

M. Tree Mitigation Plan

The importance of maintaining tree canopy is an important issue in the City of Cambridge. From the beginning of the Volpe process, it has been clear that trees will be impacted in order to accomplish the goals for the Development Parcel. Nonetheless, MIT understands and appreciates the impact the removal of trees at Volpe will have, and have taken a thoughtful and comprehensive approach to mitigating the tree loss on the Site. Additionally, MIT has ensured that its Tree Mitigation Plan anticipates the requirements in the City's soon to be adopted revised Tree Protection Ordinance.

MIT has developed its plan for Volpe with the underlying goal of trying to protect existing trees where ever possible. Approximately 90% of the street trees that border the Site will be preserved. In addition, the buildings will be set back nearly 50 feet from Loughrey Walkway/Kittie Knox Bike Path – significantly more than the 10 feet required by zoning – to celebrate and enhance the walkway and ensure the continued health of the trees along the path.

As described in the certified Tree Mitigation Plan (**Figures M1-M6**), the Project requires the removal of 117 private trees on the Volpe property and 11 street trees adjacent to the Site. To mitigate this tree loss, the Project proposes a robust planting plan that will add back approximately 221 new trees on the property and immediate surroundings for a net increase of 93 trees.

The new canopy will be more diverse and resilient than what is in place today. This will result in long-term benefits, and as soon as the trees grow and mature, they will far exceed the carbon sequestration, storm-water benefit, and contribution to air quality than what is on the Site today. Additionally, the new tree canopy will be positioned well for growth and long-term viability compared to the existing tree canopy that is older and compromised.

In the short-term, despite the increase in the number of trees and the fact that they will be planted at 4"-8" caliper, there will be a caliper-inch deficit until the new trees reach maturity. To address this, MIT will add to the tree canopy, particularly in neighborhoods adjacent to the Project, and MIT will pay into the City's Tree Replacement Fund for any remaining mitigation as required by the Tree Protection Ordinance. Additionally, MIT is reviewing the findings of its arborist with respect to trees that may be candidates for transplant and has identified a few trees on the site that may be able to be successfully transplanted. MIT is working to find sites within the Volpe project or elsewhere to relocate these trees.

Finally, and in an effort to address the large tree loss on private residential property in Cambridge, MIT has committed to work with the City and others to initiate a private tree fund to provide funding for the planting of new trees on private

property. In addition, MIT has approached the Department of Conservation and Recreation to explore opportunities to add tree canopy on state-owned land near adjacent neighborhoods.

The City street trees proposed for removal are primarily located along Broadway. The proponent is evaluating appropriate options with the TP&T department and DPW to provide safe access to the garage via left-turn from Broadway while limiting the impact to the existing trees along the Broadway median. MIT is also working with the City, CRA and others on the final design of the Broadway streetscape and its impact to existing trees will evolve.

A Resilient New Canopy

The proposed canopy planting will consist solely of native and well-adapted species and will

increase diversity. More than 200 trees will be planted, consisting of long-lived and fast-growing species with higher tolerances to urban stresses and optimal potential for carbon sequestration. A robust tree canopy will be provided in year 1 for each phase of the development, with high-performance soils and the planting support of irrigation, aeration and subdrainage below grade. By year 25, and well before, the Volpe development will have one of the most significant and continuous tree canopy systems of any part of Cambridge. Projected canopy in Year 1, Year 10 and Year 25 are shown on **Figures M7 and M8**.

Total DBH on Volpe	2,299"
Significant DBH on Volpe	2,271"









-  ORNAMENTAL TREES IN FAIR OR POOR HEALTH CONDITION
-  ORNAMENTAL TREES IN GOOD HEALTH CONDITION
-  NORWAY MAPLES
-  TREES IN POOR OR FAIR HEALTH CONDITION
-  TREES IN GOOD HEALTH CONDITION
-  CAMBRIDGE STREET TREES IN POOR OR FAIR HEALTH CONDITION
-  CAMBRIDGE TREES IN GOOD HEALTH CONDITION
-  CAMBRIDGE STREET TREES - DEAD



Figure M1: Existing Tree Inventory - Volpe Site

Total DBH on adjacent City R.O.W	1,919"
Significant DBH on adjacent City R.O.W	1,856"


-  ORNAMENTAL TREES IN FAIR OR POOR HEALTH CONDITION
-  ORNAMENTAL TREES IN GOOD HEALTH CONDITION
-  NORWAY MAPLES
-  TREES IN POOR OR FAIR HEALTH CONDITION
-  TREES IN GOOD HEALTH CONDITION
-  CAMBRIDGE STREET TREES IN POOR OR FAIR HEALTH CONDITION
-  CAMBRIDGE TREES IN GOOD HEALTH CONDITION
-  CAMBRIDGE STREET TREES - DEAD



Figure M2: Existing Tree Inventory - City of Cambridge

Total DBH removed	2,089"
Significant DBH removed	2,064"

Volpe Trees	# of Trees
 Trees in Good Health Condition	56
 Trees in Poor or Fair Health Condition	44
 Norway Maples	17
Development Plan Removals	117
Remaining Volpe Trees	11 of 128



Figure M3: Proposed Tree Removal - Volpe Site

Total DBH removed	63"
Significant DBH removed	51"

Cambridge Trees	# of Trees
Cambridge Street - Good	8
Cambridge Street Trees - Fair or Poor	2
Cambridge Street Trees - Dead	1
Development Plan Removals	11
Remaining Cambridge Trees	127 of 138



*TREES TO BE REMOVED WITHIN THE CITY R.O.W. SHALL BE HANDLED THROUGH A SEPERATE PROCESS OF M.G.L. CHAPTER 87

Figure M4: Proposed Tree Removal - City of Cambridge

Total DBH planted	1,066"
Total DBH remaining for mitigation	998"



