3.0 ASSESSMENT OF DEVELOPMENT REVIEW COMPONENTS

3.1 Urban Design

3.1.1 Introduction and Urban Design Principles

The primary urban design objective of Boston University Medical Center is to create a cohesive medical campus thoughtfully integrated into the surrounding urban fabric and neighborhoods. Since the merger of Boston City Hospital and University Hospital in 1996, sensitive design, careful open space planning, and conscientious site and streetscape enhancements along the campus periphery have supported this objective. Various improvement projects, implemented under the previous master plan, refined the presence and aesthetic of the BUMC Campus, specifically along Harrison Avenue.

The Proposed Projects are designed within the context of important urban planning principles. These principals include:

- Transform the Albany Street campus image;
- Complement the existing context massing, scale, and materials;
- Create a clear and welcoming sense of arrival;
- Enhance open spaces on the campus, both short and long-term;
- Develop pedestrian friendly street edges;
- Enable connectivity between parking and existing buildings;
- Integrate sustainable design principles and operations; and
- Plan proactively for future growth and transformation.

The master plan goals, combined with the previously applied design principles, will enrich the physical image of the BUMC Campus, improve the integration with the surrounding neighborhood, and elevate the perceptions of the Boston University Medical Center by its users, particularly on Albany Street.

3.1.2 Urban Design – Moakley Cancer Center Addition

Moakley Cancer Center Addition - Existing Context and Project Location

The Proposed Moakley Cancer Center Addition will be located on the West Campus along East Concord Street within the center of the BUMC Campus.

Currently East Concord Street plays an important role within the BUMC Campus by providing a link to the bordering residential neighborhoods located to the north, while fostering one of the campuses most important north/south pedestrian and vehicular connections. The Street is composed of academic buildings varying in scale and style, a large open green space along its east side, and the 710 Parking Garage located at the corner of Albany Street. Additionally there is a MBTA bus stop located along East Concord Street adjacent to the project site.

The project site is located on the open space directly east of the existing Moakley Cancer Center and has frontage along East Concord Street. The north face is located along the Moakley and Menino Drop-off drive and is aligned with the northern edge of the existing Moakley Cancer Center building. The south face is also aligned with the existing building and has frontage along Shapiro Drive. The east face abuts East Concord Street further defining the existing pedestrian travel path while creating a distinct bookend to the green behind the Talbot building. See Figures 3-1 and 3-2.

Moakley Cancer Center Addition - Massing and Height

The height and massing are dictated by both programmatic need and existing contextual cues. The project height and massing will be consistent with, and relate to, the existing Moakley Cancer Center building. The building will be 3-stories at approximately 53 feet above grade, aligning with the current height of the Moakley Cancer Center. There will be a 1 story mechanical penthouse which will define a sense of hierarchy consistent with the existing Moakley Cancer Center building. The overall height of building with the mechanical penthouse will be approximately 69 feet in height from grade. This is approximately 11 feet lower than the adjacent existing penthouse. Contemporary design of hierarchy and planer expression will be extended from the existing Moakley Cancer Center building to further integrate the architecture with the surrounding context.

The north and south facades of the addition are aligned with the existing Moakley Cancer Center building, helping to strengthen the east-west pedestrian corridor connecting the Moakley Cancer Center with the Boston University Medical School Campus. The east face of the addition engages the sidewalk along East Concord Street further defining the pedestrian experience along the street edge. The building will also create shelter for the proposed relocated MBTA bus stop and for traversing pedestrians along East Concord Street by providing an architecturally integrated canopy. See Figures 3-3 and 3-4.

Moakley Cancer Center Addition - Design, Character and Materials

Currently the existing Moakley Cancer Center successfully integrates itself within the neighboring historic context through the meaningful use of a simplified material palette. Brick, metal and glass curtain wall are applied in a way that resemble the typical architecture of the South End while simultaneously creating its own contemporary image.

While the massing and height of the Moakley Cancer Center Addition are an extension of the existing vocabulary, each facade is designed to express its specific function and relate to the adjacent street edge.

With the construction of the existing Moakley Cancer Center came extensive campus landscape improvements which not only created a beautiful front door for the BUMC Campus, but produced a nostalgic link to the original Boston City Hospital. The parking lots between the BCD and FGH buildings were replaced by a formal lawn mimicking the original Beaux Arts campus arrangement, with this major axis extending from Worcester Square and terminating at the Moakley Cancer Center. The composition of the existing north facade responds specifically to this ceremonial axis through the use of a large glass volume, projecting canopy, and symmetrically aligned bris-solei. The symmetrical arrangement of the BCD building, FGH building, and tree plantings; further emphasize this prominent axis. While these elements create a formal composition they also signify the building's main drop off, patient entrance, and reinforce the major east/west pedestrian campus walkway. Materially, large expanses of curtain wall were used in order to express the building's main entrance and public circulation areas. These factors lead to the frontal composition expressed on the existing Moakley Cancer Center north facade.

The north facade of the proposed Moakley Cancer Center Addition relates to and draws upon the existing condition. While there is no building entrance located here, the large glass curtain wall is used to express the major public circulation and waiting zones along this edge of the building. By maintaining existing alignments, the form of this glass extrusion further defines the existing east/west pedestrian pathway. Additionally, the glass curtain wall appearance provides a visual connection between the indoor and outdoor public spaces along the ground level.

A number of massing and material studies were analyzed to investigate the street relationship in response to the changes to the building’s east façade. Some of studies looked at a frontal expression relating to the adjacent green space, but after further analysis it was concluded that the proposed elevation approach was most responsive. The Talbot green space along East Concord Street has a significantly different character then the main lawn located between the BCD and FGH buildings. An existing service drive north of the Talbot Building causes the main longitudinal axis of the green to be slightly off center as it relates to its "bookend" buildings. Neither the Solomon Carter Fuller Building entrance plaza to the east, nor the center of the existing Moakley Cancer Center building facade to the west are on axis with this open space. This loose axial alignment, collectively with the offset pathways and non-symmetrical tree arrangement, creates a distinctly less formal condition then the main Moakley green located adjacent to Harrison Avenue. See Figures 3-5 to 3-8.

In response, the east facade of the existing Moakley Cancer Center and the proposed Addition are compiled as a series of architectural elements that are appropriately less "proper" in composition then the existing Moakley Cancer Center north facade. The first element is a continuous piece of curtain wall wrapping around the northeast corner, relating to the northern building face and expressing the end of the public circulation zone. The second element is centered on axis with the adjacent Talbot green space and is the tallest portion of the east facade (containing the penthouse). The last piece is a simpler element composed of brick with a punched window expression, which relates to the smaller scale windows seen along East Concord Street. See Figures 3-9, 3-10, 3-11, 3-12, 3-13, 3-14.

As the building face is brought closer to East Concord Street, it responds to this new condition through its materiality and facade expression. The large "picture window" from the original design has been scaled down and now has a stronger relationship to the northern curtain wall appearance. Additionally, the overall height of the penthouse volume has been lowered to respond to the new street relationship. At ground level, small scale punched windows and the use of brick relate to both the existing streetscape and to the smaller scale of the passing pedestrians. Moving north along this facade the building mass steps back from the street providing further relief to the northeast corner, where the major pedestrian circulation routes intersect.

Moakley Cancer Center Addition - Vehicle Access and Circulation

Patient and vehicular access for the Moakley Cancer Center Addition will be via the existing Moakley Cancer Center entrances located along the drop-off to the north of the building.

Construction of the Moakley Cancer Center Addition will necessitate a slight reconfiguration of the existing Shapiro Drive where it intersects with East Concord Street. The portion of Shapiro Drive located between the Moakley Cancer Center Addition and 85 East Concord will be relocated approximately 20 feet south of its existing location. This creates a more optimal intersection configuration and provides appropriate visual clarity for vehicular traffic turning right onto East Concord Street. Sidewalk and landscape improvements along this reconfigured portion of Shapiro Drive will be consistent with the existing conditions and materials.

Moakley Cancer Center Addition - Site Improvements

Proposed sidewalk and landscaping improvements will take place along the perimeter of the building defining the proposed new MBTA bus stop location and enhancing the pedestrian experience.

Along East Concord Street, as the each façade of the building recedes, a planting zone will be introduced between the building edge and the hardscaped sidewalk. This vegetative zone will consist of native plants (for decreased irrigation) and will create a soft buffer along the building edge. The southeast corner of the building is lifted to provide space for the proposed relocated MBTA bus stop which will be relocated from the street edge closer to the building footprint to provide users with added protection from the elements. The relocated bus shelter will provide clear sightlines for vehicles exiting Shapiro Drive. A simple projected canopy defines the integrated bus shelter and provides an additional element to modulate the Moakley Cancer Center Addition east facade.

The pedestrian experience at East Concord Street will be enhanced by widening the accessible sidewalk from +/- 6’ to 8, and adding a wider 5’ furnishing zone along the curb edge. Because the building will be appropriately set back, the new 8’ sidewalk dimension will exceed the 5’ pedestrian zone requirement as stated in the Harrison Albany Corridor Strategic Plan. The existing staggered jointing pattern within the concrete sidewalk will be replaced with straight saw cut joints perpendicular to the path of travel to create the smoothest surface possible for maximum accessibility and longevity. The 5’ furnishing zone will extend the brick paver accent band from the south and contain new street trees in tree grates, fire hydrants, and City of Boston acorn style street lights. The existing raised crossing at the Shapiro Drive exit drive will be maintained but will be repaved and widened with the 8’ concrete sidewalk. See Figures 3-15 and 3-16.

Figure 3-1 Moakley Addition Context Photos

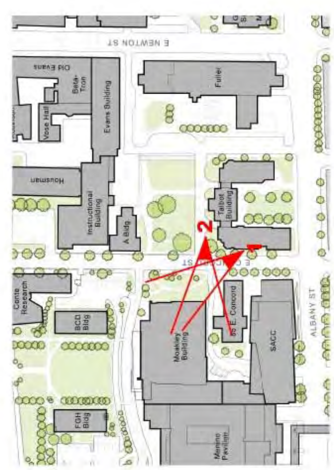
Figure 3-2 Moakley Addition Context Photos (continued)

Context Photos

March 23, 2013

Photo 3: View from East Concord St. looking west.
Southeast corner of Moakley Cancer Center.

Photo 4: View from East Concord St. looking southwest
Shapiro Drive exit with East facade of Moakley Cancer Center on right and 85 E. Concord on the left.



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MOAKLEY CANCER CENTER ADDITION

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Figure 3-3 Moakley Addition Aerial Looking South

