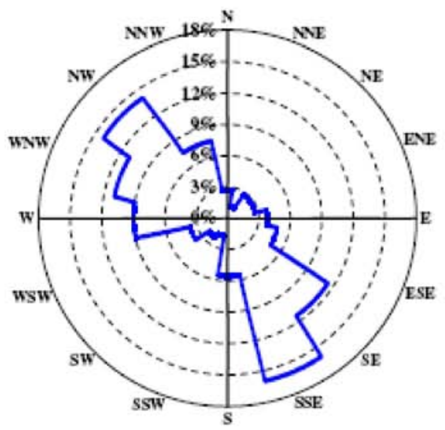
Wind data collected at several weather stations in the Ithaca area have been examined. Wind statistics recorded at the Game Farm Road Weather Station between 1998 and 2004 were found to be most representative for the current study. Figure 2 graphically depicts the distributions of wind frequency and directionality for the summer (May through October) and winter (November through April) seasons. When all wind speeds are considered, winds from the south-southeast, southeast and northwest directions are predominant from May to October, as indicated by the upper-left wind rose. The lower-left wind rose shows the data from November to April, indicating the predominance of winds from the south-southeast, southeast, northwest and west-northwest winds during this season.



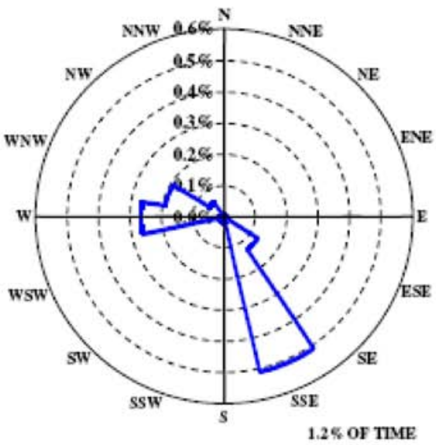
MAY TO OCTOBER WINDS
(SUMMER WINDS)



MAY TO OCTOBER WINDS
EXCEEDING 20 mph



NOVEMBER TO APRIL WINDS
(WINTER WINDS)



NOVEMBER TO APRIL
WINTER WINDS EXCEEDING 20 mph

Directional Distribution (%) of Winds (Blowing From) **Station: Game Farm Road Weather Station (1998 - 2004)** Milstein Hall - Cornell University - Ithaca, New York Project #: 08-1360	Figure No. **2** Date: April 29, 2008	RWDI

Strong winds of a mean speed greater than 20mph measured at the weather station occur for 0.2% of the time from May to October and 1.2% of the time from November to April. The south-southeast and west winds are prevalent all year, as demonstrated by the two right-hand wind roses in Figure 2. As a result, winds from the **southeast, south-southeast, northwest and west directions** are considered most prevalent and important for the current assessment, although all wind directions were taken into account in our desktop assessment.

4. RWDI WIND COMFORT CRITERIA

The wind conditions around the proposed development are assessed by use of pedestrian wind comfort criteria developed at RWDI. The four comfort categories used for this review are described in general terms as follows:

- **Sitting:** Low wind speeds during which one can read a newspaper without having it blown away. These wind speeds are appropriate for outdoor cafes and other amenity spaces that promote sitting.

- **Standing:** Slightly higher wind speeds that are strong enough to rustle leaves. These wind speeds are appropriate at major building entrances, bus stops or other areas, such as a bench along a sidewalk, where people may want to linger but not necessarily sit for extended periods of time.

- **Walking:** Winds that would lift leaves, move litter, hair and loose clothing. Appropriate for sidewalks, intersections, plazas, parks or playing fields where people are more likely to be active and receptive to some wind activity.

- **Uncomfortable**: The effects of wind speeds at this level would range from small trees swaying and wind force being felt on the body to whole trees being in motion and inconvenience being felt when walking. Wind of this magnitude would be considered a nuisance for most activities.