Type of Tree Canopy	# of Trees
8" DBH Canopy Tree	27
6" DBH Canopy Tree	119
4" DBH Canopy Tree	41
Total Trees	187

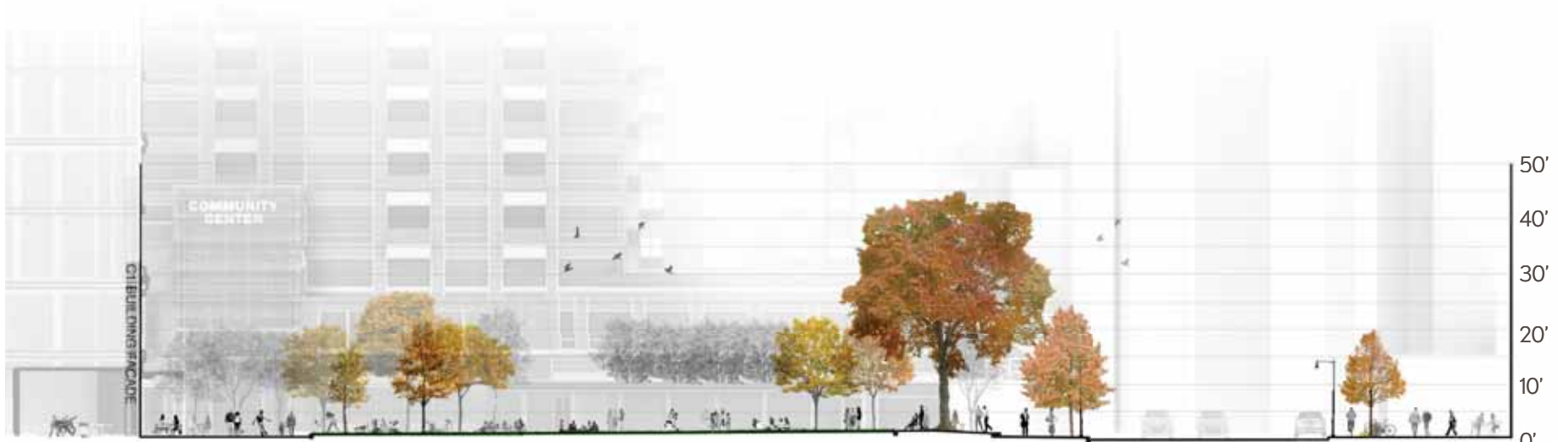
Figure M5: Proposed Tree Plan - Volpe Site

Total DBH planted	222"
Total DBH remaining for mitigation	-129"



Type of Tree Canopy	# of Trees
4" DBH Canopy Tree	34
Total Trees	34

Figure M6: Proposed Tree Plan - City R.O.W



Year 1 |————— New trees in Third Street Park —————||————— Existing trees to remain in Third Street Park and along Third Street ————|

Figure M7: Tree Canopy at Year 1

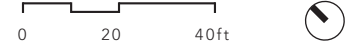
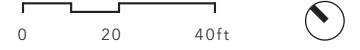




Figure M8: Tree Canopy at Year 10 and Year 25



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N. Urban Design Objectives (City of Cambridge Zoning Ordinance, Section 19.24.4)

The Project embraces each of the seven Urban Design Objectives enumerated within the PUD-7 Zoning. In addition, the proposed Project is consistent with the PUD-7 Zoning and the following documents that collectively comprise the PUD-7 Guidelines and Principles:

- Kendall Square (“K2”) Planning Study and Design Guidelines (2013);
- The Planning and Design Principles established by the City’s Volpe Working Group (2017); and
- Volpe Site Design Guidelines (2017).

Specific descriptions of the Project’s consistency with the PUD-7 Guidelines is covered elsewhere in Volume 1 of this Application under Consistency with Planning Documents. The following is intended to document the consistency between the Project, as hereby submitted for Special Permit Project Review, and the Urban Design Objectives set forth in the PUD-7 Zoning.

1. Responsiveness to the existing or anticipated pattern of development

The overarching goal of the Project is to create a welcoming, connected innovation environment, establishing a vibrant, diverse, inclusive, mixed-use district that provides opportunities for shared discovery, community and collaboration.

The Project is conceived as an interconnected whole made up of streets, parks, urban plazas and passageways which together constitute the civic framework for the Site by connecting it to surrounding neighborhoods. The Project’s diverse, connected network of open spaces is strategically located to draw the public into and through the Development Parcel. Where there is currently an isolated parcel, there will be an extension of the existing city fabric, in which the edges between existing neighborhood and new development are intentionally blurred.

Key to establishing connectivity to both the existing network of streets and to the scale of the surrounding neighborhood is the idea of breaking up the superblock of the Site. By introducing Fifth Street to connect Broadway to Binney Street, the Project reestablishes both a neighborhood scale and an urban pathway that has not existed for 50 years. By extending Broad Canal Way deeply into the Site as a multi-modal, pedestrian-focused street, the Project gives emphasis to the Broad Canal and increases the sense of connectivity to the Charles River.

The components of streets provide opportunities to support local businesses through retail frontage and spillover, while creating spaces for relaxation and gathering and weaving the urban circulation network through the fabric of the City.

2. Embrace and enhance a pedestrian- and bicycle-friendly city

The Project will embrace the unique opportunity to knit the City together by providing north-south connections from the East Cambridge neighborhood to Kendall Square, and east-west connections from the Port and Wellington-Harrington to the Charles River. Sidewalks will be provided along the entire Development Parcel with safe pedestrian crossings at all internal and adjacent intersections. The proposed Project streetscapes must meet the needs of all kinds of users, including bicyclists, pedestrians and vehicles, as they perform daily activities appropriate to an urban context including recreational strolling, walking to/from lunch or striding to/from public transit; bicycling for transportation, pleasure or exercise; and dropping off/picking up users of the Community Center or office, retail and restaurant workers – all while maintaining the Project goals of vibrancy, connectivity and inclusivity.