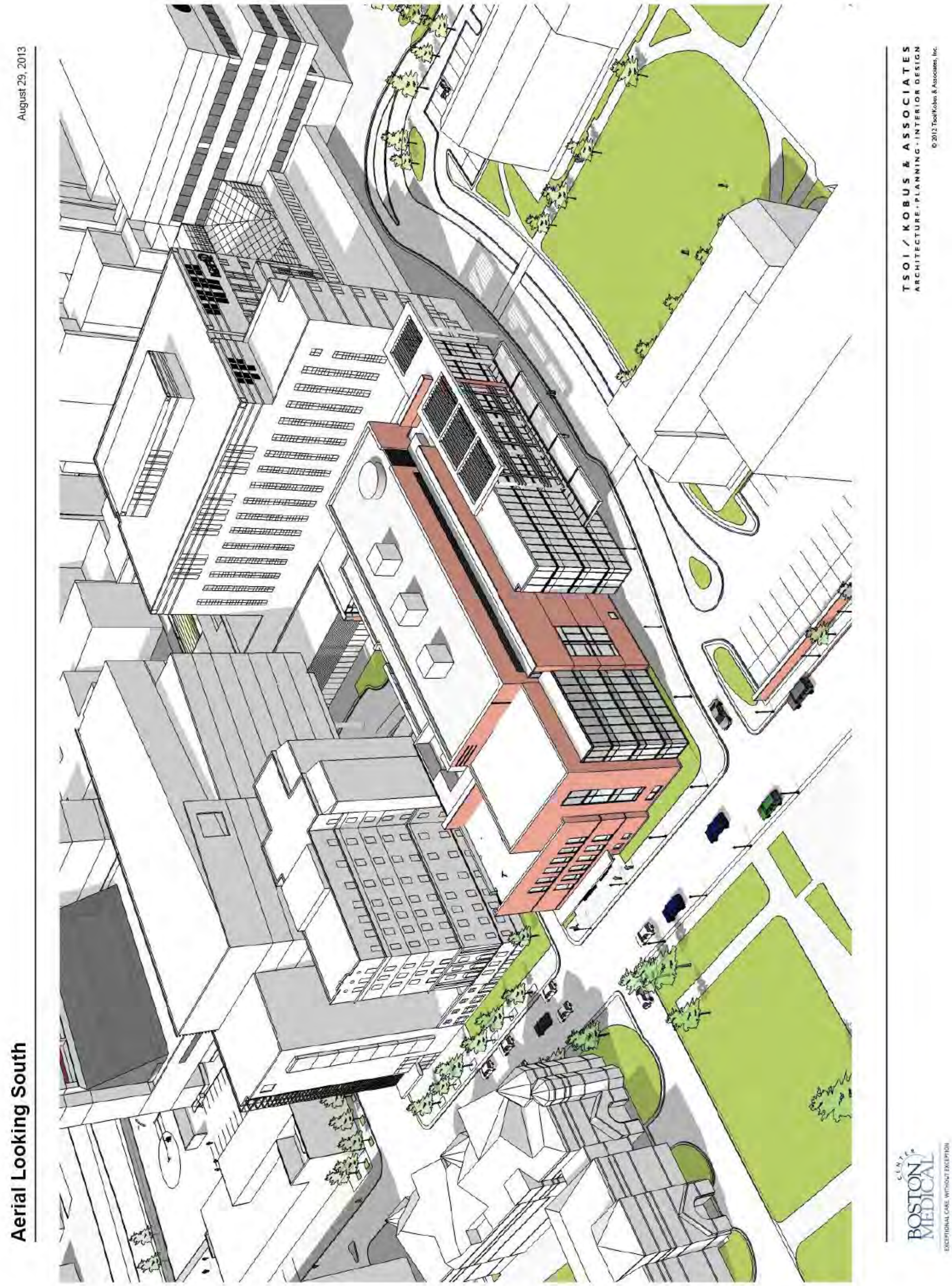


Figure 3-4 Moakley Addition Aerial Looking West

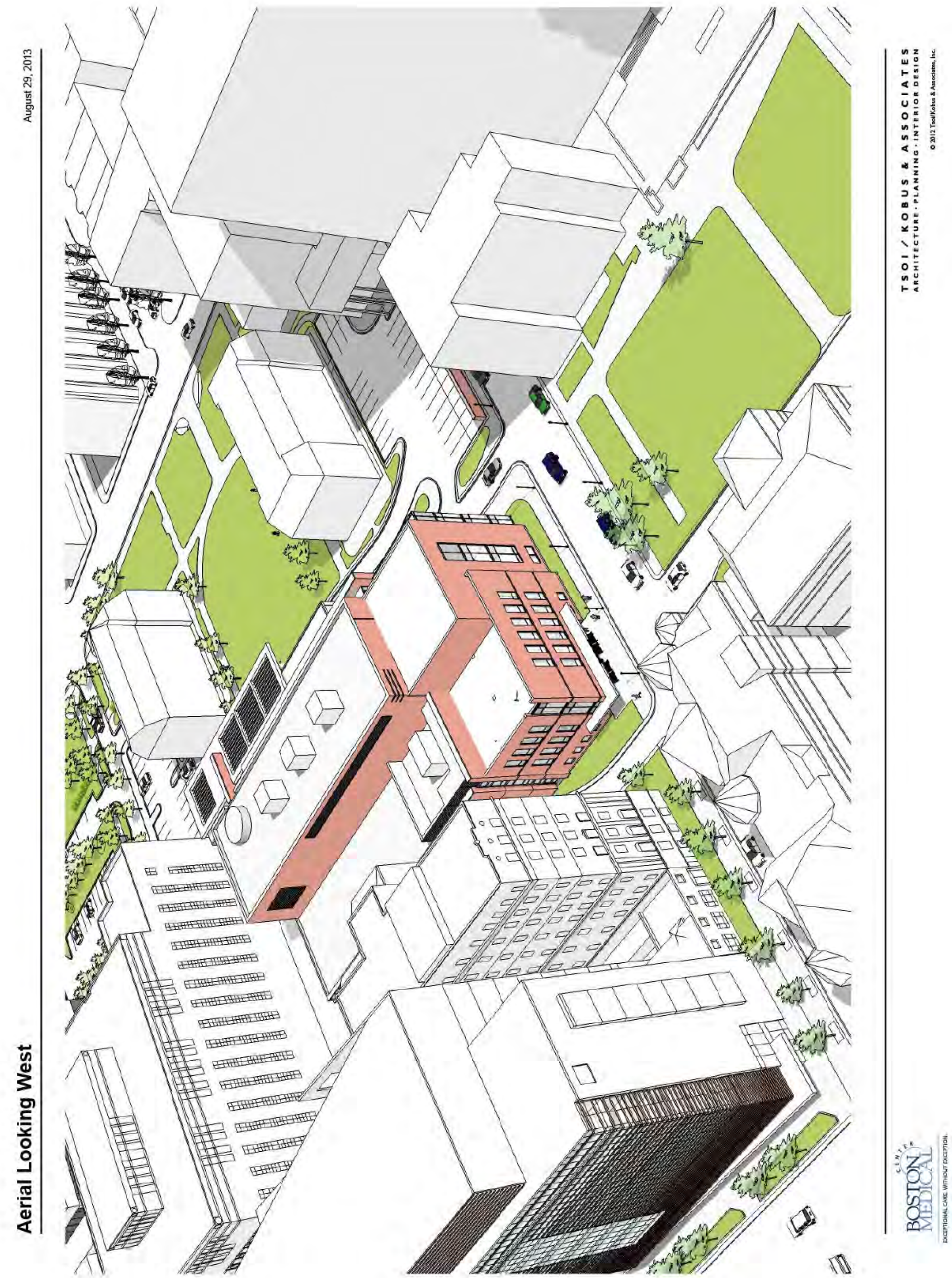


Figure 3-5 Moakley Addition Alternate ElevationStudy 1

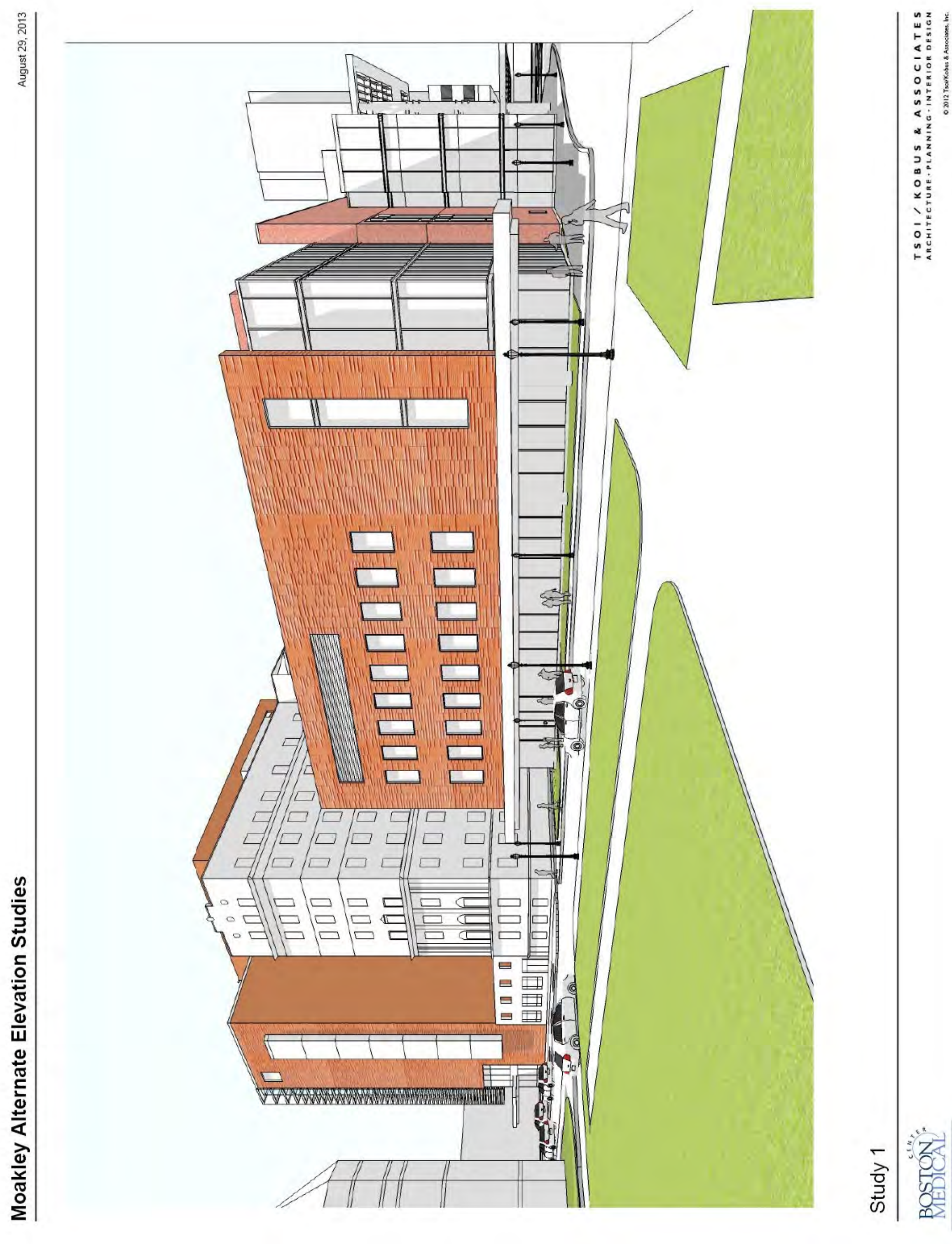


Figure 3-6 Moakley Addition Alternate ElevationStudy 2

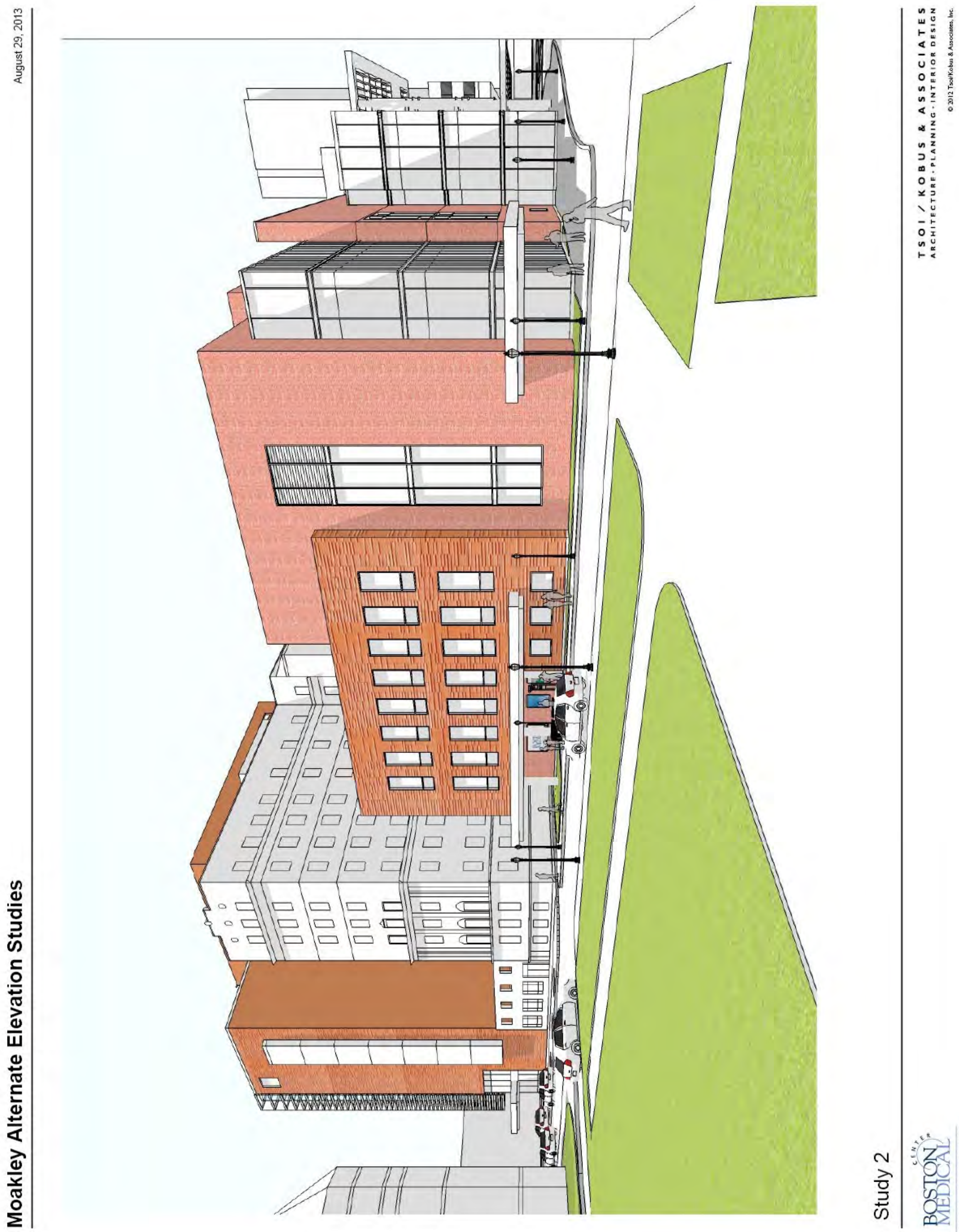


Figure 3-7 Moakley Addition Alternate ElevationStudy 3

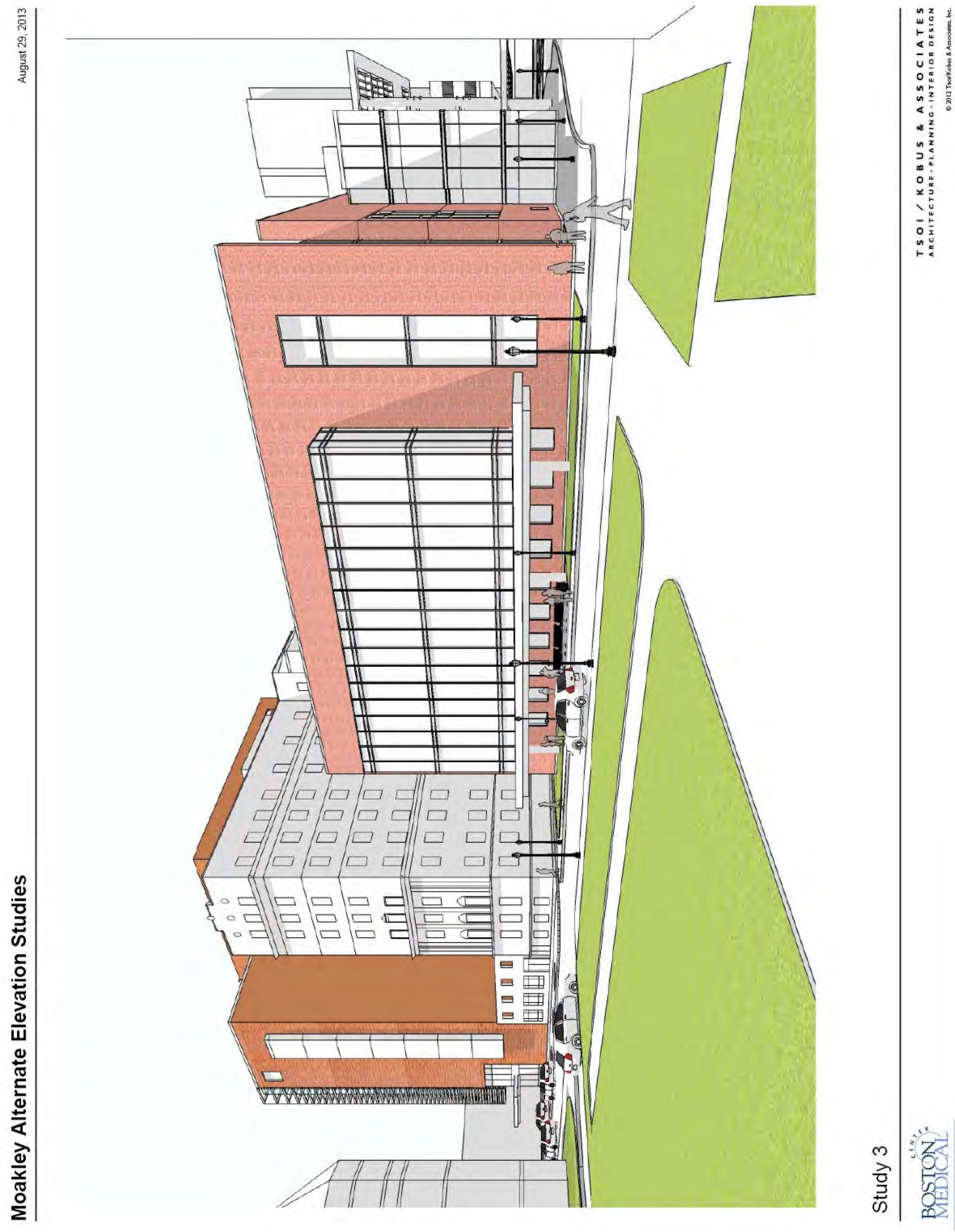


Figure 3-8 Moakley Addition Alternate ElevationStudy 4

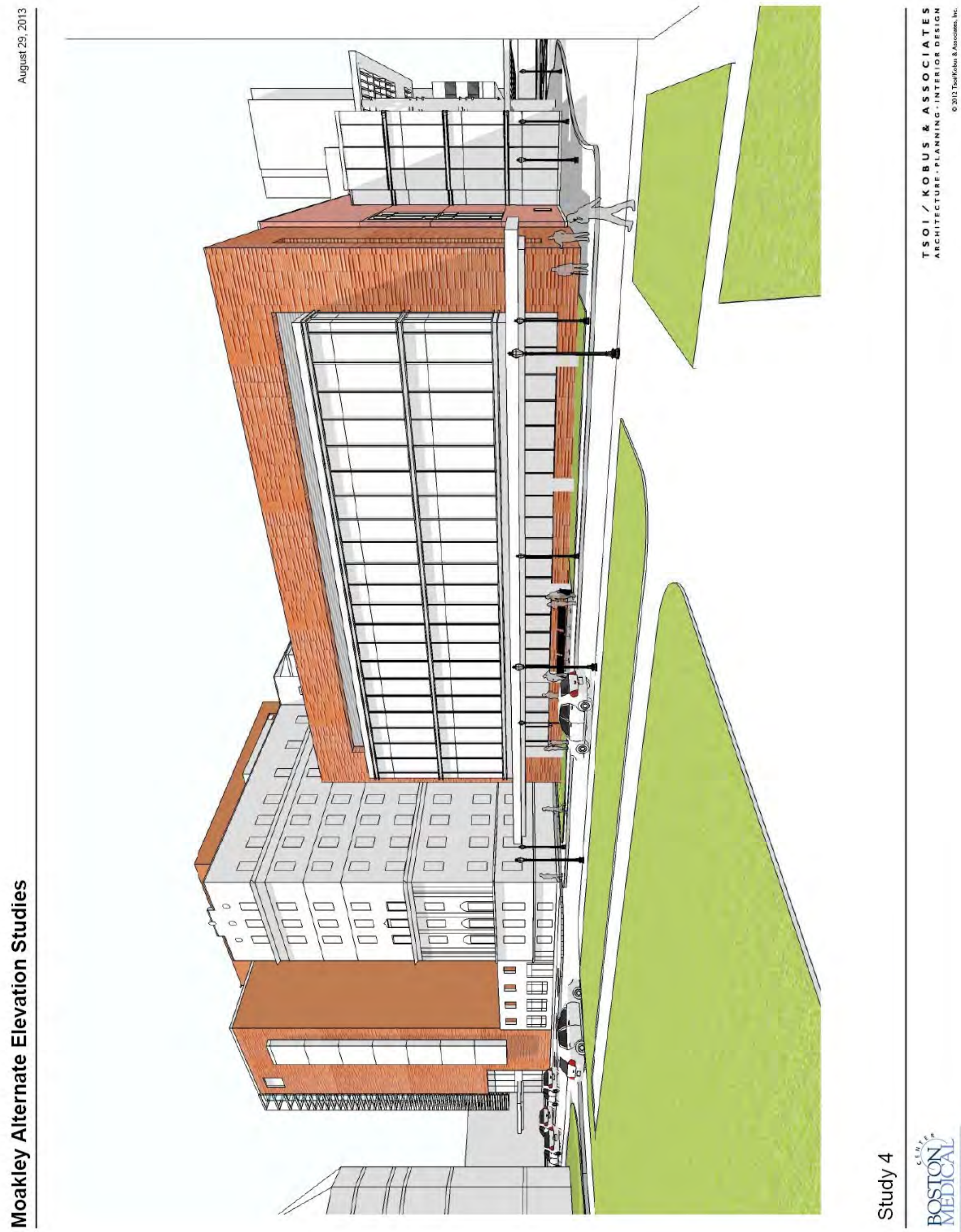


Figure 3-9 Moakley Addition Existing E. Concord Street Perspective North - Existing