Wind conditions are considered acceptable for sitting, standing or walking if the wind speeds are within their specified ranges at least 80% of the time, or four in five days. An **uncomfortable** designation means that the 80% criterion is not satisfied for any of the above activities.

Safety is also considered by the criteria and is associated with excessive wind speeds that can adversely affect a pedestrian's balance and footing. If winds sufficient to affect a person's balance occur more than two times per summer or winter season, the wind conditions are considered severe. Wind control measures are typically required at locations where winds are rated as uncomfortable or they exceed the wind safety criterion.

5. WIND COMFORT ASSESSMENT

5.1 General

Generally, wind conditions suitable for walking are appropriate for passageways and sidewalks and lower wind speeds comfortable for standing are preferred for main building entrances and bus stops. Low wind speeds comfortable for sitting are suggested for seating areas and outdoor work spaces, especially during the summer season. In the winter, these areas are typically not used and hence, higher wind speeds are considered reasonable.

Figure 1 is a Site Plan of the proposed development and the surrounding area. Section 5.2 discusses the existing wind conditions in the area, and Section 5.3 describes in detail the anticipated wind conditions at notable areas around the study site with the proposed Milstein Hall in place.

5.2 Existing Wind Conditions

The site is currently an open parking lot, surrounded by the existing buildings to the north, east and south. Dense trees along the creek to the north and large buildings to the southeast are expected to shelter the site from the prevailing winds (see site photos in Section 2). As a result, wind conditions on the site are generally expected to be comfortable for standing or sitting throughout the year. Slightly higher wind speeds are predicted along the walkway between the existing Rand Hall and Sibley Hall, but these wind conditions are expected to be suitable for the intended use (i.e., walking) of the area. Around the existing bus shelter, along University Avenue, wind conditions are also expected to be comfortable for standing throughout the year.

5.3 Potential Wind Conditions

A. Southeast Entry

As discussed previously, the southeast entry area between the existing Rand Hall and Sibley Hall (Area A in Figure 1) is sheltered from the prevailing southeast and south-southeast winds by the sloped terrain and large buildings to the southeast. The massing of the proposed development (e.g. the auditorium at the ground level) will create a back pressure to further reduce the flow of southwesterly winds. In addition, the proposed development will also keep the northwest winds from reaching the southeast entry area. The westerly winds, which may enter the southeast entry area from the seating pods and work space area, are relatively infrequent. Therefore, wind conditions comfortable for standing are predicted in the southeast entry area throughout the year.

B. East Passageway

This passageway runs in a south-north direction between the proposed auditorium and the existing Rand Hall (see Area B in Figure 1). Due to its orientation, this area will not be affected by the westerly winds, but the southeast and northwest winds may be channeled into this passageway. The resultant wind conditions are predicted to be comfortable for standing in the summer and for walking in the winter. Thus, these wind conditions are considered suitable for the passageway.

A generous air-lock vestibule has been included for the entry to the building. This is a positive design feature for wind control.

C. Pod Seating and Work Space

As shown in Figure 1, the proposed pod seating and work space are located in a passageway between the proposed auditorium and the existing Sibley Hall (Area C in Figure 1). The width of the passageway is narrower at both ends, thus limiting the wind flow through the area. Hence, low wind speeds, comfortable for sitting or standing in the summer, are expected in the vicinity of the pod seating and work spaces. Higher wind speeds, comfortable for standing or walking, are expected during the winter season. This is considered acceptable since stationary outdoor pedestrian activity is likely to be limited in the winter.

D. West Plaza

The plaza on the west side of the proposed development (Area D in Figure 1) is sheltered by the existing and proposed buildings from the prevailing southeasterly winds, but is exposed to the northwest and west winds. Overall, wind conditions in the plaza are expected to be comfortable for standing throughout the year. If a seating area is planned for the summer, the design team may consider installing a tall wind screen or a row of trees on the west side of the plaza, along the retaining wall for the underground parking ramp to further reduce the wind activity in this area.