The Project proposes to locate primary building entries along major streets (Broadway and Binney and Potter Streets) with service access provided from secondary streets. Largely transparent, active places of public accommodation will be located at ground-level (including retail, restaurants, and other active uses), infusing significant street-level activity throughout the Development Parcel. This active ground floor will contribute to the vibrancy

of the district and will foster a sense of security throughout the day and into the night.

Pedestrian circulation paths will follow sidewalks and crosswalks and lead to general entry locations for the proposed buildings. Significant planned pedestrian connections include those crossing Binney Street to the adjacent neighborhood, multiple connections across Third Street to the existing retail and commercial buildings, and connections on the south, crossing Broadway to Main Street and MIT's South of Main campus as well as to the Kendall/MIT Red Line Stations. The pedestrian easement through the Marriott Hotel is an important pedestrian connection between the site and Red Line access on Main Street and connections to it will be maintained and strengthened. MIT is committed to strengthening pedestrian crossings across Broadway between Fifth Street and the Marriott hotel and at the Third Street Park/Galaxy Park intersection, as well as a potential additional mid-block crossing across Broadway between Kendall Way and Ames Street. On the west side of the Development Parcel, the Loughrey Walkway/Kittie Knox Bike Path will remain an important pedestrian pathway along the edge of the proposed development and pedestrian connections to these facilities will be provided from Potter Street extension as well as Broad Canal Way Extension.

Bicycle pathways through and around the Development Site will connect to the East Cambridge bicycle network and will establish connections to public transit lines and to Boston and Somerville. A combination of current and planned bicycle facilities – including bike lanes, cycle tracks and/or multi-use paths – will facilitate these connections. Secondary streets internal to the Development Parcel will utilize shared vehicular and bicycle lanes. Buildings will house indoor bicycle storage in compliance with City requirements and short-term outdoor bicycle parking areas will be located throughout the Development Parcel. The placement of outdoor bike racks will meet zoning requirements regarding distance from entries and offsets from other racks. Existing BlueBike stations will be supplemented by an additional two (2) extra-large 27-dock stations, preliminarily proposed to be located along Broadway at the Third Street Park and along Fifth Street near the Community Center Park, or an alternate location mutually acceptable to the City and MIT. Bluebike valet will also be provided in a location to be mutually selected by City and MIT during the Design Review phases.

The Project contemplates two underground garages – a north garage between Binney and Munroe Streets, and a south garage between Potter Street and Broadway. Parking entrances are limited to four points within the Project, helping to

reduce cross-circulation between pedestrians and vehicles. One garage entrance on Munroe Street, two garage entrances on Potter Street, and one garage entrance on Fifth Street are proposed. The opportunity exists to introduce limited active curbs and short-term on-street parking along Fifth Street and Broad Canal Way, though locations have not been finalized. On-street parking currently exists as either public (Munroe Street) or private (the north side of Potter Street). MIT does not propose eliminating any of these existing on-street parking zones.

In 2019, the Kendall Square Association in partnership with the City and the CRA released the Transport Kendall Report: Actions to Transform Mobility. This report builds on the work of the Kendall Square Mobility Task Force and outlines priority transportation projects for the Kendall Square area. The focus areas include the Grand Junction, MBTA Red Line, and Bus Service. As part of the PUD-7 Zoning, MIT has committed to \$8.5 million for transit improvements to reduce vehicular traffic and another \$8.5 million for design and construction of the Grand Junction Path.

The foremost urban design objective is to ensure that the Site is an integrated part of the City with architecture and landscape design that is welcoming and inclusive. The following criteria are primary:

Connectivity: The framework of the proposed plan is based on connectivity of streets and paths to the surrounding context:

- Fifth Street extended through the site from Binney to Broadway restoring the historic alignment
- Potter Street extended from Fifth Street to Sixth Street Park, Loughrey Walkway/Kittie Knox Bike Path
- Broad Canal Way extended from the Canal and the development east of Third Street to the Sixth Street Park and the open space adjacent to the Loughrey Walkway/Kittie Knox Bike Path.

Grounded in its infrastructure and connections, the Project does not create a separate enclave.

Accessibility: The primary open spaces at Third Street Park, Community Center Park, Sixth Street Park, and Binney Street Pocket Park are connected to the adjacent network of open spaces; they are visible and accessible from public ways and have immediate access to public transit, and these spaces are planned with active edges of retail and restaurants at Third Street Park and Community Center Park and other active use spaces at Sixth Street Park.

Sociability: The majority of street level space is dedicated to food and beverage, retail, maker space, entertainment and other active uses that are open to the public and that will provide the invitation to meet, dwell, and to interact with neighbors, friends and strangers. These facilities of public accommodation are clustered on Broad Canal Way but, in fact, are located on more than one side of all buildings – outward looking to the surrounding neighborhood.

Comfort: Specific landscape design will create comfortable places to sit, to eat, to work or to play.

Openness: Many of the street level shops, restaurants and other active use spaces will be open, transparent and “open-able,” meaning with folding or sliding doors, blurring the line between inside and outside, inviting the guest on the street to enter and engage.

Usability: The open spaces will provide diverse venues for activity ensuring diversity of age, gender and background – venues for play at Sixth Street Park Community Center Park, and Binney Street Pocket Park, venues for dining on Broad Canal Way, Broadway and Fifth Street; venues for leisure at Third Street Park and Volpe Art Walk.

Architectural Character: The guidelines for architectural character describe buildings of appropriate scale at the level of massing with four zones of urban streetwall including pedestrian

frontage, streetwall, tower and top, buildings that are legible related to use, buildings of a materiality and window to wall ratio that is not anonymous or scaleless, that is human scaled and legible.