Figure 3-10 Moakley Addition E. Concord Street Perspective North - Proposed

Figure 3-11 Moakley Addition E. Concord Street Perspective South - Existing

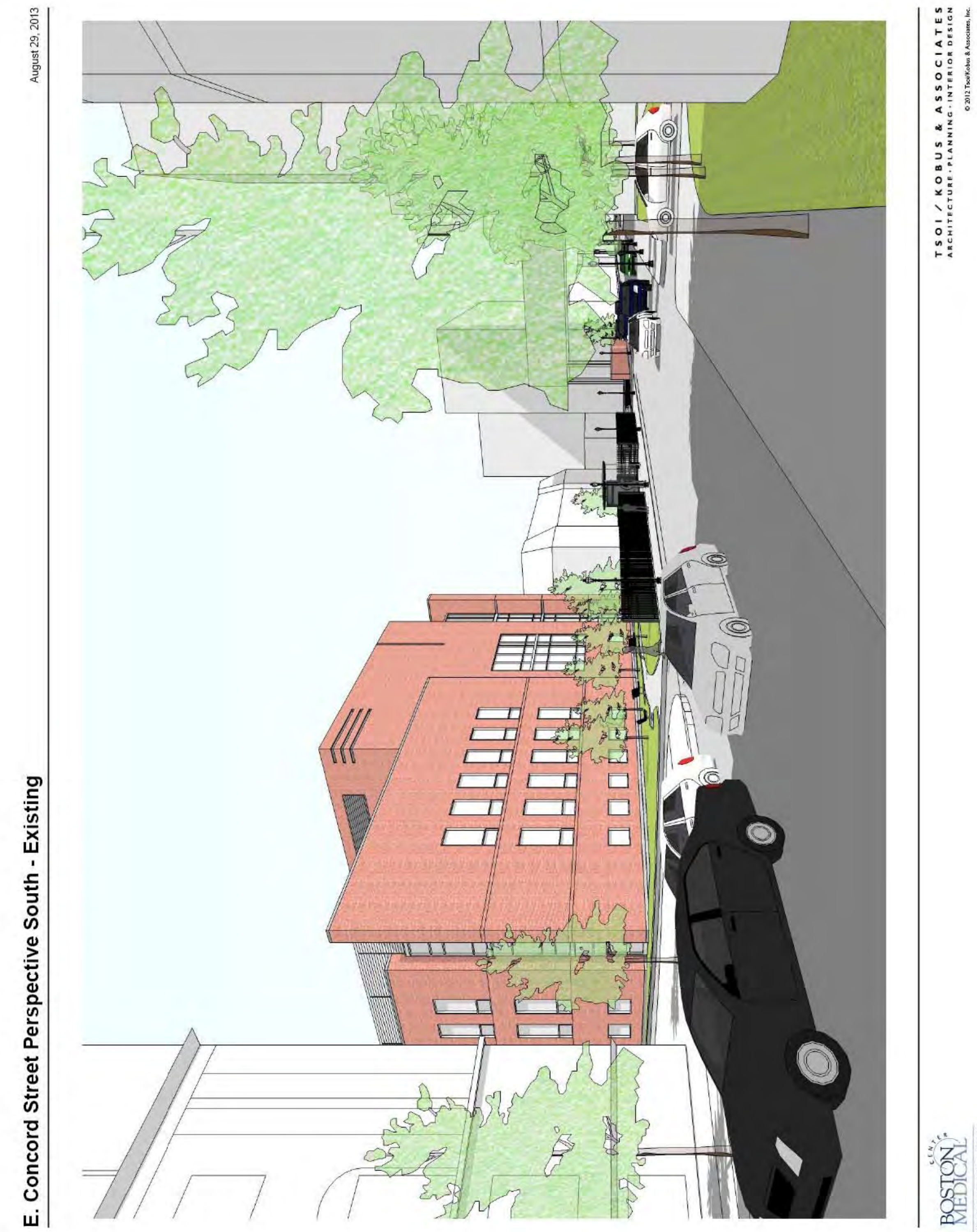


Figure 3-12 Moakley Addition E. Concord Street Perspective South - Proposed

Figure 3-13 Moakley Addition East Perspective - Existing

Figure 3-14 Moakley Addition East Perspective - Proposed

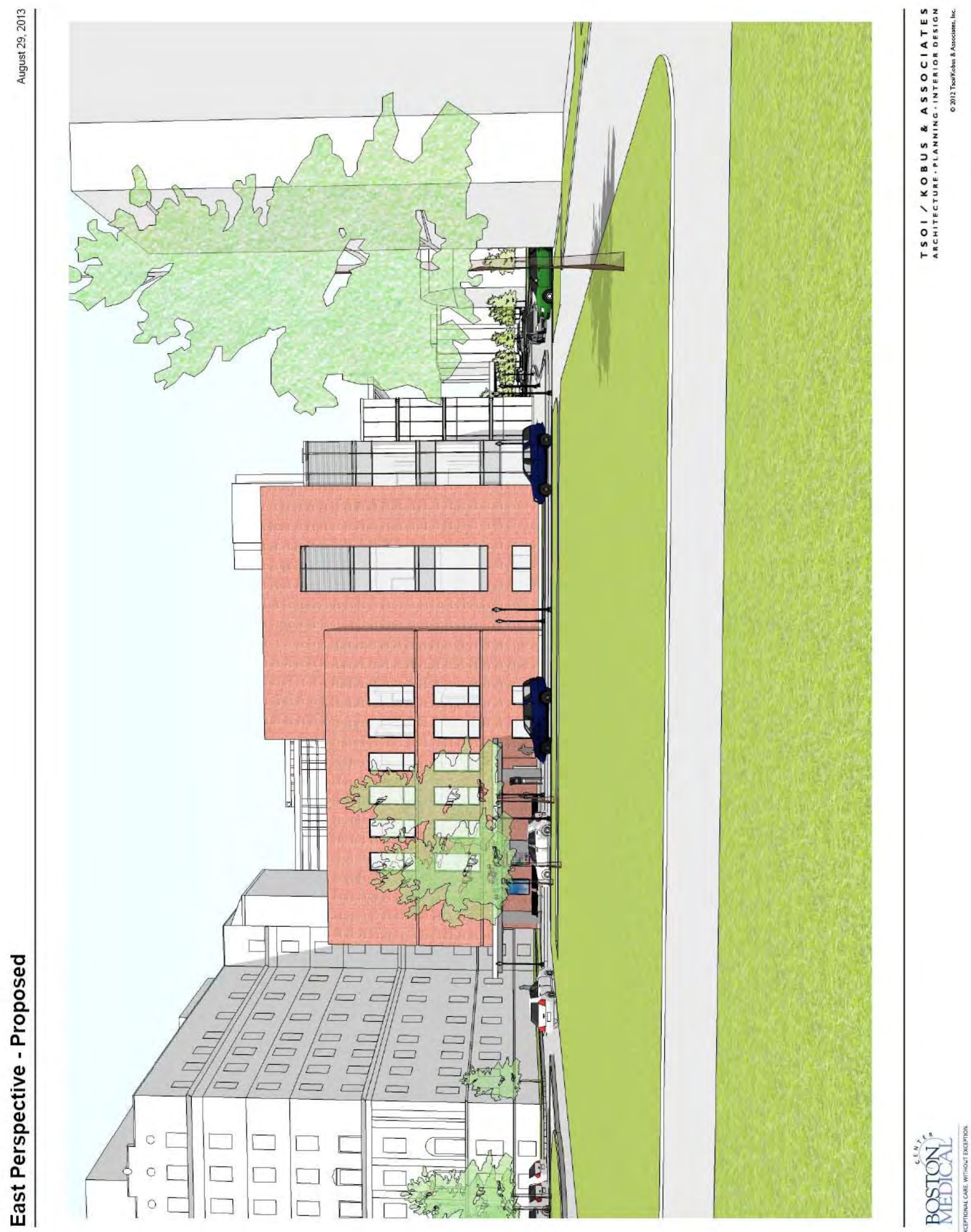


Figure 3-15 Moakley Addition Existing Site Plan

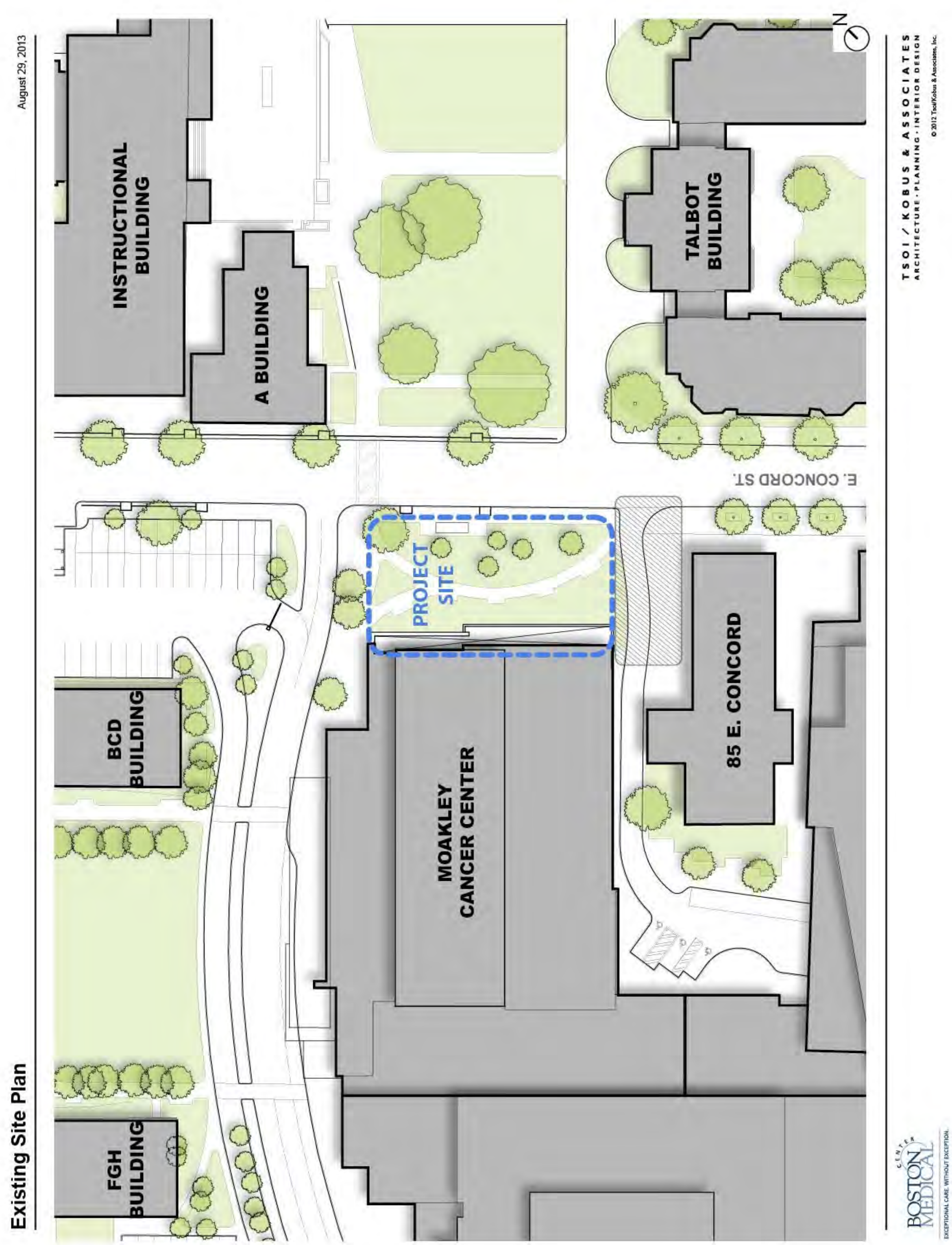


Figure 3-16 Moakley Addition Site Improvements

3.1.3 Urban Design – New Inpatient Building Phase 1

New Inpatient Building Phase 1 - Existing Context and Project Location

The proposed New Inpatient Building Phase 1 will be located on the West Campus along Albany Street.

The New Inpatient Building Phase 1 site is located on the north side of Albany Street and is proposed to replace the 3-story section of the existing Dowling Building and the current Emergency Department drop-off adjacent to the Menino Pavilion. Phase 1 of the New Inpatient Building is a 4-story infill project bordered directly on the north, east, and west sides by the Yawkey Ambulatory Care Center, Menino Pavilion, and remaining Dowling building respectfully. The 2-story connector wing will be located on the south edge of the Menino Pavilion over the existing Emergency Department entrance, ambulance parking, and loading area. The southern edge of the project site will engage the pedestrian streetscape and better define the building edge.

The current Albany Street edge is composed of varying building setbacks, scales and styles. As a major arrival point on the BUMC Campus the streetscape lacks a vital sense of clarity and organization. A coherent organization of spaces and buildings with a collective identity is what ultimately distinguishes a campus from its surroundings. This can be achieved through unified building architecture and overall landscape space organization, through a variety of smaller scale elements (i.e. benches, pavers, signage) or a combination of all.

As a result of the reconfiguration of the new Emergency Department and Trauma Center in the New Inpatient Building Phase 1, new and improved walk-in and drop-off entries will be created. A new Emergency Department walk-in and drop-off entry will be created at the rear of the existing Moakley Cancer Center via Shapiro Drive to separate patients from service areas and the ambulance entry.

Improvements will be made to the existing Menino Pavilion main entry facing Harrison Avenue to accommodate the new Emergency Department family waiting area. A glazed storefront system is proposed under the existing overhang to create a more inviting entry and improve way finding for patients.

At more than 50 feet deep in some areas, the overhang casts dark shadows over the entry which impedes way finding and does not provide a welcoming and calming atmosphere for drop-off or walk-in patients.

As BMC completes the shifting of inpatient and clinical functions to the West Campus, Albany Street's primary role will progress from being the functional "back door" to the campus to a major access point and entry into the campus. Establishing a more unified institutional identity along Albany Street will enhance the overall cohesiveness and organization of the streetscape, simplifying way finding and site orientation. Minor improvements made to create new entries (the new Emergency Department walk-in entry) and improve existing entries (Menino Pavilion entry improvements) will also enhance the overall cohesiveness of the West Campus. Streetscape enhancements along Albany Street will create a sense of place within a larger context, provide a clear sense of order, and a safer pedestrian experience. See Figures 3-17, 3-18 and 3-19.

New Inpatient Building Phase 1 - Massing and Height

The project height and massing are primarily dictated by the available site area and necessary space requirements of the program and will have a simple rectilinear form. The New Inpatient Building Phase 1 will be approximately 74 feet in height from grade including the small mechanical penthouse and will align with the Level 4 roof of the Menino Pavilion. The small mechanical penthouse will be located to the south in order to minimize visual obstruction of existing bedrooms within Menino. The connector wing will span over the existing ambulance parking area with physical links will to Menino Pavilion Levels 2 and 3. The mass of the connector wing will be a simple rectangular form along the southern face of the Menino Pavilion.

The north, east, and west facades of the New Inpatient Building Phase 1 will abut the existing Yawkey Ambulatory Care Center, Dowling Building, and Menino Pavilion. The project height and massing are consistent with the smaller scale context along Albany Street, such as the Finland and Mallory Buildings; and will provide a physical transition to the larger scale Phase 2 of the New Inpatient Building in the future. See Figures 3-20 and 3-21.

New Inpatient Building Phase 1 - Design, Character, and Materials

The exterior design of the New Inpatient Building Phase 1 along with the New Patient Transport Bridge will reflect Boston University Medical Center's desire to transform the Albany Street Campus image by visually strengthening connections to existing campus context and providing continuity along the street edge. The exterior treatment of the New Inpatient Building Phase 1 will be predominantly composed of a glass curtain wall system and a proposed phenolic resin panel system conveying a contemporary aesthetic consistent with the modern design direction of the campus. The south façade along the street edge will sponsor a large "picture" window, providing needed light to functions within and visual connections back to the Albany streetscape. The connector wing will be composed of a channel glass curtain wall with vision glazing to provide light/views to the functions beyond. A glass depression in the south wall denotes the intersection of the patient transport bridge.

The proposed New Inpatient Building Phase 1 will draw upon certain elements from the existing campus context to support campus unity, understanding and organization. The large picture window along Albany Street is a play on the existing "cut outs" located in the Shapiro Ambulatory Care Center building's facade screen. Materially, the New Inpatient Building Phase 1 currently proposes the use of a similar terracotta panel system as the consistent in color and scale. Select portions of the building will be composed of this terracotta system, while others will be standard glass curtain wall drawing on some of the curtain wall details seen on the Shapiro Ambulatory Care Center. While the New Inpatient Building Phase 1 curtain wall will not replicate the condition seen at Shapiro Ambulatory Care Center (i.e. same spandrel panels), it will include such elements as butt glazed vertical jointing and similar color solutions.

Although there is a slight variation among the programs on Level 2, 3 and 4, elevation uniformity can be maintained through rigorous planning and elevation design. Glass containing different non-reflective coatings and intentional patterning of mullions can also help to create a more consistent look. Furthermore, elements that are viewed at night from the street (lighting, ceiling design/color) can be maximized to reinforce a consistent image.

Programming on Level 2 lends itself to a clean and simple aesthetic. A majority of the floor is occupied by new operating rooms, but the current plan specifies an external corridor outboard of these intensive elements. This corridor will occupy a majority of the south facade and will afford doctors, surgeons, and nurses with a much needed breakout area. It also provides potential opportunity to draw light further into the building at certain areas where it may not usually penetrate. The program along the south facade of Levels 3 and 4 both consist of patient care rooms, with ICU's located on level 3 and Med/Surgery beds on Level 4. On these floors careful consideration will be given to the mullion locations as they correspond to the partition locations. In-board toilets freeing up the exterior curtain wall and automatic interior shading devices are additional approaches to help foster this uniform exterior image. See Figure 3-22.

The existing double door entry located at the rear of the Moakley building via Shapiro Drive will serve as the new Emergency Department walk-in and drop-off entry. New signage and way finding elements consistent with the BUMC Campus signage plan will be added to provide clear direction for patients. See Figure 3-26.

The new Menino Pavilion entry storefront system is proposed to be a glazed system intended to mimic the existing Yawkey Ambulatory Care Center entry system which incorporates a mix of spandrel and glass. The glazing would be clear in the public open corridors where patient privacy is not an issue. In areas where patient privacy is necessary such as the Emergency Department waiting area, fritted or translucent glass would be proposed. The gift shop is proposed to be spandrel or back painted glass.

The new glazing system may be backlit so that at night it will be luminous. The design will improve the street presence of the Menino Pavilion by reducing the shadows and improving way finding to the front entry door. See Figures 3-27 and 3-28.

Relationship with Phase 2 of the New Inpatient Building

The 2010 IMP proposed the New Inpatient Building as a single bed tower situated directly over a diagnostic and treatment plinth. The tower was intended to house inpatient beds while the plinth provided necessary expansion for imaging and critical care functions. While the current proposal is separated into two phases, the overall building organization has been kept the same. With this in mind, Phase 1 was designed specifically to allow for the extension of the architectural expression into Phase 2 to provide Albany Street with a clear sense of hierarchy and organization. While Phase 2 warrants further design study, it furnishes an appropriate response to the proposed future program and to its site location.

Phase 2 will be sited on the prominent corner of Massachusetts Avenue and Albany Street, currently occupied by the Dowling building. As you approach the campus from the south the segmented glass tower instantly creates a gateway into the city and campus. The extension of the Phase 1 expression into Phase 2 establishes a unified datum along the street which acts to organize the bed tower above and draw you further into the Boston Medical Center campus. Extending this vocabulary along Albany Street creates a simplified organizational understanding of the street as a whole; limiting potential confusion caused by introducing another architectural expression. Extended streetscape features and a distinct front door will further emphasize this connection and provide a clear sense of order. See Figure 3-23.

New Inpatient Building Phase 1 - Vehicle Access and Circulation

Normal staff and non-emergency patient access for the New Inpatient Building Phase 1 will be via the existing Menino Pavilion entrances located along the drop-off to the north of the building. Service access will be provided thru the connector wing via the new Bridge.

Construction of the New Inpatient Building Phase 1 will necessitate the relocation of the Emergency Department walk-in entrance and drop-off to the rear of the Moakley Cancer Center, where emergency patient and vehicular access will be provided via Shapiro Drive. The current loading truck dock will be relocated to the south side of Albany Street along the north face of the existing Power Plant.

New Inpatient Building Phase 1 - Site Improvements

The New Inpatient Building Phase 1 will infill current gaps in the Albany Street face and better define circulation paths by engaging the public street zone. The scale and materiality of the proposed architecture both relate directly to existing campus and neighborhood context. By maintaining a sensible setback along Albany Street, space along the building facade will be allocated to a new planter area and a modest walkway lined with trees.

Shade trees will be placed in raised planter curbs and be flanked by a field of special paving that compliments the adjacent Shapiro pedestrian paving to the east. A 8’-10”’ wide concrete sidewalk with saw cut joints will provide the accessible route, and will exceed the 8’ requirement set forth by the Harrison Albany Corridor Strategic Plan. The 7’-6” furnishing zone at the curb edge will contain street trees in raised planters that align with the angular planters at the Shapiro building to the east. The furnishing zone will also contain City of Boston double acorn style street lights, hydrants, and other surface utilities.

Flush transitions between paving materials will afford universal access from one end of the street to the other. These improvements will create a visual link promoting a unified campus image, establishing a much needed visual order to the street edge. This order will contribute to a heightened experience through easier patient way finding and an enhanced entry image as viewed from Massachusetts Avenue. Additionally replacing the existing utilities tube with the new patient transport bridge will provide further visual clarity to a congested and confusing street corridor. See Figures 3-24 and 3-25.

Figure 3-17 New Inpatient Building Phase 1 Context Photos

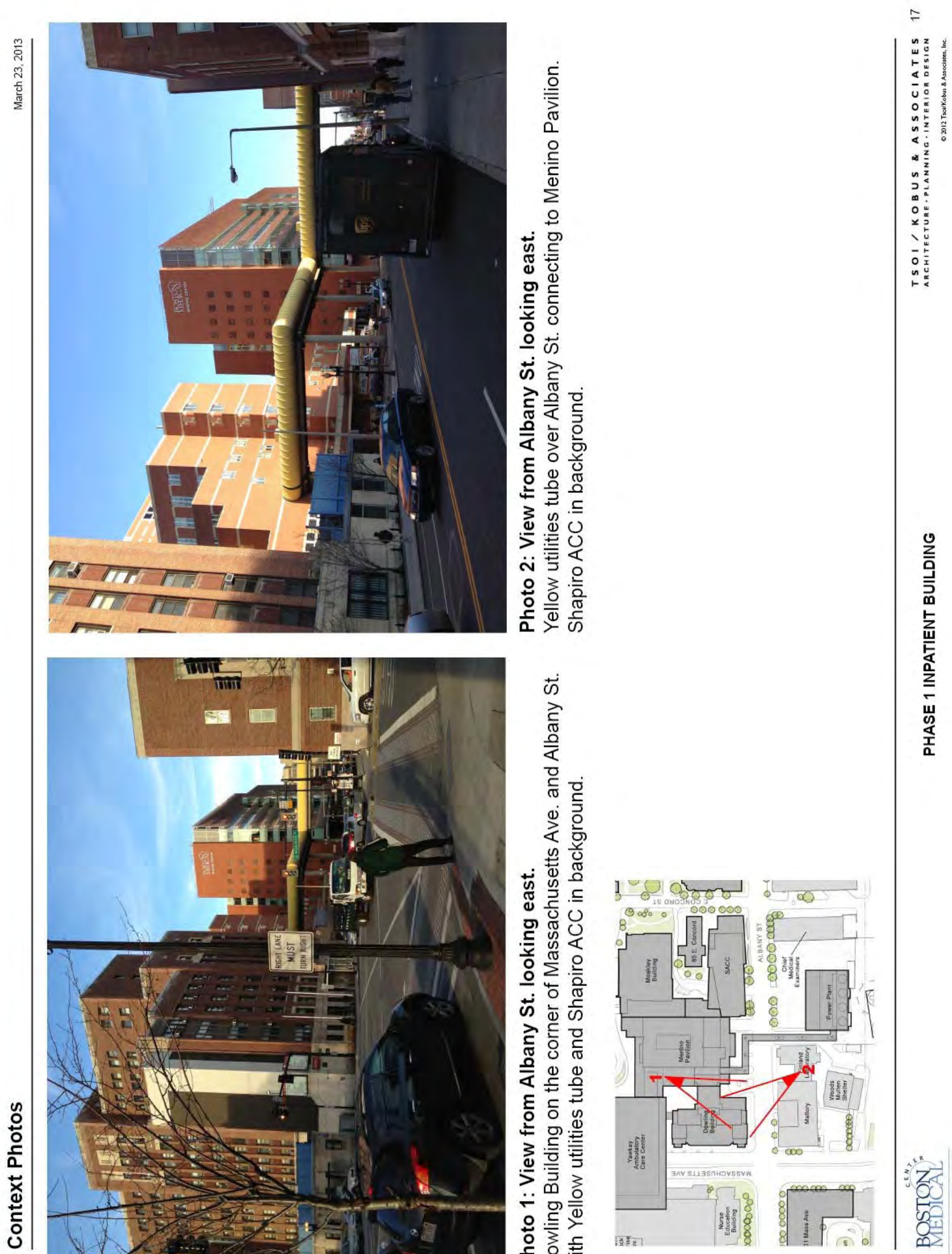


Figure 3-18 New Inpatient Building Phase 1 Context Photos (continued)

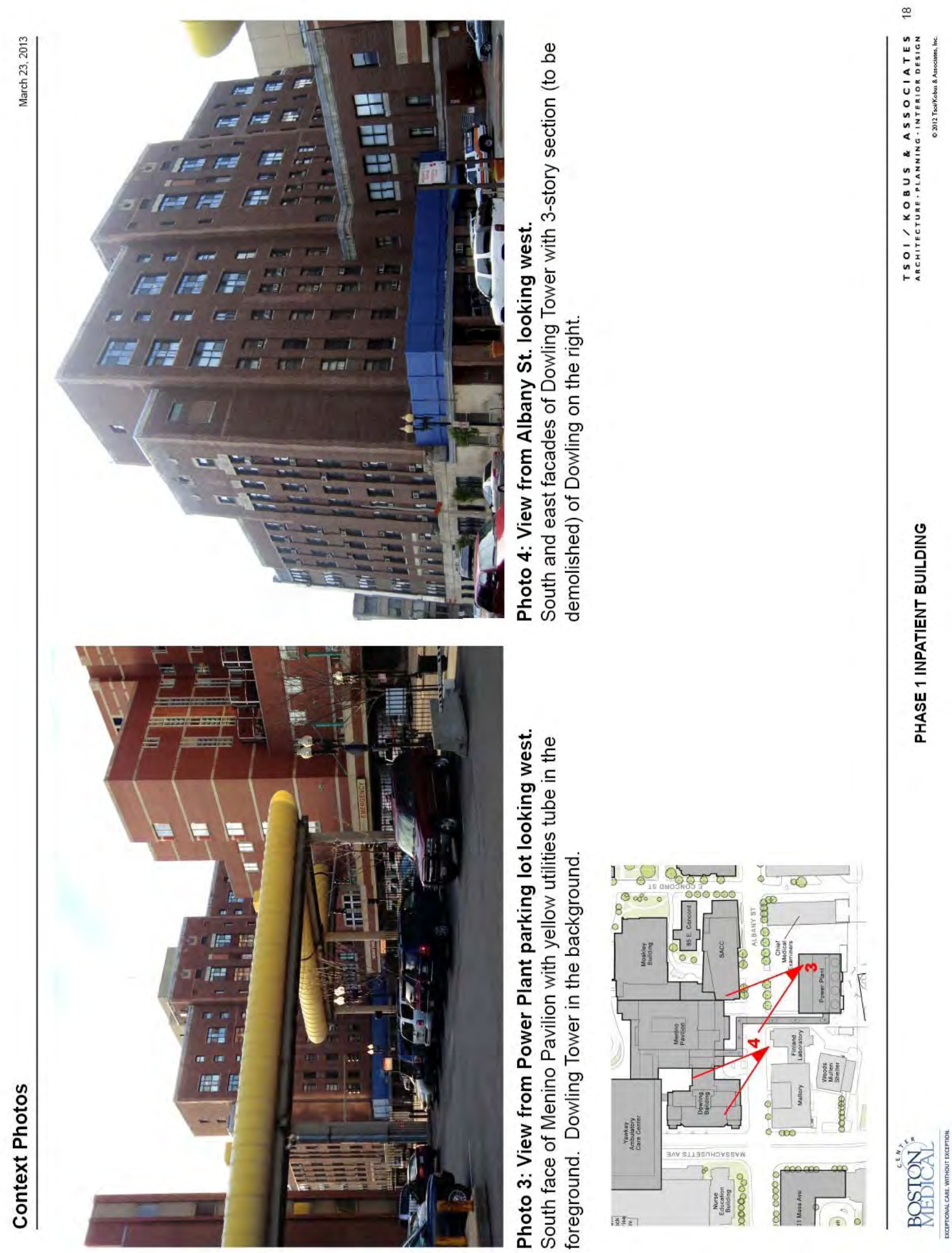


Figure 3-19 New Inpatient Building Phase 1 Context Photos (continued)

Context Photos

March 23, 2013

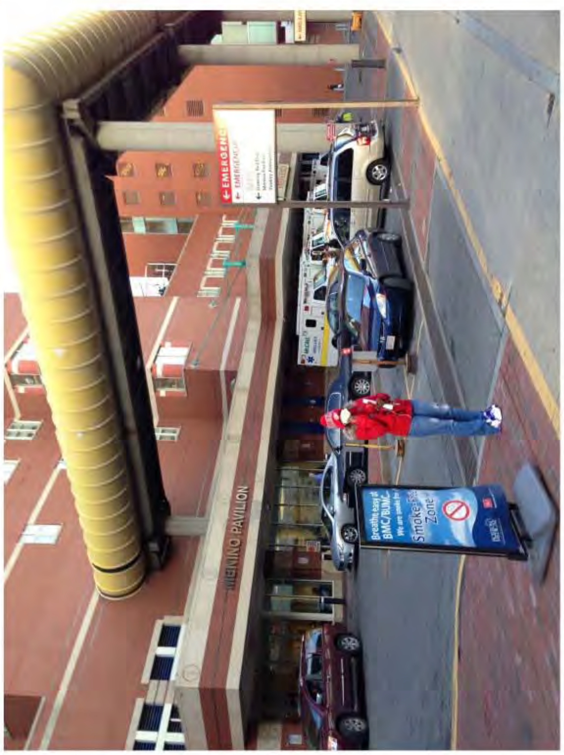


Photo 5: View from Albany St. looking east.
Emergency Department drop-off and entrance at south face of Menino Pavilion.