E. Bus Stop and Sidewalk

Similar to the west plaza, wind conditions at the bus stop and sidewalk along University Avenue (Area E in Figure 1) are expected to be comfortable for standing throughout the year. There will be wind flow accelerations underneath the proposed building when winds are from the west and northwest directions, but their impact will be insignificant, considering the proposed development is only two storeys in height. In general, wind conditions at the bus stop and sidewalks along University Avenue are predicted to be similar to the existing conditions and are considered suitable for the intended use of the area.

6. SUMMARY

Given the local wind climate and the limited height of the proposed development, wind conditions on and around the proposed Milstein Hall development are expected to be similar to the existing conditions and are considered appropriate for the expected usage of the area. This includes the southeast entry, the east passageway, the pod seating and work spaces, the west plaza and the bus stop and sidewalks along University Avenue. There will be wind flow accelerations in passageways underneath the proposed building, but their impact will be insignificant, considering the proposed development is only two storeys in height and the proposed building massing will always shelter these areas from winds from one or more prevailing wind directions. In addition, no areas are predicted to have uncomfortable wind conditions on or around the proposed development in any season.

APPENDIX J: Exhaust Design Review

RWDI, Inc.

CONSULTING ENGINEERS
& SCIENTISTS

FINAL REPORT

EXHAUST ENTRAINMENT DESIGN REVIEW
MILSTEIN HALL – CORNELL UNIVERSITY
ITHACA, NEW YORK

Project Number: #08-1360A **May 22, 2008**

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1. INTRODUCTION

RWDI was retained by Kendall/Heaton Associates to conduct an Exhaust Re-entrainment Design Review for the proposed Milstein Hall at Cornell University in Ithaca, New York. This review evaluated the potential for emissions from vehicles travelling along University Avenue under the proposed cantilevered building to enter nearby outside air intakes and other areas of concern (i.e., become entrained) and to create possible health or odor concerns. A summary of findings and recommendations is presented at the end of this report.

2. METHODOLOGY

Our understanding of the design is based primarily on the following information:

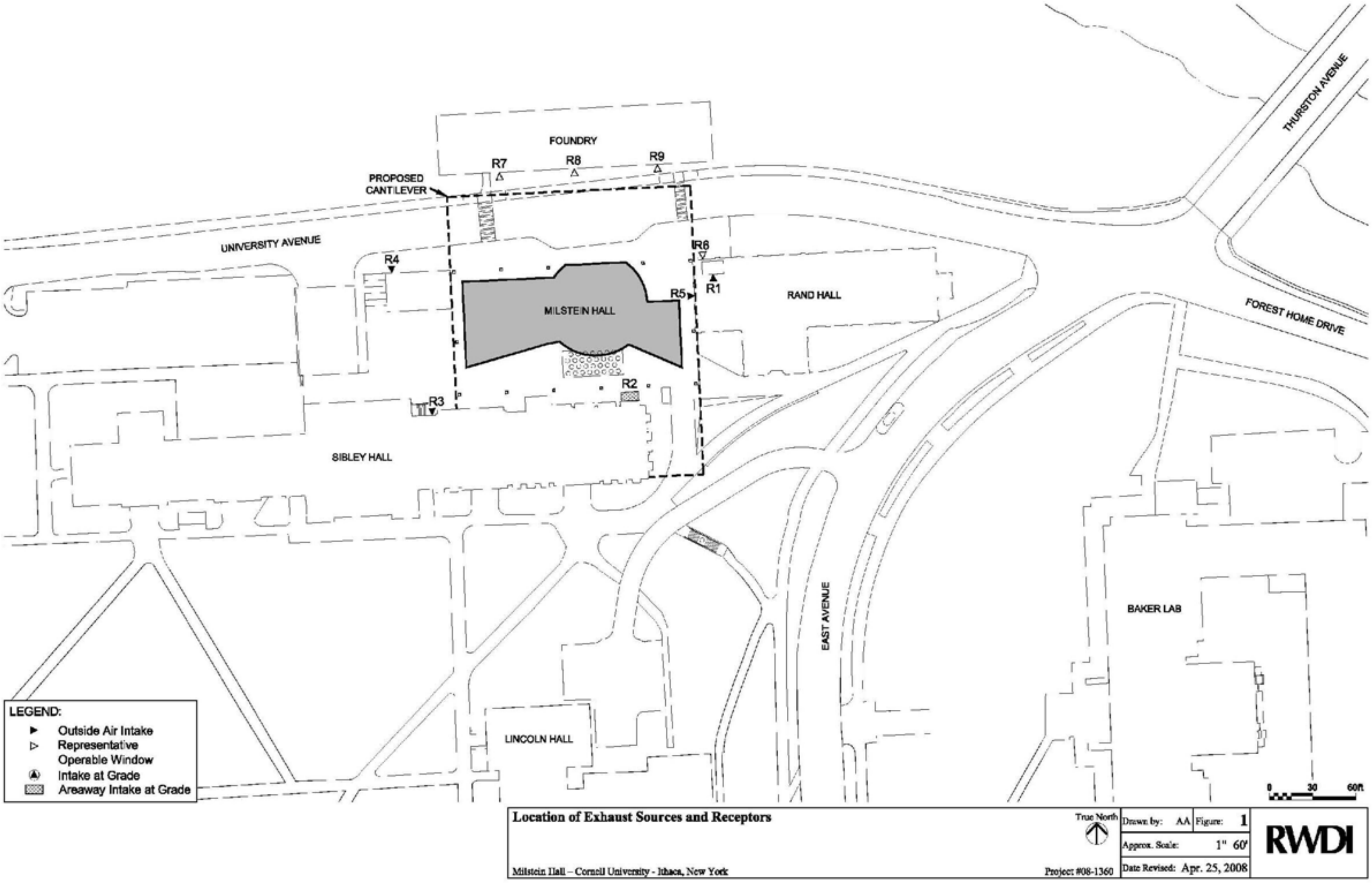
- A site visit and meeting conducted by RWDI on March 31, 2008
- Architectural and mechanical drawings received from Kendall/Heaton Associates dated April 18, 2008.
- Projected traffic information provided by Martin/Alexiou/Bryson, PLLC on April 18, 2008.

The exhaust re-entrainment design review was conducted using the above stated information sources and our experience with numerous other similar projects. Some preliminary numerical calculations were also performed that accounted for the following: emissions from idling automobiles and buses beneath the cantilevered building; a low, nearly calm wind speed through the area; and mixing of pollutants within the air volume beneath the cantilevered building. A conservative model was used, based on an enclosed tunnel with a minimum ventilation rate. It is expected that the actual concentrations of pollutants will be better than predicted with the conservative model due to openings between the buildings.

3. SITE DESCRIPTION

Figure 1 shows the site plan for the area around Milstein Hall. The proposed Milstein Hall will occupy space between Rand Hall and Sibley Hall on the Cornell campus. The Foundry Building is located to the north of the building across University Avenue. The second floor of the proposed building will cantilever above the first floor and will connect Rand Hall and Sibley Hall and create an overhang above University Avenue. Figure 1 shows the proposed second story cantilever roof as a dashed line.

University Avenue is a two lane street passing under the overhang. There will be a bus stop under the overhang on the south side of University Avenue.



4. WIND CLIMATE

For the preliminary screening calculations performed for this study, the worst-case wind direction was chosen as perpendicular with the road which will create minimum ventilation and the potential for the highest concentrations underneath the cantilevered building. The prevailing winds in Ithaca area are from the northwest and southeast directions and occur for the majority of the time. These prevailing winds will provide better ventilation than the worst case wind direction.

5. EXHAUSTS OF CONCERN

Table 1 summarizes the exhaust parameters for the exhausts considered in the design review.