3. Mitigation of adverse environmental impacts

Overarching project goals include the desire to increase connectivity between the Development Parcel and the surrounding city and to improve the quality, vibrancy, diversity and inclusiveness of the public realm through a network of open space. At the same time, future development must minimize adverse impacts on environmental comfort. The following describes strategies to minimize or mitigate any potentially adverse impacts of the proposed development.

Buildings within the Project will be designed to meet the City's Noise Control Ordinance requirements. Primary elements that contribute to sound generation within an urban development project include mechanical equipment noise, building service and loading activities, and construction activities.

Major mechanical equipment for individual buildings will be located within enclosed rooftop mechanical penthouses and lower-level mechanical service rooms. When large mechanical equipment is located outside, buildings will comply

with the Cambridge Noise Ordinance.

Building loading and service areas are planned to be located off-street, at ground-level, internal to the building footprint. Loading bays will not impinge upon adjacent sidewalk and roadway right-of-ways, and service traffic will be managed to avoid adverse impact on local traffic circulation.

Construction activities associated with the individual buildings and site infrastructure (underground utilities, roadways, and public realm landscape and hardscape features) will temporarily create an increase in noise levels emanating from within the Site. Activities that are likely to generate the highest levels of construction noise include demolition, excavation and foundations. Primary noise-generating construction activities will be limited to daytime hours. MIT will develop a series of mitigation measures, in collaboration with the City, for each of the various construction projects (both building-related and infrastructure-related).

As discussed previously, shadow studies have been performed for the proposed buildings to evaluate the shadow impacts on existing neighboring buildings and on existing and proposed elements of the public realm. The net new shadow falls on both public realm ground plane and on rooftops. Based on the shadow studies, the Project will create a degree of net new shadow consistent with an urban development project of this magnitude.

Significantly, the shadow study supports the placement of a major civic park at the corner of Third Street and Broadway. In addition to being the most public corner of the Development Parcel, existing urban form and solar orientation combine to maximize the hours of direct sunlight on a public park at this location.

The Project's street, sidewalk, pathway and landscape site lighting will provide a sense of comfort, safety and security. A consistent, cohesive approach to illumination and fixture selection will contribute to the connectivity of the open space network within the public realm. Similarly, the interior illumination of active retail, dining and entertainment venues will increase transparency into those public uses, blur the edge between indoor and outdoor space, and heighten the sense of security and neighborhood identity well into the evening. Future building and site design must address these positive attributes while also mitigating light spill, avoiding light pollution, and conforming to applicable night-sky ordinances.

A quantitative pedestrian-level wind study of the proposed Project build-out was conducted by RWDI utilizing wind-tunnel analysis. The study indicated that wind conditions at grade-level on and around the Site are generally predicted to be suitable for the intended uses. There are no locations at which winds are expected to be rated dangerous. The detailed configuration of building massing

and landscape features, as analyzed through wind-tunnel testing, is preliminary. Future design efforts for individual buildings and development-wide streetscape and landscape design will strive to mitigate any marginal conditions.

Urban heat island effects will be mitigated using a hybrid approach. Buildings will employ high-albedo, green roof, blue roof, bio-solar or solar panels, as applicable, to reflect heat and mitigate urban heat island effects in accordance with the requirements of the PUD-7 Zoning. During the building design phases, renewable energy systems for rooftops will be studied in line with Cambridge's recent amendment to Article 22.30 Green Roofs to include Green Roof Area, Biosolar Green Roof Area or Solar Energy Systems, as required for residential and non-residential buildings, on at least 80% of the roof area of each building, after excluding those portions of the roofs identified in Section 22.35.2 of the CZO, including mechanical areas. During the building design process, MIT will determine if Green Roof Area, Biosolar Green Roof Area or Solar Energy Systems are the preferred application. Site hardscape materials will be chosen for high SR/SRI values and permeability attributes. Outdoor spaces with vegetation such as canopy trees, pergolas, trellises, green walls, and other measures are to be considered as means to reduce urban heat gain.

A development of this scale will inevitably have an impact on the existing urban tree inventory. While extensive measures will be taken to ensure the integration and preservation of healthy, mature existing trees (particularly within the new Third Street Park and the existing Loughrey Walkway/Kittie Knox Bike Path), the planned streets, open spaces and buildings will require the removal of 117 private trees on the Volpe property and 11 street trees adjacent to the Site. These removals will be offset by the planting of approximately 221 new trees as part of the Project, resulting in a net gain of 93 trees. The future tree canopy will be diverse and resilient and will provide long-term advantages in terms of greater carbon sequestration, stormwater management and air quality.

To respond to climate change and prepare for projected increases in precipitation, the Project embraces resilient design strategies including elevating mission-critical equipment, residential units, and all building ground floors above the projected 2070 100-year flood elevation; incorporating stormwater mitigation strategies; and providing standby power for mission critical equipment.

4. Mitigation of burden on city infrastructure

As required by the PUD-7 Zoning, all of the Project's buildings will be certified at the LEED Gold level. An integrative sustainable design process is to be utilized in each future building design to ensure that best practices are employed in the design of exterior envelopes, building energy- and water-use systems, site planting, and site stormwater management systems. Construction practices and materials, interior and exterior lighting design, and daylight maximization will all contribute to the ability to achieve certified status under LEED Gold.

The Project has been master planned to maximize energy efficiency and support a path for a net-zero carbon future. The focus throughout the design process for individual buildings will be to drive down projected emissions, both in the manufacture of construction elements and in the long-term operation of the buildings. Residential buildings (approximately 40% of the development) will be all-electric, generating zero on-site emissions from fossil fuel, and commercial buildings will be designed with a path to electrification that will integrate with the long-term vision for a low-carbon power grid. Load sharing between complementary building programs will be explored to maximize heat exchange and optimize energy performance across the Site. On-site rooftop photovoltaic (PV) arrays, supplemented by procurement of

off-site renewable energy, will be explored during individual building design as a means of offsetting the Project's electricity use.