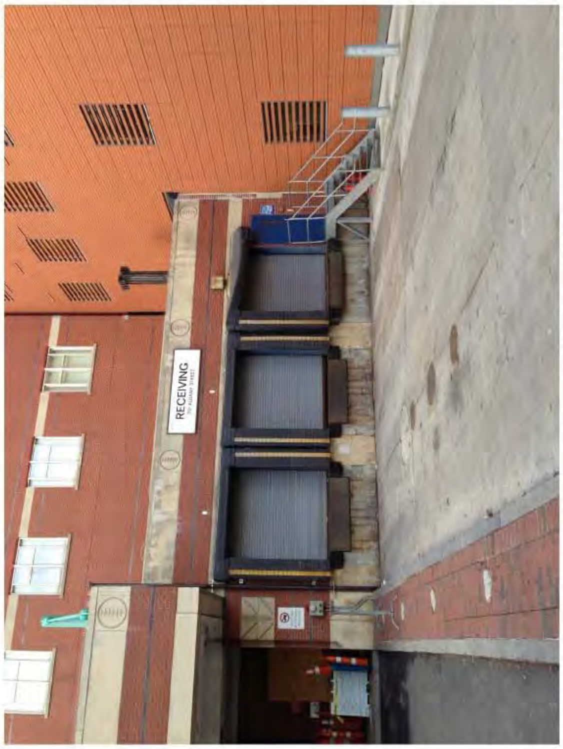
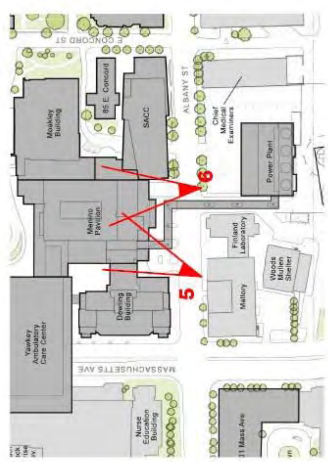


Photo 6: View from Albany St. looking east.
Truck Loading Dock at south face of Menino Pavilion with Shapiro ACC to the right.



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PHASE 1 INPATIENT BUILDING

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Figure 3-20 New Inpatient Building Phase 1 Aerial B Looking Southwest

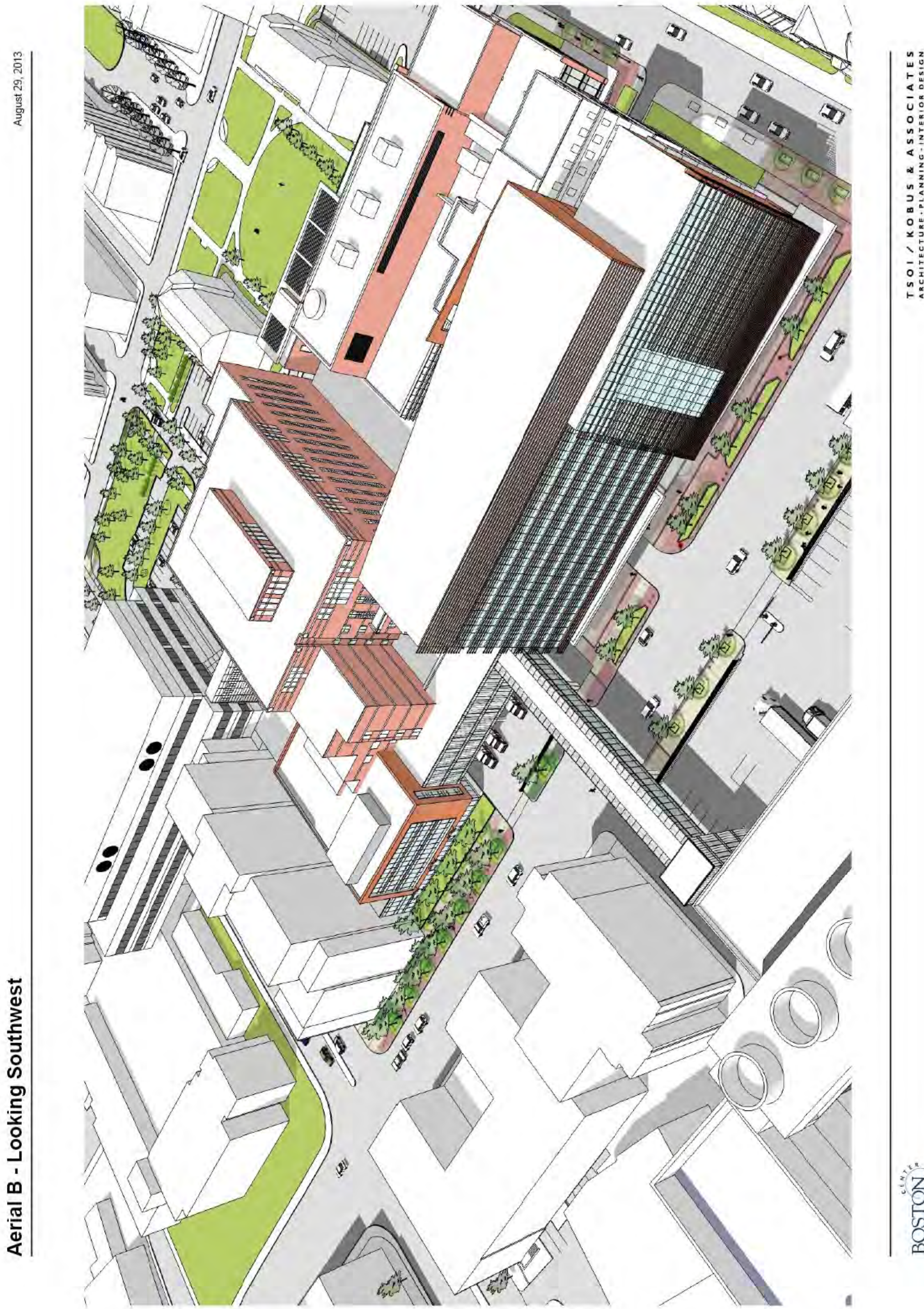


Figure 3-21 New Inpatient Building Phase 1 Aerial Looking Northwest

Figure 3-22 New Inpatient Building Phase 1 Albany Street Elevation

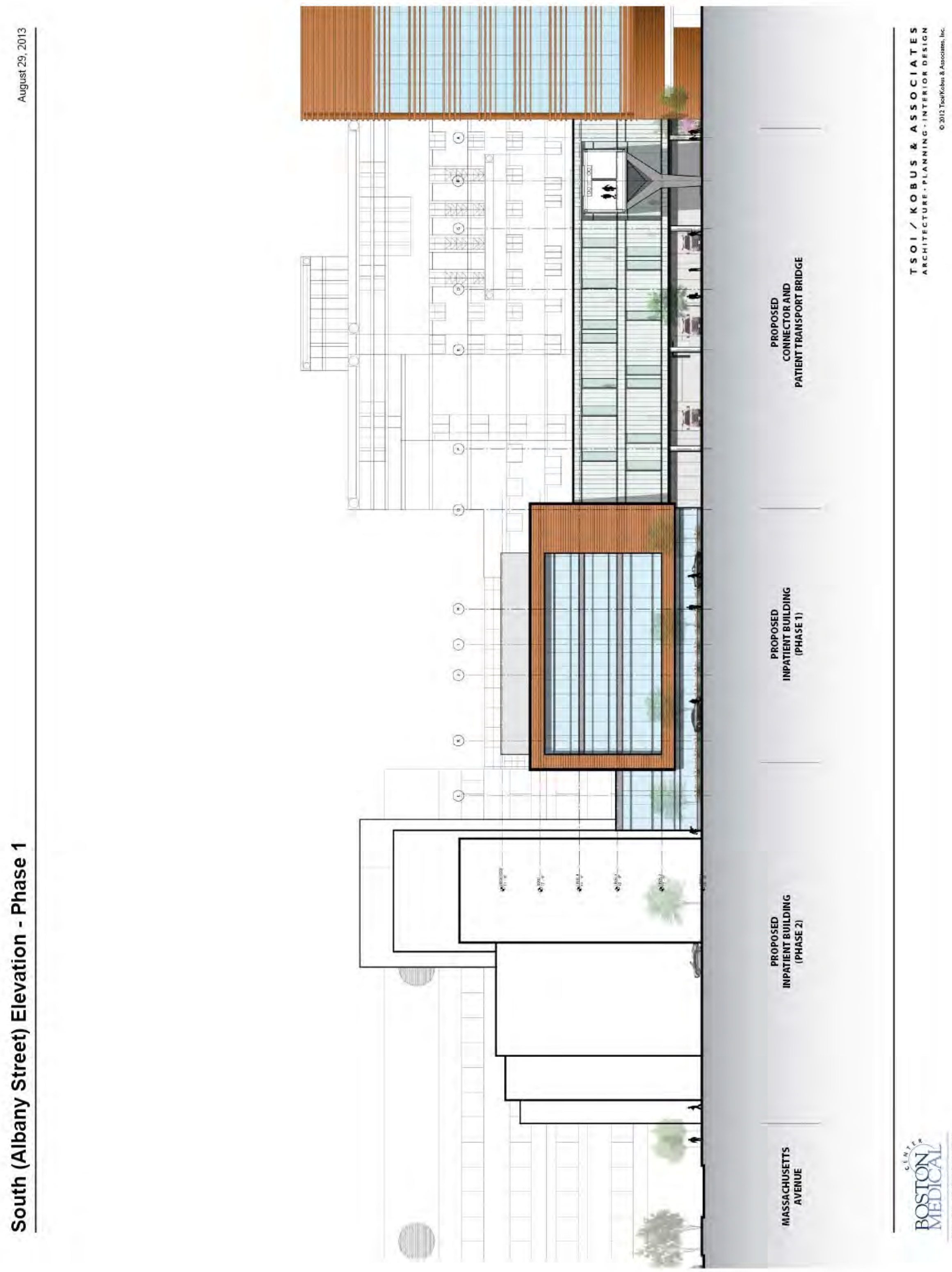


Figure 3-23 New Inpatient Building Phase 1 & Future Phase 2 Albany Street Elevation