Table 1 - Exhaust Parameters

Source Description	Specifications	Potential Air Quality Concerns
Exhaust from idling gasoline fired vehicles	Cars idling under the proposed cantilever	Meeting applicable air quality standards for carbon monoxide and other pollutants from vehicle exhaust
Exhaust from idling diesel fired buses	Bus idling under the proposed cantilever at the bus stop	Meeting applicable air quality standards for nitrogen oxides, particulate matter Nuisance diesel odors

The exhausts from the vehicles will at first travel in the direction of the exhaust tailpipe and also rise slightly due to the elevated exhaust temperature. Shortly thereafter, the exhaust will disperse with wind currents and will be reduced in concentration. Some wind currents will exist even in nominally calm conditions, and some ventilation currents will be created by the moving vehicles as well.

6. AIR INTAKES/RECEPTORS OF INTEREST

Table 2 summarizes the receptor locations that were considered for the design review and at which air quality impacts were assessed. These receptors represent outside air intakes and operable windows at proposed and existing buildings. Their locations are illustrated in Figure 1 above.

Table 2 - Summary of Air Intake Locations

Receptor	Location	Description
R1	Rand Hall Roof	Proposed Milstein Hall outside air intake
R2	Milstein Hall (Grade level adjacent to Sibley Hall)	Proposed Milstein Hall outside air intake
R3	North facade of Sibley Hall (3rd floor level)	Proposed outside air intake for Sibley Hall
R4	Parking garage stair tower	Proposed outside air intake supplying future Parking Garage
R5	West facade of Rand Hall	Outside air intake
R6	North facade of Rand Hall	Representative operable window/intake
R7-R9	South facade of the Foundry Building	Representative operable windows/doorways

7. RESULTS

The results of the design review are discussed for each source below. Recommendations are summarized at the end of this report.

7.1 Emissions from Automobiles

With regards to automobile emissions, air quality underneath the proposed Milstein Hall cantilevered structure over University Avenue is expected to meet applicable air quality standards. The standards will be met in the immediate area under the cantilever and at nearby operable windows and air intakes.

Carbon monoxide is the air pollutant of most concern for automobiles. Air quality standards from EPA and the State of New York for carbon monoxide are expressed as concentrations not be exceeded: no more than 35 ppm for any 1 hour period and no more than 9 ppm for any 8 hour period.

Carbon monoxide levels are predicted to be below these standard levels. Under worst case wind and traffic conditions including idling cars in a queue, carbon monoxide 1 hour concentrations are predicted to be at or below 15 ppm on a 1 hour basis, and at or below 6 ppm on an 8 hour basis. These predictions include the effects of background concentrations from other pollution sources.

7.2 Emissions from Diesel Buses

Air quality standards include limits on concentrations of carbon monoxide and nitrogen oxides that are emitted from automobiles and buses. For buses, nitrogen oxides are the pollutants of most concern. However, the EPA and the State of New York have only annual average standards. Several other states have short-term 1 hour standards for nitrogen oxides that were examined for this project. With regards to diesel buses idling at the bus stops, air quality underneath the proposed Milstein Hall cantilevered structure over University Avenue is expected to meet applicable annual and short-term air quality standards for nitrogen oxides and other air pollutants.

While not a health issue, odors from diesel buses in the immediate vicinity of the bus stops may be slightly stronger and longer in duration compared to the existing conditions. Occasional odors may also be experienced at open windows at the Foundry Building immediately north of University Avenue.

7.3 Mitigation

All air quality standards are expected to be met in the proposed design. Diesel odors from idling buses at the bus stop have the potential to be detected at the Foundry Building. Odor complaints may be reduced at the Foundry building by temporarily closing operable windows along University Avenue, especially those closest to the bus stop. Odors may also be reduced by switching to a non-diesel, hybrid powered bus.

8. CONCLUSIONS

RWDI conducted a design review of the air quality underneath the cantilevered building over University Avenue at the proposed Milstein Hall at Cornell University in Ithaca, New York. Air quality standards are expected to be met underneath the cantilevered overhang due to automobile and bus traffic. Odors from idling buses at the bus stop may be experienced at the operable windows at the adjacent Foundry Building. Odor complaints may be reduced by closing Foundry Building operable windows that are close to the bus stop, or by switching to a non-diesel, hybrid engine for the buses.