The Project will include one of only three blackwater treatment systems in New England, enabling 100% of all eligible building wastewater flow to be treated and reused on-site, thereby removing approximately 240-250,000 gallons per day from the city's sanitary sewer system. The collection, treatment, and reuse of all available greywater and blackwater in three phased district blackwater treatment plants will minimize potable water consumption, improve self-sufficiency of the district, and mitigate the impact of the development on regional sewer systems.

To respond to the changing climate and prepare for projected increases in precipitation, the Project will embrace resilient design strategies including elevating mission-critical equipment, residential units, and all building ground floors above the 2070 100-year flood elevation; incorporating stormwater mitigation strategies; and providing standby power for mission critical equipment. To minimize risks associated with projected temperature increases, the Project will aim to reduce urban heat island effect through high-albedo roofing and paving and minimize cooling loads by insulating and shading building facades.

5. Reinforcement of the urban framework of Cambridge

The introduction of active ground floor uses on four sides of the proposed new buildings, such as retail, entertainment and makerspaces, will energize each block, engage with the surrounding neighborhood and will be specific to Kendall Square and East Cambridge. The diverse mix of residential, lab, office, retail and community uses will enable the Project to become part of the neighborhood and seamlessly integrated into the city.

The Project is consistent with the Special Requirements of Section 13.96.3 to require an area equal to at least five percent (5%) of the office and R&D space contained within new buildings as Innovation Space, either within the development or in the vicinity, and subject to the area and lease duration limitations set forth in the PUD-7 Zoning. Innovation space dedicated to small business incubators and entrepreneurs will encourage residents to participate in the local innovation economy and foster the cross-disciplinary interaction that has made Kendall Square famous.

The inclusion of up to 100,000 square feet of largely transparent, active places of public accommodation located at street level (including retail, restaurants, and other recreational uses) will infuse significant street-level activity throughout the Site and serve

to blur the boundary between inside and outside, energizing both. This ground floor retail and active use space is an integral component of the Project. It will contribute to the vibrancy and inclusiveness of the district, foster a sense of security throughout the day and into the evening, and provide venues for both planned and serendipitous social and intellectual interaction to occur. Small, local, independent retail businesses will create the sense of neighborhood, and connectivity to greater Cambridge will be amplified.

6. Expansion of housing inventory

Consistent with the PUD-7 Zoning requirements, at least 40% of the non-exempt GFA included in the Project is devoted to residential use. This equates to approximately 1,400 units of new housing located throughout the four residential buildings. Twenty percent (20%) of the net residential unit square footage of each building will be designated as affordable. The Project also includes 20 middle-income units that will be affordable to eligible renters with incomes of 80% to 120% of the Area Median Income. The Project will include three-bedroom units to encourage families to live in the district. In addition, 5% of the net square footage of the net residential unit square footage is devoted to Innovation Units, defined as 350 to 450 SF, to further assist with affordability and diversity of housing on the Site.

The location of residential parcels between Potter Street and Broad Canal Way and at the corner of Binney and Third Streets will establish relationships of use to neighboring residential buildings, most importantly the 303 Third Street residences.

Housing will have a major impact within the overall development in terms of scale, urban presence and adjacency to open space. The Inclusionary Housing provisions will ensure that the residential nature of the project will relate to an appropriately broad cross-section of the Cambridge population.

7. Enhancement and expansion of open space

The Project's highly interconnected and differentiated network of public realm spaces—its streets, squares, parks, and courts—constitute the plan's fundamental organizing principle. It maximizes permeability for pedestrians, cyclists, workers, residents and neighbors. It emphasizes both solar exposure and the development of a long-term urban tree canopy throughout.

Third Street Park, a major urban park, will be located at the most public corner of the development – a direct response to community input – with streets on three sides and southeast location that maximizes its solar exposure. Linear open spaces at the Sixth Street Park and Loughrey

Walkway/Kittie Knox Bike Path, and at the Fifth Street Promenade, will connect Binney Street to Broadway and East Cambridge to Kendall Square. This series of significant open spaces establishes a network that permeates the Site while being intentionally open along the Site's perimeter – at Third Street Park, at Sixth Street Park, at the Community Park, and at the Pocket Park between Binney Street and Munroe Street. When completed by the Federal government, the Volpe Art Lawn will

create an urban green space that is openly shared with neighboring buildings and streets, becoming part of this continuous network of fully public open spaces.

The streets, courts, and squares will support a wide range of outdoor uses, and they will be enlivened by pedestrian-oriented functions located on the ground floors of the surrounding buildings.

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O. Infrastructure Plan and Narrative

Sewer Service Infrastructure Narrative

The sanitary sewage from the Project will be collected within the Development Parcel and ultimately discharged into the existing municipal sewer mains abutting the Development Parcel. The Project is proposing to greatly reduce the total sewer generation by the installation of blackwater treatment systems, which are proposed to collect and treat sanitary sewage on-site and re-use water for irrigation and cooling tower demand purposes.

The southern half of the Development Parcel will discharge to the 22-inch sewer main within Broadway, and the northern portion of the Development Parcel will discharge to the 28-inch by 32-inch sewer main within Binney Street via the 24-inch Fifth Street sewer main. MIT is actively working with the City's Department of Public Works (DPW) to coordinate the new sanitary connection locations. **Figure 01: Existing Utilities Plan** depicts the existing utilities within and abutting the Development Parcel, while **Figure 02: Conceptual Infrastructure Plan** depicts the conceptual utility service locations connecting to the abutting roadways from the Development Parcel.