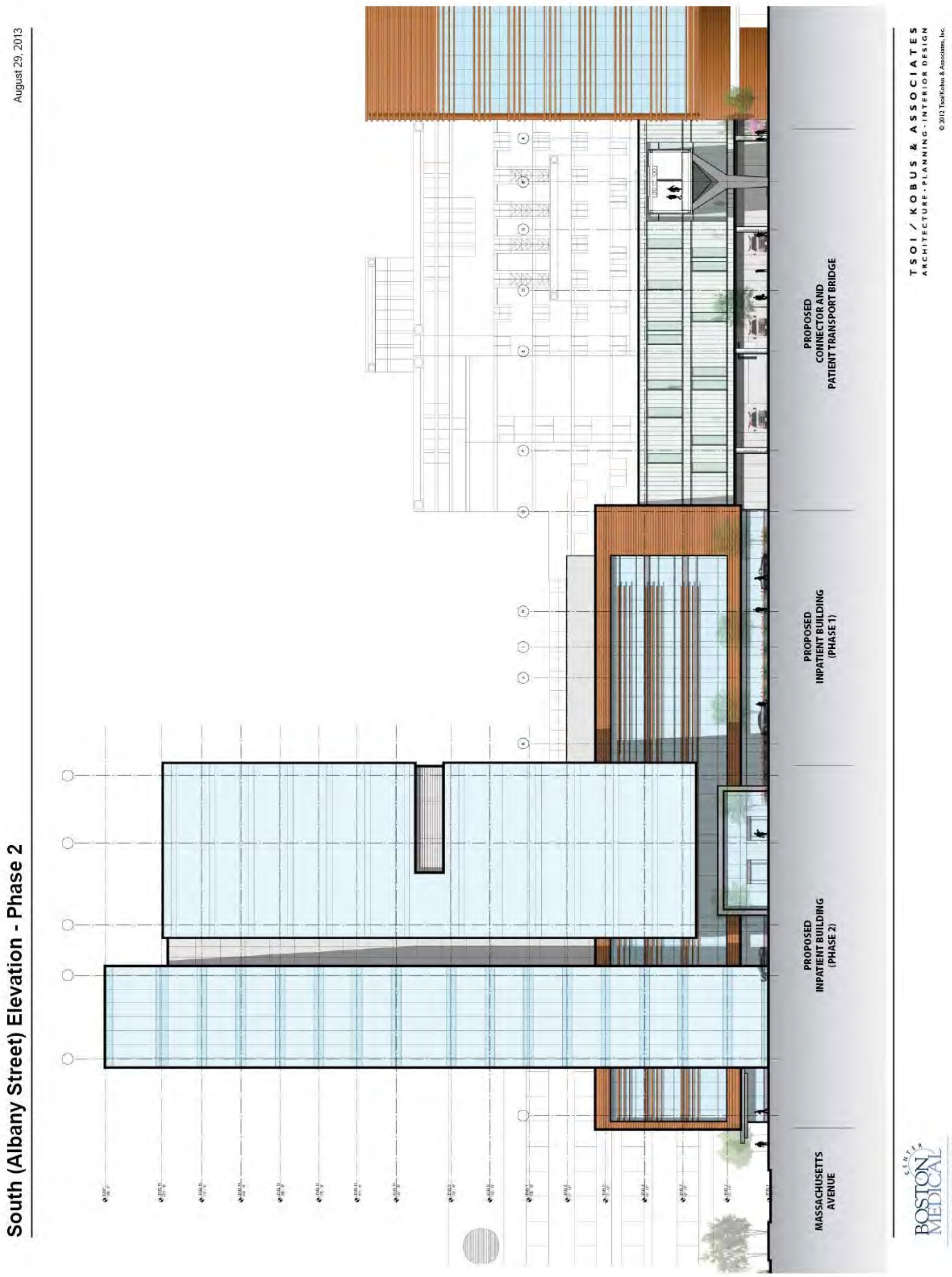


Figure 3-24 New Inpatient Building Phase 1 Existing Site Plan

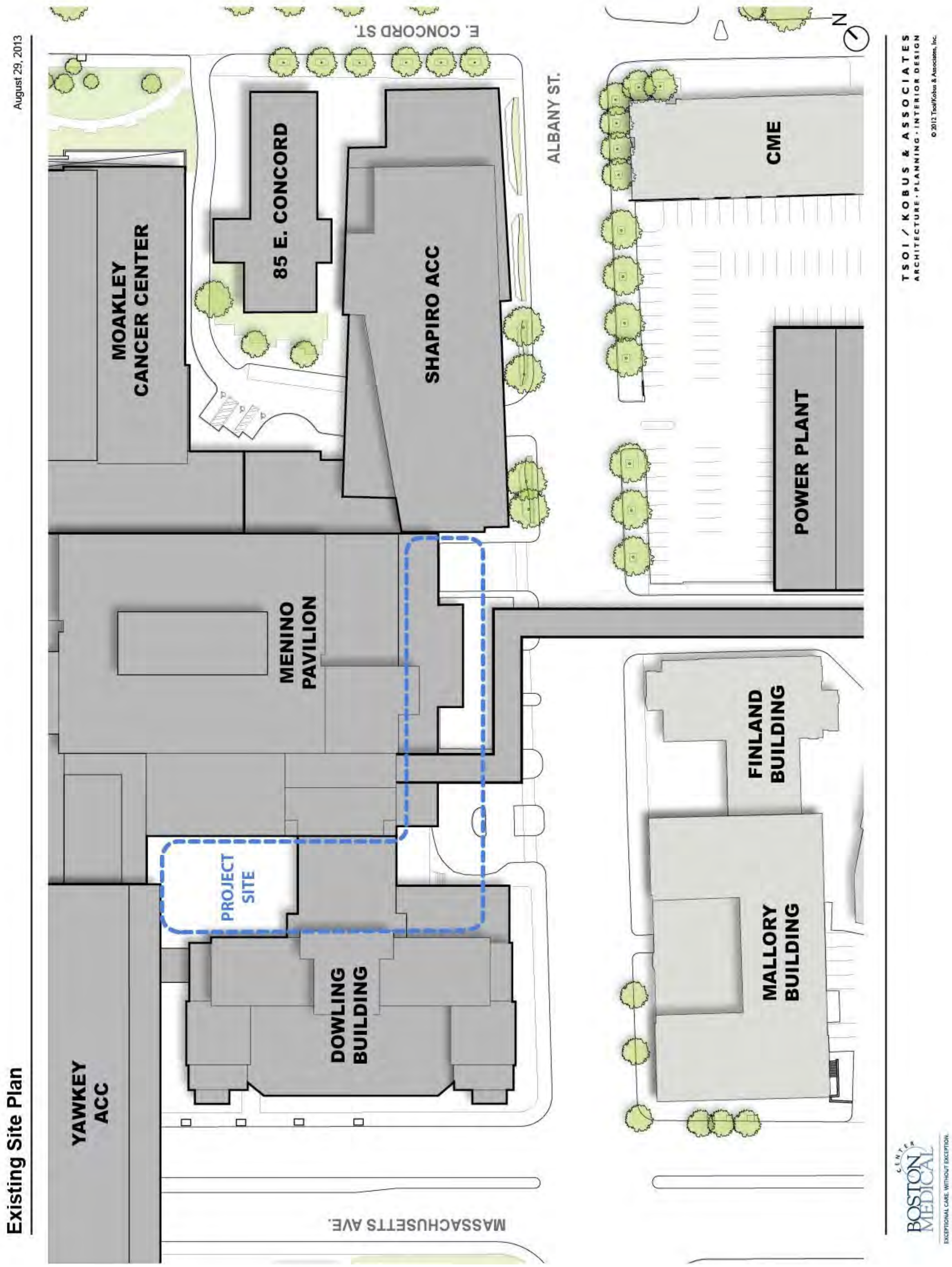


Figure 3-25 New Inpatient Building Phase 1 Site Improvements

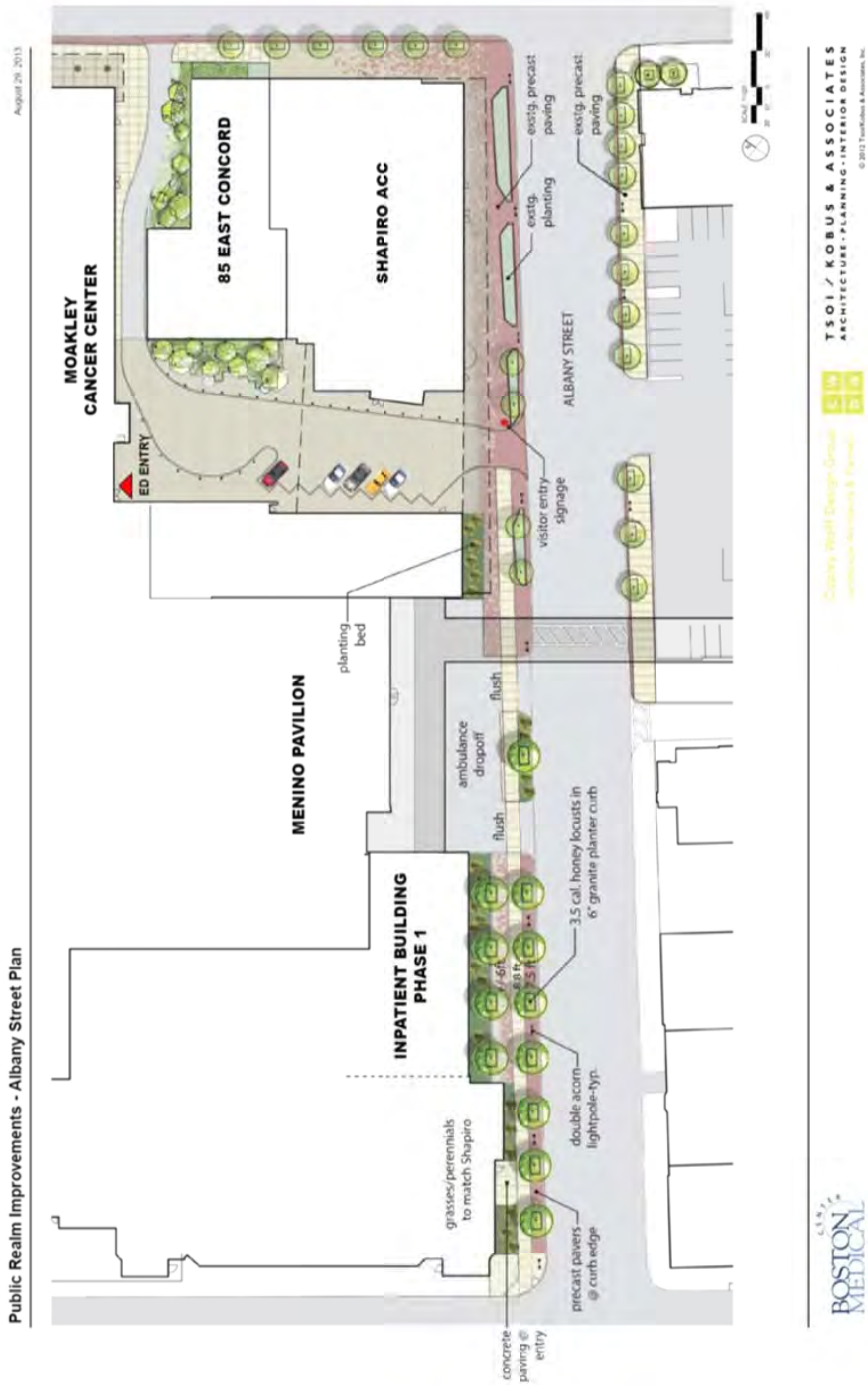


Figure 3-26 Relocated Emergency Department Walk-in / Drop-off Entry

Figure 3-27 Menino Pavilion Entry Improvements – Existing

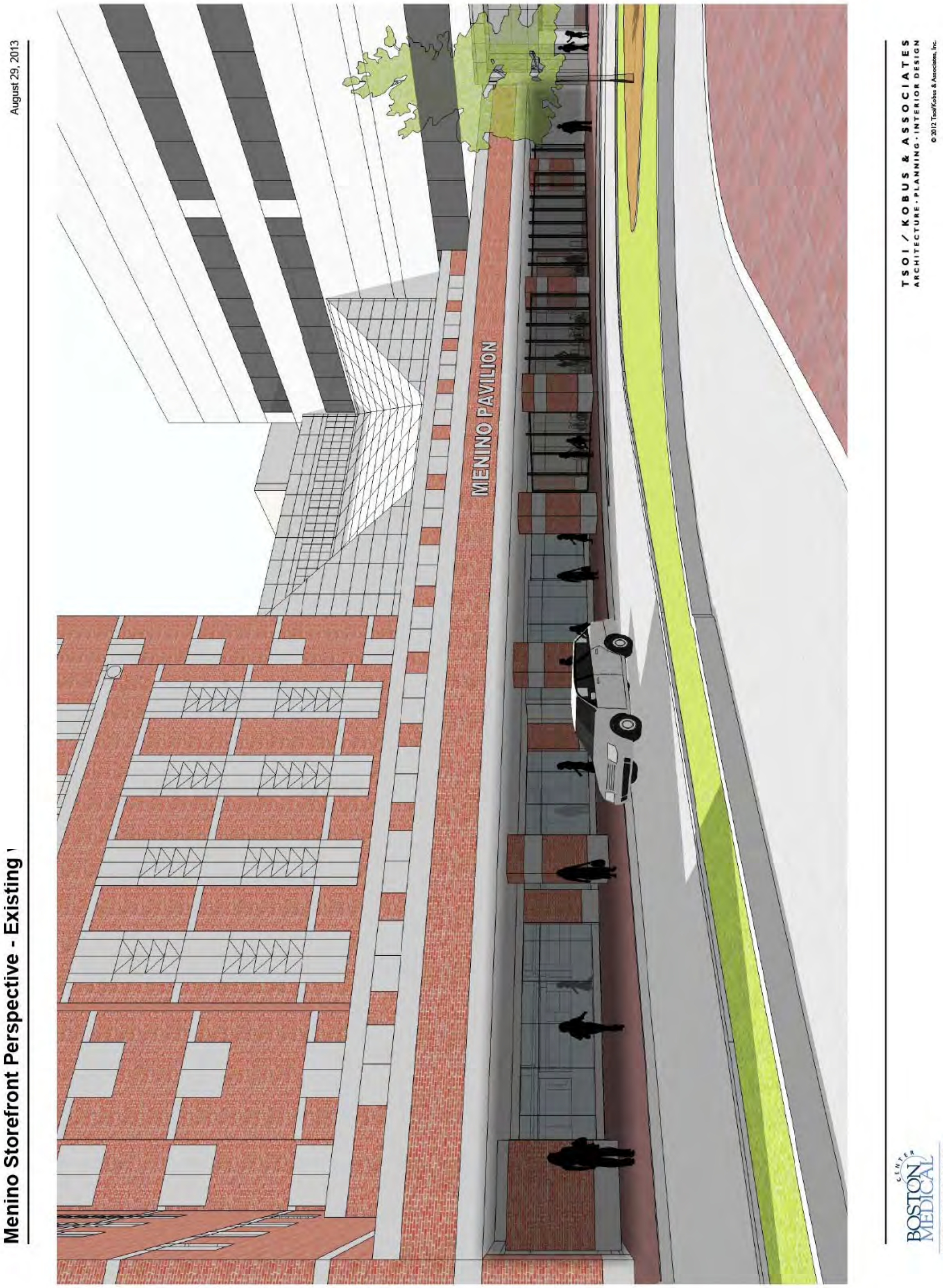
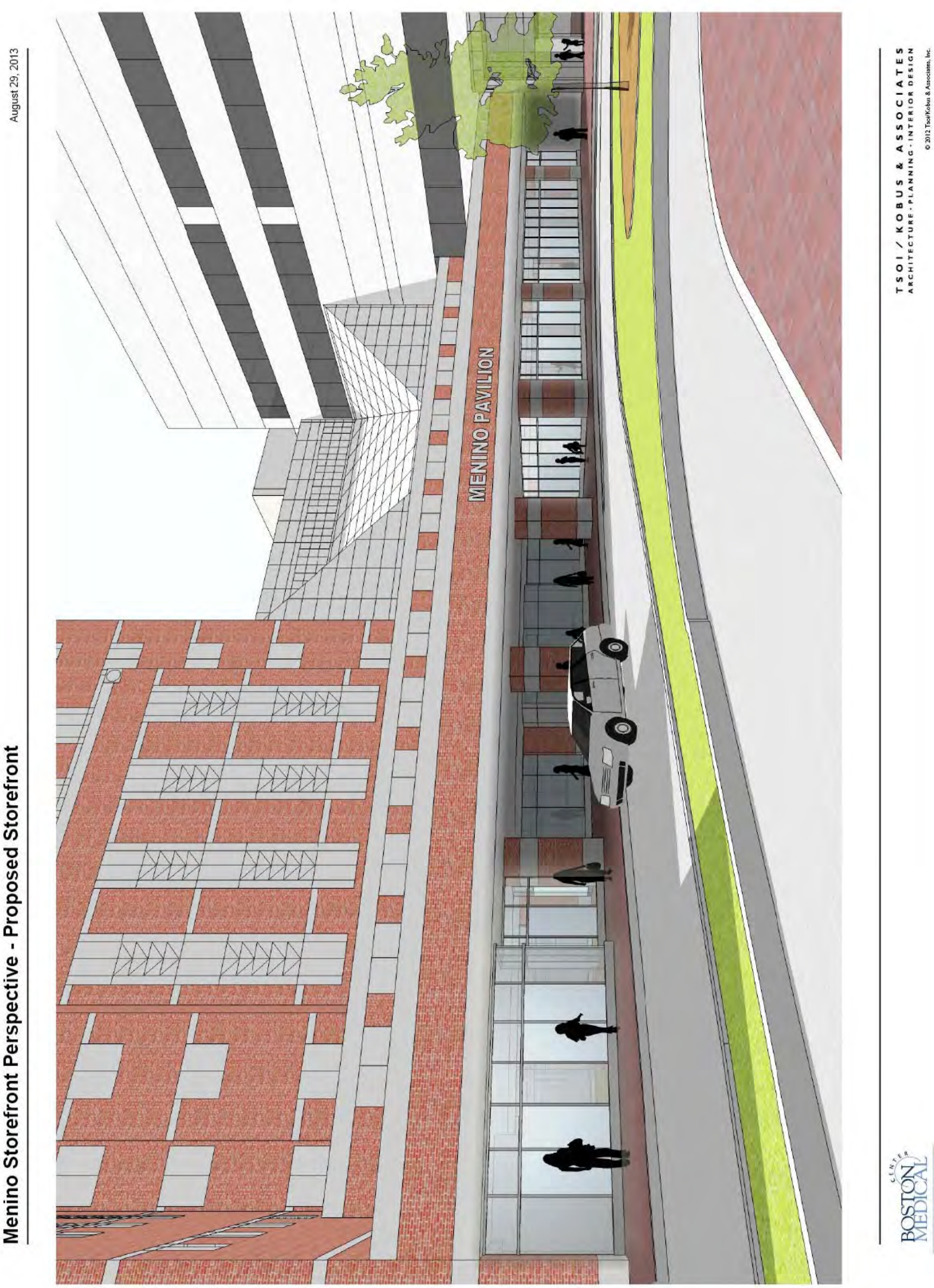


Figure 3-28 Menino Pavilion Entry Improvements – Proposed



3.1.4 Urban Design – New Patient Transport Bridge

New Patient Transport Bridge - Existing Context and Project Location

The proposed new Bridge will be located within the Boston University Medical Center West Campus spanning over Albany Street.

Currently Albany Street is composed of varying building setbacks, scales and styles. As a major arrival point on the BUMC Campus the streetscape lacks a vital sense of clarity and organization. This project in conjunction with the proposed New Inpatient Building Phase 1 will begin to better define the north edge of Albany Street and align with Boston University Medical Center's strategic urban design goals stated previously.

The project site is located both on the south and north sides of Albany Street. The project is proposed to cross south to north over Albany Street in the approximate location of the existing yellow utility tube connecting to the New Inpatient Building Phase 1 over the existing Emergency Department Entrance, Ambulance parking, and loading area. See Figures 3-29 and 3-30.

New Patient Transport Bridge - Massing and Height

The project is consistent with the surrounding contextual scale and desired contemporary aesthetic of the institution. A simplified form and a minimal material palette provide the visual clarity and consistency currently absent from the Albany Street Corridor.

The new Bridge is proposed as a simple rectilinear form spanning from the existing Power Plant on the south of Albany Street to New Inpatient Building Phase 1 on the north side. In an effort to create a lighter form and minimize the massing, the design team has made design advancements since the filing of the PNF. As a result, campus utilities have been relocated into the ceiling from the floor allowing for the simplification of the underside expression. The new Bridge will now be constructed of a truss system spanning from two structural supports on either side of Albany Street. The metal clad structural supports have been reduced in size and rotated 90 degrees to optimally support the truss structure, while diminishing visual impact from a distance. The overall width has been reduced approximately 2 feet to 25 feet wide. On the north side of Albany Street, vehicular movement at the ambulance drop off dictates the space available to site the vertical support. The southern structural support has been located to match the condition found on the north side of the street. The footprints of these structural supports have been reduced to minimize disruption to both pedestrian and ambulance circulation.

The new Bridge will have a clear height of approximately 27 feet above Albany Street. The new Bridge is approximately 16 feet tall (approximately 43 feet in height from grade) and has a roofline consistent with the connector wing of the New Inpatient Building Phase 1 and the Menino Pavilion. The new elevator and stair tower in the new Bridge will rise above the roof of the new Bridge to accommodate the elevator overrun. The overall building height including the elevator overrun will be approximately 55 feet in height from grade. A 1-story corridor approximately 16 feet in height will be located at grade to the west of the existing Power Plant providing access from the helipad for Med Flight patients to the new Bridge and to the Emergency Department. See Figure 3-31.

New Patient Transport Bridge - Design, Character and Materials

Simple massing and a minimal material palate are proposed for the project in order to reduce its visual impact on the Albany Street Corridor.

A simple curtain wall system is preferred to highlight a portion of the thin steel structure and to promote the idea of lightness. Special consideration will be given to mullion profiles and all components detailing of the glazing system in order to limit sight and shadow lines. Although programmatic constraints have limited the idea of an entirely transparent bridge, the intent is to continue the glass expression to part of the roof, providing visual transparency at the upper corners (utilities to be located in center of ceiling). A subtle lighting solution will be employed at key locations to accent portions of the bridge's structure and underside. The 1 story corridor at grade will feature a consistent material palate of metal panel and glazing. At night, the Bridge will be strategically lit to create a luminous beacon providing a new way-finding element for the Albany Street Corridor. See Figures 3-32, 3-33, 3-34, 3-35, and 3-36.

New Patient Transport Bridge - Vehicle Access and Circulation

The Bridge will facilitate new Med Flight patient transport by providing access from the existing helipad located on the south side of Albany Street to the Emergency Department within the Menino Pavilion. This new transport will provide safer and more efficient patient care while reducing operational costs associated with current ambulance patient movement.

The existing loading truck dock along the south face of the Menino Pavilion will be relocated to the existing loading dock on south side of Albany Street along the north face of the existing Power Plant. Materials will be provided to the hospital functions north of Albany Street via the new Bridge, where they will be transported to the Menino Pavilion and then distributed accordingly.

New Patient Transport Bridge - Site Improvements

Streetscape alterations will occur with the new Bridge and New Inpatient Building Phase 1 along Albany Street in order to create a simplified ambulance parking area and reduce the number of curb cuts along the north side of Albany Street. Alterations include the closing of three existing curb cuts including the removal of the curb between the existing loading dock and existing ambulance parking areas. One of the two lanes underneath the existing yellow utility tube will be closed minimizing and reducing the width of the curb cut in half. New sidewalk and urban landscaping improvements are proposed along the street edge to further integrate and enhance the Albany Street experience. See Figures 3-37, 3-38 and 3-39.

Figure 3-29 New Patient Transport Bridge Context Photos

Figure 3-30 New Patient Transport Bridge Context Photos (continued)