The Project is expected to generate a greater quantity of wastewater flow than is produced on the Site today. Based on 314 CMR 7.00, the Commonwealth's Sewer System Extension and Connection Permit Program, the Project will

generate approximately 450,000 gallons per day (GPD) of new sanitary sewage without the proposed blackwater treatment systems, as shown in Table 1, provided below in detail on a preliminary basis. The calculation reflected within Table 1 is based on the Conceptual Project program and may be subject to change during final design of the individual buildings.

The existing buildings on the Site generate approximately 26,990 GPD and have been previously accounted for within the recent development of the US DOT Volpe Exchange Project. The existing Site sewer generation is not counted against the new sewer generation for the Project.

The Project is proposing a phased on-site blackwater treatment system at three locations within the first level of the subsurface garage. The southern garage is located adjacent to Broadway with two blackwater systems proposed, and the northern garage is located adjacent to Binney Street with a single blackwater system proposed. The blackwater treatment systems are anticipated to collect, treat, and re-use all eligible sanitary sewerage discharging from the Project. The treated blackwater flow will be re-used for cooling tower demand and toilet flushing purposes within the Project. The blackwater treatment system is a sustainable measure, which is anticipated to greatly reduce on-site sanitary sewage discharge into the municipal sewer system, in addition to

reducing potable water demand for the Project.

The proposed blackwater treatment systems have been sized to collect all non-lab use sanitary sewerage flow. This includes two proposed systems on the southern site totaling a preliminary reduction of approximately 195,000 - 205,000 GPD of sanitary sewer flow. The northern site includes a single proposed system with a preliminary reduction of approximately 45,000 GPD of sanitary sewer flow. In total, the three proposed blackwater treatment systems will total a preliminary reduction of approximately 240,000 - 250,000 GPD of sanitary sewer flow discharging into the municipal sewer system. At the time of this document filing, the blackwater treatment system proposed will be the largest urban district-scale system to be installed in the northeast.

The conceptual program uses depicted within Table 1 are used as a preliminary basis for the sanitary sewer generation calculation. These uses may change as the individual building design develops and may include additional wet lab use. The final calculations will be closely coordinated with DPW and will be reviewed at the time of building permit submission.

The wastewater flow generation threshold for Cambridge DPW Inflow/Infiltration (I/I) mitigation is 15,000 GPD. MIT has begun and will continue discussions with Cambridge DPW to identify an

applicable I/I mitigation project for the Project. Based on conversations to date, MIT expects Cambridge DPW to grant an I/I credit for the reduction in sanitary sewer flow discharging into the Cambridge DPW municipal system. MIT will continue to identify an applicable I/I project with Cambridge DPW, for the significantly reduced sanitary sewer flow entering the City's municipal system.

The blackwater system will reduce the overall sanitary flow into the City's sanitary system, and it will result in significant sewer abatements that will offset this significant capital infrastructure investment.

Table 1 - Conceptual Project Program Wastewater Flows

Proposed Program	Unit / Area	DEP Category	Generation Rate*	Total Generation (GDP)	
Building R1/ Community Center					
Residential	305 Beds	Residential House	110 GPD / Bed	33,550	
Lobby/BOH	12,823 SF	Office Building	75 GPD / KSF	962	
Retail	2,500 SF	Retail Store	50 GPD / KSF	125	
Fitness	500 Lockers	Lockers & Showers	20 GPD / Locker	10,000	
Restaurant	233 Seats	Restaurant	35 GPD / Seat	8,155	
				Total	52,792
Building R2					
Residential	495 Beds	Residential House	110 GPD / Bed	54,450	
Lobby / BOH	19,036 SF	Office Building	75 GPD / KSF	1,428	
Retail	2,000 SF	Retail Store	50 GPD / KSF	100	
Fitness	100 Lockers	Lockers & Showers	20 GPD / Locker	2,000	
Restaurant	100 Seats	Restaurant	35 GPD / Seat	3,500	
				Total	61,478
Building R3					
Residential	715 Beds	Residential House	110 GPD / Bed	78,650	
Lobby / BOH	27,612 SF	Office Building	75 GPD / KSF	2,071	
Entertainment Venue	550 Seats	Movie Theater	5 GPD / Seat	2,750	
				Total	83,471
Building R4					
Residential	375 Beds	Residential House	110 GPD / Bed	41,250	
Lobby / BOH	14,534 SF	Office Building	75 GPD / KSF	1,090	
Fitness	60 Lockers	Lockers & Showers	20 GPD / Locker	1,200	
Restaurant (Fast Food)	67 Seats	Restaurant - Fast Food	20 GPD / Seat	1,340	
				Total	44,880
Retail Pavilions					
Restaurant (Fast Food)	117 Seats	Restaurant - Fast Food	20 GPD / Seat	2,340	
				Total	2,340
Building C1					
Office	282,817 SF	Office Building	75 GPD / KSF	21,211	
Wet Lab	93,902 SF	Lab**	200 GPD / KSF	18,780	
Lobby / BOH	28,355 SF	Office Building	75 GPD / KSF	2,127	
Retail	7,500 SF	Retail Store	50 GPD / KSF	375	

Proposed Program	Unit / Area	DEP Category	Generation Rate*	Total Generation (GDP)
Fitness	20 Lockers	Lockers & Showers	20 GPD / Locker	400
Restaurant	283 Seats	Restaurant	35 GPD / Seat	9,905
Restaurant (Fast Food)	100 Seats	Restaurant - Fast Food	20 GPD / Seat	2,000
Total				54,798
Building C2				
Office	351,274 SF	Office Building	75 GPD / KSF	26,346
Wet Lab	104,970 SF	Lab**	200 GPD / KSF	20,994
Lobby / BOH	34,341 SF	Office Building	75 GPD / KSF	2,576
Retail	5,500 SF	Retail Store	50 GPD / KSF	275
Restaurant	233 Seats	Restaurant	35 GPD / Seat	8,155
Restaurant (Fast Food)	83 Seats	Restaurant - Fast Food	20 GPD / Seat	1,660
Total				60,006
Building C3				
Office	318,428 SF	Office Building	75 GPD / KSF	23,882
Wet Lab	100,083 SF	Lab**	200 GPD / KSF	20,017
Lobby / BOH	31,501 SF	Office Building	75 GPD / KSF	2,363
Retail	1,000 SF	Retail Store	50 GPD / KSF	50
Fitness	100 Lockers	Lockers & Showers	20 GPD / Locker	2,000
Restaurant	33 Seats	Restaurant	35 GPD / Seat	1,155
Total				49,467
Building C4				
Office	214,015 SF	Office Building	75 GPD / KSF	16,051
Wet Lab	112,602 SF	Lab**	200 GPD / KSF	22,520
Lobby / BOH	24,584 SF	Office Building	75 GPD / KSF	1,844
Retail	5,000 SF	Retail Store	50 GPD / KSF	250
Total				40,665
Total New Flow				449,897
Existing Sewer Flow				N/A
Net New Sewer Flow				449,897
Proposed Water Demand***				494,887
<p>*314 CMR7.00 Sewer System Extension and Connection Permit Program. **Extrapolated lab use rate based upon similar City of Cambridge Projects. ***Proposed water demand based on estimated sewage generation with a factor of 10 percent for consumption.</p>				

Stormwater Infrastructure Narrative

The proposed stormwater management system will be designed to comply with the City standards and the MADEP Stormwater Management Policy for new construction projects. As currently proposed, the stormwater runoff from the Project will be collected on the roof of each building, with gravity flow discharge to nearby infiltration systems to promote groundwater recharge and reduce the total phosphorus load for the Development Parcel. The proposed roadway catch basins, and site/landscape area drains will be collected within the subsurface garage, and will be directed to a network of subsurface detention systems within the garage structure. These systems are designed to temporarily detain a portion of the stormwater runoff volume to reduce the peak rate of stormwater into the City's municipal stormwater system. These detention systems will be pumped to nearby proprietary water quality units to reduce total phosphorus load for the Development Parcel.

The Project will be designed to comply with DPW Stormwater Management Guidance. MIT intends to review the applicability of managing stormwater for the difference in volume between the 2-year, 24-hour, pre-construction runoff hydrograph and the post-construction 25-year, 24-hour, runoff hydrograph with Cambridge DPW. During a meeting held on October 27, 2020; DPW noted that the applicability of this requirement may

not provide an overall system benefit, given the proximity to the 54-inch Broad Canal Stormwater Outfall. MIT is currently proposing to achieve this design guideline with the use of infiltration systems in open site areas, and stormwater detention tanks within the subsurface garage. The applicability of this standard will be reviewed in concert with Cambridge DPW for the Project and on a system-wide basis.

MIT is anticipating reviewing the ability to incorporate natural stormwater systems into the stormwater management plan, based on feedback given during the October 27, 2020 DPW design review meeting. This would include natural stormwater systems in open space and maximizing natural stormwater systems within the Broad Canal Way Extension to celebrate the former Broad Canal to the maximum extent practicable. With the Development Parcel being an urban environment with a subsurface garage proposed below Broad Canal Way, natural stormwater solutions will present some design challenges.

MIT will work with DPW to find stormwater solutions that expect to yield improvements to the performance of the Development Parcel. This could include added pervious area or additional green roof area as practical.

The 2-year and 25-year rainfall depths used to determine the Site peak discharge rates were

supplied by the DPW in January of 2020 and are based on the predicted 2030 rainfall depths for the City of Cambridge. The 10-year and 100-year rainfall depths used to determine the Site peak discharge rates were taken from the National Oceanic and Atmospheric Administration (NOAA) Atlas Type III, 24-hour historic storm events data for Boston (Station – Boston Logan International Airport). The Project will review and analyze the City of Cambridge 2070 rainfall events provided in December 2020. The final design of the proposed stormwater management systems anticipates utilizing the Cambridge 2070 storm events as a basis for design, as provided by the DPW.

Runoff coefficients for the existing and proposed conditions were determined using NRCS Technical Release 55 (TR-55) methodology as provided in HydroCAD. The HydroCAD model is based on the NRCS Technical Release 20 (TR20) Model for

Project Formulation Hydrology. The preliminary results for the existing condition are summarized below in Tables 1 & 2, based on the above noted rainfall events.

The Project is expected to increase the area of pervious surfaces and decrease the area of impervious surfaces as compared to the existing conditions, resulting in a reduced overall runoff volume. Additionally, the Project will propose structural water quality units that will treat stormwater runoff and achieve the Cambridge DPW recommended removal rates of Phosphorus, Total Suspended Solids and other waterborne pollutants. MIT proposes phosphorus removal of 65% by reducing impervious area and utilizing structural BMPs, in addition to natural stormwater systems.

Table 2 - Existing Peak Stormwater Discharge Rates (cfs*)

Existing	2-Year (3.34")	10-Year (4.97")	25-Year (7.25")	100-Year (7.88")
C1/R1/CC	10.41	16.58	25.09	27.42
C2/R2	8.25	12.68	18.80	20.48
C3/R3	6.63	11.00	17.07	18.73
C4/R4	4.99	7.86	11.80	12.89

Table 3 - Existing Stormwater Volume Analysis (cf)

Existing	2-Year (3.34")	10-Year (4.97")	25-Year (7.25")	100-Year (7.88")
C1/R1/CC	31,893	52,133	80,921	88,922
C2/R2	26,117	41,211	62,474	68,363
C3/R3	19,956	33,807	53,761	59,333
C4/R4	15,444	24,949	38,420	42,158

Water Service Infrastructure Narrative

The estimated domestic water demand for the Project is based on the projected new approximate daily wastewater flow for the Project. As shown in Table 1 above, the Project's approximate domestic water demand is 495,000 GPD. The proposed on-site blackwater treatment systems will reduce the proposed water demand for the Project by re-using sanitary discharge for use as cooling tower demand and toilet flushing purposes within the proposed buildings. As a sustainable measure, the proposed potable water demand from the Project will be reduced by approximately 264,000 to 275,000 GPD by the installation of the blackwater treatment systems. This substantial benefit to the City's water demand will be reviewed with the Cambridge Water Department.