Figure 3-31 New Patient Transport Bridge Aerial Looking Northwest

Figure 3-32 New Patient Transport Bridge Albany Street Perspective - Existing

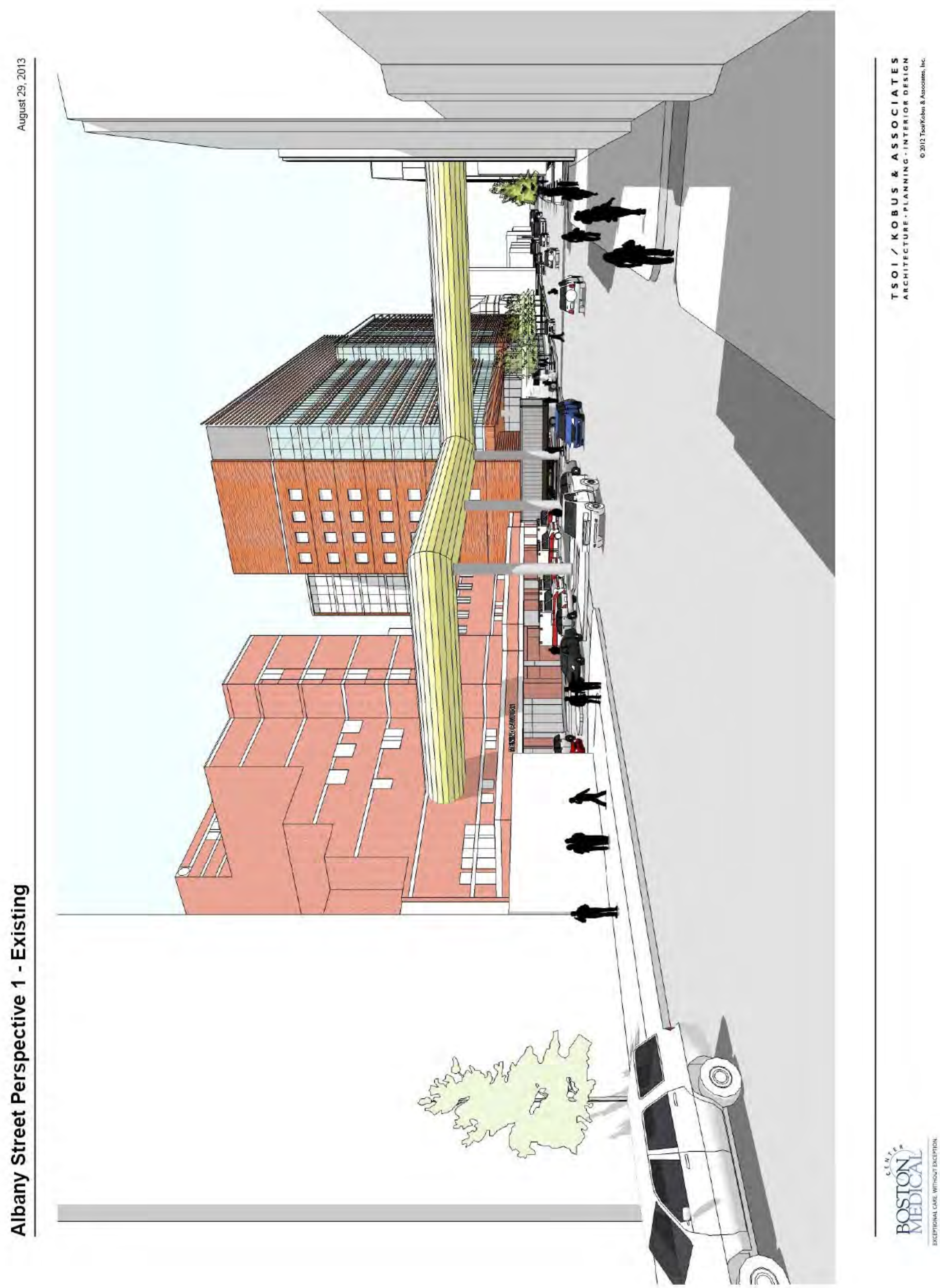


Figure 3-33 New Patient Transport Bridge Albany Street Perspective - Proposed

Figure 3-34 New Patient Transport Bridge Perspective 1

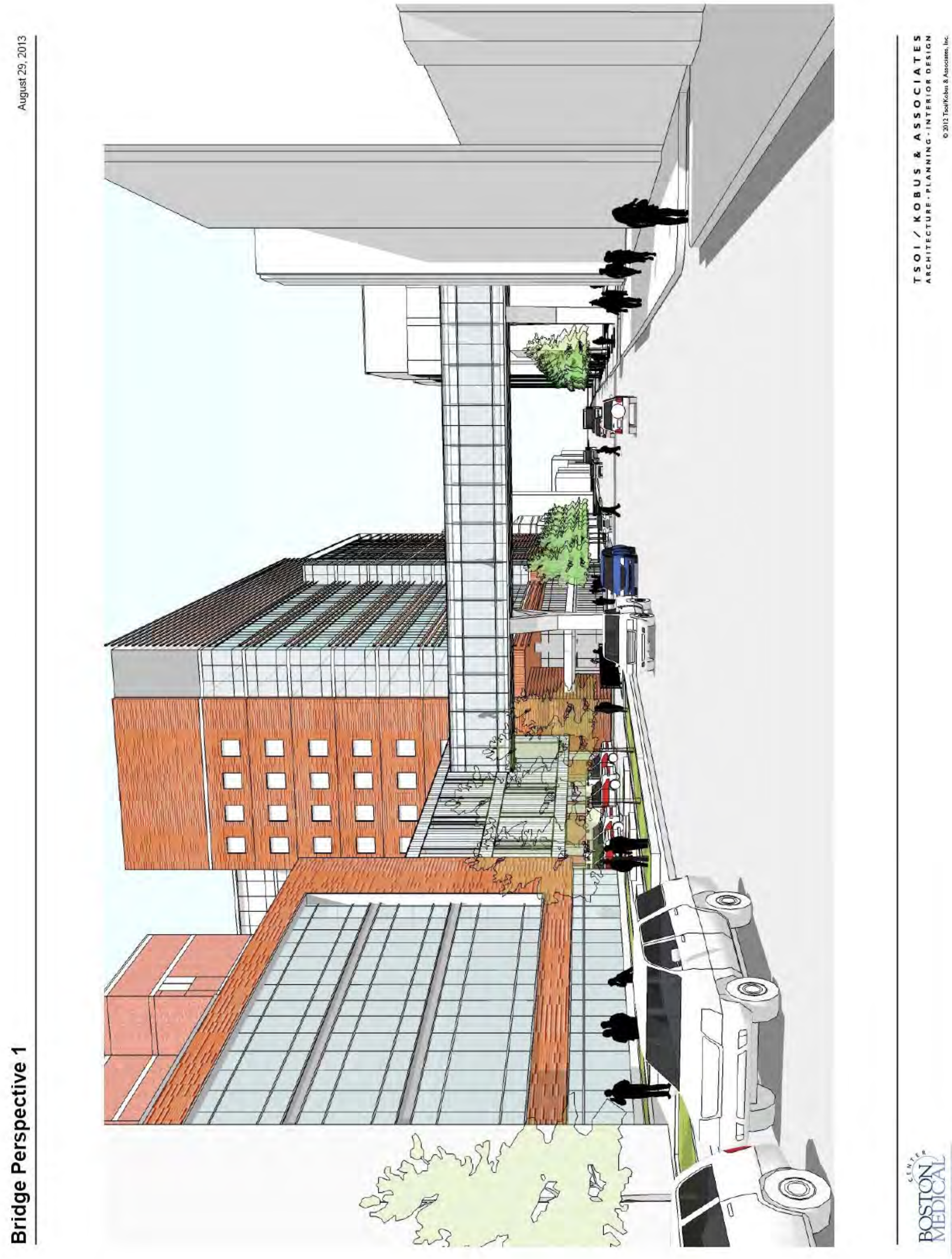


Figure 3-35 New Patient Transport Bridge Perspective 2

Figure 3-36 New Patient Transport Bridge Perspective 3

Figure 3-37 New Patient Transport Bridge Existing Site Aerial

Figure 3-38 New Patient Transport Bridge Existing Site

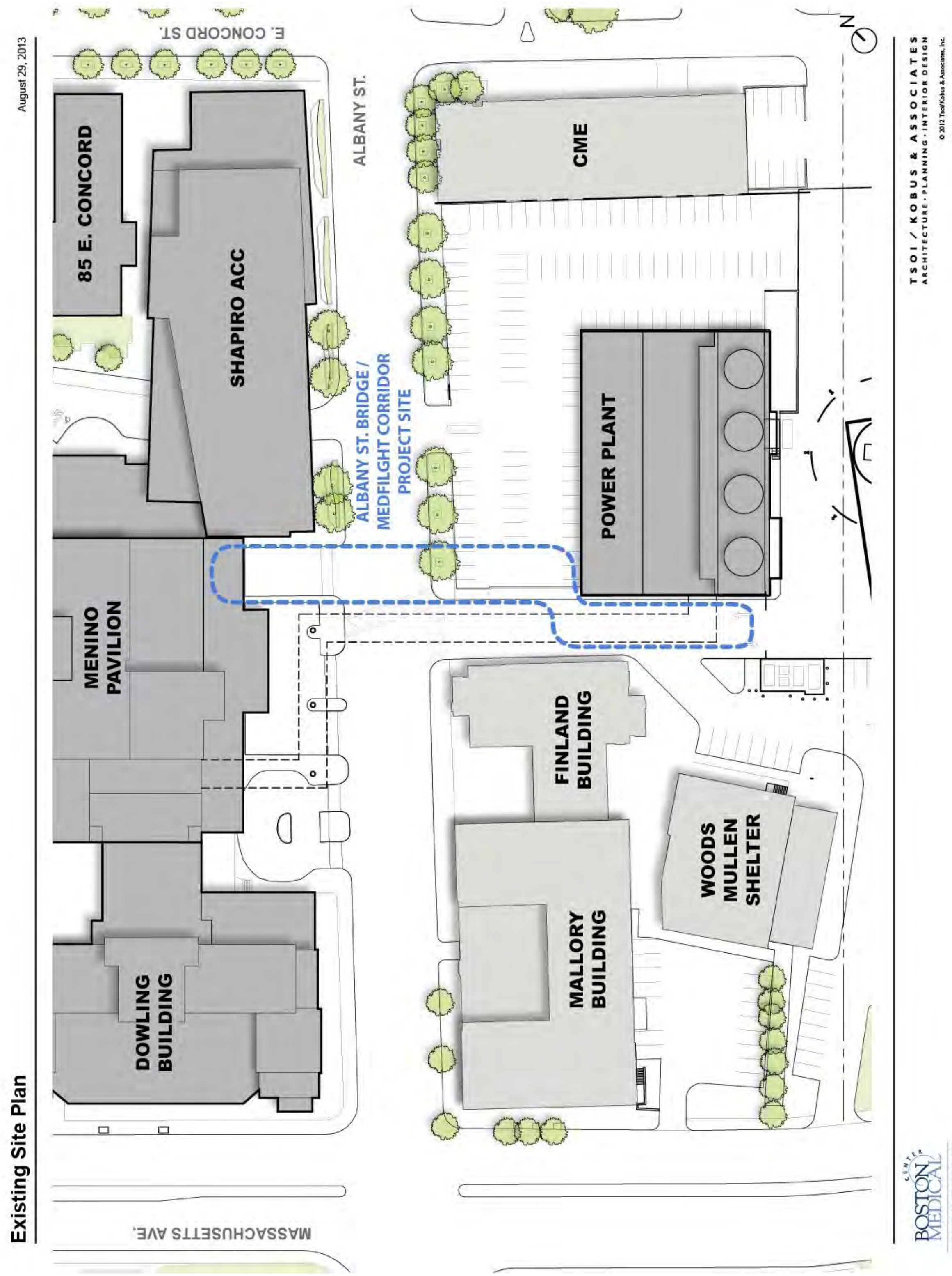
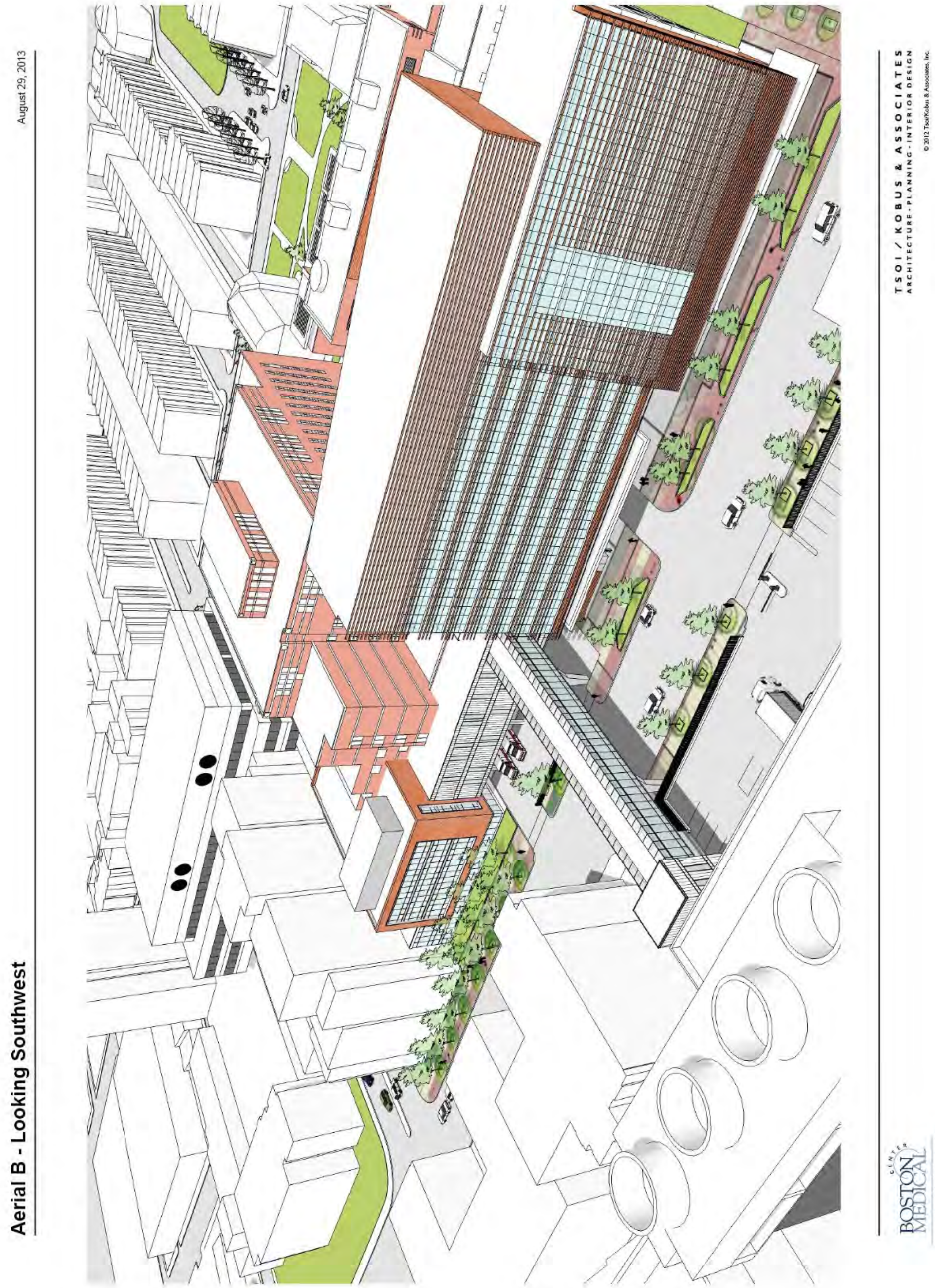


Figure 3-39 New Patient Transport Bridge Proposed Site Area with Improvements



3.2 Sustainable Design

The proposed Projects include a number of environmentally protective technologies and practices incorporated into the planning, design and operations.

All of the proposed IMP projects will meet the requirements of Article 37 of the Code. The Proponent has evaluated the projects under the U.S. Green Council's Leadership in Energy and Environmental Design (LEED) system and the projects are anticipated to receive ratings of up to "Silver" LEED-HCv3 [Healthcare]. See Appendix D for LEED Checklists for each of the proposed projects demonstrating anticipated compliance with these standards.

Overall the Moakley Cancer Center and New Inpatient Building Phase 1 demonstrate the ability to meet the goal of achieving up to 55 points and being considered LEED Silver certifiable. 45 Points are listed as certain, 26 points will be further analyzed by the project team and will serve as a menu from which to pull the required 55 points as the project progresses further.

The New Patient Transport Bridge is a circulation space which does not meet LEED minimum program requirements.

The Proponent understands the City of Boston's interest in the adaptability of the City to long-term climate change. This interest has been manifested already by the Mayor's Executive Order Relative to Climate Change in Boston and the recent convening of the Mayor's Climate Action Leadership Committee. The Proponent has completed on-line questionnaires regarding the proposed Projects climate change preparedness. Copies of the completed questionnaire for the Moakley Cancer Center Addition and the New Inpatient Building Phase 1 can be found in Appendix E.

Due to its small size and use as a circulation space, the Climate Change Preparedness Questionnaire is not applicable for the New Patient Transport Bridge. However, the new Bridge will be equipped with generators and will remain operable for up to four days in the case of a utility power outage, and measures will be taken to optimize the Bridge's energy performance.

Sustainable Sites: Moakley Cancer Center Addition (9 points), New Inpatient Building Phase 1 (10 points)

The proposed Projects are located within more than 10 "Basic Services" and all locations are linked by pedestrian infrastructure within the maximum 0.5 mile radius and also within a 0.5 mile linear footpath of the main entry to the Projects.

The Project sites provide access to multiple MBTA bus routes 1, 8, 10, 47, 170, 171, CT1, and CT3 lines. These public bus routes comply by enumerating more than two and by falling within 0.125 miles/linear footpath of the Project site entries.

New bike storage locations will be provided on Project sites. The BUMC campus also allocates bike parking within the adjacent areas throughout the campus and showers for staff are provided.

No new parking will be created as part of the proposed Projects. As indicated in the Transportation Section 4.3.2.7 there is excess capacity of parking spaces within the existing BUMC parking garages sufficient to meet the demand for the Projects. The Proponent will continue to designate preferred parking in its garages for carpool and hybrid car parking and provide electric car charging stations.

Building roofs will be designed to comply with Solar Reflectance Index (SRI) values for low-sloped roofs.

Lighting Power Density (LPD) shall be reduced for specified fixtures and times to comply with LEED. Regarding Exterior lighting strategies, the Projects are currently designated ‘LZ3: Medium’, and fixtures shall be specified within the compliant range for this zone.

Water Efficiency: Moakley Cancer Center Addition (6 points), New Inpatient Building Phase 1 (6 points)

The Proponent has committed to 35% minimum potable water use reduction for new projects associated with the IMP. This can be achieved through selection of low-flow fixtures, ultra-low flow urinals, waterless urinals (where allowable), ‘pint’ toilets, aerators, etc.

The Proponent will implement strategies for use of rainwater and process water for irrigation. These strategies also have synergies with other potential water reduction strategies, such as use of rainwater to flush toilets.

The Proponent will sub-meter water use to comply with the City of Boston’s Energy and Water Disclosure Ordinance. Applicable uses will be explored by the Proponent.

Building Equipment will be specified to specifically meet the LEED requirement for water use reduction.

Energy and Atmosphere: Moakley Cancer Center Addition (6 points), New Inpatient Building Phase 1 (7 points)

The Proponent will hire a Commissioning Agent (CxA) for the proposed Projects for fundamental commissioning of the building systems.

High efficiency mechanical equipment will be used in combination with increased insulation and high performance glazing. Glazing will incorporate insulated units and Low-E coatings with efficient solar heat gain coefficients.

Refrigerants and HVAC&R units that minimize or eliminate the emission of compounds contributing to ozone depletion and global warming will be used.

Materials and Resources: Moakley Cancer Center Addition (7 points), New Inpatient Building Phase 1 (7 points)

The proposed Projects will be designed with space allocated to serve as collection points for additional waste streams generated by the proposed Projects for removal and diversion.

Construction specifications shall mandate that at least 75% of construction waste be collected and diverted with separation/comingling to be determined by the future contractor.

The proposed Projects will have lighting specified to comply with PBT source reduction.

The project will incorporate materials with recycled content, materials that are fabricated or quarried locally and FSC-certified wood.

Indoor Air Quality: Moakley Cancer Center Addition (11 points), New Inpatient Building Phase 1 (11 points)

Indoor Air Quality (IAQ) is of priority concern in a health care environment. The Proponent will implement many strategies to achieve optimal IAQ. Buildings will have mechanically ventilated spaces and will meet FGI Guidelines for Design & Construction of Healthcare Facilities. Hazardous materials management plans will be implemented for renovations. CO2 monitoring will be in place. “Sound isolation” acoustic control measures will be in place. An Construction IAQ Management Plan will be created and implemented during construction and pre-occupancy. Low-Emitting Materials will be used. Pollutant Source Control measures will be in place. Lighting and thermal comfort controls will be used. Post-occupancy evaluations will be initiated to monitor thermal comfort and providing daylight where possible. Smoking shall be prohibited within the building and within 50’-0” project’s perimeter and shall be relegated to designated smoking facilities owned and maintained by BMC on its property. Signage shall reinforce this policy at entrances and shall lead smokers to designated areas.

Commissioning manuals and specifications will direct the proper implementation of MEP and Fire Protection Systems. The commissioning agent will develop and enforce a construction management plan to protect ductwork and other elements used in the delivery of fresh air. This ensures that the indoor air quality of the building is maintained and no mold or contaminates are distributed at the startup of MEP systems.

To control indoor chemical and pollutant sources, where vestibules do not meet the minimum 10’-0” clear wide in line of path of travel, regularly cleaned roll-out mats shall supplement the additional distance.

Innovation in Design: Moakley Cancer Center Addition (4 points), New Inpatient Building Phase 1 (4 points)

The Proponent will engage an Integrated Design Team who will develop and implement alternative strategies that are not defined within the LEED checklist. Along with the guidance of a LEED Accredited Professional, the Integrated Design Team will seek to gain additional points for the Projects. Some strategies include:

- Use of a cogeneration plants - Article 37 Modern Grid
- Transportation Demand Management - Article 37 Modern Mobility (See Transportation Section 4.4 for more information.)
- Recharging groundwater
- Implementing green housekeeping strategies

Regional Priority: Moakley Cancer Center Addition (2 points), New Inpatient Building Phase 1 (2 points)

A Stormwater Management Plan will be developed and implemented in accordance with City requirements including requirements for groundwater recharge in accordance with Article 32. Rainwater harvesting will be considered.

Building roofs will be designed to comply with Solar Reflectance Index (SRI)values for low-sloped roofs.

3.3 Environmental Protection

3.3.1 Wind

A qualitative wind analysis of the pedestrian level winds was conducted for the Moakley Cancer Center Addition, the New Inpatient Building Phase 1 and the New Patient Transport Bridge. The objective of the study was to provide an evaluation of wind comfort conditions on and around the project sites and provide recommendations for minimizing potential impacts. See Appendix B.

The Moakley Cancer Center Addition is of similar height to the existing adjacent Moakley Cancer Center and is well sheltered by existing buildings of similar or greater heights. The study demonstrates that the wind conditions at sidewalks around the proposed building are expected to meet the BRA wind criteria and winds will be suitable on an annual basis. Increased wind activity is anticipated only in the winter when winds are from the northwest. The design will include options for possible landscape elements or other wind screening elements that help reduce the wind effect at the northeast corner during the winter.

The New Inpatient Building Phase 1 will be located in an area where a building currently exists and will be shorter than immediately existing adjacent buildings. The study demonstrates that the wind conditions at sidewalks around the proposed building are expected to meet the BRA wind criteria and winds will be suitable on an annual basis. Wind conditions may increase from time to time during the winter and spring but are expected to be similar to the existing wind conditions because the proposed building massing change is minor and will have minimal effect on the local wind flows throughout the area.

The New Patient Transport Bridge is proposed to be located in generally the same location as the existing yellow utility tube and is expected to have little change over current wind conditions. The study demonstrates that the wind conditions at sidewalks around the proposed building are expected to meet the BRA wind criteria and winds will be suitable on an annual basis. Wind conditions may increase from time to time during the winter and spring, but because the bridge structure is a fairly aerodynamic structure, it is not expected to strongly redirect wind flows at grade level.

3.3.2 Daylight

The project sites are located within a dense urban environment surrounded by building of similar height and massing as the proposed projects. Due to the existing configuration of the project sites, minimal impacts to daylight obstruction are expected.

3.3.3 Shadow

The proposed project sites are located in a dense urban area on the BUMC Campus. The new Moakley Cancer Center Addition will be surrounded by and adjacent to structures of similar height and massing, therefore any shadow impact will not create significant new shadow coverage on public ways or open space in the area when compared to existing conditions during the time periods studied.

The proposed New Inpatient Building Phase 1 location is along the north side of Albany Street. Based upon the shadow study, the New Inpatient Building Phase 1 will not create any new shadows on public ways or green spaces. Net new shadows created will be primarily cast back on the roof of the new Phase 1 Inpatient Building.

The scale and location of the New Patient Transport Bridge creates a small net new shadow impact that falls primarily on itself. As the Bridge will be replacing the existing "Yellow Tube" that currently spans Albany Street, there will be a minimal shadow impact on the adjacent streetscape compared to the existing condition.

See Appendix C for Shadow Study diagrams.

3.3.4 Solar Glare

Building exteriors are expected to be constructed of a combination of brick, stone precast concrete and non-reflective glass. Therefore, the Projects are not expected to create solar glare impacts on area roadways and sidewalks or solar heat buildup in nearby buildings. If the design should change significantly where reflective materials may be used, the Proponent will provide a solar glare analysis.

3.3.5 Air Quality

No air quality impacts are anticipated from the proposed Projects. Potential long-term air quality impacts arise as a result of emissions from mechanical equipment with combustion related emissions and pollutant emissions from vehicular traffic.

The Moakley Cancer Center Addition, New Inpatient Building Phase 1 and the New Patient Transport Bridge will not include the addition of any new mechanical equipment with any combustion related-emissions (e.g., boilers, emergency generators, cooling towers, etc.).

No traffic-related air quality impacts are anticipated from the proposed Projects. The traffic analysis shows that the Project trips will have no adverse traffic impact on local intersections or roadways. Intersection delay times will not significantly increase. On-road traffic generated by the Moakley Cancer Center Addition and New Inpatient Phase 1 Projects will not increase by 10% or more and intersection Levels of Service (LOS) will not be degraded.

In addition, the advancement of automobile technologies has greatly reduced auto emissions. This, in turn, has virtually eliminated any monitored NAAQS exceedances of carbon monoxide concentrations at any intersection in Boston over the past 20 years. Thus, given the small increase in traffic and general advancements in auto technology, it is reasonable to expect that any microscale air quality analysis would demonstrate no adverse air quality impacts at local intersections.

Construction period air quality impacts and mitigation are discussed in Section 3.4.6.