Domestic water will be supplied to the proposed buildings via existing and new water mains. MIT proposes to connect the existing 16-inch water main in Broadway to the existing 16-inch water main in Third Street via a new private water main. This main will be located towards the western garage face adjacent to the proposed buildings R3 and C3 and within Potter Street, to create a continuous supply loop. Most of the buildings on

the Development Parcel will be supplied with domestic services branching off the new 16-inch water main. MIT also proposes to connect into the existing 16-inch water main in Binney Street and the existing 16-inch domestic water main in Broadway.

The project will coordinate with CWD the discontinuance of the 6-inch water main within Fifth Street through the project site in-between Munroe Street and Binney Street, during final design. This discontinuance has been partially completed at the Munroe Street intersection. The Project anticipates completing the discontinuance of the 6-inch Fifth Street water main in close coordination with CWD, which may involve scope at the Binney Street water main at an isolated location.

The Project will require fire protection services which will tie into the same municipal water mains that will supply domestic water service and include butterfly valves and redundant services as required by the City Water and Fire Departments. Prior to construction, hydrant flow tests will be completed on various fire hydrants adjacent to and within the Development Parcel to verify adequate flow and pressure for the Project's sprinkler systems.

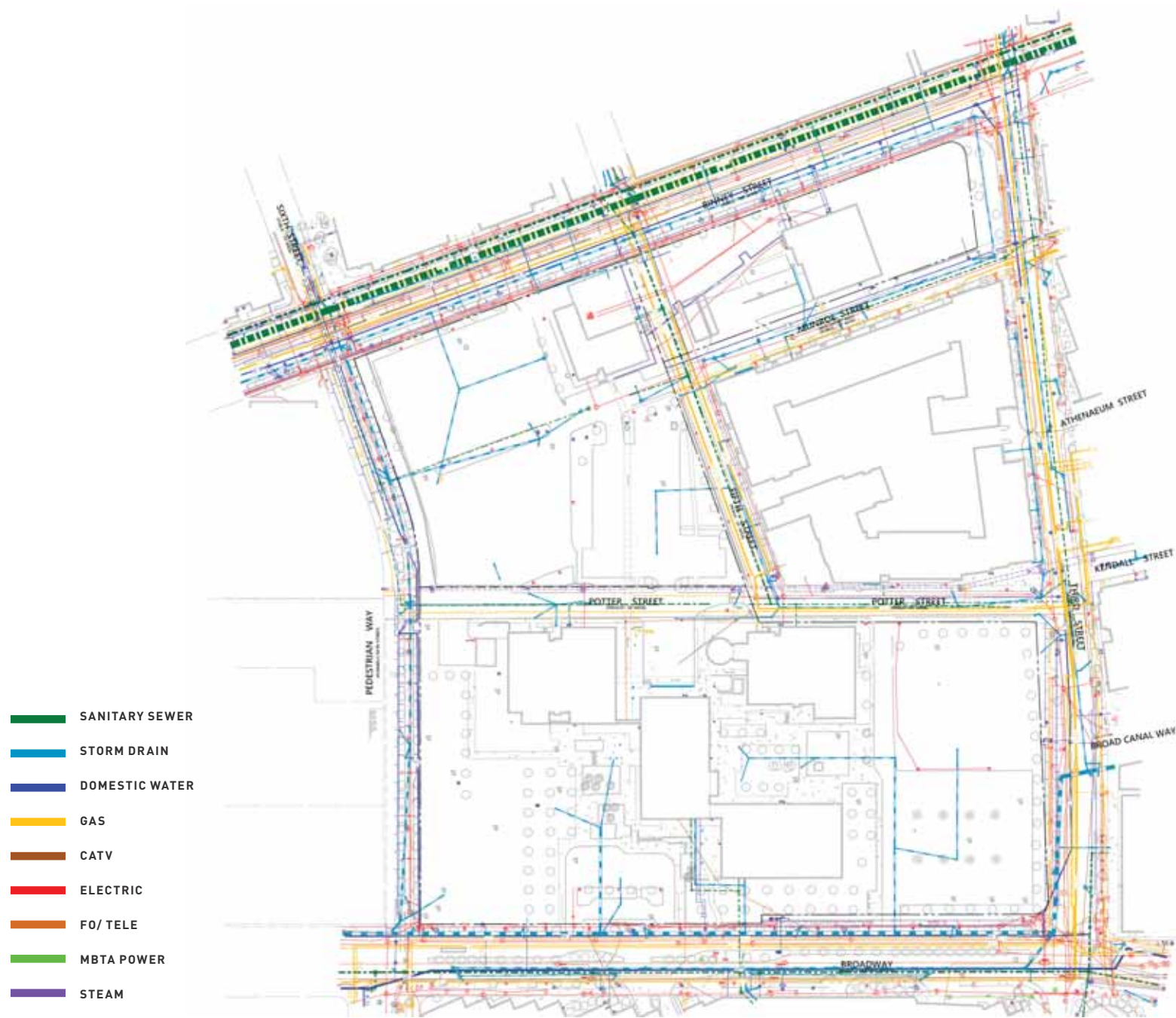


Figure 01: Existing Utilities Plan





Figure O2: Conceptual Infrastructure Plan

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