3.3.6 Noise

This section describes the noise analysis for the proposed Projects. The Moakley Cancer Center Addition and the New Inpatient Building Phase 1 will have rooftop air handling units located in acoustically attenuated enclosed roof top penthouses. There is no noise generating equipment associated with the New Patient Transport Bridge. The study included a noise-monitoring program to determine existing noise levels and an estimate of future noise levels when the Projects are in operation. The scope of the analysis is consistent with BRA requirements for noise studies. The results indicate that predicted noise levels from mechanical equipment, with appropriate noise control, will comply with MassDEP noise limits as well as the most stringent City of Boston Noise Zoning requirements for nighttime and daytime residential zones.

Construction period noise impacts and mitigation are discussed in Section 3.4.5.

3.3.6.1 Noise Terminology and Methodology

There are several ways in which sound (noise) levels are measured and quantified. All of them use the logarithmic decibel (dB) scale. The following paragraphs describe the noise measurement terminology used in this analysis.

The decibel scale is logarithmic to accommodate the wide range of sound intensities found in the environment. One property of the decibel scale is that the sound pressure levels of two separate sounds are not directly additive. For example, if a sound of 50 dB is added to another sound of 50 dB, the total is only a three-decibel increase (to 53 dB), not the doubled value of 100 dB. Thus, every three dB change in sound levels represents a doubling or halving of sound energy. Correspondingly, a change in sound levels of less than three dB is imperceptible to the human ear.

Another property of decibels is that if one source of noise is 10 dB (or more) louder than another source, then the total sound level is simply the sound level of the higher source. For example, a source of sound at 60 dB plus another source of sound at 47 dB is 60 dB.

The sound level meter used to measure noise is a standardized instrument. It contains “weighting networks” to adjust the frequency response of the instrument to approximate that of the human ear under various conditions. There are three weighting networks: A, B, and C. The A-weighted scale (dBA) most closely approximates how the human ear responds to sound at various frequencies and, consequently, it is often used in detecting sound levels in the field. A-weighted sound levels emphasize the middle frequencies (i.e., middle pitched around 1,000 Hertz sounds) and deemphasize lower and higher frequency sounds.

Because the sounds in the natural environment vary with time, they cannot simply be described with a single number. Two methods, calculated from a large number of moment-to-moment A-weighted sound level measurements, describe variable sounds: exceedance levels and the equivalent level.

- Exceedance levels are values from the cumulative amplitude distribution of all of the sound levels observed during a measurement period. Exceedance levels are designated L_n, where n can have a value of 0 to 100 percent. For example:
    - L_{90} is the sound level in dBA that is exceeded 90% of the time during the measurement period. The L_{90} is close to the lowest sound level observed. It is essentially the same as the residual sound level (the sound level observed when there are no obvious nearby intermittent noise sources).
    - L_{50} is the median sound level that is exceeded 50% of the time during the measurement period.

  - o L_{10} is the sound level in dBA that is exceeded only 10% of the time. It is close to the maximum level observed during the measurement period. The L_{10} is sometimes called the intrusive sound level because it is caused by occasional louder noises like those from passing motor vehicles.

  - o L_{max} is the maximum instantaneous sound level observed over a given period.

- ♦ Equivalent level, designated L_{eq}, is the level of a hypothetical steady sound that would have the same energy (i.e., the same time averaged mean square sound pressure) as the actual fluctuating sound observed. The equivalent level is A-weighted and represents the time average of the fluctuating sound pressure. Because sound is represented on a logarithmic scale and the averaging is done with linear mean square sound pressure values, the L_{eq} is mostly determined by occasional loud, intrusive noises.

By using various noise metrics it is possible to separate prevailing, steady sounds (L_{90}) from occasional, louder sounds (L_{10}) in the noise environment or combined average levels (L_{eq}). This analysis of sounds expected from the Project treats all noises as though they will be steady and continuous and, therefore, the L_{90} exceedance level was used. In the design of noise control treatments it is essential to know the frequency spectrum of the noise of interest. Noise control treatments do not function like the human ear, so simple A-weighted levels are not useful for noise-control design. The spectra of noises are usually stated in terms of octave band sound pressure levels (in dB) with the octave frequency bands being those established by standard. To facilitate the noise-control design process, the estimates of noise levels in this analysis are also presented in terms of octave band sound pressure levels.

Baseline noise levels were measured in the vicinity of the proposed Project in 2010. No new projects have been evaluated during that timeframe so there should be no increase in the ambient sound levels. The field results were compared to predicted noise levels derived from manufacturer-provided information regarding representative mechanical equipment or estimated from the equipment's capacity.

3.3.6.2 Noise Regulations and Criteria

The primary applicable regulations (relating to the potential increase in noise levels) are cataloged in the City of Boston Zoning District Noise Standards:

- ♦ City of Boston Code – Ordinances: Section 16–26 Unreasonable Noise; and

- ♦ City of Boston Air Pollution Control Commission Regulations for the Control of Noise in the City of Boston.

Results of the baseline ambient noise level survey and the modeled noise levels are compared to the City of Boston Zoning District Noise Standards. Separate regulations within the Standard provide criteria to control different types of noise. Regulation 2 is applicable to the effects of the completed proposed building and is considered in this noise study. Table 3-1 (on the following page) summarizes the Zoning District Standards.

The Massachusetts Department of Environmental Protection (MassDEP) regulates community noise by its Noise Policy: DAQC policy 90-001. The MassDEP policy limits source sound levels to a 10 dBA increase in the ambient measured noise level (L90) at the Project property line and at the nearest residences. The policy further prohibits “pure tone” conditions which occur when any octave band center frequency sound pressure level exceeds the two adjacent center frequency sound pressure levels by three decibels or more.

3.3.6.3 Existing Conditions

Baseline Noise Environment

An ambient noise level survey was conducted to characterize the existing “baseline” acoustical environment in the vicinity of the Project. Existing noise sources in the vicinity of the Project include: vehicular traffic (including trucks) on the local roadways; pedestrian traffic; and mechanical equipment located on the surrounding buildings.

Noise Measurement Locations

The selection of the sound monitoring receptor locations was based upon a review of the current land use in the area of the Project Site. Noise was measured at six locations in the vicinity of the Project site to establish background noise conditions. The measurement locations are depicted on Figure 3-36 and are described below.

- Location 1 is in a Boston Medical Center parking lot on East Brookline Street. The receptor was located south of the parking lot gate, adjacent to the residential property at 81 East Brookline Street.
- Location 2 is near the residential property at 107 East Brookline Street.
- Location 3 is near the Boston Medical Center Menino Pavilion entrance on Albany Street.
- Location 4 is near the Hampton Inn at 811 Massachusetts Avenue.
- Location 5 is near the intersection of Harrison Avenue and Public Alley 716 (between Massachusetts Avenue and East Springfield Street).
- Location 6 is near the residential property at 39 Worcester Square.

Figure 3-36 Noise Measurement Locations

Noise Measurement Methodology

Short-term sound level measurements were made at all six locations for 20 minutes per location during daytime hours (11:00 am to 4:00 pm) on January 07, 2010, and nighttime hours (12:00 am to 4:00 am) on January 08, 2010. Since noise impacts are greatest at night when existing noise levels are lowest, the study was designed to measure community noise levels under conditions typical of a "quiet period" for the area. Daytime measurements were scheduled to exclude peak traffic conditions.

In addition to the short-term sampling data, one continuous programmable sound level meter was placed at Location 1 on January 06, 2010. This monitor continuously measured and stored hourly sound level statistics for 36 consecutive hours in order to confirm that the short-term sampling was indeed representative of the lowest sound levels. This monitor ran from 3:00 P.M. Wednesday, January 06, 2010, until 3:00 AM on Friday, January 08, 2010. Field personnel periodically checked on the integrity of the continuous equipment, and observed and recorded the noise sources at the monitoring location.

Short-term sound levels were measured at a height of five feet above the ground while the continuous sound level was measured at a height of six feet above the ground. Both continuous and short-term sound levels were measured at publicly accessible locations. The measurements were generally made under low wind conditions and with dry roadway surfaces. Wind speed measurements were made with a Davis Instruments TurboMeter electronic wind speed indicator, and temperature and humidity measurements were made using a psychrometer. Unofficial observations about meteorology or land use in the community were made solely to characterize the existing sound levels in the area and to estimate the noise sensitivity at properties near the proposed Project.

Measurement Equipment

Short-term measurements were taken with a CEL Instruments Model 593.C1 Precision Sound Level Analyzer equipped with a CEL-257 Type 1 Preamplifier, a CEL-250 half-inch electret microphone, and a four-inch foam windscreen. Both short-term broadband and octave band ambient sound pressure level data were collected. This instrument meets the "Type 1 - Precision" requirements set forth in American National Standards Institute (ANSI) S1.4 for acoustical measuring devices. The microphone was tripod-mounted at a height of five feet above ground, and the meter was set to the "slow" response. Statistical descriptors (L_{eq}, L_{90}, etc.) were calculated for each 20-minute sampling period. Octave band levels for this study correspond to the same data set processed for the broadband levels. The measurement equipment was calibrated in the field before and after the surveys with a CEL-110/1 acoustical calibrator, which meets the standards of IEC 942 Class 1L and ANSI S1.40-1984.

A Larson Davis model 812 Sound Level Meter was used for the continuous monitoring. This meter was equipped with a Larson Davis PRM828 Preamplifier, a PCB Piezotronics 337B02 microphone, and a foam windscreen. This instrument meets Type 1 ANSI S1.4-1983 standards for sound level meters. The microphone was mounted at a height of six feet above ground, and the meter was set to the "slow" response. This model 812 has been calibrated and certified as accurate to standards set by the National Institute of Standards and Technology by an independent laboratory within the past 12 months. The model 812 has data logging capability and was programmed to log statistical data every hour for the following parameters: L_1, L_{10}, L_{50}, L_{90}, L_{max}, L_{min}, and L_{eq}.

Baseline Ambient Noise Levels

The existing ambient noise environment is impacted primarily by mechanical equipment located on surrounding buildings and by vehicular traffic on nearby roadways, including Albany Street, Harrison Avenue, and Massachusetts Avenue. Baseline noise monitoring results are presented in Table 3-1, and summarized below.

- The daytime residual background (L_{90}) measurements ranged from 54 to 65 dBA;
- The nighttime residual background (L_{90}) measurements ranged from 49 to 62 dBA;
- The daytime equivalent level (L_{eq}) measurements ranged from 61 to 74 dBA; and
- The nighttime equivalent level (L_{eq}) measurements ranged from 51 to 67 dBA.

3.3.6.4 Future Ambient Noise Levels

Future noise impacts would be associated with the two new air handling units located in the penthouses of the Moakley Cancer Center Addition and the New Impatient Building Phase I. These air handling units will be located inside of acoustically treated rooftop penthouses with minimal sound level impacts. Typical sound power levels of these units are 94 dBA. The overall sound level impacts from these units would be 41 dBA at 500 feet. Adding this impact to the lowest background L90 (49 dBA) would have an overall impact of 49.6 dBA, an increase of approximately 1 dBA over ambient. This sound level impact is considered imperceptible and complies with the MassDEP noise policy.

Table 3-1 Baseline Ambient Noise Measurements

Location and Period	Start Time	L_{10} (dBA)	L_{50} (dBA)	L_{90} (dBA)	L_{eq} (dBA)	L_{max} (dBA)	Octave Band Center Frequency (Hz)								
							32	63	125	250	500	1000	2000	4000	8000
							L_{90} (dB)	L_{90} (dB)	L_{90} (dB)	L_{90} (dB)	L_{90} (dB)	L_{90} (dB)	L_{90} (dB)	L_{90} (dB)	L_{90} (dB)
Loc 1 Day	1:47 PM	65	58	**57**	62	-	66	62	59	57	55	51	47	37	28
Loc 2 Day	11:25 AM	68	60	**57**	66	81	66	64	59	58	56	51	45	34	22
Loc 3 Day	3:02 PM	74	68	**65**	71	-	71	71	67	64	63	61	56	48	38
Loc 4 Day	2:30 PM	76	68	**64**	74	92	74	75	70	62	59	59	55	48	40
Loc 5 Day	12:31 PM	71	65	**61**	68	84	72	71	65	59	57	56	53	47	40
Loc 6 Day	1:12 PM	64	57	**54**	61	76	65	63	57	53	52	49	44	37	30
Loc 1 Night	2:39 AM	52	52	**51**	52	56	58	57	55	53	51	45	38	28	19
Loc 2 Night	2:09 AM	57	55	**55**	56	65	64	60	57	57	55	48	41	32	21
Loc 3 Night	12:19 AM	69	64	**62**	67	84	66	64	65	60	59	57	53	44	33
Loc 4 Night	12:47 AM	68	61	**57**	65	84	64	64	62	55	53	52	48	39	31
Loc 5 Night	1:15 AM	63	56	**53**	60	75	63	59	56	53	51	48	44	36	33
Loc 6 Night	1:41 AM	53	49	**49**	51	63	58	56	51	50	48	43	37	26	16

Notes:

1. Daytime weather: Temperature = 39^0 F, RH = 51%, skies sunny, winds 0-4 mph.
   Nighttime weather: Temperature = 30^0 F, overcast skies, winds 0-8 mph.
2. Road Surfaces were dry during all periods.
3. All sampling periods were approximately 20 minutes duration.
4. Daytime measurements were collected on January 07, 2010.
   Nighttime measurements were collected on January 08, 2010.

3.3.7 *Water Quality/Wetlands*

The proposed projects are located on existing developed sites. The projects are not expected to result in the introduction of any pollutants, including sediments, into the surface waters or local groundwater.

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) indicates the FEMA Flood Zone Designations for the Projects' sites (City of Boston, Community Panel Number 25025C 0079G). The map shows that the Projects' sites are located outside of the 500-year flood plain. The project sites do not contain any wetlands.

3.3.8 *Geotechnical / Groundwater*

The proposed Moakley Cancer Center Addition and New Inpatient Building Phase 1 will involve some subsurface excavation for foundations and a below grade basement. The New Patient Transport Bridge will involve limited excavation for installation of structural support columns.

The proposed New Inpatient Building Phase 1 will include one below grade level. The foundation elements that are required to extend down to competent soils, below the groundwater level, will be solid, discontinuous, discrete elements that will not cause the groundwater to raise, pond or be lowered.

Subsurface conditions will be investigated as design progresses. For construction of the basement space, a temporary excavation support system that is compatible with subsurface conditions will be designed in order to provide adequate support and protection of the adjacent streets and utilities.

The proposed Projects are located within the Groundwater Conservation Overlay District (GCOD). The Project design will comply with Article 32 and City standards by establishing design and construction methodology which protects groundwater. The Projects will demonstrate that the permanent construction results in no negative impacts to groundwater levels through engineering evaluations. An engineers' certification report will be submitted to demonstrate that the standards have been met. Methods to assure these standards include use of fully waterproofed basement (walls and lowest level floor slabs) for the portion of the structure that extends below groundwater levels which will be designed to resist hydrostatic uplift pressures. Design criteria for the Project will include provision that no long term groundwater pumping will be allowed.

Please see Section 3.6.4.2 for a more detailed discussion on compliance with Article 32. Also refer to Figures 3-37 and 3-38.

3.3.9 *Construction Waste and Disposal*

Solid waste generated by construction will consist of excavated material and debris. Excavated material will be composed of miscellaneous fill and underlying natural deposits. Excavation and off-site disposition will be conducted in accordance with a Soil Management

Plan developed for the projects and included in the Construction Documents. The Soil Management Plan will describe procedures for identification, management and off-site transport of any contaminated soils. Management of soil during excavation and construction will be conducted in accordance with applicable local, state, and federal laws and regulations.

Construction dewatering will be conducted in accordance with a Groundwater Management Plan that will be included as part of the Construction Documents. The Groundwater Management Plan will describe the procedures for maintenance of groundwater levels and for treatment (if necessary) and discharge of effluent from dewatering activities.

3.3.10 Solid Waste Generation and Recycling

The projects will generate solid waste from employees such as wastepaper, cardboard, glass bottles, aluminum cans, etc. Recycling of this material will be encouraged and managed through Boston University Medical Center's active campus recycling program. Staging areas with recycling bins will accommodate the recyclable material from the projects.

3.3.11 Integrated Pest Management Plan

The Construction Management Plan will include a plan to manage pests. A rodent extermination certificate will be filed with the building permit application to the City. Rodent inspection monitoring and treatment will be carried out before, during, and at the completion of all construction work for the proposed Project, in compliance with the City's requirements. Rodent extermination prior to work start-up will consist of treatment of areas throughout the site. During the construction process, regular service visits will be made.

3.3.12 Wildlife Habitat

The site is within a fully developed urban area and, as such, the proposed projects will not impact wildlife habitats as shown on the National Heritage and Endangered Species Priority Habitats of Rare Species and Estimated Habitats of Rare Wildlife.

3.4 Construction Management Plan

A Construction Management Plan (CMP) will be submitted to the Boston Transportation Department (BTD) for review and approval prior to issuance of a building permit. The CMP will define truck routes which will help minimize the impact of trucks on local streets. The construction contractor will be required to comply with the details and conditions of the approved CMP.

Construction methodologies that ensure public safety and protect nearby businesses will be employed. Techniques such as barricades, walkways, painted lines, and signage will be used as necessary. Construction management and scheduling, including plans for construction worker commuting and parking, routing plans and scheduling for trucking and deliveries, protection of existing utilities, maintenance of fire access, and control of noise and dust, will minimize impacts on the surrounding environment.

3.4.1 Construction Schedule and Coordination

Construction of the Moakley Cancer Center Addition is estimated to last approximately 18 months. Initial site work is expected to begin during the 4th Quarter of 2013.

Construction of the New Inpatient Building Phase 1 is estimated to last approximately 18 months. Initial site work is expected to begin during the 4th Quarter of 2013.

Construction of the New Patient Transport Bridge is estimated to last approximately 11 months. Initial site work is expected to begin during the 2nd Quarter of 2016.

The new Energy Facility will be constructed upon completion of the aforementioned projects.

Typical construction hours will be from 7:00 am to 6:00 pm, Monday through Friday, with most shifts ordinarily ending at 3:30 pm. No sound-generating activity will occur before 7:00 am. If longer hours, additional shifts, or Saturday work is required, the Construction Manager will place a work permit request to the Boston Air Pollution Control Commission and BTD in advance. Notification should occur during normal business hours, Monday through Friday. It is noted that some activities such as finishing activities could run beyond 6:00 pm to ensure the structural integrity of the finished product. (Certain components must be completed in a single pour and placement of concrete cannot be interrupted.)

Proper planning with the City, neighborhood and developers of other projects under construction in the area will be essential to the successful construction of the Projects. The construction contractor will be responsible for coordinating construction activities during all phases of construction with City of Boston agencies to minimize potential scheduling and construction conflicts with other ongoing construction projects in the area.

3.4.2 Construction Staging and Public Safety

Primary staging will be on-site. For each project the proposed construction staging plan will be designed to isolate the construction while providing safe access for pedestrians and vehicles during normal day-to-day activities and emergencies. The staging areas will be secured by chain-link fencing to protect pedestrians from entering these areas.

Although specific construction and staging details have not been finalized, the Proponent and its construction management consultants will work to ensure that staging areas will be located to minimize impacts to pedestrian and vehicular flow. Secure fencing and barricades will be used to isolate construction areas from pedestrian traffic adjacent to the site. In addition, sidewalk areas and walkways near construction activities will be well marked and lighted to protect pedestrians and ensure their safety. If required by BTD and the Boston Police Department, police details will be provided to facilitate traffic flow. Construction procedures will be designed to meet all Occupational Safety and Health Administration (OSHA) safety standards for specific site construction activities.

3.4.3 Construction Employment and Worker Transportation

The number of workers required during the construction period will vary. The Proponent will make reasonable good-faith efforts to have at least 50 percent of the total employee work hours are for Boston residents, at least 25 percent of total employee work hours are for minorities and at least 10 percent of the total employee work hours are for women. The Proponent will enter into a construction jobs agreement with the City of Boston.

To reduce vehicle trips to and from the construction site, minimal construction worker parking will be available at the site and all workers will be strongly encouraged to use public transportation and ridesharing options. The Proponent and contractor will work aggressively to ensure that construction workers are well informed of the public transportation options serving the area. Five bus routes currently service the area, and the Project site is proximate to the Silver Line. Space on-site will be made available for workers' supplies and tools so they do not have to be brought to the site each day.

3.4.4 Construction Truck Routes and Deliveries

The construction team will manage deliveries to the site during morning and afternoon peak hours in a manner that minimizes disruption to traffic flow on adjacent streets. The construction team will provide subcontractors and vendors with Construction Vehicle & Delivery Truck Route Brochures in advance of construction activity. “No Idling” signs will be included at the loading, delivery, pick-up and drop-off areas.

Truck traffic will vary throughout the construction period depending on the activity. Construction truck routes to and from the Project site for contractor personnel, supplies, materials, and removal of excavations will be coordinated by the Proponent with the BTD and established in the CMP. These routes will be mandated as a part of subcontractors' contracts for the Project. Traffic logistics and routing are planned to minimize community impacts.

3.4.5 Construction Noise

The Proponent is committed to mitigating noise impacts from the construction of the project. However, increased community sound levels are an inherent consequence of construction activities. Construction work will comply with the requirements of the City of Boston Noise Ordinance. Every reasonable effort will be made to minimize the noise impact of construction activities.

Mitigation measures are expected to include:

- Instituting a proactive program to ensure compliance with the City of Boston noise limitation policy;
- Using appropriate mufflers on all equipment and ongoing maintenance of intake and exhaust mufflers;
- Muffling enclosures on continuously running equipment, such as air compressors and welding generators;

- Replacing specific construction operations and techniques with less noisy methods where feasible;
- Selecting the quietest alternative items of equipment where feasible;
- Scheduling equipment operations to keep average noise levels low, to synchronize the noisiest operations with times of highest ambient levels, and to maintain relatively uniform noise levels;
- Turning off idling equipment; and
- Locating noisy equipment at locations that protect sensitive locations by shielding or distance.

3.4.6 Construction Air Quality

Short-term air quality impacts from fugitive dust may be expected during the early phases of construction and during excavation. Plans for controlling fugitive dust during demolition, construction and excavation include mechanical street sweeping, wetting portions of the site during periods of high wind, and carefully removing debris in covered trucks. The construction contract will provide for multiple strictly enforced measures to be used by contractors to reduce potential emissions and minimize impacts. These measures are expected to include:

- Using wetting agents on areas of exposed soil on a scheduled basis;
- Using covered trucks;
- Minimizing spoils on the construction site;
- Monitoring of actual construction practices to ensure that unnecessary transfers and mechanical disturbances of loose materials are minimized;
- Minimizing storage of debris on the site; and
- Periodic street and sidewalk cleaning with water to minimize dust accumulations.

The CMP will include the retrofit of all diesel construction vehicles. Provisions will be developed and implemented for wheel washing, the covering of trucks, monitoring of actual construction practices to ensure that unnecessary transfers and mechanical disturbances of loose materials are minimized, periodic street and sidewalk cleaning with water to minimize dust accumulations. Signage for anti-idling will also be included within the CMP.

3.4.7 Construction Waste

The Proponents will reuse or recycle construction materials to the extent feasible. Construction procedures will allow for the segregation, reuse, and recycling of materials. Materials that cannot be reused or recycled will be transported in covered trucks by a contract hauler to a licensed facility, per the MassDEP regulations for Solid Waste Facilities, 310 CMR 16.00.

3.4.8 Protection of Utilities

Existing public and private infrastructure located within the public right-of-way will be protected during construction. The installation of proposed utilities within the public way will be in accordance with the MWRA, BWSC, Boston Public Works Department, the Dig Safe program, and the governing utility company requirements. All necessary permits will be obtained before the commencement of the specific utility installation. Specific methods for constructing proposed utilities where they are near to, or connect with, existing water, sewer and drain facilities will be reviewed by BWSC as part of its Site Plan Review Process.

3.5 Historic and Archaeological Resources

Boston University Medical Center is located within the South End Harrison/Albany Protection Area (Protection Area), and encompasses the "Boston City Hospital" Area, both of which are included in the Inventory of Historic and Archaeological Assets of the Commonwealth. The Protection Area was established to protect views of the adjacent South End Landmark District, to ensure that new development or major alterations adjacent to the District are architecturally compatible in massing, setback, and height, and to protect light and air circulation within the District. Building demolitions, the height and setback of new construction, and changes to topography and landscaping within the Protection Area are subject to review by the South End Landmark District Commission (SELDC).

There are no known archaeological resources listed in the State and National Registers of Historic Places or included in the Inventory of Historic and Archaeological Assets of the Commonwealth within the Project site. The Project sites consist of a previously developed urban site; therefore, it is unlikely that the proposed Project will affect previously unidentified archaeological resources.

3.6 Infrastructure

This section evaluates the infrastructure systems that will support BMC's proposed projects. Based on initial investigations, the existing infrastructure systems in the area appear to be able to accommodate the incremental increase in demand associated with the proposed projects.

The design process for the proposed projects will include the required engineering analyses and will adhere to applicable protocols and design standards, ensuring that the proposed Project is properly supported by and properly uses the City's infrastructure.

The systems discussed below include those owned or managed by the Boston Water and Sewer Commission (BWSC), private utility companies, and on-site infrastructure. There will be close coordination between these entities and the project team during subsequent reviews and the design process. All improvements and connections to BWSC infrastructure will be reviewed as part of the BWSC site plan review process. This process includes a comprehensive design review of the proposed service connections, assessment of system demands and capacity and establishment of service accounts.

3.6.1 Regulatory Framework

This section, in addition to a description of existing and future infrastructure connections, discusses the regulatory framework of utility connection reviews and standards. All connections will be designed and constructed in accordance with city, state and federal standards.

- In the City of Boston, BWSC is responsible for all water, sewer and stormwater systems.
- The Boston Fire Department (BFD) will review the Proposed Project with respect to fire protection measures such as siamese connections and standpipes.
- Design of the site access, hydrant locations, and energy systems (gas, steam and electric) will also be coordinated with the respective system owners.
- New utility connections will be authorized by the Boston Public Works Department through the street opening permit process, as required.
- New steam and power conduits between campus buildings, within city streets, will require permitting with the City of Boston Public Improvements Commission (PIC).

3.6.2 Existing Wastewater

Local sewer service in the City of Boston is provided by the BWSC. Wastewater generated at the BMC campus is collected by various sewer mains within the surrounding streets and conveyed to the Massachusetts Water Resources Authority (MWRA) facility on Deer Island via a 66” x 68” combined sewer located in Albany Street.

3.6.2.1 Demand/Use

Wastewater generation from each of the projects has been calculated as described below.

Moakley Cancer Center Addition

The Moakley Addition will provide additional and improved space for existing uses within the building. The proposed addition does not represent an expansion of the building’s uses by increasing patient capacity, doctors or staff. Accordingly, no increase in wastewater generation from the existing Moakley building is anticipated as a result of this project.

New Inpatient Building Phase 1

The New Inpatient Building Phase 1 will include in-patient rooms, radiology and surgery areas as well as an amphitheater and circulation space for vital connector to campus buildings. The estimated wastewater generation from the New Inpatient Building Phase 1 has been calculated in gallons per day (gpd) as the sum of these uses based on rates established by the Massachusetts Department of Environmental Protection Title V 310 CMR 15.203 System Sewage Flow Design Criteria and summarized in the table below.

Table 3-2 Estimate Wastewater Generation

Use	Number	Units	Rate	Averaged Daily Sewage Flow (gpd)
Floor B: Amphitheater	250	seats	3 gpd/seat	750
Floor 1: Radiology	16,678	sf	75 gpd/1,000 sf	1,250
Floor 2: Surgery	16,678	sf	75 gpd/1,000 sf	1,250
Floors 3 & 4: In-patient	38	Beds	200 gpd/bed	7,600
			Totals	**10,850**

Average daily flow is calculated from the project to be approximately 10,850 gpd. Based on a peaking factor of 3.0, peak daily flows from the project are estimated to be approximately 32,550 gpd.

New Patient Transport Bridge

The new Bridge consists of patient transport and service corridors to connect hospital buildings. There is no wastewater generation associated with this use.

3.6.2.2 Proposed Connections

The sewer services for the proposed projects will tie into existing nearby existing sewer mains.

The Moakley Cancer Center Addition and the New Inpatient Building Phase 1 will connect to BWSC sewer mains in East Concord Street and Albany Street, respectively. These addition projects may utilize existing service connections from their respective buildings or construct new connections as appropriate based on final project design. Proposed sewer service configurations and design notes are summarized in the table below.

Table 3-3 Proposed Sewer Service Configurations

Project	Sewer Connection	Design Notes
Moakley Cancer Center Addition	27" Sewer in East Concord Street	Project will likely combine with wastewater from existing Moakley Building since the existing service connection passes through addition area.
New Inpatient Building Phase 1	66"x68" Sewer in Albany Street	Connection to existing buildings or new service connection to Albany Street to be determined during design.
New Patient Transport Bridge	None	No sewer service anticipated. Incidental wastewater will likely be routed to systems in adjacent buildings.

3.6.3 Domestic Water and Fire Protection

3.6.3.1 Existing Water Supply System

The BUMC Campus is located in the South End service area of the BWSC public water supply. Albany and East Concord Streets are served by 12-inch high and low pressure lines. Hydrant test data provided by the BWSC expressed in gallons per minute (gpm) is presented in the table below.

Table 3-4 Hydrant Test Data

Date	Location	Static Pressure (psi)	Residual Pressure (psi)	Total Flow (gpm)	Flow at 20 psi (gpm)
3/21/05	12" Low Albany Street	68	62	3,182	1,083
9/26/00	12" High Albany Street	96	88	4,388	1,479

The results of the hydrant flow tests indicate the actual amount of water (flow) available and the actual pressure (residual) flow provided. These flow metrics are analyzed to establish the quantity of water that will be delivered at 20 psi as a common evaluation point.

The data provided is the most recent test data obtained from the BWSC. Additional testing of specific hydrants in close proximity to the proposed projects will likely be performed during subsequent project phases to support design of fire protection systems.

3.6.3.2 Demand/Use

The Moakley Cancer Center Addition provides additional and improved space for existing building uses and is not expected to result in an increase in water use above existing conditions. Based on the wastewater calculations provided in Section 3.6.2.1, water use for the New Inpatient Building Phase 1 is estimated to be approximately 10,850 gpd. There is no water use associated with the New Patient Transport Bridge project.

3.6.3.3 Proposed Connections

Proposed domestic and fire service connections for each of the projects are summarized in the table below.

Table 3-5 Proposed Domestic and Fire Service Connections

Project	Water/Fire Connection	Design Notes
Moakley Cancer Center Addition	12" High and Low Services in East Concord Street	Connection to existing building water systems and/or new tap into existing Moakley service connection from East Concord Street to be determined during design.
New Inpatient Building Phase 1	12" High and Low Services in Albany Street	Connection to existing buildings or new service connection to Albany Street to be determined during design.
New Patient Transport Bridge	None	No water service anticipated.

3.6.4 Stormwater Management

3.6.4.1 Existing Conditions

The BUMC Campus is serviced by several BWSC drain lines. The proposed project sites are currently occupied by buildings, paved surfaces or landscaped areas. Runoff from these areas flows to nearby BWSC storm drain systems which discharge to the Roxbury Canal Conduit.

3.6.4.2 Proposed Conditions

Stormwater from the project sites will be routed to follow existing drainage patterns to the nearby BWSC drain lines and the Roxbury Canal Conduit. Since the BUMC Campus is located in the Groundwater Conservation Overlay District (GCOD), each of the projects will be required to infiltrate one inch of runoff per square foot of new building footprint.

The proposed projects will be designed to mitigate potential increases in peak flows, pollutants, or sediments to existing drainage infrastructure. In conjunction with the BWSC site plan review and the General Service Application, the proponent will submit a stormwater management plan. Compliance with the standards for the final site design will be reviewed as part of the BWSC site plan review process. See Figures 3-40 (drawing C-001) and 3-41 (drawing C-002) for schematic plans of the proposed groundwater infiltration gallery systems.

A summary of stormwater management controls for each project site is provided in the table below.

Table 3-6 Stormwater Management Controls

Project	Approximate Footprint (sf)	Infiltration Requirement (ft^3)	Design Notes
Moakley Cancer Center Addition	7,000	583	Increase in impervious surface will require stormwater management to mitigate potential increases in peak runoff. Groundwater recharge requirements will be met by expanding the existing infiltration gallery system serving the existing Moakley building as shown on Figure 3-37.
New Inpatient Building Phase 1 (including connector wing)	22,700	1,892	The project site is occupied primarily by existing buildings, streets, and other paved surfaces. The project will result in little, if any, increase in impervious surfaces.

Project	Approximate Footprint (sf)	Infiltration Requirement (ft^3)	Design Notes
			Groundwater recharge requirements will be met by constructing a new infiltration gallery south of the Menino Pavilion as shown on Figure 3-38.
New Patient Transport Bridge	6,700	833	Project will be located above Albany Street and adjacent sidewalks. Given the proximity of this project to the New Inpatient Building Phase 1, stormwater will be managed collectively with the new infiltration gallery south of the Menino Pavilion as shown on Figure 3-38.

Figure 3-40 Moakley Addition Proposed Recharge System

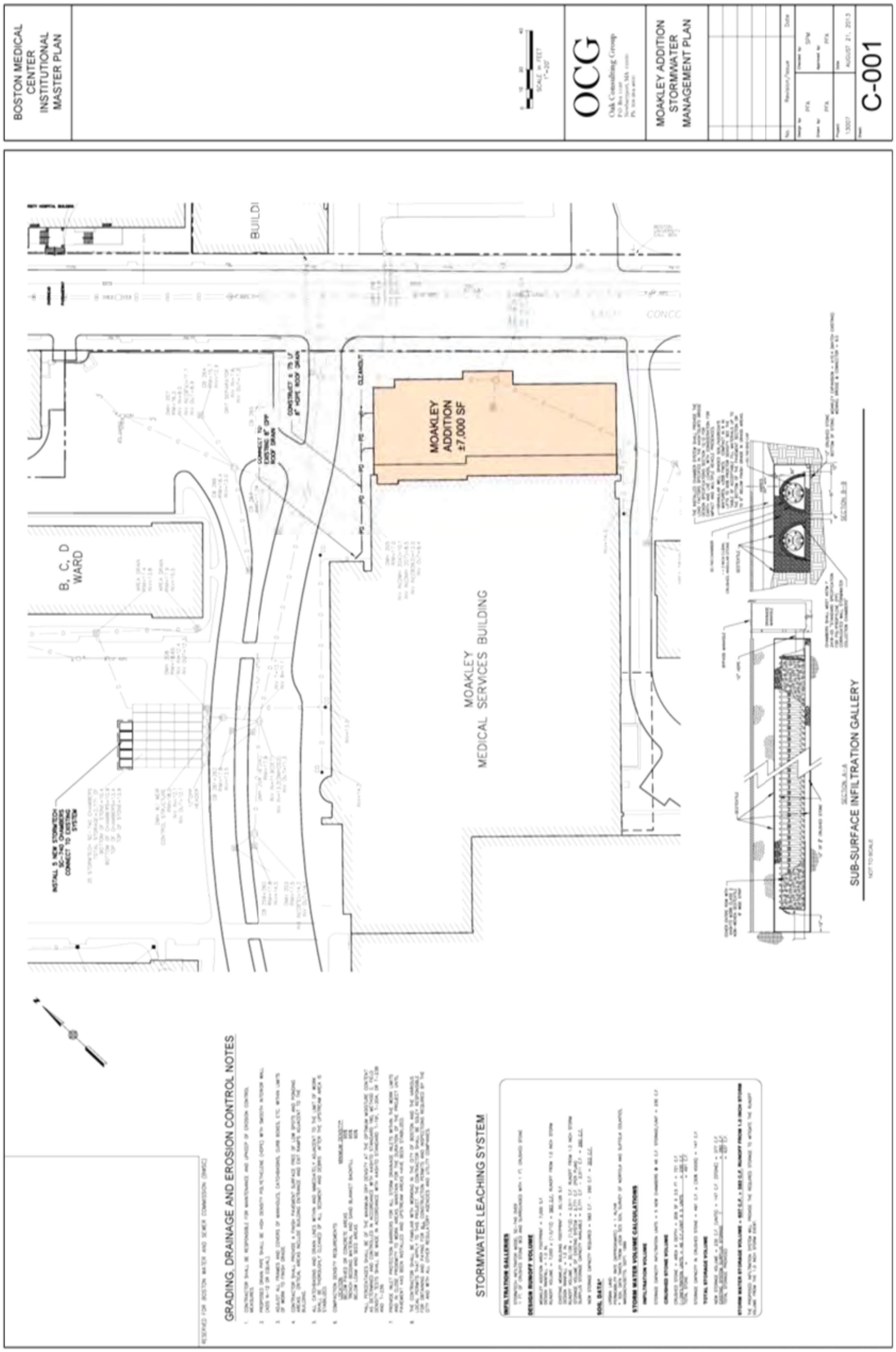
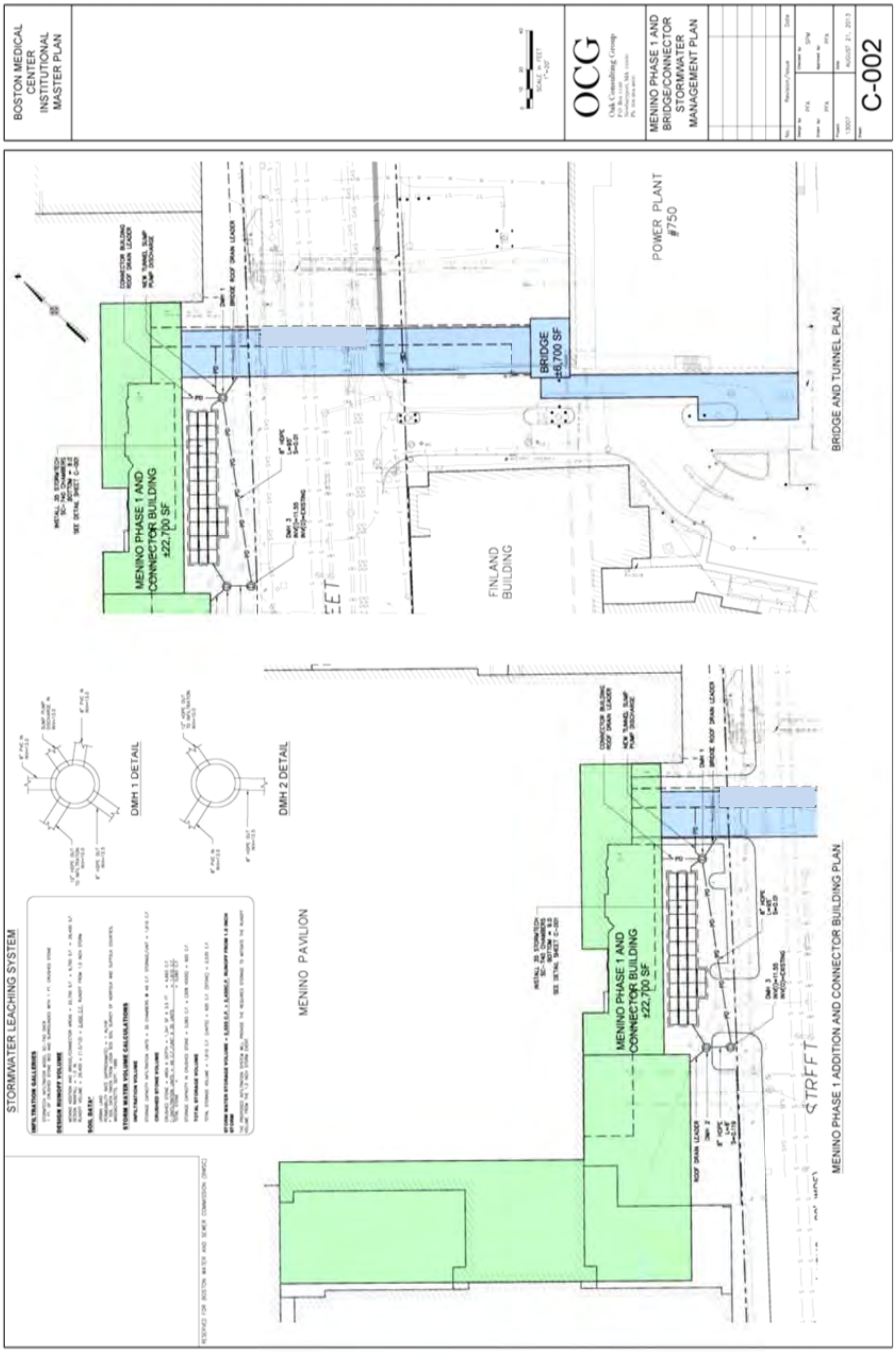


Figure 3-41 New Inpatient Building Phase 1 & Patient Transport Bridge Recharge System



3.6.5 Anticipated Energy Needs

3.6.5.1 Natural Gas Service

Natural gas for the Proposed Project will be provided by National Grid from their existing gas mains within Albany Street. The specific gas service needs for each project will be determined and coordinated with the utility company during final design.

3.6.5.2 Electrical Service

Boston University Medical Center purchases electricity from NSTAR Electric in bulk and redistributes from the existing Power Plant Building to other BUMC Campus buildings. This practice will be continued for the Moakley Cancer Center Addition, the New Inpatient Building Phase 1 and other projects until the new Energy Facility is constructed.

3.6.5.3 Steam

Steam is currently provided by Veolia Energy and distributed to the BUMC Campus from the existing Power Plant building. This practice will continue for the proposed projects until the new Energy Facility is constructed.

3.6.5.4 Telecommunications

Verizon will provide telephone and telecommunication services to the proposed projects. There are existing fiber optic services located in Albany and East Newton Streets with sufficient capacity to service the proposed project.